Assessment of Groundwater Potential in Data Scarcity Situation in Southern Laos

by

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A thesis submitted in fulfilment of the requirements for the

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Certificate of Original Authorship

I, Sinxay Vongphachanh declare that this thesis, is submitted in fulfilment of the requirements for the award of the degree of doctor of philosophy, in the School of Civil and Environmental Engineering, Faculty of Engineering and Information Technology at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise reference or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

This research is supported by the Australian Government Research Training Program.

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Abstract

Water is a vital natural resource that is needed for the sustainability of the hydro-environment and also for socio-economic development. In many developing nations, however, data necessary for assessing the available water resources and for planning the sustainable utilisation of these resources are lacking. Arising from increased population pressures in the Sukhuma District of Southern Laos, there is a need to assess the available water resources. Of particular concern is the interaction between surface water and groundwater together with the implications of this interaction on assessing sustainable water usage.

The focus of the research presented herein is the utilisation of available data to assess the seasonal interaction of surface water and groundwater in the Sukhuma District. In addition, a water balance model was developed to enable the assessment of the sustainable water resources available for anthropogenic activities. These research activities can be expressed as data-mining of the available data for information.

The available field data comprised short-term rainfall records, streamflow records, and groundwater levels collected over non-consistent time periods; in other words, no period contained data from all three sources. This limited field data was supplemented by remotely sensed data. However, the scales of the remotely sensed data and the field data differed, requiring down-scaling of the remotely sensed data. Data from the Gravity Recovery and Climate Experiment (GRACE) and from the Global Land Data Assimilation System (GLDAS) database were used for this purpose.

It was found that the remotely sensed data could be down-scaled to be consistent with the region of interest. Additionally, it was found that there was good agreement between the characteristics of the interaction between the surface water and groundwater predicted by both the water balance model and the remotely sensed data. Arising from the analysis of this interaction, it was found that groundwater recharge in Sukhuma District was 3 – 4% of annual rainfall with a lag of two to six weeks (average 3 weeks) between the wet season start and a rise in groundwater levels.

As shown in this research, non-traditional and traditional data sources can be combined in a manner leading to extraction of the available information in an efficient manner.

Preface

This dissertation is submitted for the degree of Doctor of Philosophy at the University of Technology Sydney, Sydney, Australia. The candidate had worked on the research under the supervision of a principal supervisor, Professor James Edward Ball, and associate supervision of Doctor William Milne-Home, Professor Ashim Das Gupta, and Doctor Paul Pavelic.

During this study, several publications have been written by the candidature as follows (the full papers and the abstracts are provided in Appendix 1):

Journal paper:

Vongphachanh, S., Das Gupta, A., Milne-Home, W., Ball, J.E. & Pavelic, P. (2017a), *Hydrogeological reconnaissance of Sukhuma District, Champasak Province, Southern Laos,* Journal of Hydrology, 56 (2), ISSN: 0022-1708, pp. 79-96.

Conference papers:

Vongphachanh, S., Milne-Home, W., Ball, J.E., Das Gupta, A. & Pavelic, P. (2018b). Estimation of soil infiltration and groundwater recharge in Sukhuma District of Southern Laos. *21st Congress of International Association for Hydro-Environment Engineering and Research (IAHR), Asia Pacific Division (APD), in conjunction with 6th Regional Conference on Natural Disaster (RCND): "Multi-perspective Water for Sustainable Development"*. Yogyakarta, Indonesia. 2 - 5 September 2018. 21st IAHR-APD Congress 2018.

Vongphachanh, S., Milne-Home, W., Das Gupta, A. & Ball, J. (2017b). Seasonal groundwater level fluctuations in Sukhuma District of Southern Laos. *37th IAHR World Congress*. Kuala Lumpur, Malaysia. 13 – 18 August 2017. 37th IAHR World Congress. ISSN: 1562-6865.

Vongphachanh, S., Milne-Home, W. & Ball, J.E. (2016). Groundwater recharge estimation in Sukhuma district, Champasak province, Southern Laos: A preliminary assessment. *37th Hydrology & Water Resources Symposium 2016: Water, Infrastructure and the Environment, Water infrastructure and the environment conference*. Millennium Hotel, Queenstown, New Zealand. 28 Nov-2 Dec 2016. ACT: Engineers Australia. Barton. ISBN: 9781922107954. pp. 580-587.

Conference oral presentations (Abstract):

Vongphachanh, S., Ball, J.E., Das Gupta, A., Milne-Home, W. & Pavelic, P. (2018a). *Water balance method estimation of groundwater recharge in Sukhuma District of Southern Laos.* The 8th IAHR International Groundwater Symposium on the Global Change Challenges: Water Security and Sustainability on 17 - 20 October 2018, Nanjing, China [Online]. Accessed 25 October 2018. Available: *http://gccwss2018nkg.mymova.com/*.

Vongphachanh, S., Milne-Home, W., Das Gupta, A., Ball, J. & Pavelic, P. (2017c). *Seasonal groundwater storage fluctuation in Sukhuma District of Southern Laos by field assessment and remote sensing.* Australasian Groundwater Conference 2017 on 11 - 13 July 2017. [Online]. Accessed 13 August 2017. Available: http://agc-2017.p.agc2017.currinda.com/days/2017-07-12/abstract/123#.

Conference posters:

Vongphachanh, S. (2016). Comparison of seasonal total water storage variations from GRACE with groundwater levels, streamflow and soil moisture in southern Laos. *ASEAN-EU Science, Technology and Innovation Days 2016*. Hanoi, Vietnam. 10 - 12 May 2016. ASEAN-EU Science, Technology and Innovation Days 2016. ISBN: 978-963-12-5525-6. pp. 118.

Vongphachanh, S. & Milne-Home, W. (2015). GRACE detection of seasonal variations in total water storage in southern Lao PDR*. 5th GEOINDO2015*. Khon Kaen, Thailand. 23-24 November 2015. pp. 148.

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List of Abbreviations

Abbreviation	Description
ACIAR	Australian Centre for International Agricultural Research
CSR	Center for Space Research
CWS	Canopy water storage
CWSA	Canopy water storage anomaly
DAFO	District Agriculture and Forest Office
DEM	Digital Elevation Model
DLR	German Aerospace Centre
DMH	Department of Meteorology and Hydrology
DOB	Deep Observation Bore
Dom	Domestic bore
DoNRE	District Office of Natural Resources and Environment
EC	Electrical Conductivity
EGSIEM	European Gravity Service for Improved Emergency Management
FAO	Food and Agriculture Organization
GFZ	GeoForschungsZentrum
GLDAS	Global Land Data Assimilation System
GLDAS(CWS)	Canopy water storage derived from GLDAS
GLDAS(ET)	Evapotranspiration derived from GLDAS
GLDAS(Q_{SR})	Surface runoff derived from GLDAS
GLDAS(Q_{SubR})	Subsurface runoff derived from GLDAS
GLDAS(SM)	Soil moisture derived from GLDAS
GLDAS-2	GLDAS version 2.0
GLDAS-2.1	GLDAS version 2.1
GPS	Global Positioning System
GRACE	Gravity Recovery and Climate Experiment
GRGS	Groupe de Recherche de Geodesie Spatiale
GSFC	Goddard Space Flight Center

Abbreviation	Description
GWSA	Groundwater storage anomaly
IWMI	International Water Management Institute
JICA	Japan International Cooperation Agency
JPL	Jet Propulsion Laboratory
KMR	Khamouan River
LSM	Land Surface Model
MRC	Mekong River Commission
NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency
NCEP	National Centers for Environmental Prediction
NOAA	National Oceanic and Atmospheric Administration
PoNRE	Provincial Office of Natural Resources and Environment
SCS–CN	Soil Conservation Services – Curve Number
SKM	Sukhuma District
SOB	Shallow Observation Bore
TRMM	Tropical Rainfall Measuring Mission
WTF	Water Table Fluctuation
SP	Soil sample
Mz1	Mesozoic
N2-Q	Alluvial sediments
bgl	Below ground level
E_{soil}	Evaporation from soil
E_{SW}	Evaporation from surface water
ET	Evapotranspiration
ET_0	Reference crop evapotranspiration
EWH	Equivalent Water Height
I	Infiltration
G_{in}	Lateral groundwater inflow

Abbreviation	Description
G_{out}	Lateral groundwater outflow
K	Hydraulic conductivity
K_C	Crop coefficient
Q_{bf}	Baseflow
Q_{DR}	Direct runoff
Q_{IF}	Interflow
Q_{SR}	Surface runoff
Q_{TSW}	Total stream outflow
Q_W	Groundwater abstraction
R	Groundwater recharge
R^2	Correlation coefficient
SM	Soil moisture
SMSA	Soil moisture storage anomaly
SWSA	Surface water storage anomaly
S_y	Specific yield of aquifers
$\bar{S}_y$	Averaged specific yield
TWSA	Total Water Storage Anomaly
$\bar{P}_{nm}$	Normalized dimensionless Legendre function of degree n and order m
$\hat{\theta}$	Co-latitude
$\acute{\lambda}$	Longitude
$\Delta\tilde{C}_{nm}$ and $\Delta\tilde{S}_{nm}$	Residual Earth surface density coefficients
$\acute{R}$	Mean radius of the Earth
ρ_e, ρ_w, and k_n	Mean density of the Earth, density of water, and load Love number for degree n, respectively
$\Delta\bar{C}_{nm}$ and $\Delta\bar{S}_{nm}$	Stokes coefficients
$\bar{C}_{nm}$ and $\bar{S}_{nm}$	Long-term average of Stokes coefficients

Chapter 1 : Introduction

1.1. Background and Problem Statement

Water is a vital natural resource that is required for maintaining the environment, particularly the hydro-environment, and to support a nation's social and economic development. Sustainable water resources management, therefore, is necessary if this need is to be achieved over long-periods of time. Sustainable water resources management, in this context, can be defined as ensuring there are adequate supplies of fresh clean water for the natural environment and for anthropogenic activities now and into the future (Russo et al., 2014). The future availability of fresh clean water will be changed through natural variations and also by human impacts (anthropogenic activities) (Rockström et al., 2009). Hence, the manner that water is managed today can influence the availability and quality of water for all users into the future.

A common classification of countries is into those that are developed and those that are developing; for example, refer to World Bank (2018) for one such classification. Management of the available water resources in developing countries is important if the current rate of socio-economic development is to be maintained. Laos has been defined as a developing country and therefore needs to consider how it manages its available water resources in a sustainable manner.

Laos is recognized as a water-rich country in Southeast Asia, with fresh surface water resources estimated at 54,565 m^3 per annum per capita (FAO, 2011). It is a landlocked country located on the Indochinese Peninsula in Southeast Asia, with a total area of 236,800 km^2. It shares borders with Thailand to the west, Myanmar to the northwest, China to the north, Vietnam to the east, and Cambodia to the south *(Figure 1.1)*. About 80 percent of the country's area is mountainous, particularly in the north and east, as shown in *Figure 1.1*. The climate is typically tropical and consists of two seasons, namely, a rainy season from May to October and a dry season from November to April. The average annual rainfall is 1,834 mm but ranges from 1,300 mm to 3,700 mm per annum (FAO, 2011). Some 80 percent of rainfall occurs in the rainy season. Laos had a population of 6.8 million in 2017 (Lao statistics Bureau, 2018b). About 70 percent of the population live in rural areas and earn their livelihood as subsistence farmers, primarily from the production of rice (Lao statistics Bureau, 2018a).

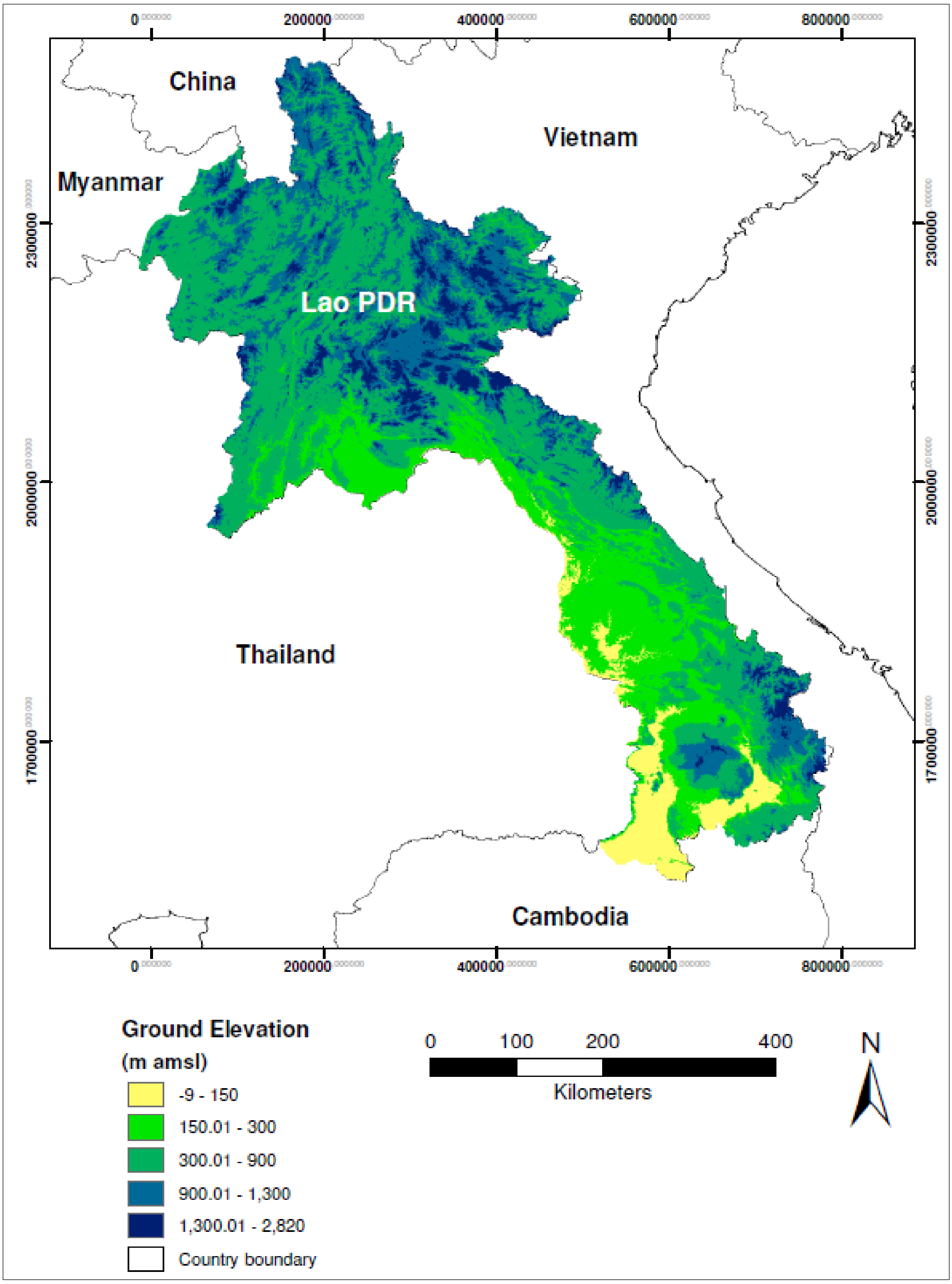


Figure 1.1: Map of Laos

In Laos, groundwater is the main water supply source for household water use, particularly in rural areas (Viossanges et al., 2017). Recent studies by Serre (2013) and Vote et al. (2014) on household groundwater use in Vientiane and Champasak Provinces indicated that groundwater abstraction from wells is tending to increase. This increasing use of groundwater may lead to local depletion of the resource. However, groundwater and associated management studies are lacking and hence there are limited data to inform management practices.

Groundwater depletion is currently not a major concern for Laos. This perception arises from the view that groundwater resources are vast, as reported in Johnston et al. (2012). However, increasing demand will put pressure on water resources generally and groundwater resources in particular (Lacombe et al., 2012; WEPA, 2015). Alley (2007) pointed out that depletion of only a portion of groundwater may affect environmentally sensitive ecosystems. A consequence of this finding is that not all the groundwater resources can be developed.

In addition, a common premise for sustainable use of groundwater resource is to limit usage to the long-term recharge of the groundwater system from upstream regions and precipitation. Hence there is a need to quantify the long-term recharge of the groundwater thereby providing knowledge of sustainable groundwater availability.

Sustainability of groundwater resource can be undertaken at a number of scales in both space and time dimensions. A good knowledge of the seasonal dynamics is required when the local hydro-environment has district wet and dry seasons. This knowledge and understanding must be considered in properly managing a groundwater system.

Recent studies in Laos and elsewhere provide insight into the effects of climate change on rainfall patterns and water systems across the region (Thompson et al., 2014b). Projections for 2050 indicate that Champasak province and the Southern region of Laos will likely be affected by increased maximum temperatures of up to 3°C above the normal maximum temperature range from 32°C to 37°C and increased precipitation (+175 mm/year) (Meynell et al., 2014). These changes will lead to higher evapotranspiration in the dry season and would diminish the surface water availability in Southern Laos, which could result in significant stress on agricultural crops and other livelihood systems. Therefore, groundwater sources would play a crucial role in amending this vulnerability and make water supply systems for domestic, agricultural and industrial users more resilient. The groundwater recharge rates and its processes should be clearly understood to provide useful information for planning long-term water resources management for the region.

A combination of groundwater and surface water management in Southern Laos has been a challenge due to limited scientific studies and information in the region. Pavelic et al. (2014) and Vote et al. (2014) pointed out that accurate scientific information on the interactions between surface water and groundwater both spatially and temporally is urgently needed to support water allocation planning, management and sustainable development in Laos. The paucity of groundwater and related data and knowledge gaps constrain the development of policies for the sustainable management of water resources. In addition and in general terms, Barthel (2014) stated that an adequate understanding of the regional hydrogeology is fundamental for accuracy in quantifying the groundwater availability. Winter et al. (1998) reported that topography and hydrogeology play a fundamental role in defining the forms of surface water and groundwater exchanges, and estimates of the total water storage in a basin area. Also, any alteration of the water balance may potentially threaten the availability of surface water and groundwater. Therefore, the hydrogeological and hydrological frameworks of a basin or a region should be clearly understood as a basis for further research and management recommendations.

While this project aims at providing a sustainable groundwater resource management plan, the focus of the research presented herein is on suitable approaches for development of an understanding of groundwater resources for those environments where the available hydrologic data are inadequate for this purpose. This inadequacy can arise from the lack of field data and from the lack of remotely sensed data at a suitable scale; both sources of inadequacy are present in the Sukhuma District.

1.2. Outline of Project and Research

According to the previous projects and studies on the hydrogeology in the Sukhuma District of Southern Laos, there is an incomplete understanding of seasonal groundwater and surface interactions, hydrogeological characteristics, groundwater recharge and seasonal fluctuations of total water storages in Sukhuma District. Therefore, reviewing and extending this understanding could be useful for estimating the groundwater and surface water availability and changes in the region. Adequate understanding of the seasonal fluctuations of total water storage and the groundwater recharge rate would provide crucial information for sustainable water resources development in the Sukhuma District, and help to make the appropriate groundwater and surface water allocation plans at local and regional scales for the future. This understanding will be based on developing a conceptual water balance model for the Sukhuma District in Champasak province.

The main objective of this study is to develop a broad understanding of the seasonal dynamics of surface water and groundwater interaction in the Sukhuma District, Champasak Province of Southern Laos where groundwater abstraction has recently increased and there are limited field observation data of geology, hydrology and hydrogeology. The total area of the Sukhuma District is approximately 1,200 km^2.

The specific objectives of the project are:

1. to develop a conceptual water balance for Sukhuma District and estimate all components of the water balance model;
2. to achieve a better understanding of the baseline interaction between surface water and groundwater during the wet and dry seasons in Sukhuma District;

3. to estimate the groundwater recharge in Sukhuma District; and

4. to investigate the seasonal groundwater storage variations at the Sukhuma District scale using the data derived from the Gravity Recovery and Climate Experiment (GRACE) satellites and the Global Land Surface Model.

To achieve these project aims, it is necessary to undertake the research activities listed as items 1 to 3 below.

1. In developing an assessment of available groundwater resources for sustainable use, data mining of the available data is required. Due to extremely limited available data, a technique for efficient extraction of the available information in both traditional and non-traditional sources of data is required.

2. Sourcing data from a non-traditional source. This will introduce issues with space and time scales; for example, the use of remotely sensed data introduces problems associated with measurement scale. In other words, the data are applied to differing magnitudes of the area. This issue needs to be reconciled before reliable conclusions can be drawn.

3. Development of a water balance model is premised on the modeller's concept of how surface water and groundwater interact at the location of interest. As shown later in Chapter 4, previous studies within the region have resulted in differing opinions on this interaction. The technique used for extraction of the information in the available data has to be developed in a manner whereby sound theoretical concepts can be developed to explain the interaction between surface water and groundwater.

1.3. Research contributions

The main contributions of the current study will include:

1. developing a conceptual water balance model for estimating groundwater recharge in the Sukhuma District;

2. identifying a clear terminology for groundwater recharge that reduces the potential for misinterpretation;

3. downscaling the remote sensing data derived from GRACE to a small region so that it is consistent with limited observation data; and

4. developing an efficient method for extraction of information about water flow in a catchment where there are limited field data of variable quality.

1.4. Dissertation outline

This study deals with the evaluation of the seasonality of surface water and groundwater interaction and estimation of groundwater recharge, that is necessary for planning long-term water use, in the Sukhuma District where data of rainfall, groundwater levels, climate data and geology are limited. Surface water and groundwater are not separable components of the hydrologic cycle (Ruehl et al., 2006), and the development or contamination of one component commonly affects the water quality and quantity of the other.

Next, the study area is described **in Chapter 2**. General information on the study area in the Sukhuma District is provided in this chapter. This section includes: location, physical characteristics, topography, hydrological and hydrogeological characteristics, climate condition and socio-economic activities in the study area. Also, available historical and in-situ data on the study area is described in this chapter.

The fundamental theory and relevant literature regarding the conceptual water balance model, and the application of the remote sensing data derived from GRACE are described **in Chapter 3.** The purpose of this chapter is to provide an overview of the appropriate methodologies for estimating the components of the water balance, the groundwater recharge and for overcoming the challenges of sustainable water resources management in a small region with limited available data and budget. A brief overview of the application of alternative data sources from remote sensing is also provided in this chapter.

Details of the conceptual water balance model formulated for the Sukhuma District are presented in **Chapter 4**. All components of the water balance are estimated and discussed. The conceptual model is used to quantify the seasonal total water storage anomalies and estimate groundwater recharge.

Subsequently, the application of remote sensing data derived from GRACE is described in **Chapter 5.** The GRACE data are downscaled to Sukhuma District scale. Then, seasonal groundwater storage anomalies at the Sukhuma District scale are also assessed.

A graphically comparison between the total water storage anomalies estimated from the field measurements and the total water storage anomalies derived from downscaled GRACE data is provided in the following chapter, **Chapter 6**. A comparison between downscaled GRACE data and measured groundwater level elevation anomalies at the Sukhuma District scale is also discussed in this chapter. A correlation between original GRACE data at the GRACE footprint and measured groundwater level elevation anomalies at the Sukhuma District footprint, and a correlation between downscaled GRACE data and measured groundwater level elevation anomalies at the Sukhuma District scale are also assessed.

Next, conclusions and recommendations for future studies are provided in **Chapter 7.** Also, the key research contributions are indicated.

Finally, references to the literature are listed and supplementary information to data collection, estimation and analysis are provided in the Appendices.

Chapter 2 : Study Area

An overview of physical characteristics and data availability in the study area is presented in this chapter.

2.1. Location, topography and climate

The Sukhuma District is located in the south-western part of Champasak Province in Southern Laos as shown in *Figure 2.1*. It is bounded by the Khorat Plateau of Thailand in the west and the Mekong River in the east. Elsewhere it is bounded by other Districts. Sukhuma District has a total area of approximately 1200 km^2 (estimated on the ArcGIS) and is situated between the latitude of 14° 28′ 15″ N and 14° 49′ 16″ N and longitude of 105° 28′ 32″ E and 105° 52′ 20″ E. The administrative centre of the Sukhuma District is located in the eastern part of the district and is approximately 60 km south of the Champasak provincial centre.

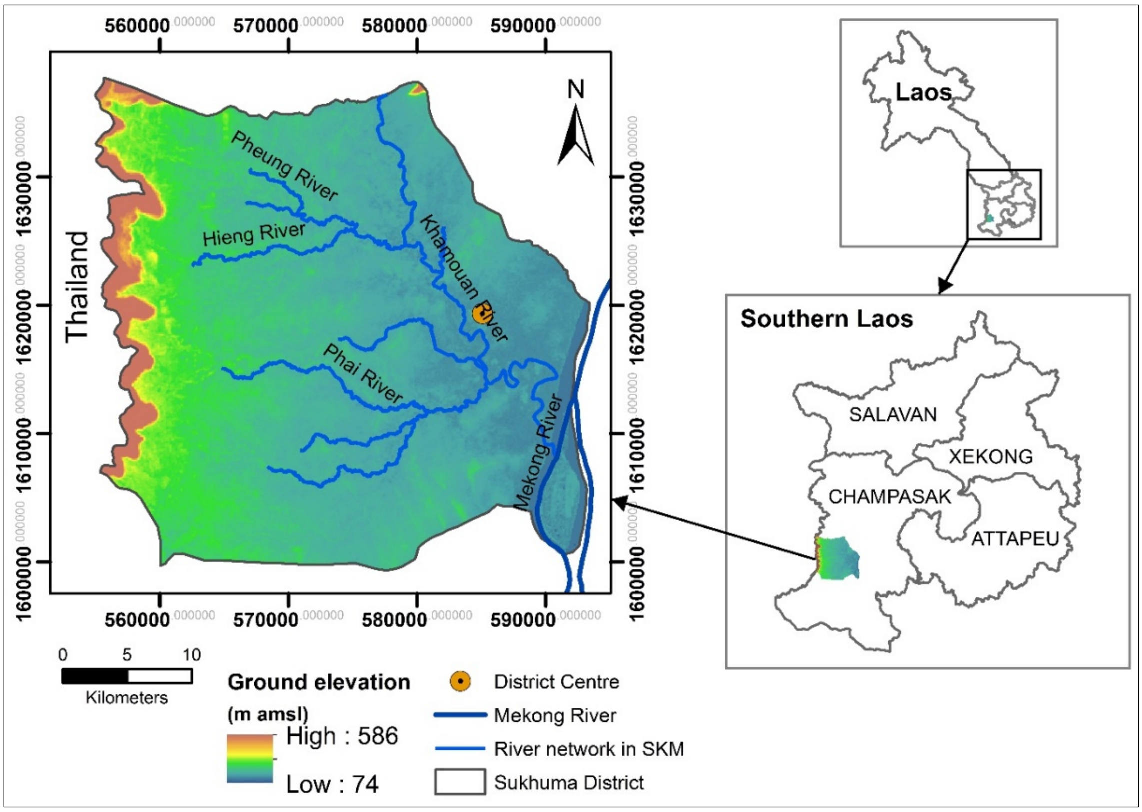


Figure 2.1: Location and topography of the Sukhuma District in south-west of Champasak Province, Southern Laos

The topography of Sukhuma District is mostly flat. About 90% of the area has a slope of between 0 and 3 percent. The lowest ground elevation is 74 m above mean sea level (amsl) in the east and the southeast areas of Sukhuma as shown in *Figure 2.1*. The highest elevation is approximately 600 m amsl (above mean see level) on the western part that runs along the Sukhuma District – Thailand border *(Figure 2.1)*. All streams in Sukhuma, as shown in *Figure 2.1*, flow from the north and west to the south and southeast and finally discharge into the Mekong River.

The climate system in Sukhuma District is classified as tropical monsoon with two different seasons, namely wet and dry. The wet season usually begins in May and ends in October. The dry season lasts from November to April. The average monthly air temperature is 28°C. The lowest monthly air temperature is commonly at 22°C in January, and the highest is about 33°C in April. The average monthly relative humidity is 70%. The monthly minimum and maximum of relative humidity usually occur during March and April (51%) and during August and September (86%), respectively. The average evapotranspiration in Sukhuma District is estimated at 1200 mm/year (54% of average annual rainfall). The source and details of climatic data used for the current study are provided in Appendix 2. Rainfall concentration in Sukhuma District is different for wet and dry seasons. The average monthly rainfall at the Sukhuma official rain gauge from May 1993 to April 2016 illustrates that about 90% of rainfall is concentrated in the wet season *(Figure 2.2)*. The average annual rainfall for this period is about 2200 mm.

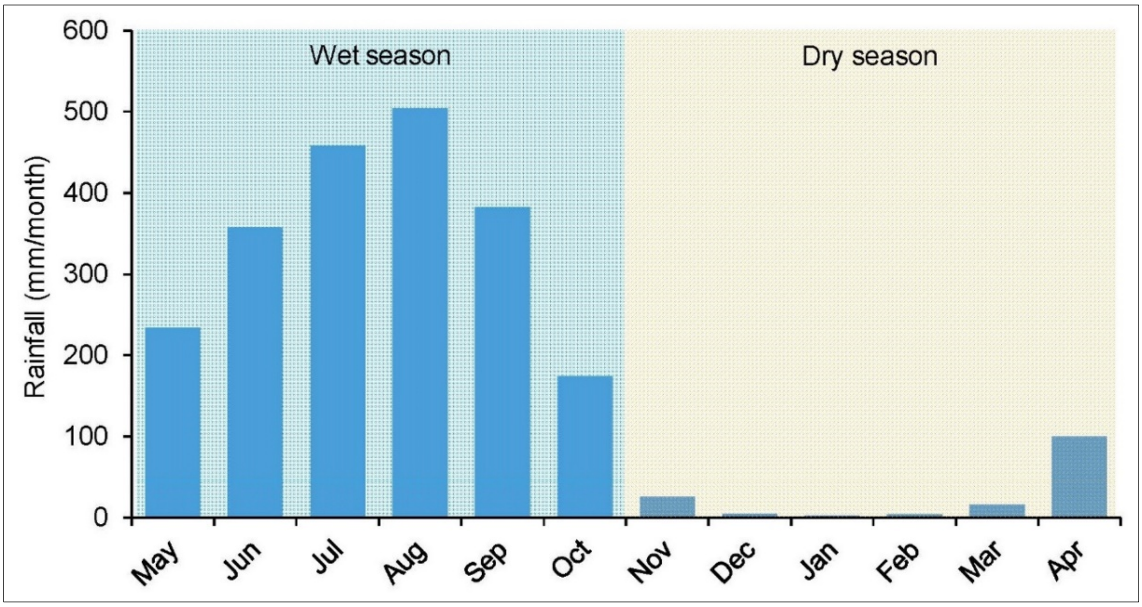


Figure 2.2: Averaged monthly rainfall at the Sukhuma District Meteorological station for the period May 1993 to April 2016

2.2. Geology and lithology

The geology of Sukhuma District is dominated by the Mesozoic (Mz1) sandstone formation (United Nations, 1990) as shown in *Figure 2.3*. The Mz1 Sandstone formation is the equivalent of the Phu Kradung Formation (Thai geological formation name) in northeast Thailand as described by Sattayarak (1983), Racey et al. (1996) and Racey (2009). The term Phu Kradung Formation is well known to Thai and regional geologists; therefore, it is being used for this study. The lithology of the Phu Kradung Formation consists of sandstones, siltstones and mudstones and its thickness is over 1000 m at various locations in northeast Thailand (Racey et al., 1996). Various rock outcrops in the Champasak District were classified as Phu Kradung Formation. These observations have been confirmed by Thai geologist (Nares Sattayarak, personal communication; and Sattayarak (1983)) during a post-conference field trip under the 5th GEOINDO 2015 conference in November 2015 to Champasak Province. Furthermore, more evidence about the Phu Kradung Formation in Southern Laos is also described in the Guidebook of geological tour to Southern Laos (Geological Society of Thailand, 2013). Using this information, during the field trip in March 2017, outcrops of sandstone and siltstone, found in the western Sukhuma District and some parts of the riverbed, such as of Pheung and Khamouan Rivers, were identified as Phu Kradung Formation. The groundwater recharge from rainfall into the fractured sandstone aquifer of the Phu Kradung formation is low, ranging from 0.5 to 4% of annual rainfall (Vouillamoz et al., 2016). The transmissivity values are between 0.14 m^2/day and 42 m^2/day (Wongsawat et al., 1992).

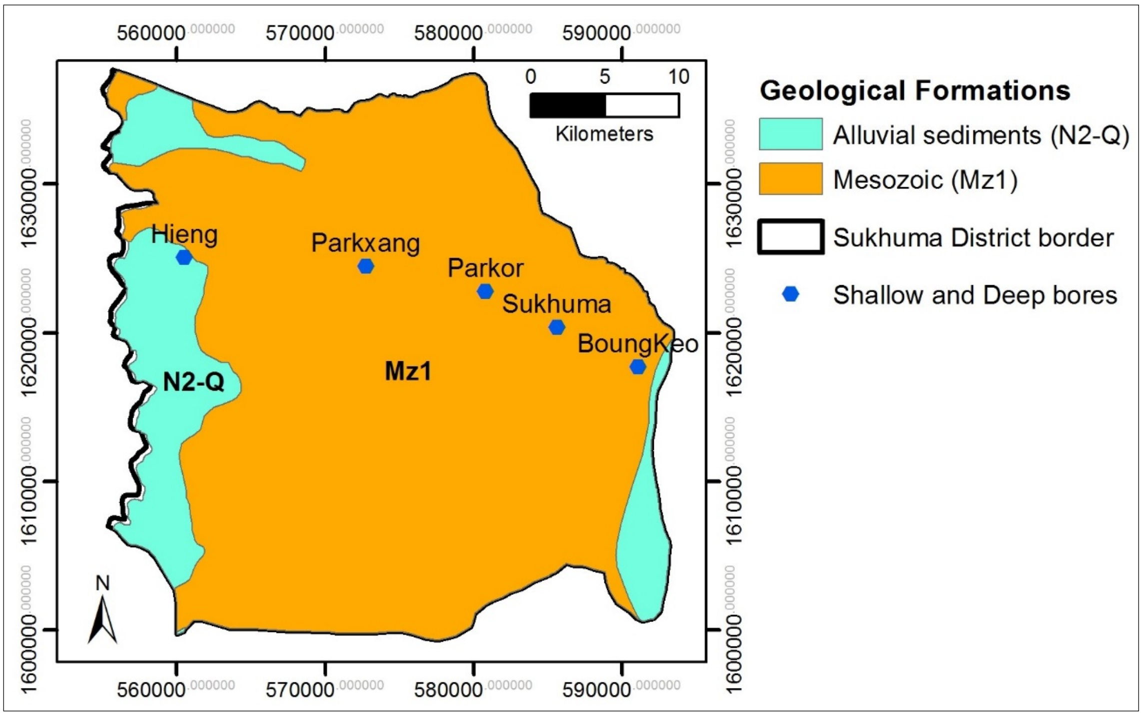


Figure 2.3: Geologic formations and locations of the shallow and deep bores in the Sukhuma District

Data on geology are sparse in Sukhuma District. The geological information used for this research was derived primarily from the lithological drilling logs of the five deep observation wells in Sukhuma District constructed by Champasak Provincial Health Department (2012) under supervision and support from the previous ACIAR (Australian Centre for International Agricultural

Research) Project (Wade et al., 2015). Locations of the five deep observation wells (Boungkeo, Sukhuma, Parkor, Parkxang, and Hieng wells) are illustrated in *Figure 2.3*. The drilling logs of these wells are compiled in Appendix 3. Moreover, some basic information on geology in Sukhuma District was collected during the three field trips: 28 November to 4 December 2015, 20 June to 8 July 2016, and 9 March to 20 April 2017. Some photos taken during these fieldworks are given in Appendix 4. Data from drilling logs were integrated with the fieldwork information and previous work by JICA (1995) to get a better understanding of the local stratigraphy.

A geological section, A-A', was created by using the Xacto Cross-Section extension in ArcGIS10.1 *(Figure 2.4)*. The Xacto extension was developed by Carrell (2014). The main task of this extension is to create and display the geological cross-section in 2 dimensions and 3 dimensions on the ArcGIS. For more details of this program refer to Carrell (2014). The lithological cross-section in *Figure 2.4* is derived mainly from the lithological drill logs as reported by Champasak Provincial Health Department (2012) and Vote et al. (2014). The logs indicate topsoil to approximately 2 m depth consisting of silty clay, sand and sandy loam. This sequence overlies a layered stratigraphy of fractured laterite and fractured sandy shale, mudstone and shale above sandstone with prominent fracture zones *(Figure 2.5)*. Shown in *Figure 2.5* is a photo of the topsoil overlying the fractured laterite; a line illustrating this divide has been included for clarity.

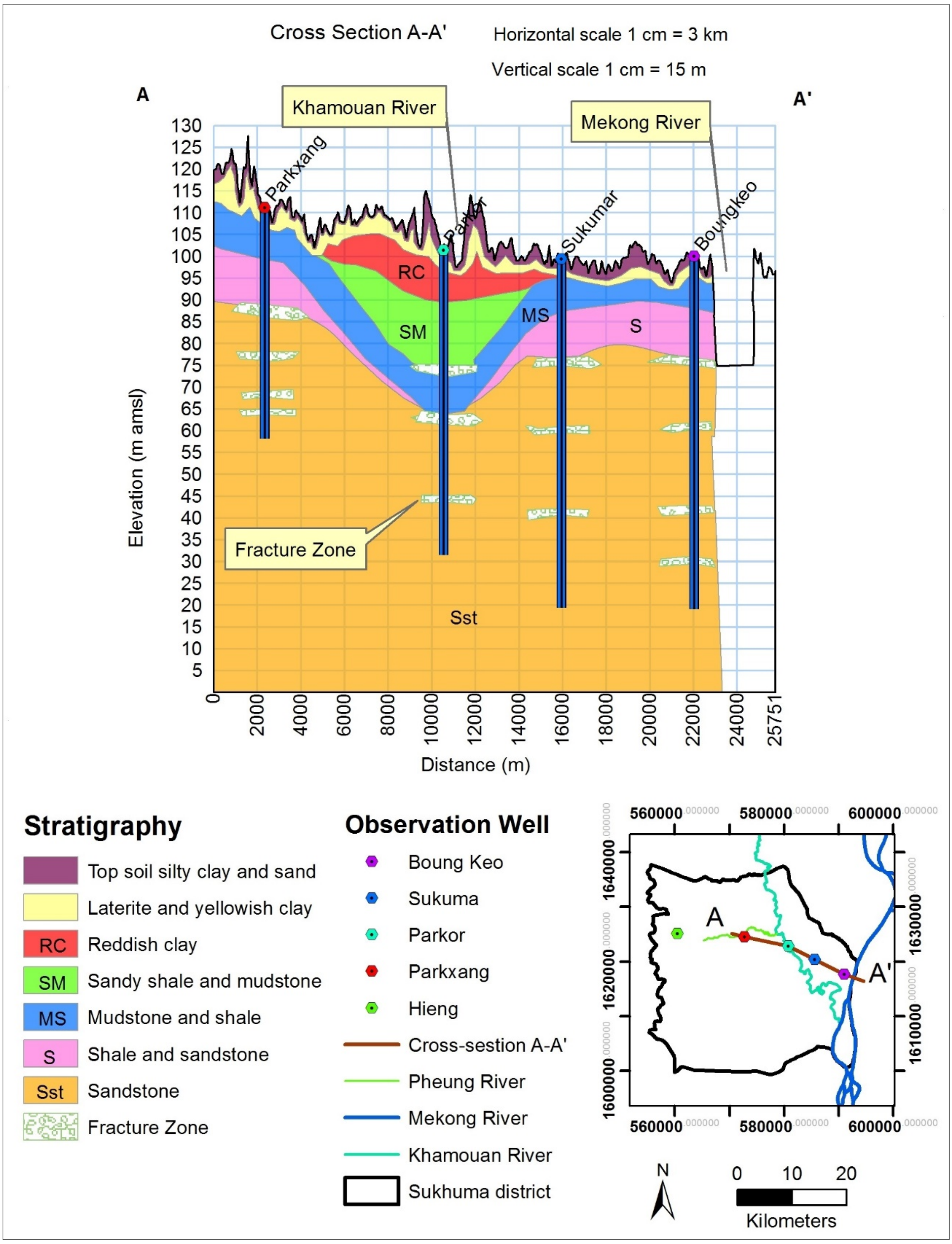


Figure 2.4: Lithological cross-section in Sukhuma District developed from drilling logs

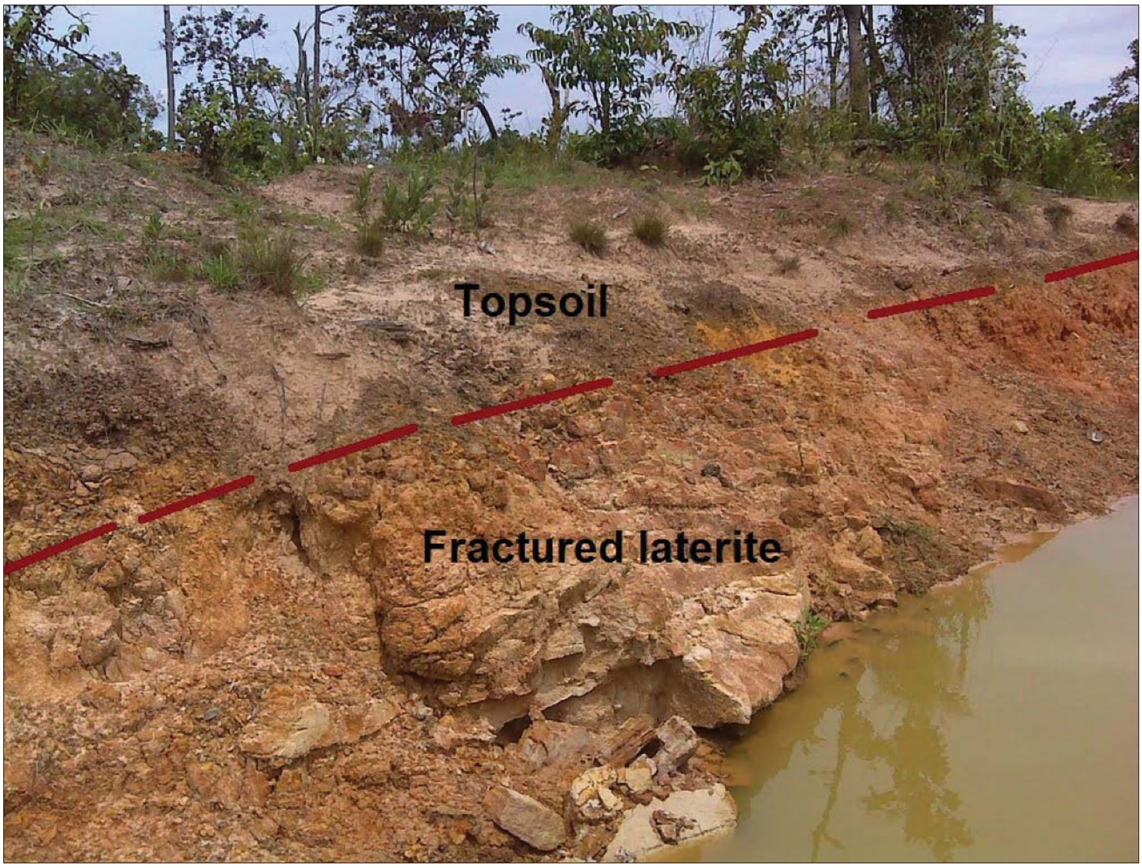


Figure 2.5: Soil profile at the Thadarn Village of Sukhuma District. This photo was modified from Mapino (2015)

The depth to the topmost fracture zone in the sandstone is in the range of 20 to 30 metres below ground level (bgl), but reported casing depths vary between 7 and 16 m bgl, so that the measuring points of the groundwater levels may include formations above the sandstone. The complete thickness of the fractured sandstone was not penetrated by the drilled bores and the detailed interconnection of the fracture zones is unknown. The fractured rocks are considered to be part of the Mz1 sandstone formation (United Nations, 1990).

2.3. Land use and surface soil types

The primary land use and vegetation cover in the Sukhuma District is shrub land as shown in *Figure 2.6*. The shrub land covers approximately 62% of the total district area. A large area of crop land can be seen from *Figure 2.6* to occur on the eastern part of Khamouan River. About 24% of Sukhuma area is covered by the crop land. The deciduous broadleaf forest (~9%) appears in the high mountain areas in the west. The dipterocarp forest occupies 2% of the district area. The residential area is less than 1% of the district area. The water bodies, bare soil and grassland cover around 2% of the district area.

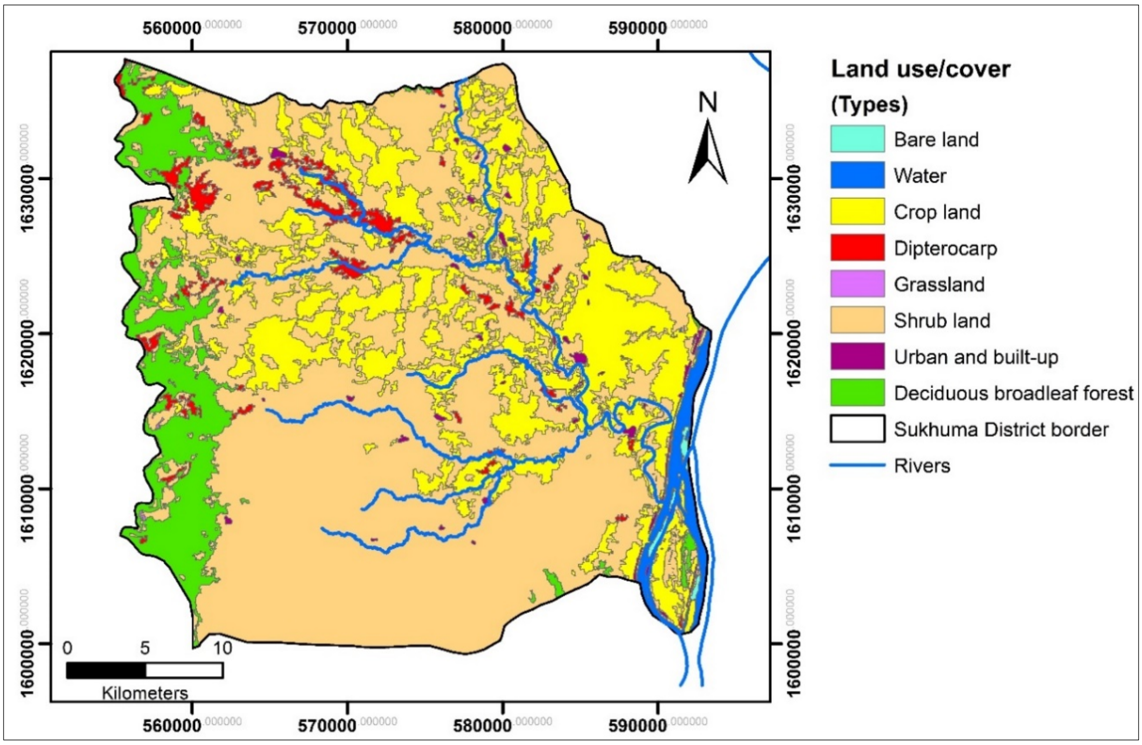


Figure 2.6: Land use and vegetation cover in the Sukhuma District

The distribution of surface soil types to 0.2 m depth in the Sukhuma District area, illustrated in *Figure 2.7*, shows that sandy loam covers a large proportion of Sukhuma District area, around 63% (SSLCC, 2000). Loamy sand is found mostly in the southeast and the northwest of the district. Loam soil can be found along the Khamouan River corridor. Sand has limited occurrence in the study area. For about 8% of Sukhuma area, surface soil type is not classified. The area of unclassified (unidentified) soil types includes parts of Mekong River in the southeast and the area of high topography in the west.

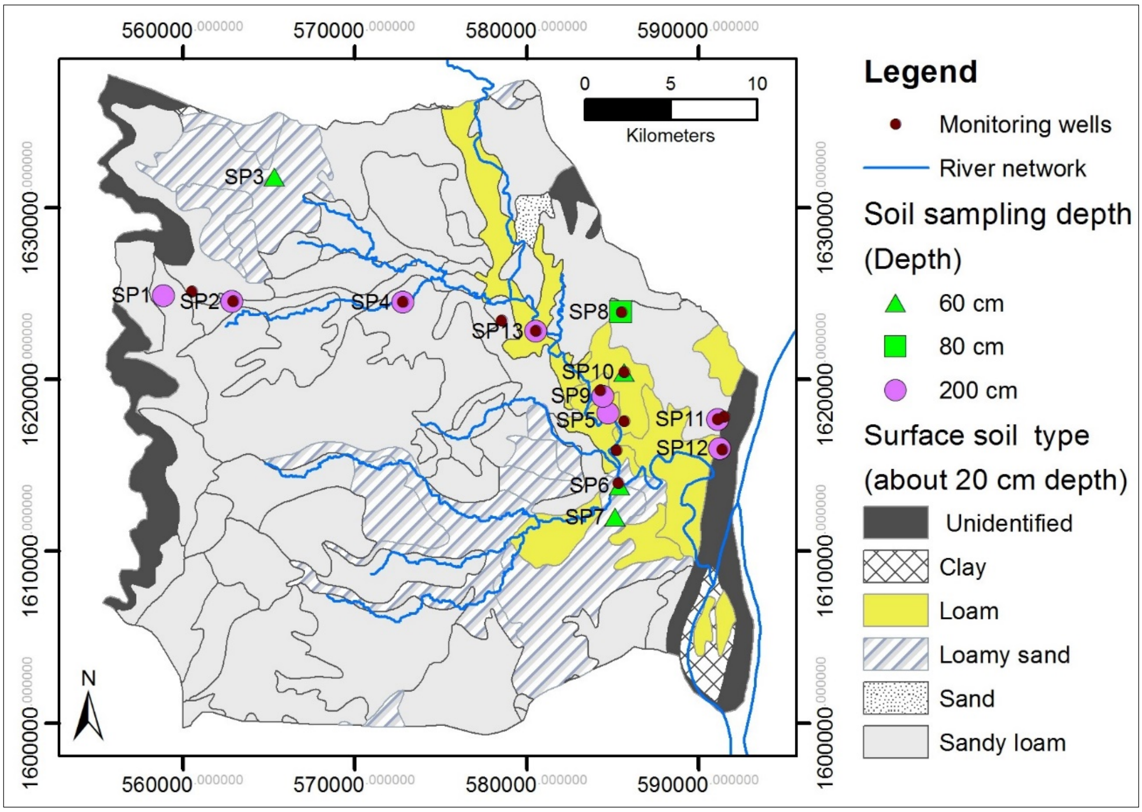


Figure 2.7: Surface soil types and locations of soil sampling in the Sukhuma District. SP1, SP2,…., SP13 stand for each soil sampling location

Data on soil properties are sparse in Sukhuma District. Only broad scale soil data from the Lao national soil map (SSLCC, 2000) provides information on soil textures in Sukhuma District *(Figure 2.7)*. In order to get a better understanding of rainfall infiltration into the topsoil and to obtain more information about the topsoil in Sukhuma District, forty-seven soil samples were collected from 13 locations during the third field visit in March 2017. There are five locations in the sandy loam, five locations in the loam, and three locations in the loamy sand as shown in *Figure 2.7*. The depths of soil sample range from 0-10 cm, 10-40 cm, 40 - 100 cm, and 100 - 200 cm. Some locations could not be dug deeper than 100 cm because of laterite soil with some gravel. Therefore, soil samples for these locations were collected at three depths only, namely 0-10 cm, 10 - 40 cm, and 40 - 60 or less than 100 cm. Three soil types are classified from these soil samples, including loam, sandy loam, silt loam and silty clay loam. The values of specific yield ($\acute{S}_y$) for the 47 soil samples in Sukhuma District are estimated and summarised based on the soil types tested from this study. The average values of $\acute{S}_y$ range from 0.15 to 0.21, as shown in *Table 2.1*. Detailed descriptions of soil samples, collection of soil samples, testing, and soil properties determination are provided in Appendix 5. The specific yield values for the soil samples collected in the Sukhuma District (0.15 – 0.21) fall in the range of the specific yield estimated by Johnson (1966). As reported in Johnson (1966), specific yield for a total of 311 soil samples collected in the South Coastal Basin in the Los Angeles area of California were estimated and range from 0.02 to 0.30. From this study it is implied that the estimated values of specific yield for the 47 soil samples in the Sukhuma are reasonable for each soil texture.

Table 2.1: Summary results for specific yield of topsoil (~2 m depth), and number of soil samples. The number in the bracket is an average value

Texture class	$\acute{S}_y$ (dimensionless)	Sample size
Loam	0.131 – 0.236 (0.206)	18
Sandy loam	0.196 – 0.217 (0.205)	4
Silt loam	0.153 – 0.260 (0.206)	21
Silty clay loam	0.108 – 0.181 (0.158)	4

2.4. Socio-economic activities

As reported by Sukhuma District Agriculture and Forest Office (2016), Sukhuma District includes 60 villages comprising 8700 households (HHs). The population growth in Sukhuma District during the period of 2006 to 2015 is indicated in *Figure 2.8*. The population increased from 49,600 in 2006 to 56,500 in 2015 with an average growth rate of 1.5%. Approximately 80% of the total households depend mainly on agricultural activities for their household income. Rice is the major crop and is commonly grown in the wet season. During the dry season, rice and some non-rice crops (e.g. maize, vegetables, watermelon and chilli) are grown where an irrigation system is accessible. Many farmers plant non-rice crops in the Mekong Riverbank during the dry season. The products of wet and dry season crops are mainly stocked for household consumption and some proportion may be sold for additional income. Moreover, products from livestock (e.g. cattle, buffalo, pigs and poultry) are also extra sources of household income. Some households, who are poor and/or far away from the Sukhuma city centre, rely on fishing in the Mekong River, timber and non-timber forest products (e.g. bamboo shoots and mushrooms) for their food and income sources. Many households in the district earn their income from the sale of handicrafts, for example, woven textiles and baskets. Currently, bottled water is produced in a factory in Sukhuma District by taking groundwater (Sukhuma District Agriculture and Forest Office, 2016). These plastic bottles are mostly 18 litres capacity and sales in Sukhuma are estimated at around 300 bottles/day.

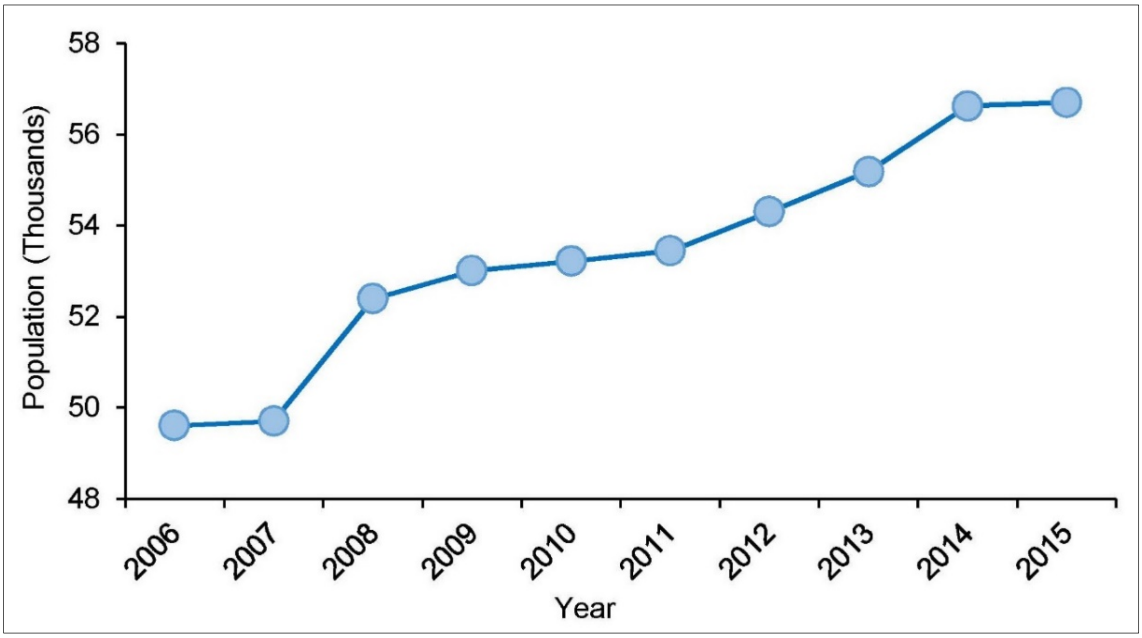


Figure 2.8: Population growth in Sukhuma District from 2006 to 2015

2.5. Surface water and groundwater conditions

The Khamouan River is a small tributary of the Mekong River and flows through the Sukhuma District from north to southeast *(Figure 2.1)*. Khamouan River and its tributaries are usually dry during the dry season and fill up during the monsoon-wet season. During the wet season, the surface water in the river is commonly unusable as a source of domestic and agriculture water supply due to sediment content and contamination (Vote et al., 2015). Thus, the groundwater resource is a significant source of the water supply in Sukhuma District.

Groundwater has been recognised as the main source of water supply for domestic and horticulture uses and there is increasing abstraction in Sukhuma District (JICA, 1995; Vote et al., 2014; Vote et al., 2015). In 1995, the water consumption per capita per day in Southern Laos, including Sukhuma District, was estimated in a range from 28 to 42 litres (JICA, 1995). In 2015, the average daily water consumption in the Sukhuma District was reported at 106 litres per capita per day (lpcd) (Vote et al., 2015). The increasing groundwater abstraction may have an influence on the availability of surface water and groundwater in the Sukhuma District and the region. The interaction between surface water and groundwater in the Sukhuma District remains unknown (Vote et al., 2015). The current situation regarding groundwater abstraction in the Sukhuma District has been estimated for this study and is described in Chapter 4.

2.6. Available data

2.6.1. Rainfall

There is an official rain gauge station in the Sukhuma District as shown in *Figure 2.9*. The Sukhuma District official rain gauge is operated and maintained by the Department of Natural Resources and Environment at the Sukhuma District. A manual rain gauge is installed at this station. The daily rainfall data is the total rainfall from 7:00 a.m. on the previous day until 7:00 a.m. on the following day and is measured in millimeters. Daily rainfall data from 1993 to 2016 are available at the Sukhuma District official rain gauge and are summarized in Appendix 6. Data were classified in hydrological years (May through April) because of the clear distinction between wet and dry seasons in the study area.

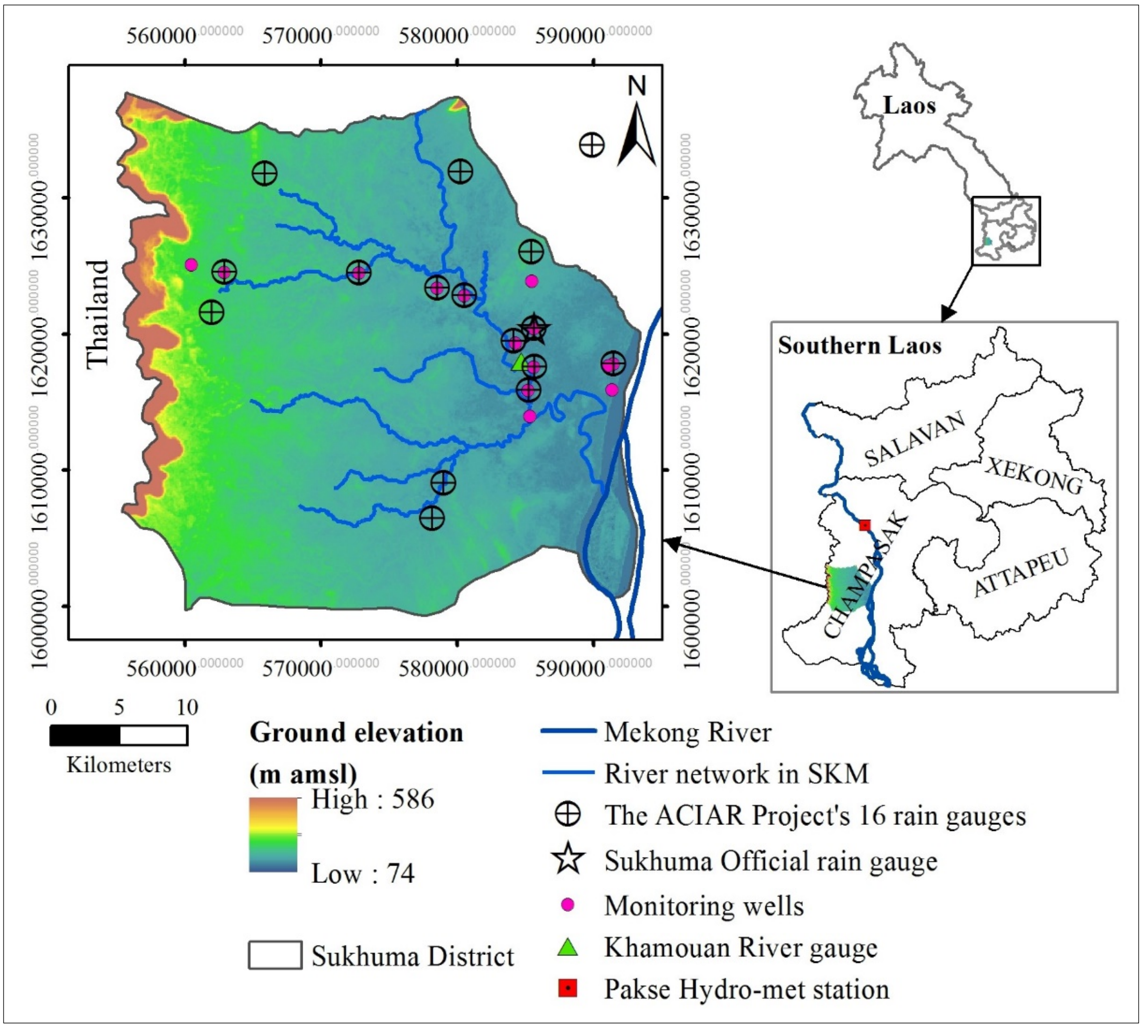


Figure 2.9: Locations of data monitoring points in the Pakse and Sukhuma Districts

During the previous ACIAR project (Vote et al., 2014; Vote et al., 2015; Wade et al., 2015), 15 manual rain gauges (Sukhuma, Nong-Phavong, Bark, Parkor, None-Yange, Parkxang, Phone-Pheung, Thubcharn, Khok-Nongboua, Boungkeo, None-Deng-Tai, None-Uang, None-Deng-Nua, Hieng, and Houy-Phueng) were installed inside the boundary of the Sukhuma District and another one (Lakbeng rain gauge) was installed outside of Sukhum District border in the north-east as indicated in *Figure 2.9*. The daily rainfall data at these rain gauges were collected by the 16 representative households, where the gauges were installed, under the supervision of the technical staff from the Sukhuma District Agriculture and Forest Office (Sukhuma DAFO). Daily rainfall data were measured at 7:00 a.m. each day. A staff member from Sukhuma DAFO collected the daily rainfall data sheets from the 16 households at the beginning of each following month and also checked the quality of the data. The daily rainfall data at these gauges are available from January 2012 to June 2013. However, the period of these data is classified in the hydrological years, as 2012-13. After June 2013, data collection from the 16 rain gauges was stopped. Therefore, this study continued the collection of rainfall data from the same 16 rain gauges from 1 June 2015 to 30 May 2016. The information on locations, coordinates, and daily rainfall data for the ACIAR Project's 16 rain gauges are provided in Appendix 7.

Figure 2.10 illustrates twenty-three water years of annual rainfall data measured at the Sukhuma District official rain gauge from 1993-94 to 2015-16. It is clear that the annual rainfall in the study area is highly variable over the years. The average annual rainfall from 1993-94 to 2015-16 is estimated at 2200 mm/year with a standard deviation of 540 mm/year. The annual minimum and maximum rainfall were 1400 mm/year (2003-04) and around 3200 mm/year (1996-97 and 2014-15), respectively. The trend of annual rainfall for this period is increasing at a rate of 33 mm/year. There are eleven years of drought (annual rainfall is lower than the average annual rainfall) and twelve wet-years (annual rainfall is higher than the average annual rainfall).

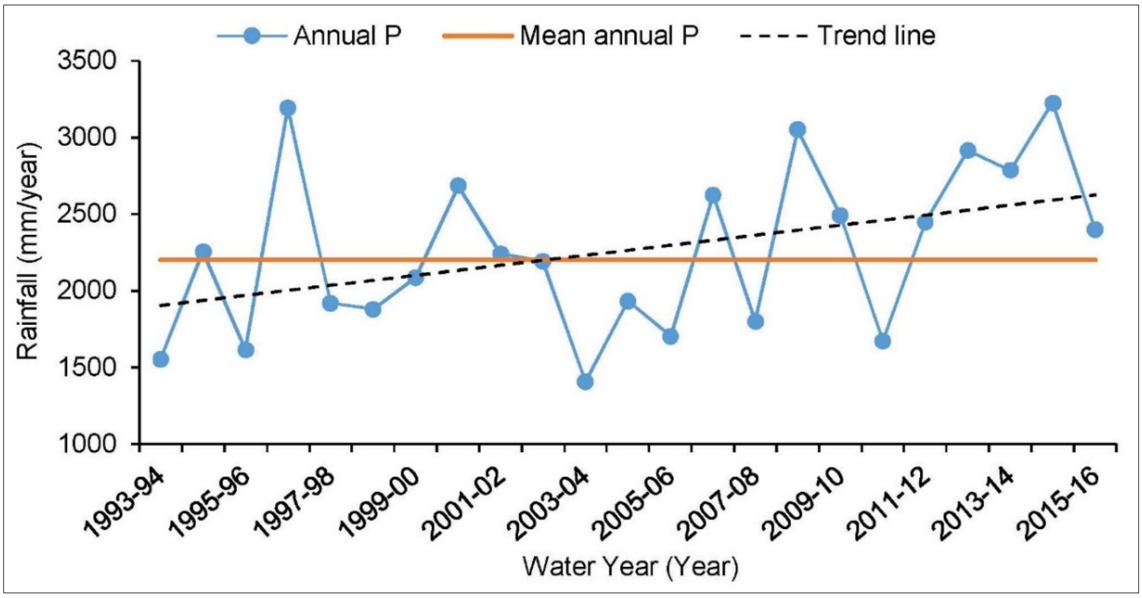


Figure 2.10: Annual rainfall (P) and its long-term average from water year 1993-94 to 2015-16 measured at the Sukhuma District official rain gauge

Cumulative daily rainfall at these rain gauges for the period 1 May 2012 to 30 April 2013 and for the period 1 June 2015 to 30 April 2016 are compared with the cumulative daily rainfall at the Sukhuma District official rain gauge and the cumulative daily rainfall at the Pakse climate station. The Pakse climate station is located approximately 60 km north of Sukhuma City *(Figure 2.9)*, and it is the nearest climate station with available climate and rainfall data. Available data from the Pakse climate station are summarized in Appendix 8. *Figure 2.11* and *Figure 2.12* illustrate that the cumulative daily rainfall at the Pakse climate station for the periods 2012-13 and 2015-16 are of similar magnitude to some of the 16 rain gauges in the Sukhuma District. However, it is depicted in these figures that rainfall data measured at the 16 rain gauges were of different magnitude from place-to-place. It was interesting to see that the cumulative daily rainfalls at the Sukhuma District official rain gauge (SKM-Official) were always the highest rainfalls for both hydrological years 2012-13 and 2015-16 (It should be noted that data at the Sukhuma private rain gauge were missing for the hydrological years 2012-13). Some discrepancy may be caused by the location of the 16 rain gauges not meeting the specifications of the World Meteorological Organization (WMO), (WMO, 2008). For example, the private rain gauge at the Parkor monitoring point was installed near to the building and is surrounded closely by tall vegetation *(Figure 2.13)*. The data collected at the 16 rain gauges will therefore include some uncertainties. However, these data are used for the current study because they are the only available field observations in the study area.

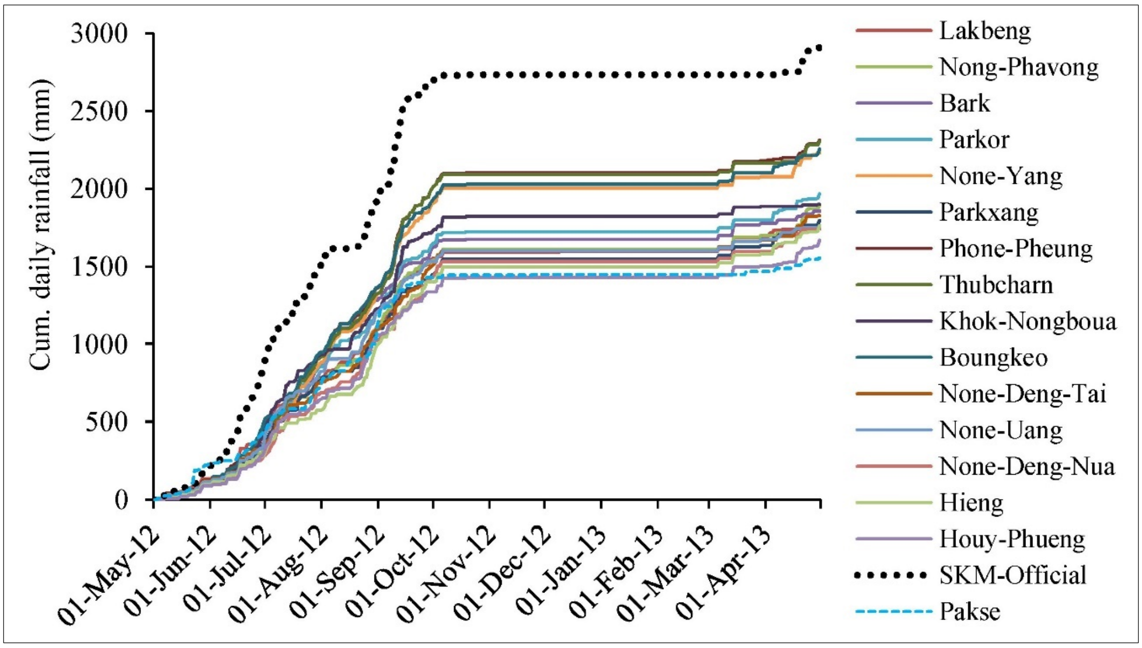


Figure 2.11: Cumulative daily rainfall at the Sukhuma District Official rain gauge, at the Pakse climate station, and at the ACIAR Project's 15 rain gauges from 1 May 2012 to 30 April 2013

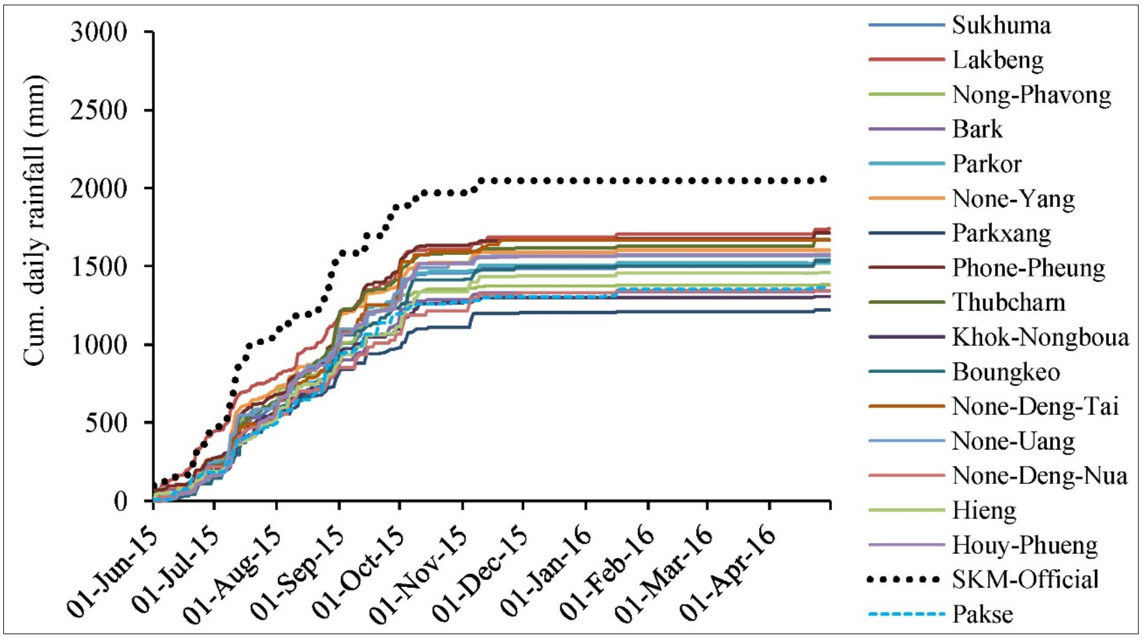


Figure 2.12: Cumulative daily rainfall at the Sukhuma District Official rain gauge, at the Pakse climate station, and at the ACIAR Project's 16 rain gauges from 1 June 2015 to 30 April 2016

Figure 2.13: The Parkor rain gauge. This photo was taken on 29 November 2015

The monthly area-averages from the 15 rain gauges were estimated by using the Theissen Polygon method in ArcGIS 10.4. The monthly minimum rainfall usually occurs during the dry season with zero rainfall recorded. The monthly maximum areal average rainfall during May 2012 to April 2013 and during June 2015 to April 2016 was measured at 470 mm (September 2012) and at 390 mm (July 2015), respectively. During the same two periods, the mean monthly rainfall from the 15 gauges over the Sukhuma District area was 160 mm/month with a standard deviation of 180 mm/month and 140 mm/month with a standard deviation of 150 mm/month, respectively.

Based on the observation of rainfall data at the 15 rain gauges located within the study area, the temporal rainfall distribution varied for each month during the hydrological years 2012-13 and 2015-16, as shown in *Figure 2.14*. The highest rainfalls during the hydrological years 2012-13 and 2015-16 were observed in July. The annual rainfall for 2012-13 was 1850 mm. About 1650 mm of annual rainfall in 2012-13 was measured during the wet season and around 200 mm occurred during the dry season.

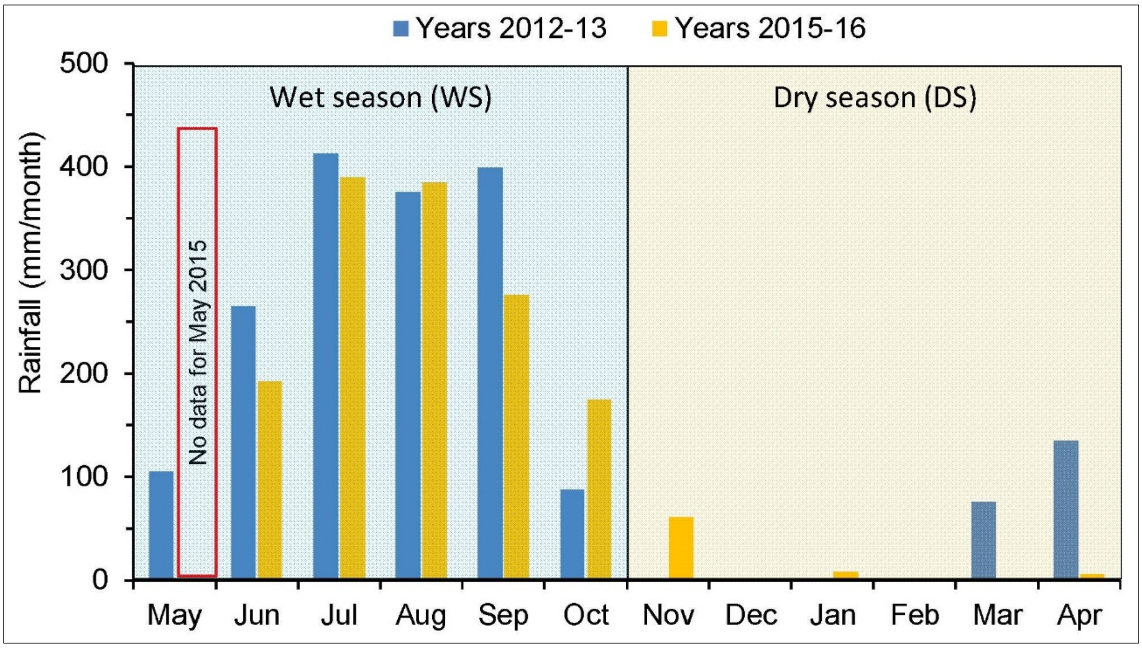


Figure 2.14: Area-averaged monthly rainfall from the 15 rain gauges within the Sukhuma District

In 2015-16, rainfall in July (390 mm) was similar to that which occurred in August (385 mm) *(Figure 2.14)*. For this year, it is important to note that rainfall data in May 2015 from the 15 rain gauges were missing because data collection for the current study commenced from 1 June 2015 and stopped on 31 May 2016. In this case, the total rainfall for the wet season 2015-16 was accumulated from June 2015 to October 2015, which was 1400 mm. Also, the total rainfall for the dry season 2015-16 was accumulated from November 2015 to April 2016, which was 70 mm. However, the total annual rainfall for 2015-16 was accumulated from June 2015 to May 2016 and estimated at 1700 mm. Annual rainfall in 2015-16 (1700 mm) was slightly less than annual rainfall in 2012-13 (1850 mm). Rainfall during the dry season was relatively small when compared to the rainfall in the wet season *(Figure 2.14)*. The rainfall in the dry season may not contribute into the groundwater recharge, but it may contribute to the evapotranspiration. Therefore, groundwater recharge from rainfall in the dry season can be negligible or assumed to be zero.

Maps of spatial rainfall distribution for wet and dry seasons in 2012-13 and 2015-16 were generated based on the observed rainfall data at the 15 rain gauges within Sukhuma District by using the Ordinary Kriging Interpolation technique in the ArcGIS10.4 software. By using this method, the total annual rainfall in 2012-13 and the total rainfall during the wet and dry seasons in 2012-13 were estimated at 1800 mm, 1600 mm and 190 mm, respectively. In 2015-16, total annual rainfall was estimated at 1640 mm. In the wet and dry seasons of 2015-16, total rainfall was estimated at 1350 mm and 60 mm, respectively. It is shown by these results that average rainfall over the Sukhuma District estimated from the Theissen Polygon and the Isohyet methods are similar. The difference between two methods is about 3 – 4%. Chow et al. (1988) indicated that the difference between these methods must be less than 10%.

The spatial rainfall distribution maps for wet season 2012-13, dry season 2012-13, wet season 2015-16 and dry season 2015-16, respectively, are presented in *Figure 2.15*. This figure shows that rainfall during the wet season for both water years was higher in the east and south-east than rainfall in the west and north-west (*Figure 2.15a* and *Figure 2.15c*). During the dry season, spatial rainfall distribution was less in the east and south-east and most rainfall was occurred in the north and north-west, as shown in *Figure 2.15b* and *Figure 2.15d*. This information will enhance a better understanding of the different spatial distribution of groundwater recharge within Sukhuma District and different groundwater recharge in each water year.

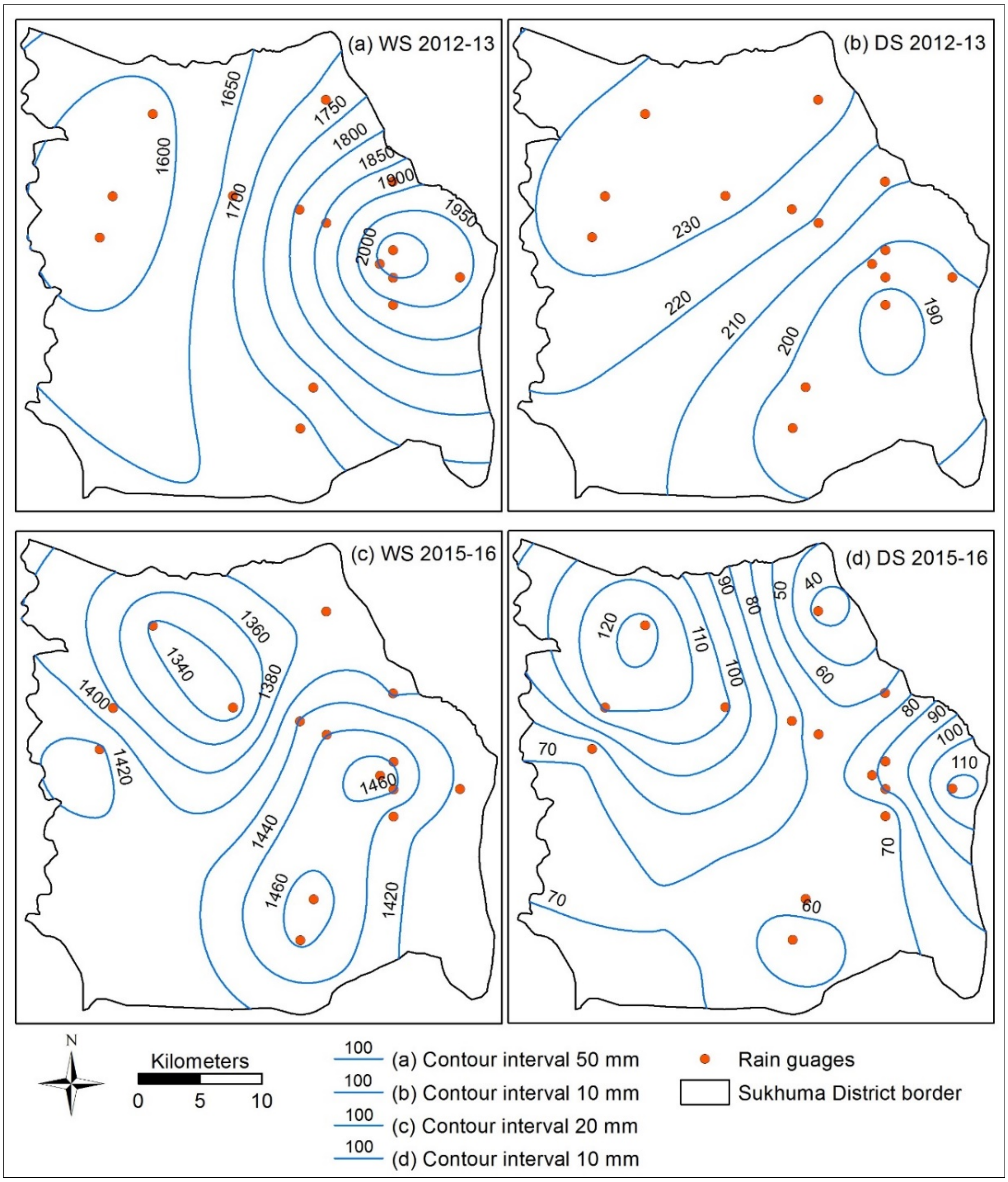


Figure 2.15: Seasonal rainfall distribution in Sukhuma District for the hydrological years 2012-13 and 2015-16 (WS = Wet Season; DS = Dry Season)

2.6.2. Streamflow

The historical data on stream water level measurements at the Khamouan River gauge were recorded each morning by a qualified observer from the District Office of Natural Resources and Environment of the Sukhuma District (DoNRE), during 1993 and from 1997 to 2006. Measurements at the stream gauge were stopped after 2006 because of the lack of funds for maintenance and operation. The stream staff gauge was reinstalled on 27 May 2015 for the present study and the stream water levels were measured until 31 May 2016. The daily stage-height data during this period was measured at 7:00 a.m. each day by a staff member from the DoNRE. The gauge location is indicated in *Figure 2.9*. The daily stream water level data measured at the Khamouan River gauge for 1993, 1997-2006, and 27 May 2015 to 31 May 2016 are compiled in Appendix 9.

The daily streamflow was estimated from the stage-discharge relationship equation that was developed for the Khamouan River gauge (Appendix 10). The monthly flows were estimated by averaging the daily flows within a month. The monthly flow at the Khamouan River gauge and monthly rainfall at the Sukhuma District Official rain gauge from May 1993 to April 2016 are compared as plotted in *Figure 2.16*. During the dry season months, streamflows were almost zero *(Figure 2.16)*. Based on the field observation during the dry season (March 2017), the Khamouan River upstream gauge were dry, while its lower reaches downstream from the stream gauge still had some water flowing in the river. Some photos taken during the field visits in March 2017 are given in Appendix 4. During the period May 1993 to April 2016, the highest monthly stream flow was recorded during the wet season at about 250 m^3/s, in August 2001. The lowest monthly flow was zero during the dry season. The average monthly stream flow for the period May 1993 to April 2016 was approximately 40 m^3/s with a standard deviation of 60 m^3/s. The average annual streamflow for this period is estimated at approximately 10,000 ML/s (1 billion m^3/s).

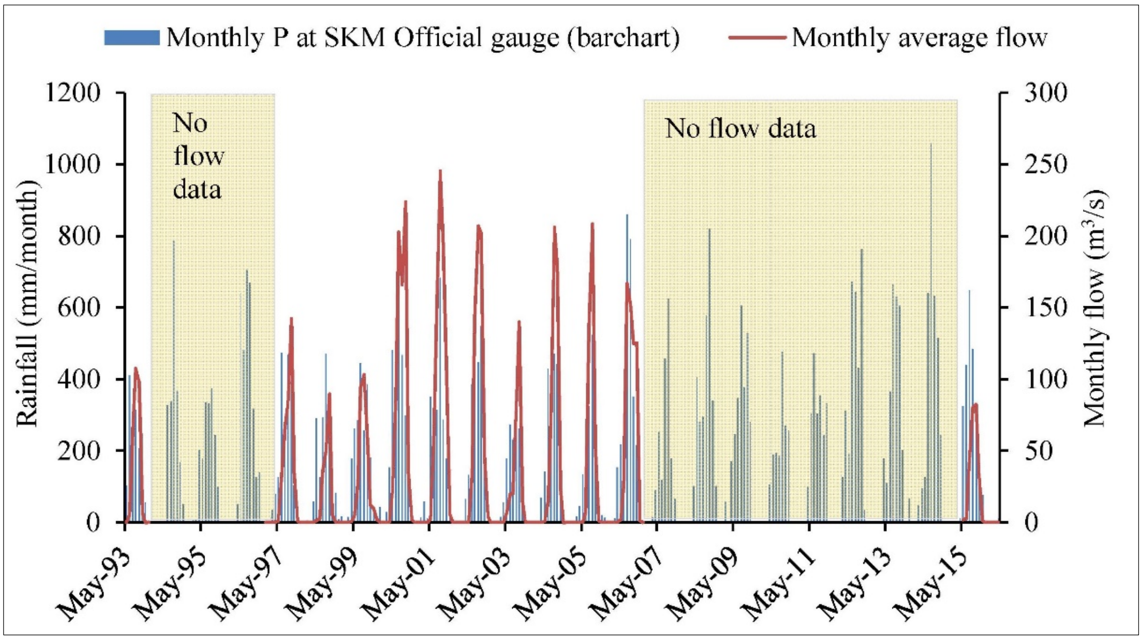


Figure 2.16: Monthly average flow at the Khamouan River gauge and monthly rainfall (P) at the Sukhuma (SKM) District Official rain gauge from May 1993 to April 2016

Figure 2.17 illustrates the comparison between the average monthly rainfall measured at the Sukhuma District official rain gauge and the average monthly streamflow measured at the Khamouan River gauge from May 1993 to April 2016. There is good correspondence between the streamflow and the seasonal rainfall fluctuation. Additionally, *Figure 2.17* also it is clear that the streamflow starts rising after two to three months of initiation of rainfall. The time lags between rainfall and streamflow rises can suggest that the Khamouan River is also recharged by shallow groundwater (baseflow) or bank storage.

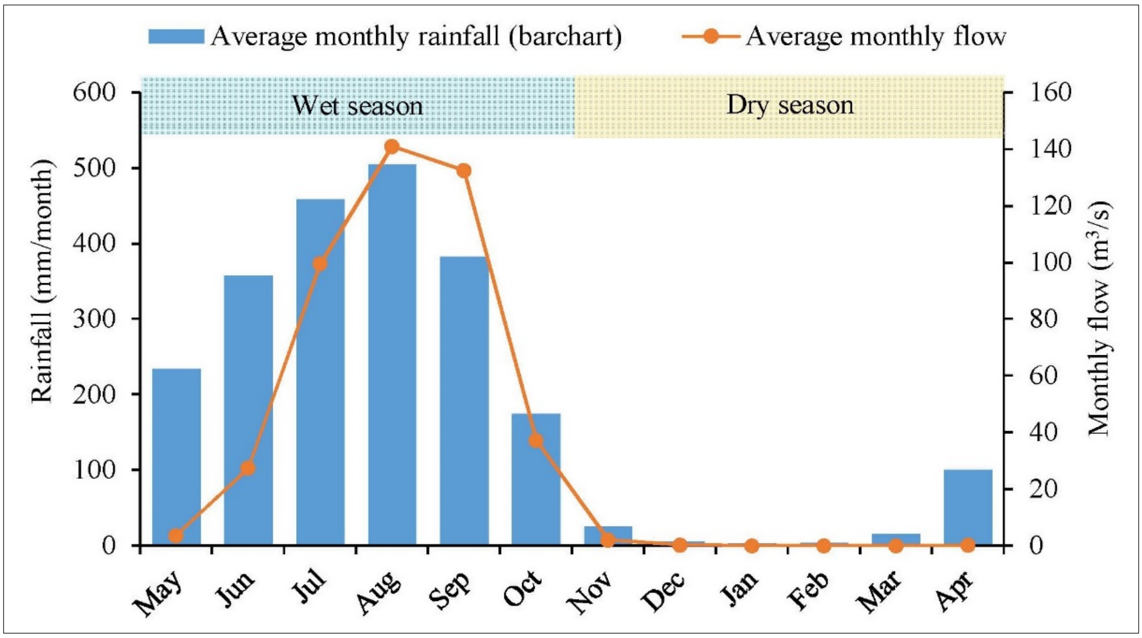


Figure 2.17: Average monthly rainfall at the Sukhuma District Official rain gauge and average monthly flow at the Khamouan River gauge from May 1993 to April 2016

2.6.3. Groundwater levels

Historical data on groundwater levels, electrical conductivity and temperature in Sukhuma District were measured manually on a weekly basis and are available from October 2011 to June 2013. These data were collected at eleven private (domestic) wells and five paired (deep and shallow) observation wells by the previous ACIAR project and used by Vote et al. (2014). ***The observation wells herein refer to the wells with no groundwater pumping. The domestic wells are those wells where groundwater is pumped occasionally by the well owner.*** The bore locations monitored for this research are indicated in *Figure 2.9*. From June 2015 to May 2016, the groundwater levels, electrical conductivity and temperature data have been collected again for the same wells by the same organisation (Sukhuma DAFO) and for the same time interval (weekly basis) using a water level meter (EC Dipper Pro, Thermo Fisher Scientific Inc., www.thermofisher.com.au). The list of all bores, their coordinates, depths, PVC casing depths, and weekly groundwater level measurements are compiled in Appendix 11. The data on electrical conductivity and temperature of groundwater are not used for the data analysis in this research. The groundwater level measurements were undertaken from the top of inner PVC casing and the depths to water table were recalculated from the ground level.

The depths of the observation and domestic wells and their PVC casing in Sukhuma District are at different positions as shown in *Figure 2.18*. This figure illustrates Mean, minimum and maximum depths of the observation and domestic wells and their PVC pipes are shown in this figure. The depths of domestic (private) wells in Sukhuma District commonly range from 12 to 54 m bgl (average 30 m bgl) based on a field survey in March 2017. Also, Vote et al. (2014) reported that the depths of eleven domestic wells, five shallow observation wells and five deep observation wells range from 14 to 45 m bgl (average 32 m bgl), from 25 to 70 m bgl (average 25 m bgl) and from 53 to 120 m bgl (average 80 m bgl), respectively. A field survey in March 2017 shows that the PVC pipes were installed in every drilled well (including eleven domestic and five paired (shallow and deep) observation wells) in Sukhuma District to protect them from collapsing and they were set at different depths. The information from the field survey in March 2017 indicated that the depths of PVC pipes for the domestic wells range from 5 to 10 m bgl (average 8 m bgl), while the depths of PVC pipes for eleven domestic wells vary from 6 to 8 m bgl (average 7.5 m bgl). The depths of PVC pipes for five shallow observation wells and five deep observation wells range from 6.5 to 9 m bgl (average 7.5 m bgl), and from 7 to 24 m bgl (average 13 m bgl), respectively (Champasak Provincial Health Department, 2012). The wells are uncased for the remaining depth beneath the PVC pipe. Therefore, the groundwater levels measurements in the study area are a combination of the shallow and deep groundwater aquifers based on the depths of observation and domestic wells and PVC pipe.

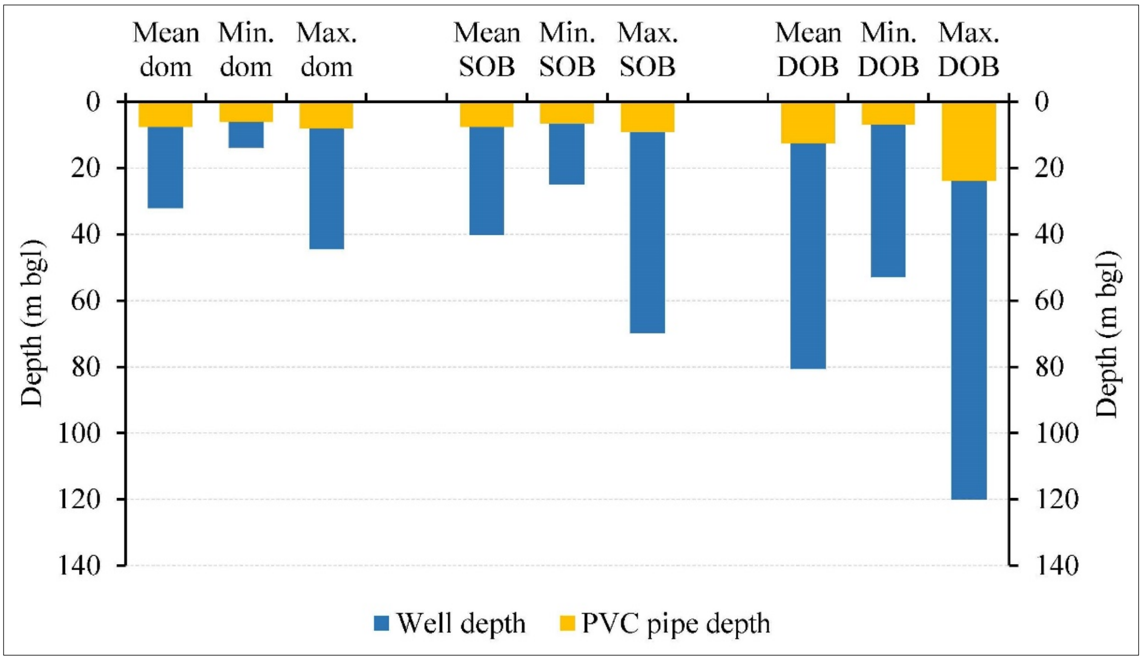


Figure 2.18: Mean, minimum (Min.) and maximum (Max.) depths of wells and PVC pipes below ground level (bgl) for the eleven domestic (dom) wells, five shallow observation wells (SOB), and five deep observation wells (DOB) in the Sukhuma District

Figure 2.19 illustrates the weekly depth to groundwater levels measured at the some representative wells: (Parkor domestic, Khoknongboua domestic, Thubcharn domestic, and

Parkxang shallow wells) in Sukhuma District from October 2011 to May 2016. A more detailed plot of depth to groundwater levels at all observation and domestic wells is provided in Appendix 12. There were no measurements from July 2013 to May 2015 as the ACIAR project had been completed. Groundwater levels data for the period October 2011 to June 2013 were not complete for all the wells, particularly for the paired observation wells. Only the wells with complete data for the period May 2012 to April 2013 were classified for the water years 2012-13. In the water years 2015-16, one month (May 2015) of groundwater levels data was missing. However, groundwater levels data for water years 2012-13 and 2015-16 were considered for data analysis for this study.

As illustrated in *Figure 2.19*, depths to groundwater levels monitored in the Sukhuma District varied in space and time. In 2012-13, the deepest groundwater levels during the dry season and the shallowest groundwater levels during the wet seasons ranged from 4 to 10 m bgl (average 6 m bgl) and from 1 to 7 m bgl (average 3 m bgl). In 2015-16, depths to groundwater levels during dry and wet seasons ranged from approximately 4 to 12 m bgl (average 8 m bgl) and 1 to 7 m bgl (average 3 m bgl), respectively. This fluctuation of groundwater levels will influence the operation of the water balance estimation. The groundwater levels in Sukhuma District fluctuated between the fractured laterite and the fractured bedrock layers *(Figure 2.19)*. This information on water level fluctuations was also useful for developing the conceptual water balance model for Sukhuma District as described in Section 4.1.

During the dry season 2015-16, groundwater levels at some wells were lower than groundwater levels measured in the dry season 2012-13, possibly caused by increased groundwater pumping. It can be seen from *Figure 2.19* that groundwater levels in the Sukhuma District increased during the wet season and decreased during the dry season. This phenomenon implies that the main source of groundwater recharge in the Sukhuma District is rainfall. Also, major ion water chemistry of groundwater and river water is similar, and analysis of the stable isotopes, deuterium (δ^2H and $\delta^{18}O$), demonstrates that the water is of meteoric origin. Details are provided in Appendix 13.

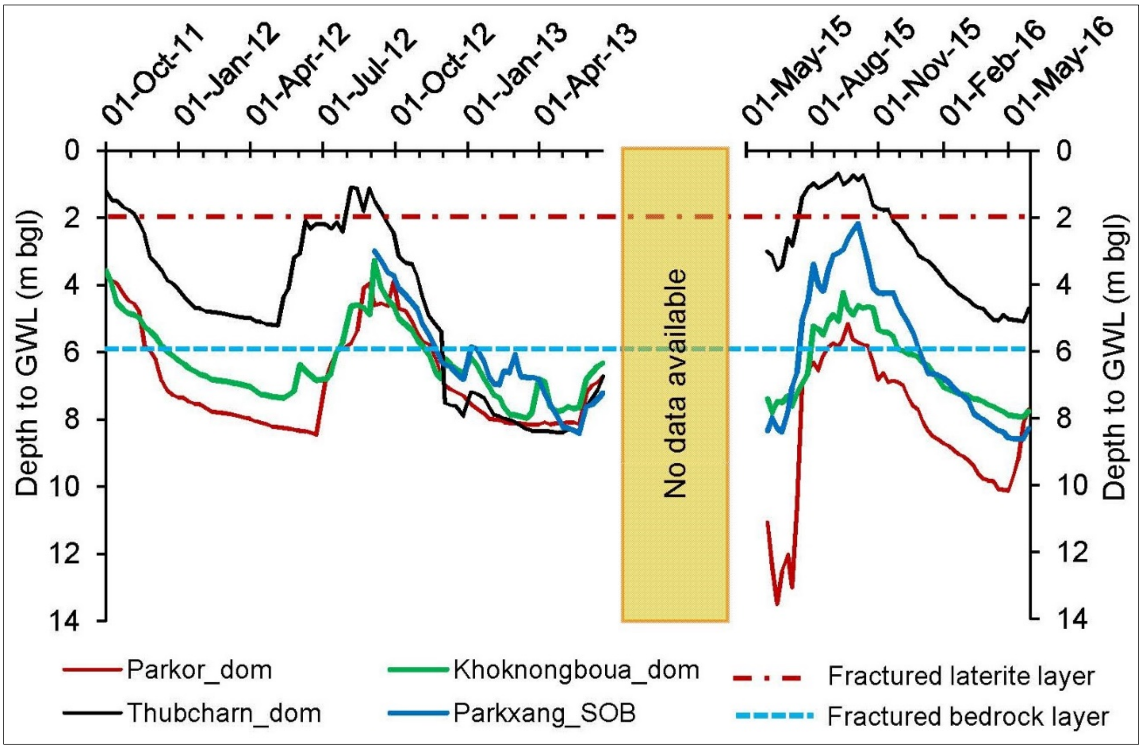


Figure 2.19: Weekly depth to groundwater level (GWL) hydrographs at the selected wells in Sukhuma District from October 2011 to May 2016; depths to fractured laterite and fractured bedrock layers. Note: dom = domestic bore, SOB = Shallow Observation Bore, m bgl = metres below ground level

2.6.4. Aquifer properties

The pumping test data are necessary for assessing the properties of the aquifer, particularly the transmissivity and specific yield (Vouillamoz et al., 2016). There have been few pumping tests done in Sukhuma District (JICA, 1995; Vote et al., 2014); test locations are shown in *Figure 2.20*. JICA (1995) conducted a pumping test at the Sarmkhar Village of Sukhuma District. The depth of the well is 43 m bgl. Casing diameter is 0.15 m. The pump was set at the depth of 30 m bgl for the sandy shale aquifer. JICA (1995) analysed pumping data by using Theis, Jacob and Jager methods. The aquifer properties (transmissivity, hydraulic conductivity and storativity values) were estimated from the single well pumping test data (JICA, 1995). The results are given in *Table 2.2*. The value of Transmissivity (T) calculated by JICA (1995) falls within the range of the transmissivity of the Phu Kradung geology formation, which ranges from 0.14 to 42 m^2/day, as indicated in Wongsawat et al. (1992).

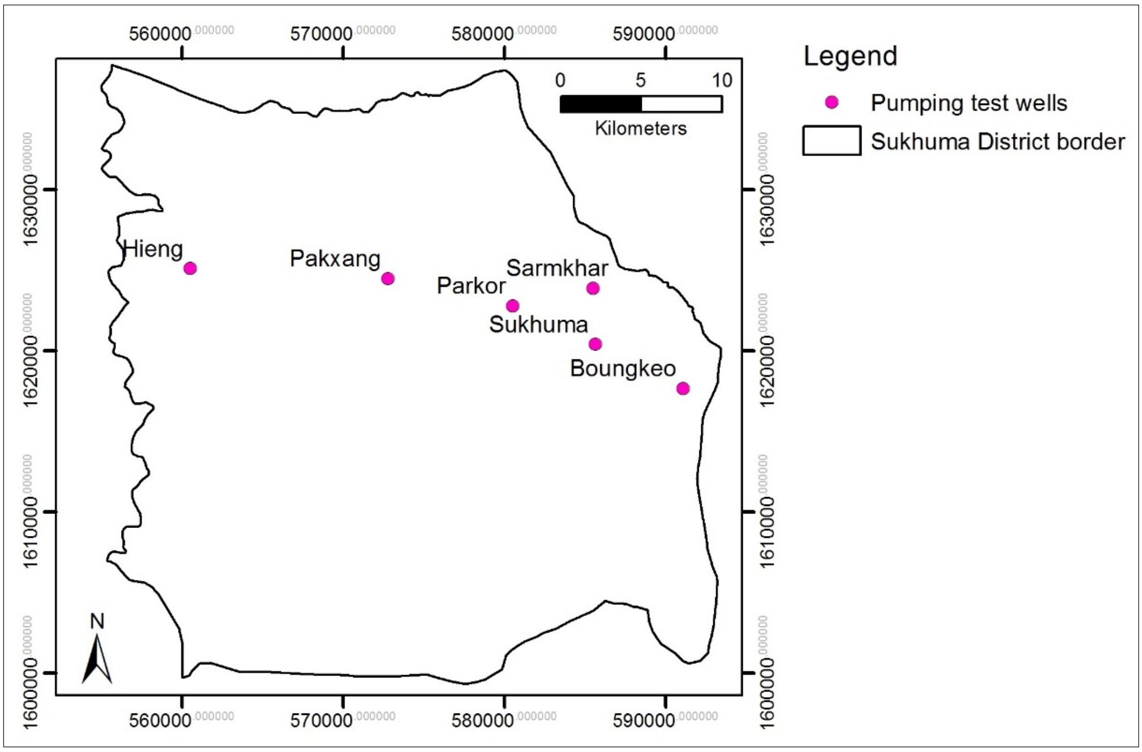


Figure 2.20: Locations of the wells test pumped in the Sukhuma District

Table 2.2: Estimated aquifer properties using the single well pumping test data from the previous studies

Data source	Well location (Village name)	Transmissivity, T (m^2/day)	Hydraulic Conductivity, K (m/d)	Storativity, $\acute{S}$ (dimensionless)
JICA (1995)	Sarmkha	40.30	2	9.63×10^{-2}
Vote et al. (2014)	Boungkeo	173	3.76	0.01
Vote et al. (2014)	Sukhuma	313	9.21	0.58
Vote et al. (2014)	Parkor	265	8.83	2.30×10^{-3}
Vote et al. (2014)	Parkxang	174	7.57	0.58
Vote et al. (2014)	Hieng	0.17	6×10^{-3}	0.05

Furthermore, *Table 2.2* also contains the results of the five pumping tests conducted by the previous ACIAR Project (Wade et al., 2015) and analysed by Vote et al. (2014). The previous ACIAR Project (Wade et al., 2015) conducted single-well pumping tests at five deep observation wells in the Sukhuma District, namely: Boungkeo, Sukhuma, Parkor, Parkxang, and Hieng. The locations of these wells are shown in *Figure 2.20*. The pumping test data sheets for these five wells are available from the well completion report by Champasak Provincial Health Department (2012) and are summarised in Appendix 14. Vote et al. (2014) analysed the pumping test data by using Theis method for the single well analysis, which is available in the Aquifer Test 2013.1 software, to estimate the aquifer properties (T, K, and $\acute{S}$). It can be seen from *Table 2.2* that the values of T, K, and $\acute{S}$ estimated by Vote et al. (2014) were higher than the results from JICA (1995), except for the pumping well at Hieng Village.

Based on the availability of the pumping test data as mentioned above, it is revealed that only single-well pumping tests have been done in Sukhuma District. However, Kruseman and de Ridder (1990) state that estimating the value of the storativity of the aquifer from single-well pumping test data has questionable reliability. Therefore, an appropriate pumping test for this study was implemented on 2 December 2015. The Parkxang deep observation well *(Figure 2.20)* was selected for this pumping test because it was convenient to access to the electric power and has an observation well located nearby. This pumping test included a pumping well and one observation well located about 30 m away from the pumping well. The pumping test data sheet is provided in Appendix 15.

The pumping test data were analysed by using Hantush's modification of the Jacob method for a partially penetrating well (Kruseman and de Ridder, 1990) to estimate the transmissivity (T), hydraulic conductivity (K) and specific yield (S_y) of the fractured sandstone aquifer in Sukhuma District. The results of estimated T, K, and S_y values are 94.40 m^2/day, 2.30 m/day and 0.013, respectively. The value of T is very much smaller than the previous calculation of 174 m^2/day by Vote et al. (2014). This low value of T probably reflects the influence of vertical hydraulic conductivity due to partial penetration. Because T and K are small, S_y also is smaller than the previous calculation by Vote et al. (2014).

2.7. Summary

This chapter shows that Sukhuma District is located in a region where clean and sufficient surface water source is limited. Hence, the groundwater becomes the major source for water supply for those who are living in the district. The geological formation in the area is mainly classified as the Mesozoic sandstone Formation or known as Phu Kradung Formation.

The largest land use type in the district is shrub land followed by crop land. About 80% of households earn their incomes from agricultural activities. The main crop grown in the area is rice. Expanding agricultural areas and rapid population growth can be expected in future. These increases will also lead to higher groundwater abstraction.

However, studies on hydrology and groundwater in the Sukhuma District are very few. This can be because the availability of hydrologic and geologic data in the Sukhuma District is sparse (see Section 2.6). In order to facilitate the better understanding of the long-term seasonal changes in surface water and groundwater in the region, a conceptual water balance model was formulated (see Chapter 4) and the methodologies for overcoming the challenges of assessment of water resources availability in a region with limited available data was also required to review (see Chapter 3) and to investigate (see Chapter 5).

Chapter 3 : Literature Review

This literature review has a number of sections. The first of these is an overview of the previous studies in Southern Laos, including Sukhuma District. This is followed by a brief discussion of the differences between lumped and distributed water balance models, in Section 3.2. An overview of the conceptual water balance models and the data needed for their implementation is also described in this section. A review of data available for remote sensing and its application for assessment of total water storage and groundwater resource availability are provided in Section 3.3. Finally, a summary has been provided at the end of this chapter.

3.1. Overview of previous studies in Southern Laos

To date, some projects and studies have been undertaken to investigate and assess the characteristics of groundwater in Southern Laos. For example, studies on groundwater in Southern Laos have been done by JICA (1995); JICA (1997); JICA (2012); Vote et al. (2014); Vote et al. (2015); and Phommavong (2015). Provinces in which these studies were conducted are indicated in *Figure 3.1*. In 1995, Japan International Cooperation Agency (JICA) conducted a feasibility study on groundwater development for domestic water supply in Champasak and Salavan provinces in Southern Laos. In 1997, JICA continued the groundwater development project in the same provinces by installing 305 deep wells in 189 villages in order to study more about hydrogeology in Southern Laos. Furthermore, in 2012 JICA drilled 5 more deep wells in Salavan, Attapue, and Xekong provinces. The outcomes from these projects include: basic information for groundwater study, including geological cross-sections, lithological well logs, well locations, groundwater and surface water use survey at household level, and pumping test data (transmissivity, hydraulic conductivity, storativity). The hydraulic properties values from the JICA projects were estimated from single-well pumping tests.

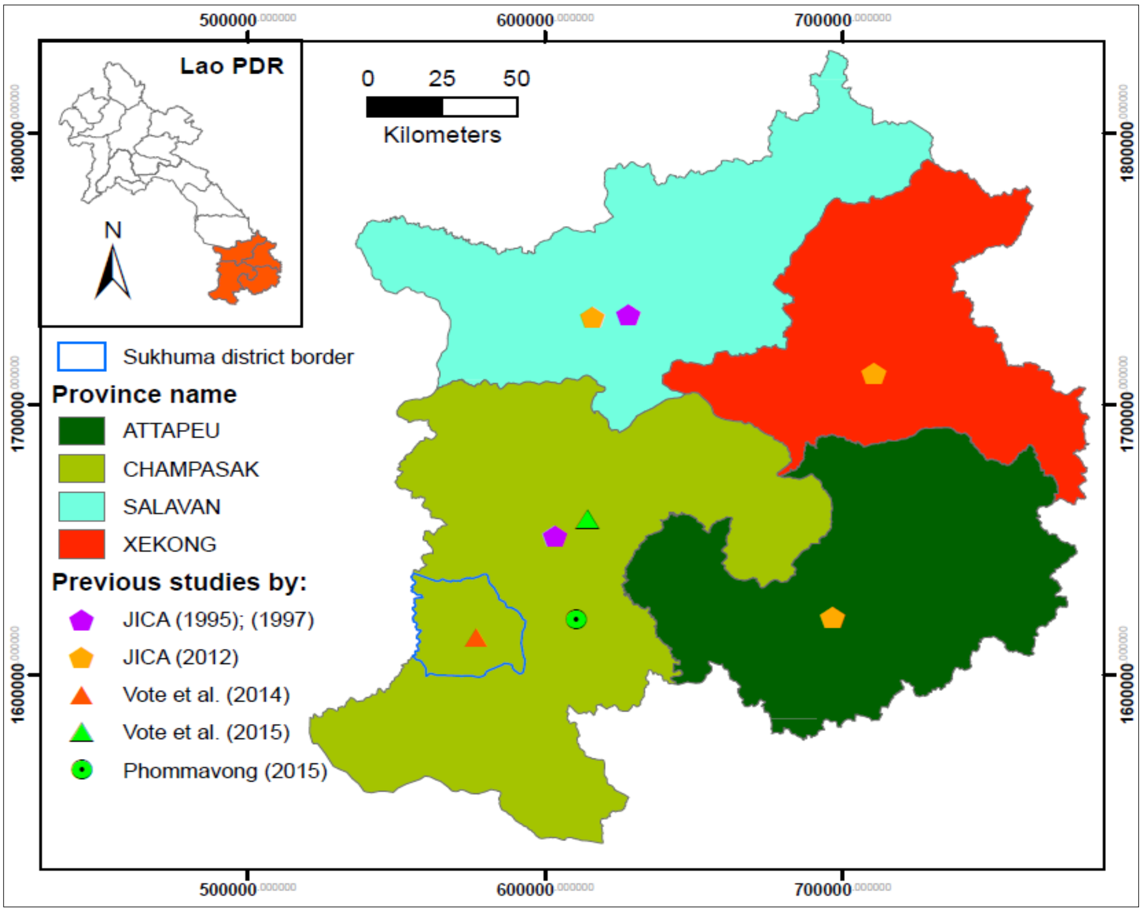


Figure 3.1: Previous groundwater projects and studies in the Sukhuma District and Southern Laos

Following the JICA project, Vote et al. (2014) conducted a study on the interaction between shallow groundwater and rainfall in Sukhuma District, Champasak Province *(Figure 3.1)*. As part of the study, five paired shallow and deep observation wells were constructed, and 16 rain gauges were set up in 16 villages where the groundwater table in domestic wells was monitored. Vote et al. (2014) indicated that groundwater level observations at the four paired wells (Boungkeo, Sukhuma, Parkor and Parkxang) show similar depths to groundwater. Therefore, distinguishing characteristics between deep and shallow groundwater could not be identified. They further pointed out that the paired wells at Hieng village are situated in two different stratigraphic layers from four other paired observation wells. Vote et al. (2014) also estimated the values of hydraulic properties from single-well pumping tests. Additionally, Phommavong (2015) estimated groundwater recharge and groundwater use at household levels in Phathumphone District, Champasak Province.

In the Sukhuma District, a few studies have been undertaken for estimating the groundwater recharge. The project of JICA (1995) was the first attempt to estimate the groundwater recharge in the Sukhuma District of Champasak Province, Southern Laos. Their estimation was based on a simple static conceptual water balance model (tank model) and using limited field data on rainfall, evaporation and streamflow. The recharge was estimated at 12% of annual rainfall. The study of Vote et al. (2014) was the second attempt to quantify the groundwater recharge in the Sukhuma District. They estimated the recharge rate at 23% of annual rainfall by using the Water Table Fluctuation method based on limited understanding of the geological conditions. There is large variability in these previous estimations of groundwater recharge. Therefore, to develop a reliable groundwater management plan in Sukhuma District requires a more realistic value of groundwater recharge based on a suitable conceptual water balance model with low uncertainty of estimation. More details on establishing a conceptual water balance model and estimation of the new values of groundwater recharge are discussed in Chapter 4.

3.2. Overview of conceptual water balance models

The water balance technique is crucial for assessing water resources sustainability (Mays, 2012). Water balances, also known as water budgets, are used to identify the water movement through the hydrologic cycle and have been used to investigate the interactions between surface water and groundwater (Todd and Mays, 2005). The water balance method has been used to assess water resources availability and estimate the groundwater recharge for a variety of space and time scales, ranging from local to global, by many researchers (Mays, 2012; Scanlon et al., 2002; Todd and Mays, 2005).

The basic conceptual water balance model for a basin is based on the law of conservation of mass which states that any change (ΔS) in the basin (surface and subsurface water storages) during a specified period equal the difference between the volume of water inflow (In) to the basin and the volume of water outflow (Out) from it. The water balance model can be on daily, monthly, seasonal or annual time basis. The basic water balance equation for a basin is usually expressed as:

$$\Delta S = In - Out \qquad \text{(3.1)}$$

Where ΔS is the change in total water storage (storage in surface water, soil moisture and groundwater), In is all inflow components into the basin (e.g. precipitation, stream inflow and groundwater inflow), and Out is all outflow components from the basin (e.g. evapotranspiration, stream outflow, lateral groundwater outflow, and groundwater abstraction). The units of these parameters (ΔS, In and Out) can be expressed as the volume (m^3) or the volume per catchment area (m^3/m^2) or (mm).

At present, many hydrological models with different assumptions and parameterisations have been developed for water balance computations. These models can be classified based on the spatial description of the catchment processes as lumped or distributed models (Thapa et al., 2017). A lumped model refers to a simple water balance model in which it is assumed that all components are constant across the basin area. In other words, all components of a lumped water balance model are only changed with time and not changed in space, examples of such models are: Tank model, HBV model, and NAM Module for MIKE 11 model (Agrawal and Desmukh, 2016; Orth et al., 2015; Thapa et al., 2017). In contrast, a distributed water balance model is formulated by dividing a basin into sub-basins or grids. Each grid will represent all physical characteristics for a real area, in models such as SWAT (Soil Water Assessment Tool) model and MIKE SHE model (Thapa et al., 2017). Some examples for lumped and distributed water balance models are reviewed in the following paragraphs.

The complexity of the conceptual water balance model for a basin can vary from a simple model to more complex models. Jakeman et al. (2016) indicated that setting the number of model parameters will rely primarily on the available data and the project objectives.

For an example of a lumped water balance model, Zhang et al. (2002) and Zhang et al. (2008) defined a simple conceptual water balance model for a catchment by using only the primary components of total water storage, rainfall, evapotranspiration and total runoff. Zhang et al. (2008) tested their conceptual water balance model by using daily rainfall, potential evapotranspiration, and streamflow for the period 1974 to 1994 (21 years) from 265 catchments in Australia. The rainfall data were interpolated from over 6000 rainfall stations in Australia. The results from their research indicated that their model has the potential to be used for ungauged catchments and shows the best performance with monthly time steps. However, the conceptual water balance model proposed by Zhang et al. (2008) focused mainly on predicting the streamflow, while the groundwater recharge and flow in the saturated zone were not separately estimated. Their model also requires large amounts of input data. In the current research on the Sukhuma District, the groundwater recharge and lateral groundwater inflow and outflow components were separately estimated (see Chapter 4). The available data on rainfall, climate and streamflow in Sukhuma District are very limited (see Section 2.6). Thus, the conceptual model developed by Zhang et al. (2008) is not applicable for this study.

As another example of a lumped model, Yeh et al. (2007) developed a simple water balance model for the Ching-Shui watershed in Taiwan. They defined water balance by using the rainfall (precipitation), excess infiltration, excess saturation runoff, infiltration, evapotranspiration (ET), and groundwater recharge *(Figure 3.2)*. Their conceptual water balance model was developed based on the adequacy of available data in the catchment, which include the soil hydraulic properties and meteorological data from 1992 to 2001 (10 years). The lateral groundwater inflow (G_i) and outflow (G_o) and groundwater abstraction were not included in their model because the model focuses mainly on the water movement in the unsaturated zone and the drainage from the unsaturated zone to the saturated zone *(Figure 3.2)*. Yeh et al. (2007) indicated that their conceptual model could produce a reasonable rate of groundwater recharge under a variety of climate conditions and soil properties. The main input data for their water balance equation are continuous long-term records of soil moisture and meteorological data. Collection of these data will need a large budget and will consume much time (Mathias et al., 2017). The data on soil moisture and meteorology in the Sukhuma District is sparse as described in Section 2.6. Thus, the conceptual model proposed by Yeh et al. (2007) is not suitable to be applied directly to the Sukuma District. Lakshmi (2016) suggested that the simulated soil moisture data from the GLDAS-Noah and remote sensing data can be used to supplement the missing data in calculating the water balance at the basin scale. Hence, the evaluation of water balance in the Sukhuma District was combined between the field observation data and the soil moisture data derived from GLDAS. More details of using soil moisture data from GLDAS in the Sukhuma District water balance equation are provided in Section 4.10.2. The literature review of using remote sensing data for hydrological studies is also described in Section 3.3.

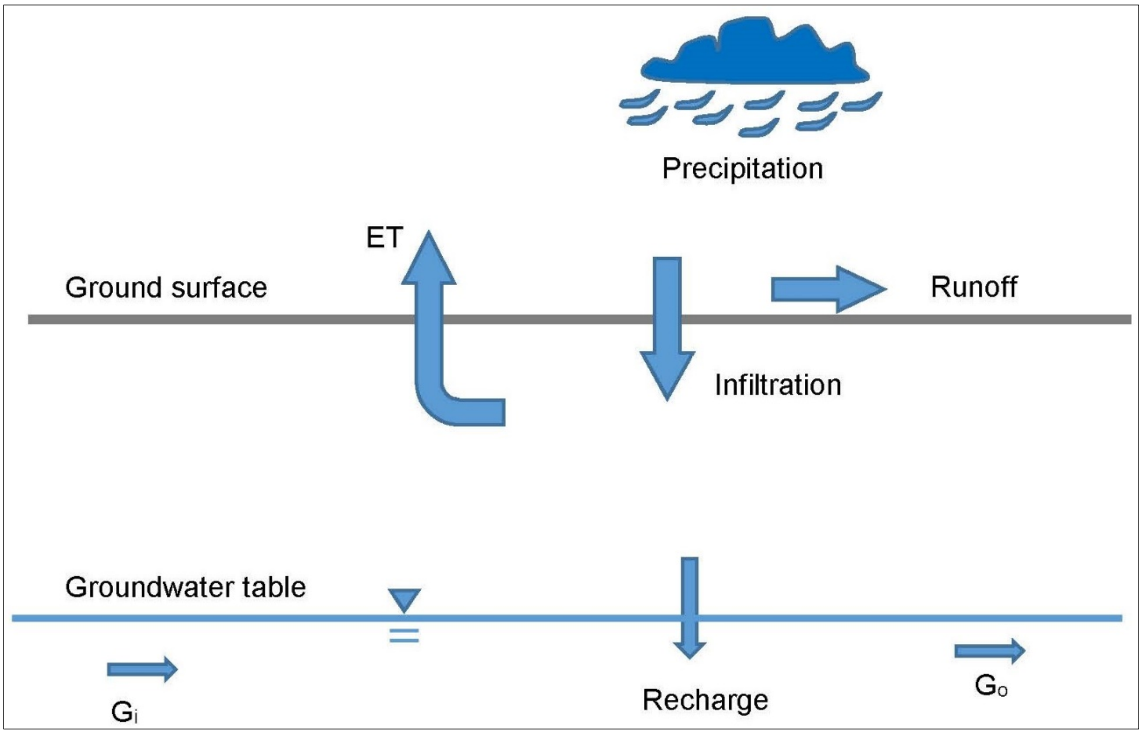


Figure 3.2: Conceptual water balance model adapted from Yeh et al. (2007)

A commonly distributed model used for groundwater studies is the Systeme Hydrologique European (SHE) model introduced by Abbott et al. (1986). The SHE is a physically based model and requires extensive physical parameters. The SHE model can be applied at various spatial and time scales. The various components of water balance are included in this model, such as precipitation, evapotranspiration, interception, streamflow, unsaturated flow, and groundwater flow, groundwater recharge, digital elevation model (DEM), soil properties, land use, etc. More details of data requirements for the SHE model are available from the Danish Hydraulic Institute (2017).

Graham and Butts (2005) indicated that the SHE model is a flexible and integrated watershed model. It can be applied in many fields of studies, such as river basin management, integrated surface water and groundwater, groundwater modelling, etc. Also, it is applicable at spatial scales ranging from a single soil profile to large regions including several catchments.

Although the SHE model is flexible and useful, it has some limitations which include the extensive data requirements which may not be available all the time for many regions around the world (GEMStat, 2018), for example: Sukhuma District of Southern Laos as described in Chapter 2; also the users need to be familiar with using the model code. These limitations can make it difficult to set up the model which requires extensive computation time. Furthermore, there can be difficulty in interpreting the results and a significant budget is required for data collection.

Walker and Zhang (2002) and Orth et al. (2015) pointed out that adding complexity to a model does not necessarily lead to improved performance of the water balance models. Their studies also proved that the accuracy of the models will not depend on their complexity but relies primarily on the structure of a model and quality of data. Several researchers (Beven, 2006; Devi et al., 2015; Duan et al., 2007; Thapa et al., 2017) argue that no single model is better than other models and can be used under all conditions and for all cases because each model has got its own unique characteristics and respective applications.

To minimise the errors and bias that may occur from the application of other catchment's water balance model, a new conceptual water balance model should be established with all available data. In order to check the model accuracy, Deus et al. (2013) suggested that the conceptual water balance model for a basin should be calibrated and validated with the available observation data or with valid remote sensing data, for a region with sparse observation data. Hence, a conceptual water balance model was formulated for Sukhuma District as described in Chapter 4.

Generally, the major components of a basin water balance equation include: rainfall (precipitation), surface runoff, evapotranspiration, baseflow, lateral groundwater inflow and outflow, groundwater abstraction, and groundwater recharge. Each component of the water balance equation can be estimated using different methods. The common approaches used for estimating some components of a water balance equation are described in the following paragraphs:

<u>Rainfall:</u>

Rainfall is usually the largest input component in the water balance equation and can be measured using rain gauges. The mean areal rainfall for a catchment is commonly calculated by using the Thiessen Polygon or Isohyetal methods (Zhang et al., 2008). Where limited available rainfall data exists, the rainfall data derived from the remote sensing are often used (Deus et al., 2013).

Surface runoff:

The surface runoff is the overland flow that occurs when the rainfall rate is higher than the soil infiltration rate. The surface runoff can be estimated by using several methods; however, the most commonly used method is the Soil Conservation Services Curve Number method.

The Soil Conservation Services (SCS) Curve Number method (Maidment, 1993) is versatile and widely used to estimate the surface runoff (Q_{SR}). The SCS Curve Number method is a good model which is convenient to use and requires only details of soil properties, land use and vegetation cover, and antecedent soil water conditions (Kumar, 2003). Generally, this method is suitable for small watersheds with an area of less than 250 km^2 (Sharma et al., 2001). However, the model is very flexible and can be adapted for large watersheds. For example, Phetprayoon et al. (2009) applied the SCS-CN method to the upper Lam Phra Phloeng watershed with an area of 780 km^2 in the north-eastern Thailand. Their study shows good correlation between observed and simulated runoff with r^2 of 0.75 and 0.89. Phetprayoon et al. (2009) modified the values of curve number (CN) for their study area in Thailand, where has similar climate and vegetation cover conditions to Laos. Moreover, Phetprayoon (2015) used the SCS-CN method for the upper Lam Ta Kong watershed with an area of 1,200 km^2 which is located in Nakhon Ratchasima Province, Thailand. The result from his study shows very good correlation between observed runoff and simulated runoff with the values of r^2 ranging from 0.75 to 0.87. These previous studies in Thailand also show the potential and validity of applying the SCS-CN method for estimating the surface runoff in Laos.

The equation of SCS Curve Number method (Cronshey, 1986) is expressed as follows:

$$Q_{SR} = \frac{(P-I_a)^2}{(P+0.8\,.S)} \qquad \text{.......................... (3.2)}$$

$$I_a = 0.2\,.S \qquad \text{.......................... (3.3)}$$

$$S = \frac{25400}{CN} - 254 \qquad \text{.......................... (3.4)}$$

Where Q_{SR} is daily surface runoff depth (mm/day), P is an area-averaged daily rainfall within study area (mm/day), I_a is initial abstraction (mm/day), the 0.2 is the initial abstraction parameter, S is potential maximum retention after surface runoff begins (mm), and CN is curve number. If $P < I_a$, then $Q_{SR} = 0$.

Infiltration:

In this research, the infiltration is considered as the rain water movement from the ground surface into the subsurface soil layers (Scanlon et al., 2002). The infiltration can be simulated by using various models. The most commonly used models include the Green-Ampt infiltration model

(Green and Ampt, 1911) and the HYDRUS model (Šimůnek et al., 2008). Based on studies by Dafny and Šimůnek (2016) and Xiang et al. (2016) these models require extensive input data on the soil porous media characteristics. Sequential data on change in soil moisture and soil properties are required by these models to solve the Richard's equation. Hence, the Green and Ampt infiltration model and the HYDRUS suits of models are not suitable for applying in the Sukhuma District because of insufficient input data as described in Section 2.6. Instead, a simple catchment water balance equation was derived for estimating the infiltration in the Sukhuma District. It was estimated as the residual of rainfall, ET and direct runoff. More details of infiltration estimation for the current research are described in Section 4.12.

Evapotranspiration:

Generally, evapotranspiration (ET) is the second largest component of the water balance components. The accuracy of spatial and temporal estimation of ET are essential for water balance models.

Evapotranspiration (ET) is the sum of evaporation from soil and surface water (lake and river) and plant transpiration. It is very difficult to estimate the ET for a large area (Allen et al., 1998). However, Allen et al. (1998) indicated that the monthly ET is commonly calculated as the product of the reference crop evapotranspiration (ET_0) and the crop coefficient (K_C) as expressed in the following equation:

$$ET = K_C \,.\, ET_0 \qquad \text{………………..} \; (3.5)$$

Where ET is the monthly evapotranspiration (mm/month), K_C is the crop/tree coefficient (dimensionless), and ET_0 is the reference crop evapotranspiration (mm/month).

There are many methods available for estimating ET_0. For example, the Hargreaves method (Hargreaves et al., 1985) and the Penman-Monteith method (Allen et al., 1998). The Hargreaves method requires data on minimum and maximum air temperature and extraterrestrial radiation, which needs less input data than the Penman-Monteith method. However, the estimated ET_0 from the Hargreaves method can be up to 20% lower than the ET_0 estimated from the Penman-Monteith method (Allen et al., 1998). Selection of a suitable method for a specific region will depend mainly on the data availability.

The daily ET_0 can be estimated by using the Penman-Monteith equation (Allen et al., 1998). This equation has been widely used in many countries, including Laos (Deus et al., 2013; Finch, 1998; Inthavong et al., 2011; Thompson et al., 2014a; Zhou et al., 2006). For example, Deus et al. (2013) simulated water balance for the Lake Manyara in Tanzania; Finch (1998) studied water balance in the United Kingdom; Inthavong et al. (2011) applied a water balance model for characterization of length of growing period and water stress development for rainfed lowland rice in the Lower Mekong Basin countries (Laos, Cambodia and Thailand). All these studies show the usefulness of applying the Penman-Monteith equation for quantifying the ET component.

The Penman-Monteith approach was recommended by the Food and Agriculture Organization (FAO) because the Penman-Monteith equation is an international standard equation for estimating the ET_0 (Allen et al., 1998) and produces highly accurate estimates of ET_0 (Alkaeed et al., 2006). The Penman-Monteith equation estimates the ET_0 based on a hypothetical grass reference surface that is about 0.12 m height and has a surface resistance of 70 s/m with an albedo of 0.23. The most sensitive parameters for this equation are solar radiation (R_S) and wind speed (u), but the equation is less sensitive to humidity (RH) and air temperature (Debnath et al., 2015). The Penman-Monteith equation is based on the availability of all parameters of climate data (air temperature, wind speed, sunshine hours and humidity). The Penman-Monteith equation (Allen et al., 1998) has the form as follows:

$$ET_0 = \frac{0.408\Delta(R_n - G) + \gamma \frac{900}{T_{mean}+273} u_2 (e_s - e_a)}{\Delta + \gamma(1 + 0.34 u_2)} \quad \text{.................. (3.6)}$$

Where ET_0 is the estimated ET_0 by using the Penman-Monteith equation (mm/day), T_{mean} is mean temperature (°C), u_2 is wind speed at 2 m above the ground (m/s), R_n is net radiation flux ($MJ/m^2/day$), G is sensible heat flux into the soil ($MJ/m^2/day$) which is usually assumed to be zero for the daily basis, γ is psychrometric constant (kPa/°C), e_s is saturation vapour pressure (kPa), e_a is actual vapour pressure (kPa), (e_s - e_a) is saturation vapour pressure deficit (kPa), and Δ is slope of the vapour pressure curve (kPa/°C), 900 is the conversion factor, 0.408 is the coefficient for converting the unit from $MJ/m^2/day$ to mm/day. The standardised equations for calculating all parameters of the Penman-Monteith equation are described in Allen et al. (1998) and Zotarelli et al. (2010).

<u>Baseflow:</u>

Baseflow is the volume of groundwater discharge to streamflow in catchments. Commonly, two main components make up the stream hydrograph: quick-flow and baseflow (Ladson, 2008). Quick-flow is the direct response to a rainfall event including overland flow (runoff), and direct rainfall onto the stream surface (direct rainfall); base-flow is a low frequency component that is derived from natural storages and from lateral movement in the aquifer (interflow) (Brodie and Hostetler, 2005).

Baseflow can be estimated by various methods, for example, tracer mass balance and graphical hydrograph separation. Chapman and Maxwell (1996) pointed out that the tracer mass balance methods depend on chemical constituents in the river and river discharge data. Miller et al. (2015) pointed out that a long-term record of continuous monitoring of chemical data for a river is a big challenge for using this method. Although the tracer mass balance methods can provide more accurate results of baseflow estimation than the graphical hydrographic separation method (Miller et al., 2015), they will require a significant budget for collecting data and laboratory testing.

The graphical hydrographic separation method depends on the river discharge alone to estimate the baseflow (Eckhardt, 2008). Brodie and Hostetler (2005) conducted a review of existing techniques for quantifying the baseflow from stream hydrographs. They stated that there are many existing graphical methods, which can be classified into two main categories, such as recession curve methods and digital filter methods. Halford and Mayer (2000) indicated that baseflow estimated from the recession curve method has been questioned due to the accuracy of its assumptions. Hannula et al. (2003) stated that the baseflow is usually assumed as the representative groundwater discharge into the stream. Thus, the accuracy of baseflow estimation will mainly depend on the assumptions used and precise streamflow measurements.

The single parameter algorithm method proposed by Chapman and Maxwell (1996) has been widely used. The daily streamflow data are the major inputs for this method. Chapman and Maxwell (1996) assumed that base-flow is a simple weighted average of direct runoff and the base-flow at the previous time interval and that the form of the digital filter implied that base-flow would be constant when there was no direct runoff. Then, base-flow can be estimated from the following equation (Chapman and Maxwell, 1996):

$$Q_{bf(i)} = \frac{k}{2-k} Q_{bf(i-1)} + \frac{1-k}{2-k} Q_{(i)} \quad \text{Subject to } Q_{bf(i)} \leq Q_{(i)} \qquad \text{………………. (3.7)}$$

Where i is the time interval (day), $Q_{bf\,(i)}$ and $Q_{bf\,(i-1)}$ are daily average baseflow at time interval (i) and $(i-1)$ (m^3/s), $Q_{(i)}$ is daily average streamflow at time interval i (m^3/s), and k is the recession constant or depletion factor during no direct runoff (dimensionless).

A long-term average Baseflow Index (BFI) for the catchment can be estimated as follows (Beck et al., 2013):

$$BFI = \frac{\sum_{i=1}^{n} Q_{bf}(i)}{\sum_{i=1}^{n} Q(i)} \qquad \text{……………….. (3.8)}$$

Where BFI is the long term average baseflow index (dimensionless), $Q_{bf}(i)$ and Q(i) are the baseflow and total streamflow at time i (m^3/s).

The hydrograph separation method has been applied not only for estimating the baseflow volume but also used to investigate the interaction between surface water and groundwater. For example, Yihdego and Khalil (2017) used the hydrograph separation method to quantify the baseflow and assess the surface water and groundwater interaction in the Aiga and Soloda Creeks of the Murray-Darling Basin, Australia.

Naturally, groundwater is recharged by surface water (e.g. water in rivers and lakes) and rainfall. Groundwater also discharges to surface water by drainage and/or evapotranspiration. Brodie et al. (2007) define an interaction of water resource as being the combination of surface water feature(s) and the groundwater system(s) that can indirectly or directly exchange in terms of the movement of water. Groundwater and surface water are interconnected in the hydrological cycle and their interactions are affected by different conditions of the topography, geology, soil and climate (Sophocleous, 2002; Winter et al., 1998). There are a variety of definitions for the terms surface water and groundwater that have been presented in hydrology literature. However, this study will use the basic definition that *"all water above the surface of the land is considered as the surface water and all water below the groundwater table is considered as the groundwater".* The water contained in the unsaturated zone is considered as *"the soil water or soil moisture".*

Surface water (stream) can be recharged by multiple sources of water, including direct rainfall, surface runoff and groundwater. According to Winter et al. (1998), the interaction between stream and groundwater commonly occurs in three basic ways, namely: gaining surface water source, losing surface water source, and both gaining and losing.

Groundwater recharge:

Various definitions of groundwater recharge have been provided in the literature (Crosbie et al., 2005; Healy and Cook, 2002; Izady et al., 2017; Rodhe and Bockgård, 2006; Rushton and Ward, 1979; Scanlon et al., 2002). For the purpose of this study, the groundwater recharge refers to the portion of rainfall that enters and stores in the deep fractured bedrock aquifer system. More details of groundwater recharge estimation are provided in Chapter 4.

Understanding the processes of groundwater recharge-discharge is crucial for sustainable water resources management (Sophocleous, 2000) and to enable the identification and quantification of the interaction between surface water and groundwater (Sophocleous, 2002). Healy (2010) indicated that estimating groundwater recharge is often quite challenging and still cannot be solved directly utilising any ground or satellite measurements. Many techniques have been suggested for quantifying groundwater recharge (Scanlon et al., 2002). However, the water table fluctuation method has been widely used.

The original equation of the water table fluctuation (WTF) method (Healy and Cook, 2002) is based upon the assumption that groundwater level rises in the unconfined aquifer are caused by recharge. If the groundwater level rise is known and the specific yield is known then groundwater recharge can be estimated from:

$$R = S_y \frac{\Delta h}{\Delta t} \qquad \text{.......................................} \ (3.9)$$

Where R is the groundwater recharge (mm/month), Δh is the water table rises during the time of Δt (mm/month).

The Water Table Fluctuation (WTF) method is widely used for estimating groundwater recharge, e.g. Moon et al. (2004), Crosbie et al. (2005), Park and Parker (2008), Cuthbert (2010), Cuthbert (2014), Cuthbert et al. (2016), Cai and Ofterdinger (2016), etc. This is likely because of the abundance of available groundwater level measurements and the simplicity of estimating groundwater recharge rates from groundwater level fluctuations temporally and spatially (Healy and Cook, 2002). However, an insufficient budget for conducting a suitable number of pumping test can be one of the key challenges to estimate an accurate value of S_y for use in the WTF method (Cai and Ofterdinger, 2016; Healy and Cook, 2002). Moreover, in order to reduce uncertainties and increase accuracy in quantifying groundwater recharge, Scanlon et al. (2002) suggested applying a variety of approaches, for example, water table fluctuation, water budget, baseflow separation, etc. Applying some of these methods in the study area will depend on data availability.

It has been nearly two decades since researchers have done studies to improve the WTF method. Most of these studies have targeted quantifying the groundwater level rise due to the recharge and some studies have been focussed on how to determine the groundwater drainage for the period of groundwater level decline.

An example of the studies to improve the calculation of the groundwater level rise is provided by Moon et al. (2004). They modified the WTF method by considering the relationship between cumulative precipitation and cumulative groundwater level rise during the wet season. The equation of the modified WTF method (Moon et al., 2004) is expressed as:

$$\alpha = \frac{\Delta h_1 + \Delta h_2 + \cdots + \Delta h_n}{P_1 + P_2 + \cdots + P_n} \times S_y = \frac{\sum \Delta h}{\sum P} \times S_y \qquad \text{……………………………… (3.10)}$$

Where α is the ratio of water table rise to the cumulative rainfall during the rainy period (dimensionless); Δh_1, Δh_2, ….., Δh_n is the monthly water table rise (mm/month); P_1, P_2, …., P_n is the monthly rainfall (mm/month); $\sum \Delta h$ is the total water table rise due to the cumulative rainfall (mm); $\sum P$ is the cumulative rainfall in the period corresponding to the water level rise; and S_y is the specific yield.

Moon et al. (2004) estimated groundwater recharge from the relationship between groundwater and rainfall in South Korea by comparing the cumulative groundwater fluctuation with cumulative rainfall and applying the cross-correlation technique. This is a statistical analysis technique, which can identify the best correlation between two time-series datasets (Davis 1986 cited in Moon et al. 2004). Their study used groundwater level data from 66 wells and rainfall data from 310 stations in South Korea. In contrast, for this research, there are only 15 rain gauges and five dedicated paired observation bores with 11 domestic water bores available in Sukhuma District for monitoring. Moon et al. (2004) estimated groundwater recharge in South Korea from a relationship between the groundwater level fluctuations and the time lags between rainfall and groundwater level rises. They determined the time lags using the cross-correlation technique.

They indicated that the groundwater recharge amount obtained from the modified WTF method was reliable. However, some limitations of the modified WTF method include the accuracy of the estimate. Obtaining a suitable value of specific yield for this method remains a challenge and this method can be applied only in the wet season. Therefore, details of groundwater level fluctuations and rainfall measurements are the crucial processes.

Many researchers have claimed that actual groundwater level fluctuations or water table rises are caused not only by rainfall but also by other factors. Crosbie et al. (2005) improved the WTF method by taking an empirical approach to accounting by introducing a drainage term (D). Following Crosbie et al. (2005), Park and Parker (2008) also included an expression for the drainage term (D) which is linked to the aquifer properties in their model to estimate water table fluctuation in response to precipitation. However, Cuthbert (2010) argued that the WTF method modified by Park and Parker (2008), is not appropriate for the areas where the groundwater recharge is not only from rainfall. Therefore, Cuthbert (2010) modified the WTF method by emphasizing the drainage term (D) as presented in Equation (2.11). Moreover, Cuthbert et al. (2016) also continued to improve the method for estimating the D by upgrading the model from one-dimension to two-dimensional model and assumed no inflow at the boundaries. All of the mentioned early studies (Crosbie et al., 2005; Cuthbert, 2010; Cuthbert et al., 2016; Park and Parker, 2008) applied a similar method (recession curve) to quantify the value of D and relied on a similar conceptual model of the aquifer, which does not include the lateral groundwater inflow. This assumption for excluding the lateral inflow may not be always applicable for all types of study areas because the groundwater recharge in some study areas, such as Sukhuma District, may also be affected by external lateral inflow. Equation (3.9) is modified to:

$$R = \left(S_y \frac{\Delta h}{\Delta t}\right) + D \qquad \text{....................................... (3.11)}$$

Where S_y is specific yield, Δh is water table rises (mm/month) through a period of time (Δt), and D is the drainage term (mm/month).

The assumption of Equation (3.11) is that water level fluxes are not caused by entrapped air or barometric fluctuations (Cuthbert, 2010). A constant value of D was applied for groundwater recharge estimation (Cuthbert, 2010), but this situation may not be suitable for study areas, such as Sukhuma District, where changing groundwater water levels are affected by variation in seasonal groundwater abstraction of unknown magnitude. Cuthbert (2010) estimated the drainage term using the master recession curve for the duration of no-rainfall and with water table decline. Similarly, Cai and Ofterdinger (2016) also estimated the value of D using a linear fitting process of daily water table recession. This method is simple and straightforward to estimate a value of D. However, the D term cannot be estimated for the current research because of insufficient data of groundwater level (only 1 year). The accuracy of estimating the drainage term is one of the main limitations of this method (Cai and Ofterdinger, 2016).

Based on the literature review of the WTF method as mentioned above, the original WTF method as shown in Equation (3.9) is selected for estimating the groundwater recharge in the current study based on the available data. It is to be noted that the pumping during the period of water table rise is not of appreciable magnitude compared to the stored water volume in the aquifer system. To assess the accuracy and suitability of the WTF method in estimating the recharge in the Sukhuma District, a water balance approach has been considered also for the current study to estimate the groundwater recharge. A comparison of the results obtained from both approaches is provided in Section 4.10.3.

3.3. Application of remote sensing data derived from GRACE

The Total Water Storage Anomalies (TWSA) data derived from the Gravity Recovery and Climate Experiment (GRACE) satellite have been utilised in recent years to quantify and investigate changes in total water storage and the changes in groundwater storage. The GRACE satellite program was developed jointly by the National Aeronautics and Space Administration (NASA) of the United States and the German Aerospace Centre (DLR) and launched in March 2002 (Tapley et al., 2004). The system of GRACE satellites consists of two chasing satellites (also called Tom and Jerry) about 220 km apart and located in the same Earth orbit at an elevation of about 450 km as shown in *Figure 3.3*. Variations in the distance between them are affected by changes in the Earth's gravity field and are measured with great precision by a K-band microwave system (Tapley et al., 2004). Wahr et al. (2004) indicated that the accuracy of the GRACE data varies from approximately 10 to 15 mm of equivalent water height (EWH) on a wide range of spatial and temporal scales.

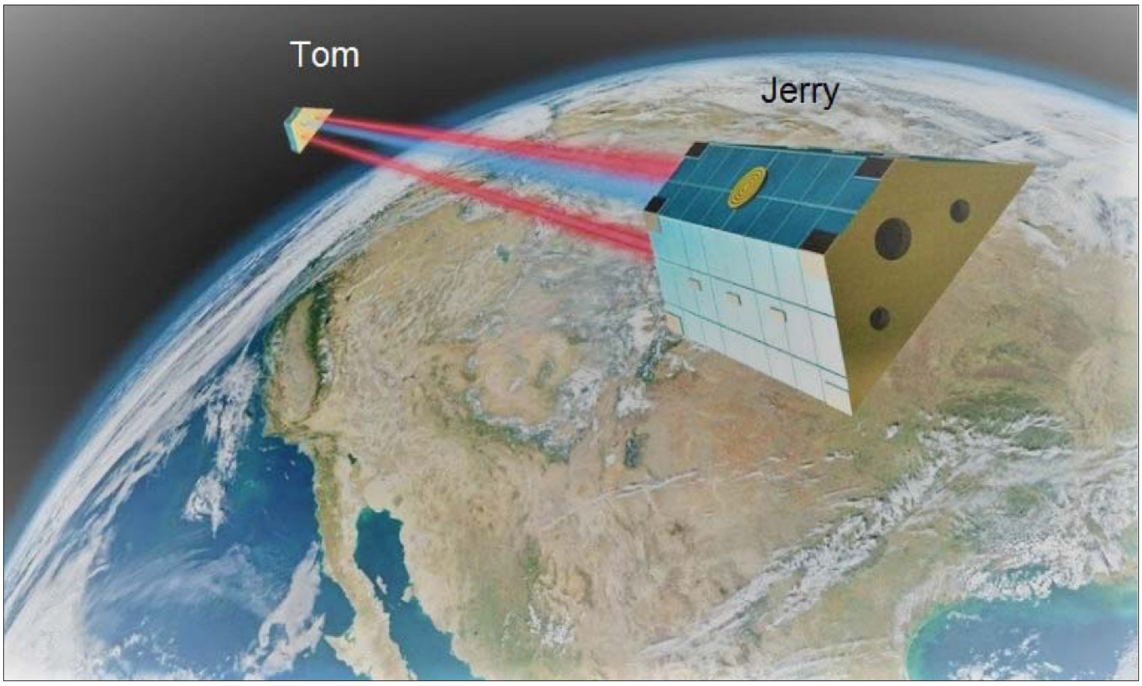


Figure 3.3: The twin satellites (Tom and Jerry) of the Gravity Recovery and Climate Experiment (GRACE) orbiting the earth at altitude of about 450 km and at about 220 km distance apart from each other. The Tom satellite follows the Jerry satellite. This photo was adapted from NASA (2016)

The Earth's gravity field is described in terms of the shape of the geoid, the equipotential surface that best fits, in the least squares sense, the global mean sea level (Wahr et al., 1998). Consequently, changes in gravity are equivalent to variations in the geoid (Ferreira et al., 2016). The changes reflect water storage in surface water, soil moisture and groundwater but it is difficult to estimate these components separately from the signals received from the GRACE satellites. Extensive processing of the signal is needed to extract the information on total water storage anomalies (TWSA) as equivalent water height (EWH) (Swenson and Wahr, 2002; Yeh et al., 2006). EWH is a value which is composed of the changes in groundwater, soil moisture, surface water and vegetation in unknown proportions and auxiliary information is required to interpret individual components (Zaitchik et al., 2008). The EWH or TWSA derived from GRACE for any given maximum degree n_{max} can be estimated from the variations of the geoid (considering that the atmospheric and oceanic components have been removed from GRACE data during data processing for this purposes) by using a method proposed by Wahr et al. (1998) as follows:

$$TWSA(\hat{\theta},\hat{\lambda},t) = \sum_{n=0}^{n_{max}} \sum_{m=0}^{n} \left[\Delta\tilde{C}_{nm}(t)\cos m\hat{\lambda} + \Delta\tilde{S}_{nm}(t)\sin m\hat{\lambda}\right]\bar{P}_{nm}\cos\hat{\theta} \qquad \text{...... (3.12)}$$

Where TWSA is the total water storage anomaly or EWH in kg/m^2 or (mm) for a particular month t, $\bar{P}_{nm}$ is the normalized dimensionless Legendre function of degree n and order m, $\hat{\theta}$ is the co-latitude, $\hat{\lambda}$ is the longitude, and $\Delta\tilde{C}_{nm}$ and $\Delta\tilde{S}_{nm}$ are the residual surface density coefficients estimated from the method proposed by Wahr et al. (1998).

The TWSA derived from GRACE estimated from Equation (3.12) contains some errors. Ramillien et al. (2005) found that these errors appear in the maps of water storage anomalies as stripes. The stripes commonly appear as linear features in the north-south direction. The appearance of these stripes indicates a high degree of spatial correlation in the errors of GRACE in short wavelength components. Therefore, Swenson and Wahr (2006) recommended removing stripes using a post-processing method to minimise the errors from GRACE as a prerequisite process.

Currently, many post-processing methods have been developed to reduce north-south striping errors from GRACE. Frappart et al. (2016) provided a comprehensive review of commonly used methods. Li et al. (2018) indicated that using different post-processing methods may produce different results of GRACE data and its uncertainties. However, a post-processing method, *a Gaussian averaging kernel width* (W_n), proposed by Wahr et al. (1998) has been widely used. The GRACE data (Bourgogne, 2016) derived for the current study were also smoothed by using a method proposed by Wahr et al. (1998), expressed as:

$$W_0 = \frac{1}{2\pi}\ ,\ W_1 = \frac{1}{2\pi}\left(\frac{1+e^{-2b}}{1-e^{-2b}} - \frac{1}{b}\right),\ \text{and}\ W_{n+1} = -\frac{2n+1}{b}W_n + W_{n-1} \qquad \text{…………… (3.13)}$$

Where the parameter b can be estimated as (Ferreira et al., 2014):

$$b = \frac{\ln 2}{1-\cos\frac{r}{R}} \qquad \text{…………… (3.14)}$$

Where r is the distance on the Earth's surface at which W has dropped to a half value (Wahr et al., 1998).

For about 16 years, many studies have used data derived from GRACE to estimate the variations of hydrological processes. These include changes in groundwater storage (Rodell et al., 2007; Shamsudduha et al., 2012; Strassberg et al., 2007; Yeh et al., 2006) and correlations with peak observed water levels during flood season (Chen et al., 2010; Steckler et al., 2010; Vongphachanh et al., 2017). These examples show the feasibility of using GRACE to estimate the seasonal fluctuations of groundwater storage from the total water storage (TWS) derived from GRACE for the large-scale basins. These studies indicated that GRACE data are useful and can be applied in a region with limited field observation data.

Henry et al. (2011) estimated the variation of groundwater availability and annual recharge in southern Mali, Africa in a total area of 54,971 km^2 using GRACE satellite data. Although the area in their study is small, the total water storage (TWS) of GRACE was obtained for a 445 x 445 km area. Then TWS data was modified for a small area of 54,971 km^2. They used the Global Land Data Assimilation System (GLDAS) model to subtract monthly groundwater storage anomalies and annual net groundwater recharge from GRACE-derived TWS. Their study indicated that data derived from GRACE satellite and GLDAS are useful for identifying the groundwater storage anomalies in areas with limited hydrogeological data. More details on the application of GLDAS data in the current research are provided in Chapter 5.

Many researchers have shown the essential combination between data from GRACE and GLDAS for estimating the groundwater storage anomalies at the basin scales. For example, Strassberg et al. (2009) estimated the groundwater storage anomalies in the central United States by subtracting the soil moisture storage anomalies (derived from GLDAS) from the total water storage anomalies derived from GRACE. Their study did not account for the surface water storages anomalies because the availability of surface water storage in the study area is limited. Furthermore, Shamsudduha et al. (2012) also computed the groundwater storage anomalies in the Bengal Basin by using a similar method. However, the study by Shamsudduha et al. (2012) estimated the groundwater storage anomalies by subtracting the soil moisture and surface water storages from GRACE data. The storages of soil moisture were taken from the GLDAS data, but the surface water storages were computed from a network of about 300 river gauges across Bangladesh.

Recently, Ferreira et al. (2016) examined the uncertainties of the GRACE satellite data derived from four GRACE satellite processing centres (including the Center for Space Research (CSR), the Jet Propulsion Laboratory (JPL), the GeoForschungsZentrum (GFZ), and the Groupe de Recherche de Geodesie Spatiale (GRGS) by using the three-cornered hat method (Premoli and Tavella, 1993). Ninety-one river basins with areas larger than 100, 000 km^2 around the world, including the Mekong River Basin that covers most of the area of Laos, were selected for their study. The results indicated that the CSR-GRACE product presented the most precise monthly solution in terms of TWS variations at the global and basin scales. In the current study, GRACE data derived from GFZ were used for the Sukhuma District as discussed further in Chapter 5.

As stated above, most previous studies have applied GRACE data to large-scale basins, but the application of GRACE data to small-scale catchments is the subject of few studies and remains a challenge. Longuevergne et al. (2010) and Tregoning et al. (2012) pointed out that application of GRACE data for small catchments remains a big challenge mainly because of low spatial resolution of GRACE footprint (400 km x 400 km or ~160,000 km^2). Alley and Konikow (2015) also indicated that although GRACE can provide very useful information for water resources management, the low spatial resolution of GRACE needs to be improved. The spatial resolution of filtered GRACE data for hydrology has been discussed in a recent publication by Vishwakarma et al. (2018). They show that the appropriate spatial resolution of filtered GRACE data can be varied depending on the adopted method. Sun (2013) used a statistical downscaling procedure which included an artificial neural network (ANN) model to predict groundwater level fluctuations in three areas (Texas, Nebraska and Illinois) in the United State. Recently, a publication by Miro and Famiglietti (2018) also described downscaling GRACE data using the ANN models to assess the groundwater storage change in the Central Valley of California. Their study indicate that GRACE data can be downscaled to a high resolution of 16 km^2. The studies by Sun (2013) and Miro and Famiglietti (2018) show that it will require sufficient data and can be time consuming to downscale the GRACE data by using the ANN models. It is shown that the ANN model is not appropriate to apply to the current research in the Sukhuma District because of insufficient data.

Ning et al. (2014) provided a successful method of downscaling GRACE data to a pixel of GLDAS data (~800 km^2). They used a simple statistical downscaling method. The total water storage anomalies derived from GRACE were compared with the total water storage anomalies estimated from a multiple data sources, including rainfall data from TRMM (Tropical Rainfall Measurement Mission), Evapotranspiration from MODIS Global Evapotranspiration Project (MODIS16), and runoff from GLDAS. The study by Ning et al. (2014) has not only demonstrated success of downscaling GRACE data to a small area, but has also provided useful methodologies of using multiple data sources in evaluating the GRACE data. Their study could generate an essential case for other regions with limited measurements data. Therefore, the estimation of total water storage anomalies from multiple data sources was modified for the current study (see Section 5.1). Also, a simple statistical downscaling approach proposed by Ning et al. (2014) was adopted for the current research as described in Section 5.2.

GRACE satellite data have been utilised widely to determine the variations of groundwater storage in many large river basins around the world, including areas with limited field observation data (Shamsudduha et al., 2012). However, this has not yet been implemented in Laos. Therefore, the current study is the first attempt to use GRACE-derived data for assessing the seasonal total water storage variation and seasonal groundwater storage variation in Sukhuma District of Southern Laos, where data on groundwater levels, rainfall and streamflow are limited. Details of application of GRACE data for the Sukhuma District are provided in Chapter 5.

In the near future, the new GRACE project (also called GRACE Follow-On) is expected to provide more precision of GRACE data than the previous GRACE project (NASA, 2018). The GRACE Follow-On (GRACE-FO) has been launched recently in May 2018 with the same spatial and temporal resolution as the previous GRACE project (https://gracefo.jpl.nasa.gov/). The new GRACE data from GRACE-FO are planned to be released at the end of 2018 (NASA, 2018).

3.4. Summary

From the literature review in this chapter, water resources (surface water and groundwater) in the Sukhuma District have not been managed effectively. Only few groundwater studies have been conducted in the area. A proper conceptual water balance model for the district had not been established, although a conceptual model is crucial for understanding the movement of all water balance components and for effective planning of long-term, surface water and groundwater management. Many components of water balance were not accounted for by the previous projects and studies in the Sukhuma District; as well sufficient details of geological data were lacking. Hence, groundwater recharge estimated by the previous studies remains questionable for planning sustainable groundwater resource management (see Section 3.1). Estimating the appropriate volume of groundwater recharge in this area needs further studies to be done.

In addition, the literature review also shows that a conceptual water balance model established for a catchment may not be able to be applied to another catchment directly because each model has its own unique and physical characteristics, as reviewed in Section 3.2, and different numbers of input data requirements, as summarised in *Table 3.1*. Moreover, these conceptual water balance models cannot be applied directly to the Sukhuma District because of insufficient available data. In addition, some common approaches used to quantify the major components of water balance are also reviewed and critiqued in Section 3.2.

Table 3.1: Main characteristics and input data requirements of the lumped and distributed hydrological models

References	**Model name**	**Model type**	**Spatial resolution**	**Data requirement**	**Limited available data in Sukhuma District (Section 2.6)**
Yeh et al. (2007)	Simple water balance model	Lumped	Catchment	Rainfall, streamflow, soil moisture content, soil properties, soil profiles	Rainfall, streamflow, groundwater levels, aquifer properties
Danish Hydraulic Institute (2017)	MIKE SHE model	Distributed	Grid	DEM, rainfall, climate data, evapotranspiration, interception, land use, river network, soil properties, aquifer properties, overland flow, unsaturated flow, saturated flow	

Furthermore, application of remote sensing data for investigating the change in total water storage and the groundwater storage has been conducted in many regions around the world where available data are limited (see Section 3.3). However, application of the remote sensing data in a small region with sparse of available data remains a challenge. This issue remains a gap for future research.

In order to fill the research gaps and supporting the sustainable surface water and groundwater management in the Sukhuma District, in the current study, a conceptual water balance model for Sukhuma District is therefore developed to quantify the seasonal total water storage and the groundwater recharge as described in Chapter 4. The conceptual model is created based on the available data and field observation in the Sukhuma District.

Regarding the limitation of available field data in the Sukhuma District as described in Section 2.6, the remotely sensed data derived from GRACE, TRMM and simulated data from GLDAS are adopted and used for the research (see Chapter 5). Also, a conceptual water balance model for Sukhuma District was validated by comparing it with the remote sensing data. The comparison between the two models is discussed in Chapter 6.

Chapter 4 : Conceptual Water Balance Model for the Sukhuma District

4.1. Conceptual water balance development

Developing a conceptual water balance model is necessary to understand the hydrological processes including the inflow and outflow components of the Sukhuma District and the changes in the amount of water stored in the aquifers. For this study, a water balance model is developed with proper conceptualization of the sub-surface flow processes underlying the Sukhuma (SKM) District *(Figure 4.1)*. The sub-surface stratification is hypothesized based on the understanding of existing geological data, field observation data and the inferences derived from field visits conducted during the study. The area of the water budget calculation is delineated coinciding with the Sukhuma District boundaries. The dark blue dashed line represents the average peak water table in the wet season (WS-WT). The dark blue line illustrates the average lowest water table in the dry season (DS-WT). ∆SMS represents the change in soil moisture storage in the unsaturated zone, ∆GWS is the change in groundwater storage. The river in the Figure is the Khamouan River. *Figure 4.1* is a schematic hydrogeological cross-section from West (left) to East (right) of Sukhuma District.

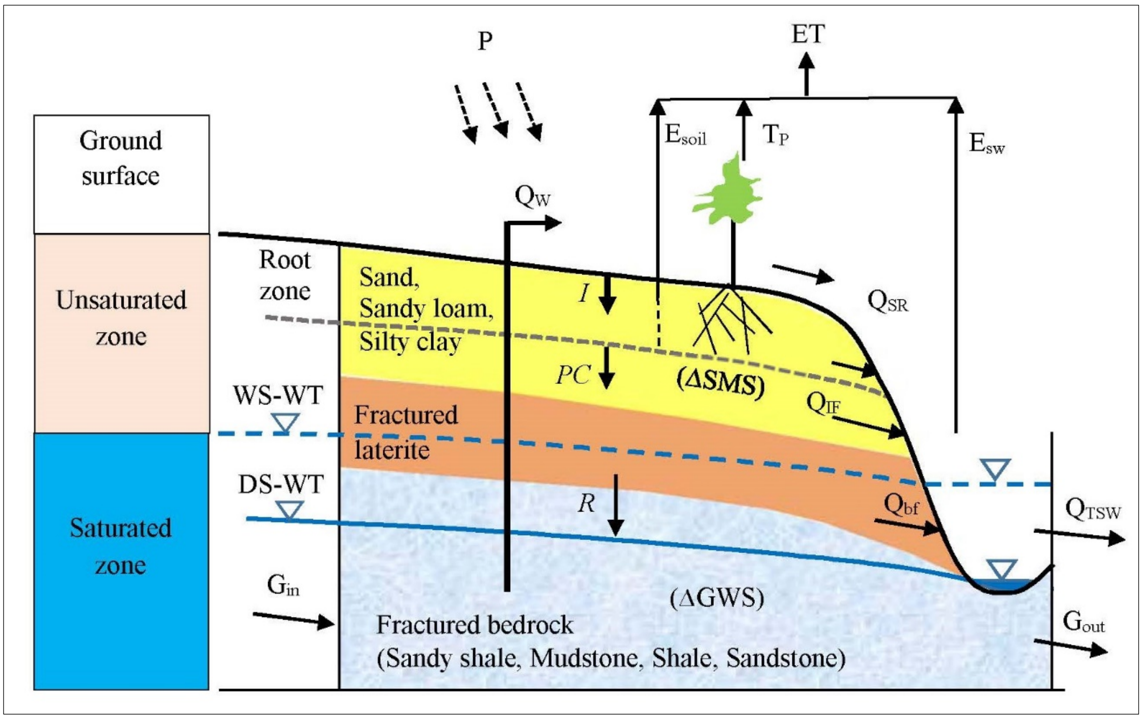


Figure 4.1. Conceptualization of water balance components of the Sukhuma District. The gray dashed line represents the root zone depth of 1 m below ground surface

The inflow and outflow components of the water balance model of Sukhuma District are illustrated in *Figure 4.1*. The inflow terms include the rainfall (P) and the lateral groundwater inflow (G_{in}).

The outflow terms consist of the lateral groundwater outflow (G_{out}), the evapotranspiration (ET) that comprises evaporation from soil (E_{soil}) and surface water (E_{SW}) and plant transpiration (T_P), the groundwater abstraction (Q_w), and the total stream outflow (Q_{TSW}) that includes the groundwater discharge to streams as baseflow (Q_{bf}), interflow (Q_{IF}) and surface runoff (Q_{SR}). The surface water storage in Sukhuma District is negligible in the water balance model because all rivers are normally dry during the dry season.

The water balance model consists of two water storage zones. The first water storage zone is in the unsaturated zone as the soil moisture. The main inflow variable for the unsaturated zone is the infiltration from rainfall herein mentioned as the total infiltration (I). ***The infiltration is herein defined as the rain water movement from the ground surface into the subsurface soil layers*** (Scanlon et al., 2002). This infiltration water may or may not reach the groundwater table depending on the amount of infiltrated water, processes of the unsaturated zone, and conditions in the saturated zone (Scanlon et al., 2002). The output variables from this zone are the direct runoff (Q_{DR}) that combines Q_{IF} and Q_{SR}, and percolation (PC) or net infiltration. ***The percolation is herein defined as the soil water that drains from beneath the root zone (Healy, 2010)*** *(Figure 4.1)*. The percolation may be stored in the soil layer as the soil moisture, draining mostly to the surface water as the interflow but some of it will continuously flow downward to fill the groundwater storage as the groundwater recharge (R) as shown in *Figure 4.1*. In the current study, the percolation and the groundwater recharge are assumed to be different because there is an unknown soil layer between the root zone and saturated zone. ***The groundwater recharge (R) is herein defined as the amount of downward water movement across the groundwater table and stored in the aquifer.*** The recharge can be very small during the dry season owing to lower rainfall. If the water table is shallow and close to the root zone depth, particularly during the wet season, the percolation volume can be the same as the groundwater recharge (Healy, 2010).

The second water storage zone is in the saturated zone as the groundwater storage. It has variable thickness due to seasonal changes in the water table (WT), between DW-WT and WS-WT *(Figure 4.1)*. The inflow terms of this zone consist of the recharge (R) from the rainfall as the root zone drainage (Percolation) and the lateral groundwater inflow (G_{in}). The flow direction of groundwater in Sukhuma District is from north-west and north to south-east and discharges to the Mekong River on the east (JICA, 1995). The lateral groundwater outflow (G_{out}), groundwater pumping (Q_W), and baseflow (Q_{bf}) are the output components of the saturated zone.

The methods utilised to calculate the inflow and outflow components of the water balance of the Sukhuma District and their results are discussed in the following sections of this chapter. The components of the water balance were calculated for the period June 2015 to May 2016 in monthly and seasonal time-intervals. The period June 2015 to May 2016 was selected because the field observation data were available for all components during this period.

4.2. Rainfall (Inflow)

Daily rainfall data at the 15 private rain gauges located within the boundary of Sukhuma District for the period of Jun 2015 to May 2016 were used for this research. The monthly rainfall at an individual gauge was aggregated from daily rainfall. The monthly average rainfall for the entire district area (1,200 km^2) was estimated by using the Thiessen Polygon method. The depth of rainfall for the period of Jun 2015 to May 2016 was estimated at 1,700 mm. Total rainfall during the wet season 2015-16 (Jun – Oct) and the dry season 2015-16 (Nov – May) was 1400 mm and 300 mm, respectively.

4.3. Evapotranspiration (Outflow)

The monthly ET values are calculated using the Penman-Monteith equation (Allen et al., 1998) as described in Section 3.2. The values of K_C used for the ET calculation were assumed based the land use and vegetation cover data in Sukhuma District (see Section 2.3) and the literature. Allen et al. (1998) and Verstraeten et al. (2005) indicated that the K_C value changes are related to the leaf area index (LAI). This means that the K_C value is high when the LAI is large and becomes small when LAI is small or less leaves on the trees. The long term monthly average of the green leaf area index (LAI) changes of the forests in southern Laos (observed at the Pakse District) for the period 1901 to 2001 have been reported by Zhou et al. (2006) in Figure 11(b) on page 167 of their paper. For the current study, *Figure 4.2* illustrates the monthly K_C values for rice and forests for the Sukhuma District that were assumed based on the FAO guideline (Allen et al., 1998) and the monthly LAI changes in southern Laos as indicated by Zhou et al. (2006).

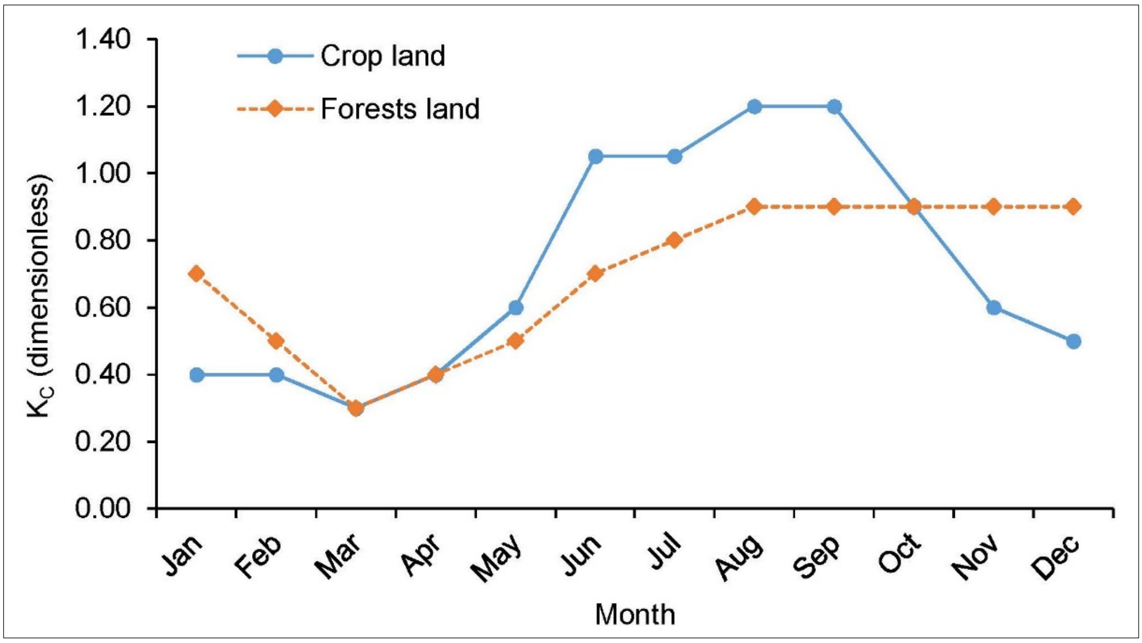


Figure 4.2: The monthly K_C values for crops and forests in the Sukhuma District

The result shows that ET accounts for about 75% of annual rainfall. This value is commonly estimated in the Lower Mekong Basin region and in Southern Laos (JICA, 1995; Lacombe et al., 2017; Tsubo et al., 2006). ET is one of the significant factors influencing the rainfall recharge in the region of southern Laos (Lacombe et al., 2017). ***ET estimated from the current study is defined as the total evapotranspiration***, which includes the transpiration from vegetation, evaporation from soil surface and evaporation from surface water bodies. The evaporation from groundwater storage was negligible for this study because the average depth to water table in Sukhuma District was more than 2 m bgl for both wet and dry seasons (Shamsudduha et al., 2011). The average depths to water table in the study area were about 3.5 m bgl during the wet season and about 8 m bgl during the dry season.

For the current study, monthly ET values from May 2006 to May 2016 were estimated. The monthly estimated ET varied from a minimum value of 60 mm (in the dry season) to a maximum value of 130 mm (in the wet season). A higher value of ET during the wet season than the dry season could be due to the fact that the water sourced from surface water bodies, leaves of trees and grasses are usually limited during the dry season. Based on field observation during the dry season (March 2017), leaves of trees (shrub and deciduous trees) and grasses dropped and were dry. The long-term annual average ET from 2006-07 to 2015-16 is 1200 mm with a minimum value of 1100 mm, a maximum value of 1300 mm and a standard deviation of 45 mm.

The annual ET for the hydrological years 2015-16 was estimated at 1300 mm. About 700 mm was estimated for the wet season and 600 mm was estimated for the dry season. The estimated ET for the wet season 2015-16 at the Sukhuma District shows similarity with the ET in the Pakse and Phonthong Districts of Champasak Province as reported by Tsubo et al. (2006).

4.4. Surface runoff (Outflow)

Historical surface runoff data are not available for the study area. Instead, they were estimated by using the SCS-Curve Number method. The result shows that the annual surface runoff estimate for 2015-16 is small, about 0.02 mm/year (~0.001% of annual rainfall). A reason for this can be because the amount of daily rainfall during these water years rarely exceeded the value of initial abstraction (I_a = 45 mm) as shown in *Figure 4.3*. *The initial abstraction value herein is defined as the depth of rainfall when direct runoff started* (Lim et al., 2006). It consists of interception, infiltration, antecedent soil moisture and depression storage and these components happen before surface runoff starts. *Figure 4.3* also depicts a comparison between area-averaged daily rainfall and a constant value of initial abstraction (I_a) for the period 1 June 2015 to 31 May 2016. For this period, only two rainfall events exceeded the initial abstraction. The first rainfall event was measured during July 2015 and the second event was in October 2015. The annual surface runoff estimated from the current study for Sukhuma District is low. Another reason for this low estimation of surface runoff is because most of the area of Sukhuma District is flat and covered by sandy loam (as described in Chapter 3). Sandy loam has been recognized as a soil type with higher infiltration rates compared to loam and clay loam (Critchley et al., 1991).

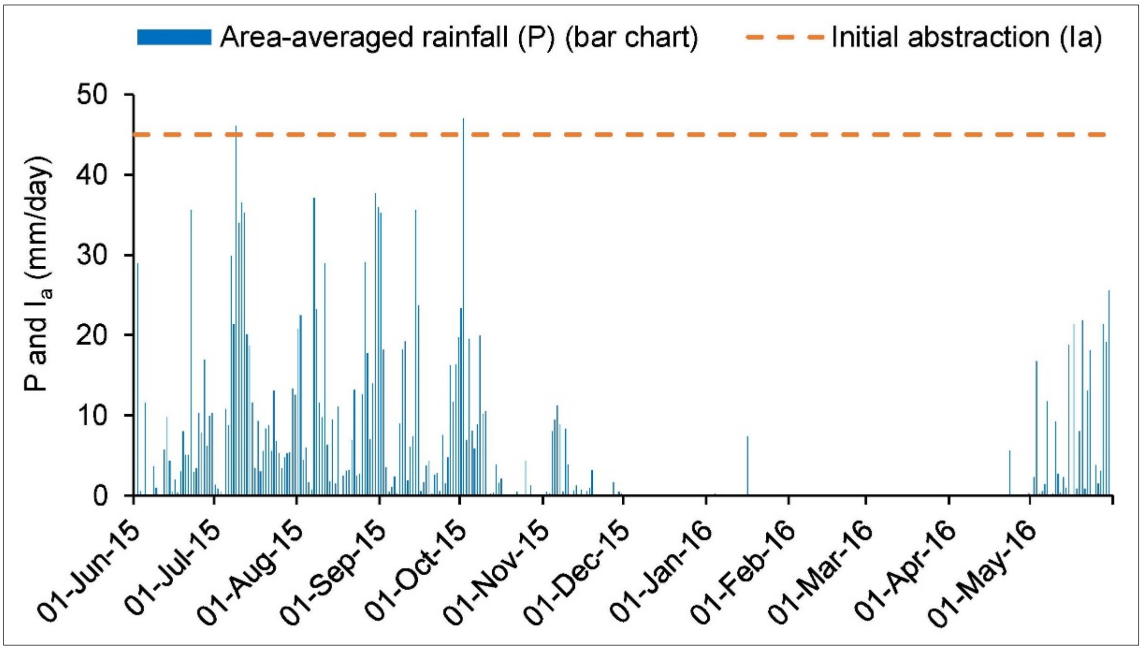


Figure 4.3: Comparison between area-averaged daily rainfall (P) and estimated initial abstraction (I_a) for hydrological years 2015-16.

4.5. Khamouan River discharge (Outflow)

The total annual streamflow at the Khamouan River gauge for the period June 2015 to May 2016 was accumulated from monthly streamflow. It was estimated at 600 mm/year. The streamflow accounts for approximately 580 mm in the wet season and 20 mm in the dry season. The annual streamflow accounts for both baseflow (Q_{bf}) and the direct runoff (Q_{DR}). Details of estimation of baseflow and direct runoff are discussed in the following Section 4.6 and Section 4.7, respectively.

4.6. Baseflow (Outflow)

The baseflow was estimated using the single parameter algorithm proposed by Chapman and Maxwell (1996). The values of the baseflow recession constant (k) for 11 hydrological years (1997-98 to 2006-07 and 2015-16) were estimated from the streamflow hydrograph at the Khamouan River gauge. The estimated k values range from 0.92 to 0.97 with an average value of 0.95. The difference between the minimum and maximum values of k is relatively small (~0.06). It appears that the variation of annual streamflow may not affect the values of recession constant. Fetter (2018) indicated that the baseflow recession constant of a drainage basin is a function of the overall topography, drainage patterns, soils, and geology of the watershed. In the current study, the average recession constant of 0.95 is used for separating the baseflow from total streamflow measured at the Khamouan River gauge for the 11 water years.

The estimated annual baseflow index (BFI) is the ratio of long-term baseflow to total streamflow. It ranges from 39% to 49% with an average annual value of 45%. The value of BFI (45%) estimated from the current study seems to be high when compared with the local lithology of the aquifers in Sukhuma District. However, this result can be possible because both sides of the Khamouan Riverbank consist of sandy soil and fractured laterite soil based on field observation during this study and a project report by JICA (1995). The JICA report shows extensive areas of sediments along both sides of the Khamouan River; therefore, the primary sources for streamflow could be bank storage. For 2015-16, annual baseflow was an aggregate of monthly baseflow that separated from the total streamflow at the Khamouan River gauge *(Figure 4.4)*. It was estimated at 230 mm/year. The baseflow at the river gauge was estimated at 228 mm in the wet season and about 5 mm in the dry season.

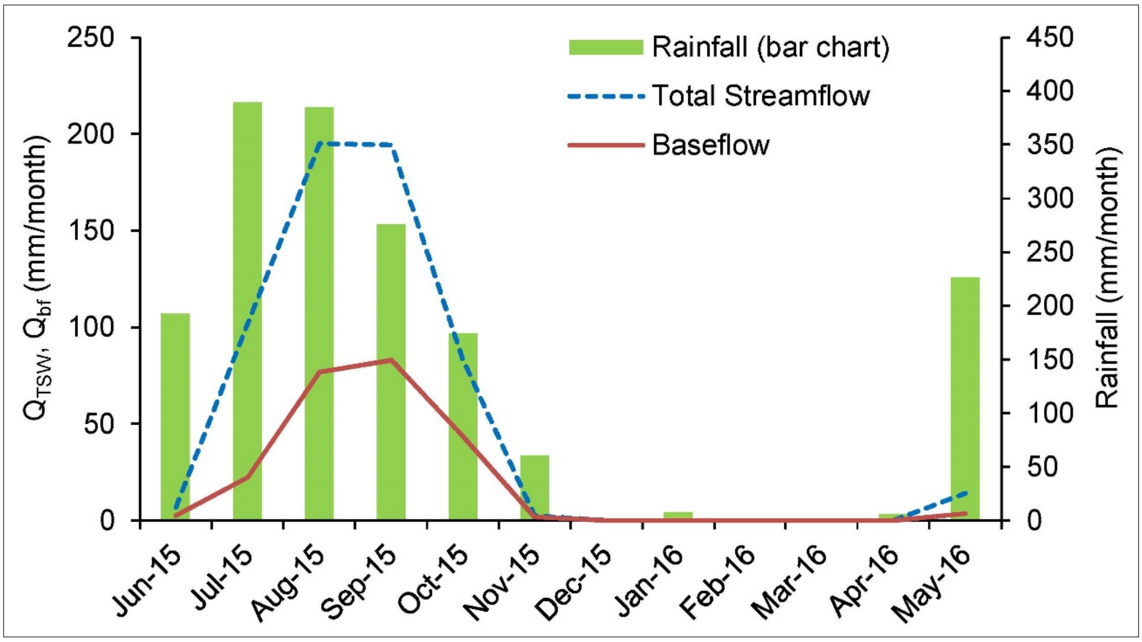


Figure 4.4: Baseflow (Q_{bf}) separated from the total streamflow (Q_{TSW}) measured at the Khamouan River gauge and the monthly average rainfall over the Sukhuma District for the period June 2015 to May 2016

4.7. Direct runoff (Outflow)

The direct runoff herein is considered as proportion of total streamflow that includes surface runoff and interflow. The annual direct runoff (Q_{DR}) was estimated by subtracting the annual baseflow (Q_{bf}) from the total streamflow (Q_{TSW}) as follows:

$$Q_{DR} = Q_{TSW} - Q_{bf} \quad \text{..........................} \ (4.1)$$

The annual direct runoff for 2015-16 was estimated at 360 mm/year. Most proportions of direct runoff would come from interflow and drainage from the unsaturated zone during heavy rainfall. The direct runoff accounts for 350 mm in the wet season and at 10 mm in the dry season.

4.8. Groundwater abstraction (Outflow)

The groundwater abstraction in Sukhuma District is estimated based on a household water use survey. The groundwater herein refers to the water withdrawn from aquifers, which includes the well water, spring water and bottled water. For this research, 80 households were randomly selected and interviewed. Based on this survey, an average of daily groundwater abstraction per household per day was determined from the collected information of the pump capacity, duration of pumping per day, volume of daily groundwater abstraction from different sources (well, spring and bottled water), volume of daily groundwater use for various purposes. More details of questionnaires used for the survey are provided in Appendix 16. After that, an average of water use per capita per day was calculated by dividing average water use per household per day to average household members (5 persons/household). Next, the depth of groundwater abstraction over Sukhuma District per day was estimated by multiplying the total population with average groundwater abstraction per person per day and divided by the area of Sukhuma District.

In current, Sukhuma District has approximately eight small bottled water plants. The owners of these bottled water plants were interviewed about their production. The collected data show that these water plants produced about 100 bottles/day during the wet season and 250 bottles/day during the dry season. The bottle size is 18 litres. In Sukhuma, the bottled water plants produced approximately 800 bottles/day (14.40 m^3/day) in dry season and 2000 bottles/day (36 m^3/day). However, it is important to note that all of the bottled water produced from the eight water plants is not only sold only within the Sukhuma District, but also some water is exported to other districts nearby. The information on the total number of bottles sold inside and outside of Sukhuma District were not available from the owners. Therefore, an approximation of numbers of bottled water use by a household was estimated from a household survey. The total number of bottled water bottles used per household was divided by the number of people in a household. Then, the depth of bottled water use over the district was also estimated using the same approach as the estimation of daily domestic water use.

Agricultural activities in the Sukhuma District are mainly practiced during the wet season and rely primarily on rainwater. However, groundwater source is mainly used to irrigate the small home gardens during the dry season and the wet season when has no rain. In this study, the areas of the small gardens at the target households were measured. Types of crops planted in the gardens were also observed and noted. The volume of groundwater used for irrigating the crops was estimated based the real capacity of pump and duration of groundwater pumping measurement at the field. Then, the depth of groundwater used for agricultural purposes per square meter was estimated by dividing the total volume of groundwater abstraction with the total area of the gardens.

Finally, the annual groundwater abstraction was aggregated from the daily groundwater abstraction that was estimated from all groundwater usages as mentioned above. The results from the current study show that groundwater abstraction by households within the Sukhuma District area was estimated at approximately 2.2 mm/year. It accounts for about 1 mm in the wet season and at 1.2 mm in the dry season. The amount of groundwater pumped during the dry season was more than during the wet season because most rivers and surface water sources are usually limited during the dry season. Details of groundwater abstraction estimation are provided in Appendix 15. The limitation of hard data of groundwater abstraction in the form of measured volumes across different parts of the Sukhuma District can be a challenge for making an effective plan on sustainable water resources management.

4.9. Lateral groundwater inflow and outflow

The lateral groundwater inflow and outflow in the aquifer section are estimated by using transmissivity, the hydraulic gradient, and the area of the section that groundwater was moving through. The geological condition in Sukhuma District is assumed to be homogeneous. Therefore, an area-averaged transmissivity was estimated. The equation from Nonner (2016) and used by Yihdego and Khalil (2017) was adopted and applied for this study as follows:

$$G_x = \frac{T\,.i\,.W}{A_{SKM}} \times\ 10^3 \qquad \text{..........................} \ (4.2)$$

Where G_x (mm/month) is the monthly groundwater lateral inflow to or out flow from the considered section, A_{SKM} (m^2) is the total area of Sukhuma District, the 10^3 is a constant to convert the unit from metre to millimetre, T (m^2/month) is the transmissivity of aquifer and estimated from a pumping test (equal to 2,832 m^2/month or 94.40 m^2/day), which was conducted in the period of this study (see Section 2.6.4), *i* (dimensionless) is the hydraulic gradient of water table and estimated by using the GRADIENT.XLS Spreadsheet (Devlin and Schillig, 2016), and W (m) is the width of the section that groundwater flows through, which is measured from the groundwater flow-net. In other words, the width (W) of a stream tube is defined as a distance between two flow lines (Cedergren, 1989; Nonner, 2016).

The groundwater flow directions and hydraulic gradients were determined using a spreadsheet proposed by Devlin and Schillig (2016) and water table contour maps created in ArcGIS10.4. The results from the spreadsheet approach show that the groundwater in Sukhuma District flows from northwest and north to south and southeast, then finally draining to the Mekong River in the east.

The monthly groundwater level elevation contours generated in ArcGIS show similar groundwater flow directions, and previous studies by JICA (1995) reported similar results. An example of monthly groundwater level elevation contours for October 2015 is depicted in *Figure 4.5*. Also, an example of the groundwater flow direction map for October 2015 is shown in *Figure 4.6*. The red arrows on this figure represent directions of groundwater flow and were drawn manually. The monthly contour maps of groundwater heads in the Sukhuma District from June 2015 to May 2016 are given in Appendix 17.

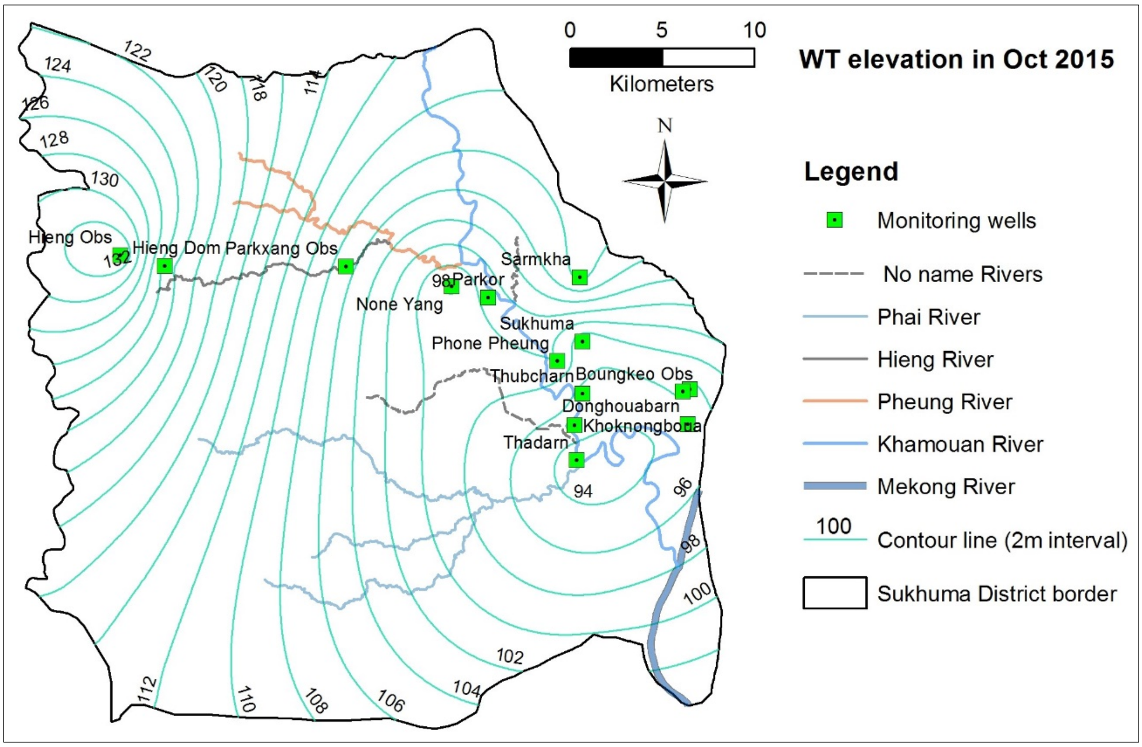


Figure 4.5: The contour lines of water table (WT) elevation for the wet season 2015 (October 2015)

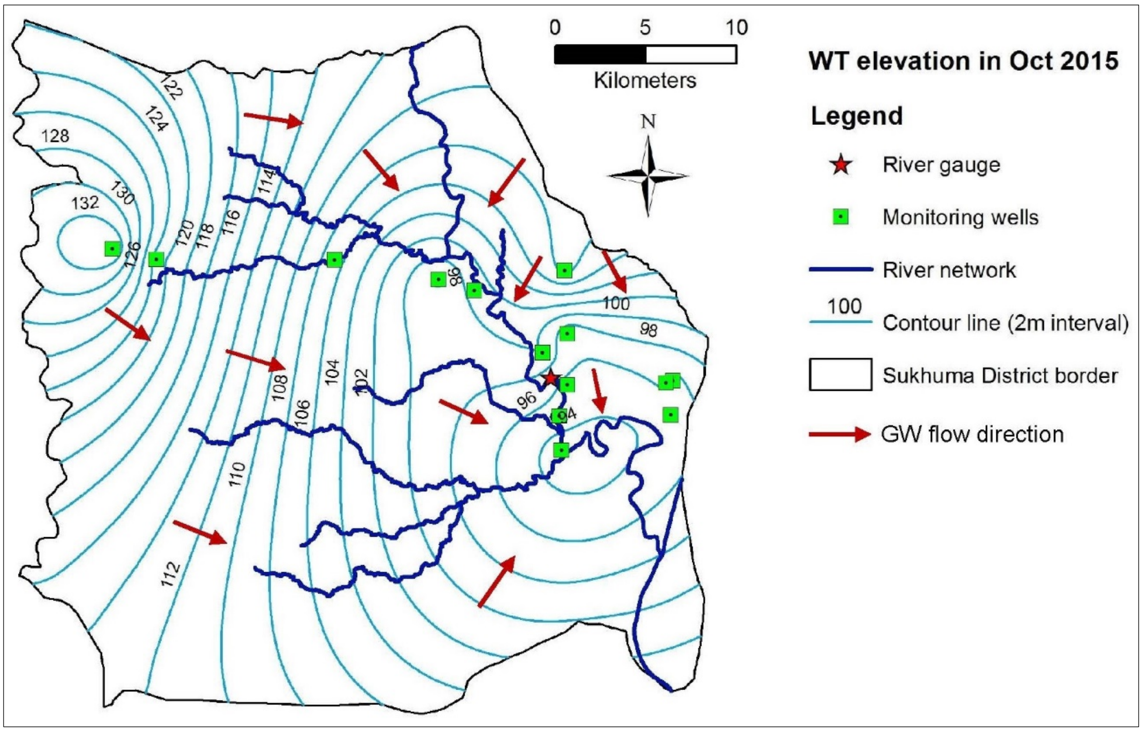


Figure 4.6: Groundwater (GW) flow direction map for the wet season (October 2015)

Figure 4.5 illustrates that the water table elevation is relatively high in the west and the north and low in the southeastern area of the Sukhuma District. This elevation reflects the topography in the gravitational groundwater flow system. According to field observation data during this study, the population density and number of groundwater wells in the western area were lower than in the southeastern area. The groundwater level in the western area, at Hieng well, is always higher than the groundwater levels at other monitoring points. Additionally, the groundwater level at the Sarmkha domestic well is higher than levels in the southern area.

Based on the groundwater level contour and groundwater flow direction maps, an average value of the hydraulic gradient of groundwater flow in the Sukhuma District for wet and dry seasons was estimated using the spreadsheet proposed by Devlin and Schillig (2016). The estimate is approximately 0.0013. The average hydraulic gradient for the upstream groundwater flow (Northwest and North) was estimated as 0.0016. Downstream groundwater flows out of the Sukhuma District to the Khamoun River mouth and the Mekong River to the southeast. The average downstream hydraulic gradient was estimated as 0.0011.

The lateral groundwater flow was quantified using Equation (4.2). The results show that annual lateral groundwater inflow and outflow to the Sukhuma District were calculated approximately as 2.40 mm and 1.90 mm, respectively. The seasonal inflow and outflow during the wet season were estimated as 1.24 mm and 0.96 mm, respectively. During the dry season, the lateral groundwater inflow and outflow were estimated as 1.20 mm and 0.94 mm, respectively. The results of lateral groundwater flow estimation in the Sukhuma District show that lateral inflow is slightly higher than lateral outflow.

4.10. Groundwater recharge

The accuracy of estimating groundwater recharge is often a challenge for assessing the groundwater availability. For this study, the groundwater recharge in Sukhuma District was estimated by using the Water Table Fluctuation (WTF) method and the Water Balance (WB) method. These two methods were selected based on data availability and also to compare their results to the previous studies. Details of using these methods are described in the following sections.

4.10.1. Water table fluctuation method

The Water Table Fluctuation (WTF) method as shown in Equation (3.9) was used to estimate annual groundwater recharge at the 10 observation and 11 domestic wells. The WTF method estimates groundwater recharge by using groundwater level height build-up in observation wells during/after a rainfall event times the specific yield. This method assumes that increases in groundwater level in the study area are caused by recharge from rainfall. Other causes of water table fluctuations, such as: pumping, evapotranspiration, lateral groundwater flows, and moisture changes in unsaturated zone, are not related to recharge. Healy and Cook (2002) recommended that this approach is suitable for estimating the groundwater recharge at the unconfined aquifer that receives direct recharge from rainfall. The change in water-table height (Δh) over the time interval Δt for Equation (3.9) was computed as the difference between the peak of the water table rise and low point of the extrapolated antecedent recession curve at the time of the peak (Healy, 2010). The specific yield of the aquifer (S_y) at the observation point was estimated using the recession curve method proposed by Udayakumar et al. (2015). A reliable estimate of specific yield (S_y) for the WTF method is commonly determined from the analysis of pumping test data (Healy and Cook, 2002); however, these data are sparse in the Sukhuma District and Southern Laos.

Area-averaged groundwater recharge within Sukhuma District was then estimated from all observation points using the Thiessen Polygon technique. The equation is expressed as:

$$\bar{R}_{WTF} = \frac{\sum_{i=1}^{n}(A_{Wi})\,(R_{WTFi})}{A_{SKM}} \qquad \text{.........................} \ (4.3)$$

Where $\bar{R}_{WTF}$ is the area-averaged groundwater recharge within the Sukhuma District (mm), A_{Wi} is the area that is covered by the ith monitoring well, i = 1, 2, …, n (mm^2), R_{WTFi} is the groundwater recharge at the ith observation point (mm), A_{SKM} is the total area of Sukhuma District (mm^2).

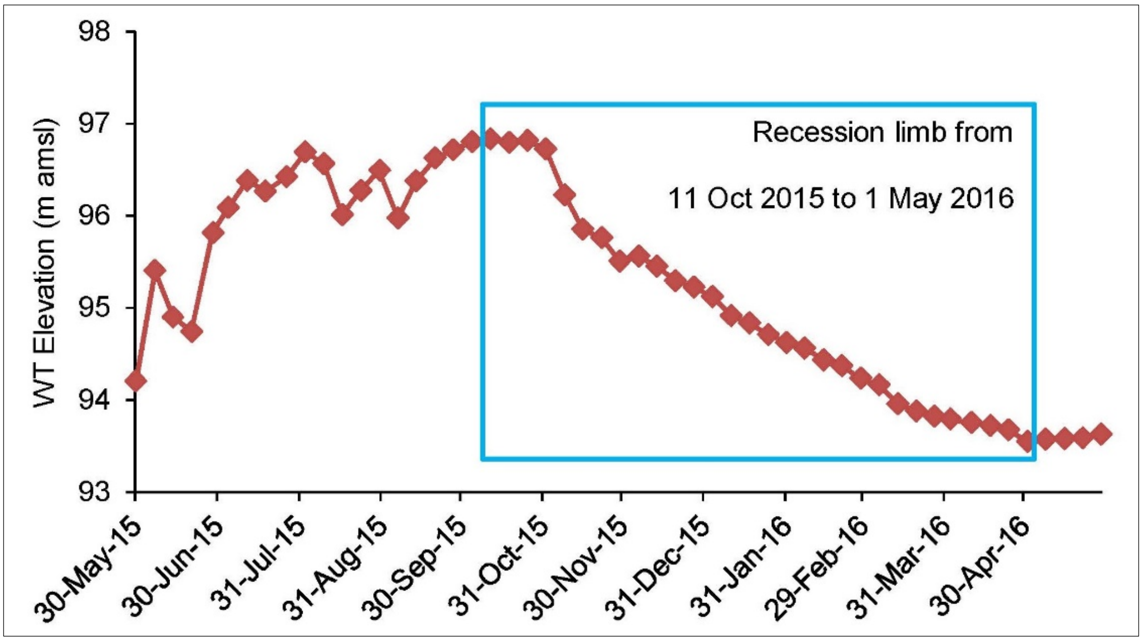
The specific yield of aquifers in the Sukhuma District was estimated by using two methods, namely the groundwater recession method proposed by Udayakumar et al. (2015) and analysis of data from a pumping test. Using these two methods herein aims to justify the average value of S_y estimated from the groundwater recession method by a value of S_y computed from pumping test data.

An example of the recession curve and the exponential recession equation for the Sukhuma domestic well is presented in *Figure 4.7a* and *Figure 4.7b*, respectively. *Figure 4.7a* illustrates that the water table recession at this domestic well occurred from 11 October 2015 to 1 May 2016. From this recession period, an exponential equation can be generated as presented in *Figure 4.7b*. The value of the recession constant (α) for the Sukhuma domestic well was found to be 0.0002 m/day with a t value of 202 days and a d value of 3.28 m. The values of α from all monitoring wells (observation and domestic) in Sukhuma District were estimated in the same way as for the Sukhuma domestic well and ranged from 0.0001 m/day to 0.0003 m/day; these were then used to estimate S_y. The results from the groundwater level recession analysis gave values of S_y between 0.007 and 0.067 with an average value of 0.015. The values of S_y for all observation and domestic wells in the Sukhuma District are summarised in *Table 4.1*. It should be noted that using the S_y value from the recession hydrograph method will produce the minimum possible recharge as reported by Udayakumar et al. (2015).

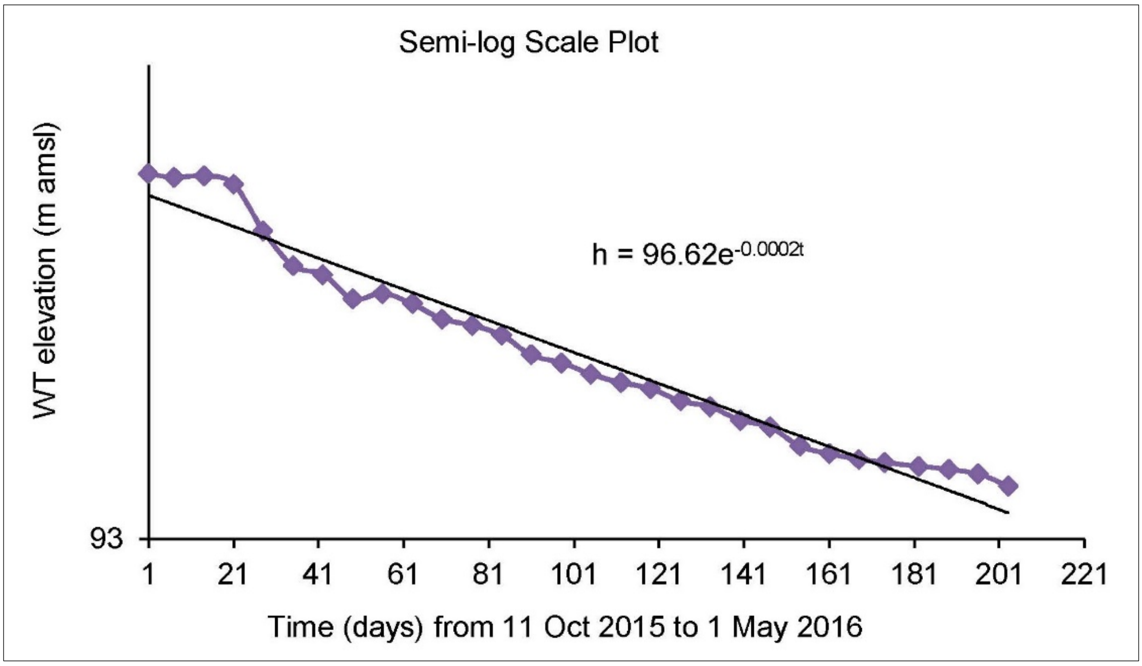
An averaged value of S_y for Sukhuma District was then estimated from all observation points by using the following formula:

$$\bar{S}_y = \sum_{i=1}^{n} \frac{S_{y(i)}}{n} \qquad \text{………………………. (4.4)}$$

Where $\bar{S}_y$ is the averaged S_y from estimates of wells (dimensionless), $S_{y(i)}$ is the S_y at the i^{th} well (dimensionless), and n is the number of wells that were used to estimate the S_y.



(a)



(b)

Figure 4.7: (a) Recession curve and (b) exponential recession equation for the Sukhuma domestic well

Table 4.1: Estimated S_y from well hydrograph for individual well

No.	**Well name**	**Status**	**S_y**
1	Pakxang	Observation deep well	0.007
2	BoungKeo	Observation deep well	0.011
3	Sukhuma	Observation deep well	0.009
4	Parkor	Observation deep well	0.007
5	Pakxang	Observation shallow well	0.010
6	BoungKeo	Observation shallow well	0.011
7	Sukhuma	Observation shallow well	0.011
8	Parkor	Observation shallow well	0.008
9	Hieng	Observation deep well	0.055
10	Hieng	Observation shallow well	0.067
11	BoungKeo	Domestic well	0.011
12	Sukhuma	Domestic well	0.015
13	Parkor	Domestic well	0.010
14	Dong Houabarn	Domestic well	0.011
15	Thardarn	Domestic well	0.011
16	Phone Pheung	Domestic well	0.009
17	Thupcharn	Domestic well	0.010
18	KhokNongboua	Domestic well	0.009
19	Sarmkha	Domestic well	0.008
20	None Yang	Domestic well	0.008
21	Hieng	Domestic well	0.007
Arithmetic mean			**0.015**
Minimum			**0.007**
Maximum			**0.067**

Table 4.1 shows that the highest values of S_y were estimated at the Hieng observation wells. The high values of S_y at these wells is because the Hieng (shallow and deep) observation wells are located in the Alluvial Sediments geological formation, but other wells are located in the Mesozoic geological formation as previously shown in *Figure 2.3*. Viossanges et al. (2017) reported values of S_y for the Mesozoic (fractured sandstone aquifer) and alluvial sediments geological formations at the Lao national scale range from 0.03 to 0.15 with an average of 0.08 and from 0.07 to 0.18 with an average of 0.13, respectively. The average value of S_y estimated from the current study by using the recession curve method falls in these ranges. This can imply that the estimated S_y from the recession curve method is reasonable.

The analysis of data from a pumping test conducted at the Parkxang deep well with an observation well in December 2015 (in connection with this study) indicated S_y value as 0.013. The pumping test data analysis was based on the Hantush method for partially-penetrating wells as given in Kruseman and de Ridder (1990). The value of S_y from the pumping test analysis falls in the range of estimates of S_y derived using the hydrograph recession method.

The specific yield estimated from the recession method (0.015) and the pumping test (0.013) produced similar values. These S_y are also similar to the previous studies in the Lower Mekong River region and other countries with similar groundwater aquifers as reported by Vongphachanh et al. (2017). This result indicates that the recession curve method proposed by Udayakumar et al. (2015) can be used for estimating the specific yield in a region with limited data of pumping test and geology.

The spatial distribution of annual groundwater recharge varies across Sukhuma District and is illustrated by the contour lines in *Figure 4.8*. This figure depicts that the monitoring points in the Sukhuma District are sparse. Most of the south and southwest of Sukhuma District do not have monitoring points. Thus, the contour lines extended over these areas are subject to a lot of error. In future studies, more observation data points should be considered and cover the study area entirely.

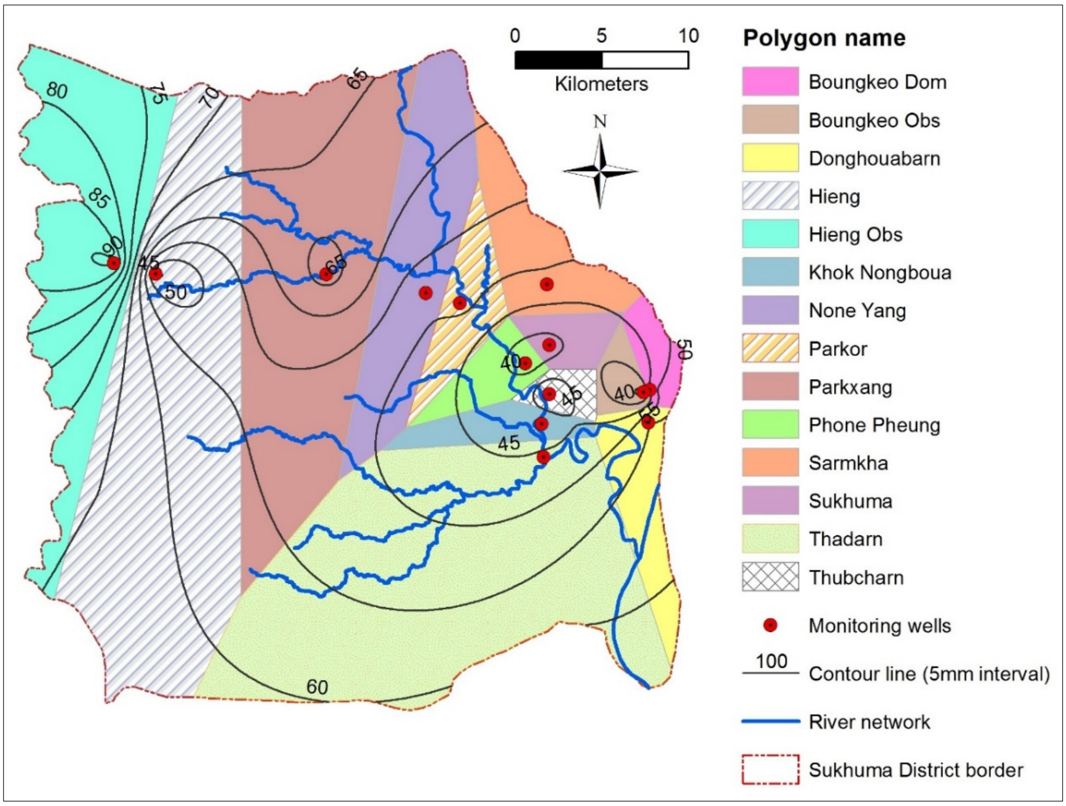


Figure 4.8: Contour lines of annual groundwater recharge (mm) in water depth for 2015-16 and the area of the Thiessen Polygon that is covered by each monitoring well. Note: Dom and Obs stands for domestic well and (shallow and deep) observation wells, respectively

Furthermore, it can be seen in *Figure 4.8* that the highest recharge was calculated at the Hieng observation wells, at about 5% (90 mm/year) of the area-averaged annual rainfall (1700 mm/year). The next highest recharge rates were estimated at the Parkxang observation wells at 4% (68 mm/year). The lowest recharge rate was found at the Boungkeo observation points, at approximately 2% (30 mm/year). Other monitoring wells show similar recharge rates at approximately 2% to 3% of annual rainfall. The area-averaged annual groundwater recharge for 2015-16 computed using the Thiessen Polygon technique was estimated as 3.2% (55 mm/year) of annual rainfall.

4.10.2. Water balance method

Based on the conceptual water balance model of Sukhuma District as presented in *Figure 4.1*, the water balance method can be also applied to estimate the water recharge into the groundwater storage. The water balance method can be applied to estimate recharge at any spatial and temporal scale (Healy, 2010). This method focuses on the contribution of the various components to the groundwater storage fluctuations, for example, the storage usually increases during the wet season and decreases during the dry season. The changes in groundwater storage can be caused by recharge from rainfall, lateral groundwater inflow to and outflow from the study area, baseflow (groundwater drainage to the river), and groundwater abstraction by pumping.

For this study, the spatial groundwater recharge within the Sukhuma District was estimated from the following water balance equation adapted from Zhang et al. (2002), Maréchal et al. (2006) and Healy (2010):

$$R_{WB} = (\mathrm{PC} + G_{in}) - \left(Q_{bf} + Q_W + G_{out} + \Delta GWS \right) \qquad \text{..........................} \ (4.5)$$

Where R_{WB} is the groundwater recharge estimated from the water balance method (mm), Q_{bf} is the baseflow (mm), Q_W is the groundwater abstraction by pumping (mm), G_{in} and G_{out} are the lateral groundwater inflow to and outflow from the study area (mm), ΔGWS is the changes in groundwater storage (mm), and PC is the percolation from the root zone (mm) which is calculated as:

$$PC = P - ET - Q_{DR} \pm \Delta SMS \qquad \text{..........................} \ (4.6)$$

Where P is the rainfall (mm/month) that is provided in Section 4.2, ET is the evapotranspiration (mm/month) that is described in Section 4.3, Q_{DR} is the direct runoff (mm/month) that is provided in Section 4.7, and ΔSMS is the change in soil moisture content in the root zone (~1 m depth below ground surface) derived from GLDAS (mm/month). ΔSMS is calculated as the different between the soil moisture content at the current month and the previous month.

Because rainfall during the dry season in Sukhuma District is usually less than 10% of annual rainfall and less than evapotranspiration, the groundwater recharge from rainfall during the dry season was assumed to be zero. Then, Equation (4.3) can be utilized to estimate only the groundwater recharge during the wet season and is rewritten as follows:

$$R_{WB}^{Wet} = (PC^{Wet} + G_{in}^{Wet}) - (Q_{bf}^{Wet} + Q_{W}^{Wet} + G_{out}^{Wet} + \Delta GW^{Wet}) \qquad \text{......................... (4.7)}$$

The methodology used to calculate the groundwater storage fluctuation is the WTF method (Healy, 2010) as follows:

$$\Delta GWS^{Wet} = S_y . \frac{\Delta h^{Wet}}{\Delta t} \qquad \text{......................... (4.8)}$$

Where ΔGWS^{Wet} is the change in groundwater storage during the wet season (mm), S_y is the averaged specific yield of aquifer in Sukhuma District estimated from the recession curve method (S_y = 0.015) (dimensionless), Δt is the considered time period (wet season 2015-16 from June to October), and Δh^{Wet} is the averaged groundwater level rise from all observation points within the Sukhuma District during the wet season (mm). The Δh^{Wet} herein was estimated as a difference between the water table elevation at the end month of the wet season (October 2015) and the water table elevation at the first month of the wet season (June 2015).

All components of water balance in the Sukhuma District used to estimate the recharge are given in *Table 4.2*. The value of the percolation (PC) was estimated using Equation (4.5). Details of estimation of the baseflow (Q_{bf}), the groundwater abstraction (Q_w), and the lateral groundwater inflow (G_{in}) and outflow (G_{out}) components are described in Section (4.6), Section (4.8), and Section (4.9), respectively. The change in groundwater storage (∆GWS) was calculated using Equation (4.8). The groundwater recharge estimated from the water balance method as shown in Equation (4.7) is 4.4% (74 mm/year) of annual rainfall. This result suggests that the recharge into the deep groundwater aquifer in the Sukhuma District is relatively low compared to the annual rainfall. Also, including the soil moisture content at the root zone derived from the GLDAS in the percolation estimation as shown in Equation (4.6) can improve the groundwater recharge estimation by using the water balance equation, Equation (4.7). This results indicates that using a combination of limited field observation data (e.g. streamflow, groundwater levels, rainfall and climate data) and the simulated data (soil moisture content) derived from GLDAS can be a useful method for quantifying the groundwater recharge in a region with sparse of available data.

Table 4.2: Summary of estimated groundwater recharge using the water balance method. Units of all components are (mm), except for the recharge in percentage of annual rainfall

Season	PC	G_{in}	G_{out}	Q_{bf}	Q_w	∆GWS	R	R in % of annual P
Wet season 2015-16 (Jun - Oct)	350	1.24	1	228	0.82	48	74	4.35

Note: PC is percolation, G_{in} and G_{out} are the lateral groundwater inflow and outflow, respectively, Q_{bf} is the baseflow, Q_W is the groundwater abstraction, ∆GWS is the change in groundwater storage, R is the groundwater recharge, and P is the rainfall.

4.10.3. Comparison of estimated recharge rates to other studies

In the current study, the groundwater recharge was estimated using the WTF method and the water balance method. The WTF method provides a slightly lower estimated recharge rate (3%) than the water balance method (4%). One of the main reasons for this can be the WTF method does not account for other components of the water balance. This method is suitable for estimating the groundwater recharge in an unconfined aquifer getting direct recharge from rainfall (Healy and Cook, 2002).

The recharge rates estimated in the current study differ from the values reported in the previous studies (JICA, 1995; Vote et al., 2014) as shown in *Figure 4.9*. The recharge rate estimated by JICA (1995) was approximately 12% of annual rainfall based on a water balance approach. The higher recharge rates obtained can be interpreted as the soil infiltration which combines recharge into the topsoil layer, shallow fractured laterite soil and the deep fractured bedrock aquifer.

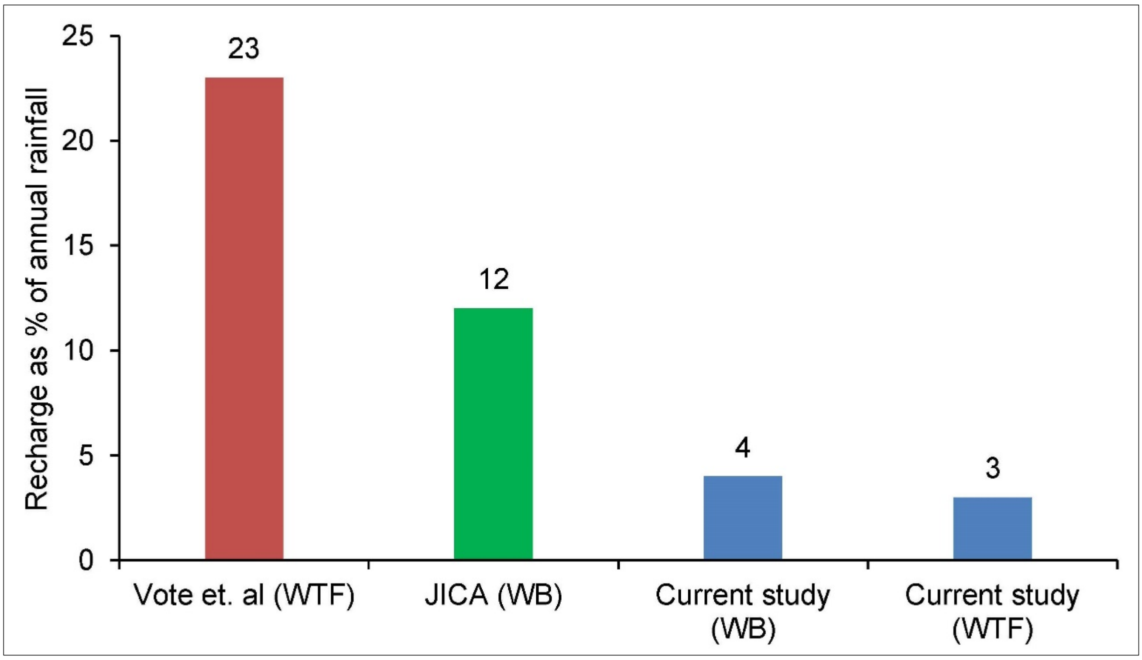


Figure 4.9: Comparison between estimated groundwater recharge in the Sukhuma District from the current study and from other researchers. Note: WB stands for water balance method and WTF stands for water fluctuation method

Vote et al. (2014) estimated groundwater recharge using the WTF method for the same monitoring network utilised in the present study. The estimated recharge rates were 23% of annual rainfall, much higher than the estimates of the present study *(Figure 4.9)*. This can be attributed to using a higher value of specific yield (S_y = 0.1) than in the present study, which may be not appropriate for estimating the rainfall recharge to the fractured bedrock aquifer.

It should be noted that, in the previous studies by JICA (1995) and Vote et al. (2014), the lateral groundwater inflow and outflow, groundwater abstraction, soil infiltration, soil moisture storage, adequate understanding of geological conditions, and other components of the water balance, that are important, were not taken into consideration in determining the groundwater recharge.

The results from the current study are that the WTF method and the water balance method produced similar recharge rates. A primarily reason for this similarity can be the groundwater recharge estimated using the WTF method was averaged over the Sukhuma District area by using the Thiessen Polygon technique. In other word, all variables (the water table rise and specific yield) of the WTF equation were averaged within the Sukuma District. In similar manner, all components of the water balance equation were also constant in space over the Sukhuma District area.

In addition, the recharge rates estimated from the current study also show the same range as the groundwater recharge rates that were calculated in Northwest Cambodia by Vouillamoz et al. (2016), where the geological characteristics are similar to Sukhuma District. The recharge rates in Northwest Cambodia were estimated at 0.5 – 4% of annual rainfall (1754 mm) by using the WTF method. Based on these inferences from published literature, the estimates of recharge rates using the WTF and the WB methods and values of S_y derived in the present study are considered to be reasonable based on the limited available data of geological conditions, groundwater level variations and hydrogeological characteristics.

4.11. Seasonal groundwater and surface water interaction

In the current study, the relationship between rainfall and groundwater table rises was investigated. The time series of weekly rainfall and weekly groundwater levels at each monitoring well from 1 June to 29 November 2015 were used as the input and the output, respectively, for the cross-correlation analysis to estimate time lags between them (Appendix 18). Regarding the assessment of these time lags in some areas the domestic bores and shallow and deep bores were similar. For example, the monitoring wells in Sukhuma domestic, shallow and deep wells all showed the same lags of approximately 3 weeks (Appendix 18). An example of a lag of three weeks found at the Sukhuma domestic bore is shown in *Figure 4.10*. This similarity could be caused by the way how the wells were constructed and geological structure. However, time lags between rainfall and rise in groundwater levels at all monitoring wells are shown to vary at different locations and range from two to six weeks with an average of three weeks between the start of the rainy season and rise in groundwater level.

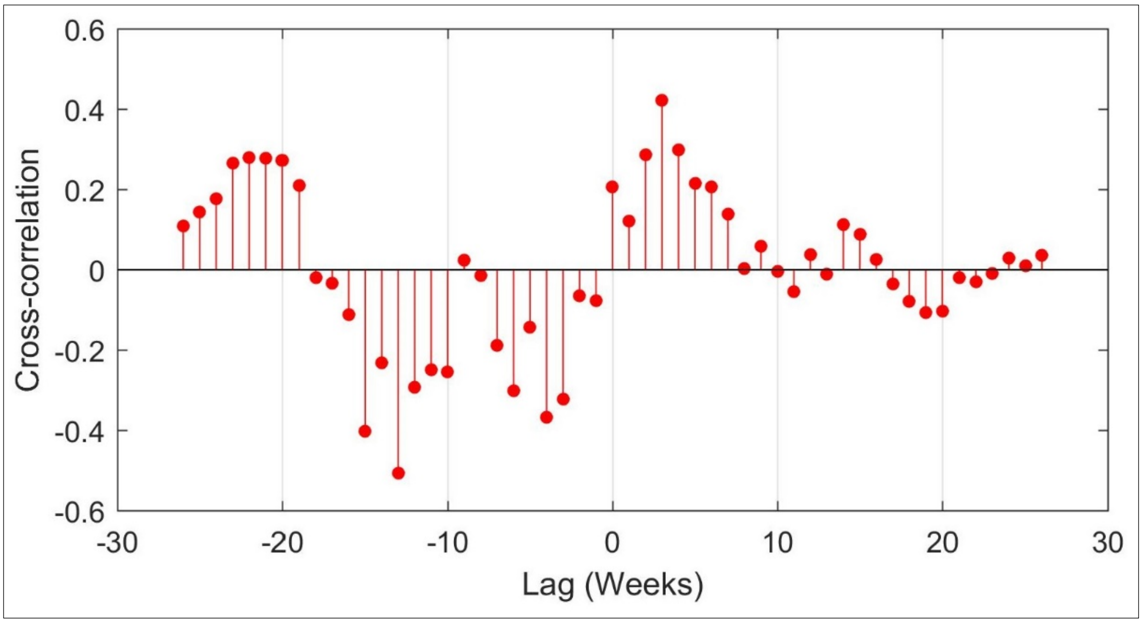


Figure 4.10: Cross-correlation between weekly rainfall and weekly groundwater levels at the Sukhuma domestic bore for the period June – November 2015

The spatial variation in the delay between rainfall and water table rise depends on a number of factors, such as: spatial variation of surface soil types; land use and vegetation cover; and, spatio-temporal variation of rainfall. Lucas and Wendland (2016) indicated that land use and vegetation cover were parameters influencing the groundwater recharge rate. However, the impacts of these parameters (land use and cover, soil type, etc.) on the rainfall recharge are out of the scope of this research. The spatial variation of time lags between rainfall and groundwater levels rise can also imply that further evaluation of the groundwater level and rainfall time series in the Sukhuma District should be carried out to improve the accuracy of groundwater recharge estimation and also support better groundwater management planning in the region.

Furthermore, the seasonal connection between the water table and river beds in Sukhuma District was assessed by comparing the water table elevations from the monitoring wells to the elevations along the beds of the Khamouan and Pheung rivers, for the dry and wet seasons of 2015-16. The assessment was processed with the Xacto Section Tools as developed by Carrell (2014) and which are implemented in the GIS (Geographic Information System) to create a 2-dimensional or a 3-dimensional cross-section. For this research, a cross-section of comparison between groundwater level and riverbed elevations was generated *(Figure 4.11)*. The partial connection is demonstrated clearly on the cross-section. Within most parts of Khamouan River, the groundwater table is always above the river bed, indicating that the stream and aquifer are hydraulically connected. *Figure 4.11* also illustrates that only a few parts of the Khamouan River were disconnected from the river bed during the dry season 2015-16.

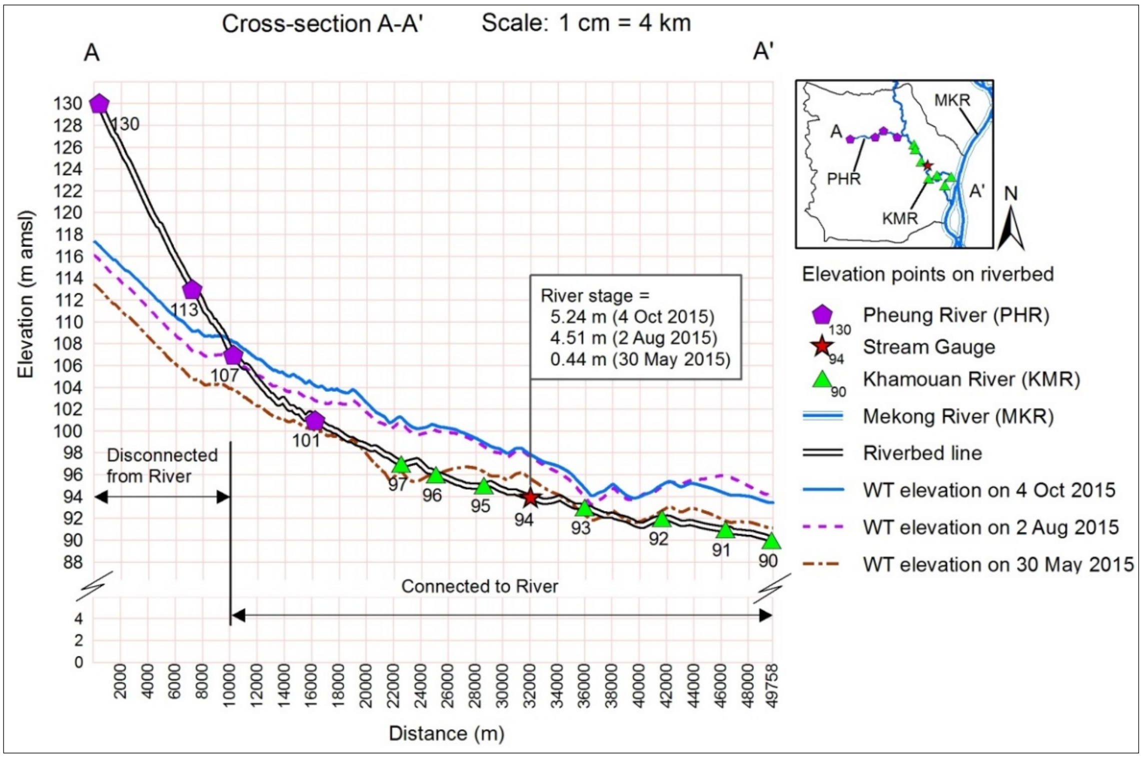


Figure 4.11: Connection between water table (WT) and riverbed elevations during the dry season and the wet season of 2015

Along the Pheung River, which is located on the upper part of the Khamouan River catchment, groundwater is partially connected to the river bed during the wet season. In contrast, in the dry season, groundwater level is below the river bed and this portion of the river is disconnected *(Figure 4.11)*.

Figure 4.12 illustrates the correlation between monthly flow in the Khamouan River at the river gauge and the monthly water table elevation at the Phone Pheung domestic well for the wet season of 2015-16. Phone Pheung domestic well is located about 1 km north of the river gauge and about 0.5 km from the east bank of the Khamouan River *(Figure 4.8)*. The coefficient of determination, R^2, value of the two components is 0.82 with a significant value of p < 0.01, demonstrating a good correlation between groundwater level and surface water in Khamouan River in this reach. During the dry season of 2015-16, surface water flow in Khamouan River was very low and could not be measured by the staff gauges.

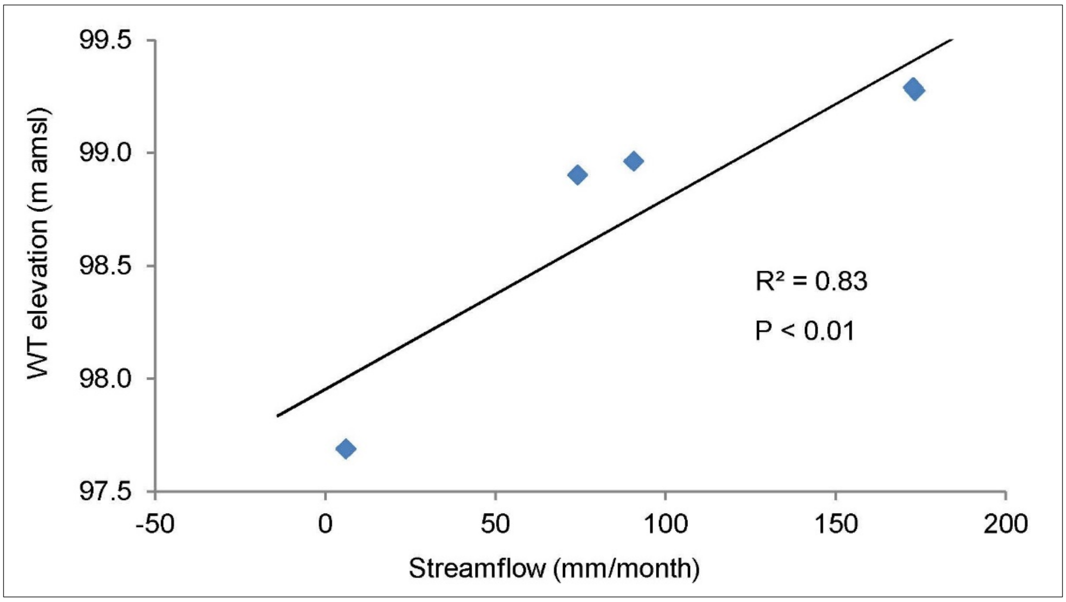
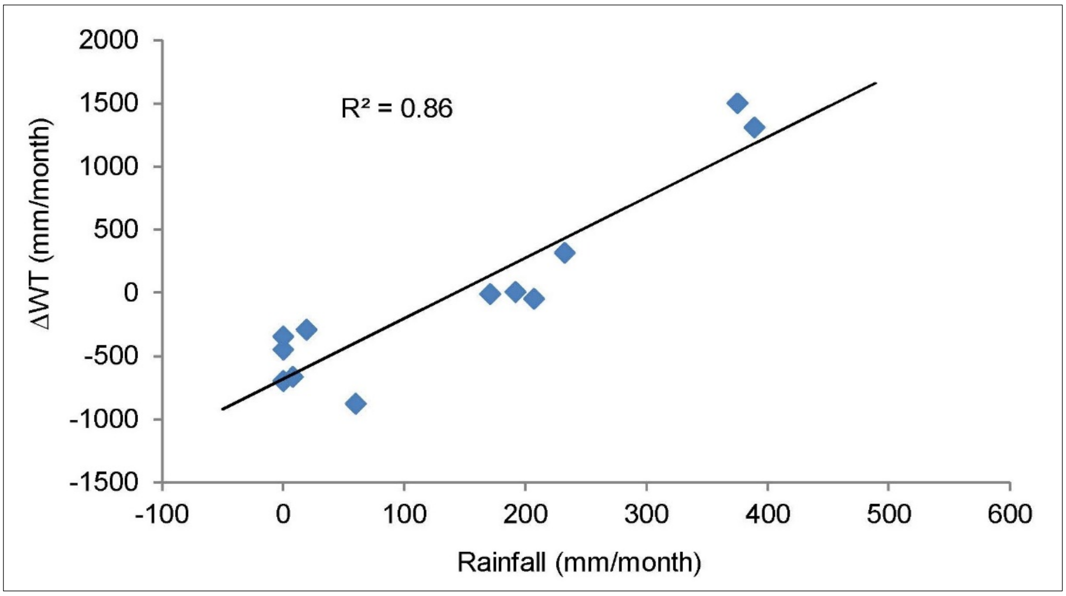


Figure 4.12: Correlation between water table (WT) elevation at the Phone Pheung domestic well and Khamouan River flow at the river gauge during the wet season of 2015 (June – October)

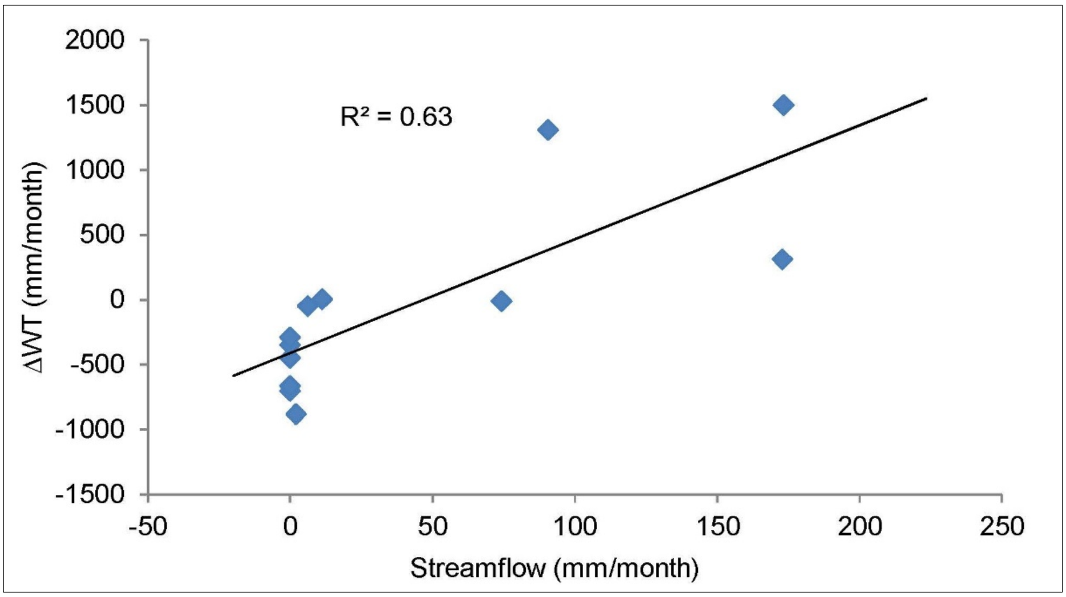
The connection between surface water and groundwater can also be inferred from springs that occur along a river bank (White et al., 2016). The observed flow of the spring close to the Khamouan River gauge station *(Figure 4.13)* was sufficient for villagers to collect enough water for their household use. The spring was flowing from fractures in mudstone, shale and laterite exposed at the base of the sandy alluvial material of the Khamouan River valley. These fractured formations are exposed elsewhere in river sections in southeast Sukhuma, suggesting a hydraulic connection between the surface drainage and the groundwater system. Therefore, this information corresponds relatively well with *Figure 4.11*.

Figure 4.13: Spring at the Khamouan River bank where the river gauge is located. This photo was taken on 24 March 2017 (dry season)

Furthermore, the dependency of water table fluctuation with rainfall and streamflow is also investigated through linear regression analysis. The monthly change in water table elevation is correlated with monthly rainfall data at Sukhuma District and with monthly streamflow data at Khamouan River gauge, as shown in *Figure 4.14*. The R^2 (coefficient of determination) values for correlation of change in water table elevation with rainfall and streamflow are 0.86 and 0.63, respectively (*Figure 4.14a* and *Figure 4.14b*). This implies that the groundwater table responses are much more dependent on rainfall rather than streamflow.



(a)



(b)

Figure 4.14: Correlation between (a) change in water table elevation (ΔWT) and rainfall, (b) change in water table elevation and streamflow for the period of June 2015 to May 2016

4.12. Change in total water storage estimated from field observation data

Based on the conceptual water balance model of the Sukhuma District *(Figure 4.1)*, the total water storage change (ΔS) for a specific region is commonly described as the balance between precipitation or rainfall (P), evapotranspiration (ET), and direct runoff (Q_{DR}) (surface and subsurface runoff) and can be expressed as (Becker et al., 2011; Chen et al., 2010; Famiglietti et al., 2011; Jiang et al., 2014; Ning et al., 2014):

$$\Delta S^{(Obs)} = P^{(Obs)} - ET^{(Obs)} - Q_{DR}^{(Obs)} \qquad \text{.......................... (4.9)}$$

Where $\Delta S^{(Obs)}$ is the total water storage change (including surface water, soil moisture and groundwater storage changes) in i^{th} month (mm), and $P^{(Obs)}$, $ET^{(Obs)}$ and $Q_{DR}^{(Obs)}$ are monthly rainfall, evapotranspiration and direct runoff, respectively (mm).

The interception on the ground surface and vegetation canopy surface water components are not considered in Equation (4.9) because they are stored for a relatively short time scale rarely exceeding one day (De Groen, 2002).

Based on the availability of field observation data in Sukhuma District, the three variables of rainfall, ET and direct runoff can be estimated for the hydrological years 2015-16 and are illustrated in *Figure 4.15*. Then, change in monthly total water storage was estimated for this water year as shown in *Figure 4.16*. This figure illustrates that change in monthly total water storage from June 2015 to October 2015 are positive values and negative values from November 2015 to April 2016. The positive values refer to the rainfall infiltrated into the soil layers or potential recharge into the aquifer storage. The negative values refer to the soil water deficits.

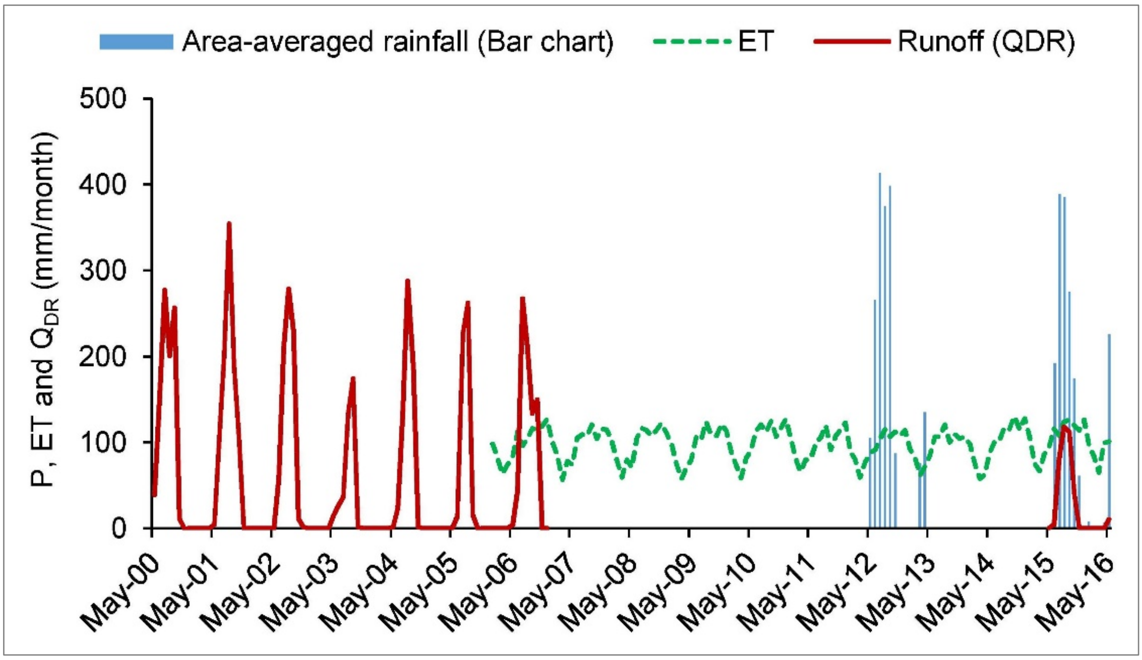


Figure 4.15: Availability of the area-averaged rainfall, estimated ET and estimated runoff from the observation data in the Sukhuma District for the period May 2000 to May 2016

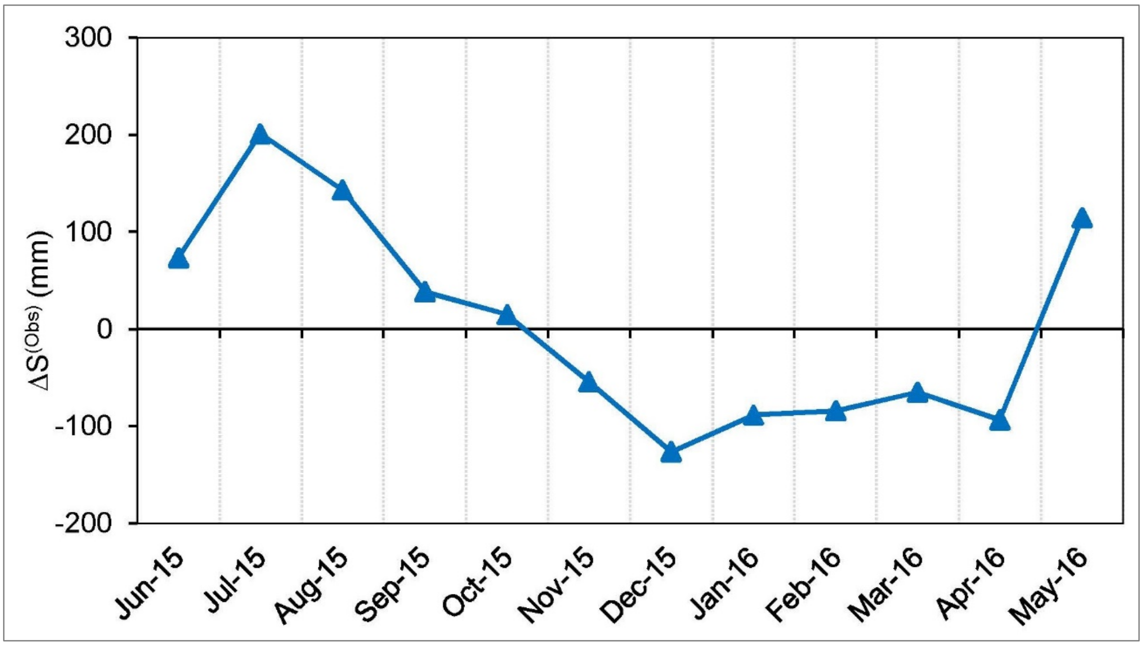


Figure 4.16: Change is monthly total water storage estimated from the field observation data in the Sukhuma District for the hydrological years 2015-16 (June 2015 – May 2016)

As shown in *Figure 4.16*, soil infiltration from rainfall for the wet season 2015-16 was estimated by accumulating monthly soil infiltration from June to October 2015 and May 2016. It was estimated at 585 mm which was about 34% of annual rainfall (1700 mm). At the annual scale, the total soil infiltration or total water storage remaining in the Sukhuma District was also quantified by aggregating the monthly soil infiltration from June 2015 to May 2016. The annual total water storage was estimated at 70 mm which was approximately 4% of annual rainfall. This result implies that very small amount of rainwater was stored in the aquifer system. It also means that large amount of rainfall (about 96%) was contributed into ET and runoff. This result of water storage in the aquifer (~4%) is consistent with the groundwater recharge rate estimated using the water balance equation (see Section 4.10.2).

4.13. Summary

This chapter provides an overview of establishing the conceptual water balance model for the Sukhuma District. The terminologies of main components of water balance are also defined. The components of the water balance model are set up based on the available data and field investigation during the research project. The main components of the model include: rainfall, ET, surface runoff, total streamflow, baseflow, direct runoff, groundwater abstraction, lateral groundwater inflow and outflow, and groundwater recharge. These components were estimated in monthly time steps for the period June 2015 to May 2016.

Additionally, the seasonal interaction between surface water and groundwater along the Khamouan River was also investigated as discussed in Section 4.11. The connection between groundwater level rises and rainfall was also assessed in this section. It is shown that most parts of the Khamouan River at and downstream from the river-gauge were connected to the river at all times of the year. However, from about 1 km upstream from the river-gauge presented as a partial connection between river and groundwater. The rainfall would take about 3 weeks to replenish the groundwater storage. The groundwater recharge estimated from this study is demonstrated at about 3 – 4% of annual rainfall. Based on this study the main source of groundwater recharge is from rainwater, as also has been shown by the results of the water chemistry and stable isotope analysis described in Chapter 2 and Appendix 13. This information could be very useful for future groundwater studies and for planning on sustainable surface water and groundwater management in the Sukhuma District.

Furthermore, the change in total water storage from June 2015 to May 2016 was also estimated. This result was used to compare with the change in total water storage estimated from remote sensing data. This comparison aims to justify the reliability of the conceptual water balance model developed for the Sukhuma District (see Chapters 5 and 6).

Chapter 5 : Application of Remote Sensing Data for the Sukhuma District

To overcome the issue of limited available measurement data and support long-term surface water and groundwater management planning in the Sukhuma District, the feasibility of applying remote sensing data derived from the Gravity Recovery and Climate Experiment (GRACE) satellites has been investigated in this chapter. Alternative data derived from other sources (GLDAS and TRMM) were also used for this investigation (Section 5.1) and downscaling GRACE data to Sukhuma District scale as discussed in Section 5.2. The seasonal groundwater storage change at the Sukhuma scale was estimated using data derived from GRACE and GLDAS as presented in Section 5.3. Finally, a summary of this chapter is provided in Section 5.4.

5.1. Change in total water storage estimated from GLDAS and TRMM data

The data derived from the Global Land Data Assimilation System (GLDAS) have been utilised for global and regional hydrological studies. Several studies have used GLDAS data to isolate the groundwater storage changes from the TWSA derived from GRACE in regions with limited field measurements (Leblanc et al., 2009; Rodell et al., 2007; Shamsudduha et al., 2012) and to evaluate the TWSA derived from GRACE (Lakshmi, 2016). The GLDAS data are simulated by using land surface models (LSMs), (Rodell et al., 2004). The GLDAS products from the Noah Land Surface Model (LSM), which include: soil moisture, surface runoff, subsurface runoff, plant canopy water storage, and evapotranspiration, were applied for the current study. More details of GLDAS data and methods used for estimating these parameters are summarised in Appendix 19.

Many previous studies have estimated the change in total water storage (ΔS) for a specific region as the balance between precipitation or rainfall (P), evapotranspiration (ET), and direct runoff (Q_{DR}) (surface and subsurface runoff) and can be expressed as (Becker et al., 2011; Chen et al., 2010; Famiglietti et al., 2011; Jiang et al., 2014; Ning et al., 2014):

$$\Delta S_{(i)} = P_{(i)} - ET_{(i)} - Q_{DR(i)} \quad \text{……………………… (5.1)}$$

Where $\Delta S_{(i)}$ is the monthly change in total water storage (including surface water, soil moisture and groundwater storage changes) in i^{th} month (mm), and P, ET and Q_{DR} are monthly rainfall, evapotranspiration and direct runoff, respectively (mm).

For the current study, Equation (5.1) was applied to estimate the change in total water storage by using the input data derived from GLDAS and TRMM and can be expressed as:

$$\Delta S^{(GLDAS)} = P^{(TRMM)} - ET^{(GLDAS)} - Q_{DR}^{(GLDAS)} \quad \text{……………………… (5.2)}$$

Where $\Delta S^{(GLDAS)}$ is the total water storage change (including surface water, soil moisture and groundwater storage changes) in i^{th} month (mm), and $P^{(TRMM)}$, $ET^{(GLDAS)}$ and $Q_{DR}^{(GLDAS)}$ are monthly rainfall derived from TRMM, evapotranspiration and direct runoff derived from GLDAS, respectively, (mm).

The data derived from TRMM and GLDAS are 0.25° x 0.25° (~800 km^2) on a regular grid and are presented within the GRACE footprint *(Figure 5.1)*. However, the Sukhuma District area does not have a regular shape that will fit with the grids of the TRMM and the GLDAS data. Therefore, data derived from TRMM and GLDAS for the Sukhuma District area are weighted by using Equation (5.3).

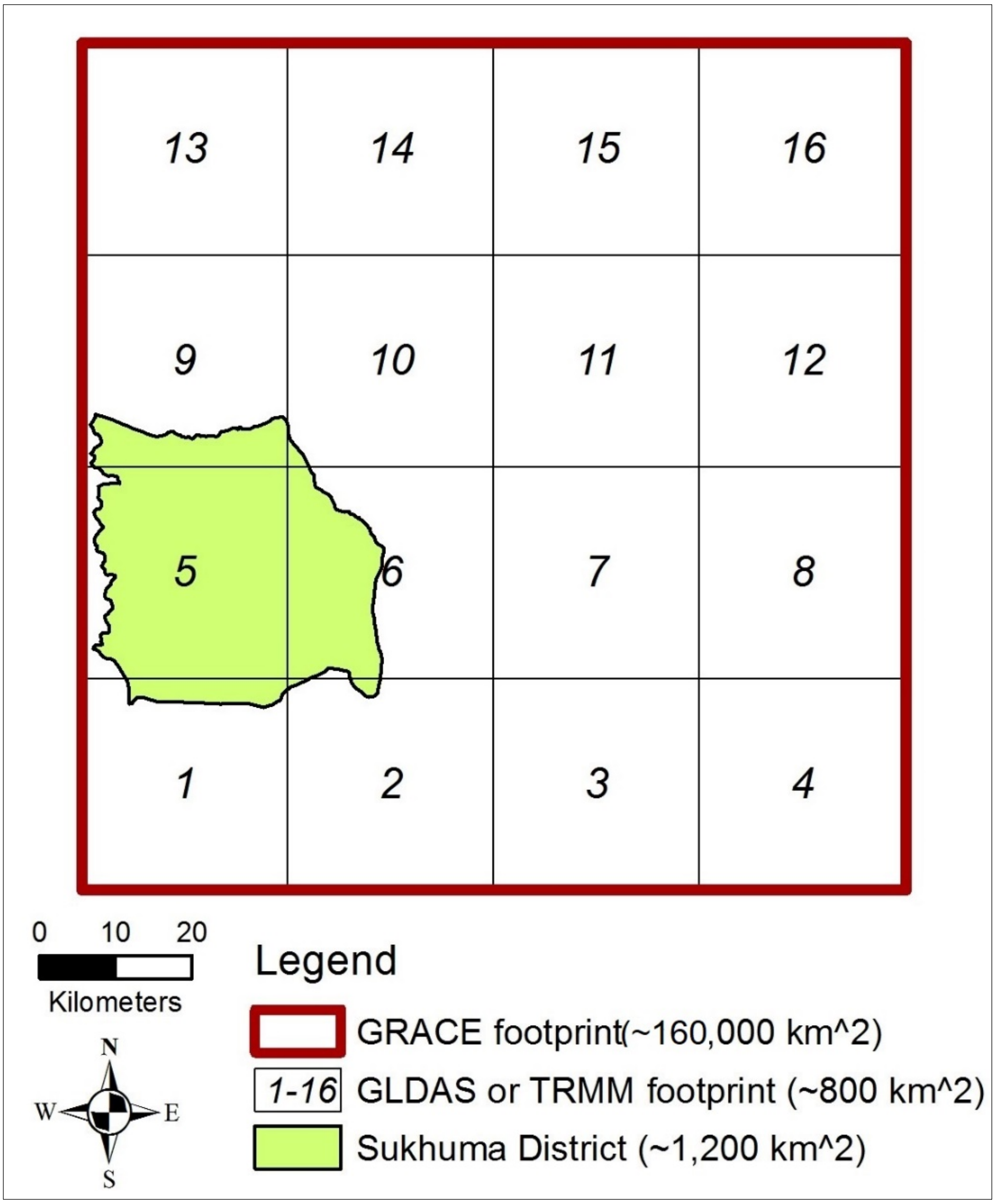


Figure 5.1: Sukhuma District area overlaid with TRMM and GLDAS grid cells.

$$X^{(SKM)} = \frac{\sum_{i=1}^{n}(Y_i \cdot A_i)}{A} \quad \text{.......................... (5.3)}$$

Where $X^{(SKM)}$ is the monthly estimated TRMM-P or monthly GLDAS data at the Sukhuma District scale (mm/month), Y_i is the monthly TRMM-P or GLDAS data at 0.25° at the i^{th} grid (mm/month), A_i is the area of Sukhuma District in the i^{th} grid (km^2), and A is the total area of Sukhuma District (km^2).

The Tropical Rainfall Measuring Mission (TRMM) is a joint project between the National Aeronautics and Space Administration (NASA) of the United States and the National Space Development Agency (NASDA) of Japan. It was launched on 27 November 1997 to monitor the rainfall and energy (e.g. latent heat of condensation) exchange in the tropical and subtropical regions (Kummerow et al., 1998). There are five rainfall measuring instruments on the TRMM satellite, namely the Microwave Imager (TMI), the Visible Infrared Scanner (VIRS), the Precipitation Radar (PR), the Clouds and Earth's Radiant Energy System (CERES) and the Lightning Imaging Sensor (LIS) (Liu et al., 2017). The TRMM provides a best precipitation estimate in latitudes between 50°N to 50°S (Huffman et al., 2010).

Currently, the rainfall products of the TRMM have been updated to version 7 (v7) on the relatively fine scale of 0.25°x0.25° spatial resolution and 3-hourly temporal resolution in both real and post-real time (Tropical Rainfall Measuring Mission (TRMM), 2011). Based on the literature review, it is shown that TRMM rainfall products at the monthly scale perform better than at the daily scale (Arias-Hidalgo et al., 2013). For the current study, the TRMM 3B43 v7 product was used. The TRMM 3B43-v7 dataset is the monthly version of the TRMM 3B42 v7 (daily data). It is generated using TRMM-adjusted merged microwave-infrared precipitation rate (in mm/hr) and root-mean-square precipitation-error estimates (Huffman, 1997). The 3B43 v7 dataset is available from 1 January 1998 to 31 December 2017 (Tropical Rainfall Measuring Mission (TRMM), 2011) on the Giovanni website [https://giovanni.gsfc.nasa.gov/giovanni/]. However, the duration of the TRMM 3B43-v7 monthly rainfall data used in the current study is from May 2000 to April 2016.

The TRMM-rainfall and the GLDAS-data on ET and direct runoff from 2000-01 to 2015-16 were utilized to estimate change in total water storage at the Sukhuma District. The rainfall derived from TRMM satellite at the Sukhuma District (SKM) scale was estimated by using Equation (5.3). The annual TRMM-derived rainfall was estimated by accumulating the monthly rainfall within each hydrological year. *Figure 5.2* depicts annual area-averaged TRMM-derived rainfall from 2000-01 to 2015-16 over the SKM footprint. The annual minimum and maximum area-averaged rainfall derived from TRMM for this period was 1500 mm/year (in 2010-11) and 2500 mm/year (in 2000-01, 2002-03 and 2006-07), respectively. The mean annual area-averaged rainfall was 2100 mm/year with a standard deviation of 300 mm/year. The annual area-averaged TRMM-derived rainfall at the SKM footprint shows slightly declining trends from 2000-01 to 2015-16 with an annual rate of around 26 mm. In addition, the mean annual area-averaged TRMM-derived rainfall at the SKM footprint for this period was approximately less than 10% lower the observed rainfall in the Sukhuma District.

Figure 5.2. Comparison between the estimated annual change in total water storage from GLDAS and TRMM data (GLDAS-ΔS) and the rainfall (TRMM-P), evapotranspiration (GLDAS-ET) and direct runoff (GLDAS-QDR) from water year 2000-01 to 2015-16

The monthly GLDAS-derived data (ET and Q_{DR}) at the Sukhuma District scale were computed by using Equation (5.3). Then, the annual values for each GLDAS-derived parameter were calculated by aggregating from monthly data. *Figure 5.2* illustrates the annual GLDAS-ET from 2000-01 to 2015-16. The annual minimum and maximum GLDAS-ET for this period were 1000 mm (in 2004-05) and 1300 mm (in 2011-12), respectively. The mean annual GLDAS-ET was 1100 mm with a standard deviation of 73 mm/year. The annual GLDAS-ET at the SKM footprint shows an increasing trend from 2000-01 to 2015-16 at a rate of 10 mm. The increase of annual ET may be caused by rising air temperatures in the region. Based on the observed air temperature data at the Pakse climate station, average annual air temperature from 2000 to 2016 at the Pakse station shows a slight increase of 0.007°C per year. Hoanh et al. (2010) also reported that climate change will impact on average annual air temperature in Southern Laos to increase about 0.023°C per year with likely increase in ET.

Figure 5.2 also illustrates the annual GLDAS-derived direct runoff (Q_{DR}) from 2000-01 to 2015-16 over the Sukhuma District area. The annual minimum and maximum GLDAS-Q_{DR} for this period were 400 mm (in 2010-11) and 1200 mm (in 2000-01), respectively. The mean annual GLDAS- Q_{DR} was 860 mm with a standard deviation of 250 mm/year. The annual area-averaged GLDAS-Q_{DR} shows a declining trend from 2000-01 to 2015-16 at an annual rate of 30 mm. The decreasing trends of GLDAS-Q_{DR} may be affected by the declining of annual rainfall and increasing of evapotranspiration.

The trend of annual change in total water storage estimated from GLDAS and TRMM data also shows a gentle decline from 2000-01 to 2015-16. The average decline in annual change in total water storage in Sukhuma estimated at around 6 mm. As illustrated in *Figure 5.2*, the magnitude of annual fluctuations of total water storage is based on not only the amount of annual rainfall in the same year but also the amount of direct runoff and ET. For example, the annual change in total water storage in 2000-01 (120 mm) is approximately one-third of the annual change in storage in 2003-04 (300 mm); however, the annual rainfall in 2000-01 (2500 mm) is higher than the annual rainfall in 2003-04 (2100 mm). The annual ET in 2000-01 and 2003-04 are almost the same value, but the amounts of direct runoff during these years are different. The depth of annual direct runoff in 2003-04 (700 mm/year) is about a half of the direct runoff in 2000-01 (1200 mm/year) because the average monthly rainfall intensity in 2000-01 (200 mm/month) was higher than the average monthly rainfall intensity in 2003-04 (170 mm/month).

Figure 5.3 depicts results of monthly change in total water storage estimated from GLDAS and

TRMM data for the period May 2000 to April 2016 and compares them with monthly rainfall derived from TRMM, monthly ET and monthly direct runoff derived from GLDAS. It illustrates that change in total water storage is lower than zero during the dry season because monthly rainfall during this period is usually less than monthly ET. The estimated annual infiltration (positive change in total water storage) in 2015-16 is approximately 9% of annual rainfall (1700 mm/year).

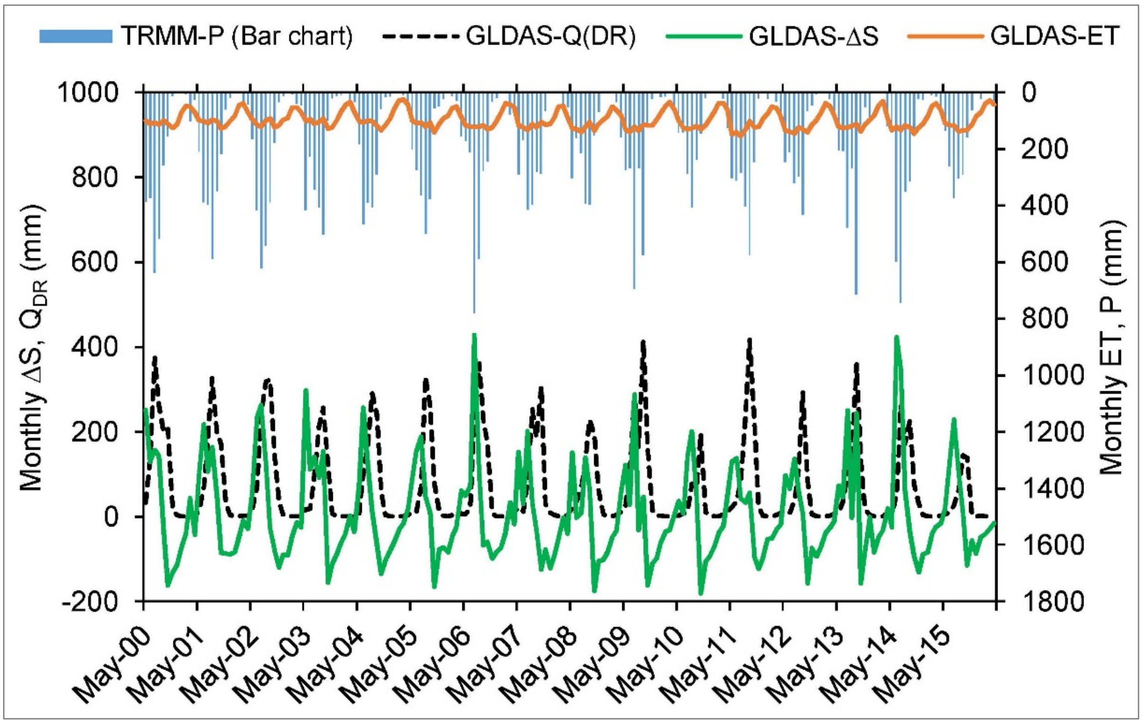


Figure 5.3: Monthly rainfall derived from TRMM (TRMM-P), Monthly data derived from GLDAS for direct runoff (GLDAS-Q_{DR}), evapotranspiration (GLDAS-ET), and estimated monthly change in total water storage from GLDAS and TRMM data (GLDAS-ΔS) for the period May 2000 to April 2016

5.2. Downscaling GRACE data to Sukhuma District scale

GRACE satellite data are publicly available from a number of institutions. Most GRACE data are available from August 2002 to March 2016 as a series of monthly equivalent water heights (EWH). These data can be downloaded from the website of the European Gravity Service for Improved Emergency Management (EGSIEM) [http://plot.egsiem.eu/]. From this website, users can download EWH data for a single point with surface area of ~12,000 km^2 (Bourgogne, 2016). The value of a point is averaged from four surrounding grid points. The GRACE products from the EGSIEM were processed in the spherical harmonic models with the Decorrelation (DDK5) filter and with a 400 km (1-degree x 1-degree) radius Gaussian smoother (Kusche et al., 2009). The noise contained in these data was removed by using the smoothing method proposed by Swenson et al. (2006). After smoothing procedure, some signal amplitudes could be lost in GRACE data. These signal amplitudes lost can be restored by using the scaling factors in GRACE data analysis with sufficient data of hydrology, geology and geography of the study area

(Swenson & Wahr 2006). It should be noted that, for the current study, these data are not available in the Sukhuma District and hence using of the scaling factors were not considered in the current study.

In addition, the errors and uncertainties in GRACE data for small spatial scales are larger compared to larger spatial scales. This means that errors in GRACE data will increase when basin scale is decreased. The errors and uncertainties in GRACE data for small areas can be addressed by considering the effects of signal leakage from surrounding area. It is important to note that, data and understanding of geology and groundwater in the surrounding areas are required. For the current study, these data are sparse and insufficient for considering the effect of leakage errors in GRACE data.

For this research, the monthly EWH or total water storage anomalies (TWSA) data from the GRACE GFZ (GeoFoschungsZentrum Potsdam) RL05a on the EGSIEM website were downloaded for the period November 2002 to February 2016, including 20 missing months. The missing GRACE-derived TWS data were estimated by using the linear interpolation method (Shamsudduha et al., 2012). A grid area of GRACE located in between latitude 14.25 to 15.25° N and longitude 105.5 to 106.5° E with a spatial resolution of ~160,000 km^2 was selected for this research because it covers the entire Sukhuma District area and all data monitoring points *(Figure 5.4)*. The GRACE data footprint covers a total of 16 grids of GLDAS or TRMM data.

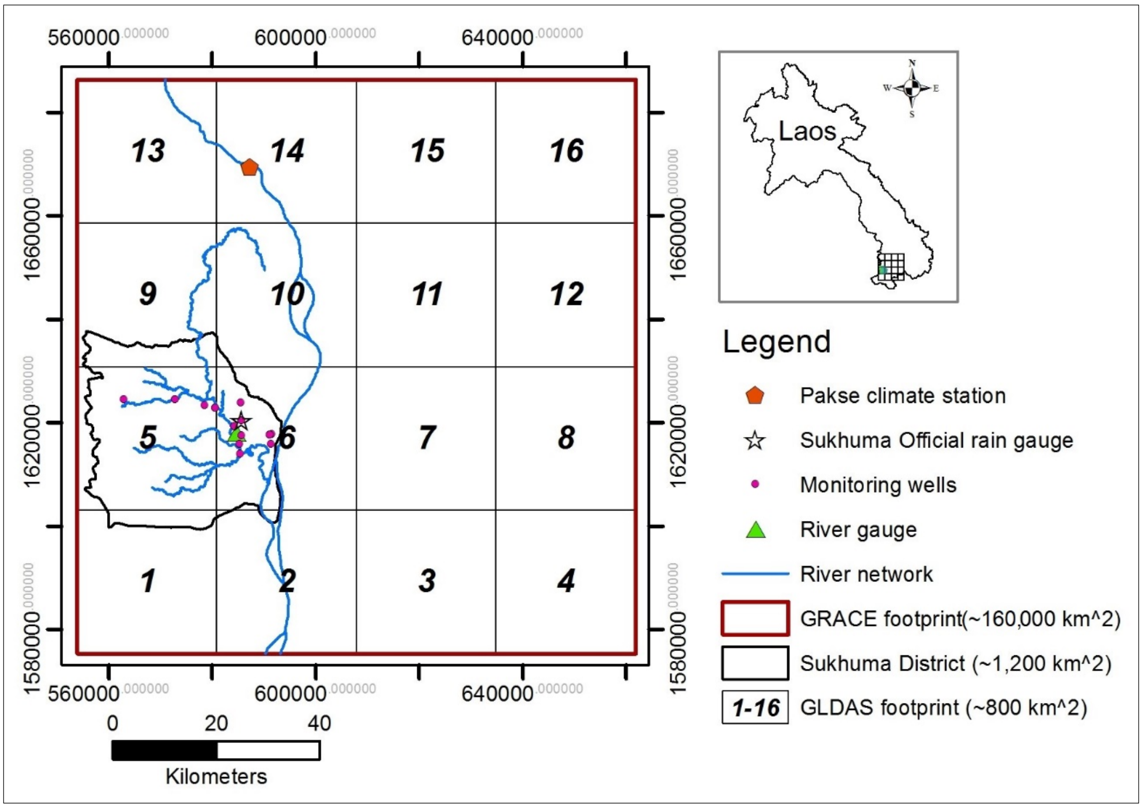


Figure 5.4: Footprints of GRACE, TRMM and GLDAS data compared with the area of Sukhuma District

The total water storage change (TWS) is derived from GRACE (GRACE-derived TWS) at the spatial resolution of ~160,000 km^2 (1° x 1°) which is larger than the Sukhuma District footprint (~1,200 km^2). Therefore, the GRACE data were downscaled to fit the study area. The procedures of downscaling GRACE data applied for the current study were modified from the method of Ning et al. (2014). The input data used for this analysis was derived from GLDAS and TRMM. The data analysis is based on a simple water balance equation as presented in Equation (5.2). The main assumption of the downscaling method made by Ning et al. (2014) is that the GRACE-derived TWS and ∆S computed from Equation (5.2) show a good correlation. A summary of the downscaling GRACE-derived TWS processes is presented in *Figure 5.5*.

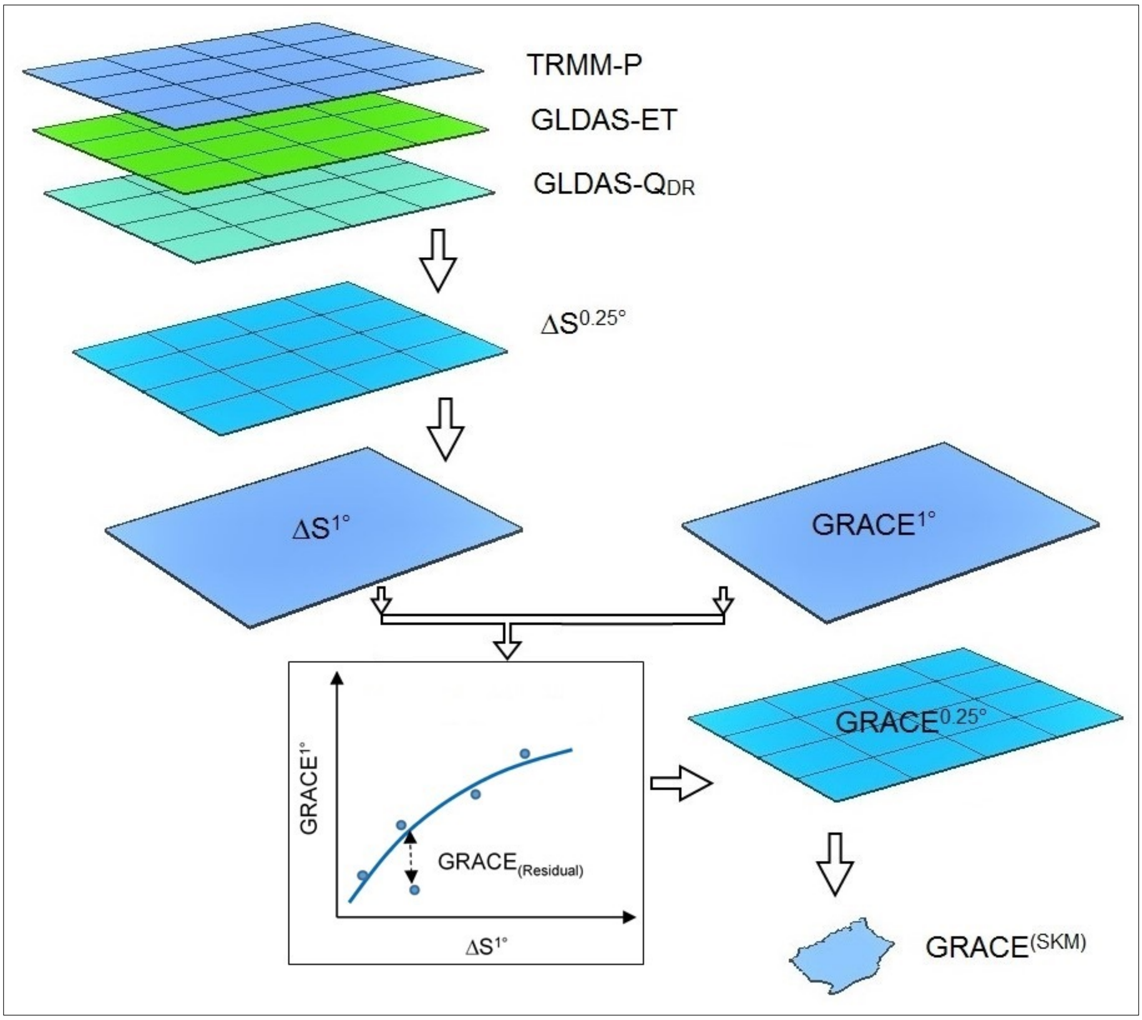


Figure 5.5: Framework of statistical downscaling GRACE-derived total water storage change (TWS) from GRACE footprint to the Sukhuma District (SKM) scale.

Note: TRMM-P = TRMM-derived rainfall, GLDAS-ET = GLDAS-derived ET, GLDAS-Q_{DR} = GLDAS-derived Q_{DR}, $\Delta S^{0.25°}$ = estimated total water storage anomalies at the grid footprint of 0.25° (~800 km^2), $\Delta S^{1°}$= estimated total water storage anomalies at the GRACE footprint of 1°, $GRACE^{1°}$ = GRACE-derived TWSA at the GRACE footprint of 1°, $GRACE^{0.25°}$ = downscaled

GRACE-derived TWSA at the footprint of 0.25°, and GRACE(SKM) = estimated GRACE-derived TWSA at the Sukhuma District scale

Details of each step of downscaling GRACE-derived TWS from 1° to Sukhuma District scale are described as follows:

1. aggregate the monthly data derived from TRMM (P) and GLDAS (ET and Q_{DR}) at the spatial resolution of 0.25° x 0.25° to the GRACE footprint (1° x 1°) by pixel averaging, (e.g. $P^{1°}, ET^{1°}, Q_{DR}^{1°}$);
2. compute the monthly $\Delta S^{(GLDAS)}$using monthly P derived from TRMM, ET, and Q_{DR} derived from GLDAS of grids 0.25° and estimated at GRACE footprint based on Equation (5.2), respectively (e.g. $\Delta S^{0.25°}$, $\Delta S^{1°}$);
3. create a relationship between ΔS and GRACE-TWS at 1° for a specific period by using the regression technique. Multiple regression techniques were tested. The best regression model with the significant value ($p < 0.05$) and highest R^2 was chosen and applied for further downscaling GRACE data;
4. calculate monthly total water storage change at the GRACE footprint from $\Delta S^{1°}$ using the regression equation obtained in step (3), (e.g. $GRACE_{\Delta S^{1°}}^{1°}$);
5. estimate residual of system, ($GRACE_{(residual)}$), by computing the difference between $\Delta S^{1°}$ and $GRACE_{\Delta S^{1°}}^{1°}$. $GRACE_{(residual)}$ was considered as the amount of monthly GRACE-derived TWS that cannot be predicted by the regression model chosen in step (3);
6. compute monthly GRACE-TWS at the special resolution of 0.25° from $\Delta S^{0.25°}$ using the regression function obtained in step (3), (e.g. $GRACE^{0.25°}$);
7. correct the values of estimated GRACE-TWS at 0.25° by adding back the residual correction term ($GRACE_{(residual)}$) computed in step (5). At this step, GRACE-derived TWS at 1° was downscaled to the same spatial resolution (0.25° x 0.25°) with TRMM and GLDAS data footprints, (e.g. $GRACE_{Correction}^{0.25°}$);
8. finally, estimate the GRACE-TWS at the Sukhuma District scale ($GRACE^{(SKM)}$) from the GRACE-TWS at 0.25° by using the weighted area technique as the following Equation:

$$GRACE^{(SKM)} = \frac{\sum_{i=1}^{n}(GRACE_i \,.\, A_i)}{A} \qquad \text{.........................} (5.4)$$

Where $GRACE^{(SKM)}$ is the monthly estimated GRACE-TWS at the Sukhuma District scale (mm), $GRACE_i$ is the monthly $GRACE_{Correction}^{0.25°}$ at the i^{th} grid (mm), A_i is the area of Sukhuma District in the i^{th} grid (km^2), and A is the total area of Sukhuma District (km^2).

The comparison between the original total water storage anomalies derived from GRACE (Original GRACE-TWSA) at the GRACE footprint and the total water storage anomalies (ΔS) or the total water storage anomalies estimated from the data derived from the GLDAS and TRMM (GLDAS-TWSA) using Equation (5.2) for the period August 2002 to March 2016 is presented in

Figure 5.6. This figure illustrates some lags between the two datasets. To confirm the time lags between two datasets, the cross-correlation between them was conducted by using the cross-correlation function in the MATLAB program. The result indicated a time lag of about 2 – 3 months. This implies that the TWSA in the current month will be detected by the GRACE satellites in the next 2 – 3 months. This phenomenon has also been found in many large scale basins around the world, for example: in southern Mali in Africa (Henry et al., 2011), in African watersheds (Ahmed et al., 2011), in the Amazon basin (Frappart et al., 2013), in China (Ning et al., 2014), over the Tonle Sap basin in Cambodia (Tangdamrongsub et al., 2016), and at the global scale (López et al., 2017). The time lag between the GRACE-TWS and the GLDAS-TWS is due to the fact that the calculation processes of the GLDAS-TWS do not consider the changes in storages of surface water, soil moisture and groundwater (Scanlon et al., 2018), but the GRACE-TWS has included all water storage changes, such as surface water, soil moisture and groundwater storages (Tapley et al., 2004). The changes in the soil moisture and groundwater storages are delayed because it will take some time for rainfall to infiltrate into the soil layers and aquifers (Xiao et al., 2015). In the Sukhuma District, rainfall will take approximately 2 to 6 weeks to reach the groundwater levels.

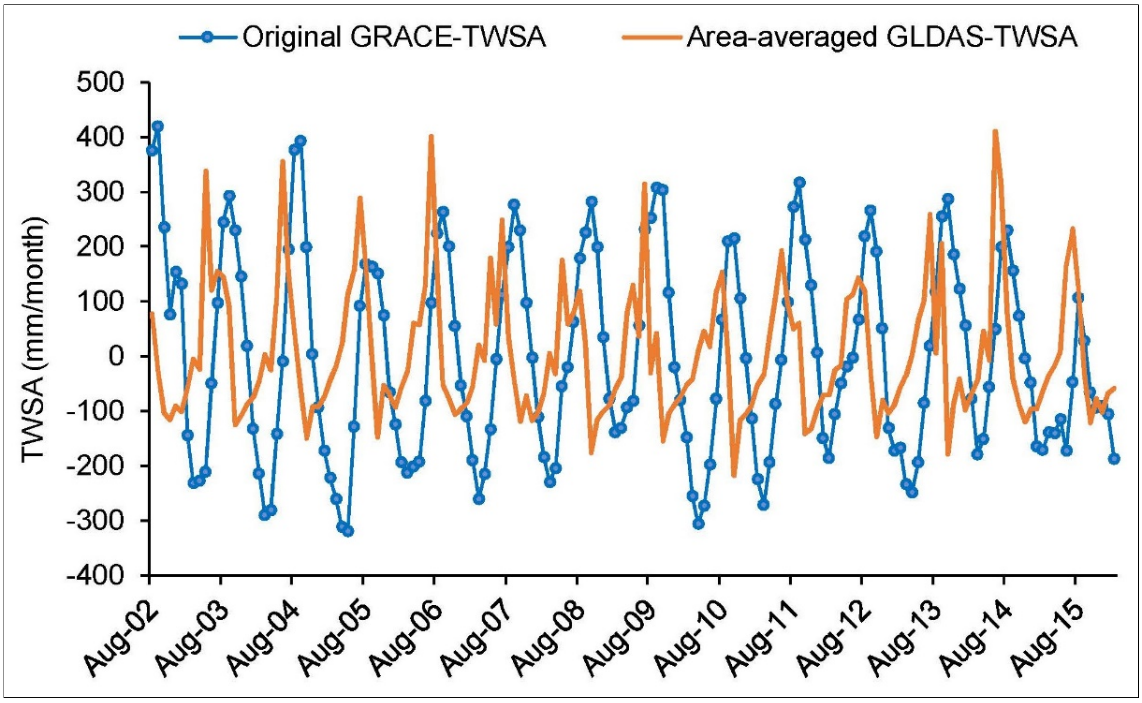


Figure 5.6: Comparison between original GRACE-TWSA and area-averaged GLDAS-TWSA at the GRACE footprint for the period August 2002 to March 2016

Therefore, for downscaling GRACE-TWSA from the GRACE footprint to the Sukhuma District footprint, the original GRACE-TWSA has been shifted three months steps forward before generating a regression equation with the GLDAS-TWSA (ΔS) *(Figure 5.7)*. The best relationship between two datasets can be expressed with the second-order polynomial equation with R^2 of 0.60 as shown in Equation (5.5).

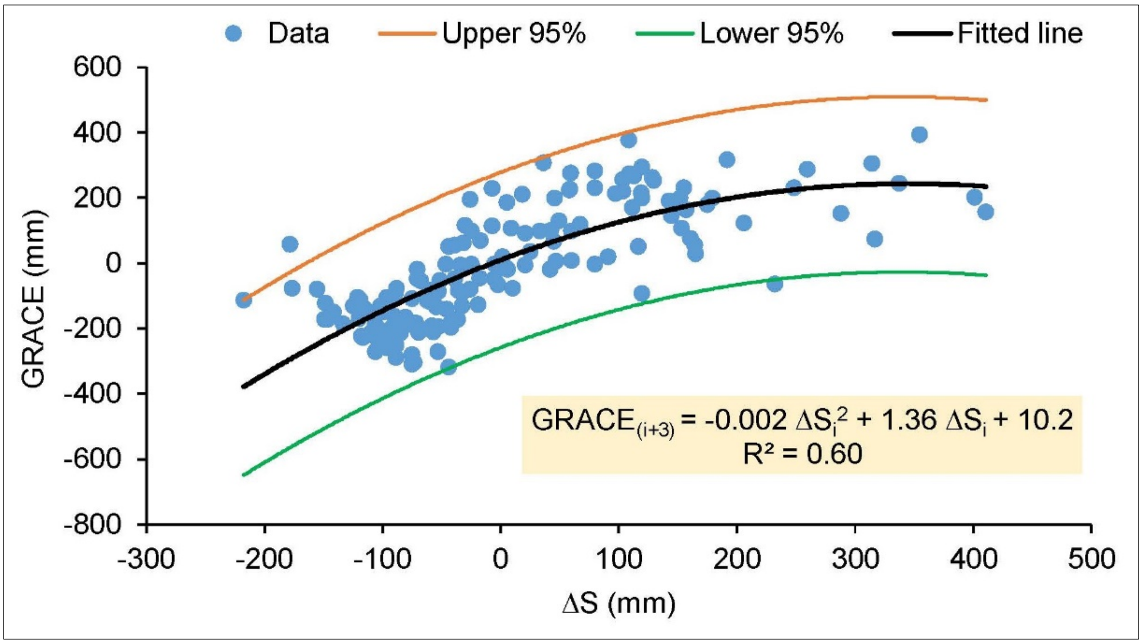


Figure 5.7: The regression equation of GLDAS-TWSA (ΔS) and the GRACE-TWSA at the GRACE footprint

$$GRACE_{(i+3)} = -0.002\,\Delta S_i^2 + 1.36\,\Delta S_i + 10.2 \quad \text{.............................. (5.5)}$$

Where $GRACE_{(i+3)}$ is the predicted GRACE-TWS at the i^{th} month (mm), ΔS_i is the GLDAS-TWS at the i^{th} month (mm).

The downscaled GRACE-TWS data from November 2002 to March 2016 are illustrated in *Figure 5.8*. The minimum and maximum values of monthly downscaled GRACE-TWSA for this period were -340 mm in May 2005 and 380 mm in September 2004, respectively. The mean value was around -7.5 mm with a standard deviation of 180 mm. The downscaled GRACE data illustrates seasonal total water storage fluctuations, which reach the lowest level during the dry season and the peak level during the wet season.

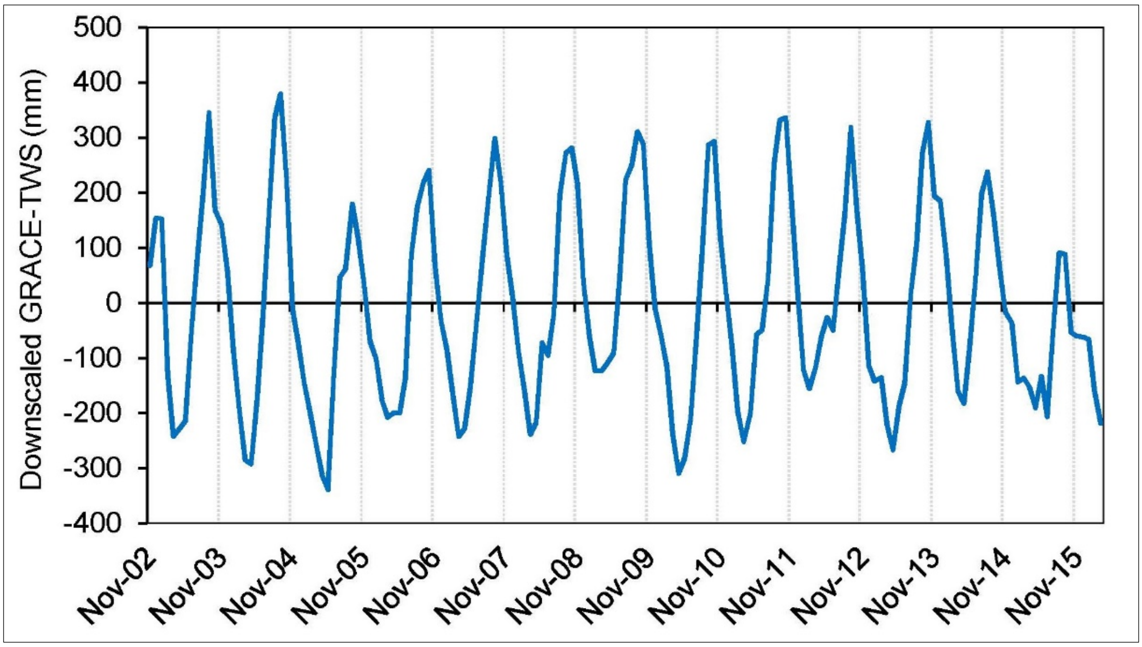


Figure 5.8: Downscaled GRACE-TWS at Sukhuma District (SKM) scale for the period November 2002 to March 2016

5.3. Change in groundwater storage estimation from GRACE-TWSA

The total water storage derived from GRACE consists of groundwater, soil moisture and surface water. Therefore, the GWSA can be estimated from the TWSA derived from GRACE if other components are known. For regions with limited field measurements, the soil moisture storage anomalies (SMSA), the surface water storage anomalies (SWSA) and the canopy water storage anomalies (CWSA) are estimated from GLDAS products (Fatolazadeh et al., 2016; Hu and Jiao, 2015). The groundwater storage anomaly at the Sukhuma District scale can be estimated from the following equation:

$$GWSA = GRACE^{(SKM)} - SMSA - SWSA - CWSA \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5.6)$$

Where GWSA is monthly groundwater storage anomaly estimated from the downscaled GRACE-TWSA at the Sukhuma District scale (mm), $GRACE^{(SKM)}$ is monthly total water storage anomaly downscaled from GRACE footprint (mm), SMSA is monthly soil moisture storage anomaly obtained from GLDAS (mm), SWSA is monthly surface water storage anomaly (surface runoff) obtained from GLDAS (mm), and CWSA is monthly canopy water storage anomaly obtained from GLDAS (mm). The anomaly in the SMS, SWS and CWS components was computed by removing the mean value for the entire study period from the particular monthly data.

Figure 5.9 depicts annual area-averaged GLDAS-derived canopy water storage (CWS) from 2000-01 to 2015-16 over the SKM area. The annual minimum and maximum area-averaged GLDAS-CWS for this period were 1.6 mm (in 2015-16) and 2.5 mm (in 2002-03), respectively. The mean annual GLDAS-CWS was 2 mm with a standard deviation of 0.3 mm/year. The trend of annual area-averaged GLDAS-CWS at the SKM footprint shows a slight decline from 2000-01 to 2015-16 at an annual rate of around 0.05 mm. The amount of GLDAS-CWS over the SKM area was small. Therefore, the GLDAS-CWS can be neglected in the water balance equation for the SKM area.

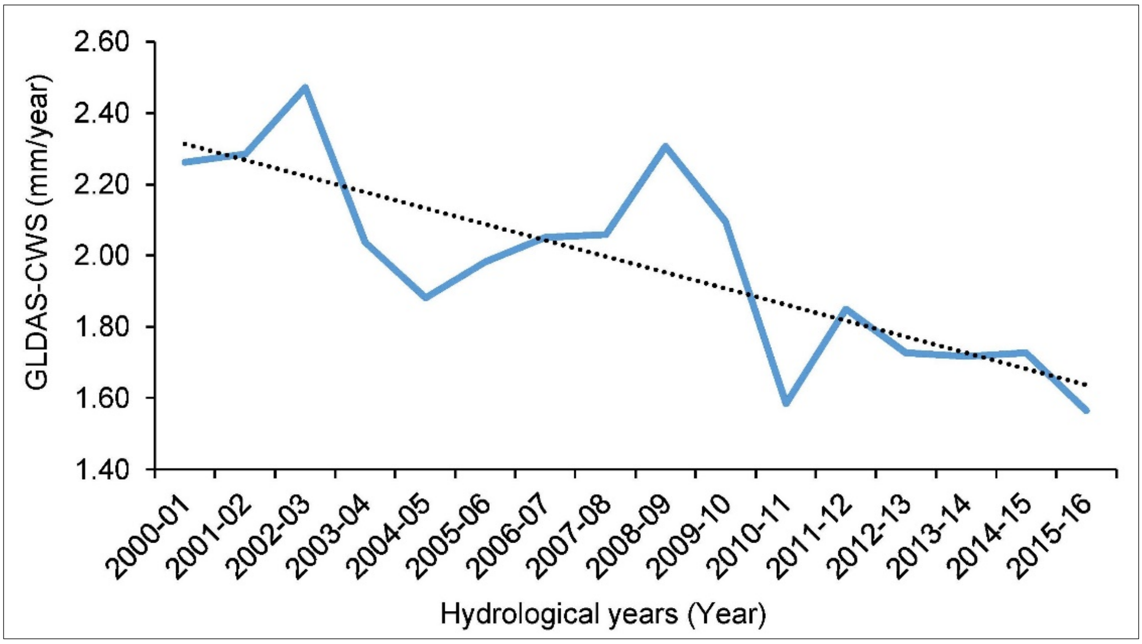


Figure 5.9: Annual GLDAS-derived CWS (Canopy water storage) at the Sukhuma District scale from 2000-01 to 2015-16

The annual change in soil moisture content derived from the GLDAS database for the period 2000-01 to 2015-16 was estimated by the following equation:

$$\Delta SM_i^j = SM_{i(April)}^j - SM_{i(\,May)}^j \qquad \text{.........................} \quad (5.7)$$

Where ΔSM_i^j is the annual change in GLDAS-derived soil moisture at the j^{th} soil layer in the hydrological years i^{th} (mm), $SM_{i(April)}^j$ is the GLDAS-derived soil moisture at the j^{th} soil layer in the end month (April) of the hydrological years i^{th} (mm), and $SM_{i(\,May)}^j$ is the GLDAS-derived soil moisture at the j^{th} soil layer in the first month (May) of the hydrological years i^{th}.

Figure 5.10 illustrates the annual change in soil moisture content derived from GLDAS for four soil layers from 2000-01 to 2015-16. Annual soil moisture content at the first top soil layer (SM1) from 0 – 10 cm depth shows similar magnitude for the entire period of data. The annual minimum and maximum GLDAS-SM1 for the period 2000-01 to 2015-16 were -2 mm (in 2013-14) and -10 mm (in 2004-05), respectively. The mean annual GLDAS-SM1 for this period was -7 mm with a standard deviation of 2.4 mm/year. The negative value for annual GLDAS-SM change means declining soil moisture content. The declining soil moisture will contribute to ET and recharge to the deeper soil layers.

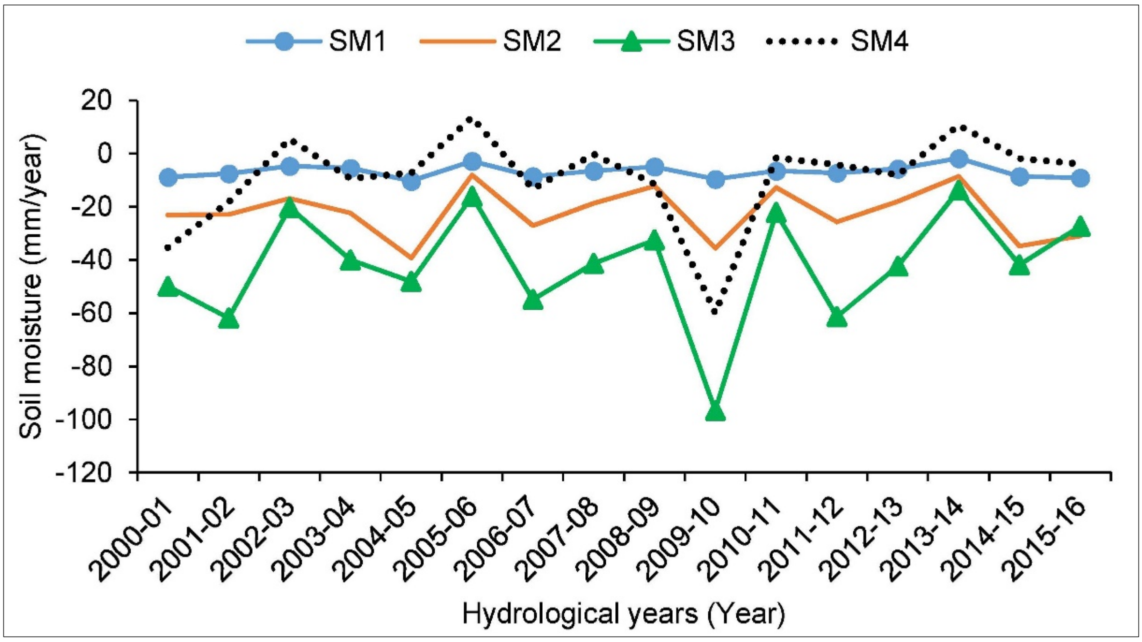


Figure 5.10: Annual change in GLDAS-derived soil moisture (SM) for four soil layers: SM1 (0-10cm), SM2 (10-40cm), SM3 (40-100cm), and SM4 (100-200cm), at the Sukhuma District footprint from 2000-01 to 2015-16

The second soil layer (SM2) from 10 – 40 cm depth shows small fluctuations of annual soil moisture content from 2000-01 to 2015-16 *(Figure 5.10)*. The annual fluctuation patterns of GLDAS-SM2 shows similarity with GLDAS-SM3 and GLDAS-SM4. The minimum and maximum values of annual GLDAS-SM2 were -8 mm (2005-06) and -39 mm (in 2004-05), respectively. The mean annual GLDAS-SM2 was -22 mm with a standard deviation of 10 mm/year. The losing soil moisture content at the GLDAS-SM2 would be mainly from evapotranspiration and some proportions of it would percolate downward to the soil layer below.

The annual change in GLDAS-SM3 followed the same pattern as the GLDAS-SM4 for the period 2000-01 to 2015-16 *(Figure 5.10)*. The annual minimum and maximum values of GLDAS-SM3 for this period were -14 mm (in 2013-14) and -97 mm (in 2009-10), respectively. The mean annual GLDAS-SM3 was -42 mm with a standard deviation of 21 mm/year. The change in GLDAS-SM3 can be mainly contributions to the soil moisture in the GLDAS-SM4. This is because the annual change in the GLDAS-SM4 is observed to increase *(Figure 5.10)*. The annual minimum and maximum values of GLDAS-SM4 were -60 mm (in 2009-10) and 14 mm (in 2005-06), respectively. The mean annual GLDAS-SM3 was -9 mm with a standard deviation of 18 mm/year.

Some proportion of soil moisture contents in this soil layer will percolate downward and recharge to the groundwater storage.

Figure 5.11 shows a comparison between downscaled GRACE-TWSA, GLDAS-SMSA, and estimated groundwater storage anomalies from GRACE-TWSA (GRACE-GWSA) for the period November 2002 to March 2016. This figure illustrates that downscaled GRACE-TWSA has a similarity of seasonal fluctuations with GLDAS-SMSA, but different fluctuations from the GRACE-GWSA. The magnitude of the variation in monthly GLDAS-SMSA appears lower than the original GRACE-TWSA, except for the hydrological years 2005-06 and 2015-16. The estimated GRACE-GWSA shows opposite seasonal variation with GRACE-TWSA and GLDAS-SMSA. It can be inferred from this result that the largest component of the GRACE-TWSA is the changes in soil moisture storage and followed by the changes in groundwater storage, as had been found in Illinois by Rodell and Famiglietti (2001). The estimation of GRACE-GWSA can be improved if soil moisture storage data are sufficiently available in space and time (Tangdamrongsub et al., 2015). Therefore, subtracting the groundwater storage changes from the GRACE-TWSA using the data derived from GLDAS needs more investigation and validation of the field observation data.

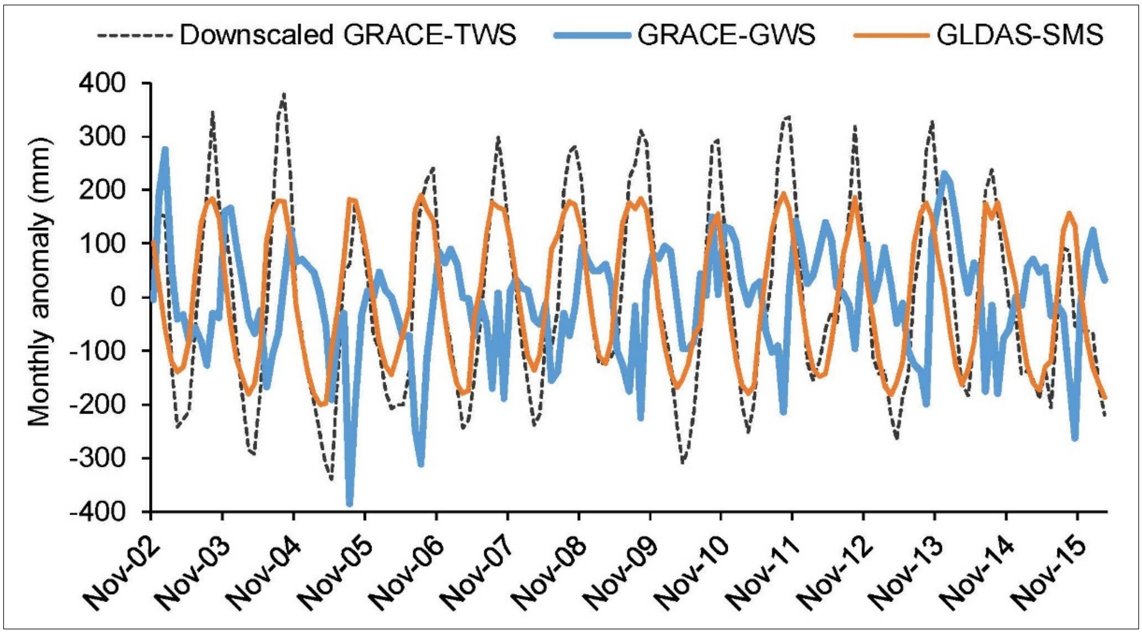


Figure 5.11: Comparison between GRACE-GWSA, downscaled GRACE-TWSA and GLDAS-SMSA for the period November 2002 to March 2016

5.4. Summary

Based on the limitation of field observation data on groundwater levels, surface water and rainfall in the study area, a statistical downscaling approach was adopted from the previous research studies by Ning et al. (2014) to acquire the necessary data from remote sensing data (GRACE and TRMM) and global land surface model databases (GLDAS). These extra data were used to supplement the missing and extend the existing data in the Sukhuma District to investigate the long-term groundwater storage anomalies.

The current research shows that downscaling GRACE data to small catchment areas, such as Sukhuma District, is feasible and useful. Based on the results from the current study, the GRACE signal can detect the seasonal total water storage change in the Sukhuma District area and seasonal change in groundwater storage (see Section 5.3).

The change in total water storage derived from GRACE are used to validate the change in total water storage estimated from field observation data in the Sukhuma District (Chapter 6). This comparison aims to evaluate the accuracy of the conceptual water balance model that created for Sukhuma as previously described in Chapter 4.

Chapter 6 : Validation of Water Balance Model for the Sukhuma District

The main purpose of this chapter is to validate the water balance of the Sukhuma District developed in Chapter 4 with the water balance estimated from GLDAS and TRMM data and the GRACE satellites data in Chapter 5. The comparison conducted in this study aims to investigate the variability of the conceptual water balance model developed for the Sukhuma District and also to investigate whether there is any differences between the outputs from observation data and the remote sensing data, particularly the TWSA derived from GRACE. The water balance estimation for Sukhuma District was based on a lumped model over the district area. The GLDAS and TRMM data were also averaged over a grid size of ~800 km^2. For GRACE satellites data were originally observed over a large spatial resolution; thus, this data was downscaled to the Sukhuma District as discussed in Section 5.2. Hence, the monthly total water storage anomalies from observation data, GLDAS and TRMM data, and downscaled GRACE data at the Sukhuma District scale were compared as described in Section 6.1. In this study, a visual comparison between the line graphs of datasets has been used. This visualization method was selected because of limited available observation data. Thus, a statistical comparison and analysis method is not suitable for data comparison in this study. Furthermore, comparison and correlation between the original GRACE-TWSA and observed groundwater level anomalies, and between the downscaled GRACE-TWSA and observed groundwater level anomalies are also discussed in this chapter. The aim of this comparison and correlation is to investigate the performance of the methodologies used for downscaling GRACE data to the Sukhuma District scale and the conflict fluctuations between the two datasets.

6.1. Comparison between change in total water storage estimated from field observation data, GLDAS-TRMM data, and detected by GRACE satellites

Comparison based on the graphical fitting is made to investigate whether the overall shape of the graph of the estimated total water storage anomaly from the field observation data (Obs-TWSA) (details of Obs-TWSA calculation are described in Section 4.12) properly captured by the estimated total water storage anomaly from the data of GLDAS and TRMM (GLDAS-TWSA), and by the downscaled total water storage derived from GRACE (Downscaled GRACE-TWSA). The monthly total water storage anomaly (TWSA) from the data of GLDAS and TRMM agrees well with the monthly TWSA estimated from the field observations as shown in *Figure 6.1*. It can be seen from this figure that TWSA from observation data are slightly underestimated by the GLDAS and TRMM data during the wet season and overestimated during the dry season. It is also illustrated that there are some lags between the downscaled GRACE-TWSA and the Obs-TWSA. The amplitudes of the Obs-TWSA, GLDAS-TWSA and downscaled GRACE-TWSA varied from – 127 mm in December 2015 to 201 mm in July 2015, from – 115 mm in October 2015 to 228 mm in July 2015, and from – 219 mm in March 2016 to 91 mm in August 2015, respectively. *Figure 6.1* shows that the difference in amplitude of the GLDAS-TWSA and the Obs-TWSA was insignificant. However, these two datasets show some lags with the GRACE-TWSA. The disagreement between GRACE-TWSA and GLDAS-TWSA can be attributed to the lack of groundwater storage in the estimation of GLDAS-TWSA.

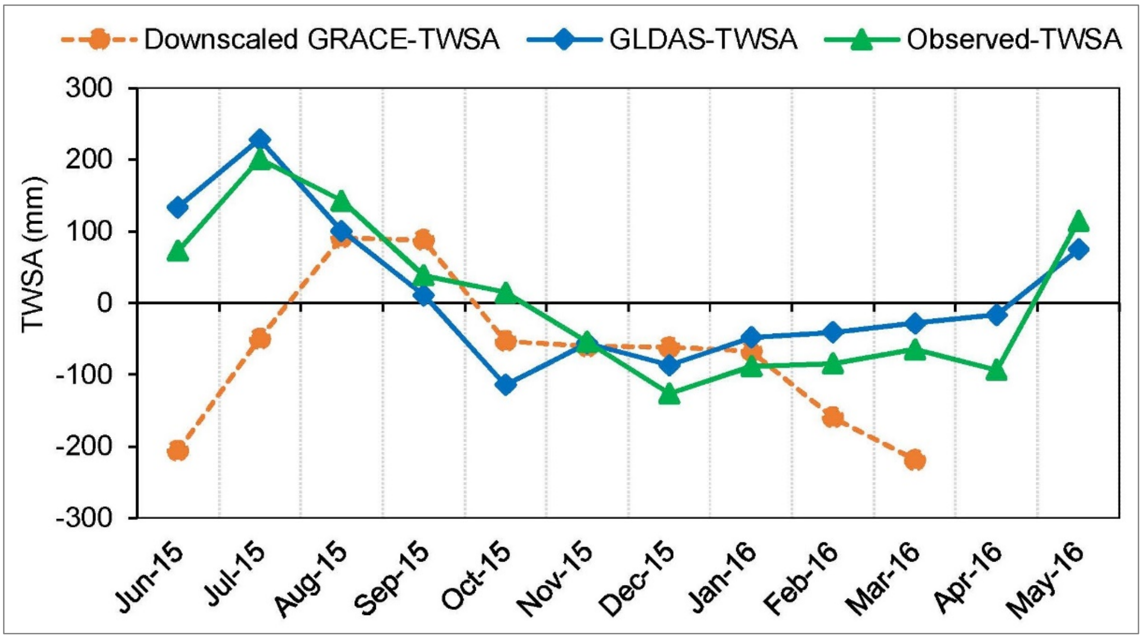


Figure 6.1: Comparison between downscaled GRACE-TWSA, GLDAS-TWSA and Obs-TWSA at the Sukhuma District scale for the period June 2015 to May 2016

For the period June 2015 to May 2016, the difference between GLDAS-TWSA and Obs-TWSA varied from – 129 mm to 77 mm *(Table 6.1)*. It should be noted that the negative and positive values presented in columns (2), (3) and (4) represent the variations of the TWS estimated from observation data, GLDAS and TRMM data, and derived from GRACE data, respectively. The negative and positive values presented in columns (5) and (6) of *Table 6.1* represent the underestimated and overestimated TWSA, respectively. Although, there were some differences between GLDAS-TWSA and Obs-TWSA, the relative difference between the two datasets was insignificant. The differences between the two results may be due to the fact that the GLDAS and TRMM data were observed at the spatial resolution of 0.25° x 0.25°, while the field observations were measured at points. However, the results from two datasets show good agreement of seasonal variation. This result indicates the benefit of using data derived from GLDAS and TRMM in situations where field observations are not available.

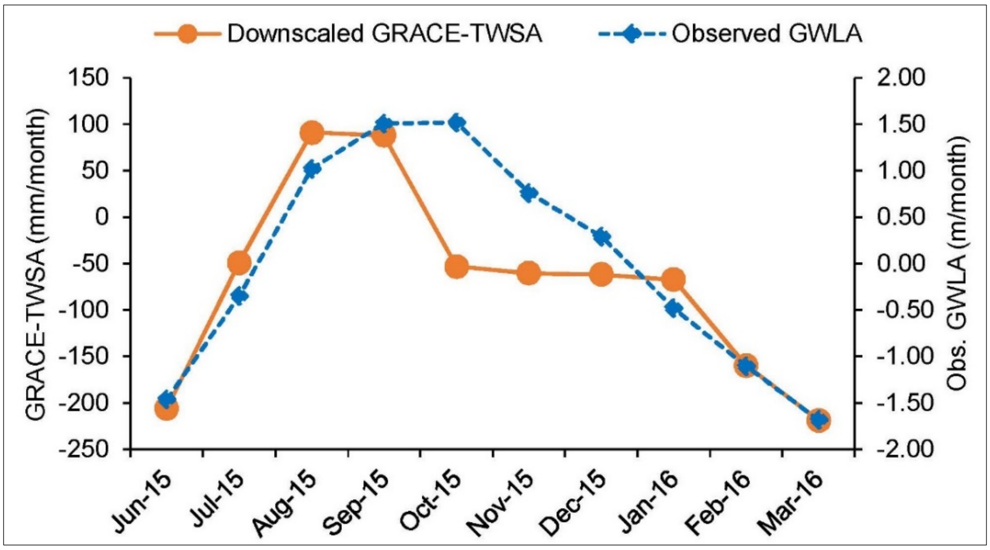
Table 6.1: Differences and relative differences between the total water storage anomalies (TWSA) estimated from observation data (Obs-TWSA), the TWSA estimated from GLDAS and TRMM data (GLDAS-TWSA), and the TWSA derived from GRACE for the period June 2015 to May 2016

(1)	(2)	(3)	(4)	(5)		(6)	
Month	Obs-TWSA ($\pm$) (mm)	GLDAS-TWSA ($\pm$) (mm)	Downscaled GRACE-TWSA ($\pm$) (mm)	Difference ($\pm$) (mm)		Relative difference ($\pm$) (dimensionless)	
				$= (3) - (2)$	$= (4) - (2)$	$= \frac{(3)-(2)}{(2)}$	$= \frac{(4)-(2)}{(2)}$
Jun-15	73	134	-206	61	-279	0.83	-3.83
Jul-15	201	228	-49	27	-250	0.14	-1.25
Aug-15	143	101	91	-42	-52	-0.30	-0.36
Sep-15	39	11	88	-28	49	-0.72	1.28
Oct-15	15	-115	-53	-129	-68	-8.67	-4.57
Nov-15	-54	-56	-60	-2	-6	0.04	0.12
Dec-15	-127	-87	-62	39	65	-0.31	-0.51
Jan-16	-88	-48	-67	40	21	-0.46	-0.24
Feb-16	-84	-41	-160	43	-75	-0.52	0.90
Mar-16	-65	-28	-219	36	-154	-0.56	2.38
Apr-16	-93	-16	*No data*	77	*Not estimated*	-0.83	*Not estimated*
May-16	115	75	*No data*	-40	*Not estimated*	-0.35	*Not estimated*

As discussed in Section 5.2, the time-lag between GLDAS-TWSA and GRACE-TWSA is approximately 3 months. Thus, it can be said that the change in total water storage estimated from field observation data also has about 3 months lag with the GRACE data. A comparison between the observed TWSA and the downscaled GRACE-TWSA at the Sukhuma District scale is also illustrated in *Figure 6.1*. It is shown there that the largest difference between the two datasets occurred at the beginning of the wet season during June and July. The differences between these datasets were estimated at – 279 mm in June 2015 and at – 250 mm in July 2015 *(Table 6.1)*. In this period, the observed TWSA was at the highest magnitude in July. The occurrence of peak Obs-TWSA in July 2015 could be due to the fact that the heavy rainfall occurred during this month. However, the GRACE-TWSA reached the peak level during August and September *(Figure 6.1)*. It can be implied from this result that the changes in the surface water storage in the Sukhuma District area were not a major impact factor on the GRACE-TWSA. However, the changes in the storages of soil moisture and groundwater are the essential impact factors for the GRACE-TWSA. In order to gain a better understanding of the correlation between GRACE-TWSA and the observed groundwater levels, a comparison between these two datasets is discussed in the following Section 6.2.

6.2. Comparison between downscaled GRACE-TWSA and measured groundwater levels anomalies

The downscaled GRACE-TWSA at the Sukhuma District footprint shows a good agreement with the observed groundwater levels anomalies (Observed-GWLA) at the Sukhuma District. The correlation coefficient (R^2) between the two datasets was estimated at 0.74 *(Figure 6.2b)*. *Figure 6.2a* is the comparison between the downscaled GRACE-TWSA and the observed GWLA for the period June 2015 to March 2016. It illustrates that during the wet season from June to September 2015 there is consistent increases in the two datasets. The downscaled GRACE-TWSA and observed GWLA declined during the dry season from October 2015 to March 2016. This result clearly indicates that the GRACE satellites could detect the seasonal changes in groundwater storage in the Sukhuma District. Also, the original GRACE-TWSA can be downscaled to a small area, such as Sukhuma District. This information can be useful for planning purposes for water resources management in a region with limited field data.

a) 

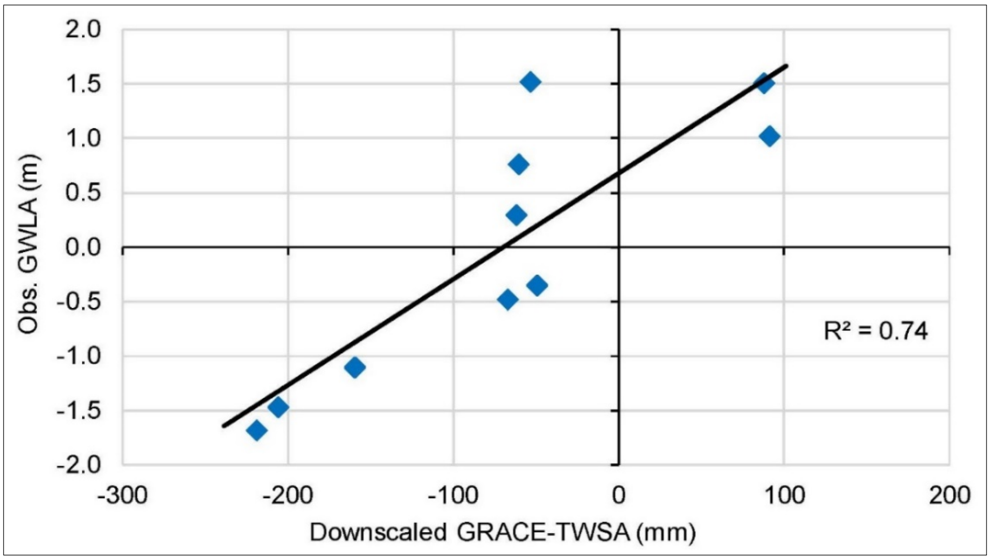
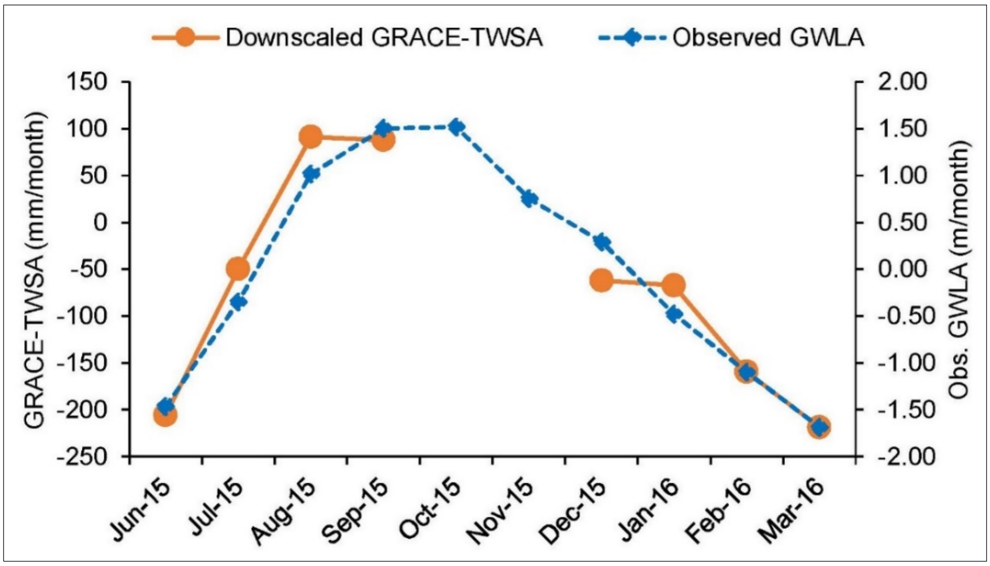
b) 

Figure 6.2: a) Comparison and b) Correlation between the downscaled GRACE-TWSA at the Sukhuma District footprint and the observed GWLA measured in the Sukhuma District from June 2015 to March 2016

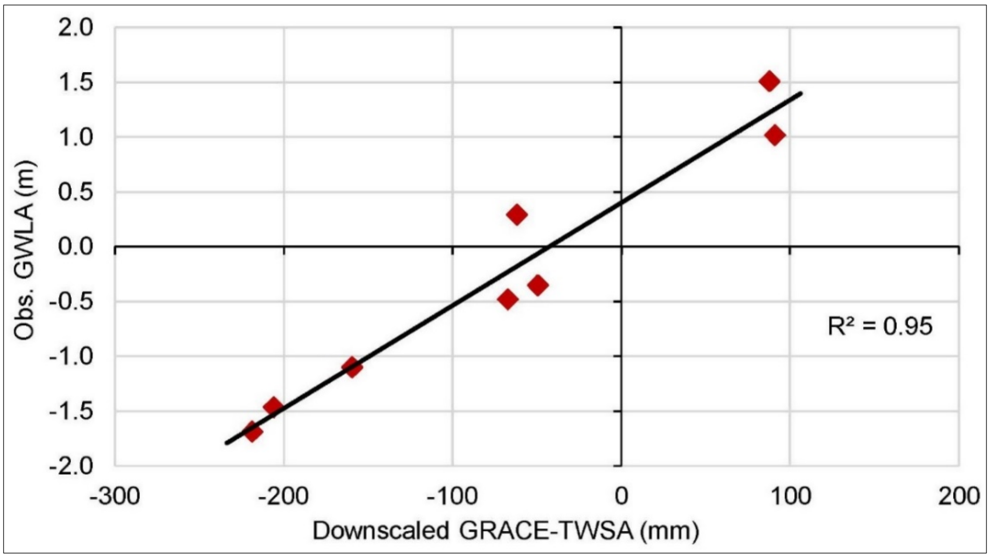
Strong correlation between the downscaled GRACE-TWSA at the Sukhuma District footprint and the observed GWLA measured in the Sukhuma District from June 2015 to March 2016 in Figure 6.2 suggests that GRACE can detect changes in total terrestrial water storage including shallow and deep groundwater; whereas, GLDAS models (e.g., NOAH) do not represent groundwater storage, which could be a substantial proportion of GRACE signal variability as observed in the Bengal Basin by Shamsudduha et al. (2012).

Additionally, it is illustrated in *Figure 6.2a* that data points from the downscaled GRACE-TWSA for October and November 2015 were not well correlated to the observed GWLA. In order to check the effects which may be caused by these data points from downscaled GRACE-TWSA, a correlation between these two datasets was conducted after removing the downscaled GRACE-

TWSA for October and November 2015. *Figure 6.3a* is a plot of the downscaled GRACE-TWSA at the Sukhuma District scale and the observed GWLA measured averaged over the Sukhuma District scale from June 2015 to March 2016, but data of downscaled GRACE-TWSA for October and November 2015 were not included. The result shows the increased value of the correlation coefficient (R^2) between the two datasets from 0.74 *(Figure 6.2b)* to 0.95 *(Figure 6.3b)*. The result of increasing R^2 between these two datasets suggests that the conflict between the downscaled GRACE-TWSA and the observed GWLA during the end of the wet season and the beginning of the dry season (October and November) needs to be further investigated to support sustainable water resources management in Sukhuma District. However, the investigation of this misclosure between the two datasets are outside the scope of the current study.



a)



b)

Figure 6.3: a) Comparison and b) Correlation between the downscaled GRACE-TWSA at the Sukhuma District footprint and the observed GWLA measured at the Sukhuma District from June 2015 to March 2016 after removing data in October and November 2015

Furthermore, the results from the current study also indicate that the method used in downscaling GRACE-TWSA shows an improvement in the predicted GRACE-TWSA at the Sukhuma District scale compared to the original GRACE-TWSA. The R^2 values of the correlation between the GRACE-TWSA and the observed GWLA for the period June 2015 to March 2016 was improved from 0.66 (before downscaling) to 0.74 (after downscaling) as shown in *Figure 6.4a* and *Figure 6.4b*, respectively. This result implies that the downscaling method and assumptions utilized in the current study are reasonable and applicable to downscaling GRACE data from the original footprint to a small catchment. It also means that the method can provide more details on the TWSA within the GRACE footprint. The method used in this study can be essential for the regions with limited field observations to study the seasonal TWSA.

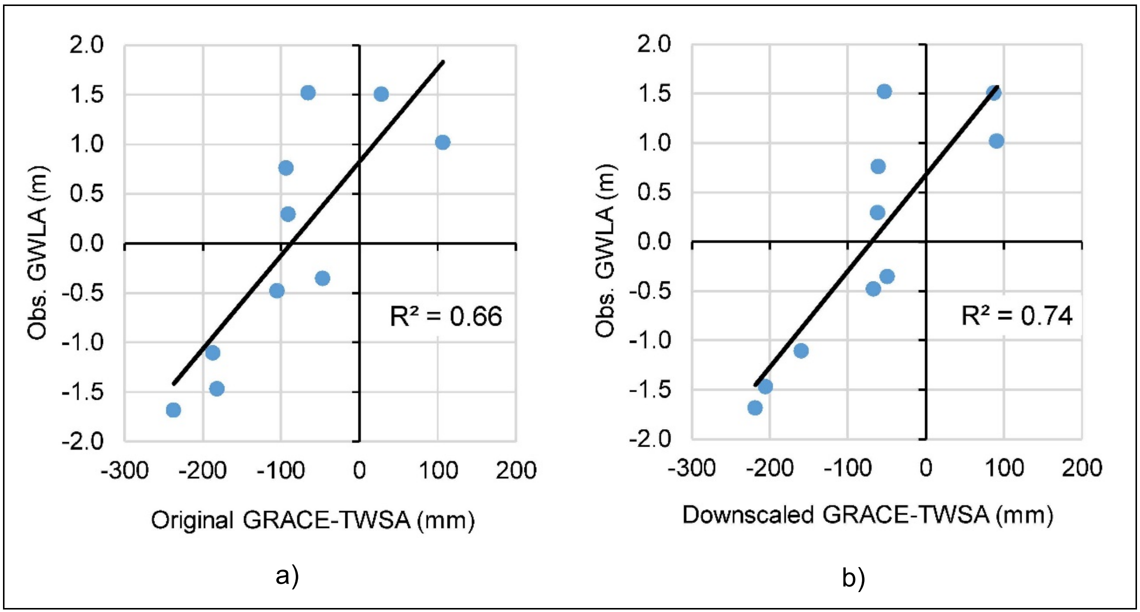


Figure 6.4: a) Correlation between Original GRACE-TWSA at the GRACE footprint and the observed groundwater levels anomalies (Obs. GWLA) at the Sukhuma District, and b) Correlation between downscaled GRACE-TWSA and the observed GWLA at the Sukhuma District for the period June 2015 to March 2016

6.3. Interpretation of comparisons

The comparison of the TWSA estimated from the in-situ measurements and alternative data derived from GLDAS, TRMM and GRACE indicated that the simple conceptual water balance model developed in this study provided a reasonable groundwater recharge rate (3 – 4% of annual rainfall) based on the geological characteristics of the study area. Thus, the recharge rate estimated in this study can be very useful for the planning purpose of long-term water resources management in Sukhuma District.

Furthermore, the validation of remote sensing data and the developed conceptual model shows a potential for developing a simple conceptual water balance model for the Sukhuma District and the significance of using GRACE data in water resources management planning for a small region with limited field data. Hence, the methodologies applied in the current study can provide a fairly robust assessment of the groundwater levels and storage fluctuations, the water balance components and their temporal variations. These methodologies will also assist the hydrogeological studies in those developing regions which still lack the infrastructure that would permit accurate environmental monitoring of groundwater level data.

6.4. Summary

A comparison between estimated TWSA from field measurement data and from data derived from GLDAS and TRMM reveals that the data derived from GLDAS and TRMM are useful for assessing the seasonal fluctuation of water storage in a small region with limited field data. Furthermore, this comparison also proves that a simple water balance model with proper conceptualisation of the different flow components based on the evaluation of geological and hydrogeological conditions underlying the study area for the Sukhuma District is useful and the groundwater recharge estimated in this research is suitable for long-term groundwater resource management.

A successful downscaling of GRACE-data to the Sukhuma District scale was also discussed in this chapter. It has been demonstrated that downscaled GRACE-data can be used to assess the seasonal total water storage anomalies and the seasonal groundwater storage anomalies in a small region with limited field data availability.

Chapter 7 : Conclusions and Recommendations

7.1. Research summary and contributions

The seasonal variation of surface water and groundwater interaction in the Sukhuma District has been investigated using limited field observation data of geology, rainfall, streamflow, climate, and groundwater levels. Several techniques have been adopted and used for estimating the specific yield of aquifers, the groundwater recharge, and other components of the water balance for Sukhuma District, as well as downscaling the GRACE data footprint. The current study provided useful contributions for assessment of the total water storage and groundwater level anomalies in a region with limited measurement data. The main contributions of the research are:

1. developing the conceptual water balance model for estimating groundwater recharge in the Sukhuma District (see Chapter 4);
2. identifying a clear terminology for groundwater recharge that reduces potential for misinterpretation (see Chapter 4);
3. downscaling the remote sensing data derived from GRACE in a small region with limited observation data, such as Sukhuma District (see Section 5.2); and
4. developing efficient methods for extraction of information about water movement in a catchment where there is limited field data of variable quality.

7.2. Conceptual water balance model

A simple conceptual water balance model for Sukhuma District was developed to assess the seasonal total water storage fluctuation and the groundwater recharge (see Section 4.1). This conceptual model was created based on the available data for the Sukhuma District. The results from the conceptual model show good agreement with the results from the data derived from GLDAS and TRAM (see Section 6.1). It is implied from this result that the created model can provide useful information and a cost-effective approach for planning long-term water resources management in a region with data scarcity.

7.3. Groundwater recharge terminology

A clear terminology of the groundwater recharge has been defined as described in Section 4.1. The groundwater recharge herein will not include the soil moisture storage in the unsaturated zone, baseflow, and other output components of water balance. The recharge rate estimated from this study is approximately 3 – 4% of annual rainfall (1700 mm) in 2015-16. The current research has also shown that the WTF method proposed by Healy and Cook (2002) and the water balance equation modified for Sukhuma District conditions (see Chapter 4) produced similar recharge estimation. This similarity of recharge values can also imply that the specific yield estimated from this study is appropriate for the geological conditions in the Sukhuma District. The techniques used for estimating the specific yield are also reliable and do not require extensive measurement data and budget for pumping tests (see Section 4.10.1). The WTF method can be applied for quantifying the recharge when only groundwater levels data is available. Based on the groundwater recharge estimated in this study (see Section 4.10), the long-term groundwater resource management planning and the decision of water resources management in the Sukhuma District can be made reasonably.

7.4. Downscaling remote sensing data

The results from the current study are an example of successfully downscaling remote sensing data from GRACE to a small region. The downscaled GRACE-data show good correlation with the observed groundwater levels as discussed in Section 6.2. This result is also a demonstration of the great potential to make use of the GRACE data for water balance studies in small regions with limited existing and in-situ data (see Section 6.3). Most developing regions lack the infrastructure that would permit accurate environmental monitoring of groundwater level data. Hence, the methodologies applied in the current study can provide a fairly robust assessment of the groundwater levels and storage fluctuations, the water balance components and their temporal variations.

7.5. Recommendations for future research

Based on the results of the current study and other observations of existing data gaps, the following recommendations and suggestions can be given for future studies on the interaction between surface water and groundwater in the Sukhuma District:

- the conceptual water balance model for Sukhuma District developed in this study needs validation in other regions in Laos and other countries that have similar data deficiencies to Sukhuma District;
- future studies should compare the conceptual water balance model developed in this study with the new remote sensing data from GRACE Follow-on satellites by using similar methodology; and

- For the current study, only one GRACE product derived from GFZ was used. Hence, multiple GRACE products should be considered for future studies in order to reduce uncertainty in GRACE data as discussed in Section 3.3.

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Appendices

Lists of appendices

Appendix 1: Publications written during the PhD project

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Hydrogeological reconnaissance of Sukhuma District, Champasak Province, Southern Laos

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Abstract

Sparse hydrogeological data is a significant limitation to the study of groundwater in many areas. The objective of this study was to assess the hydrogeology in Sukhuma District of Champasak Province in Southern Laos where such a limitation occurs. The connection between surface water and groundwater was assessed by comparing groundwater levels and river bed elevations. Groundwater recharge was estimated by the water table fluctuation method. The feasibility of remote sensing to address data limitations for the future study of groundwater in the region was also investigated by comparing the Mekong River flow and rainfall data with the Equivalent Water Height derived from the Gravity Recovery and Climate Experiment; soil moisture data obtained from the Global Land Data Assimilation System was also compared with rainfall and groundwater levels in Sukhuma District. The results show that some parts of Khamouan River bed are disconnected from the water table during the dry season, whereas the river bed is fully connected to the water table during the wet season. However, in the Pheung River, which flows into the Khamouan River upstream of the river gauge, the groundwater level is fully disconnected from the river bed in the dry season and partially connected in the wet season. Groundwater recharge estimates vary according to the specific yield values used for the aquifer. The comparison between in-situ hydrological measurement and remote sensing data provides insights into the general hydrogeological conditions. The comparison also provides useful information for future studies of the hydrogeology in Sukhuma District and Southern Laos, where field observation data are sparse, to support sustainable groundwater development in the region.

Keywords

hydrogeology, surface water and groundwater interaction, groundwater recharge, GRACE, GLDAS

Introduction

Groundwater is a vital natural resource for socio-economic development and the environment. However, in many developing nations, there is a lack of data for assessing the availability of groundwater and surface water resources for determining sustainable water use. Laos is a developing country located in Southeast Asia. About seventy percent of the population lives in lowland areas, which are at risk from floods and droughts. Groundwater is the main source of domestic water supply for rural households.

In the Sukhuma District of Southern Laos, groundwater abstraction has been increasing to enhance the resilience of water users to climate variability (Vote *et al.*, 2015), and there are plans for developing groundwater for irrigation and water supply to alleviate dry season water shortages. However, information on the hydrogeology in this region is limited; in particular, data on groundwater levels and lithology are sparse. An adequate understanding of regional hydrogeology is fundamental for assessing groundwater availability (Barthel, 2014) and the topography and hydrogeology play a significant role in defining the surface water and groundwater exchanges and estimating the total water storage in a basin area (Winter *et al.*, 1998). Therefore, the hydrogeological conditions in Sukhuma District should be clearly understood as a basis for further research and management recommendations to support the long-term groundwater and surface water development in the region.

To date, some studies have been undertaken to investigate and assess the characteristics of groundwater in Southern Laos (JICA, 1995, 1997, 2012; Phommavong, 2015; Vote *et al.*, 2014, 2015). Most of these studies dealt with development of groundwater and provision of wells to meet the domestic water requirement. However, their contribution to understanding hydrogeological conditions on a regional scale is not manifested because of inadequate data and information. Therefore, this study was undertaken to assess hydrogeological conditions at the local scale based on field data and to provide a methodology for 'up-scaling' to a regional scale through remote sensing.

Study area

The Sukhuma District of Champasak Province in Southern Laos was selected for this study because it is typical of the region. The location and physical features of Sukhuma District are indicated in Figure 1.

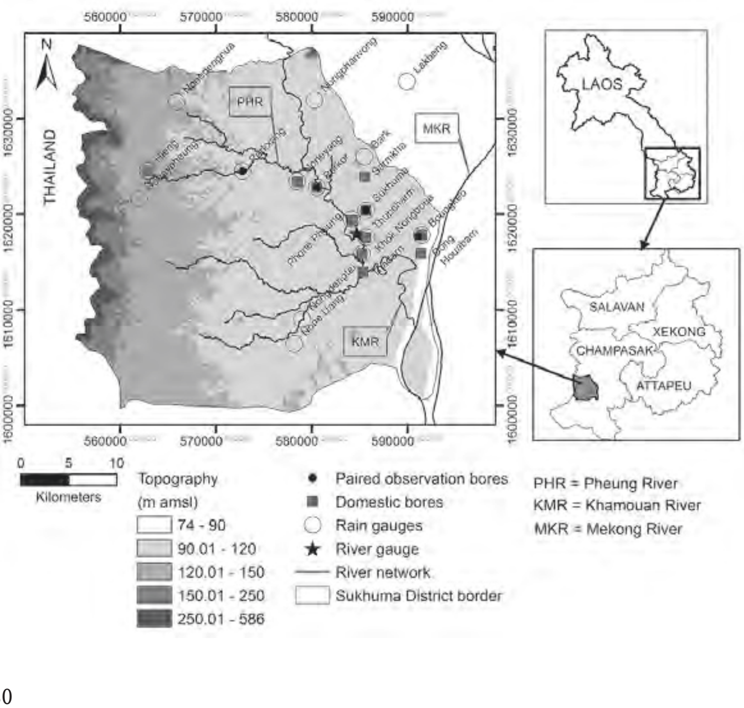

Figure 1 – Location of Sukhuma District of Southern Laos, showing paired (shallow and deep) observation bores, domestic bores (household bores), rain gauges, stream gauge, and river networks.

Groundwater abstraction has been increasing as a result of increased access to electricity and the low cost of well drilling (Vote *et al.*, 2015). Sukhuma has more basic geological and hydrogeological data than other districts in Champasak Province and elsewhere in Southern Laos, because it was a focal area of a project by the Australian Centre for International Agricultural Research (ACIAR) (Wade *et al.*, 2015). The study area is located in the southwest of Champasak Plain and covers a total area of about 1200 km^2.

Within the study area, the stream network flows from the west and north to the southeast into the Mekong River (Fig. 1). Most small streams, the Pheung River, and the upper part of Khamouan River are dry during the dry season. Therefore, the main source of water for residents in Sukhuma District is groundwater.

According to the Lao National Landuse and Vegetation Cover Map obtained from the Ministry of Agriculture and Forestry (Mekong River Commission, 2011), about 62% of Sukhuma is predominantly covered by shrub land. Cropland occupies around 24%, mostly in the eastern part of the Khamouan River basin. Deciduous broadleaf forest, covering 9%, occurs in upland areas, such as the steep-sided ridges in the north and along the border with Thailand in the west. Only one percent of Sukuma District is urban; housing and commercial development are heavily concentrated in the lower part and lowland area on the eastern side of Khamouan River, forming the urban centre of Sukhuma District.

Figure 2 is based on the Lao National Surface Soil Map (SSLCC, 2000) and shows the surface soil types to about 20 cm depth in the study area. Sandy loam soil covers the largest proportion, about 63%, of the Sukhuma District. Loamy sand is found in the southeast and the north of the district, mainly along the Khamouan River corridor. Sandy soil is a very minor component of the Sukhuma area (SSLCC, 2000). As shown in Figure 2, about half of the monitoring wells are located on the sandy loam, one well (at Thadarn) is located on loamy sand, and the rest are situated on the loam soil. The monitoring wells include bores used for domestic water supply.

The climate of Sukhuma District is tropical monsoon with a distinct wet season from May to October and a dry season from November to April. The average annual rainfall from 1993 to 2015 was 2052 mm

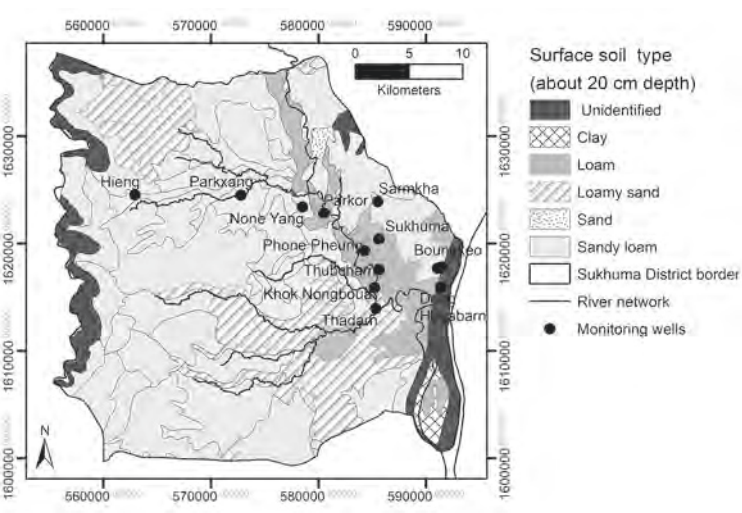

Figure 2 – Surface soil types of Sukhuma District

and the average air temperature is 27°C as determined from weather records at the Sukhuma District climate station maintained by the Sukhuma District Meteorology and Hydrological Office. The lowest air temperature is about 23°C in January and the highest is about 32°C in April. The average annual evapotranspiration is 1300 mm with the average humidity at 71%.

Overview of previous investigations

There have been a few investigations of the groundwater hydrology in Southern Laos and Sukhuma District. In 1995, Japan International Cooperation Agency (JICA) conducted a feasibility study on groundwater development for domestic water supply in Champasak and Salavan provinces in Southern Laos. In 1997, JICA continued the groundwater development project in the same provinces by installing 305 deep wells in 189 villages in these two provinces, but detailed hydrogeological data from the bores are not available. In 2012, JICA drilled five more deep wells in Salavan, Attapue, and Xekong provinces for further study of the hydrogeology in Southern Laos. The outcomes from these projects include some basic information on the hydrogeology at the regional scale.

Following the JICA project, Vote *et al.* (2014) conducted a study on the interaction between the shallow aquifer and rainfall in Sukhuma District. Locations of the rain gauges and monitoring wells are indicated on Figure 1. Five paired observation wells (shallow and deep) were constructed (Champasak Provincial Health Department, 2012), and 16 rain gauges were set up in 16 villages where the groundwater table in domestic wells was monitored. The depths of the five shallow observation wells, five deep observation wells and eleven domestic wells range from 25 to 27 m below ground level (bgl), 53 to 120 m bgl and 14 to 38 m bgl, respectively. PVC pipes were installed in these wells to protect them from collapsing. The PVC pipes were set at different depths, varying from 7 to 9 m bgl for the shallow observation wells, 7 to 24 m bgl for the deep observation wells, and 7 to 12 m bgl for the domestic wells, respectively. Beneath the PVC pipe, the wells are uncased for the remaining depth.

In addition, Vote *et al.* (2014) estimated hydraulic properties from a single-well pumping test on each of the five deep observation wells and obtained values of storativity ranging from 0.01 to 0.58. The annual recharge was estimated at about 23% of annual rainfall in 2012 based on the water table fluctuation and a specific yield (S_y) of 0.1. This recharge rate was nearly double the recharge rate of 12% of annual rainfall estimated by JICA (1995) using a water balance approach.

Data collection and analysis

The data used for this research includes in-situ observation, remote sensing data derived from the Gravity Recovery and Climate Experiment (GRACE) and the Global Land Data Assimilation System (GLDAS). The details of these data are provided in the following sub-sections.

In-situ data

The in-situ observation data consists of two sets, for the Sukhuma District and for the Pakse hydro-met station in Pakse District. The first set of in-situ data comprises the daily river discharge, daily rainfall, weekly groundwater level, and some basic geological information for Sukhuma District. The daily streamflows measured at the Khamouan River gauge (Fig. 1) from June 2015 to May 2016 were used for this study. The observed discharge for this period shows the maximum value at 550 GL/month (214 m^3/s) with a mean value of 54 GL/month (21 m^3/s) and a median of 2.5 GL/month (1 m^3/s).

The rainfall data for Sukhuma District was obtained from the Sukhuma District Natural Resources and Environment Office for an official rain gauge and the 16 rain gauges that were set up by the previous ACIAR project as reported in Vote *et al.* (2014), for the period June 2015 to May 2016. The maximum rainfall recorded in Sukhuma for this period was 389 mm/month in July 2015, with an average of 140 mm/month, a median of 110 mm/month and a standard deviation of 150 mm/month.

Data on geology and groundwater levels are sparse in Sukhuma District. The geological information used for this study was derived primarily from the lithological drilling logs of the five deep observation wells in Sukhuma District. Moreover, some basic information on geology in Sukhuma District and Southern Laos was collected during fieldwork for this project from 28 November to 4 December 2015. Data from drilling logs were integrated with this information and previous work by JICA to delineate the local hydrostratigraphy.

The groundwater levels were monitored at eleven domestic wells and five paired deep and shallow observation wells, drilled by ACIAR (Champasak Provincial Health Department, 2012), from June 2015 to May 2016. The information on depth and casing of these wells was also reported by Vote *et al.* (2014). The minimum elevation of groundwater monitored from June 2015 to May 2016 was 97.13 m above mean sea level (amsl) during the dry season (April 2016). The highest elevation observed was 100.47 m amsl during the late wet season (September 2015). The mean water table for this period was about 98.50 m amsl with a standard deviation of 1.29 m.

Cross-correlation analysis between weekly groundwater levels and weekly rainfall for the period June 2015 to May 2016 indicates time lags between rainfall and rise in groundwater levels at different monitoring points ranging from two to six weeks with an average of four weeks. The observed water level data from these monitoring wells were used to develop well hydrographs that explain the temporal variation of water level at different locations. Temporal and spatial analysis was carried out on the distribution of groundwater levels fluctuations. A preliminary estimate of natural recharge from rainfall was arrived at based on the observed water table fluctuation and the specific yield of the formation. The specific yield of the formation was estimated by analysis of the recession limb of the well hydrographs.

The second set of in-situ data was obtained from the Department of Meteorology and Hydrology in Vientiane Capital, comprising daily Mekong River flow and daily rainfall for the period of January 2008 to December 2015 at the Pakse hydro-met station in Pakse District, Champasak Province (Fig. 3). The lowest observed discharge at the Pakse station was 2400 GL/month (910 m^3/s), during the dry season of 2010 (March 2010), and the highest value of observed discharge was 113400 GL/month (43700 m^3/s) during the wet season of 2011 (August 2011) when a major flood occurred in the Mekong River system (Mekong River Commission, 2011). The mean flow from 2008 to 2015 was 24800 GL/month (9500 m^3/s) and median flow was 12300 GL/month (4700 m^3/s).

About 90% of the rainfall measured at the Pakse climate station occurred in the wet season. The maximum monthly rainfall recorded was 932 mm in July 2014. The mean monthly rainfall was 176 mm with a standard deviation of 210 mm.

GRACE and GLDAS data

Due to the limited field observation data in Sukhuma District, as well as in Southern Laos in general, the feasibility of applying remotely sensed data on the total water storage derived from the Gravity Recovery and Climate Experiment (GRACE) (Tapley

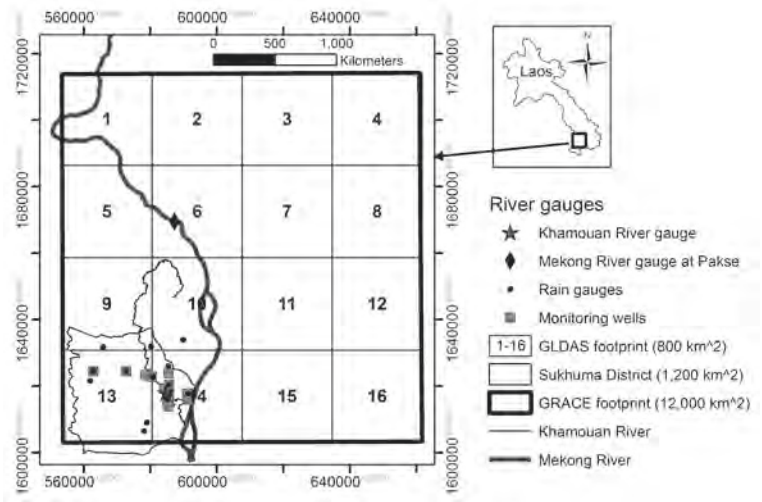

Figure 3 – Locations of stream gauges and rainfall stations in the study area, indicating the GRACE and GLDAS footprint scales.

et al., 2004) and the soil moisture derived from the Global Land Data Assimilation System (GLDAS) (Rodell *et al.*, 2004) for further study of the regional hydrogeology was investigated. The total water storage (TWS) or the equivalent water height (EWH) derived from GRACE consists of the combined total storage of groundwater, soil moisture and surface water, including lakes, reservoirs and rivers (Leblanc *et al.*, 2009). The monthly EWH data is currently available from August 2002 to March 2016 with a spatial resolution of about 12,000 km^2 (Bourgogne, 2016). For this research, the monthly EWH was downloaded for the period January 2008 to December 2015 at a grid scale of GRACE bounded between latitude 14.5 to 15.5° N and longitude 105.5 to 106.5° E (Fig. 3). The minimum EWH for this period was -270 mm and the maximum was 427 mm with a standard deviation of 166 mm and shows a slightly declining trend.

The monthly GLDAS-derived soil moisture of four soil layers at depths 0-10, 10-40, 40-100, and 100-200 cm, respectively, were downloaded from the NASA's Earth Science Data System website [https://earthdata.nasa.gov/]. This information has a spatial resolution of about 800 km^2 (0.25 degree × 0.25 degree) and is derived from the Noah land surface model (Ek *et al.*, 2003). It is available from January 2000 to the present in units of kg/m^2 or mm. The GLDAS-derived soil moisture at the GRACE footprint from January 2000 to May 2016 show the minimum total soil moisture was about 369 mm in February 2005 and the maximum soil moisture was about 814 mm in July 2000. The average value of total soil moisture was approximately 616 mm/month with a standard deviation of about 137 mm. During the period January 2000 to May 2016, the total soil moisture in the study area was declining. For this study, the GLDAS-derived soil moisture data for grid 13 of GLDAS (Fig. 3) were obtained for the period June 2015 to May 2016. The different scales of GRACE and GLDAS footprints are indicated in Figure 3, along with the locations of rain gauges, stream gauges and monitoring wells.

Hydrogeological conditions

Hydrostratigraphy

The geological cross-section in Figure 4 is derived mainly from the lithological drill logs as reported by Champasak Provincial Health Department (2012) and

Vote *et al.* (2014), which indicate topsoil to approximately 2 m depth consisting of silty clay, sand and sandy loam. This sequence overlies a layered stratigraphy of fractured laterite and fractured sandy shale, mudstone and shale above sandstone with prominent fracture zones. The depth to the topmost fracture zone in the sandstone is in the range of 20 to 30 metres below ground level (bgl), but reported casing depths vary between 7 and 16 m bgl, so that the measuring points of the groundwater levels may include formations above the sandstone.

The complete thickness of the fractured sandstone was not penetrated by the drilled bores and the detailed interconnection of the fracture zones is unknown. The fractured rocks are considered to be part of the Mz1 sandstone formation (United Nations, 1990), which is the equivalent of the Phu Kradung Formation in northeast Thailand described by Sattayarak (1983) and Racey *et al.* (1996). According to Racey *et al.* (1996) the thickness of the Phu Kradung Formation is greater than 1000 m at various locations in northeast Thailand. These formations comprise the deep aquifer system in the region.

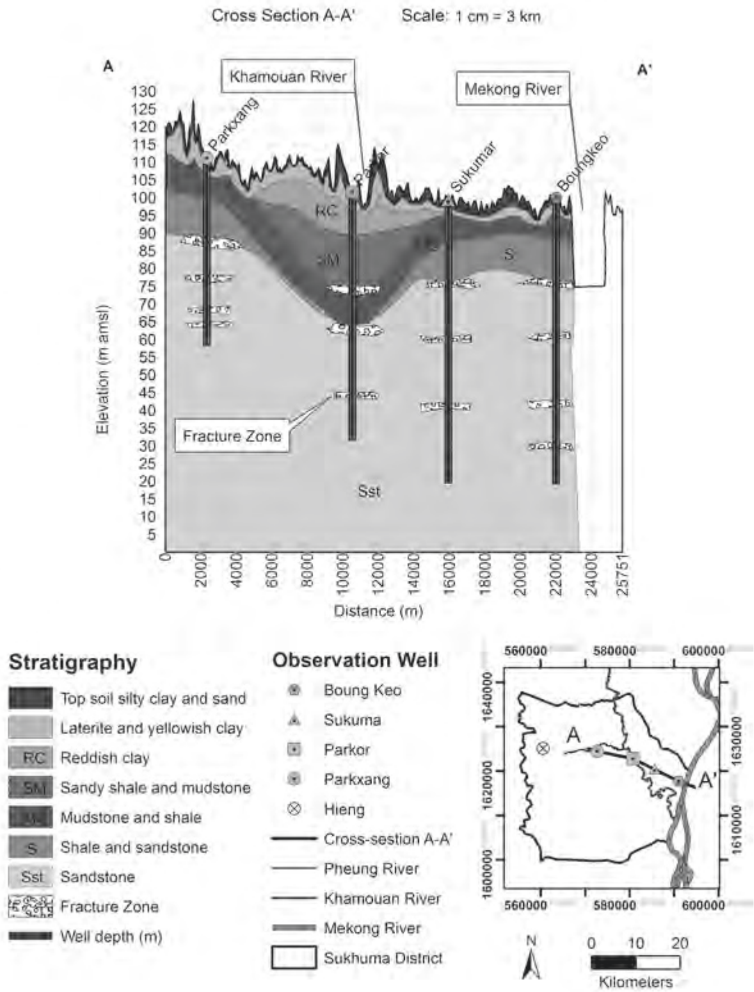

Figure 4 – Sukhuma District geological cross-section developed from drilling logs

Stream-aquifer interaction

The seasonal connection between water table and river beds in Sukhuma District was assessed by comparing the water table elevations from 19 monitoring wells to the elevations along the river beds of the Khamouan and Pheung rivers, for the dry and wet seasons of 2015. The assessment was processed with the Xacto Section Tools as developed by Carrell (2014) and which are implemented in the GIS (Geographic Information System) to create a 2-dimensional or a 3-dimensional cross-section. For this research, a cross-section of comparison between groundwater level and river bed elevations was generated (Fig. 5). The partial connection is demonstrated clearly on the cross-section. Within most parts of Khamouan River the groundwater table is always above the river bed, indicating that the stream and aquifer are hydraulically connected. Figure 5 also illustrates that only a few parts of the Khamouan River were disconnected from the river bed during the dry season 2015.

Along the Pheung River, which is located on the upper part of the Khamouan River catchment, groundwater is partially connected to the river bed during the wet season. In contrast, in the dry season, groundwater level is below the river bed and this portion of the river is disconnected (Fig. 5). However, this result is highly uncertain due to the lack of observation wells along this reach of Pheung River.

Figure 6 illustrates the correlation between monthly flow in the Khamouan River at the river gauge and the monthly water table elevation at the Phone Pheung domestic well for the wet season of 2015. Phone Pheung domestic well is located about 1 km north of the river gauge and about 0.5 km from the east bank of the Khamouan River

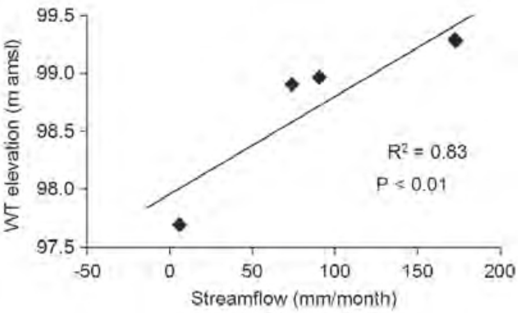

Figure 6 – Correlation between water table (WT) elevation at the Phone Pheung domestic well and Khamouan River flow at the river gauge during the wet season of 2015 (June–October).

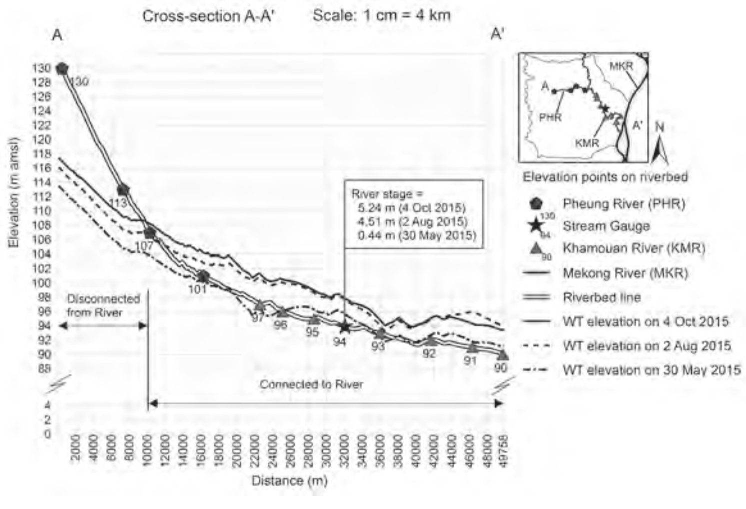

Figure 5 – Connection between water table (WT) and river bed elevations during the dry season and the wet season of 2015.

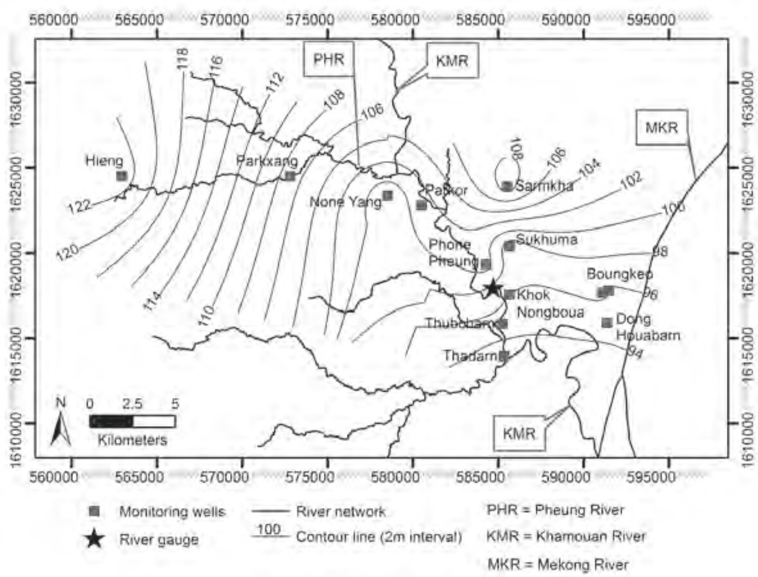

Figure 7 – Water table elevation contours for the wet season of 2015

(Fig. 7). The coefficient of determination, R^2, value of the two components is 0.82 with a significant value of $P < 0.01$, demonstrating good correlation between groundwater level and surface water in Khamouan River in this reach. During the dry season of 2015-16, surface water flow in Khamouan River was very low and could not be measured by the staff gauges.

The connection between surface water and groundwater can also be inferred from springs that occur along the river bank (White *et al.*, 2016). During the first field observation, on 3 December 2015, a spring close to the gauge station was observed. The observed flow of the spring was sufficient for villagers to collect enough water for their household use. The spring was flowing from fractures in mudstone, shale and laterite exposed at the base of the sandy alluvial material of the Khamouan River valley. These fractured formations are exposed elsewhere in river sections in southeast Sukhuma, suggesting a hydraulic connection between the surface drainage and the groundwater system. Therefore, the information from the field survey corresponds relatively well with Figure 5.

For this study, it was not possible to investigate the connection between the water table and surface water for the entire Sukhuma District due to the lack of groundwater level monitoring points and river gauges. Therefore, setting up more observation wells and river gauges should be considered for future studies on the interaction between surface water and groundwater in Sukhuma District.

Groundwater flow pattern

The groundwater flow directions and hydraulic gradients were determined using an Excel spreadsheet method (Devlin, 2003) and water table contour maps created in ArcGIS10.1. The results from the Excel spreadsheet method show that the groundwater in Sukhuma District flows from northwest and north to south and southeast, then finally draining to the Mekong River in the east. The monthly groundwater level elevation contours generated in ArcGIS show similar groundwater flow directions (Fig. 7), and previous studies by JICA (1995) reported similar results.

Figure 7 illustrates that the water table elevation is relatively high in the west and the north and low in the southeastern area of the Sukhuma District. According to field observation data during this study, the population density and number of groundwater wells in the western area were lower than in the southeastern area. The groundwater level in the western area, at Hieng well, is always higher than the groundwater levels at other monitoring points. Additionally, the groundwater level at the Sarmkha domestic well is higher than levels in the southern area.

The high population density and groundwater use is expected to have caused local groundwater level depletion. The groundwater level contours near the None Yang and Sukhuma monitoring wells show groundwater flow into the area, creating a sink, as shown in Figure 7. A large bottled water factory has been set up close to the None Yang domestic well and the potentially high pumping rate from this factory could be a reason for the sink in the None Yang area. However, information on the volume of groundwater pumped by the factory is not available for this research. The Sukhuma monitoring well used in this study is close to the urban centre of Sukhuma District. The area has a higher population density than other areas and has many groundwater users such as bottled water factories, guest houses and restaurants. These factors are likely to contribute to lower groundwater levels in the vicinity of the Sukhuma monitoring well.

Furthermore, Figure 7 also depicts that the groundwater level at the Phone Pheung well, located close to Sukhuma well, shows groundwater mounding. The groundwater levels in the Phone Pheung well could be affected by water leaking from a large reservoir (approximately 1 km × 1 km) that is located about 500 m away from the Phone Pheung well. For future studies, the interaction between groundwater level fluctuation at this well and water level changes in the reservoir should be considered.

Preliminary estimate of groundwater recharge

Groundwater recharge in the study area was estimated by the water table fluctuation (WTF) method (Healy and Cook, 2002) with the following equation:

$$R = \frac{\Delta h}{\Delta t} \times S_y \tag{1}$$

where R is the groundwater recharge (mm), Δh is the water table rise over a time interval (Δt), and S_y is the specific yield. To estimate groundwater recharge using the WTF method, the values of S_y at the monitoring points are required.

Specific yield estimation

A reliable estimate of S_y is commonly determined from the analysis of pumping tests with observation wells, but no such pumping test data were available for southern Laos. For this research, S_y was estimated from the analysis of well hydrograph recession curves, based on the concept that the total drawdown during the dry periods equals the total withdrawal of water from the well during the same period, as expressed by Udayakumar *et al.* (2015):

$$S_y = \frac{\alpha \times t}{d} \tag{2}$$

where α is the recession constant (m/day), t is the duration of the recession period (days) and d is the drawdown during the recession period (m). The values of α and t are determined from the exponential recession equation of the well water level decline curve, as follows:

$$h = h_0 \times e^{-\alpha t} \tag{3}$$

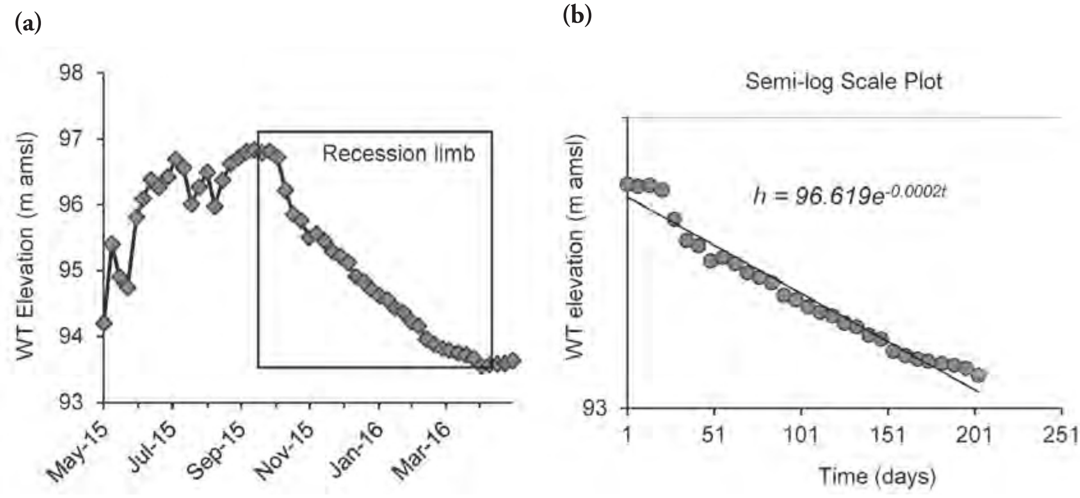

Figure 8 – (a) Recession curve and (b) exponential recession equation for the Sukhuma domestic well, 11 October 2015 to 1 May 2016.

where h is the water table elevation at time t, and h_0 is the initial water table elevation (m amsl).

An example of the recession curve and the exponential recession equation for the Sukhuma domestic well is presented in Figures 8a and 8b, respectively. Figure 8a illustrates that the water table recession at this monitoring well occurred from 11 October 2015 to 1 May 2016. From this recession period, an exponential equation can be generated as presented in Figure 8b. The value of the recession constant (a) for the Sukhuma domestic well was found to be 0.0002 m/day with a t value of 202 days and a d value of 3.28 m. The values of a from all monitoring wells in Sukhuma District, including domestic, shallow and deep observation wells, were estimated in the same way as for the Sukhuma domestic well and ranged from 0.0001 m/day to 0.0003 m/day; these were then used to estimate S_y using Equation 2. Udayakumar *et al.* (2015) noted that using the S_y value from the recession hydrograph method will produce the minimum possible recharge.

The analysis gave values of S_y in Sukhuma District between 0.001 and 0.01 with an average value of 0.0096 and a standard deviation of 0.0021. This value of the standard deviation of S_y was used to determine the uncertainty in estimating groundwater recharge using the WTF method as indicated in Lucas *et al.* (2015). The uncertainty, given herein, is defined as the standard error divided by the mean. The total uncertainty associated with the WTF method was estimated at 21%. In comparison, analysis of data of a pumping test of the Parkxang deep well with an observation well in December 2015 (in connection with this study) indicated S_y to be 0.013. The pumping test data analysis was based on the Hantush method for partially-penetrating wells as given in Kruseman and de Ridder (1979). The value of S_y from the pumping test analysis falls in the range of estimates of S_y derived using the hydrograph recession method.

The average value of S_y from this research is similar to previous studies in the Lower Mekong River region and other countries with similar groundwater aquifers. Vouillamoz *et al.* (2016) estimated S_y for the Phu Kradung sandstone aquifer in northwest Cambodia, which is located about 150 km southwest of Sukhuma District. They conducted pumping tests at nine sites and calculated S_y values ranging from 0.002 to 0.024. Erban and Gorelick (2016) estimated S_y using pumping test data for the sandstone aquifer in the transboundary area between Cambodia and Vietnam. They found S_y values ranging between 0.005 and 0.2.

Kuo (2014) indicated that the specific yield of unconfined aquifers generally ranges between 0.1 and 0.3; for confined aquifers the equivalent parameter, storage coefficient (S), typically ranges between 10^{-4} and 10^{-5}, and for leaky confined aquifers S is in the order of 0.001. Gburek and Folmar (1999) determined S_y for a fractured sandstone, siltstone, and shale system in east-central Pennsylvania, USA by applying a water balance method. They measured water level fluctuations in wells and recorded the recharge from the rainfall infiltration by installing pan lysimeters at depths of 1 to 2 m near to the monitoring wells, and then calculated S_y using the WTF method. Their results showed an average S_y value of 0.009. Maréchal *et al.* (2006) calculated the average S_y for the fractured rock aquifer system in the Maheshwaram pilot watershed in India to be 0.014 by using the water balance method. Similarly, a range of S_y values from 0.005 to 0.01 was selected for quantifying groundwater recharge for the hard bedrock aquifer in northwest Ireland (Cai and Ofterdinger, 2016). Generally, the estimated values of S_y (0.001 to 0.01) in Sukhuma District are similar to those in regions with fractured bedrock aquifers. However, it should be noted that S_y results may be highly uncertain because of the way in which the monitoring wells were completed, as discussed above.

A previous study of groundwater recharge in Sukhuma District using the WTF method assumed a S_y value of 0.1 (Vote *et al.*, 2014). Applying this value for estimating the recharge to the deep aquifer may not be appropriate. According to Healy and Cook (2002) the S_y is not constant but changes as a function of depth to the water table. Johnson (1966) also noted that S_y values vary according to soil type. For example, S_y of silty sand and sandy silt vary from 0.05 to 0.3 (Johnson, 1966).

In Sukhuma District, the monitoring wells are located in different surface soil types, as shown in Figure 2, with silty sand and sandy silt recorded in the topsoil layers of the well logs. Therefore, the S_y of 0.1 may be applicable to the topsoil layer up to 2 m depth but not to the deep groundwater aquifers. In order to assess the availability of long-term groundwater resources, the estimation of appropriate values of S_y for the deep aquifers and the overlying variably saturated zones will be necessary. The analysis of the hydraulic connection between these two systems in Sukhuma District is, however, outside the scope of this paper.

Estimate of groundwater recharge

Equation 1 was used to estimate annual groundwater recharge at the monitoring wells. Groundwater recharge varies across Sukhuma District. The highest recharge was calculated at the Donghouabarn monitoring point, at about 4.3% of the total annual rainfall (1203 mm). The next highest values were at Parkor and Parkxang, at ~4% and ~3.5% of total rainfall, respectively. The lowest recharge rate was found at the Phone Pheung observation point, at approximately 1.5% of total rainfall. Note that the recharge estimates, given herein, refer to the portion of rainfall that enters the deep fractured bedrock aquifer system.

The results of area-averaged monthly recharge in Sukhuma District varied in each month during the wet season of 2015. The mean estimate of monthly recharge was close to 7.6 mm with a standard error of 1.6 mm (equivalent to 21% of uncertainty in the recharge estimation). The minimum and maximum monthly recharge estimates for the wet season 2015 were 0 and 14.1 mm/month, respectively. The maximum recharge occurred in August and then declined until the end of the wet season in October. From November 2015 to May 2016 the monthly recharge rates were less than zero (negative values) indicating declining recharge from rainfall to the deep aquifer as this was the period of groundwater recession or discharge. As mentioned above, the estimated recharge from the current study is to be interpreted as the recharge to the deep fractured bedrock aquifer. The uncertainty in the direct recharge corresponds to a value of 21% of the recharge in Sukhuma District and is consistent with other studies at the watershed scale. Maréchal *et al.* (2006) calculated the uncertainty for the components of the water balance at the watershed scale, and they indicated a relative error of 22–24% in the natural recharge estimation.

The recharge rates estimated for the Sukhuma District in the present study are lower than the values reported in the previous studies (JICA, 1995; Vote *et al.,* 2014). The resulting recharge rate was approximately 12% of annual rainfall, and is about 3 to 6 times higher than our results (around 2 to 4% of rainfall). The higher recharge rate obtained with the water balance can be explained by the fact that the upper part of the fractured laterite soil cover may be partially saturated in some areas of Sukhuma District during the wet season, which increases the groundwater storage. Chilton and Foster (1995) pointed out that laterite soil has much higher recharge rates (or higher specific yield) than fractured bedrock aquifers. The recharge rate estimated by JICA (1995) can be interpreted as the combined value of recharge into the shallow fractured laterite soil and the deep fractured bedrock aquifer. Vote *et al.* (2014) estimated groundwater recharge using the WTF method for the same monitoring network utilised in the present study. The estimated recharge rates were around 23% of the rainfall in the wet season (28 April to 12 October 2012), much higher than the estimates of the present study. This can be attributed to using a higher value of specific yield (S_y = 0.1) than in the present study, which may be not appropriate for estimating the recharge to the deep fractured bedrock aquifer, as previously discussed. Many researchers have noted that selecting an appropriate value of S_y for estimating the recharge using the WTF method is challenging and S_y is a very sensitive parameter in the WTF equation (Crosbie *et al.*, 2005; Cuthbert, 2010; Cuthbert, 2014; Healy and Cook, 2002; Scanlon *et al.*, 2002). However, the recharge rates estimated from the current study show the same range as the groundwater recharge rates were calculated in Northwest Cambodia (Vouillamoz *et al.*, 2016), where the geological characteristics are similar to Sukhuma District. The recharge rates in Northwest Cambodia were estimated at 0.5 – 4% of annual rainfall (1754 mm) by using the WTF method (Vouillamoz *et al.* 2016). Based on these inferences from published literature, the estimates of recharge rates and values of S_y derived in the present study are considered to be reasonable considering the limited data relating to geological conditions, groundwater level variations and hydrogeological characteristics.

Inference from remote sensing data

Comparison between the observed rainfall, Mekong River discharge at Pakse station and the EWH derived from GRACE shows that the GRACE satellite signal detected the flood event at Pakse station in 2011 (Fig. 9). Figure 9 also illustrates that the in-

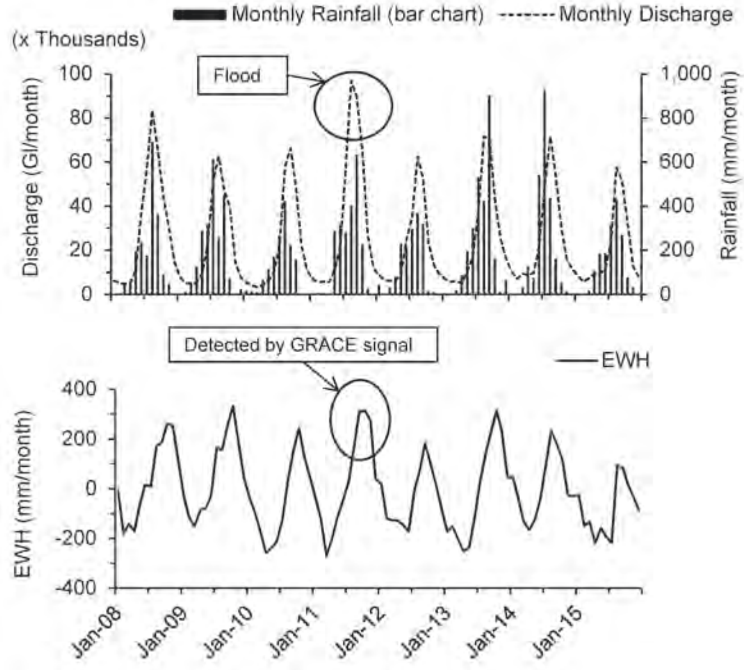

Figure 9 – Comparison between the Equivalent Water Height (EWH) derived from GRACE and observed monthly rainfall and monthly discharge in the Mekong River at Pakse.

situ observation data at Pakse station and EWH from GRACE show similar seasonal dynamic patterns. Previously, many studies have used the EWH derived from GRACE to estimate the variations in hydrological processes. These include changes in groundwater storage (Rodell *et al.*, 2007; Shamsudduha *et al.*, 2012) and correlations with the peak observed water level during the flood season (Steckler *et al.*, 2010). Therefore, there is good potential for further investigation of GRACE data application to the region of Southern Laos.

The comparison between soil moisture from four soil layers (about 2 m deep) derived from grid 13 of GLDAS and the observed groundwater levels and rainfall data in Sukhuma District also shows a good correlation (Fig. 10). The GLDAS-estimated soil moisture in different soil layers shows different responses to rainfall. Figure 10 depicts that soil moisture in deeper soil layers has a longer time lag to rainfall. Furthermore, the correlation between the total soil moisture of four layers from GLDAS and water table rise in 19 observation wells in Sukhuma District shows an R^2 value of 0.91 with a significant $P < 0.01$ (Fig. 11). The comparison shows the feasibility of applying the GLDAS-derived soil moisture data to future studies of the hydrogeology in the region.

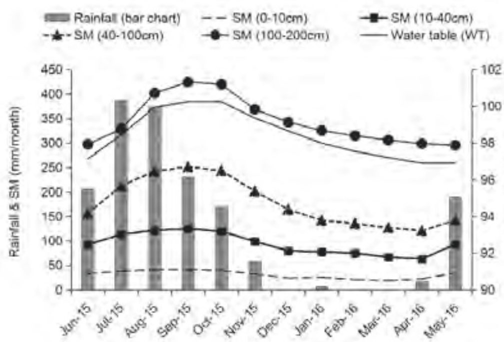

Figure 10 – Comparison between soil moisture (SM) derived from grid 13 of GLDAS and observed rainfall and water table (WT) in Sukhuma District.

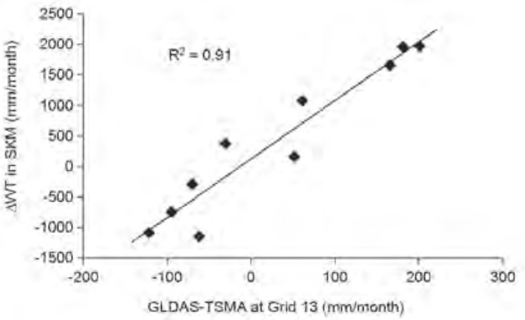

Figure 11 – Correlation between the water table rise (DWT) and the total soil moisture anomalies derived from GLDAS (GLDAS-TSMA) at grid 13 for the period June 2015 to March 2016.

The initial results using GRACE EWH data and GLDAS soil moisture data show good correspondence with field observations at both scales for Sukhuma District and Southern Laos. However, further analysis and refinement are needed to improve the reliability and enhance the certainty of derived data as representative at the regional scale.

Conclusion

A summary of hydrological data availability and improved understanding of hydrogeological conditions in Sukhuma District is presented in this study. In-situ observation data on geology, groundwater levels and stream flow in the region is sparse. Investigation of the interaction between surface water and groundwater along the Khamouan and Pheung rivers found that groundwater levels and surface water in the study area are partially connected. During the wet season, along the studied part of the Khamouan River, the river bed is connected with the water table. However, some parts of this reach of the Khamouan River are disconnected from the water table during the dry season. Along the Pheung River, groundwater is also disconnected from the river bed during the dry season. In the wet season, only the lower part of Pheung River shows a connection between groundwater and the river bed. It is important to note that the findings relating to surface water and groundwater interaction contain high uncertainty due to the limited groundwater monitoring points and river gauges in the study area.

Values of S_y to estimate groundwater recharge using the WTF method (Healy and Cook, 2002) were derived. The values of S_y estimated from well hydrographs and one pumping test fit within the same range (10^{-2} – 10^{-3}) and are similar to the results of previous studies in locations nearby. Regarding the estimated S_y values from this study indicate that the groundwater aquifer in Sukhuma District can be identified as a fractured hard rock aquifer. This study also shows the estimate of groundwater recharge in Sukhuma District can range from about 2 to 23% of annual rainfall. It can be inferred from the wide range of recharge estimates that the challenges of selecting an appropriate method and value of S_y in the WTF method remain. Further information on geology and groundwater level and pumping test data should be obtained for future studies.

This research found good correlation between in-situ data (groundwater level and stream flow) and remote sensing data (total water storage derived from GRACE and soil moisture derived from GLDAS). Therefore, further investigation and analysis should be carried out in order to make sure that the data from GRACE and GLDAS can be applied validly in hydrogeological studies and to support sustainable groundwater resource management in Sukhuma District and Southern Laos.

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ESTIMATION OF SOIL INFILTRATION AND GROUNDWATER RECHARGE IN SUKHUMA DISTRICT OF SOUTHERN LAOS

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ABSTRACT

This study is presented to estimate net soil infiltration and groundwater recharge in Sukhuma District of Southern Laos. A soil water balance approach is used to estimate the net infiltration from the Tropical Rainfall Measuring Mission (TRMM) and Global Land Data Assimilation System (GLDAS) data. The groundwater recharge is estimated by using the water table fluctuation method from observation groundwater levels at eleven domestic wells and five paired observation wells (shallow and deep). The results show that average annual net infiltration flux from 2000-01 to 2015-16 is decreasing at a rate of 6 mm/year. For the same period of the net infiltration flux, the average annual rainfall derived from TRMM for the Sukhuma District also depicts a declining trend with a rate of 26 mm/year. A value of specific yield for the shallow fractured sandstone aquifer in the Sukhuma District is quantified at approximately 0.03. Groundwater recharge for 2012-13 and 2015-16 is estimated at 5% (118 mm) and 4% (95 mm) of annual rainfall, respectively. The net infiltration estimated from GLDAS and TRMM data shows reasonable agreement with the ground-based measurements. The results of the current study provide useful basic information for future groundwater resource management planning in Sukhuma District. The methods applied in this study may be also useful for studying the soil infiltration and groundwater recharge in regions with limited field data.

Keywords: Soil infiltration, groundwater recharge, soil water balance, Sukhuma District, Laos

1. INTRODUCTION

Knowledge and understanding of quantifying groundwater recharge is a prerequisite for effective groundwater resource management planning in Laos (Pavelic et al., 2014). In the Sukhuma District of Southern Laos, for example, groundwater is a significant source of water supplies for domestic and horticulture uses and abstraction is increasing in recent years (Vote et al., 2015) but there are few studies of groundwater recharge (JICA, 1995; Vote et al., 2014). None of the previous studies assessed the long-term fluctuations of net soil infiltration in the Sukhuma District owing to sparse field observations of the hydrogeology and hydrology. The net infiltration is defined herein as the water draining beneath the base of the root zone (Healy, 2010).

Net infiltration at the watershed scale is often simulated by using data intensive, sophisticated models and adequate field observation data, for example: Hevesi et al. (2003); Heilweil et al. (2007); Robertson and Sharp (2015). However, these and related models used by the previous researchers are not suitable for applying in the Sukhuma District because of insufficient input data. Instead, a simple soil water balance equation was derived for estimating net infiltration in the Sukhuma District. Knowledge of net infiltration fluctuations in the unsaturated zone will provide valuable information on the temporal variations of groundwater storage and recharge.

Estimation of groundwater recharge is a big challenge and a complex process (Blarasin et al., 2016). Application of multiple methods (three at least) is therefore recommended to minimize uncertainty about groundwater recharge estimation (Delin et al., 2007). However, rarely more than one method has been usually used to estimate the groundwater recharge in most developing countries owing to limited hydrological measurement data (Lucas et al., 2015). Thus, selecting a suitable method for estimating groundwater recharge for a study area will depend on the available data, objectives, scale, accuracy, cost and expected recharge mechanism (Jassas and Merkel, 2014). The Water Table Fluctuation (WTF) method (Healy and Cook, 2002) is widely used for quantifying the groundwater recharge due to its accuracy, ease of use and low cost of application (Maréchal et al., 2006). The groundwater recharge is defined herein as the water that flows downward through the unsaturated zone and reaches the water table, adding to groundwater storage (Healy, 2010).

The objectives of this study are to estimate the net infiltration and groundwater recharge in Sukhuma District. A simple soil water balance (SWB) is applied herein to estimate the net infiltration with data derived from GLDAS and TRMM. To evaluate validity of the results from GLDAS and TRMM data, estimated net infiltration from these two databases is compared with net infiltration computed from ground-based measurements in Sukhuma District. Groundwater recharge was estimated from the measured groundwater levels in the study area by using the water table fluctuation (WTF) method.

2. STUDY AREA

The Sukhuma District (Figure 1) lies between latitudes 14° 28′ 15″ N and 14° 49′ 16″ N and longitudes 105° 28′ 32″ E and 105° 52′ 20″ E. It covers an area of 1,200 km^2 with generally flat topography. The ground elevation ranges from 74 to 600 m amsl (above mean sea level) and slopes gently towards the southeast.

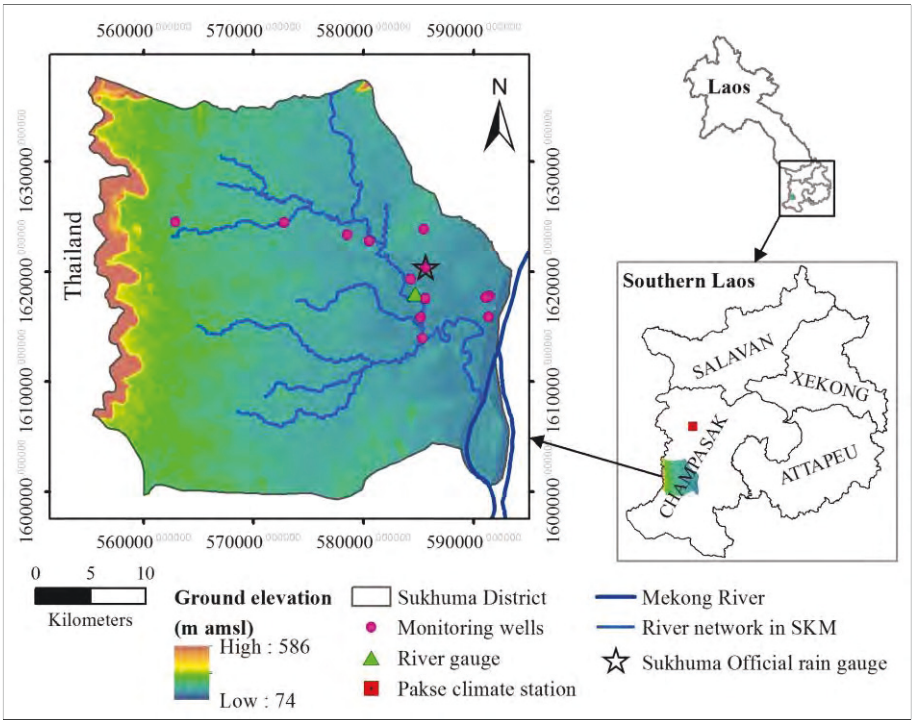

Figure 1. Study area with location of rain gauges, stream gauge, river network and topography

The Khamouan River system in Sukhuma drains from the west and the north to the southeast into the Mekong River (Figure 1) and flows only in the wet season from May to October. During the dry season from November to April, most small streams and the sector of the Khamoun River upstream from the gauge are dry. Therefore, the main source of water supply for residents and horticulture is from groundwater resources.

The average annual rainfall recorded at the Sukhuma District Official rain gauge from 2000-01 to 2015-16 was 2300 mm. The location of Sukhuma Official rain gauge is given in Figure 1. Approximately 90% of annual rainfall is concentrated in the wet season. The daily temperature measured at the Pakse climate station, located about 60 km north of the centre of Sukhuma District (Figure 1), ranges from 23 °C to 33°C with an average of 27°C. The average annual evapotranspiration in Sukhuma from 2000-01 to 2015-16 was estimated at 1200 mm (equivalent to 54% of annual rainfall).

The surface soil to 20 cm depth mainly consists of sandy loam (63% of Sukhuma District) and the rest of district is covered by loamy sand and sandy soil (SSLCC, 2000). Lithological drill logs (Champasak Provincial Health Department, 2012; Vote et al., 2014) show silty clay and sand and sandy loam up to 2 m depth. This profile occurs above fractured laterite and fractured sandy shale, mudstone and shale, which are above the fractured sandstone aquifer.

The geology of Sukhuma District is dominated by the Mesozoic (Mz) sandstone formation (United Nations, 1990). The Mz Sandstone formation is the equivalent of the Phu Kradung Formation in northeast Thailand as described by Sattayarak (1983), Racey et al. (1996) and Racey (2009). The groundwater recharge from rainfall into the fractured sandstone aquifer of the Phu Kradung formation is low, ranging from 0.5 to 4% of annual rainfall (Vouillamoz et al., 2016). The transmissivity values are between 0.14 m^2/day and 42 m^2/day (Wongsawat et al., 1992). JICA (1995) conducted a pumping test for the fractured sandstone aquifer of the Sukhuma District and estimated average value of transmissivity at 40 m^2/day. The specific yield value of the shallow aquifer of the Phu Kradung or the Mz Sandstone formation were estimated at the national scale from field observation data and ranges from 0.03 to 0.15 with an average value of 0.08 (Viossanges et al., 2017).

Land use and vegetation in Sukhuma District are mainly shrubland (~62%) and cropland (~24%) areas. Deciduous broadleaf and dipterocarp forests occupy approximately 9% and 2% of district area, respectively. About 3% of the district area is covered by villages, water bodies, bare soil and grassland.

Details of data availability and collection from the monitoring points as shown in Figure 1 are provided in Section 3.1.

3. METHODOLOGY

3.1 Data availability and collection

The data for the current study were obtained from various sources, including field observations, remote sensing data derived from the Tropical Rainfall Measurement Mission (TRMM), and reanalysis products between satellite and ground-based measurements derived from the Global Land Data Assimilation System (GLDAS).

3.1.1 Field observation data

In-situ measurement data in Sukhuma District consist of groundwater levels, rainfall and stream stage. Weekly groundwater levels data are available from November 2011 to April 2013 (Vote et al., 2014) and from June 2015 to April 2016 (the present study). These data were measured manually at eleven domestic wells, and five paired shallow and deep observation wells (Figure 1). The weekly groundwater levels were converted into monthly average groundwater levels at each observation well. Subsequently, the monthly area-average groundwater level at the Sukhuma District scale was calculated by using the Thiessen Polygon technique. The daily rainfall data record from May 2000 to April 2016 was acquired from the Sukhuma District Natural Resource and Environment Office (DoNRE) for the Sukhuma District official rain gauge. Mean daily streamflow measurements at the Khamouan River gauge were available from May 2000 to November 2006 and from June 2015 to April 2016. The daily rainfall and flow data were accumulated into monthly data. The locations of rainfall and streamflow data monitoring points are indicated in Figure 1.

Furthermore, the daily climatic data records at the Pakse climate station were also obtained from the Department of Meteorology and Hydrology (DMH) in Vientiane Capital. The location of Pakse climate station is shown in Figure 1. The available climate data at this station from May 2000 to April 2016 include daily air temperature (maximum and minimum), relative humidity and sunshine duration. However, wind speed data is available only from April 2006 to April 2016.

The limited field measurements of groundwater levels, rainfall, streamflow, and climatic parameters provided sparse spatial and temporal coverage of the Sukhuma District in Southern Laos. Therefore, data from GLDAS and TRMM were obtained for the current study as described in the following sections.

3.1.2 GLDAS data

The GLDAS data (Rodell et al., 2004) are available at a spatial resolution of 0.25° x 0.25° (~800 km^2) and a temporal resolution of 3-hourly and monthly (Rui and GES DISC, 2016). Four variables of GLDAS are derived for the period of May 2000 to April 2016 and used for the current study, as presented in Table 1. These GLDAS products were obtained from the National Centers for Environmental Prediction/Oregon State (Noah) land surface model (Ek et al., 2003) on the NASA's Earth Science Data System website.

Table 1. Summary of variables of GLDAS and TRMM used in this study (Data source: https://earthdata.nasa.gov/)

Database	Parameters	Spatial resolution	Temporal resolution	Time span
GLDAS	Actual evapotranspiration (ET)	0.25° x 0.25°	Monthly sum	May'00 - Apr'16
GLDAS	Runoff (surface and subsurface runoff) (Q_{DR})	0.25° x 0.25°	Monthly sum	May'00 - Apr'16
GLDAS	Soil moisture (4 layers from 0-200 cm depth) (SM)	0.25° x 0.25°	Monthly average	May'00 - Apr'16
GLDAS	Canopy water storage (CWS)	0.25° x 0.25°	Monthly average	May'00 - Apr'16
TRMM	Rainfall (P)	0.25° x 0.25°	Monthly sum	May'00 - Apr'16

3.1.3 TRMM data

The Tropical Rainfall Measuring Mission (TRMM) multi-satellite precipitation product (3B43-v7) with a spatial resolution of 0.25° x 0.25° (Huffman et al., 2007) is used together with the GLDAS products to estimate the net soil infiltration in the Sukhuma District by using a simple soil water balance approach. The duration and source of the TRMM 3B43-v7 monthly rainfall used in the current study are given in Table 1.

3.2 Conceptual water balance model of the Sukhuma District

The conceptual model of water balance for Sukhuma (SKM) District (Figure 2) was developed from the interpretation of existing data on groundwater levels and lithological bore logs (Champasak Provincial Health Department, 2012; JICA, 1995; Vote et al., 2014), and the field observation data on groundwater levels, river flow measurements, supported by field visits during the current study.

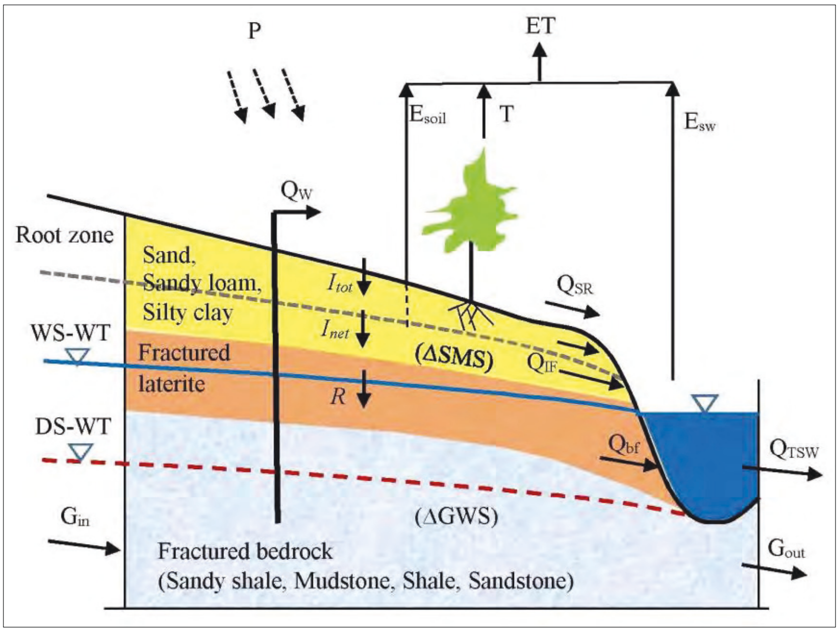

Figure 2. Conceptualisation of water balance components of the Sukhuma District. The gray dashed line represents the root zone depth of 1 m below ground surface. The dark blue line represents the average water table in wet season (WS-WT). The red dashed line illustrates the average water table in dry season (DS-WT). Symbols description: ΔSMS = Change in soil moisture storage in the unsaturated zone, ΔGWS = Change in groundwater storage

The maximum depth of the root zone (Figure 2) is approximately 1 m below ground surface based on the field observations during this study. Lithology of the root zone consists of sand, sandy loam and silty clay. The main input components of the water balance at the root zone are the total infiltration (I_{tot}) from the rainfall (P). The total infiltration (I_{tot}) in the current study was not calculated. The output components of the root zone water balance consist of the actual evapotranspiration (ET), interflow (Q_{IF}), and the net infiltration (I_{net}). A combination between surface runoff (Q_{SR}) and interflow (Q_{IF}) will generate the direct runoff (Q_{DR}). The total river flow (Q_{TSW}) includes baseflow (Q_{bf}) and direct runoff (Q_{DR}). The ET accounts for the transpiration from plants (T) and evaporation from surface water (E_{SW}) and evaporation from soil moisture in the root zone (E_{Soil}). During the wet season, a proportion of the net infiltration will become soil moisture and some of it will continuously flow downward to recharge the groundwater storage in the fractured bedrock aquifer (Figure 2). The recharge can be very small in the dry season owing to lower rainfall. If the water table is shallow and close to the root zone depth, the net infiltration volume can be the same as the groundwater recharge (Healy, 2010).

The inputs of the groundwater balance in Sukhuma District consist of the recharge (R) from the rainfall as the product of the root zone drainage and the lateral groundwater inflow (G_{in}) (Figure 2). The groundwater flow direction in Sukhuma is from north-west and north to south-east and drains to the Mekong River on the east (JICA, 1995). The output components of groundwater balance include the lateral groundwater outflow (G_{out}), groundwater pumping (Q_W), and baseflow (Q_{bf}).

3.3 Net infiltration estimation

Based on the conceptual water balance model of the root zone (Figure 2), the net infiltration (I_{net}) can be estimated as:

$$I_{net} = P - ET - Q_{DR} \tag{1}$$

Where I_{net} is the net infiltration, P is the rainfall, ET is the actual evapotranspiration, and Q_{DR} is the direct runoff. All components have the unit as the length per time interval (mm/month).

The values of I_{net} can be either negative or positive. Negative values refer to the soil moisture deficit and positive values show a groundwater recharge potential. ET comprises: evaporation of intercepted precipitation, soil evaporation and plant transpiration. Field observations of soil moisture are not available at Sukhuma District. However, the water storage fluctuations in the vadose zone are commonly neglected over a suitably long period of several years (Szilagyi et al., 2013) and these fluxes in soil moisture at the root zone were therefore neglected in this study. Eq. (1) was applied to GLDAS (ET and Q_{DR}) and TRMM (P) data and to the field observations in order to compare the remotely sensed and ground based measurements.

For the observation data, P is the rainfall measurements at the Sukhuma District station. Q_{DR} is estimated by the difference between total streamflow and baseflow at the Khamouan River gauge. The baseflow was separated from the total streamflow hydrograph using the method of Chapman (1999). The monthly actual ET is the product of the reference crop evapotranspiration (ET_0) and the crop coefficient (K_C) as expressed in the following equation (Allen et al., 1998):

$$ET = K_C . ET_0 \tag{2}$$

Different values of K_C for different stages of crop growth during wet and dry seasons are derived for the Sukhuma District from the FAO guideline (Allen et al., 1998). For the current study, two types of land use are classified for Sukhuma District, namely, cropland (rice) and forested land. The monthly ET_0 were estimated by using a combination of the Penman-Monteith approach (Allen et al., 1998) and the Hargreaves method (Hargreaves et al., 1985) as described by Allen et al. (1998). The mean ET for the entire Sukhuma District area was calculated from the weighted averages for the rice and forests based on their respective areas.

3.4 Estimation of groundwater recharge from groundwater level measurements

The annual groundwater recharge was calculated from monitored groundwater levels in Sukhuma District using the water table fluctuation (WTF) method (Healy, 2010). The groundwater recharge is estimated by multiplying the change in water table (Δh) over a specified time interval of interest (Δt) by the specific yield (S_y) of the aquifer, as expressed below:

$$R = S_y . \frac{\Delta h}{\Delta t} \tag{4}$$

Where R is annual groundwater recharge (mm), Δh is change in groundwater levels (mm), Δt is time interval (water year), and S_y is specific yield of shallow fractured sandstone aquifer (dimensionless). The Δh was computed as the difference between the peak of the water table rise and low point of the extrapolated antecedent recession curve at the time of the peak (Healy, 2010).

A method proposed by Naik and Awasthi (2003) for estimating regional specific yield was modified and used to compute an average value of specific yield (S_y) in Sukhuma District. The modified equation can be expressed as:

$$S_y = \frac{\left(Q_W^{DS} + Q_{bf}^{DS}\right) - P^{DS}}{\Delta h^{DS}} \tag{5}$$

Where S_y is specific yield (dimensionless), Q_W^{DS} is groundwater pumping by households in Sukhuma District during the dry season (mm), Q_{bf}^{DS} is baseflow during the dry season (mm), P^{DS} is total rainfall during the dry season (mm), and Δh^{DS} is total water level decline during dry season (mm). The data on groundwater pumping was collected from a households water use survey in Sukhuma District during the dry season, in March 2017.

4. RESULTS AND DISCUSSION

4.1 Estimated net infiltration from GLDAS and TRMM data

Figure 3 depicts declining trends of annual rainfall derived from TRMM during 2000-01 to 2015-16 decreased with a rate of 30 mm/year. The trend of annual net infiltration estimated from GLDAS and TRMM data also shows a gentle decline from 2000-01 to 2015-16. The average decline in annual net infiltration is around 6 mm/year. The average annual ET for this period increased by nearly 10 mm/year (Figure 3). The rainfall and estimated ET from climate data measured at the Pakse climate station from 2000 to 2016 also illustrate that average annual rainfall declined at a rate of 27 mm/year and average annual ET increased around 4 mm/year. Average annual air temperature from 2000 to 2016 at the Pakse station shows a very slight increase of 0.007°C per year. Hoanh et al. (2010) reported that climate change will impact on average annual air temperature in Southern Laos to increase about 0.023°C per year with likely increase in ET. Furthermore, observed regional decrease in annual rainfall will directly reduce the rate of soil infiltration and groundwater recharge from the rainfall. Therefore, implications of climate change for soil infiltration and groundwater recharge in Sukhuma District and Southern Laos should be investigated.

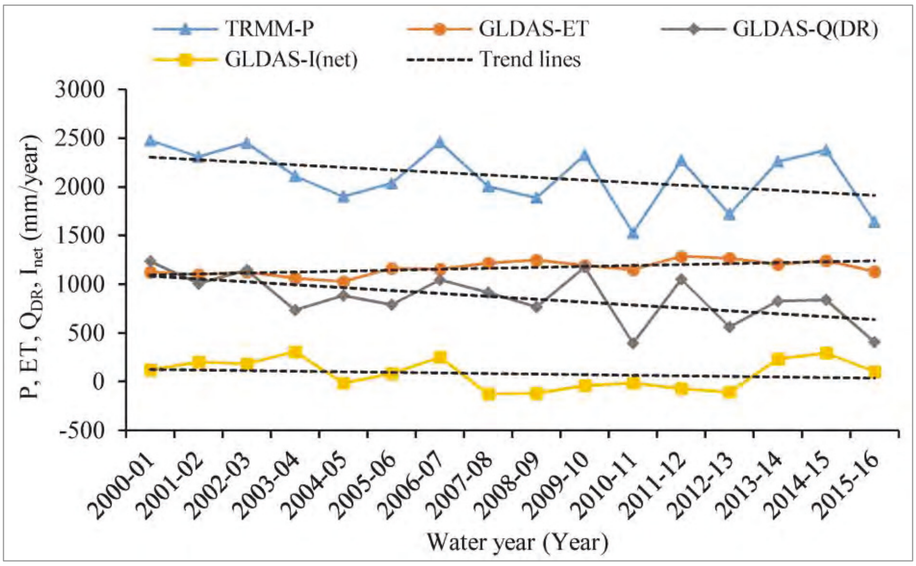

Figure 3. Comparison between the estimated annual net infiltration (GLDAS-I_{net}) and the rainfall (TRMM-P), evapotranspiration (GLDAS-ET) and direct runoff (GLDAS-Q_{DR}) from water year 2000-01 to 2015-16

The magnitude of annual net infiltration fluctuations is based on not only the amount of annual rainfall in the same year, but also the amount of direct runoff and ET. For example, the annual net infiltration in 2000-01 (120 mm) is approximately one-third of the annual net infiltration in 2003-04 (300 mm); however, the annual rainfall in 2000-01 (2500 mm) is higher than the annual rainfall in 2003-04 (2100 mm). The annual ET in 2000-01 and 2003-04 are almost the same value, but the amounts of direct runoff during these years are different. The depth of annual direct runoff in 2003-04 (700 mm/year) is about a half of the direct runoff in 2000-01 (1200 mm/year). It may be due to the fact that the average monthly rainfall intensity in 2000-01 (200 mm/month) was higher than the average monthly rainfall intensity in 2003-04 (170 mm/month).

4.2 Comparison between GLDAS-I_{net} and I_{net} from observation data

Comparison based on the graphical fitting is made to see whether the overall shape of the graph of the estimated net infiltration from the field observation data (I_{net} from observation data) is properly captured by the estimated net infiltration from the data of GLDAS and TRMM (GLDAS-I_{net}). Monthly net infiltration from the data of GLDAS and TRMM agrees well with the I_{net} estimated from the field observations (Figure 4). However, some of the peak net infiltrations from observation data are slightly underestimated by the GLDAS and TRMM outputs, for example during June and July 2015. The differences between the two results may be due to the fact that the GLDAS and TRMM data were observed at the spatial resolution of 0.25° x 0.25°, while the field observations were measured at individual points.

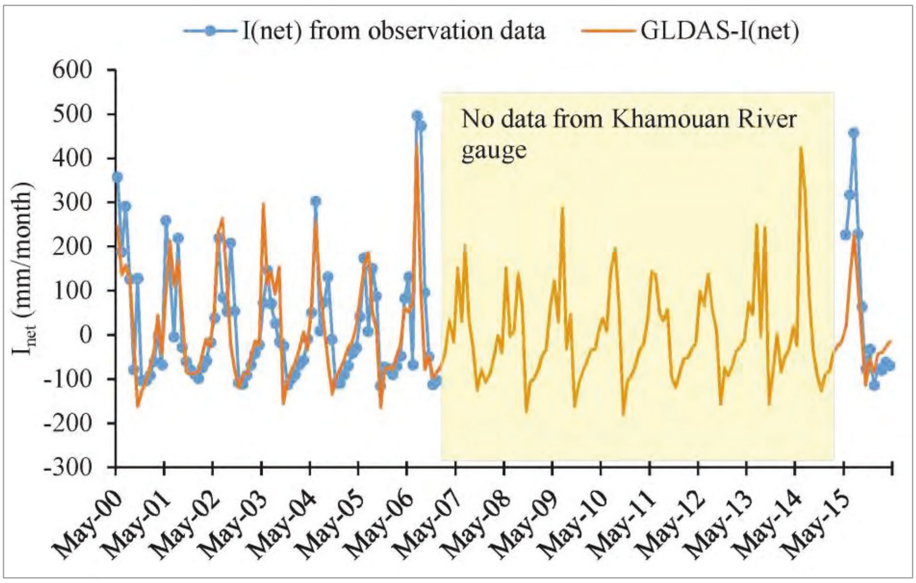

Figure 4. Comparison between estimated monthly net infiltration (I_{net}) from observation data and data derived from GLDAS and TRMM for the period of May 2000 to April 2016

4.3 Estimated annual groundwater recharge from observed groundwater levels

A value of $S_y = 0.034$ for the shallow fractured sandstone in Sukhuma District was estimated from the current study. This value of S_y falls within the range of the minimum and maximum values of S_y (0.03 – 0.15) reported by Viossanges et al. (2017) for the fractured sandstone aquifer at the national scale.

Based on limited field observation data on groundwater levels in Sukhuma District, groundwater recharge for 2012-13 and 2015-16 was estimated by using the WTF method. The annual recharge in 2012-13 is approximately 5% (118 mm) of annual rainfall (2500 mm) and 4% (95 mm) of annual rainfall (2400 mm) in 2015-16. The recharge estimated for the fractured sandstone aquifer in Sukhuma District is similar to the recharge rates (0.5 – 4% of annual rainfall) estimated by Vouillamoz et al. (2016) for the fractured sandstone aquifer in the north-west of Cambodia using the WTF method.

5. CONCLUSIONS

A simple water balance approach is used to compute net soil infiltration from rainfall with a combination of rainfall data derived from TRMM and GLDAS products (ET and runoff) for the water years 2000-01 to 2015-16. A reducing trend of annual net infiltration at a rate of 6 mm is observed. The results derived from TRMM and GLDAS data are validated with the results obtained by applying the same approach to the field observations (rainfall, ET and runoff) in Sukhuma District. A good agreement of seasonal fluctuations indicates the benefit of using remote sensing data in the situations where field observations are not available. The annual groundwater recharge for 2011-12 and 2015-16 were estimated at 5% of annual rainfall (2500 mm) and 4% of annual rainfall (2400 mm), respectively. These estimates are based on the WTF method using a value of S_y as 0.034.

The outcome of the present study provides significant information to the local water resources management authority for effective planning of long-term groundwater resource management in the Sukhuma District. Furthermore, the methods applied to derive results are simple and input data are freely accessible from the GLDAS and TRMM databases. Estimation of net infiltration using GLDAS and TRMM databases, as demonstrated in this study, is essential for effective groundwater resource management, particularly in data poor regions.

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SEASONAL GROUNDWATER LEVEL FLUCTUATIONS IN SUKHUMA DISTRICT OF SOUTHERN LAOS

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ABSTRACT

The objective of this study is to investigate the seasonal fluctuation of groundwater level in Sukhuma District by using observed data on groundwater, rainfall and streamflow from June 2015 to May 2016 and remote sensing data derived from the Gravity Recovery and Climate Experiment (GRACE) and the Global Land Data Assimilation System (GLDAS) for the period of June 2015 to March 2016. The results show that the groundwater level in Sukhuma District increased to the peak elevation during the late wet season (September – October) and it started declining from November until reached the lowest elevation during the late dry season (April – May). Rainfall was found as a significant ($P<0.01$) factor influencing the groundwater level fluctuation. The delay time between rainfall and groundwater level rise was also estimated at about 4 weeks. Moreover, the results also show that groundwater level during the study period in Sukhuma District was not yet depleted. However, the time-series for this analysis is very short to investigate the trend of groundwater level in Sukhuma District. The results of this research also showed good correlation between the soil moisture from GLDAS and groundwater level measurement in Sukhuma District (R^2 = 0.91) and also showed a good agreement between the soil moisture from GLDAS at a GRACE footprint and the equivalent water height (EWH) derived from GRACE at a GRACE footprint with an R^2 value of 0.72. Therefore, regarding the results of this study, a further investigation using these remote sensing data for groundwater study in this region will be carried out to support in groundwater study for Sukhuma and Southern Laos. The products from GRACE and GLDAS will provide pivotal data for the study of hydrogeology in the areas with limited field observation data.

Keywords: Sukhuma District, seasonal groundwater level fluctuation, correlation, GLDAS, GRACE

1 INTRODUCTION

Groundwater is the main source of water supply for agricultural and domestic uses in many developing countries. The monitoring and analysis of groundwater levels fluctuations are necessary for developing an effective management plan for sustainable use of groundwater resources (Pavelic et al, 2014). In recent year, groundwater abstraction in Laos has been increasing to enhance the resilience to climate variability, such as in Southern Laos (Suhardiman et al, 2016; Vote et al, 2015; Wade et al, 2015). However, groundwater levels measurement data is sparse in Southern Laos (Vongphachanh et al, 2016). This is because groundwater levels measurement is generally expensive and requires well trained manpower (Anayah & Kaluarachchi, 2009). There is urgent need to have the groundwater levels monitoring systems along with good institutional support to acquire sufficient information for the long-term groundwater resource development in Laos (Pavelic et al, 2014).

Knowing and understanding of seasonal fluctuations of groundwater levels are crucial for sustainable surface water and groundwater resources management and development (Lutz et al, 2014). In Sukhuma, groundwater is the only source for domestic water supply. Khamouan River and its tributaries are usually dry during the dry season and water in the river is commonly unusable during the rainy season due to sediment content and contamination. In 2015, Sukhuma District Nam Sa-Ath (fresh water) Office reported that about 6,000 bores were drilled in Sukhuma District and this number will be increased in future. However, assessment of seasonal groundwater fluctuations is limited. Therefore, this study is aiming to assess these phenomena in Sukhuma by using very limited field data and remote sensing data.

2 METHODOLOGY

2.1 Study area

This study was conducted from June 2015 to May 2016 in Sukhuma District which is located on the floodplain of Champasak Province, Southern Laos. It lies between latitudes 14° 28′ 15″ N and 14° 49′ 16″ N and longitudes 105° 28′ 32″ E and 105° 52′ 20″ E. It covers an area of about 1,200 km^2. The lowest ground elevation is about 74 m amsl (above mean sea level) along the Mekong River and Khamouan River's mouth and the highest is about 600 m amsl on the Western side (along the border with Thailand) (Figure 1). Sukhuma shares a border with Champasak District to the North, Mounlapamok District to the South, Khong District to the Southeast, Pathoumphone District to the East, and Thailand to the West.

Geologically, the topsoil layer of about 2 m depth consists of silty clay and sand. The underlying layer has an average thickness of about 25 m and mainly consists of fractured laterite, clay, sandy shale and mudstone, shale and sandstone. Generally, the groundwater aquifer in Sukhuma District is identified as a fractured sandstone aquifer and its actual depth is unknown. It is continuous with the groundwater aquifers of the Khorat Plateau in Thailand on the west of Sukhuma District. Vote et al (2014) reported that the average value of transmissivity and hydraulic conductivity for the fractured sandstone aquifer in Sukhuma were about 98.9 m^2/day, 7.34 m/day, respectively. Moreover, Vongphachanh et al (2016) indicated that an average value of specific yield for this aquifer was about 0.01.

Sukhuma is subject to a monsoonal climate which consists of wet and dry seasons. Commonly, the wet season is from May to October and the dry season from November to April. The average annual rainfall is about 2,052 mm (average from 1993-2015). The daily temperature usually ranges from 23 °C to 33°C with an average of about 27°C. The average annual evapotranspiration was estimated at about 1,660 mm. The main source of domestic water use comes from groundwater resources and it has been increasing.

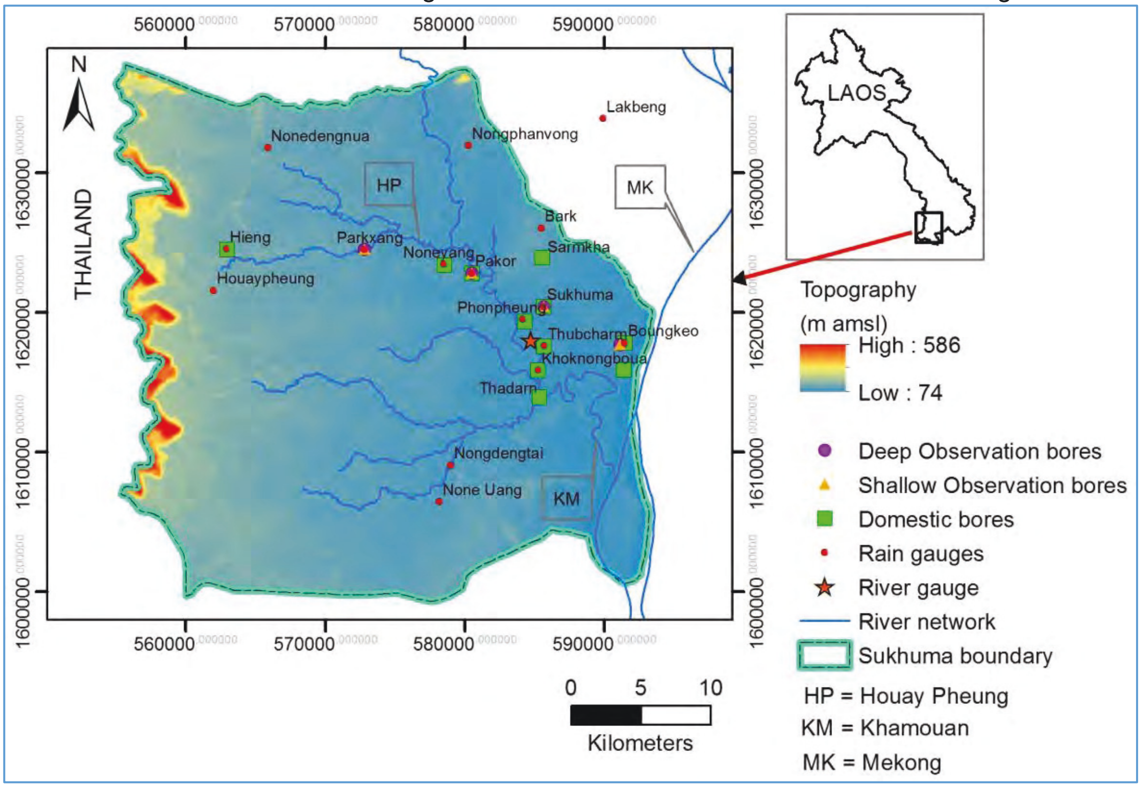

Figure 1. Location map of Sukhuma District, stream and rainfall gauges, topography and monitoring wells. KM is the Khamouan

2.2 Data collection and analysis

The primary input data for this study include field observation data and remote sensing data. The field measurement data included the data of groundwater levels, rainfall and stream stage collected in Sukhuma District for the period of June 2015 to May 2016. The weekly groundwater levels data was measured manually at the eleven domestic wells and five paired shallow and deep observation wells. These data were converted into monthly average groundwater level at each observation well. The daily rainfall data were collected from the 16 rain gauges (Figure 1). The mean daily river flow was measured manually at the Khamouan River gauge. The daily rainfall and flow data were aggregated into monthly data at each observation point. The locations and groundwater surface elevation of monitoring wells are presented in Table 1.

Due to the limitation of field observation data (including hydrology, climate and geology) in Sukhuma District as well as Southern Laos, the feasibility of applying remotely sensed data derived from the Gravity Recovery and Climate Experiment (GRACE) (Tapley et al, 2004) and the Global Land Data Assimilation System (GLDAS) (Rodell et al, 2004) to the future study of hydrogeology in the region was investigated. Currently, the monthly total water storage anomalies (TWSA), expressed as equivalent water height (EWH) from GRACE, are available from August 2002 to March 2016 on the website of the European Gravity Service for Improved Emergency Management (EGSIEM) [http://plot.egsiem.eu/]. From this website, users can download EWH data at a spatial resolution of ~12,000 km^2 (Bourgogne, 2016). The GRACE-TWSA or GRACE-EWH data consist of a combined total storage of groundwater, soil moisture and surface water (including lakes, reservoirs, and rivers) (Leblanc et al, 2009). For this research, the monthly EWH derived from the GRACE GFZ (GeoFoschungsZentrum Potsdam) RL05a on the EGSIEM website were downloaded for the period of June 2005 to March 2016 at a grid scale of GRACE that is located between latitude 14.5 to 15.5° N and longitude 105.5 to 106.5° E with a spatial resolution of ~12,000 km^2 (Figure 2). Figure 2 illustrates a comparison between the footprint scales of GRACE and GLDAS and Sukhuma District area. This figure also depicts the locations of monitoring wells, rainfall stations and stream gauges that are located in the study area.

Table 1. The code and location of monitoring wells

No.	Well code	Locations	Well status	Latitude (m)	Longitude (m)	Elevation of measurement point (m amsl)
1	SKM_Dom	Sukhuma	Domestic	585663.00	1620405.00	98.00
2	Pkor_Dom	Parkor	Domestic	580519.15	1622802.21	107.00
3	NY_Dom	Nonyang	Domestic	578529.35	1623387.15	105.00
4	KNB_Dom	Khoknongboua	Domestic	585228.64	1615856.35	100.00
5	THC_Dom	Thubcharn	Domestic	585661.59	1617564.21	97.00
6	BK_Dom	BoungKeo	Domestic	591483.00	1617810.00	98.00
7	PPH_Dom	Phonphueng	Domestic	584290.88	1619336.13	105.00
8	SKH_Dom	Sarmkhar	Domestic	585526.79	1623896.54	111.00
9	DHB_Dom	Donghouabarn	Domestic	591383.00	1615913.00	102.00
10	THD_Dom	Thadarn	Domestic	585346.00	1613938.00	98.00
11	BK_DW	Boungkeo	Deep Observation	591103.94	1617673.77	101.00
12	SKM_DW	Sukhuma	Deep Observation	585663.00	1620395.00	98.00
13	Pkor_DW	Parkor	Deep Observation	580519.15	1622802.21	107.00
14	PKX_DW	Pakxang	Deep Observation	572798.00	1624489.00	111.00
15	BK_SW	Boungkeo	Shallow Observation	591103.94	1617673.77	101.00
16	SKM_SW	Sukhuma	Shallow Observation	585663.00	1620395.00	98.00
17	Pkor_SW	Parkor	Shallow Observation	580519.15	1622802.21	107.00
18	PKX_SW	Pakxang	Shallow Observation	572798.00	1624489.00	111.00
19	Hieng_Dom	Hieng	Domestic	562939.38	1624512.69	125.00

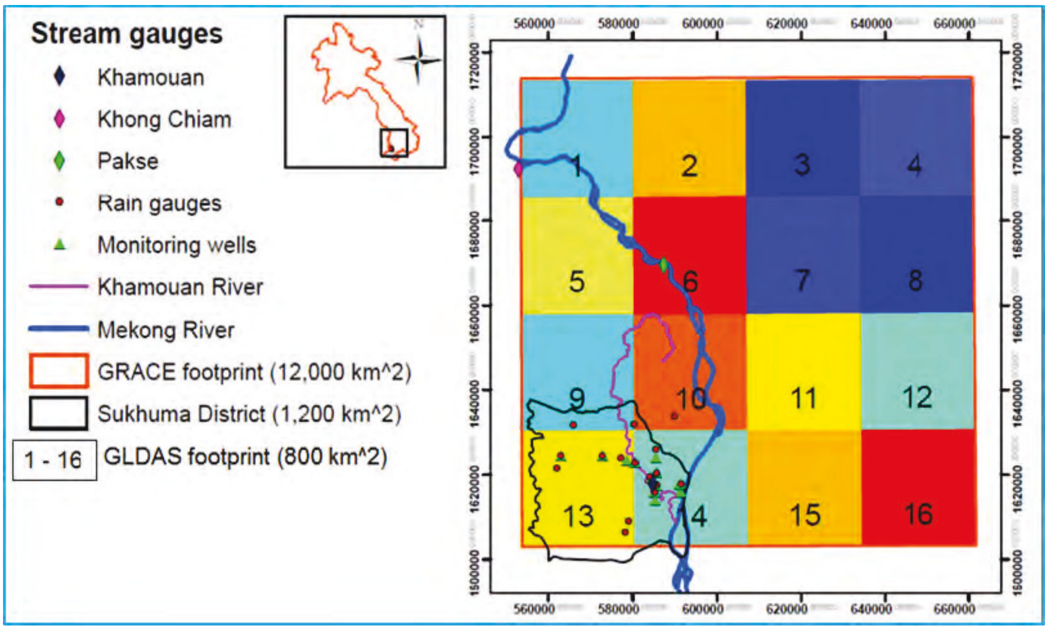

Figure 2. Locations of stream gauges and rainfall stations in the study area, and comparison between GRACE footprint scale, GLDAS footprint scale and Sukhuma District area.

Since field observations of soil moisture data are not available in Sukhuma District and in the districts nearby, reliance is placed on the remote sensing data from NASA's Earth Science Data System website [https://earthdata.nasa.gov/] with a spatial resolution of 0.25 degree x 0.25 degree (~800 km^2) (Figure 2) and a temporal resolution of 3-hourly and monthly (Rui & GES DISC, 2016). For this research, the soil moisture data from June 2005 to March 2016 at grid 13 of GLDAS and at a grid scale of GRACE, which covers totally 16 grids of GLDAS (Figure 2), were downloaded from the National Centers for Environmental Prediction/Oregon State (Noah) land surface model (Ek et al, 2003) on the NASA's website. The Noah model provides soil moisture data for four soil depth layers ranging from 0 to 10, 10 to 40, 40 to 100, and 100 to 200 cm. The unit of soil moisture data is kg/m^2 or millimeter.

3 RESULTS AND DISCUSSION

3.1 Trend of water table fluctuation

Groundwater level fluctuation in Sukhuma District is different in magnitude at different locations depending on the groundwater pumping and recharge. The available data at the 19 wells from June 2015 to May 2016 are plotted as the well hydrographs of Sukhuma District (Figure 3). This figure illustrates that all hydrographs had increased during the wet season (May – October), declined during the dry season (November – April) with the water table level reaching approximately the same elevation at the beginning of the wet season. In some locations, groundwater level rapidly increased during the wet season, such as at Pakor domestic, Pakor shallow and Donghouabarn domestic wells, while other areas had gentle rises. The location of these bores is presented in Figure 1. During the dry season, well hydrographs depicted smooth decline until the end of the season in May (Figure 3). Moreover, Figure 3 also illustrates that the highest rainfall intensity in Sukhuma District was concentrated in July and August for 2015. However, the groundwater level rises to its peak during September and October (Figure 3). This could also mean that rain water would take some time to infiltrate into the deep soil and refill the groundwater. More details of lags between rainfall and the start of rise in groundwater level are given in Section 3.3. From this study, it was observed that the trend of groundwater level in Sukhuma District remained the same from the end of dry season 2015 to the end of dry season 2016. However, the time-series data of groundwater level for this study is too short to provide the accurate result of the trend of groundwater level fluctuation. Therefore, longer time-series data should be employed for future study.

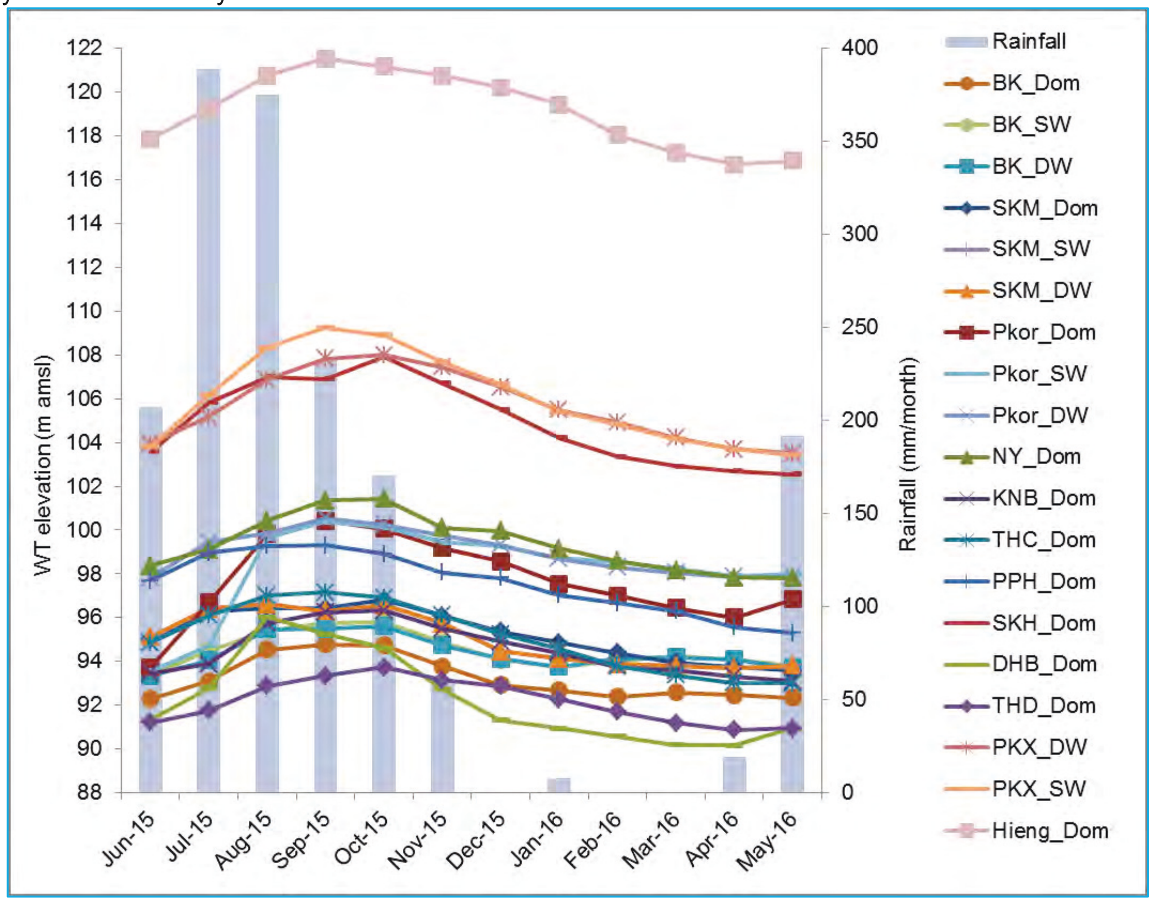

Figure 3. Well hydrograph of 19 monitoring wells and the area-averaged rainfall of 16 stations of Sukhuma District from June 2015 to May 2016.

3.2 Spatial and temporal variation of groundwater level

Due to limitation of data availability, a representative area encompassing all the observation points is selected, as shown in Figure 4, to assess the groundwater level fluctuation in the area. The spatial variations of groundwater level at two time scale, respectively for the end of wet season of October 2015 and for the late dry season of May 2016 are indicated in Figure 4.

The elevation of groundwater level is comparatively high in the West and the North and low in the Southeastern area of the district. The western area shows the highest groundwater level because the density of population in this area is not high compared with the southeastern area and groundwater abstraction is also low. The highest and lowest groundwater level elevations at Hieng domestic well were 123.54 m amsl in September 2015 and 118.70 m amsl in April 2016. The north area always showed high groundwater level where Sarmkha (SKM) domestic well was monitored. Some reasons for this are many small surface water bodies (ponds) occur there; a small forested upland area is located about 1.5 km north-west from the Sarmkha well and moreover, there is not many groundwater wells in this area. At Sarmkha well, the highest water table was observed at 108.89 m amsl in October 2015 and the lowest was 103.55 m amsl in May 2016.

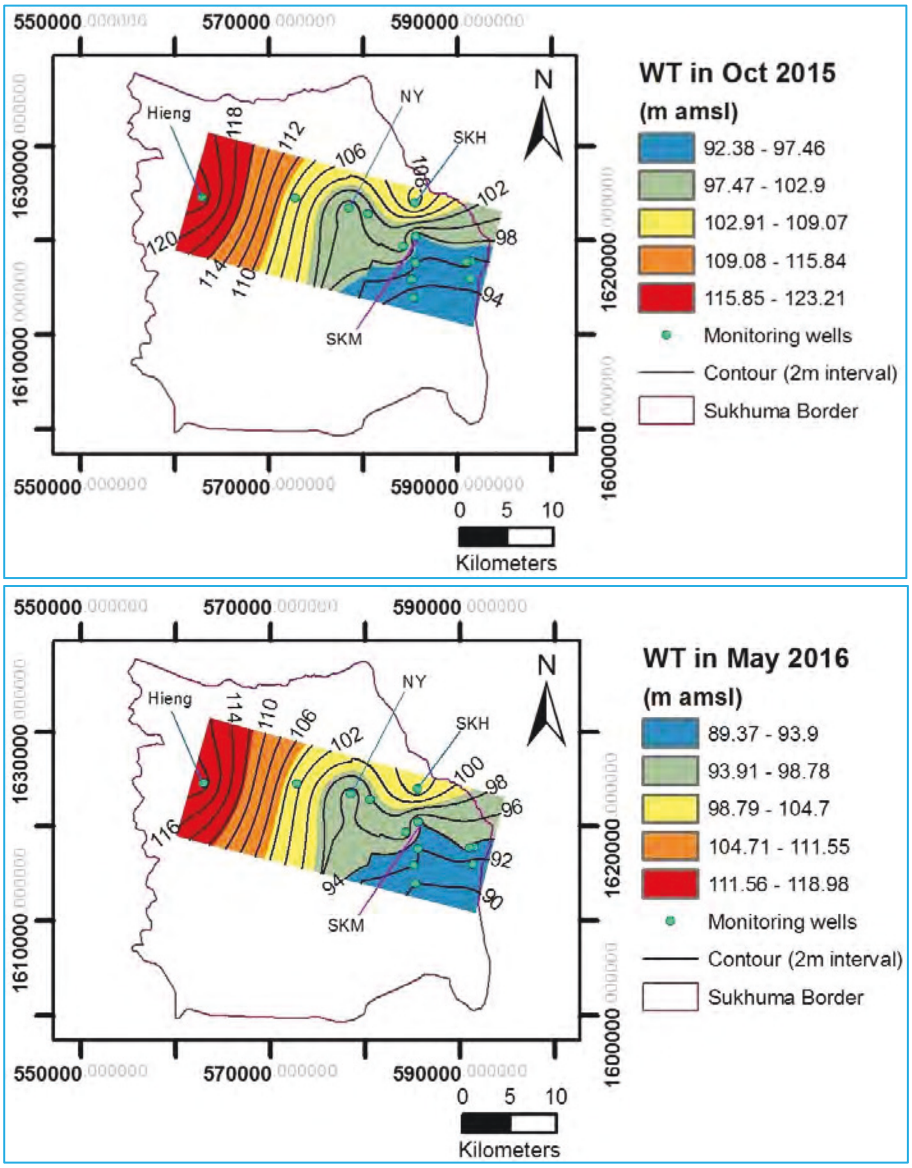

Figure 4. Groundwater contour maps of Sukhuma District during the late wet season (October 2015) and the late dry season (May 2016).

The groundwater level contours near the None Yang (NY) and Sukhuma monitoring wells show a groundwater sink for both wet and dry seasons (Figure 4). The main reason for this sink in the None Yang area is because a big bottled water factory has been set up close to it. However, for this study, we do not have information on the volume of groundwater pumped by this factory. In the case of the groundwater level sink in vicinity of the Sukhuma monitoring well, it was clearly found that this area is the city center of Sukhuma District. This area has a higher density of population than other areas. Also, many bottled water factories, guest houses and restaurants are located in this area. According to the data on bores recorded for 2015 at

Sukhuma District Nam Sa-Ath (Fresh Water) Office about 6,000 bores have been drilled. This number is more than half of the households in the district, which is about 9,000 households. The maximum water table recorded at the Sukhuma well was 96.81 m amsl in October 2015 and the minimum was 93.58 m amsl in May 2016. However, the groundwater level at the Phone Pheung well, located close to Sukhuma well, always shows groundwater mounding (Figure 4) for wet and dry seasons. This is because a big reservoir (about 1 km x 1 km) is located about 500 m from this monitoring point. Therefore, groundwater levels in the Phone Pheung well could be affected by leaking from this reservoir. The connection between groundwater level fluctuation at this well and water level change in the reservoir should be taken into account for the future study of groundwater level fluctuation in Sukhuma District.

The groundwater flow directions and hydraulic gradients were determined by using an Excel spreadsheet method (Devlin, 2003). The results show that groundwater flows in Sukhuma District from north-west and north to south and southeast and finally, it drains to the Mekong River in the east. This result is similar to the previous studies by JICA (1995). Moreover, this result indicates a good connection between groundwater flow direction and topography in Sukhuma District. The hydraulic gradient of groundwater flow in this region for wet and dry seasons was estimated equivalent with an average value of 0.0013.

3.3 Statistical analysis

In this research, the time series of weekly rainfall and weekly groundwater levels at each monitoring well from Jun 2015 to May 2016 were used as the input and the output, respectively, for the cross-correlation analysis. Regarding the preliminary assessment of these time lags in some areas the domestic bores and shallow and deep bores were similar. For example, the monitoring wells in Sukhuma domestic, shallow and deep wells all showed similar lags of 4 to 5 weeks. This similarity could be caused by the way how the wells were constructed and geological structure. However, the results show that time lags between rainfall and rise in groundwater levels at all monitoring wells vary at different locations and range from two to six weeks with an average of four (4) weeks between the start of the rainy season and rise in water level. An example of a lag of four to five weeks found at the Boungkeo domestic bore is shown in Figure 5. The spatial variation in the delay between rainfall and water table rise depends on a number of factors, such as: spatial variation of surface soil types; land use and vegetation cover; and, spatio-temporal variation of rainfall. Lucas & Wendland (2016) indicated that land use and vegetation cover was a parameter influencing the groundwater recharge rate. However, the impacts of these parameters (land use and cover, soil type, etc.) on the rainfall recharge are out of the scope of this research.

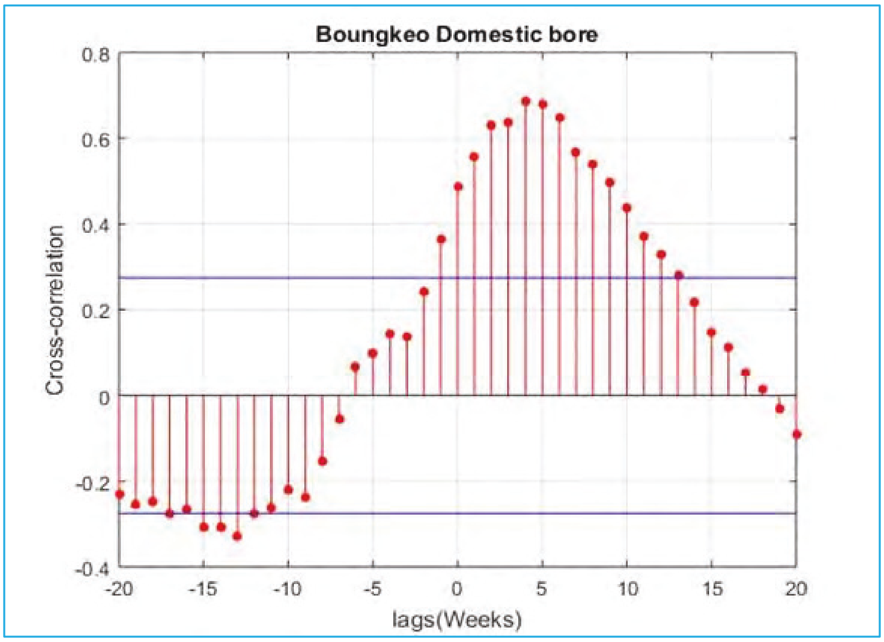

Figure 5. Cross-correlation between weekly rainfall and weekly water table fluctuations at Boungkeo Domestic well during June 2015 to May 2016.

Dependency of water table fluctuation with rainfall and streamflow is investigated through linear regression analysis. The monthly change in water table elevation is correlated with monthly rainfall data at Sukhuma District and with monthly streamflow data at Khamouan River gauge, as shown in figure 6. The R^2 (coefficient of determination) values for correlation of change in water table elevation with rainfall and streamflow are 0.86 and 0.63, respectively. This implies that the groundwater table responses are much more dependent on rainfall rather than streamflow. However, it is to be pointed out that groundwater table fluctuation observed close to the stream will have a higher correlation with streamflow because of hydraulic interconnection between stream and groundwater aquifer.

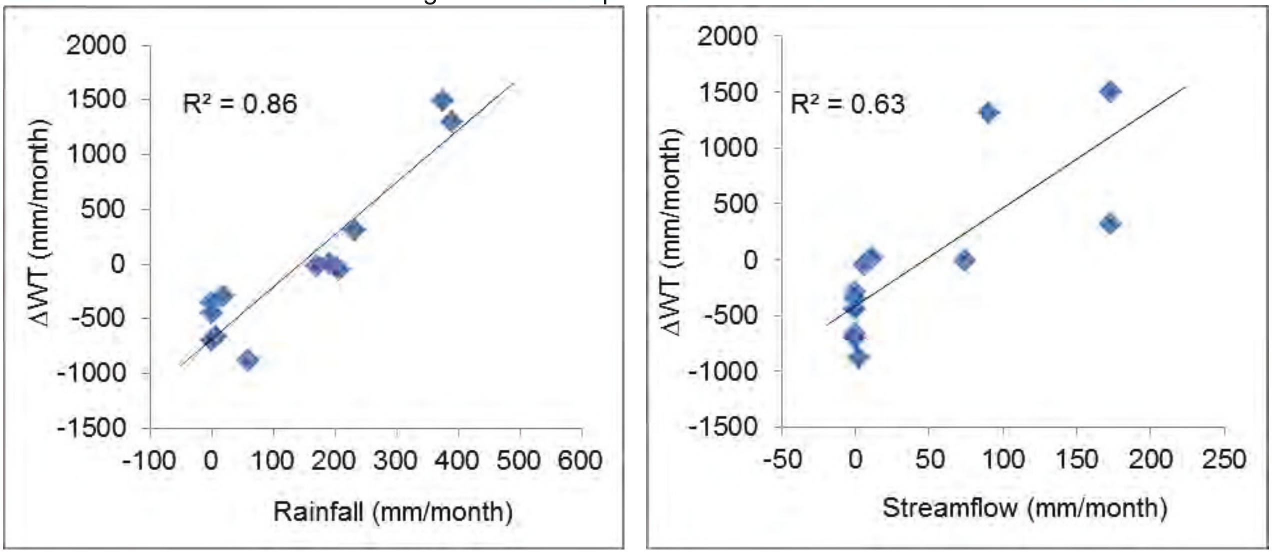

Figure 6. Correlation between rainfall, streamflow and change in water table (ΔWT) in Sukhuma District for the period of June 2015 to May 2016.

Soil moisture data derived from GLDAS at grid 13 correlated with the area-averaged monthly change in water table of 19 monitoring wells in Sukhuma District (Figure 7). The result shows good correlation between two datasets with an R^2 value of 0.9. This result also provides a potential for taking the further investigation of using data derived from GLDAS to support the future study of seasonal groundwater level fluctuation in Sukhuma District. Moreover, GLDAS also provides data for the large scale area; therefore, these data can be used to estimate the groundwater fluctuation and availability in Southern Laos.

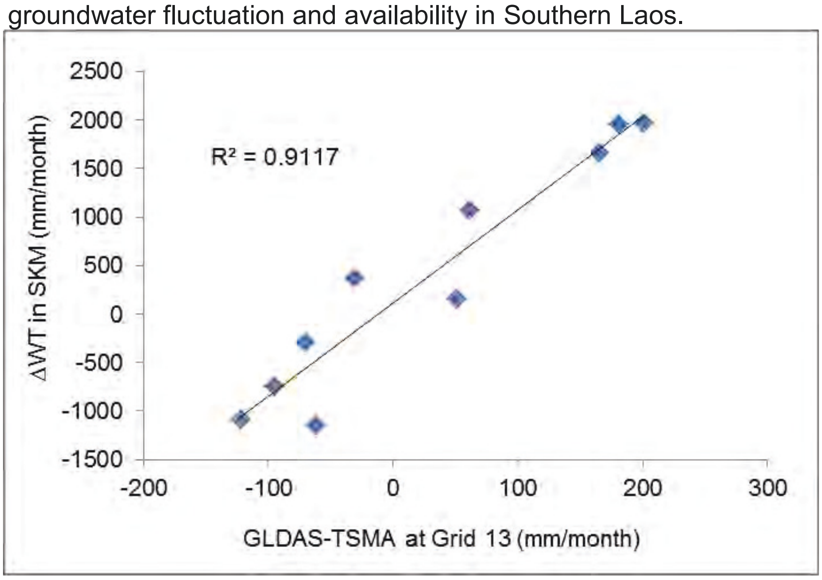

Figure 7. Correlation between the change in water table in Sukhuma District and the total soil moisture anomalies derived from GLDAS at the grid 13, which is covered by Sukhuma District boundary, for the period of June 2015 to March 2016.

In order to assess the possibility of utilizing the products from GLDAS for studying the groundwater in Sukhuma District and Southern Laos, the total soil moisture of 2 m depth derived from GLDAS at the GRACE footprint scale was correlated with the equivalent water height (EWH) or the total water storage (TWS) derived from GRACE at a GRACE footprint scale. This study found that soil moisture from GLDAS and GRACE-EWH correlates well with an R^2 value of 0.72 (Figure 8). Liesch & Ohmer (2016) also reported a strong correlation (R^2 = 0.74) between these two datasets for the Yarmouk basin in Jordan. GRACE satellite data has been widely utilised to determine the variations in groundwater storage in many countries, including the areas with limited field observation data (Shamsudduha et al, 2012). Therefore, the results of this preliminary assessment of using the products from GLDAS and GRACE show a great potential for conducting further of using these remotely sensed data to determine the long-term groundwater storage fluctuation in Sukhuma District and Southern Laos.

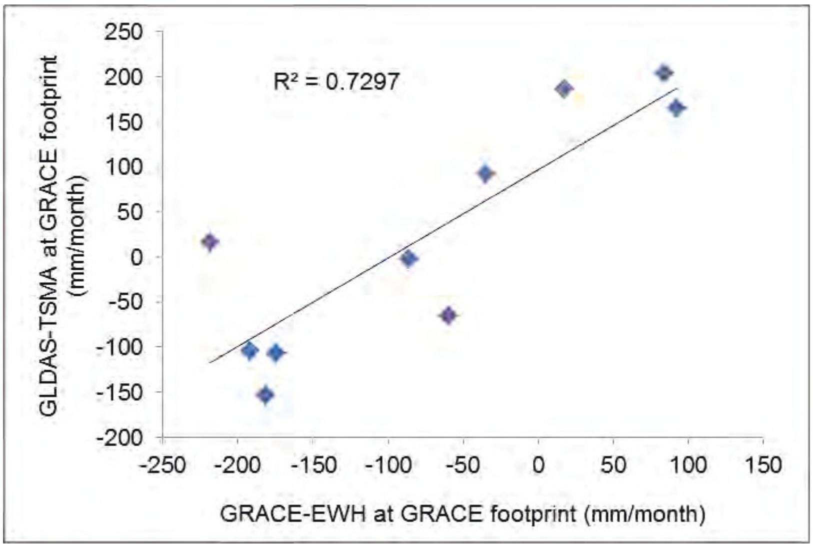

Figure 8. Correlation between the EWH derived from GRACE and the total soil moisture anomalies derived from GLDAS at the scale of GRACE footprint for the period of June 2015 to March 2016.

4 CONCLUSIONS

The observed trend of groundwater level in Sukhuma District during the period of June 2015 to May 2016 reflected not much overall decline as the groundwater levels in most of the observation wells at the end of May 2016 reach more or less the same levels as they were in June 2015. During the study period, the magnitudes of groundwater level fluctuation were different between west and north and south area of Sukhuma District. Moreover, this study also found that rainfall is a significant ($P < 0.01$) factor influencing the groundwater fluctuation in Sukhuma District. The delay between rainfall and groundwater level rise was estimated at about 4 week lags.

The soil moisture derived from GLDAS (grid 13) a grid of GLDAS (grid 13) has correlated with observed groundwater level in Sukhuma District with an R^2 value of 0.91 and also showed a good agreement between the soil moisture from a large area, which is the same as the GRACE footprint, and the GRACE-EWH with an R^2 value of 0.71. Further evaluation and study of GRACE and GLDAS data will be carried out to assist in groundwater study for this area.

Furthermore, for the future study of groundwater level fluctuation in Sukhuma District and Southern Laos, the data of groundwater abstraction should be collected, particularly from the bottled water factories. Also, the continued monitoring of groundwater levels and other hydrological variables in Sukhuma District is of great importance. This information will improve the accuracy of water balance analyses and will provide sufficient information for the long-term water resources management in the region.

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☒**Student Paper**

Water Infrastructure and the Environment Conference, 28 Nov – 2 Dec 2016, Millennium Hotel, Queenstown, New Zealand

Groundwater Recharge Estimation in Sukhuma District, Champasak Province, Southern Laos: A Preliminary Assessment

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Abstract

Southern Laos is undergoing economic and agricultural development, resulting in a large increase in groundwater and surface water use. However, these water resources are not known in detail. This study aims to investigate the groundwater and surface water interactions in the Sukhuma District of Champasak Province using a network of sixteen rain gauges and groundwater levels measurement points. Groundwater levels are measured weekly in eleven domestic wells, which are pumped irregularly, and also in five observation bores. Aquifer recharge occurs from direct infiltration of rainfall and also is derived using baseflow calculated from daily streamflow measurements at the re-established gauging station on the Khamouan River in Sukhuma District. The Khamouan River is connected to the groundwater in its lower reaches in both dry and wet seasons. Baseflow proportion to the total streamflow in the wet season 2015 has been estimated at 46%. The distribution of direct recharge has been mapped with ArcGIS and is spatially variable. Preliminary estimates of rainfall recharge have been calculated by the water table fluctuation method for 2015 but show a high degree of uncertainty related to the specific yield estimates. Time series analysis has confirmed the observed lag of some three to four weeks between the wet season start and rise in groundwater levels. These preliminary results indicate that there is close interaction between groundwater and surface water in the Sukhuma District. Further analysis will refine these results and extend them through remote sensing across southern Laos for application to integrated water resources management.

1. INTRODUCTION

Water is a vital natural resource for the environment and for socio-economic development. However, in many developing nations there is a lack of the data necessary to study the interaction between surface water and groundwater (GW-SW) for assessing sustainable water use. Laos is a developing country located in Southeast Asia. it is recognized as a water-rich country in the region, with fresh surface water resources estimated at 54,565 m^3 per annum per capita (FAO, 2011). About 80 percent of the country's area is mountainous, particularly in the north and east. In contrast, about 70 percent of the population live in lowland areas, which are at risk from floods and droughts. Groundwater is the main source for domestic water supply in the floodplain areas. In Southern Laos, for example, there are plans for developing groundwater for irrigation and water supply to alleviate dry season water shortages. However, an integrated assessment of the available surface and ground water resources in this region has been hampered by limitations in the available data. Groundwater data in the region is very limited although some rainfall and stream flow data are available from Lao government agencies, such as Department of Meteorology and Hydrology (DMH) and the Mekong River Commission (MRC). Fortunately, with the increasing number of remote sensing satellites, it is possible to improve estimation of groundwater and other components of hydrological cycle. For this study, the water balance equation will be used for assessing the interaction between groundwater and surface water in the area with limited field observation data, such as groundwater level, stream-flow, geology, and climate data.

2. METHODOLOGY

The water balance technique is crucial for assessing water resources sustainability (Mays, 2012). Water balances are used to identify the water movement through the hydrologic cycle and to investigate the interactions between surface water and groundwater (Todd & Mays, 2005). The water balance method has been used by many researchers on a variety of space and time scales, ranging from local scales to global scales (Mays, 2012, Scanlon *et al*, 2002, Todd & Mays, 2005).

According to Fitts (2002) and Mays (2012), the components of the water balance equation for a catchment commonly include the groundwater recharge (R) from rainfall and stream water on the catchment, the groundwater inflow (G_i), the groundwater outflow (G_o), the groundwater discharge to streams or baseflow (G_S), the evapotranspiration (ET), the groundwater abstraction (Q_w), the stream outflow (Q) from the catchment, all in terms of volume over a time interval. The fluctuation of total water storage (TWS) in the catchment (ΔS) can be estimated from the equation below:

$$\Delta S = R + G_i - G_o - G_s - ET - Q_w - Q \qquad (1)$$

2.1. Study Area

In Laos very few studies have been done on groundwater in terms of quantity, and not any scientific research on the seasonal fluctuations of groundwater and surface water interactions. A site, Sukhuma District, Champasak Province in southern Laos was selected for this study, where groundwater is the main source for domestic water use but there are very few studies of its occurrence. Sukhuma has more basic geological and hydrogeological data than other districts in Champasak Province, as well as elsewhere in southern Laos. Sukhuma is located in the Lower Mekong Basin on the flat land of Champasak Plain. Extensive irrigation development and rapid economic growth are anticipated in the region. Also, nearly 100 percent of households in the district use groundwater for their primary water supply (Vote *et al*, 2015).

The Khamouan River divides Sukhuma into two parts. The eastern part is the floodplain area, which is mainly used for agricultural activities, particularly rice paddy fields in the wet season, while the western side area of the Khamouan River is mostly forested. In addition, the Mekong River, the biggest river in Laos, lies to the east of Sukhuma. Figure 1 shows the location and physical features of Sukhuma.

2.2. Data Availability and Collection

Currently, the availability of input data for this study includes rainfall, stream stages, stream discharge, groundwater levels, and remote sensing data. Sources and available periods for these data are described in Sections 2.2.1 to 2.2.4.

2.2.1. Precipitation Data

Historical daily rainfall data in Sukhuma are available from January 2012 to July 2013 at 16 rain gauges. These rainfall data were collected by the previous project of the Australian Centre For International Agricultural Research (ACIAR) (Vote *et al*, 2014, Vote *et al*, 2015, Wade *et al*, 2015). A long record of rainfall data from 1993 to 2015 is also available from Sukhuma District Agriculture and Forestry Office (DAFO) and is used in this study. Also, this study continued the collection of rainfall data from the same 16 rain gauges (Table 1) from June 2015 to May 2016. More climatic data (wind speed, solar radiation, air temperature and relative humidity) and rainfall data in southern Laos will be collected from the Department of Meteorology and Hydrology (DMH), Ministry of Natural Resources and Environment (MONRE) in Vientiane Capital, if supporting funds become available.

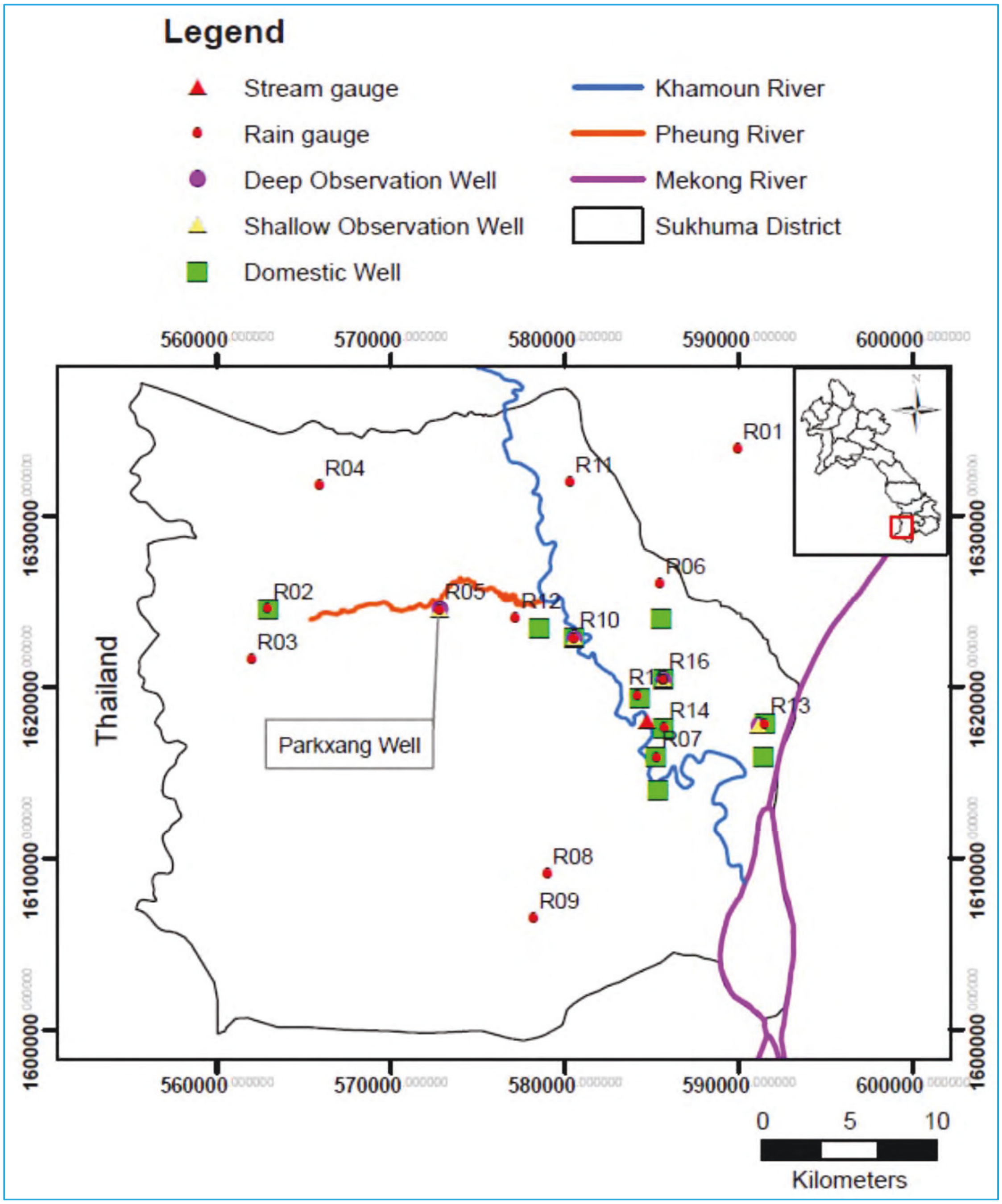

Figure 1 Location Map of Sukhuma, showing Wells, Rain Gauges and Stream Gauge.

Table 1. Name of Rain Gauges in Study Area

Code Number	Name of Rain Gauge	Latitude (m)	Longitude (m)
R01	Lakbeng	589922.00	1633861.00
R02	Hieng	562900.00	1624532.00
R03	Houay Pheung	561994.00	1621565.00
R04	Nondengnue	565894.00	1631761.00
R05	Parkxang	572788.00	1624493.00
R06	Bark	585457.00	1626008.00
R07	Khoknongboua	585254.00	1615850.00
R08	Nongdengtai	578996.00	1609042.00
R09	None Ueng	578191.00	1606442.00
R10	Pakor	580519.15	1622802.21
R11	Nongphanvong	577141.57	1623993.17
R12	Nonyang	576770.00	1624160.00
R13	Boungkeo	591483.00	1617810.00
R14	Thubcharm	585689.00	1617589.00
R15	Phonpheung	584144.00	1619484.00
R16	Sukhuma	585663.00	1620394.00
R17	Sukhuma DAFO	584657.00	1618041.00

2.2.2. Stream-flow Data

Historical stream stage data for the Khamouan River are available from 1997 to 2006. In order to continue collecting the stage data for the Khamouan River, particularly for this study, a new stream gauge was established on 27 May 2015. The discharge observations in Khamouan River from June 2015 to May 2016 are also available. Location of the gauge is presented on Figure 1.

2.2.3. Groundwater Data

Historical data on groundwater levels, electrical conductivity and temperature in Sukhuma district at weekly intervals are available from October 2011 to June 2013. The groundwater levels were monitored for eleven domestic wells and five paired deep and shallow observation wells by the previous ACIAR project and used by Vote *et al* (2014). From June 2015 to May 2016, water table data have been collected again for the same wells. Figure 1 shows the bore locations which are monitored for this study. A comparison of water table elevations for the wet season 2015 along the profile of the Khamouan River is shown in Figure 2. It can be seen that the lower part of the river is connected to the water table throughout the wet and dry seasons, whereas the upper portion is disconnected.

River stages are compared with groundwater levels near the stream gauge for dry season (May 2015) and wet season (August and October 2015) in Figure 2. The water table matches the level of water above the bed of the river on each date. The Khamouan River in this reach flows through a deep channel incised into the extensive sandy alluvial deposits, mapped by Japan International Cooperation Agency (JICA, 1995). The correspondence of the levels may reflect the influence of bank storage.

2.2.4. Remote Sensing Data

The Gravity Recovery and Climate Experiment (GRACE) gravity satellite program was jointly developed by the National Aeronautics and Space Administration (NASA) of the United States and the German Aerospace Centre (DLR) and launched in March 2002 to measure changes in the earth's gravity field (Tapley *et al*, 2004). These changes are caused by movement of mass in surface water, soil water and ground water. GRACE measurements are processed mathematically to extract estimates of total water storage (TWS) expressed as equivalent water height (EWH). GRACE data have a spatial resolution of about 200,000 km^2, or ~400 km.

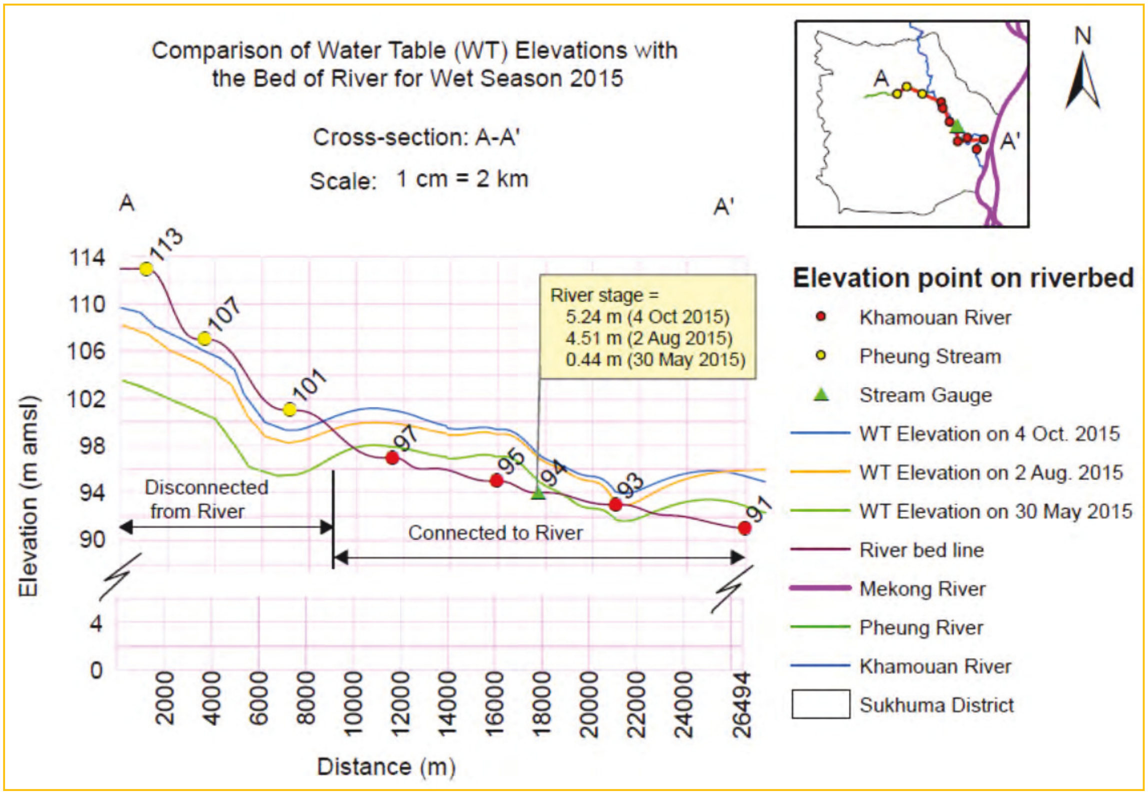

Figure 2 Comparison of Water Table Elevation with Khamouan River Bed Elevation for the Wet Season 2015.

The GRACE-derived TWS consists of a combined total storage of groundwater, soil moisture and surface water (including lakes, reservoirs, and in river water) (Leblanc *et al*, 2009). GRACE satellite data has been widely utilised to determine the variations of groundwater storage in many countries, including the areas with limited field observation data (Shamsudduha *et al*, 2012). For about 13 years, many studies have used data derived from GRACE to estimate the variations of hydrological processes. These include changes in groundwater storage (Rodell *et al*, 2007, Shamsudduha *et al*, 2012) and correlations with peak observed water level during flood season (Steckler *et al*, 2010). We have observed good correspondence between Mekong River flood levels in September 2011 at Pakse and EWH from GRACE.

Since field observations of soil moisture are not available in Sukhuma district and in the districts nearby, reliance is placed on the remote sensing data from NASA's Earth Science Data System website [https://earthdata.nasa.gov/] or data derived directly from the Global Land Data Assimilation System (GLDAS) web link [http://gdata1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=GLDAS 025_3H] with a spatial resolution of 0.25 degree (~28 km) (Rui & Beaudoing, 2015). The GLDAS version 1 (GLDAS-1) product is being investigated from this web link and is being considered for this study. These data are simulation products from the National Centers for Environmental Prediction/Oregon State University/Air Force/Hydrologic Research Laboratory. This website provides soil moisture data for four soil depth layers ranging from 0 to 10, 10 to 40, 40 to 100, and 100 to 200 cm. The unit of soil moisture data is kg/m^2. Moreover, it also allows users to download rainfall, total evapotranspiration, total canopy water storage, and other climatic data. Therefore, these satellite data will be analysed and validated with field data.

Initial results from GRACE TWS data and GLDAS soil moisture data show good correspondence with field observations in both the Sukhuma area and Southern Laos. However, this investigation utilised only simple comparison techniques. Therefore, more sophisticated analysis is required for future work in order to increase the precision using satellite data from GRACE and GLDAS.

2.3. Groundwater Recharge Estimation

2.3.1. Estimate Groundwater Recharge from Groundwater Level Measurements

The in-situ groundwater level observations in Sukhuma from October 2011 to June 2013 and from June 2015 to May 2016, provided useful information to estimate groundwater recharge by the water table fluctuation (WTF) method. The WTF method estimates groundwater recharge from groundwater level height increases in observation wells during/after a rainfall event when multiplied by the specific yield (Healy & Cook, 2002). The method is very sensitive to the value of specific yield (S_y).

A reliable estimate of specific yield is commonly determined from the analysis of pumping tests with observation wells. However, these are non-existent in Sukhuma and in southern Laos. The Parkxang deep observation well was pumped and levels in a nearby domestic well were monitored. The value of S_y was estimated at 1.20×10^{-2}. For comparison, S_y in the study area was estimated from groundwater recession hydrograph at each well (Udayakumar *et al*, 2015). The range of S_y by this method is from 10^{-3} to 10^{-2}. Vouillamoz *et al* (2016) estimated a similar range of values for a sandstone aquifer in the same geological formation in North-West Cambodia. Use of this range in Sy values give a range of estimated of recharge, as a percentage of rainfall, between 2.3% and 3.3%. Future work will attempt to refine these estimates.

2.3.2. Estimate Groundwater Recharge Using Cumulative Groundwater Fluctuation

Moon *et al* (2004) estimated groundwater recharge by comparing the water table fluctuations with cumulative rainfall and analysing how groundwater level changes related to corresponding rainfall. The assumption for this WTF method is that all increases in water table are affected by rainfall and does not incorporate the G_i, G_o and G_s terms of the water balance equation. Groundwater recharge is quantified as the ratio of the rise in groundwater level to the cumulative rainfall during the rainy period.

In this research, followingMoon *et al* (2004), a relationship between cumulative rainfalls and groundwater level changes for each domestic well in the wet season of 2015 was developed. A lag between groundwater fluctuations and rainfall was found and was studied by time series analysis.

The relationships between rainfall and groundwater levels for the domestic bores in Sukhuma district were analysed by using the Cross-correlation Function (CCF) in SPSS software. Figure 3 is an example from the Sukhuma domestic well and a nearby rain gauge. The peak at lag 3 between the two series can be interpreted as an average lag time of three weeks between the start of the rainy season and rise in water level in the Sukhuma domestic bore (Figure 3). The cross-correlation coefficient of the two time series is 0.398. This result will be used for estimating groundwater recharge by using cumulative groundwater fluctuation method in the next steps of this study.

2.4. Baseflow Separation

A baseflow separation method, using the Chapman filter (Chapman, 1999), is applied in this research to estimate the groundwater discharge to the stream, G_s. The input data for this method is the daily streamflow. In this study, daily flow data are calculated from daily stage observations at the stream gauge and from two field discharge measurements in the Khamoun River. Baseflow proportion to the total streamflow in the wet season 2015 has been estimated at 46%.

3. CONCLUSIONS

The scarcity of field data observation is a remaining challenge for studying the interaction between groundwater and surface water in any developing country. Groundwater data are very limited compared to stream-flow and rainfall data. More importantly, the aquifer systems are not yet clearly identified not only in the study area but also in the rest of the country. Therefore, this research is developing a methodology for assessing the connection between groundwater and surface water for the region with limited observation data by combining the availability of field data with remote sensing data from GRACE and GLDAS.

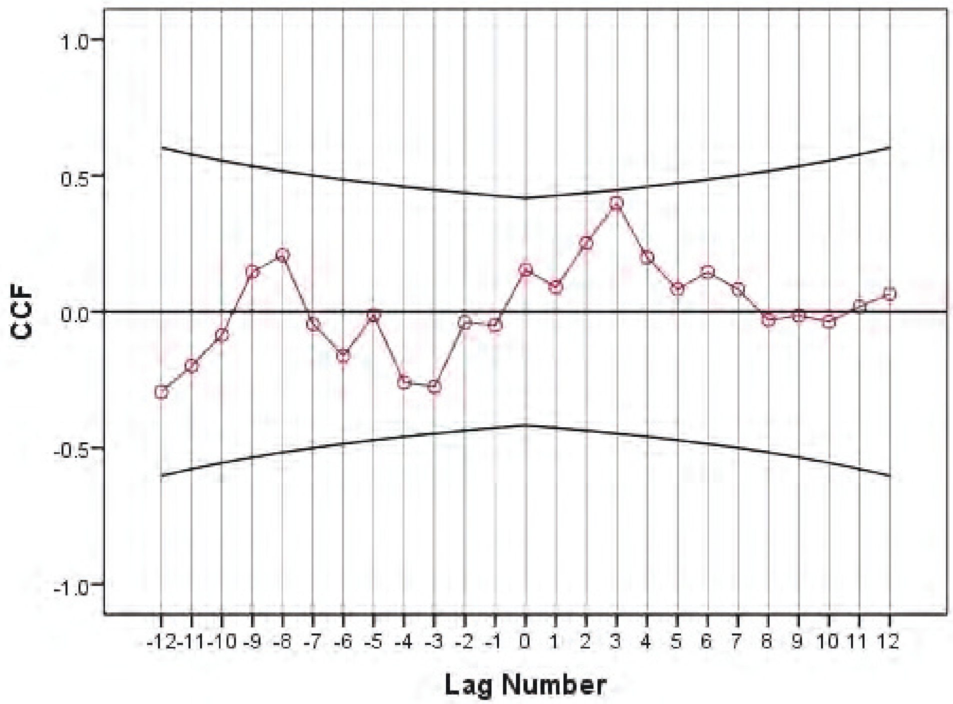

Figure 3 Cross-correlation between Weekly Rainfall and Weekly Water Table Fluctuations at Sukhuma Domestic Well During 31 May to 1 Nov. 2015.

4. ACKNOWLEDGEMENTS

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Seasonal groundwater storage fluctuation in Sukhuma District of Southern Laos by field assessment and remote sensing

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Groundwater is the main source of domestic water supply in many developing regions. In Sukhuma District of Southern Laos, for example, groundwater pumping has been increasing in recent years due to population growth and increased climate variability. Within the context of limited data on groundwater resources and the essential need of such information for their sustainable management, this research aims at quantifying the seasonal changes in groundwater storage in Sukhuma District by combining sparse in-situ measurements with remote sensing data. Groundwater levels, rainfall and streamflow were measured in the field. Total water storage (TWS) data from the Gravity Recovery and Climate Experiment (GRACE) satellites, soil moisture, canopy water storage and other hydrological data derived from the Global Land Data Assimilation System (GLDAS) and rainfall data derived from the Tropical Rainfall Measurement Mission (TRMM) were downloaded for statistical analysis. The period of this study was from Jan 2015 to March 2016. The methodology was based mainly on the water balance equation and the regression method. The groundwater storage fluctuations were estimated from the changes in TWS by calculating the other components of the water balance equation from GLDAS and TRMM. The results were then used to validate the water balance from in-situ observation data in Sukhuma District using a regression method. This research provides a feasible and cost-effective approach to estimating seasonal groundwater storage fluctuations and assessing the data needed for planning sustainable groundwater resources development in regions with sparse field observation.

WATER BALANCE METHOD ESTIMATION OF GROUNDWATER RECHARGE IN SUKHUMA DISTRICT OF SOUTHERN LAOS

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An adequate understanding of the (actual) groundwater recharge is necessary for sustainable groundwater resource management. The objective of the research presented herein is to apply a water balance model for the Sukhuma District of Southern Laos using the combination between field observation data and alternative data sources to estimate annual groundwater recharge for water years 2015-16. The availability of field observation data on rainfall, streamflow, groundwater levels, and groundwater abstraction is limited. To supplement these limited information, soil moisture and evapotranspiration data were obtained from the Global Land Data Assimilation System database. Analysis of this data indicates that the annual groundwater recharge in Sukhuma is approximately 3% (49 mm) of annual rainfall. This result is within the range of annual groundwater recharge (0.5 – 4% of annual rainfall) estimated by researchers in the north-west of Cambodia, where similar geological formations to those in Sukhuma District are found. However, the result of the current study contradicts with the results derived in previous studies conducted in the Sukhuma District, where the annual groundwater recharge was estimated at 12% of annual rainfall in 1994-95 and 23% of annual rainfall in 2012-13. Previous estimates were derived based on a simple hydrologic water balance of surface water and groundwater systems and also by applying water table fluctuation technique. However, in present study a complex conceptual model of the groundwater system is formulated considering variability of geological stratifications, aquifer conditions and their properties to estimate the (actual) recharge. Therefore, the groundwater recharge estimated from this study shows a lower recharge rate (~3%) than outcomes from the previous studies. Also, this estimate can be considered as a representative value of feasible recharge in the study area while planning further groundwater development.

Keywords: Groundwater recharge, water balance, Sukhuma District, Laos

Comparison of Seasonal Total Water Storage Variations from Grace with Groundwater Levels, Stream Flow and Soil Moisture in Southern Laos

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Abstract

The Gravity Recovery and Climate Experiment (GRACE) gravity satellite program was launched jointly by the National Aeronautics and Space Administration (NASA) of the United States and the German Aerospace Centre (DLR) in March 2002 to measure changes in the earth's gravity field (Tapley et al. 2004). The movement of mass in surface water, soil water and ground water causes these changes. GRACE measurements are processed mathematically to extract estimates of total water storage (TWS) expressed as equivalent water height (EWH) with a spatial resolution of about 200,000 km^2. In 2013, a new website for GRACE was developed by The Australian National University (ANU) using the spherical harmonic fields of the French Groupe de Rechercheen GéodesieSpatiale (GRGS). This website provides a Data Visualisation Tool (DVT) by which users can estimate the EWH in a user specified region (polygon) or point with a spatial resolution of about 62,500 km^2. GRACE data has been widely utilised to determine the variations of groundwater storage in many countries. However, this has not yet been implemented in Laos. Therefore, the main objective of this study is to investigate the feasibility of applying GRACE satellite data to estimate total groundwater storage in Southern Laos by comparing time series data of GRACE-derived TWS with groundwater levels, streamflow observations and soil moisture. A basin scale of about 25,000 km^2 was utilised to investigate the GRACE-derived total water storage correlation with in situ groundwater levels and measured streamflow in southern Laos, one of the main target areas for agricultural development. The total groundwater availability in this area is currently not yet known exactly. This study presents the first direct comparison of total water storage derived from GRACE satellite missionwith in situ hydrological monitoring. Monthly time series of soil moisture derived from the Global Land Data Assimilation System (GLDAS) and TWS drawn from GRACE between November 1, 2011 and April 30, 2013 are compared with groundwater levels from a piezometer network in Sukhuma district and Mekong River flow at Pakse hydro-meteorological station in Champasak Province, Southern Laos. Moreover, seasonal soil moisture maps derived from GLDAS are also compared with surface soil, land use and vegetation cover maps. The results illustrate that the GRACE-derived TWS agrees with the on-site groundwater table and streamflow measurements. In addition, comparison between soil moisture derived from GLDAS and measured groundwater table elevation in Sukhuma district and flow at Pakse station demonstrates similar seasonal fluctuations. The comparison between seasonal soil moisture maps and surface soil and vegetation maps shows that the highest volumes of soil moisture are usually found in Shrub land areas underlain by sandy loam soils. These preliminary results could be useful for estimating total groundwater storage variations and availability from GRACE data for Sukhuma district and Southern Laos in the future.

Keywords: GRACE, GLDAS, Seasonal variations, Total Water Storage, Soil moisture, Groundwater levels, Southern Laos

GRACE detection of seasonal variations in total water storage in southern Lao PDR

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Introduction

The Gravity Recovery and Climate Experiment (GRACE) gravity satellite program was jointly developed by the National Aeronautics and Space Administration (NASA) of the United States and the German Aerospace Centre (DLR) and launched in March 2002 to measure changes in the earth's gravity field (Tapley et al. 2004). These changes are caused by movement of mass in surface water, soil water and ground water. GRACE measurements are processed mathematically to extract estimates of of total water storage (TWS) expressed as equivalent water height (EWH). GRACE date have a spatial resolution of about 200,000 km^2, or ~400 km.

In 2013, a new website for GRACE (Darbeheshti et al. 2013) was developed using the spherical harmonic fields of the French Groupe de Rechercheen Géodesie Spatiale (GRGS). This website provides a Data Visualisation Tool (DVT) by which users can estimate the EWH from a user specified region (polygon) or point (Figure 1). The precision of areal and point data derived from the DVT is not clear. However, qualitative, seasonal variations in EWH in a small region in Southern Laos were mapped with the DVT. Also, time series of point measurements of EWH at Pakse were compared graphically with streamflow measurements of the Mekong River at Pakse.

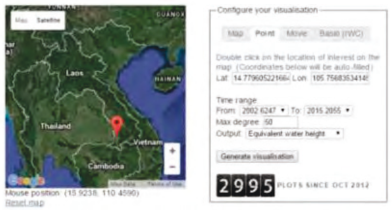

Figure 1: Data entry in the ANU GRACE DVT (Source: http://grace.anu.edu.au/evasph.php)

Study Area

Many studies concluded that GRACE offered satisfactory results at the spatial scale of about 200,000 km^2. However, a region about 25,000 km^2 was utilised to investigate the GRACE detection of TWS changes in Southern Laos. Sukhuma district is situated in this region (Figure 2). Southern Laos is one of the main target areas for agricultural development. However, floods and droughts often occur in this area and availability of water resources is not yet known exactly.

The study area consists of 32.29 percent of sandy loam which is the highest proportion in the area, and follows by clay (25.46 %), loam (23.81 %) and loamy sand (10.87 %). The highest proportion of land use area is covered by shrub land (32.83 percent). The deciduous broadleaf forest covers 24.39 percent of total area and 20.66 percent for dipterocarps. The crop land area covers 16.32 percent. Data from Ministry of Agriculture and Forestry, Lao PDR (MAF, 2000, 2010)

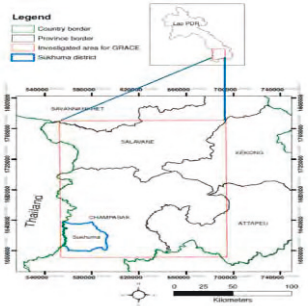

Figure 2: Study area map

Methods and Results

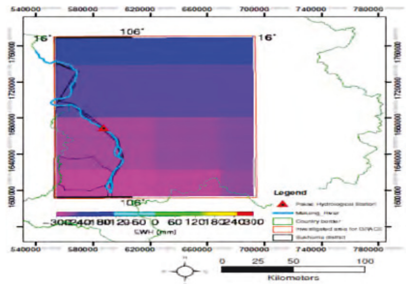

Figure 3: EWH map for April 2011(dry season)

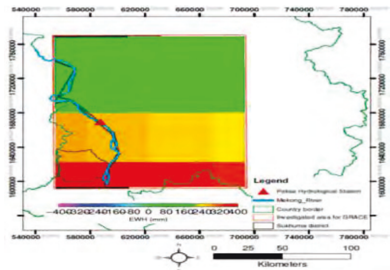

Figure 4: EWH map for September 2011(wet season)

The EWH map of April and September 2011 shows that the area with the lowest and the highest EWH are in the southwest corner of the region, which is in the same area including Sukhuma district. These EWH maps depict that GRACE can detect the seasonal variations in TWS. In the wet season loam has the highest EWH and clay has the lowest EWH but in the wet season loam has the lowest EWH. The influence of land-use vegetation modifies TWS so that EWH in each season is highest on sandy loam and crop land.

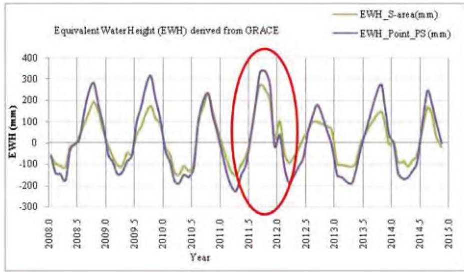

Figure 5: Comparison of the EWH derived from polygon and points during 2008-2014

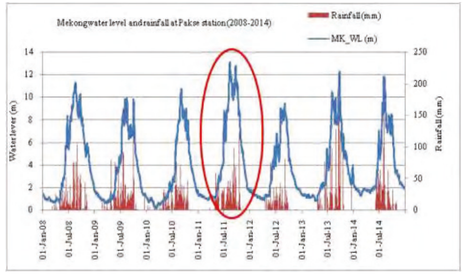

Figure 6: Rainfall and Mekong (MK) water level (WL) at Pakse station during 2008-2014

The time series data of EWH derived from a polygon (25,000 km^2) and a point (at Pakse hydro-meteorology station) from the ANU GRACE DVT are illustrated in Figure 5. These line graphs show the highest value of EWH is detected by GRACE in 2011. The Mekong River Commission (MRC), MRC (2011), reported that serious floods occurred in central and southern Lao PDR in 2011. These floods were caused by rising of water levels at some stations along Mekong River that exceeded the danger level, for instance, the highest water level at the Pakse (PS) hydrological station in Champasak province was recorded in 2011 (MRC 2011).This implies that GRACE satellites could detect the peak flood level in this area quite well.

Conclusions

- GRACE can detect the seasonal EWH flux and the extreme flood events in Southern Lao PDR. This could mean that GRACE data can be used to estimate the total groundwater, surface water and soil moisture in southern Lao PDR and/or Sukhuma area.
- The proportion of soil and land use types could have a high potential influence on the EWH values.

Future work will:

- apply other GRACE data sources to estimate total groundwater availability in southern Laos;
- utilise the Global Land Data Assimilation System (GLDAS) data and land model to estimate soil water in study area;
- investigate how to minimise the errors in GRACE data.

Acknowledgement

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References

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MAF 2010, Land use map of Lao PDR.

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MRC 2011, *Flood Situation Report, November 2011, MRC Technical Paper No. 36*, Mekong River Commission, Phnom Penh, Cambodia, viewed 28 August 2015, <http://www.mrcmekong.org/assets/Publications/technical/Tech-No36-Flood-Situation Report2011.pdf>.

Tapley, B.D., Bettadpur, S., Watkins, M. & Reigber, C. 2004, 'The gravity recovery and climate experiment: Mission overview and early results', *Geophysical Research Letters*, vol. 31, no. 9.

Appendix 2: Climate data from the Pakse Climate station

Table 1: Locations, coordinates and ground elevations of the climate and river gauge stations in the Pakse District

No.	Station name	Latitude (°)	Longitude (°)	Elevation (m AMSL)
1	Pakse climate station	15.13	105.78	103
2	Mekong River hydro-met station	15.09	105.81	87

Climate data, including air temperature, relative humidity, pan evaporation, sunshine duration and wind speed, are not available at the Sukhuma District climate station. Thus, daily climate data observed at the Pakse climate station from 2000 to 2016 were obtained from the Department of Meteorology and Hydrology in Vientiane Capital and used for this study. The duration of available climate data at the Pakse station and all data obtained for the current study are presented in Table 2. Locations for these data monitoring points are shown in Figure 1. The daily climate data measured at the Pakse station from 2000 to 2016 are provided in Appendix 5. A brief description of the annual average for each climate variable is discussed in this appendix (Appendix 2) as following paragraphs.

Table 2: Data availability for the current study.

Variable	Hydrological Year																						
	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
1. Data measured at the Pakse Climate station																							
1.1. Air temperature																							
1.2. Relative humidity																							
1.3. Pan evaporation																							
1.4. Sunshine hours																							
1.5. Wind speed																							
1.6. Rainfall at Pakse																							
1.7. Mekong River flow at the Pakse																							
2. Data measured in the Sukhuma District																							
2.1. Rainfall data at SKM Office																							
2.2. Khamouan River flow																							
2.3. Rainfall data at the ACIAR Project's 16 rain gauges																							
2.4. Groundwater levels, EC, T_{GW}																							

Note: SKM = Sukhuma District, ACIAR = Australian Centre for International Agricultural Research, EC = Electrical Conductivity, T_{GW} = Temperature of Groundwater

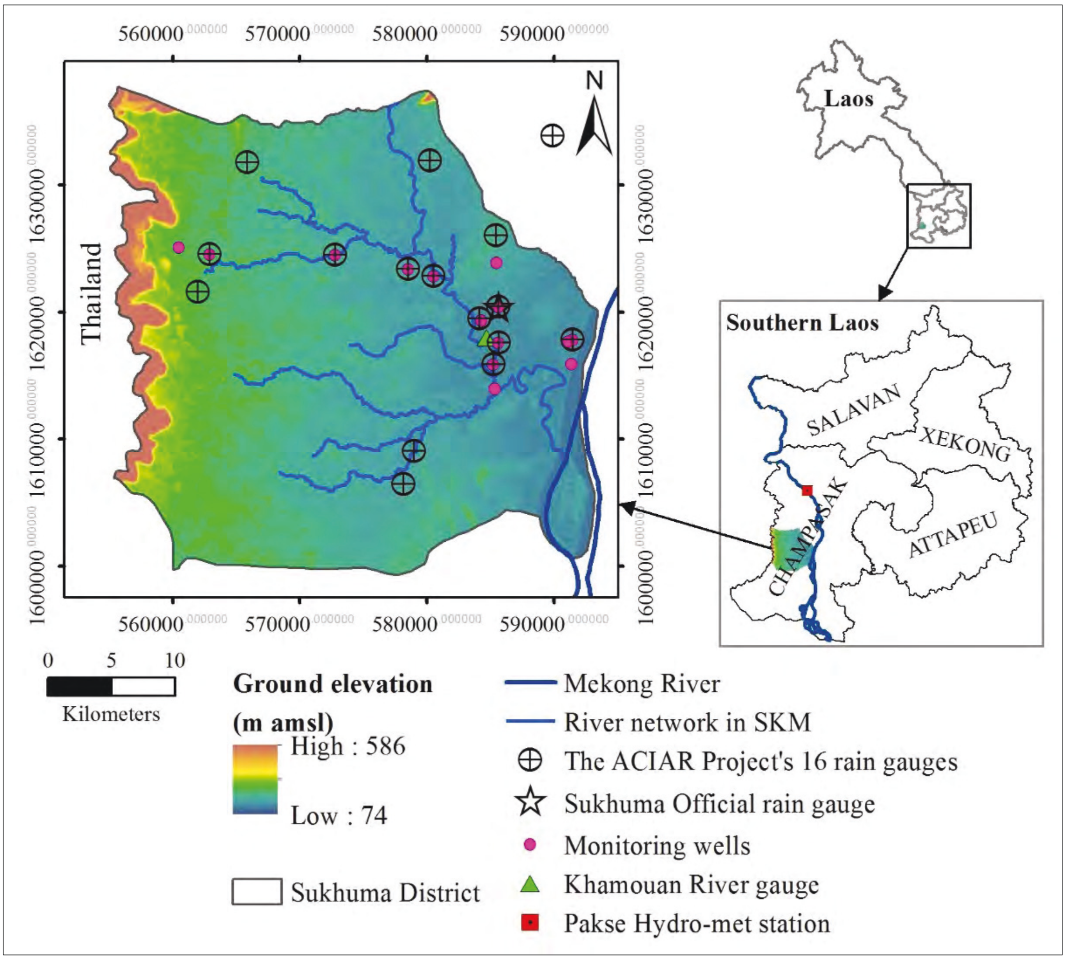


Figure 1: Locations of data monitoring points in the Pakse and Sukhuma Districts.

Air temperature data at the Pakse climate station from 2000 to 2016 were obtained for this study *(Table 2)*. The trend of annual average air temperature from 2000-01 to 2015-16 was slightly increasing at a rate of 0.007°C/year. Increasing long-term annual average air temperature can lead to rising evapotranspiration in the region. This phenomenon may reduce the availability of potential water infiltration into groundwater storage. The annual average air temperature from 2000-01 to 2006-07 is likely stable, but it shows high variability from 2007-08 to 2015-16 *(Figure 2)*. Average annual mean air temperature from 2000-01 to 2015-16 is 27.90°C with a standard deviation of 0.39°C. The annual minimum and maximum air temperature are 27.20°C in 2013-14 and 28.60°C in 2015-16, respectively. However, the monthly minimum mean and monthly maximum mean air temperature for this period are 22.50°C and 33°C, respectively. Average monthly mean air temperature from 2000-01 to 2015-16 was 27.90°C with a standard deviation of 1.70°C. The monthly minimum mean and monthly maximum mean air temperature commonly occurred between December and January and between April and May, respectively.

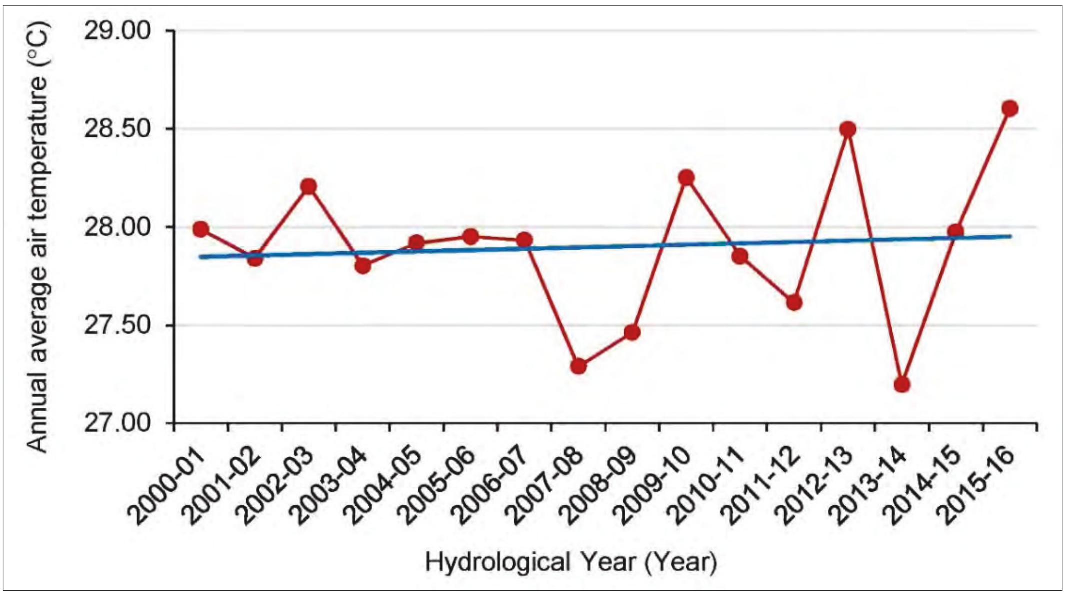


Figure 2: Annual average temperature at the Pakse climate station from 2000-01 to 2015-16

The annual average relative humidity (RH) data shows a slightly increasing trend from 2000-01 to 2015-16 at a rate of 0.03% per year. During the same period, the annual mean RH depicted high fluctuations in some periods as shown in Figure 3. The minimum annual mean RH was around 68% in 2010-11 and the maximum annual mean RH was about 72%. The average annual mean RH from 2000-01 to 2015-16 was 70% with at a standard deviation of 1.24%. The fluctuation of monthly average RH ranges from minimum monthly average RH of 51% to maximum monthly average RH of 86%. The standard deviation of monthly average RH was nearly 10%.

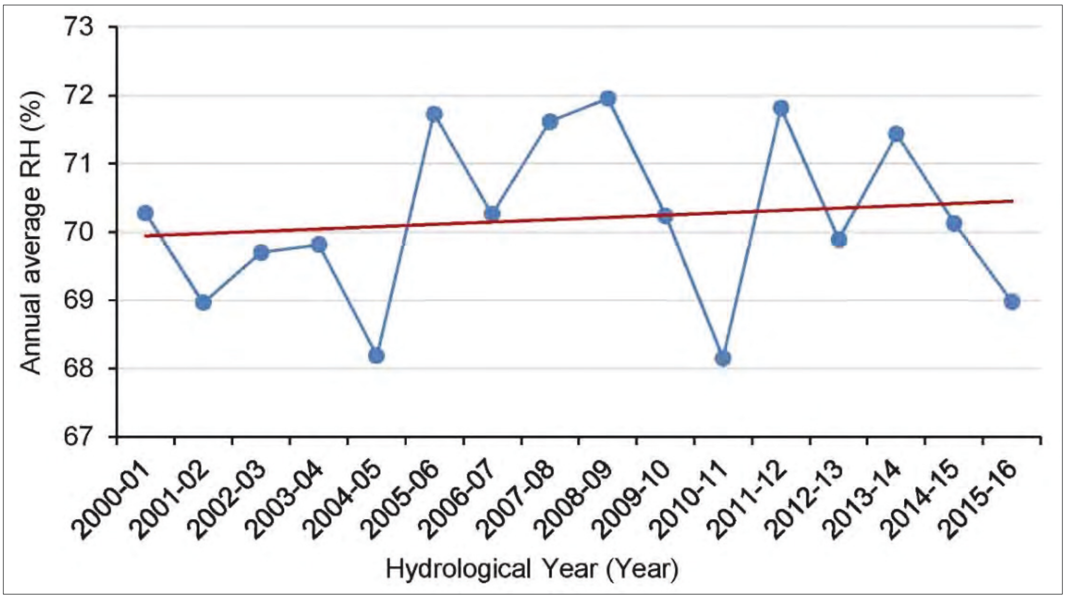


Figure 3: Annual average relative humidity at the Pakse climate station from 2000-01 to 2015-16

The plot in Figure 4 of annual pan evaporation measured at the Pakse climate station from 2000-01 to 2015-16 shows a rising trend at a rate of 23 mm/year. The increasing trend of pan evaporation may correspond with the rise in annual mean air temperature in the region. The minimum and maximum annual pan evaporation during this period were approximately 900 mm in 2002-03 and 1600 mm in 2010-11, respectively. The average annual pan evaporation from 2000-01 to 2015-16 was 1400 mm/year with a standard deviation of 190 mm.

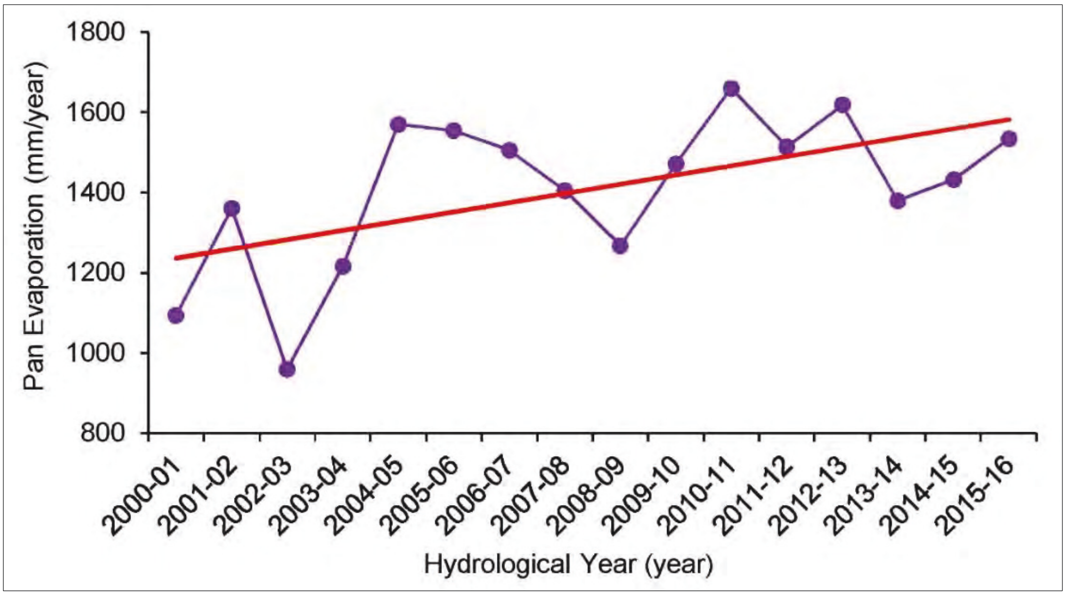
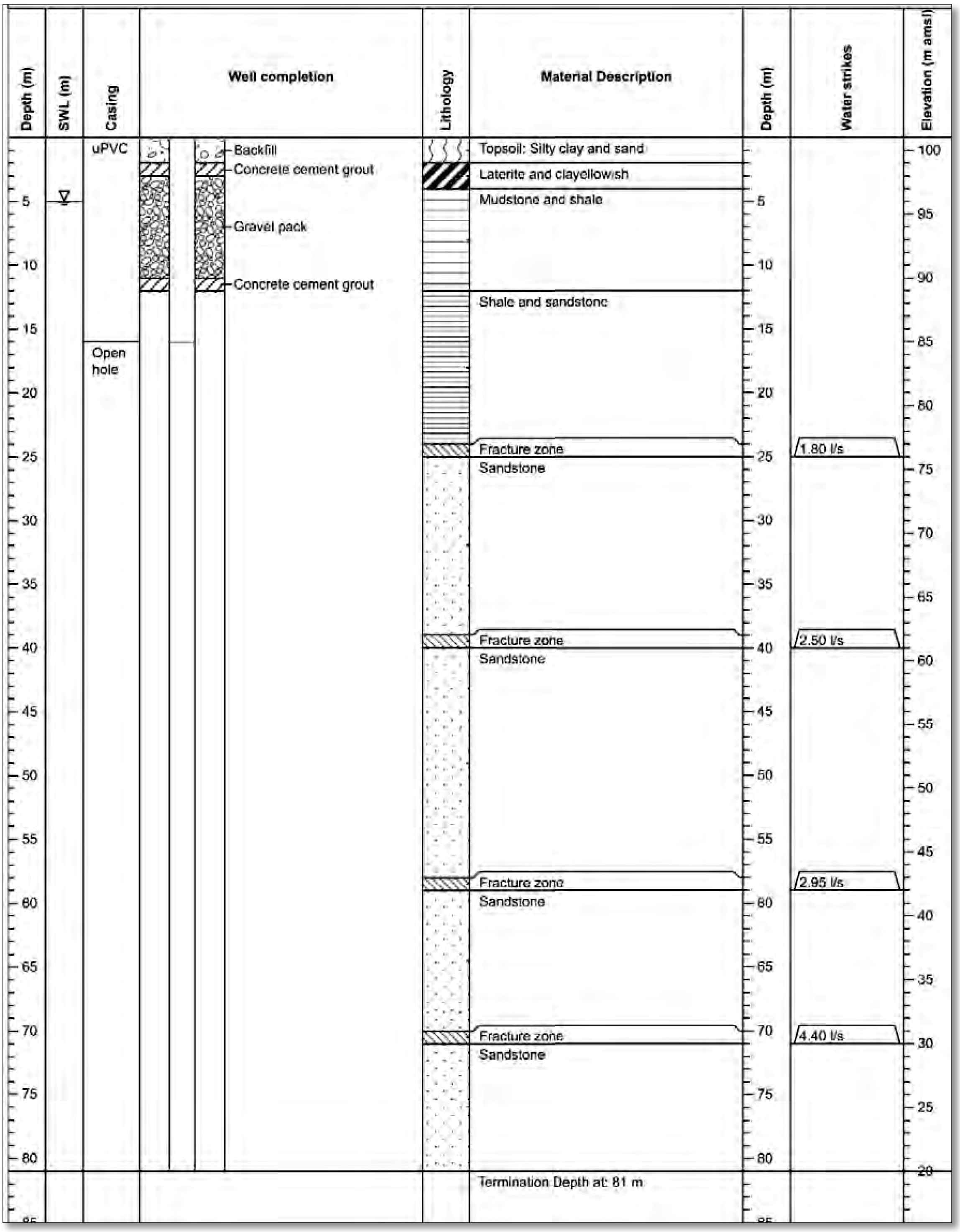


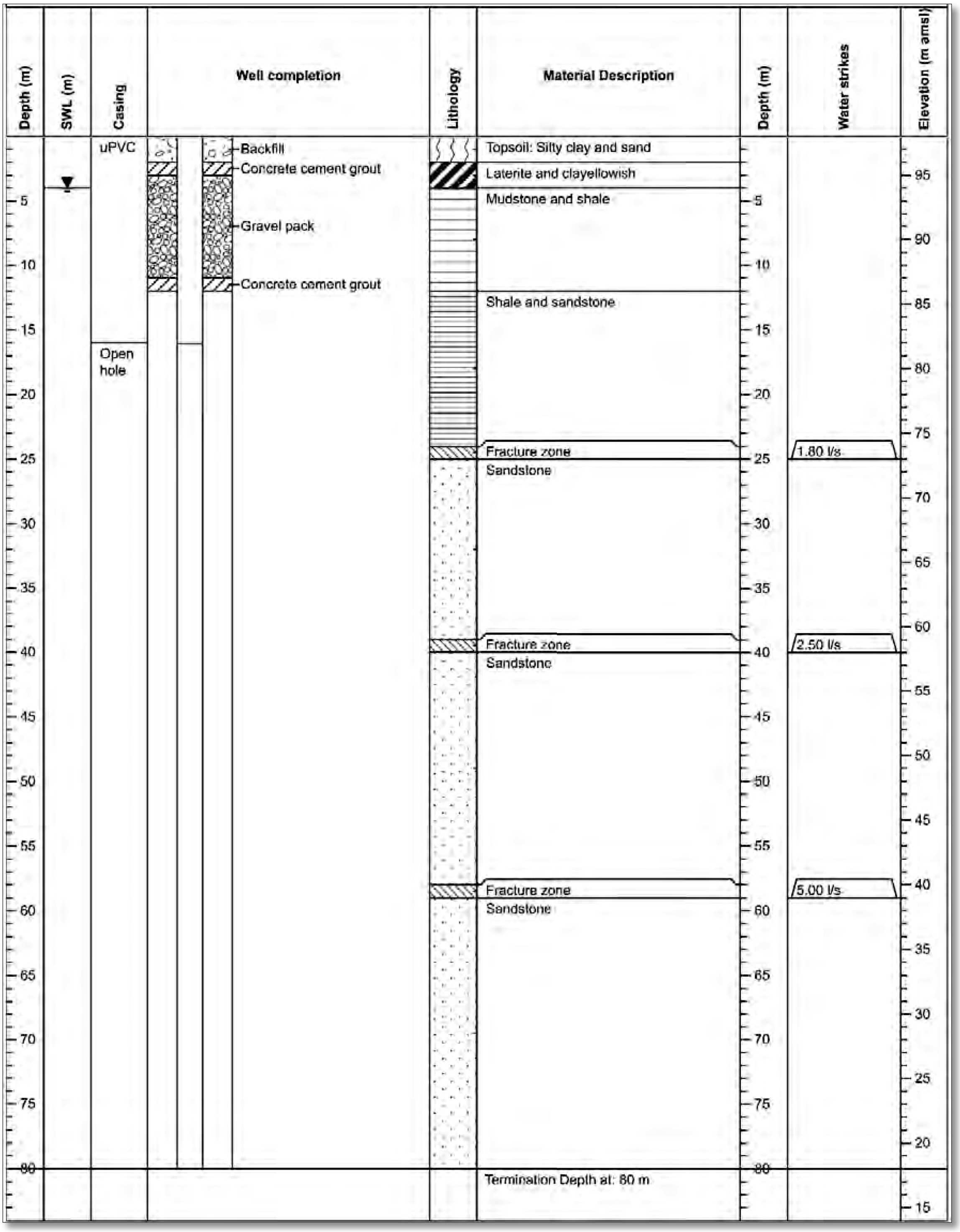
Figure 4: Annual pan evaporation at the Pakse climate station from 2000-01 to 2015-16

Appendix 3: Well logs in Sukhuma District

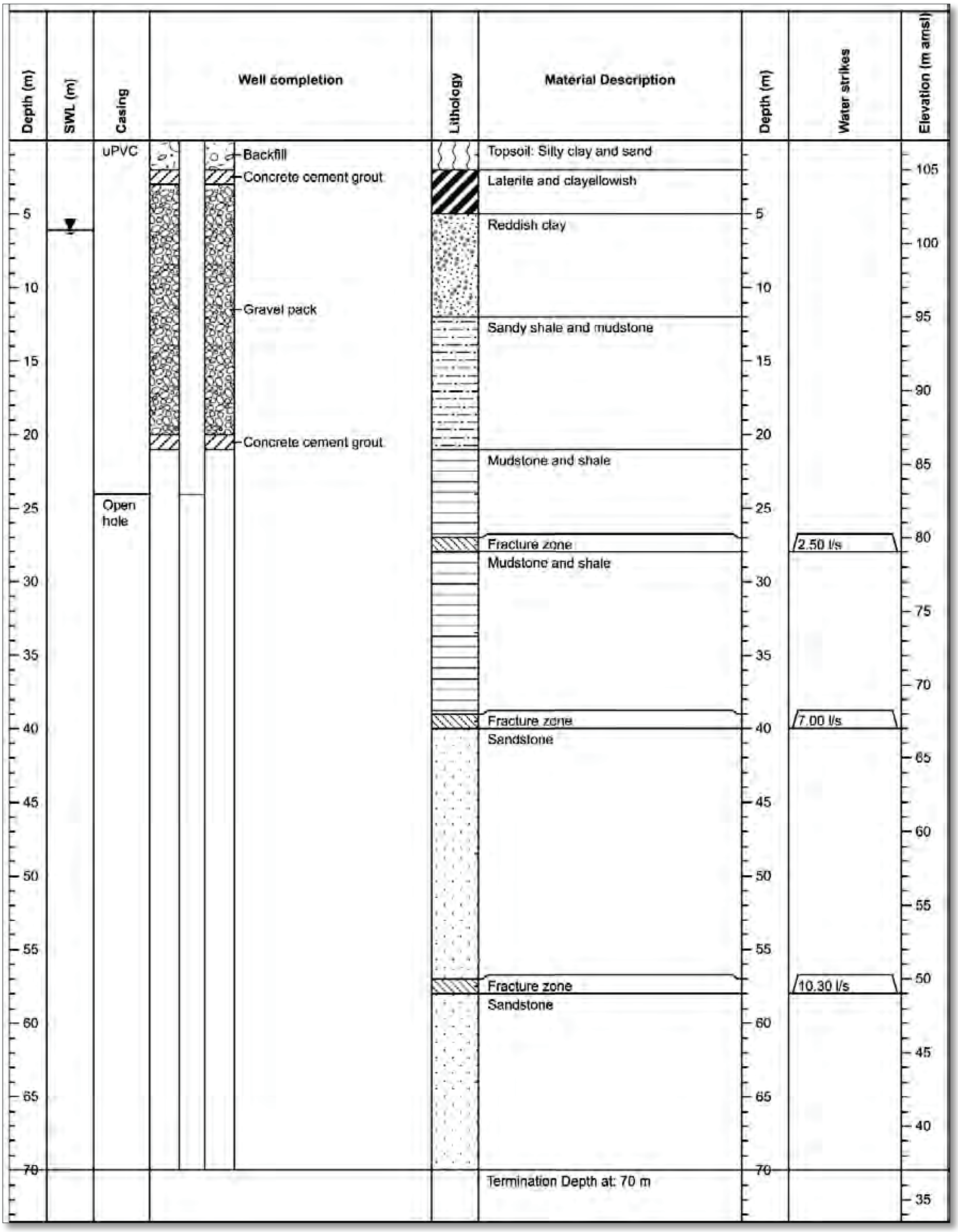
Bore name:	Boungkeo Deep Observation Bore	Monitoring bore	Yes
Bore ID code:	BKeo-DOB	Static Water Level (SWL)	5 m
Easting (m):	591103.94	Depth	81 m
Northing (m):	1617673.77	Elevation	101 m amsl
Data source:	Champasak Provincial Health Department (2012)		



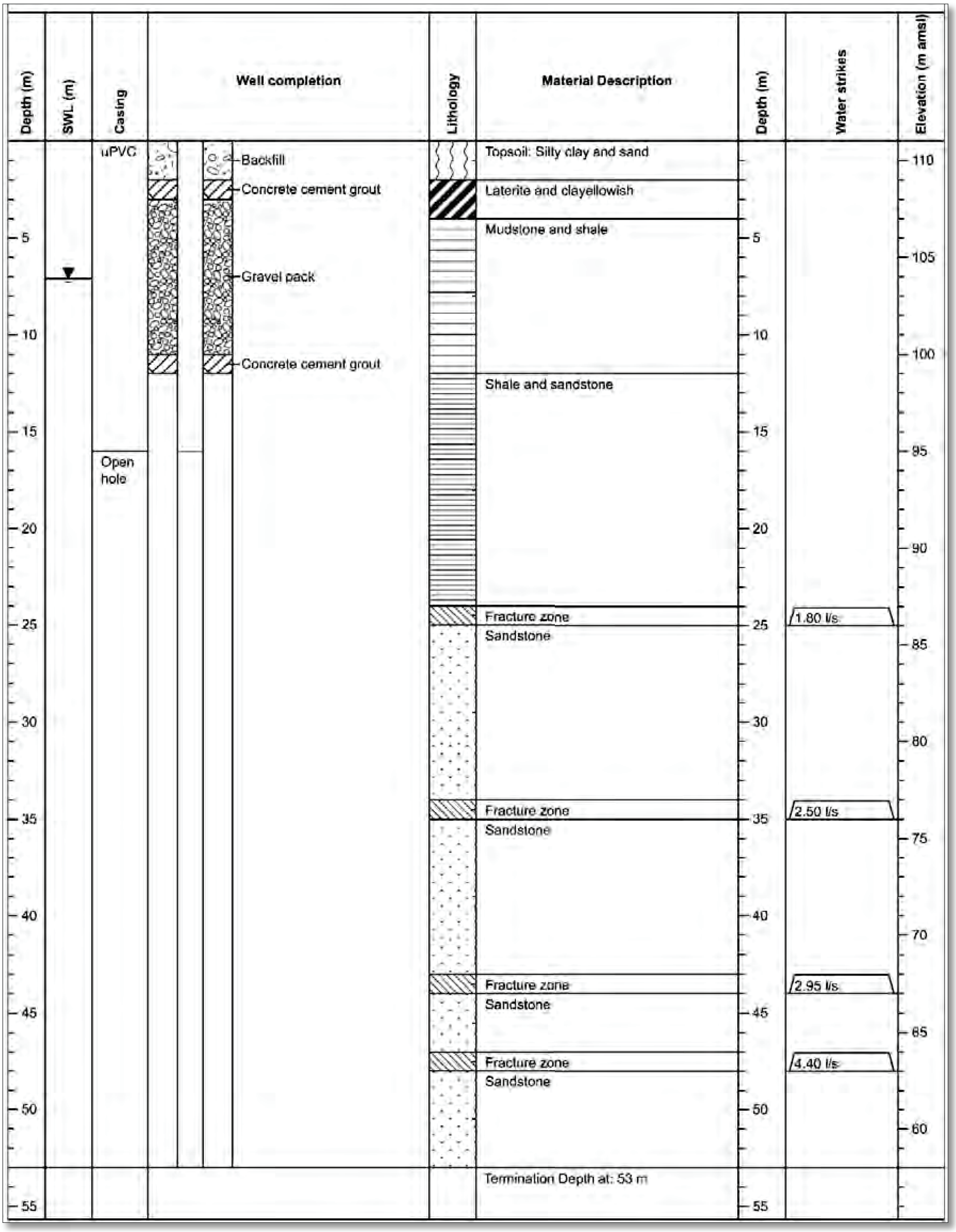
Bore name:	Sukhuma Deep Observation Bore	Monitoring bore	Yes
Bore ID code:	SKM-DOB	Static Water Level (SWL)	4 m
Easting (m):	585663.00	Depth	80 m
Northing (m):	1620405.00	Elevation	98 m amsl
Data source:	Champasak Provincial Health Department (2012)		



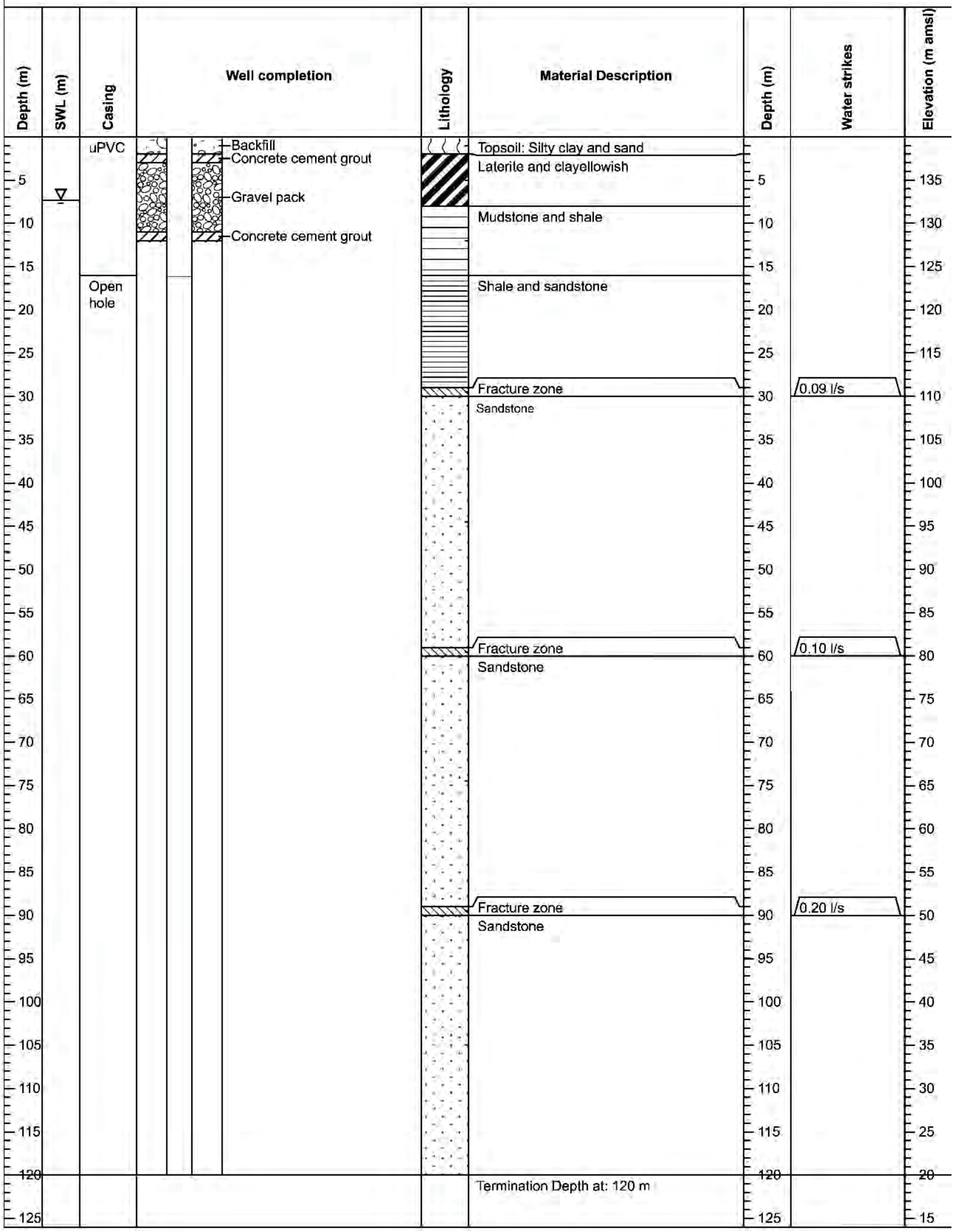
Bore name:	Parkor Deep Observation Bore	Monitoring bore	Yes
Bore ID code:	PKor-DOB	Static Water Level (SWL)	6.1 m
Easting (m):	580519.15	Depth	70 m
Northing (m):	1622802.21	Elevation	107 m amsl
Data source:	Champasak Provincial Health Department (2012)		



Bore name:	Parkxang Deep Observation Bore	Monitoring bore	Yes
Bore ID code:	PKX-DOB	Static Water Level (SWL)	7.1 m
Easting (m):	572798.00	Depth	53 m
Northing (m):	1624489.00	Elevation	111 m amsl
Data source:	Champasak Provincial Health Department (2012)		



Bore name:	Hieng Deep Observation Bore	Monitoring bore	Yes
Bore ID code:	Hieng-DOB	Static Water Level (SWL)	7.3 m
Easting (m):	560525.74	Depth	120 m
Northing (m):	1625106.38	Elevation	140 m amsl
Data source:	Champasak Provincial Health Department (2012)		



Appendix 4: Project photo documentation

Figure 1: Flat land in the eastern Sukhuma District. Main land use in the area is the wet season paddy rice field. This photo was taken on 27 March 2017.

Figure 2: Shrub land and flat topography in the southern Sukhuma District. This photo was taken on 24 March 2017 during the third fieldwork in Sukhuma District.

Figure 3: Broadleaf forest land cover in the western Sukhuma District (Close to Lao-Thai border). This photo was taken on 22 March 2017 during the third fieldwork in Sukhuma District.

Figure 4: Dipterocarp forest at Hieng Village in the western Sukhuma District. This photo was taken on 22 March 2017 during the third fieldwork in Sukhuma District.

Figure 5: Outcrop of fractured bedrock (probably Phu Kradung Formation) at a road cut in western Sukhuma District (close to Lao-Thai border). The western part of Sukhuma is mountainous and is expected to be the deep groundwater recharge zone. It is close to the eastern edge of the Khorat Plateau in Thailand which is the likely recharge zone for the regional gravity flow groundwater system which discharge eastwards towards the Mekong River. This photo was taken on 22 March 2017 during the third fieldwork in Sukhuma District.

Figure 6: The outcrop of bedrock along the Khamouan Riverbed. This photo was taken on 24 March 2017 at the Khamoun River Bridge in Thadarn Village in the southeast of Sukhuma District.

Figure 7: Sandstone (Phu Kradung Formation) outcrop in an area on the road from Hieng Village to None Deng-Nua Village on the western Sukhuma District. This photo was taken on 23 March 2017.

Figure 8: Sandstone (Phu Kradung Formation) outcrop in the upper reach of the Pheng River at the None Deng-Nua Village. This photo was taken on 23 March 2017 (Middle dry season).

Figure 9: Soil profile at the landfill at the Parkor Village. This photo was taken on 3 December 2015 during the first field visit to Sukhuma District. This photo illustrates that roots of trees are shallow and less than approximately 1 m below ground level. The clay loam soil can be seen above the mainly clay profile below the large tree marked “Pf”.

Figure 10: Soil profile of the Khamoun River bank is close to the river gauge. This photo was taken on 24 March 2017.

Figure 11: Usually, there is not flow in the middle and upper parts of Khamoun River during the dry season. This photo was taken on 25 March 2017 (dry season).

Figure 12: Spring in the Khamouan River bank where the river gauge is located. This photo was taken on 24 March 2017.

Figure 13: There was very low flow in Khamouan River at the gauge station 0n 25 March 2017 (Dry season).

Figure 14: There was very low flow in some parts of Khamouan River during the dry season (25 March 2017). The flow was not able to measure by staff gauges as shown in Figure 14. The water flow in Khamouan River may come from shallow groundwater drainage. In this area of the river valley, the outcrop of bedrock can be found.

Figure 15: Soil profile at the western Hieng Village which is close to the Lao-Thai border. This photo was taken on 24 March 2017. The tape length is approximately 2 m.

Figure 16: Soil samples collection at the Hieng Domestic well using a hand auger with a length of 2.30 m at the Hieng Village. This photo was taken on 22 March 2017.

Figure 17: Preparing soil samples for testing at the soil laboratory in the Faculty of Water Resources, National University of Laos.

Figure 18: Soil grain size analysis in the soil laboratory in the Faculty of Water Resources, National University of Laos.

Figure 19: Groundwater use survey and groundwater levels measurements in Sukhuma District. This photo illustrates that water levels at some wells could not be measured because they are closed by the owners. However, the pump capacity was measured and daily household water use was estimated by interviewing the owners.

Appendix 5: Soil samples collection and results of testing

1. Description of soil sample (SP) collection in the field

Table 1: Description of soil samples

Sample name	**Soil layer depth (cm)**	**Soil characteristics description based on field observations and comments**
Hieng Village (SP1)	0 - 10	This soil sample was collected at a point located in Hieng Village and close to the Lao-Thai border check-point. Surface soil is covered by short grasses. Soil sample at this layer is mixed with some grasses roots. Soil color is grey and brown. Soil texture includes sand, clay, and loam.
	10 - 40	Soil sample from this layer is mixed with some grasses roots but less than the upper soil layer. Soil has a mixing colors between white and red. Soil texture combines sand, more clay and loam.
	40 - 100	Soil color in this layer is a mixture of more white, red and yellow. Soil texture is a combination of clay, loam and mixed with pebbles and cobbles.
	100 - 200	Soil color is a mixture of white, yellow and more red. Soil texture for this layer is made by the typical reddish clay sandy soil mixed with pebbles cobbles.
Hieng domestic well (SP2)	0 - 10	The sampling location of this soil sample is about 20 m from Hieng domestion monitoring well. Soil color is dark grey and brown. Soil texture is made up of clay, sand and loam. Soil is slightly sticky.
	10 - 40	Soil color is white grey and brown. Soil texture is made up by clay, sand and loam. Soil is slightly sticky.
	40 - 100	The color of soil sample from this layer is different from the upper layer because its color is a mixing between dark brown and yellow. Soil texture may contain more clay than sand and loam soil because it is much more sticky than upper soil. Soil moisture is likely higher than upper layer also.

Sample name	Soil layer depth (cm)	Soil characteristics description based on field observations and comments
	100 - 200	Soil color at this layer is dark brown. Soil texture consists of very fine grain size because it was smooth when touched. During digging the soil sample at this location, moisture content in soil was found to be very high.
Nong Deng-Nua (SP3)	0 - 10	This sample was collected at the Nong Deng-Nua Village. There are no grasses on the surface at this point. Soil color for this layer is yellow and brown. Soil texture mainly consists of sandy loam and some loam.
	10 - 40	The soil texture of this layer is similar with the upper soil layer. Soil color is white, unlike the top layer. Soil texture include some white pebbles and cobbles mixed with sandy loam.
	40 - 100	Soil color of soil for this layer is yellowish and reddish. Soil texture is made up of little sand, more clay and some reddish laterite. It was very hard to get more soil sample at this point by using the hand auger.
Parkxang (SP4)	0 - 10	This soil sample was collected at a point located close to the Pakxang observation shallow and deep wells. There are some grasses roots mixed in the soil sample. Soil color is greyish white and brown. Soil texture seems to be made up of clay, sandy and loam soil. The moisture content in this layer is low.
	10 - 40	Soil color in this layer is dark yellowish and brown. Soil texture can be made up by white clay, sandy and loam soil. Soil is not very sticky and has low moisture content.
	40 - 100	Soil color is a mixing of white, reddish and yellowish. Soil texture combines with reddish laterite and clay. Moisture content is higher than in the upper layer.

Sample name	Soil layer depth (cm)	Soil characteristics description based on field observations and comments
	100 - 200	Soil color is dark brownish red. Soil texture for this layer mainly consists of brown clay and reddish laterite.
Khamouan Riverside (SP5)	0 - 10	The soil sample was collected at the Khamouan Riverside which is located close to Khamouan River gauge. There are some grasses roots mixed with the soil sample. Soil color is dark brown. Soil texture is made up of loam, sand and clay. It is slightly sticky with moderate moisture content.
	10 - 40	There are some grasses roots mixed with soil sample. Soil color is a mixture of brown and white. Soil texture consists of sandy clay and loam. The moisture content is quite high.
	40 - 100	Soil color is dark brown and yellowish. Soil texture is similar to the upper layer. There is some white pebbles and cobbles mixed with this soil sample. The percentage of clay may be moderate to high because it is quite sticky.
	100 - 200	Soil color for this layer is different from the upper layer, it is mixed between white and dark yellow. Soil texture is made up of sand, clay and some pebbles and cobbles. The percentage of sand can be high for this layer because it is not very sticky. The moisture content is quite high.
Thadarn domestic well (SP6)	0 - 10	This sample was collected at a point located close to Thadarn domestic well. There are some grasses covering the surface soil. Some grasses roots are found in the soil sample from this layer. Soil color is white and grey. Soil texture consists of clay, fine sandy and loam soil.
	10 - 40	Soil color is white and red. Soil texture is made up of sand and white pebbles and cobbles. Therefore, it is very hard to collect soil samples from the deeper layer.
	40 - 100	Soil color is a mixture of white, yellow and red. Soil texture for this layer is mixed of sand, pebbles, cobbles and reddish laterite.

Sample name	Soil layer depth (cm)	Soil characteristics description based on field observations and comments
		Using hand auger it was not possible to get to the deeper layers.
Thadarn Village (SP7)	0 - 10	This soil sample was collected from a point located in Thadarn Village but quite far from Thadarm domestic monitoring well. Some grasses roots were found in the soil sample. Soil color is dark brown. Soil texture combines sandy loam and loam.
	10 - 40	Soil color is a mixture of yellow, grey and white. Soil texture consists of sand, loam and some reddish laterite.
	40 - 100	Soil color is dark red. Soil texture for this layer consists of clay and reddish laterite. It is very hard to break through this soil layer by using the hand auger.
Sarmkha (SP8)	0 - 10	This sample was collected at a point located close to Sarmkha domestic monitoring well. Soil color is white grey. Soil texture is a mixture of sandy and loam. The moisture content is low.
	10 - 40	Soil color is white and red. Soil texture is made up of clay, sandy, loam and some reddish laterite.
	40 - 100	Soil color for this layer is white and dark red. Soil texture consists of more reddish laterite than clay and with sand.
Phone Pheung (SP9)	0 - 10	This soil sample was collected at a point located close to Phone Pheung domestic monitoring well. Soil color is white grey. Soil texture is made up of clay, fine sand and loam. The surface soil was quite dry.
	10 - 40	Soil color is yellow and white. Soil texture can be made up by very fine sand, clay and loam. Moisture content seems to be less than in upper layer.
	40 - 100	Soil color is red.

Sample name	Soil layer depth (cm)	Soil characteristics description based on field observations and comments
		Soil texture is made up of clay and laterite. It is a bit hard to break through this layer because of some laterite rocks.
	100 - 200	Soil color is a mixture of dark red and yellow. Soil texture for this layer consists of clay, sand and laterite soil.
Sukhuma DAFO (SP10)	0 - 10	This soil sample was collected at a point located close to the Sukhuma observation shallow and deep wells. Soil color is dark brownish red and white. Soil texture combines clay, silt and laterite. Moisture content is quite high. Soil is sticky.
	10 - 40	Soil color for this layer is light yellow and dark red. Soil texture is made up of clay, loam and laterite. The reddish laterite rocks made soil sampling difficult.
	40 - 100	Soil color is dark reddish. Soil texture combines sticky clay and reddish laterite rocks. It was not possible to continue collecting soil sample for the deeper layer at this point by using hand auger.
Boungkeo (SP11)	0 - 10	This soil sample was collected at a point located close to Boungkeo observation shallow and deep wells. Soil color is grey. Soil texture is made up of sandy, clay and loam.
	10 - 40	Soil color for this layer is white and yellow. Soil texture is made up of very fine sand, clay and loam. It was very smooth to touch. Moisture content seems to be high.
	40 - 100	Soil color for this layer is reddish. Soil texture is mainly reddish clay and with some laterite rocks. It is very sticky.
	100 - 200	Soil color for this layer is dark reddish.

Sample name	Soil layer depth (cm)	Soil characteristics description based on field observations and comments
		Soil texture is similar to the upper layer. Moisture content is very high.
Dong Houabarn (SP12)	0 - 10	This soil sample was collected at a point located close to Dong Houabarn domestic monitoring well. Soil color is white. Soil texture consists of coarse sand and loam.
	10 - 40	Soil color for this layer is a mixture of white, red and light yellow. Soil texture is made up of fine sand, clay, loam and some reddish laterite.
	40 - 100	Soil color for this layer is yellow and red. Soil texture is made up of fine sandy, yellow clay and reddish laterite. It is quite sticky.
	100 - 200	Soil color for this layer is red. Soil texture consists of clay, loam and laterite. Moisture content is quite high.
Pakor (SP13)	0 - 10	This soil sample was collected at a point located close to Pakor observation shallow and deep wells. There are some grasses roots mixed with this soil sample. Soil color is very dark brown. Soil texture consists of sand and loam.
	10 - 40	Soil color is dark brown. Soil texture is mainly made up by loam. Moisture content is low.
	40 - 100	Soil color for this layer is red and grey. Soil texture consists of clay, loam and some reddish laterite rocks.
	100 - 200	Soil color for this layer is brown and black. Soil texture consists of mainly loam and some laterite.

2. Soil samples testing and soil properties determinations

Data on soil properties are sparse in Sukhuma District. Only broad scale soil data from the Lao national soil map (SSLCC, 2000) provides the information on soil textures in Sukhuma District (Figure 1). In order to get a better understanding of rainfall infiltration into the topsoil and to obtain more information about the topsoil in Sukhuma District, forty-seven soil samples (SP) were collected from 13 locations during the third field visit in March 2017. There are five locations in the sandy loam, five locations in the loam, and three locations in the loamy sand as shown in Figure 1. The depths of soil sample range from 0-10 cm, 10-40 cm, 40 - 100 cm, and 100 - 200 cm. Some locations could not be dug deeper than 100 cm because of laterite soil with some gravel. Therefore, soil samples for these locations were collected for three depths only, namely 0-10 cm, 10 - 40 cm, and 40 - 60 or less than 100 cm.

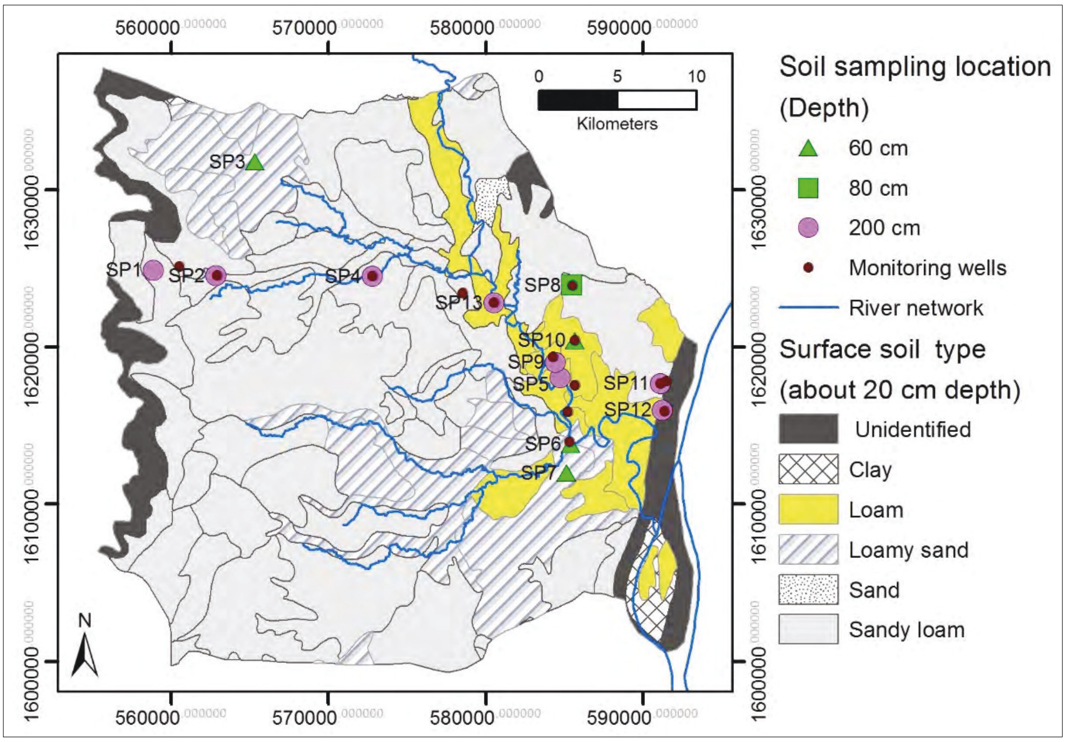


Figure 1: Locations of soil samples (SP) and soil texture in Sukhuma District

The equipment used for collecting soil samples included: a hand auger with a length of 2.30 m, a plastic bag for packing samples, a weight scale, a shovel, a metric tape with a length of 3 m, a GPS, a bucket, a permanent marker, and notebook (as shown in Figure 2).

Figure 2: Equipment for soil sampling.

The soil samples were sent for testing to the soil laboratory of the Faculty of Water Resources in Vientiane Capital by the researcher and an assistant from the laboratory. The purposes of soil testing in the laboratory are to determine the soil moisture content, the grain size distribution, Atterberg limits and indices, and specific gravity of soil. The results were mainly used to identify the soil types, determine the hydraulic conductivity, and specific yield of the unsaturated soil in the research area. This information will also provide a better understanding of groundwater recharge processes in the Sukhuma District. Details of soil samples testing and soil properties determination are provided in the following section.

2.1. Soil properties

This section provides details of soil characteristics tests for the forty-seven soil samples collected in the Sukhuma District. The tests of soil samples aims to determine the soil moisture contents, grain size distribution, void ration and porosity, specific gravity, liquid limit, plastic limit, plasticity index, the percentage of sand-silt-clay contents, soil types, soil bulk density, and soil specific yield, as described in the following subsections.

2.1.1. Moisture contents

The soil moisture content of field samples are calculated by the Gravimetric Method (Black et al., 1965). All soil samples were weighed before and after drying in the oven. The wet soil was dried in the oven at the temperature between 100 – 110°C for about 24 hrs. The water mass (or weight) was determined by the difference between the weights of the wet and oven dry soils and exclude weights of tins. The soil moisture content was calculated by using the following equation:

$$W_d = \frac{W_{Water}}{W_{Drysoil}} \times 100 \qquad \text{.................................... (5.48)}$$

Where $W_{Drysoil}$ is the weight of dry soil (g) and W_{Water} is the weight of water (g).

The results of soil moisture calculation are summarised in Section 2.2.1. Additionally, the plots of soil moisture expressed in percentage are given in Section 2.2.2. The results show that values of soil moisture of topsoil (about 2 m below ground level, bgl) are different from place to place and range from 3.45 to 33.21%. This spatial variation in soil moisture may be due to the different soil texture and land cover conditions. An important consideration should be noted for the high soil moisture at some locations, namely, there was some rainfall at some locations in Sukhuma District about a week before collecting the soil samples, based on personal communication with Sukhuma DAFO staff. However, observed rainfall at Sukhuma District Official gauge was not accessible for this period, March 2017.

Furthermore, the soil moisture content on a volumetric basis was calculated from:

$$W_v = W_d \times \frac{\rho_b}{\rho_w} \qquad \text{.................................... (5.49)}$$

Where: W_v is volumetric water concentration in the soil (cm^3 water /cm^3 soil), W_d is weight of dry soil water concentration (g of water / g of dry soil), ρ_w is density of water (1 g water / cm^3 water), ρ_b is soil bulk density (g dry soil / cm^3 soil).

Soil bulk density (ρ_b) can be one of the significant parameters for studying groundwater recharge. Dam et al. (2005) indicated that soil bulk density directly affects soil properties such as porosity, soil moisture content, and hydraulic conductivity. Derby et al. (2013) also found a connection between surface soil properties and groundwater recharge to an unconfined aquifer under irrigated fields in southeastern North Dakota, USA. For this research, values of dry bulk density of the forty-seven soil samples from Sukhuma District are estimated by using the following equation (USDA, 1986):

$$\rho_b = \frac{G_S * \rho_W}{(1 + W_d \cdot G_S)} \qquad \text{.................................... (5.50)}$$

Where ρ_b is the dry bulk density (g/cm3), ρ_w is the water bulk density (g/cm3), G_s is the specific gravity of soil (dimensionless), W_d is the dry soil water content (g soil/g water).

In order to convert the volumetric soil moisture content in each soil layer collected in Sukhuma District to be the same unit with soil moisture data obtained from the GLDAS database, the following equation is utilised for calculation of soil moisture concentration in a soil layer:

$$W_z = W_v \,.\, Z_{soil} \,.\, 1000 \qquad \text{.....................................} (5.51)$$

Where: W_z is soil moisture concentration in a given depth zone of soil layer (kg/ m^2 of soil) or (mm), W_v is volumetric water concentration in a given depth zone of soil layer (cm^3 water / cm^3 soil), Z_{soil} is depth of a soil layer (m). The depths of soil layer in this research and in the GLDAS-derived soil moisture are the same and range from 0-10 cm, 10-40 cm, 40 -100 cm, and 100-200 cm. The value of 1000 is used to convert unit of W_v from "cm^3 water / cm^3 soil" to "Kg/m^3".

The results of soil moisture content in millimetres were compared with the GLDAS-derived soil moisture as shown in Figure 3. This figure illustrates that monthly GLDAS-derived soil moisture at grid 5 (as shown in Figure 5.1 under Section 5.1 of thesis) depicts a good correspondence with the field observations of soil moisture in Sukhuma District in March 2017.

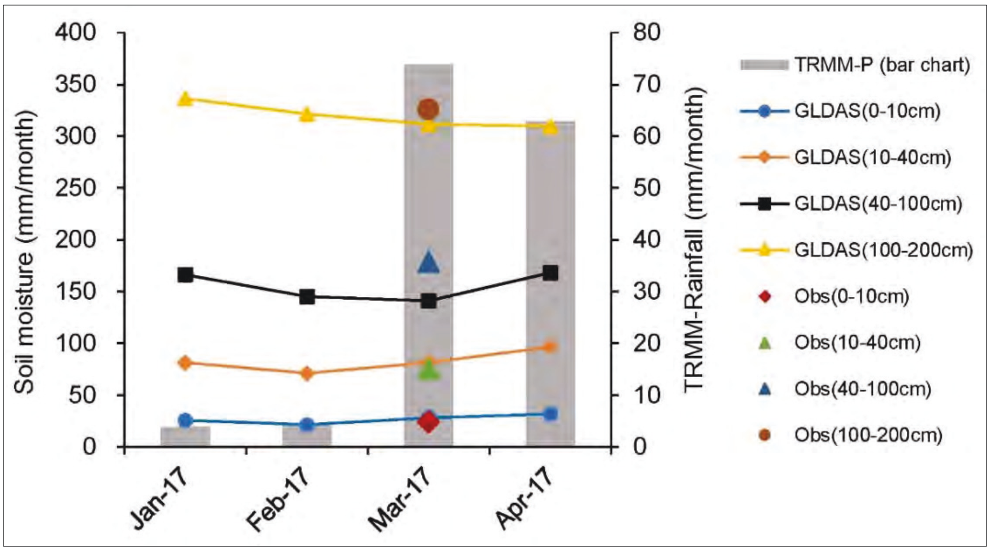


Figure 3: Comparison between monthly GLDAS-derived soil moisture (GLDAS) at grid 5 for the period January to April 2017 and field measurements of soil moisture (obs) in March 2017 from soil samples located in the GLDAS-grid 5 as shown in Figure 5.1 under Section 5.1 of thesis

2.1.2. Grain size distribution

Grain size distribution tests were done for the forty-seven soil samples. The main objective of this test is to support the soil texture and soil type classifications and identify the particle size distribution. The tools and equipment used for the test include:

1. sieves of size 3/4, 3/8, 4, 10, 20, 40, 60, 120, 140, and 200;
2. drying oven capable of maintaining a temperature of 100 to 110°C;

3. balance readable and accurate to 0.5g;
4. metal trays;
5. metal containers;
6. scoop;
7. sieve brushes;
8. lid and receiving pan for fines; and
9. pen and data form sheets.

The procedures for this test are briefly described as below:

1. About 1.5 kg of soil sample was collected and placed on a metal tray. The sample was then put into the drying oven for a duration of about 12 to 24 hours at a temperature of 100°C to 110°C. This is to make sure that all the water or moisture is extracted from the soil sample.
2. The dried sample is removed from the oven and cooled up to room temperature.
3. The representative sample is then weighed to get the exact mass of 500g which can be used to carry out the test.
4. The representative sample was mixed with the water and left for a period of about 12 to 24 hours.
5. The representative sample is washed through the number #10 and #200 sieves. This step is to make sure that particles of silt and clay are washed through sieve number #200. Silt and clay were left to run out with water. The remaining soil in sieves number #10 and #200 were combined into a metal container and put it into the oven for a period of about 12 to 24 hours at a temperature of 100℃ to 110℃ before carrying out dry sieving. After the sample was removed from the oven and cooled to room temperature, it should be ready to be sieved.
6. The sieves were arranged from the biggest size on the top to the smallest size at the bottom. At the bottom end of the sieves is pan and on the top of them was closed by a cover or lid. The sieves were shaken carefully. The particles retained on each sieve were removed and weighted. The results were written down on the recorded sheet.
7. After recording all the weights retained on each sieve, the percent of weight retained, the percent of cumulative weight retained and the percent of passing or finer in each sieve were calculated. An example of calculation is shown in Table 2.
8. The last step was plotting the results on a semi-logarithmic graph as given in Section 2.2.3.

Table 2: An example of recording sheet for grain size analysis for a soil sample at the Hieng Village where location of soil sample is close to the Lao-Thai border

Project location :	**Village:** Hieng	**District:**	Sukhuma		**Province:**	Champasak
Project Name:	Sinxay's PhD					
Sampling location :	Close to Lao-Thai border					
Sample Number :	SP-01				Date of testing:	2-Apr-17
Date of sampling:	22 Mar 2017				Depth (cm):	0 - 10 cm
Soil Description:	Sandy clay loam					
Weight of original dry soil sample (W_{org}) :	500.00	g				
Weight of dry soil after washing :	211.00	g				
Weight of soil loss during washing :	289.00	g	Note : This is weight of very fine sand, silt and clay			

Sieve Size (inch)		Sieve Size (mm)	Retained Weight (g)	Percent of Retained Weight (%)	Cumulative Percent Retained (%)	Percent finer (%)
Class	(1)	(2)	(3)	(4) = (3) x 100 / W_{org}	(5)	(6) = 100 - (5)
Gravel	3/4	19.000	0.00	0.00	0.00	100.00
	3/8	9.510	1.70	0.34	0.34	99.66
	# 4	4.760	6.40	1.28	1.62	98.38
Sand	# 10	2.000	8.80	1.76	3.38	96.62
	# 20	0.841	8.10	1.62	5.00	95.00
	# 40	0.420	32.40	6.48	11.48	88.52
	# 60	0.250	61.80	12.36	23.84	76.16
	#120	0.125	63.20	12.64	36.48	63.52
	# 140	0.105	10.30	2.06	38.54	61.46
	# 200	0.074	18.30	3.66	42.20	57.80
Silt & clay	Pan	0.000	289.00	57.80	100.00	0.00

2.1.3. Void ratio and porosity

Void ratio (e) is commonly estimated from the ratio of the volume of air and water in a soil mass to the volume of soil solids. For this study, the volumes of soil samples are not available; therefore, the void ratio is calculated by using the following equation (USDA, 1986):

$$e = \frac{G_S * \rho_W}{\rho_b} - 1 \qquad \text{.................................... (5.52)}$$

Where e is the void ratio (dimensionless), G_s is the soil specific gravity (dimensionless), ρ_w is the water density (g/cm^3), and ρb is the soil bulk density (g/cm^3).

Regarding the missing data of soil sample volume, the porosity (n) of soil samples are calculated by using the following equation (USDA, 1986):

$$n = \frac{e}{1+e} \times 100 \qquad \text{.....................................} (5.53)$$

The results of the void ratio and the porosity calculation are given in Section 2.2.3.

2.1.4. Specific gravity

The specific gravity of the soil fraction passing No.200 sieve was determined by using the density bottle method. The equipment needed for this testing include: density bottle of 50 ml with stopper having capillary hole, balance to weigh the material accurately to 0.5 g, a thermometer, metal trays, and distilled water. The specific gravity is calculated by using the following equation:

$$G_s = \frac{W_s}{(W_s + W_{bw} - W_{bws})} \times G_T \qquad \text{.....................................} (5.54)$$

Where G_s is Specific gravity of soil (dimensionless), W_s is weight of soil (g), W_{bw} is weight of density bottle and water (g), W_{bws} is weight of density bottle plus water and soil (g), and G_T is specific gravity of water at temperature X°C (dimensionless). According to ASTM specifications (ASTM D 854-92) (ASTM, n.d), the values of G_T are available as shown in Table 3.

Table 3: Specific gravity of water (G_T) at various temperature

Temperature (°C)	G_T (dimensionless)
18	0.99862
19	0.99843
20	0.99823
21	0.99802
22	0.99780
23	0.99757
24	0.99733
25	0.99708
26	0.99682
27	0.99655
28	0.99627
29	0.99598
30	0.99568
31	0.99537
32	0.99505

The specific gravity of soil depends mainly on the density of the minerals making up the individual soil particles. However, some typical values for specific soil types are as follows (ASTM, n.d):

1. The specific gravity of the solid substance of most inorganic soils range from 2.60 to 2.80;

2. Tropical iron-rich laterite, as well as some lateritic soils, commonly have a specific gravity of between 2.75 to 3.0 but could be higher;
3. Sand particles composed of quartz have a specific gravity ranging from 2.65 to 2.67;
4. Inorganic clays generally range from 2.70 to 2.80;
5. Soils with large amounts of organic matter or porous particles (such as diatomaceous earth) have specific gravities below 2.6. Some range as low as 2.00.

The specific gravity of the forty-seven soil samples in Sukhuma District range from 2.07 to 3.01 as summarised in Section 2.2.1. About 47% of samples have specific gravity values of 2.60 or higher and about 53% of samples show values of specific gravity lower than 2.60. From these results, it can inferred that more than half of soil samples (53%) are soils with large amounts of organic matter or porous particles. About 43% of samples are classified as inorganic soils and tropical iron-rich laterite soil. General description of soil samples characteristics in the field was also summarized in Section 1.

2.1.5. Liquid limit

According to ASTM (n.d), the liquid limit (LL) of soil sample is the water content expressed as a percentage of the weight of the oven-dried soil at the boundary between the liquid and the plastic states and reported as a whole number. The boundary is randomly defined by a standard test method. The test is performed on two halves of a prepared soil specimen in an LL equipment. The LL is determined when the soil halves flow together along a distance of 13 mm when the cup is dropped or exactly 25 times from a height of 1 cm. This frequency of drop is about 2 drops per second.

The purpose of the LL determination is to assist in soil type classification by determining the LL from three moisture content samples. The equipment needed for this test include:

1. a balance scale sensitive to 0.01 g;
2. an LL device and a grooving tool;
3. sieve size #40, #200, and pan;
4. metal tray;
5. a ground-glass plate with a size of about 30 x 30 cm for mixing soil and rolling plastic limit (PL) threads;
6. plastic bags;
7. moisture container boxes;
8. a spatula;
9. a laboratory oven; and
10. distilled water.

The liquid limit for a soil sample is commonly calculated by using the following equation (Geotechnical Engineering Bureau, 2015):

$$LL = W_d * \left(\frac{N}{25}\right)^{0.12} \qquad \text{(5.55)}$$

Where LL is the liquid limit (%), W_d is the soil water content (%), and N is the number of drops of the cup required to close the groove at the moisture content, W_d (times).

For this study, the liquid limit values for the 47 soil samples collected from the 13 location points in Sukhuma District are calculated by using the following equation:

$$LL = a * \ln(x) + b \qquad \text{(5.56)}$$

Where LL is the liquid limit (%), a and b are the coefficient values of the linear regression equation on the semi-log plot (Figure 4), and x is the number of drops of the cup and its value will be always equal to 25 for this calculation. An example of the liquid limit of about 25.5% for a soil sample collected at the Dong Houabarn at depth between 0-10 cm is demonstrated in Figure 4.

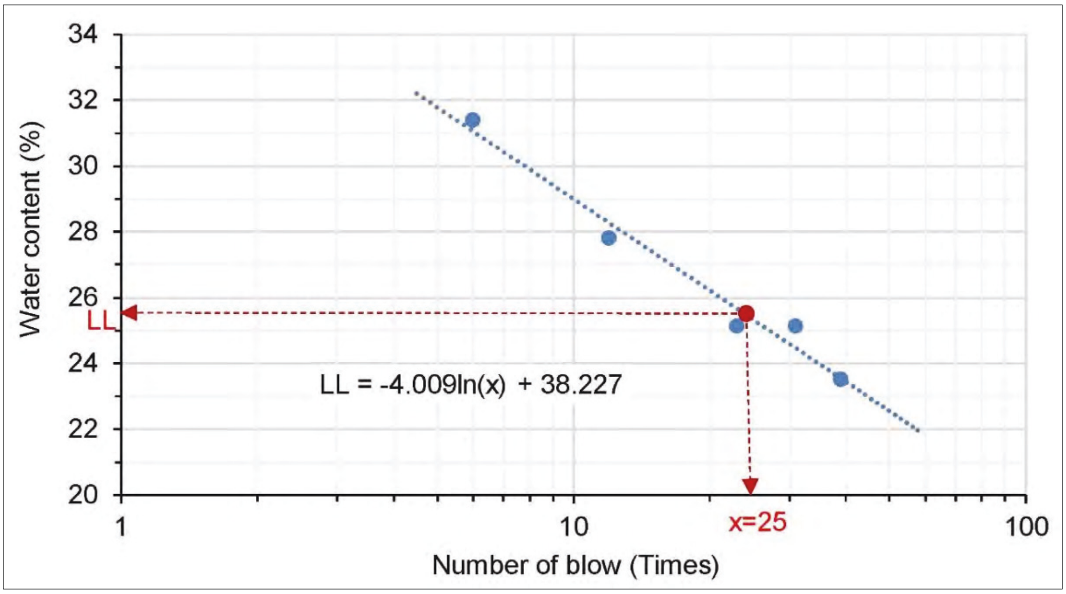


Figure 4: Liquid limit determination for a soil sample at the Dong Houabarn Village for the depth between 0 – 10 cm

The plots and results of LL determination for the 47 soil samples in Sukhuma District are given and summarised in Section 2.2.4 and Section 2.2.5, respectively.

2.1.6. Plastic limit

The plastic limit (PL) of a soil is the moisture content, expressed as a percentage of the weight of the oven-dry soil, at the boundary between the plastic and semisolid states of consistency. It is the moisture content at which a soil will just begin to crumble when rolled into a thread 3 mm in diameter using a ground glass plate. Tools and equipment used for this test include:

1. Spatula;
2. Balance sensitive to 0.01g;
3. Watering bottle;
4. Distilled water;
5. Metal cans;
6. Surface for rolling could be a ground glass plate;
7. Laboratory oven with a capable of maintaining temperatures of about 105 – 115°C; and
8. Desiccator.

The plastic limit (PL) calculation of each soil sample expressed as a percentage of the weight of the oven-dry soil, as follows:

$$PL = \frac{(Weight\ of\ water)}{(Weight\ of\ oven\ dry\ soil)} * 100 \qquad \text{………………………………. (5.57)}$$

The results of the PL calculation are summarised and given in Section 2.2.5.

2.1.7. Plasticity index

The Plasticity Index (PI) for each soil sample was calculated by using the following formula (ASTM, n.d):

$$PI = LL - PL \qquad \text{………………………………. (5.58)}$$

The fine-grain size of soil sample are classified by plotting the LL versus the PI on the Unified Soil Classification System (USCS) Plasticity Chart as follows:

- The material plotted on or above the "A line" is classified as clay, and the material plotted below the "A line" is classified as silt.
- The material plotted on or to the right of the 50 percent line has a high LL (H), and the material plotted to the left of the 50 percent line has a low LL (L).
- The upper, or U, line is an approximate upper boundary. Although not impossible, any results plotted above this line should be considered suspect and the tests should be rechecked.

Equation of the “A line” is “A line” horizontal at PI = 4 to LL = 25.5, then:

$$PI = 0.73(LL - 20) \quad \text{.....................................} \quad (5.59)$$

Equation of the “U line” vertical at LL =16 to PI = 7, then:

$$PI = 0.9(LL - 8) \quad \text{.....................................} \quad (5.60)$$

An example of LL versus PI plot for the soil sample collected at the Hieng Village point is given in Figure 5. The plots of LL versus PI for 47 samples are given in Section 2.2.6.

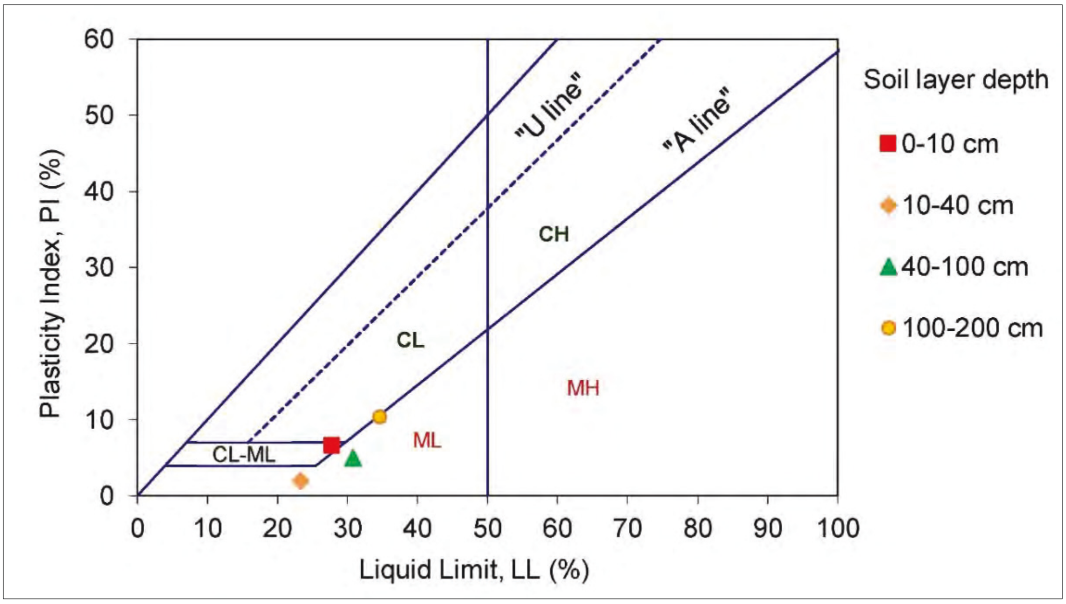


Figure 5: Fine-grained soil classification and field plasticity tests for a soil sample at the Hieng Village point. Note: CL = Low clay, CH = High clay, CL-ML = Medium clay and silt, ML = Low silt, and MH = High silt.

2.1.8. Percentage of clay content

Keller and Dexter (2012) studied the relationship between soil plastic limits and soil texture by using soil samples from many countries, such as Australia, France, Germany, Israel, Poland, Sweden, The Netherlands, The UK, and The USA (Keller and Dexter, 2012, Table 1). They provide many equations for estimating the liquid limit, plastic limit and plastic index from clay content and organic matter content. For this research, the clay content in a fraction of the 47 soil samples were not measured in the laboratory; however, the clay content is estimated from a relationship between clay content and plasticity index (PI) of these samples by using the equation of the Keller and Dexter (2012), as follows:

$$PI = 0.582\ (0.047).Clay - 5.71(1.96) \quad \text{.....................................} \quad (5.61)$$

$R^2 = 0.759, \; P < 0.0001$

Where Clay is the percentage of clay content (%), the values in parentheses are the standard error.

Subsequently, Equation (5.59) was reformulated to estimate the percentage of clay content for the 47 soil samples as the following equation:

$$Clay = \frac{PI - 5.71}{0.582} \qquad \text{.................................... (5.62)}$$

The results of clay fraction calculation are summarised and given in Section 2.2.5.

2.1.9. Percentage of sand, silt and clay

The USDA soil textural classification system is applied for this study as shown in the following Table 4:

Table 4: USA soil textural classification system

Sand size	2.0 > diameter ≥ 0.05 mm
Silt size	0.05 > diameter ≥ 0.002 mm
Clay size	diameter < 0.002 mm

The relative percentage of sand, silt and clay for the 47 soil samples are estimated based on the USDA system by using the following equations:

$$Relative\ \%Sand = \frac{\%Sand\ in\ soil\ sample}{(100\% - \%Gravel\ in\ soil\ sample)} \times 100 \qquad \text{.................................... (5.63)}$$

$$Relative\ \%Silt = \frac{\%Silt\ in\ soil\ sample}{(100\% - \%Gravel\ in\ soil\ sample)} \times 100 \qquad \text{.................................... (5.64)}$$

$$Relative\ \%Clay = \frac{\%Clay\ in\ soil\ sample}{(100\% - \%Gravel\ in\ soil\ sample)} \times 100 \qquad \text{.................................... (5.65)}$$

The results of sand and clay contents for all soil samples are shown in Figure 6 and all size fractions are summarised in Section 2.2.5.

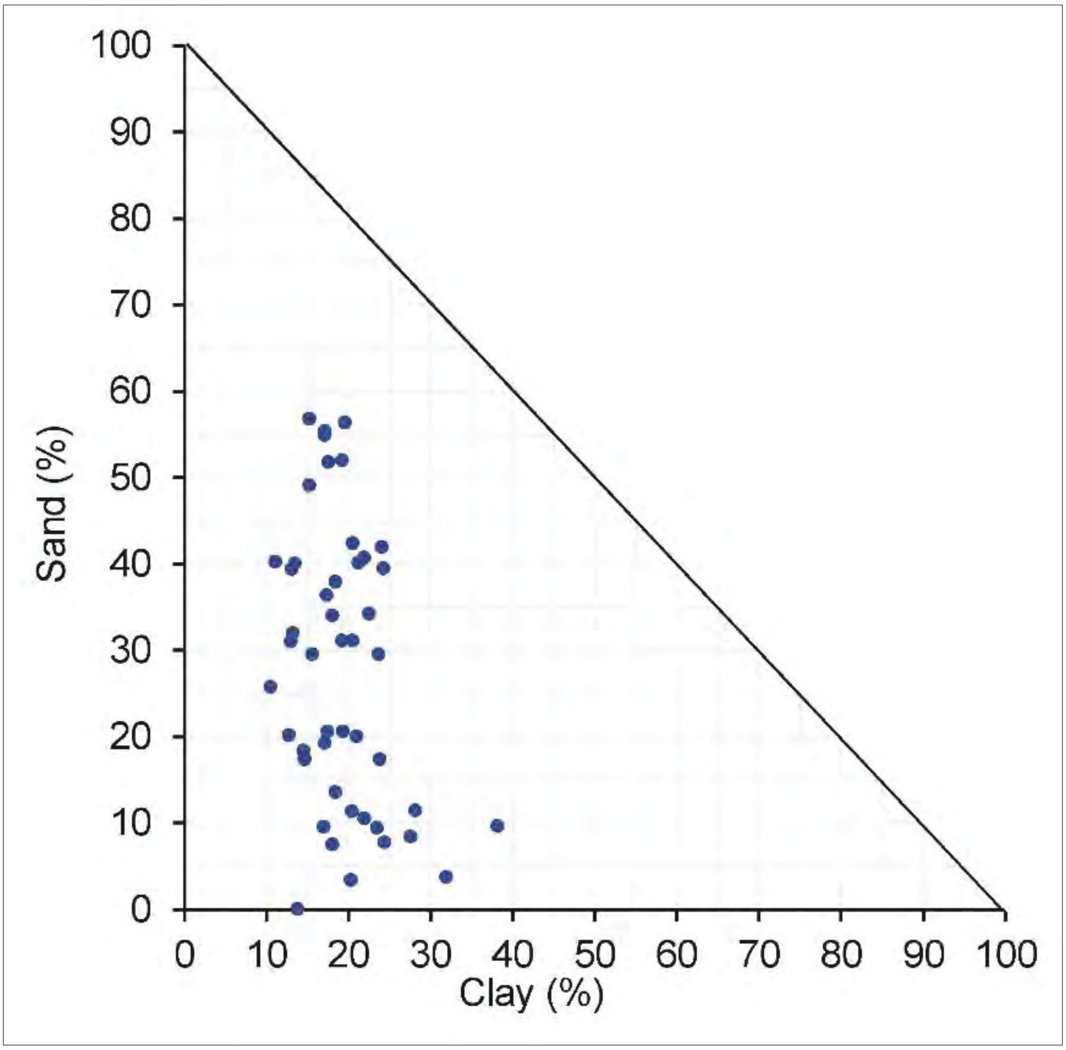


Figure 6: Distribution of soil samples within the particle size triangle based on percent contents of sand (0.05 – 2 mm) and clay (<0.002 mm)

2.1.10. Soil types

Soil types for 47 samples in Sukhuma District were determined based on the soil texture classification triangle method of the United States Department of Agriculture (USDA). This method requires information of sand, silt and clay percentage for each soil sample as given in Section 2.2.5. The results of soil type classification from this study show four main soil types in the Sukhuma District for soil depth of about 2 m bgl, which include Loam, Sandy loam, Silt loam, and Silty clay loam. The results of soil type for each soil layer are provided in Section 2.2.5.

2.1.11. Soil water retention curve

The soil water retention curve (SWRC) analysis is essential for studying the water movement in unsaturated soils and the relationship between soil water content and tension head in soils. The SWRC can be estimated by many models. Too et al. (2014) summarised and reviewed many soil water retention characteristic models from previous studies. The SWRC model from Van Genuchten (1980) is most widely used model (Patil and Singh, 2016). Additionally, it can produce a continuous output in the unsaturated zone and provides a good description of the soil water retention curve under most circumstances (Song et al., 2013).

However, Ghanbarian-Alavijeh and Liaghat (2009) indicated that the Saxton et al. (1986) method produced the better result of the soil water retention curve estimation than other methods in their study. Therefore, the soil water retention curves for the soil samples collected in Sukhuma District for this study were estimated by using the equation of Saxton et al. (1986).

Saxton et al. (1986) introduced pedotransfer functions for three ranges of the soil water retention curve based on saturated soil water content, sand and clay contents. The first range is for the water potential head (ψ) between 0 and ψ_e, the water potential at air entry (kPa). The second range is from ψ_e to 10 kPa; from 10 to 1500 kPa or greater are for the third range. . The equations are as following:

Water potential from 0 to ψe:

$$\theta(h) = \theta_s \qquad \text{.....................................} (5.66)$$

From ψe to 10 kPa:

$$\theta(h) = \theta_{10} + \frac{(10-\psi)\,(\theta_s-\theta_{10})}{(10-\psi_e)} \qquad \text{.....................................} (5.67)$$

$$\theta_{10} = exp\left(\frac{2.302-lnA}{B}\right) \qquad \text{.....................................} (5.68)$$

$$\psi_e = 100\,[-0.108 + 0.341\,(\theta_s)] \qquad \text{.....................................} (5.69)$$

$$\theta_s = 0.332 - 0.0007251(\%Sand) + 0.1276\log_{10}(\%Clay) \text{.....................................} (5.70)$$

From 10 to 1500 kPa or greater:

$$\theta = \left(\frac{\psi}{A}\right)^{1/B} \qquad \text{.....................................} (5.71)$$

$$A = 100\exp[-4.396 - 0.0715\,(\%Clay) - 0.000488\,(\%Sand)^2 - 0.00004285\,(\%Sand)^2(\%Clay)]$$
$$\text{.....................................} (5.72)$$

$$B = -3.140 - 0.00222\,(\%Clay)^2 - 0.00003484(\%Sand)^2(\%Clay) \qquad \text{................} (5.73)$$

Equation (5.69) was reformulated to estimate the water potential heads for observed soil moisture from each soil sample as follows:

$$\psi = A \, . \, \theta^{B} \quad \text{.................................... (5.74)}$$

Where ψ is water potential or suction (kPa), ψ_e is water potential at air entry (kPa), θ is soil water content (m³/m³), θ_s is soil water content at saturation (m³/m³), θ_{10} is water content at 10 kPa (m³/m³), (%Sand) and (%Clay) are percent sand and percent clay (%), respectively.

The saturated and unsaturated hydraulic conductivity for all soil samples were estimated by using the following equation modified from Saxton et al. (1986):

$$K = \left\{0.000002778\left\{exp\left[12.012 - 0.0755(\%Sand) + [-3.8950 + 0.03671(\%Sand) - 0.1103(\%Clay) + 0.00087546(\%Clay)^2]\left(\frac{1}{\theta}\right)\right]\right\}\right\} \times 86400 \times 100 \quad \text{......................... (5.75)}$$

Where K will be saturated hydraulic conductivity (K_s) (cm/day) when saturated soil moisture (θ_s) (m³/m³) is used in the calculation, K will be unsaturated hydraulic conductivity (K_u) (cm/day) when unsaturated soil moisture (θ) (m³/m³) is used in the calculation, 86400 is the value to convert time unit from second to day, and 100 is the value used to convert metre unit to centimetre.

The results of van Genuchten's parameters and soil hydraulic properties for 47 soil samples collected in Sukhuma District are summarised based on soil types as shown in Table 5. Details of van Genuchten's parameters for each soil sample are given in Section 2.2.7.

Table 5: Summary results of van Genuchten's parameters for soil samples in Sukhuma District

Texture class	θ_s **(m³/m³)**	θ_r **(m³/m³)**	$\theta_{(-33\ kPa)}$ **(m³/m³)**	$\theta_{(-1500\ kPa)}$ **(m³/m³)**	ψ_e **(kPa)**	**Sample size**
Loam	0.437 – 0.486 (0.465)	0.056 – 0.093 (0.079)	0.24 – 0.29 (0.26)	0.10 – 0.14 (0.12)	4.086 – 5.777 (5.065)	18
Sandy loam	0.442 – 0.456 (0.449)	0.076 – 0.083 (0.081)	0.22 – 0.24 (0.23)	0.11 – 0.13 (0.12)	4.263 – 4.744 (4.515)	4
Silt loam	0.444- 0.504 (0.478)	0.048 – 0.084 (0.067)	0.27 – 0.32 (0.29)	0.10 – 0.14 (0.11)	4.342 – 6.370 (5.492)	21
Silty clay loam	0.509 – 0.527 (0.517)	0.090 – 0.109 (0.097)	0.33 – 0.38 (0.35)	0.15 – 0.21 (0.18)	6.547 – 7.168 (6.819)	4

Furthermore, in order to complete the soil water retention curve (Van Genuchten, 1980) for all soil samples, the following equation is employed:

$$\theta(h) = \theta_r + \frac{(\theta_s - \theta_r)}{[1 + (\alpha\psi)^n]^m} \quad \text{.................................... (5.76)}$$

Where $\theta(h)$ is the moisture content at the h water potential head (cm³/cm³), the α is related to the inverse of air entry value (1/kPa), the n is related to the pore size distribution of the soil, the m is a parameter that related to the asymmetry of the model and it is derived from n using $m = 1 - 1/n$.

The unsaturated hydraulic conductivity, $K(S_e)$, of a soil for any water potential heads of each soil sample is determined by using the combined equation of Mualem (1976) and Van Genuchten (1980) that was introduced by Schaap and Van Genuchten (2006) as the following equation:

$$K(S_e) = K_s . S_e^L . \left[1 - \left(1 - S_e^{1/m}\right)^m\right]^2 \qquad \text{.................................... (5.77)}$$

Where L is a parameter describing the pore structure of the material usually set to 0.5 (Mualem, 1976; Schaap and Leij, 2000; Schaap and Van Genuchten, 2006), and S_e is the effective saturation (m³/m³) and estimated by using the following equation:

$$S_e = \frac{\theta - \theta_r}{\theta_s - \theta_r} \qquad \text{.................................... (5.78)}$$

An example of soil water retention curves and hydraulic conductivity curves for the soil samples at the Hieng Village in Sukhuma District is shown in Figure 7 and Figure 8, respectively. For more results of soil water retention curves and hydraulic conductivity curves for all soil samples are given in Section 2.2.8.

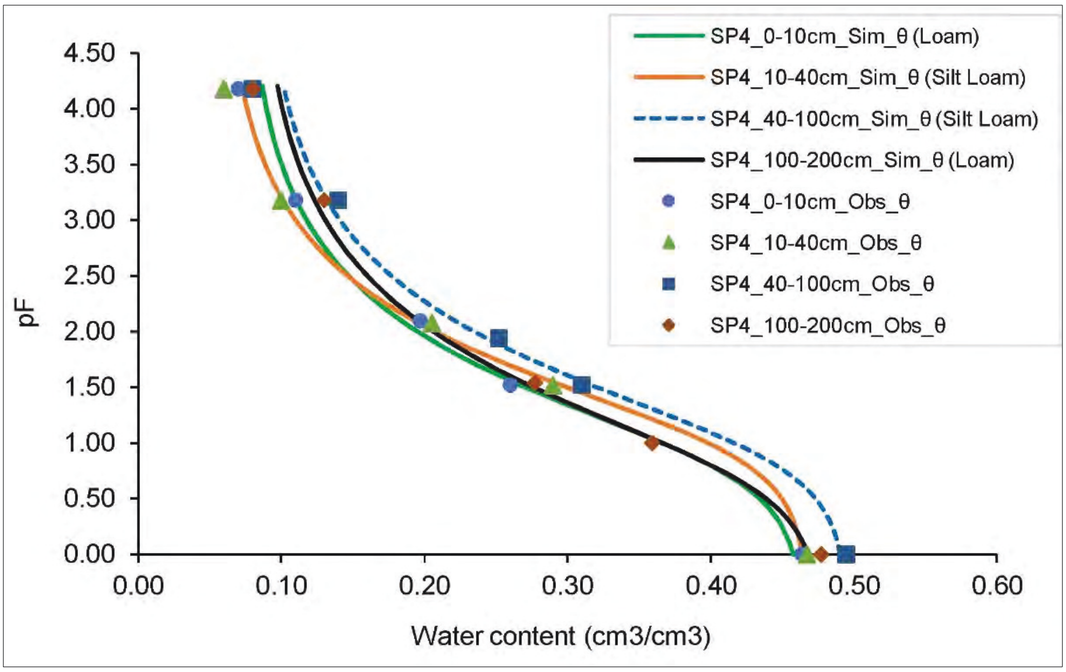


Figure 7: Soil water retention curve for the soil samples at the sample point 4 (SP4) at Parkxang Village. Note: Sim. = simulated values and Obs. = observed values.

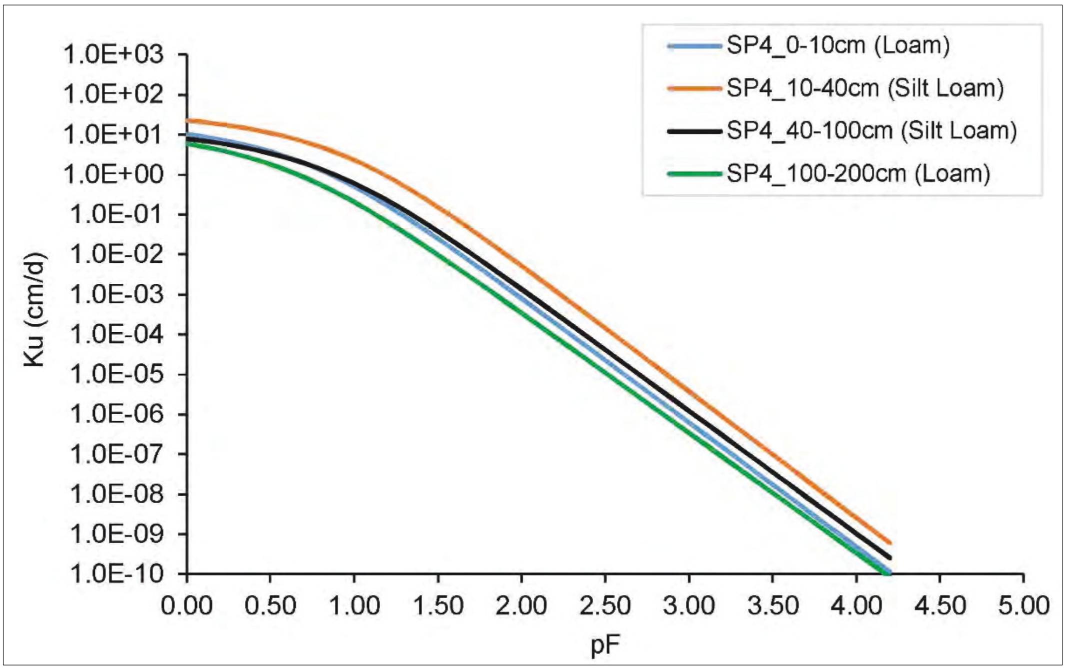


Figure 8: Hydraulic conductivity curves for the soil samples at the sample point 4 (SP4) at Parkxang Village

2.1.12. Soil specific yield

Duke (1972) developed an equation for estimating the apparent specific yield ($\acute{S}_y$). It is equal to the change in soil-water storage per unit area per unit change in water table depth (Duke, 1972), as follows:

$$\acute{S}_y = (\theta_s - \theta_r)\left(1 - \left(\frac{\psi_e}{d}\right)^{\lambda}\right) \quad \text{.................................... (5.79)}$$

Where d is depth from soil surface to water table (m), λ is pore-size distribution index presented by Brooks and Corey (1964) (dimensionless), ψ_e is water potential head at air entry (kPa), θ_s and θ_r are saturated and residual water contents (m^3), respectively. Saturated water content is estimated by using Equation (5.73). The residual water content, θr, and pore-size distribution, λ, are respectively calculated by using the equations of Rawls et al. (1992) (Rawls et al., 1992, cited in Ghanbarian-Alavijeh and Liaghat (2009)), expressed as follows:

$$\theta_r = -0.0182482 + 0.00087269(\%Sand) + 0.00513488(\%Clay) + 0.02939286\,(\theta_s) - 0.00015395\,(\%Clay)^2 - 0.0010827\,(\%Sand)\,(\theta_s) - 0.00018233\,(\%Clay)^2\,(\theta_s)^2 + 0.00030703\,(\%Clay)^2\,(\theta_s) - 0.0023584(\%Clay)(\theta_s)^2 \quad \text{................................ (5.80)}$$

$$\lambda = exp(-0.7842831 + 0.0177544(\%Sand) - 1.062498(\theta_s) - 0.00005304(\%Sand)^2 - 0.00273493(\%Clay)^2 + 1.11134946(\theta_s)^2 - 0.03088295(\%Sand)(\theta_s) +$$

$0.00026587(\%Sand)^2(\theta_s)^2 - 0.00610522(\%Clay)^2(\theta_s)^2 - 0.00000235(\%Sand)^2(\%Clay) + 0.00798746(\%Clay)^2(\theta_s) - 0.00674491(\theta_s)^2(\%Clay))$ ……………………………. (5.81)

In equation (5.79), Duke (1972) assumed that the change of the depth to water table (d) is relatively small or constant. Nachabe (2002) confirmed that Equation (5.79) is not suitable for the areas with large water table fluctuation. In Sukhuma District, the difference between peak water table in the wet season and the lowest water table in the dry season is commonly large (> about 2 m). Therefore, equation (5.79) may not be an appropriate equation for estimating specific yield ($\acute{S}_y$) of the soil layer in Sukhuma District. In order to quantify the value of $\acute{S}_y$ in the area with large water table fluctuation, Nachabe (2002) modified the equation of Duke (1972) as shown below:

$$\acute{S}_y = \frac{(\theta_s - \theta_r)}{\Delta h}\left(\Delta h + \frac{\psi_e}{(1-\lambda)}\left(\left(\frac{\psi_e}{d_1}\right)^{\lambda-1} - \left(\frac{\psi_e}{d_2}\right)^{\lambda-1}\right)\right) \quad \text{……………………………….. (5.82)}$$

Where Δh is water table drop (m), d_1 and d_2 are the peak water table in wet season and the lowest water table in dry season (m), respectively, and meaning of the rest parameters are stated in the previous equations.

The values of $\acute{S}_y$ for the 47 soil samples in Sukhuma District are summarised based on the soil type has been tested from this study. The results are provided in Table 6. Details of $\acute{S}_y$ value for each soil layer are given in Section 2.2.7.

Table 6: Summary results for specific yield of topsoil (~2 m depth), and number of soil samples. The number in the bracket is an average value.

Texture class	$\acute{S}_y$ **(dimensionless)**	**Sample size**
Loam	0.131 – 0.236 (0.206)	18
Sandy loam	0.196 – 0.217 (0.205)	4
Silt loam	0.153 – 0.260 (0.206)	21
Silty clay loam	0.108 – 0.181 (0.158)	4

2.2. Results of testing

2.2.1. Summary of testing for soil samples properties of the 47 soil samples at the 13 locations in Sukhuma District

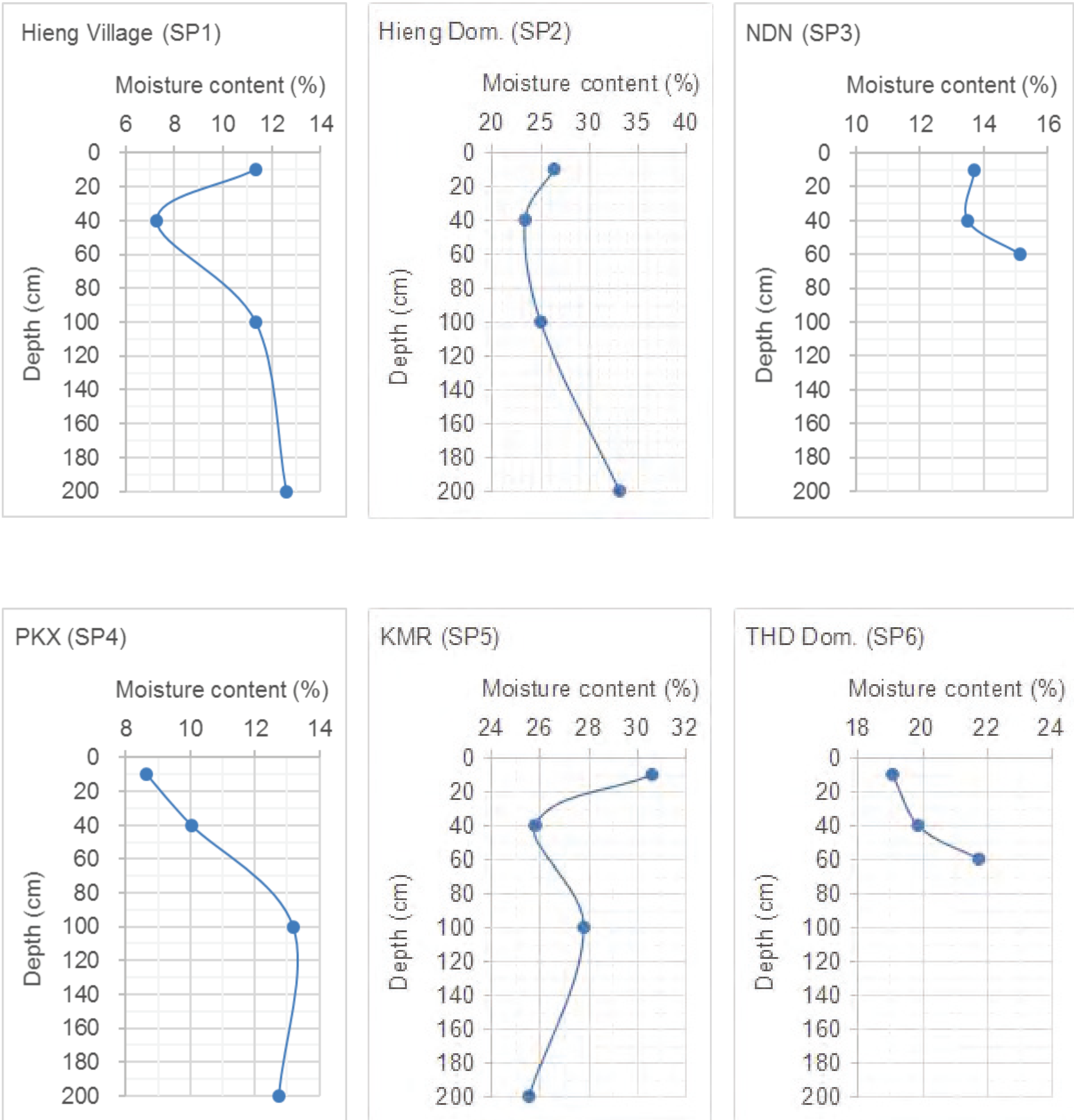
Sample name	Soil layer depth (cm bgl)	Depth	Field soil moisture content, W_d		Specific gravity, G_s	Dry ρ_b	Water bulk density, pw	Volumetric of soil water contrent, W_v		Soil moisture (SM) to compare with GLDAS-SM	Void ratio	Porosity	Soil type class based on USDA triangle method	
		(m)	(%)	(g/g)	(-)	(g/cm3)	(g/cm3)	(cm^3/ cm^3)	(%)	(kg/m^2) or (mm)	(%)	(%)	(Name with gravel)	(Soil type class)
Hieng Village (SP1)	0 - 10	0.1	11.33	0.11	2.42	1.90	1.00	0.22	21.52	21.52	27.42	21.52	Gravelly Loam	Loam
	10 - 40	0.3	7.27	0.07	2.64	2.21	1.00	0.16	16.10	48.31	19.19	16.10	Gravelly Loam	Loam
	40 - 100	0.6	11.36	0.11	2.52	1.96	1.00	0.22	22.26	133.54	28.63	22.26	Gravelly Silt loam	Silt loam
	100 - 200	1	12.62	0.13	2.6	1.96	1.00	0.25	24.71	247.06	32.81	24.71	Gravelly silty clay loam	Silty clay loam
Hieng domestic well (SP2)	0 - 10	0.1	26.45	0.26	2.71	1.58	1.00	0.42	41.75	41.75	71.68	41.75	Gravelly silt loam	Silt loam
	10 - 40	0.3	23.46	0.23	2.55	1.60	1.00	0.37	37.43	112.29	59.82	37.43	Gravelly silt loam	Silt loam
	40 - 100	0.6	25.06	0.25	2.86	1.67	1.00	0.42	41.75	250.50	71.67	41.75	Gravelly silty clay loam	Silty clay loam
	100 - 200	1	33.21	0.33	2.64	1.41	1.00	0.47	46.72	467.16	87.67	46.72	Gravelly silt loam	Silt loam
Nong Deng-Nua (SP3)	0 - 10	0.1	13.7	0.14	2.13	1.65	1.00	0.23	22.59	22.59	29.18	22.59	Gravelly sandy loam	Sandy loam
	10 - 40	0.3	13.48	0.13	2.13	1.65	1.00	0.22	22.31	66.92	28.71	22.31	Gravelly sandy loam	Sandy loam
	40 - 100	0.6	15.13	0.15	2.74	1.94	1.00	0.29	29.31	175.84	41.46	29.31	Gravelly silt loam	Silt loam
	100 - 200		na		na									
Parkxang (SP4)	0 - 10	0.1	8.65	0.09	2.84	2.28	1.00	0.20	19.72	19.72	24.57	19.72	Gravelly loam	Loam
	10 - 40	0.3	10.04	0.10	2.57	2.04	1.00	0.21	20.51	61.53	25.80	20.51	Gravelly silt loam	Silt loam
	40 - 100	0.6	13.2	0.13	2.55	1.91	1.00	0.25	25.18	151.10	33.66	25.18	Gravelly silt loam	Silt loam
	100 - 200	1	12.76	0.13	3.01	2.17	1.00	0.28	27.75	277.50	38.41	27.75	Gravelly loam	Loam
Khamouan Riverside (SP5)	0 - 10	0.1	30.65	0.31	2.07	1.27	1.00	0.39	38.82	38.82	63.45	38.82	Gravelly sandy loam	Sandy loam
	10 - 40	0.3	25.82	0.26	2.43	1.49	1.00	0.39	38.55	115.66	62.74	38.55	Gravelly loam	Loam

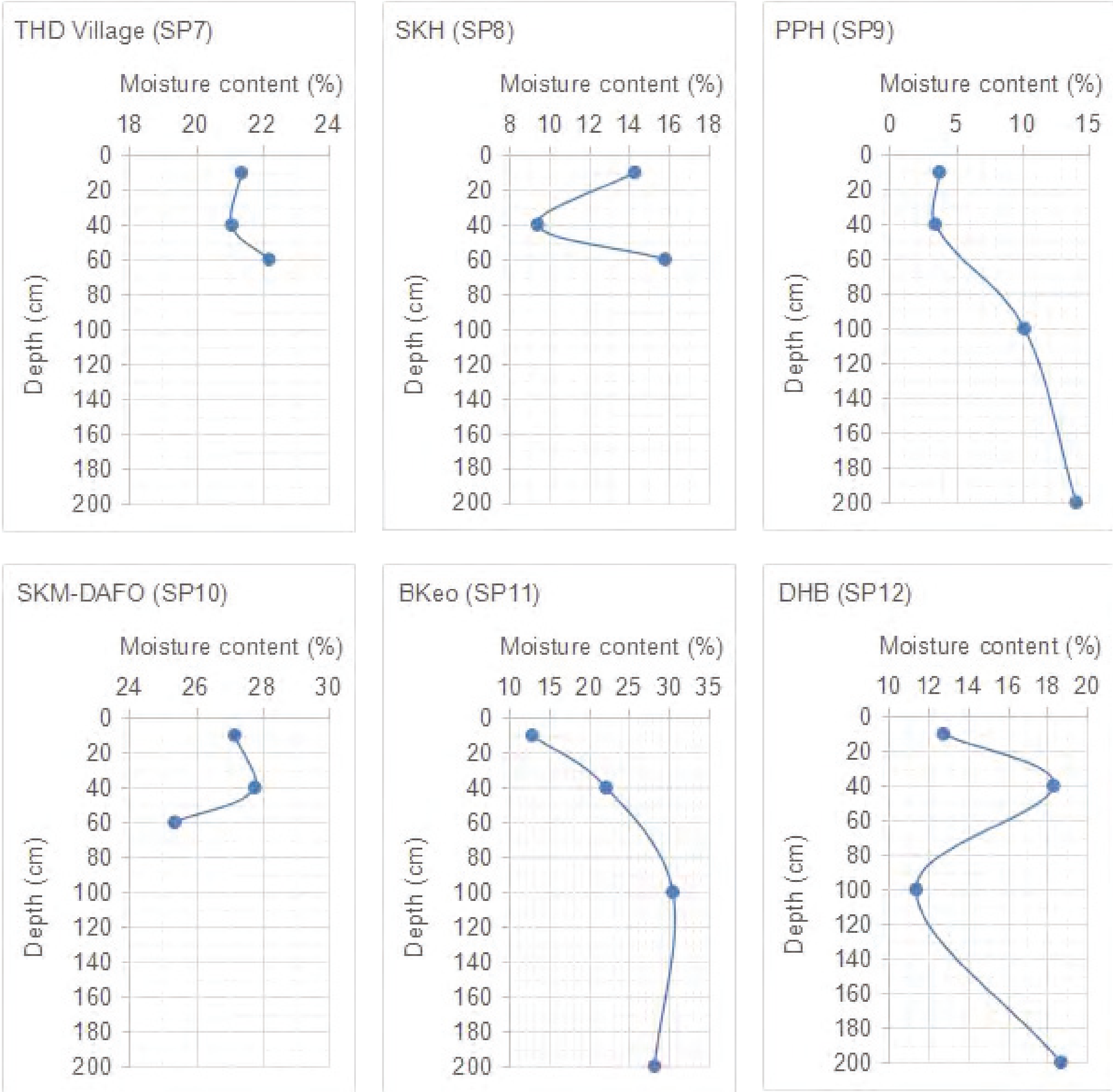
Sample name	Soil layer depth (cm bgl)	Depth	Field soil moisture content, W_d		Specific gravity, G_s	Dry ρ_b	Water bulk density, ρw	Volumetric of soil water contrent, W_v		Soil moisture (SM) to compare with GLDAS-SM	Void ratio	Porosity	Soil type class based on USDA triangle method	
		(m)	(%)	(g/g)	(-)	(g/cm3)	(g/cm3)	(cm^3/ cm^3)	(%)	(kg/m^2) or (mm)	(%)	(%)	(Name with gravel)	(Soil type class)
	40 - 100	0.6	27.82	0.28	2.28	1.40	1.00	0.39	38.81	232.87	63.43	38.81	Gravelly loam	Loam
	100 - 200	1	25.57	0.26	2.49	1.52	1.00	0.39	38.90	389.01	63.67	38.90	Gravelly silt loam	Silt loam
Thadarn domestic well (SP6)	0 - 10	0.1	19.09	0.19	2.49	1.69	1.00	0.32	32.22	32.22	47.53	32.22	Gravelly silt loam	Silt loam
	10 - 40	0.3	19.88	0.20	2.28	1.57	1.00	0.31	31.19	93.57	45.33	31.19	Gravelly loam	Loam
	40 - 100	0.6	21.77	0.22	2.39	1.57	1.00	0.34	34.22	205.34	52.03	34.22	Gravelly silt loam	Silt loam
	100 - 200		na		na									
Thadarn Village (SP7)	0 - 10	0.1	21.38	0.21	2.26	1.52	1.00	0.33	32.58	32.58	48.32	32.58	Gravelly loam	Loam
	10 - 40	0.3	21.09	0.21	2.49	1.63	1.00	0.34	34.43	103.30	52.51	34.43	Gravelly silt loam	Silt loam
	40 - 100	0.6	22.21	0.22	2.13	1.45	1.00	0.32	32.11	192.69	47.31	32.11	Gravelly silt loam	Silt loam
	100 - 200		na		na									
Sarmkha (SP8)	0 - 10	0.1	14.28	0.14	2.8	2.00	1.00	0.29	28.56	28.56	39.98	28.56	Gravelly loam	Loam
	10 - 40	0.3	9.42	0.09	2.95	2.31	1.00	0.22	21.75	65.24	27.79	21.75	Gravelly loam	Loam
	40 - 100	0.6	15.82	0.16	2.98	2.03	1.00	0.32	32.04	192.24	47.14	32.04	Gravelly loam	Loam
	100 - 200		na		na									
Phone Pheung (SP9)	0 - 10	0.1	3.77	0.04	2.48	2.27	1.00	0.09	8.55	8.55	9.35	8.55	Gravelly loam	Loam
	10 - 40	0.3	3.45	0.03	2.69	2.46	1.00	0.08	8.49	25.48	9.28	8.49	Gravelly silt loam	Silt loam
	40 - 100	0.6	10.19	0.10	2.19	1.79	1.00	0.18	18.24	109.47	22.32	18.24	Gravelly silt loam	Silt loam
	100 - 200	1	14.1	0.14	2.98	2.10	1.00	0.30	29.59	295.86	42.02	29.59	Gravelly silt loam	Silt loam
Sukhuma DAFO (SP10)	0 - 10	0.1	27.18	0.27	2.62	1.53	1.00	0.42	41.59	41.59	71.21	41.59	Gravelly silt loam	Silt loam
	10 - 40	0.3	27.78	0.28	2.98	1.63	1.00	0.45	45.29	135.87	82.78	45.29	Gravelly silt loam	Silt loam
	40 - 100	0.6	25.37	0.25	2.93	1.68	1.00	0.43	42.64	255.83	74.33	42.64	Gravelly silty clay loam	Silty clay loam
	100 - 200		na		na									

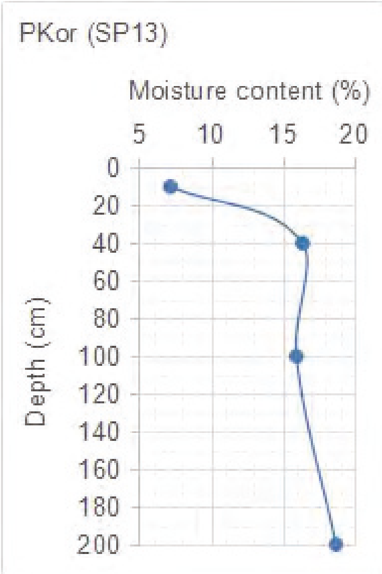
Sample name	Soil layer depth (cm bgl)	Depth	Field soil moisture content, W_d		Specific gravity, G_s	Dry p_b	Water bulk density, pw	Volumetric of soil water contrent, W_v		Soil moisture (SM) to compare with GLDAS-SM	Void ratio	Porosity	Soil type class based on USDA triangle method	
		(m)	(%)	(g/g)	(-)	(g/cm3)	(g/cm3)	(cm^3/ cm^3)	(%)	(kg/m^2) or (mm)	(%)	(%)	(Name with gravel)	(Soil type class)
Boungkeo (SP11)	0 - 10	0.1	12.86	0.13	2.62	1.96	1.00	0.25	25.20	25.20	33.69	25.20	Silt loam	Silt loam
	10 - 40	0.3	22.15	0.22	2.78	1.72	1.00	0.38	38.11	114.33	61.58	38.11	Gravelly silt loam	Silt loam
	40 - 100	0.6	30.5	0.31	2.64	1.46	1.00	0.45	44.60	267.63	80.52	44.60	Gravelly silty clay loam	Silty clay loam
	100 - 200	1	28.24	0.28	2.53	1.48	1.00	0.42	41.67	416.73	71.45	41.67	Gravelly silt loam	Silt loam
Donghouabarn (SP12)	0 - 10	0.1	12.75	0.13	2.59	1.95	1.00	0.25	24.82	24.82	33.02	24.82	Gravelly loam	Loam
	10 - 40	0.3	18.32	0.18	2.59	1.76	1.00	0.32	32.18	96.54	47.45	32.18	Gravelly sandy loam	Sandy loam
	40 - 100	0.6	11.37	0.11	2.67	2.05	1.00	0.23	23.29	139.73	30.36	23.29	Gravelly loam	Loam
	100 - 200	1	18.69	0.19	2.64	1.77	1.00	0.33	33.04	330.39	49.34	33.04	Gravelly silt loam	Silt loam
Pakor (SP13)	0 - 10	0.1	7.21	0.07	2.33	1.99	1.00	0.14	14.38	14.38	16.80	14.38	Gravelly loam	Loam
	10 - 40	0.3	16.41	0.16	2.55	1.80	1.00	0.30	29.50	88.50	41.85	29.50	Loam	Loam
	40 - 100	0.6	15.98	0.16	2.76	1.92	1.00	0.31	30.61	183.64	44.10	30.61	Gravelly loam	Loam
	100 - 200	1	18.72	0.19	2.41	1.66	1.00	0.31	31.09	310.89	45.12	31.09	Gravelly loam	Loam

Note : na = not data available

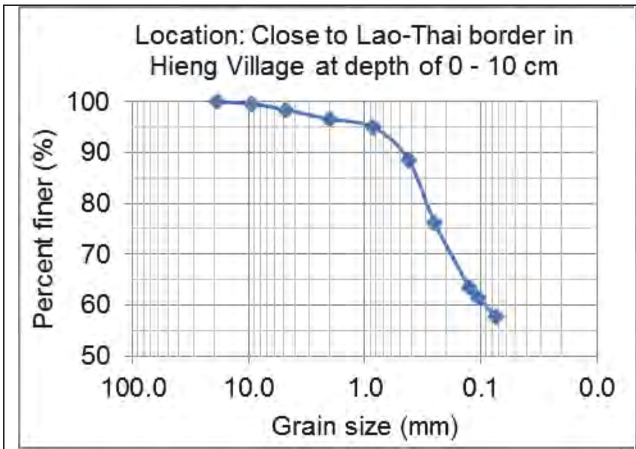
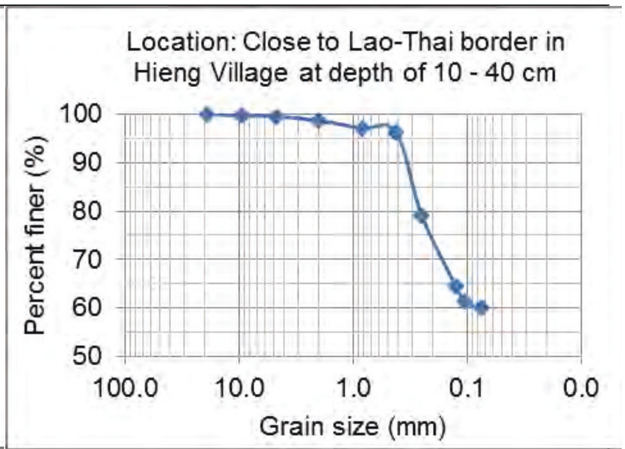
2.2.2. Soil moisture content plots for soil samples at each location in Sukhuma District in March 2017

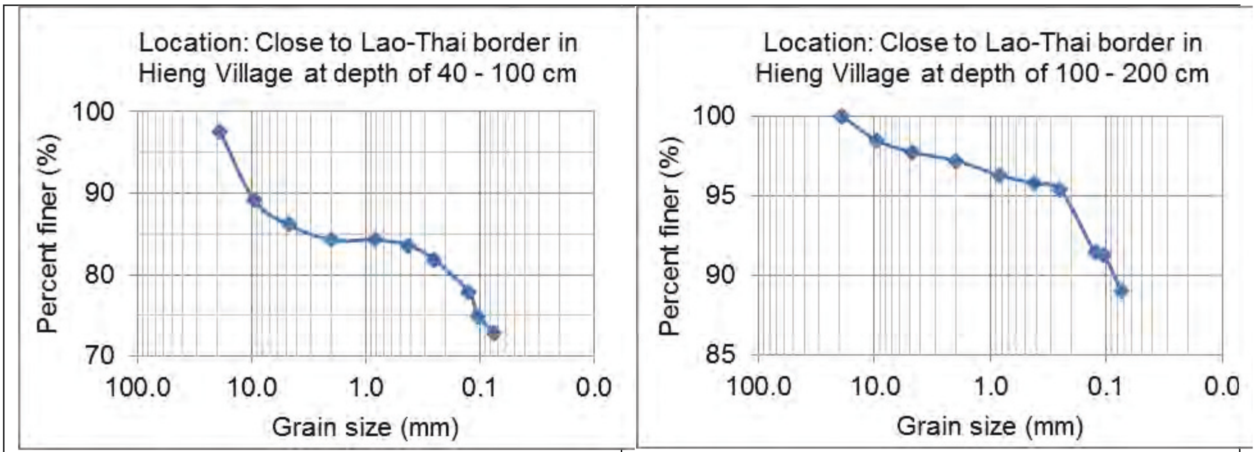



THD Village (SP7)
SKH (SP8)
PPH (SP9)
SKM-DAFO (SP10)
BKeo (SP11)
DHB (SP12)
Moisture content (%)
Depth (cm)



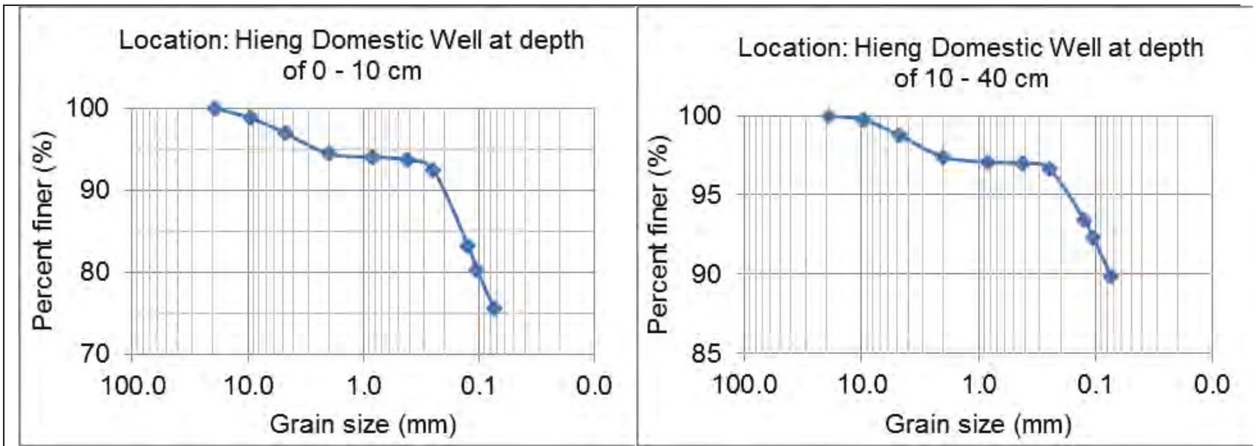
2.2.3. Soil grain size distribution plots for each soil layer of soil samples collected in Sukhuma District.

	
(a)	(b)

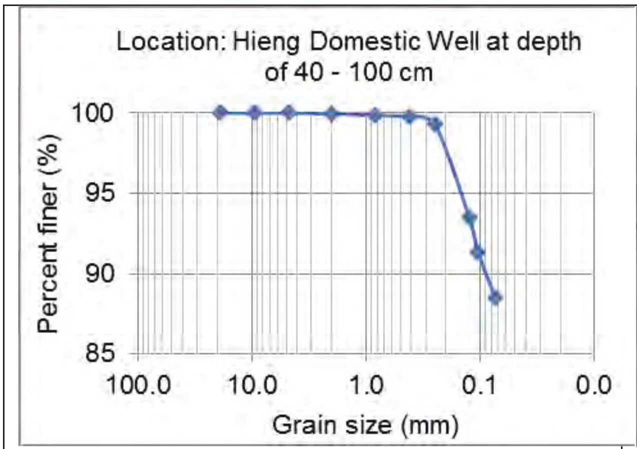


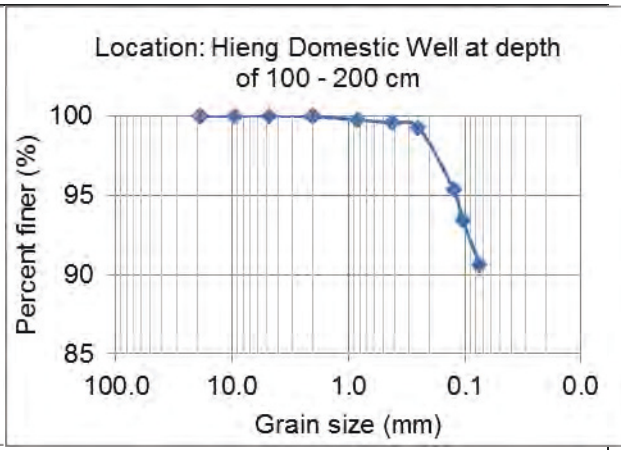
(c)	(d)

Figure 9: Plots of grain size distribution for soil samples at a point located close to Lao-Thai border in Hieng Village. Graph (a), (b), (c) and (d) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, 40 – 100 cm, and 100 – 200 cm, respectively.



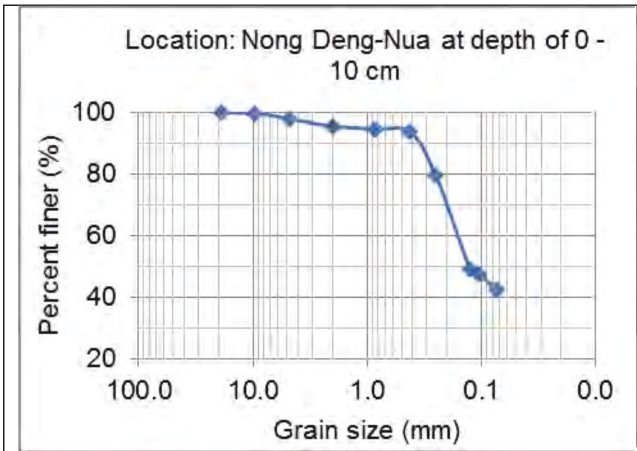
(a)	(b)

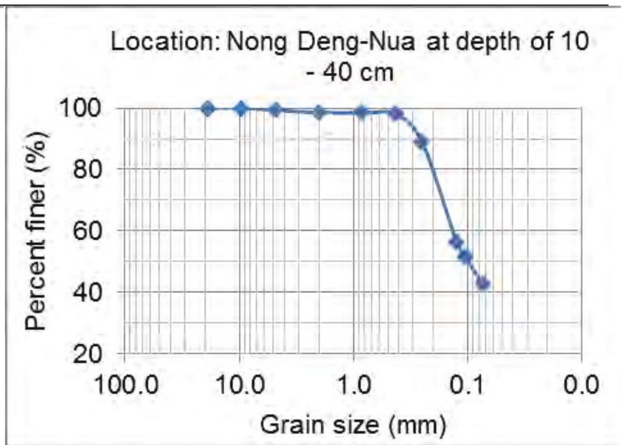




(c)	(d)

Figure 10: Plots of grain size distribution for soil samples at a point located close to the Hieng domestic monitoring well in Hieng Village. Graph (a), (b), (c) and (d) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, 40 – 100 cm, and 100 – 200 cm, respectively.





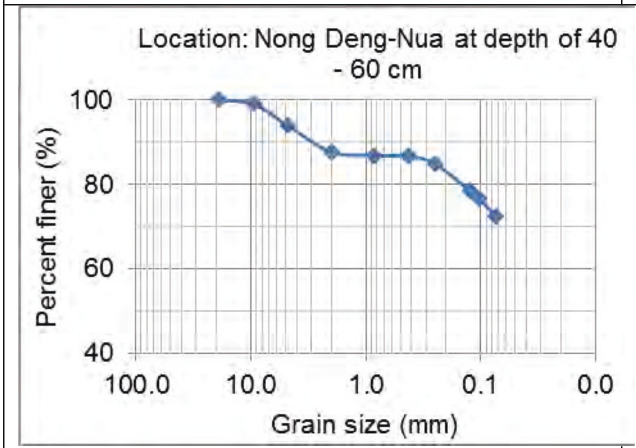
(a)	(b)
	
(c)	

Figure 11: Plots of grain size distribution for soil samples at a point located in the Nong Deng-Nua Village. Graph (a), (b), and (c) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, and 40 – 60 cm, respectively.

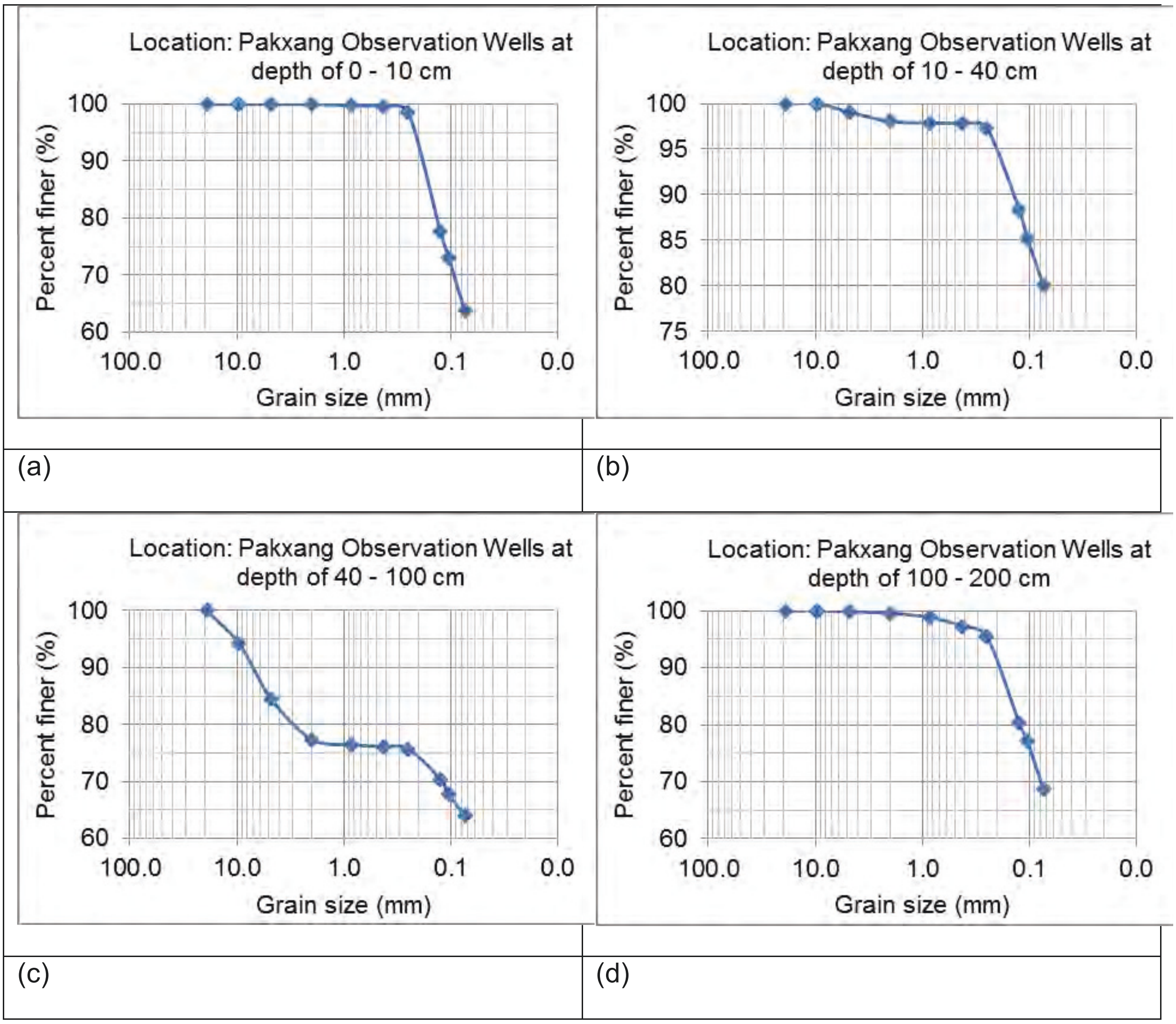


Figure 12: Plots of grain size distribution for soil samples at a point located close to the Pakxang shallow and deep observation wells in Pakxang Village. Graph (a), (b), (c) and (d) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, 40 – 100 cm, and 100 – 200 cm, respectively.

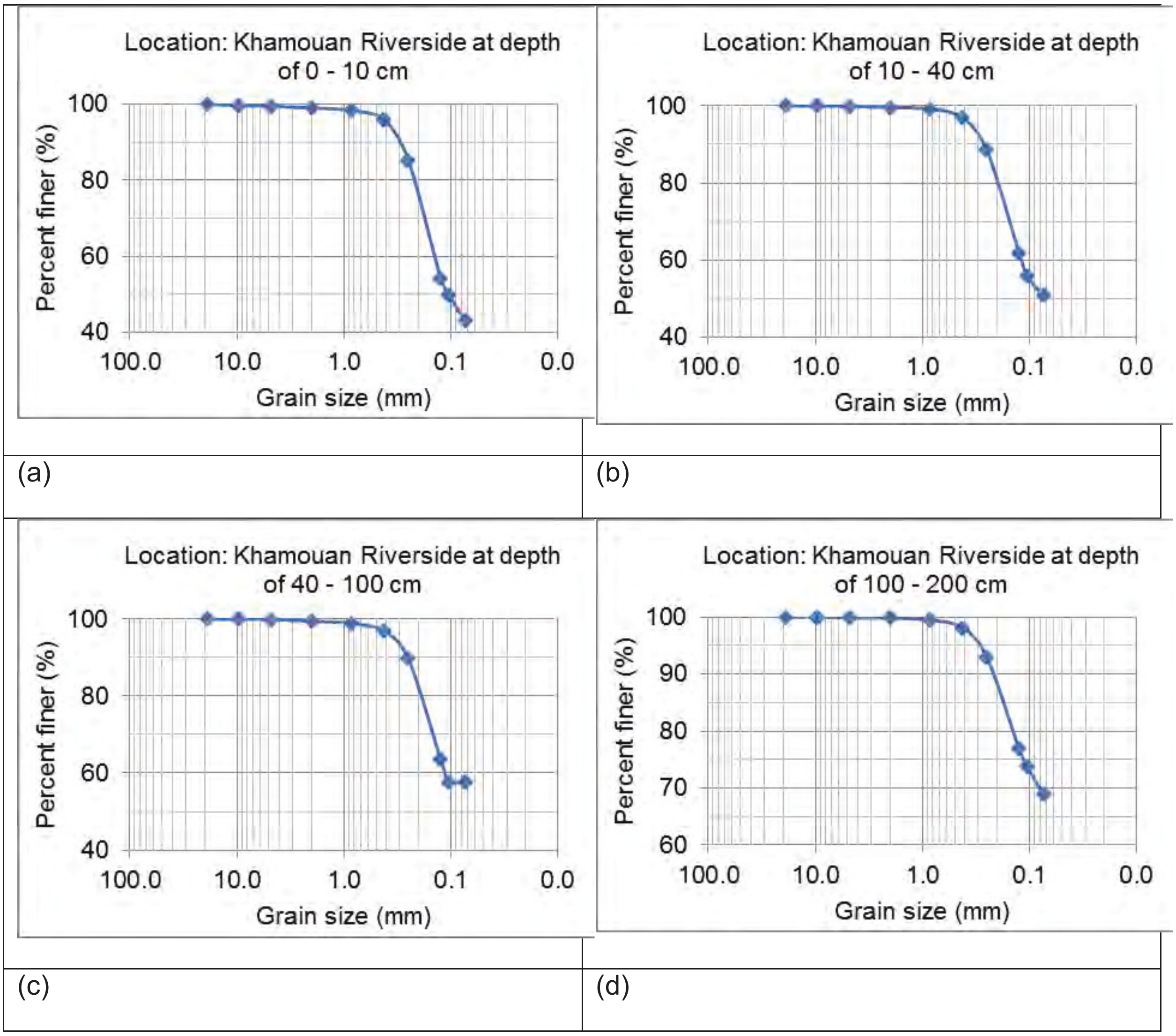
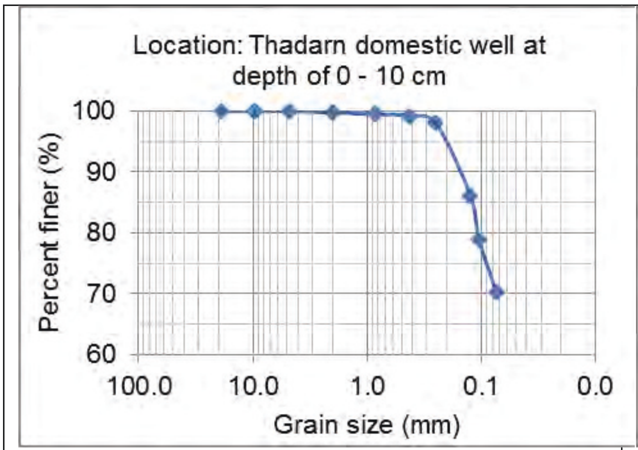
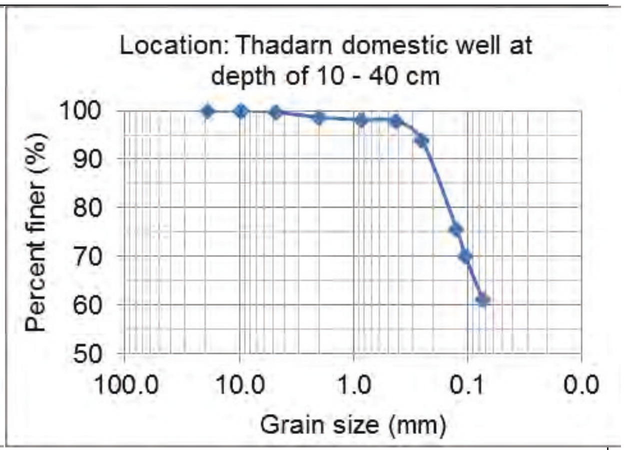


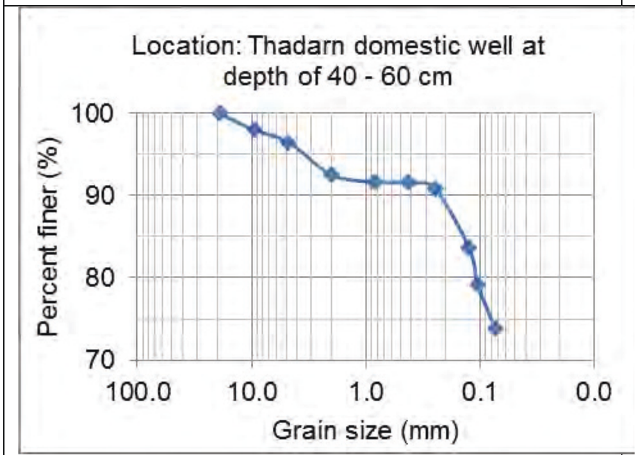
Figure 13: Plots of grain size distribution for soil samples at a point located at the Khamouan Riverside in Sukhuma Village. Graph (a), (b), (c) and (d) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, 40 – 100 cm, and 100 – 200 cm, respectively.



(a)

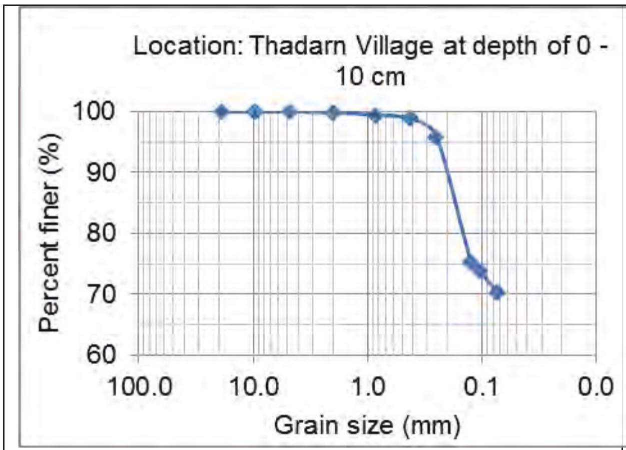


(b)

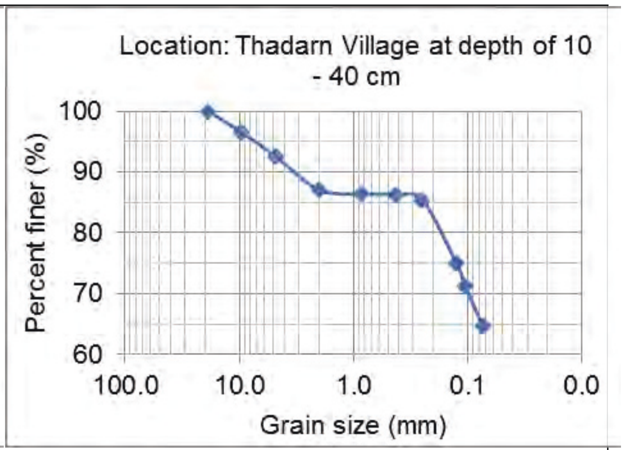


(c)

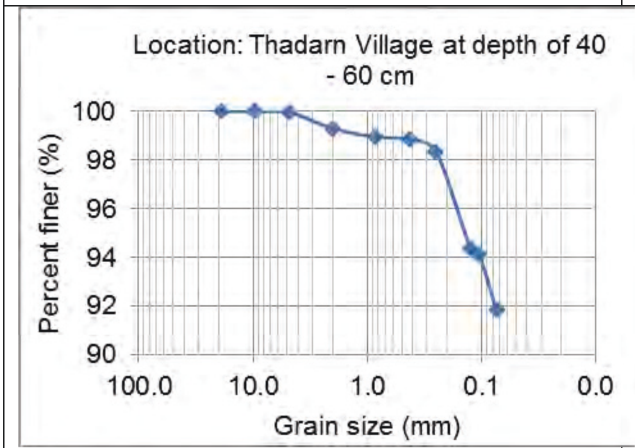
Figure 14: Plots of grain size distribution for soil samples at a point located close to the Thadarn domestic monitoring well in Thadarn Village. Graph (a), (b), and (c) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, and 40 – 60 cm, respectively.



(a)

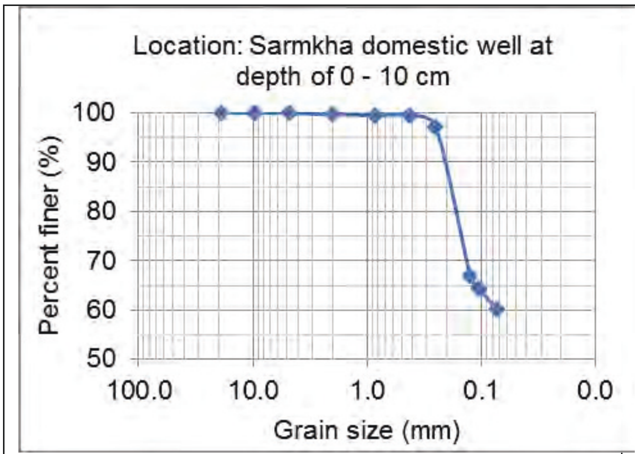


(b)

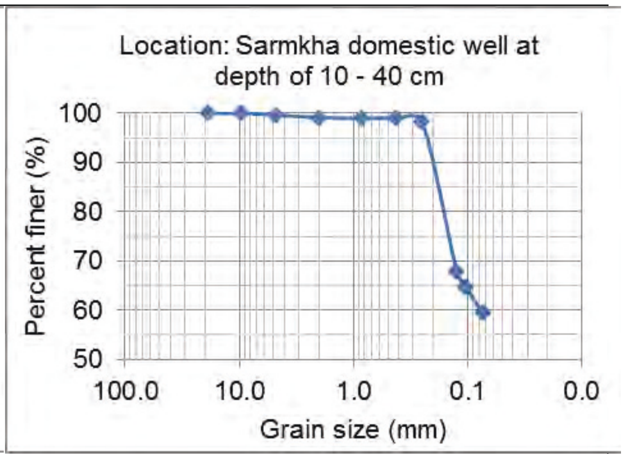


(c)

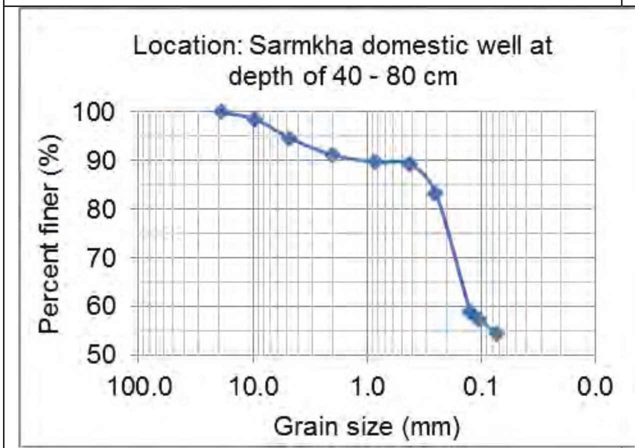
Figure 15: Plots of grain size distribution for soil samples at a point located in Thadarn Village. Graph (a), (b), and (c) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, and 40 – 60 cm, respectively.



(a)

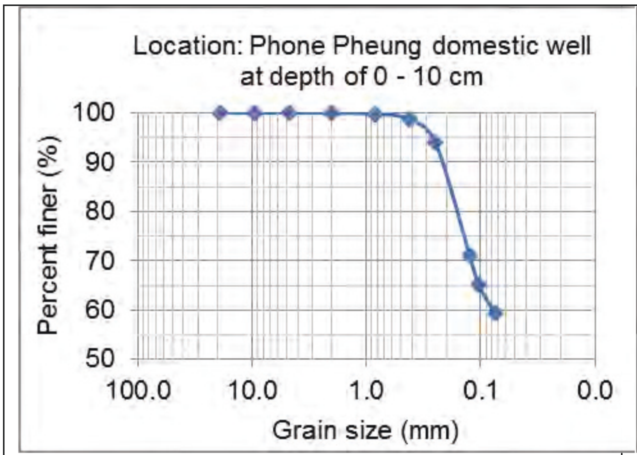


(b)

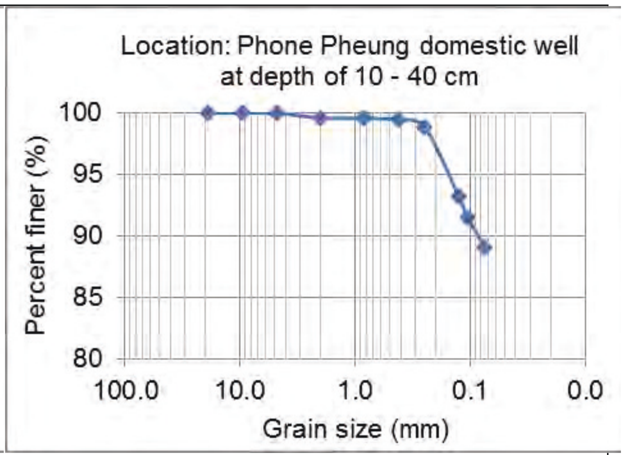


(c)

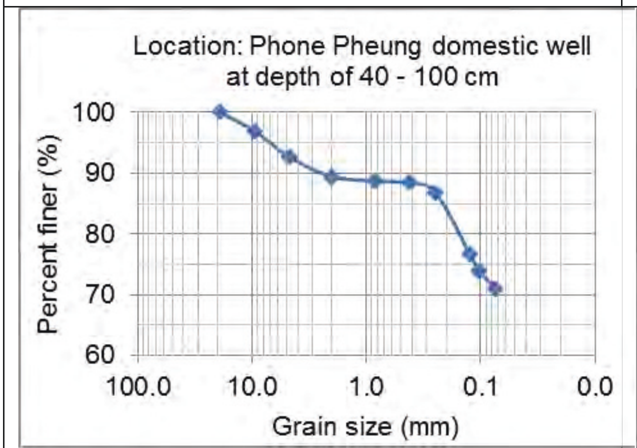
Figure 16: Plots of grain size distribution for soil samples at a point located close to the Sarmkha domestic monitoring well in Sarmkha Village. Graph (a), (b), and (c) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, and 40 – 80 cm, respectively.



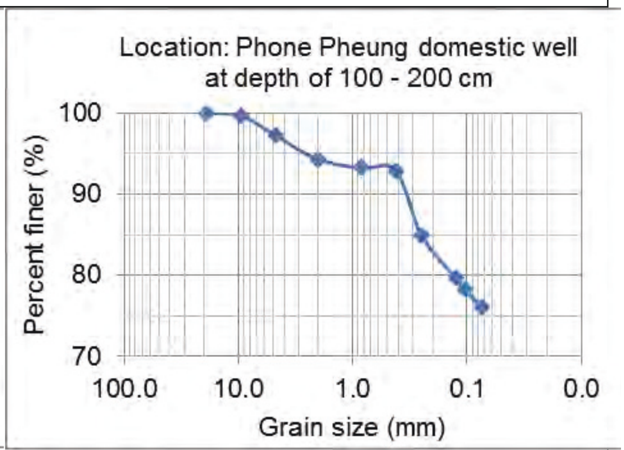
(a)



(b)

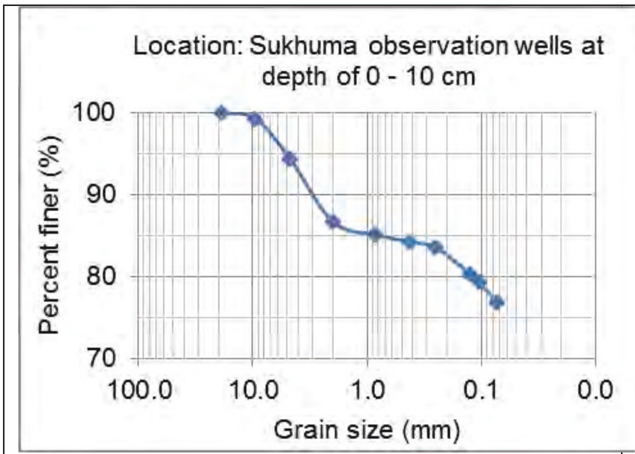


(c)

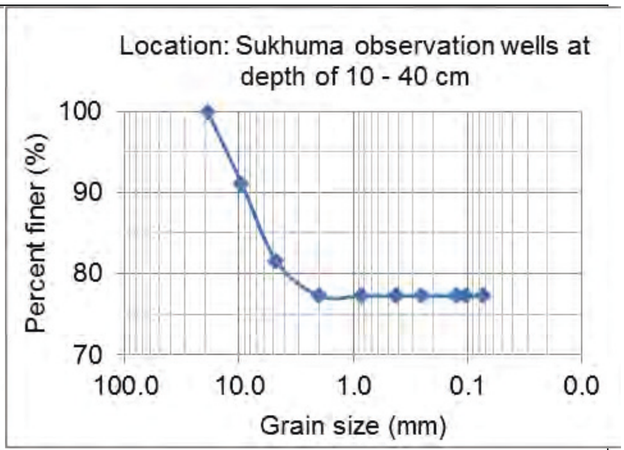


(d)

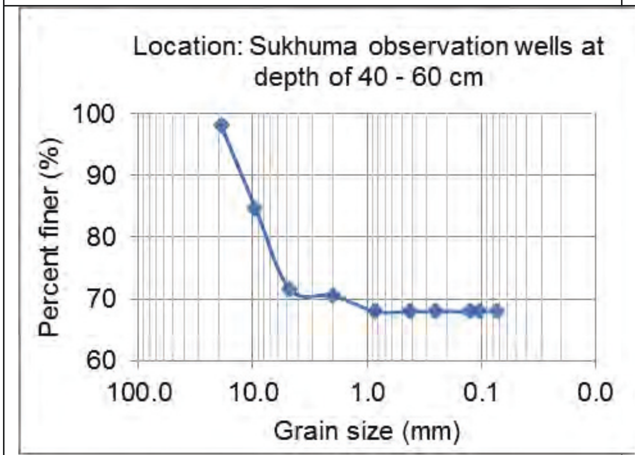
Figure 17: Plots of grain size distribution for soil samples at a point located close to the Phone Pheung domestic monitoring well in Phone Pheung Village. Graph (a), (b), (c) and (d) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, 40 – 100 cm, and 100 – 200 cm, respectively.



(a)



(b)



(c)

Figure 18: Plots of grain size distribution for soil samples at a point located close to the Sukhuma shallow and deep observation wells in Sukhuma Village. Graph (a), (b), and (c) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, and 40 – 60 cm, respectively.

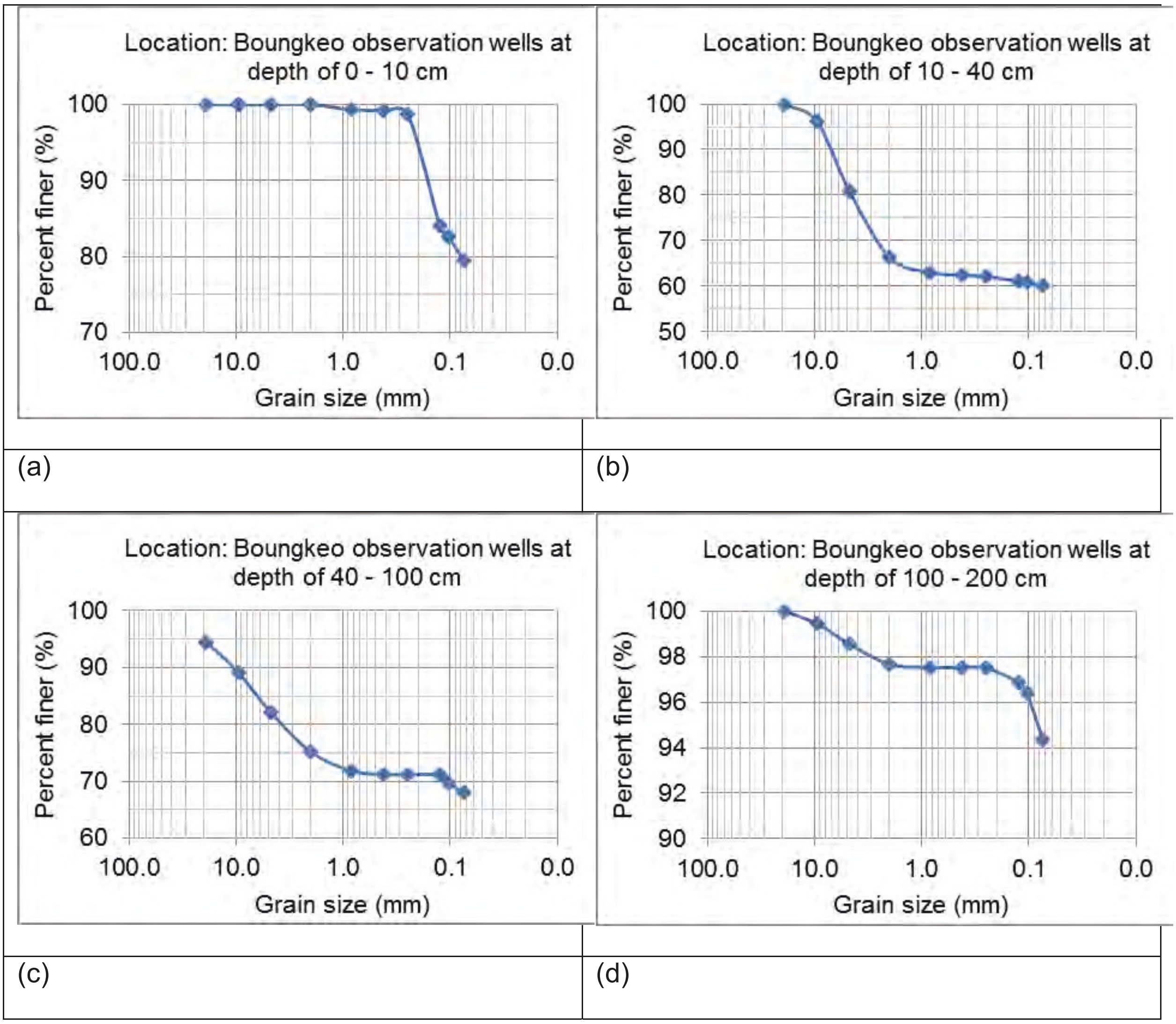
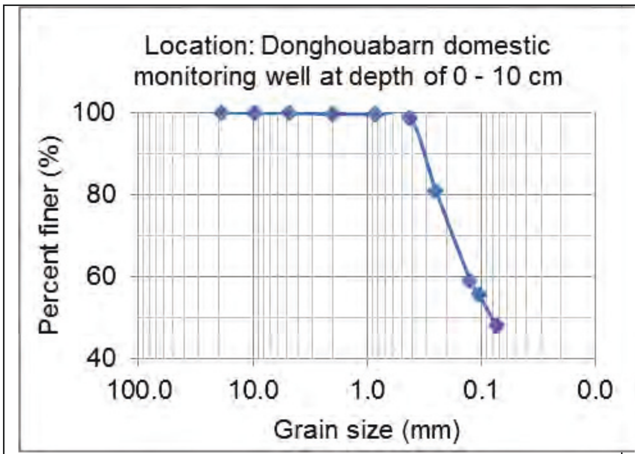
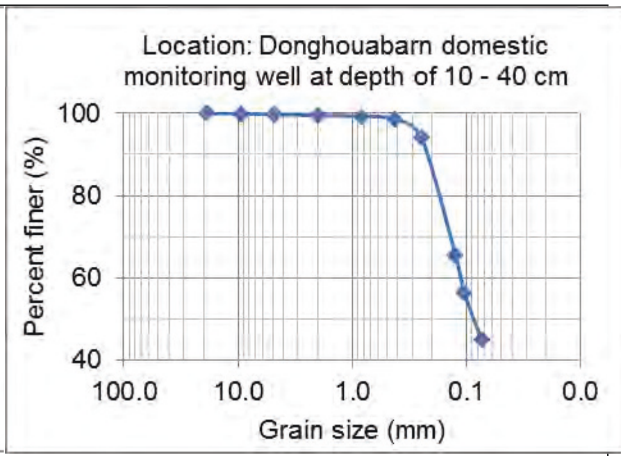


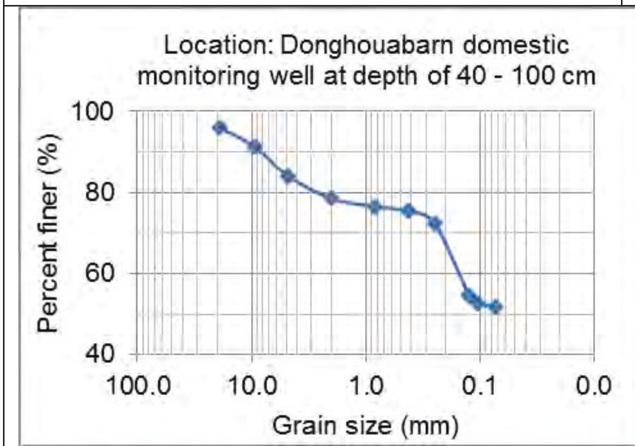
Figure 19: Plots of grain size distribution for soil samples at a point located close to the Boungkeo shallow and deep observation wells in Boungkeo Village. Graph (a), (b), (c) and (d) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, 40 – 100 cm, and 100 – 200 cm, respectively.



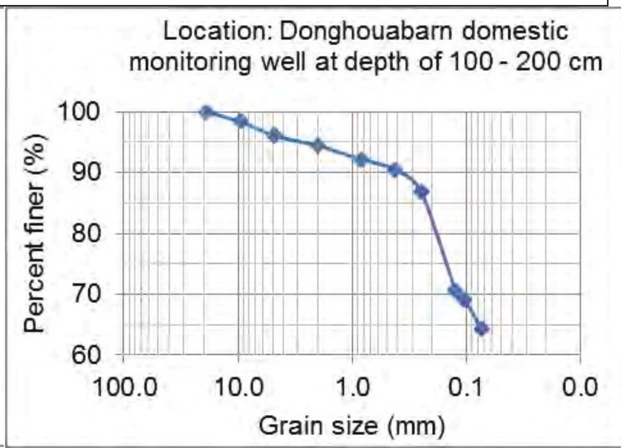
(a)



(b)

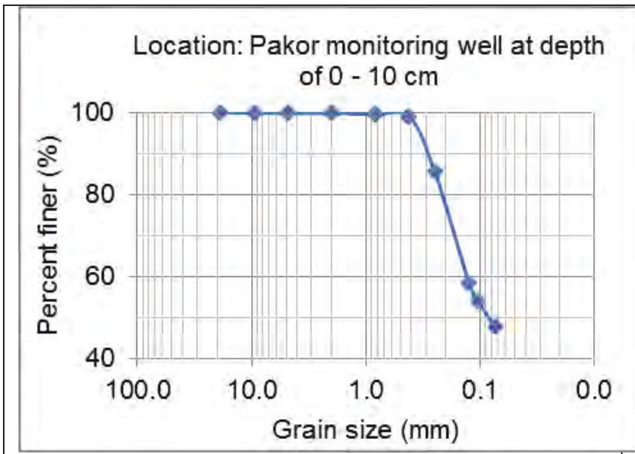


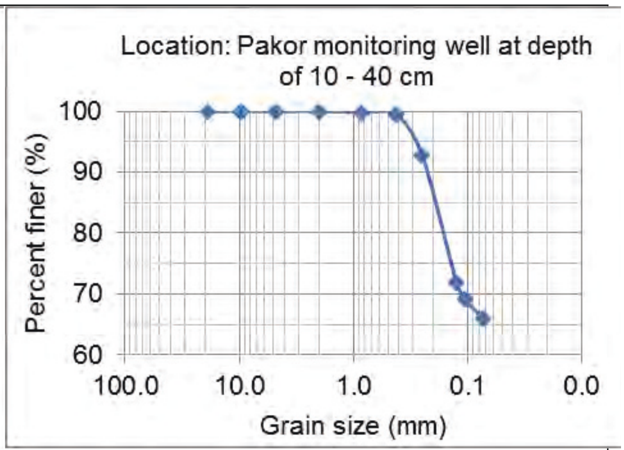
(c)



(d)

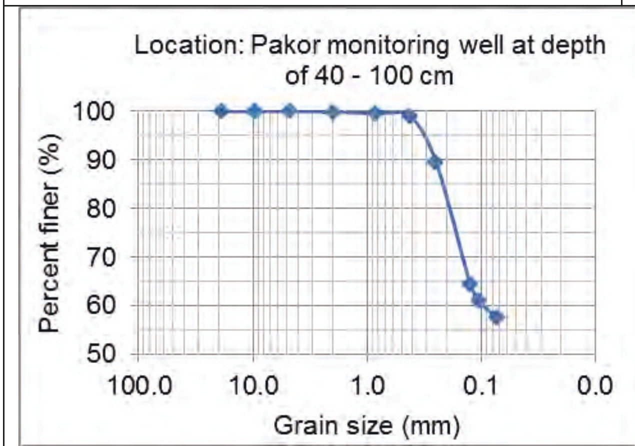
Figure 20: Plots of grain size distribution for soil samples at a point located close to the Donghouabarn domestic monitoring well in Donghouabarn Village. Graph (a), (b), (c) and (d) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, 40 – 100 cm, and 100 – 200 cm, respectively.

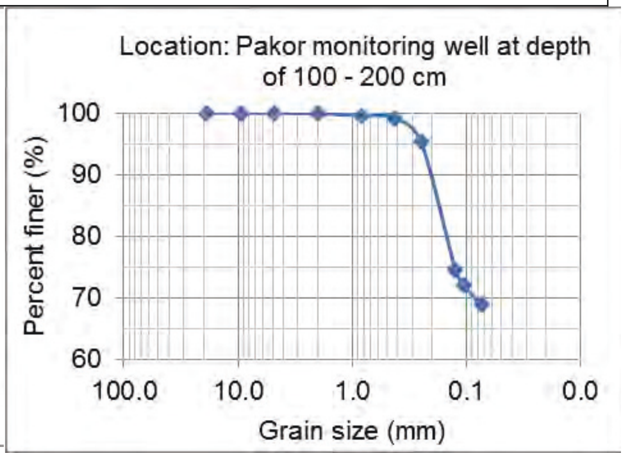




(a)

(b)



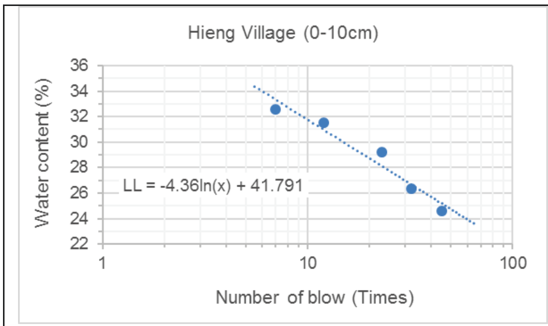


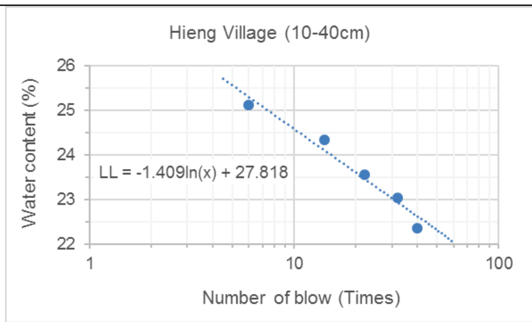
(c)

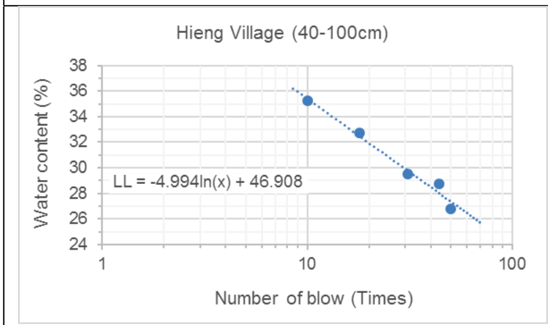
(d)

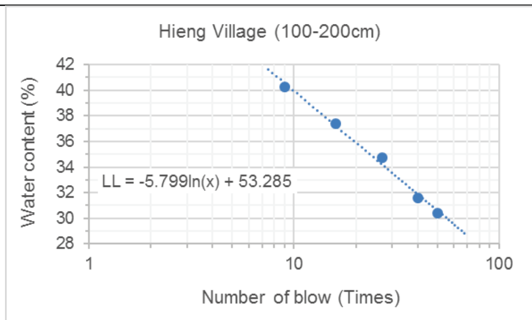
Figure 21: Plots of grain size distribution for soil samples at a point located close to the Pakor monitoring wells in Pakor Village. Graph (a), (b), (c) and (d) are for soil sample at depth of 0 – 10 cm, 10 – 40 cm, 40 – 100 cm, and 100 – 200 cm, respectively.

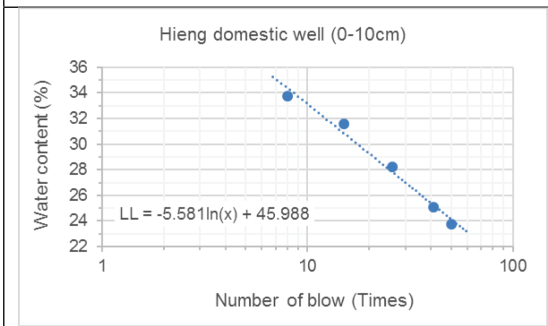
2.2.4. Liquid limit determination for each soil layer in Sukhuma District

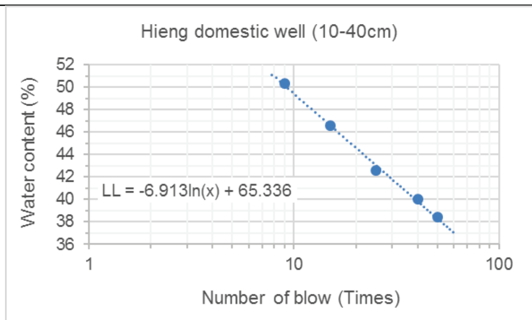


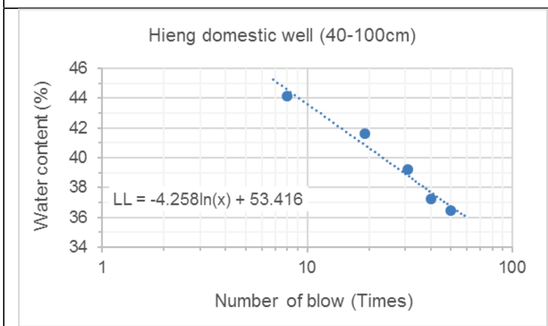


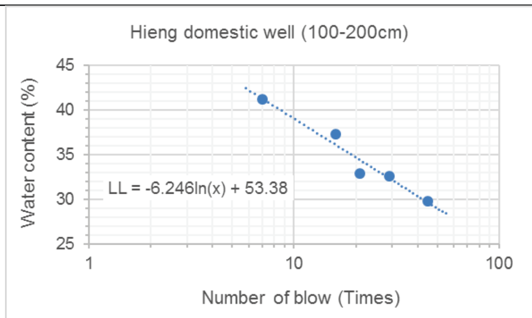


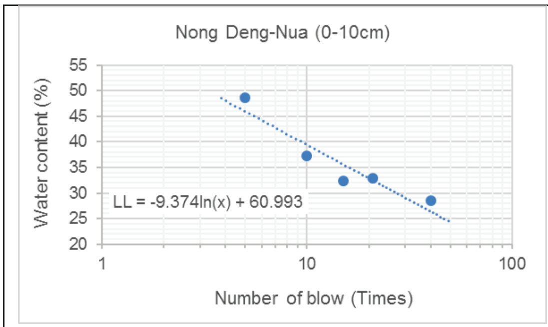


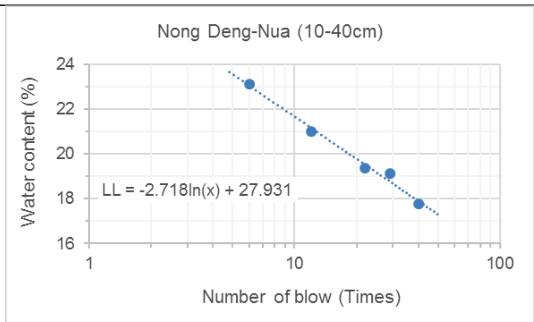


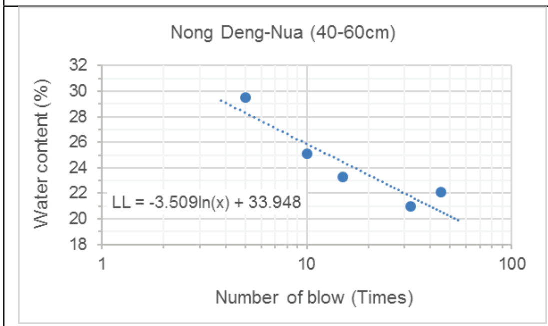


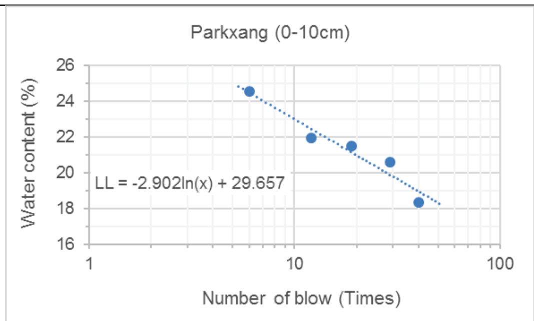


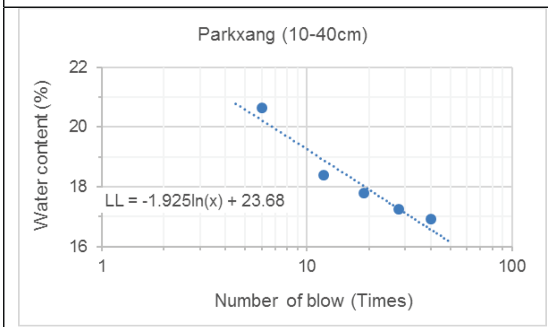


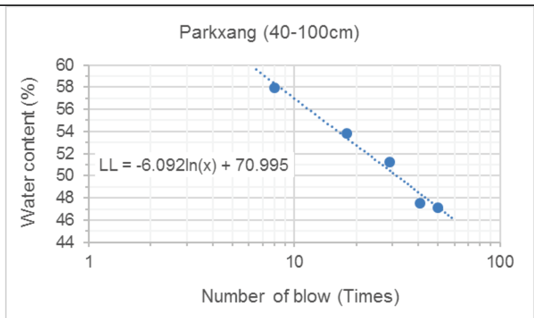

Nong Deng-Nua (0-10cm)
Water content (%)
LL = -9.374ln(x) + 60.993
Number of blow (Times)

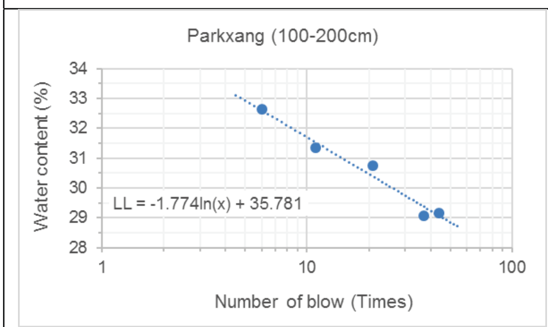

Nong Deng-Nua (10-40cm)
Water content (%)
LL = -2.718ln(x) + 27.931
Number of blow (Times)

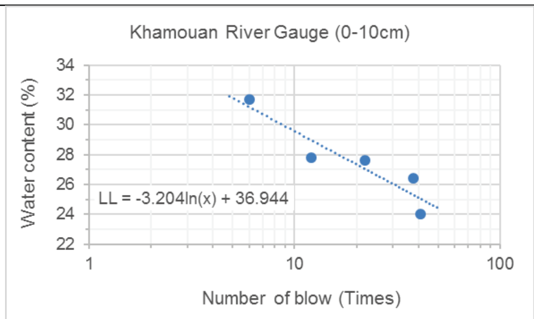

Nong Deng-Nua (40-60cm)
Water content (%)
LL = -3.509ln(x) + 33.948
Number of blow (Times)

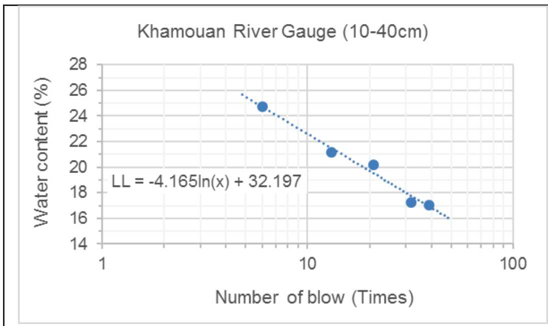

Parkxang (0-10cm)
Water content (%)
LL = -2.902ln(x) + 29.657
Number of blow (Times)

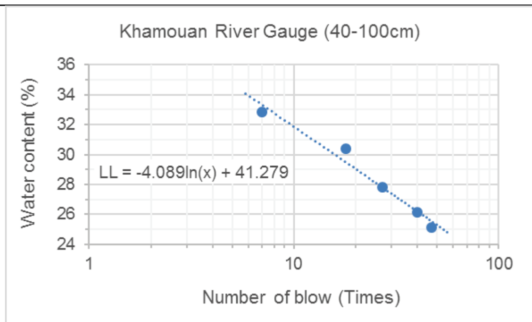

Parkxang (10-40cm)
Water content (%)
LL = -1.925ln(x) + 23.68
Number of blow (Times)

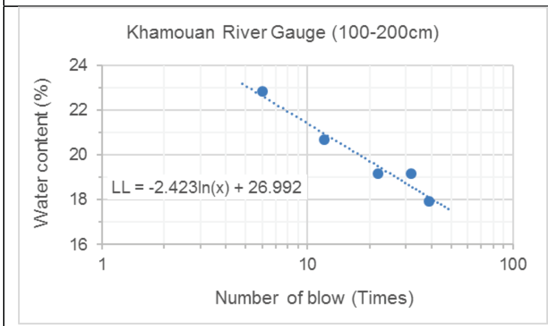

Parkxang (40-100cm)
Water content (%)
LL = -6.092ln(x) + 70.995
Number of blow (Times)

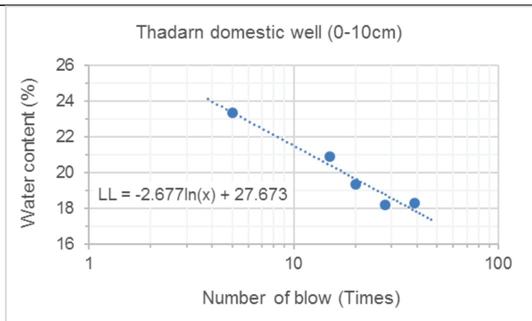

Parkxang (100-200cm)
Water content (%)
LL = -1.774ln(x) + 35.781
Number of blow (Times)

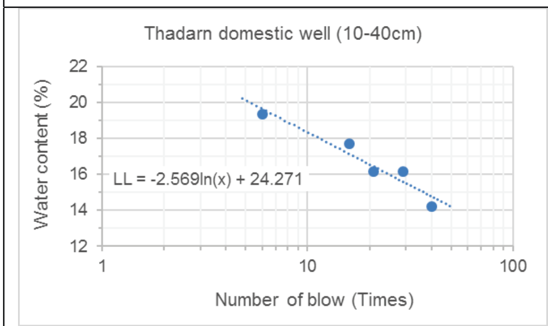

Khamouan River Gauge (0-10cm)
Water content (%)
LL = -3.204ln(x) + 36.944
Number of blow (Times)

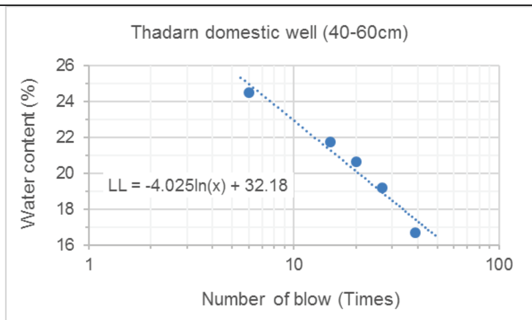

Khamouan River Gauge (10-40cm)
Water content (%)
LL = -4.165ln(x) + 32.197
Number of blow (Times)

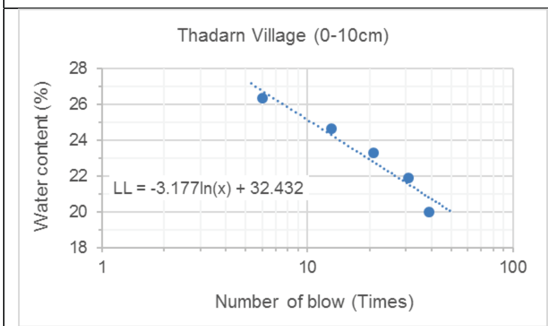

Khamouan River Gauge (40-100cm)
Water content (%)
LL = -4.089ln(x) + 41.279
Number of blow (Times)

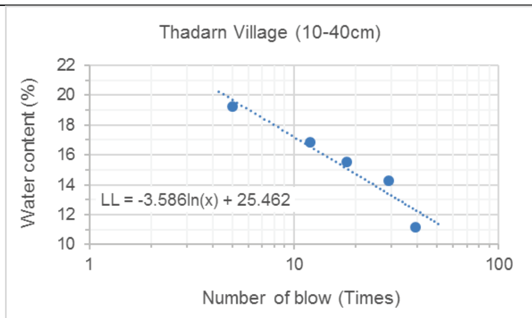

Khamouan River Gauge (100-200cm)
Water content (%)
LL = -2.423ln(x) + 26.992
Number of blow (Times)

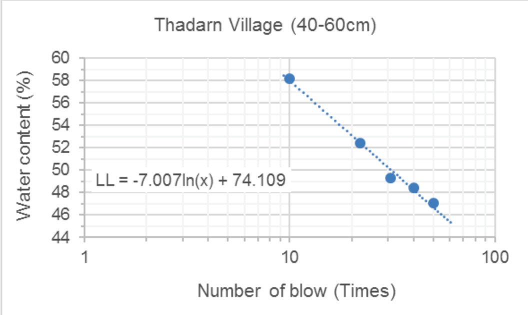

Thadarn domestic well (0-10cm)
Water content (%)
LL = -2.677ln(x) + 27.673
Number of blow (Times)

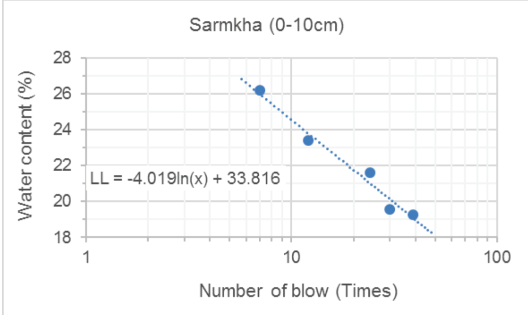

Thadarn domestic well (10-40cm)
Water content (%)
LL = -2.569ln(x) + 24.271
Number of blow (Times)

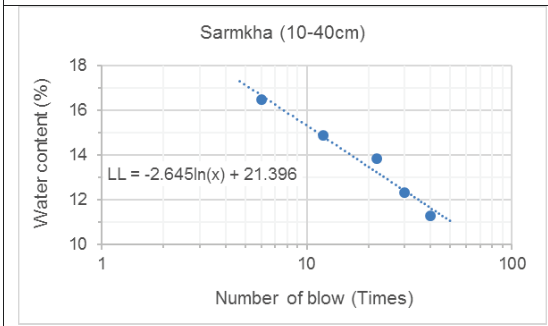

Thadarn domestic well (40-60cm)
Water content (%)
LL = -4.025ln(x) + 32.18
Number of blow (Times)

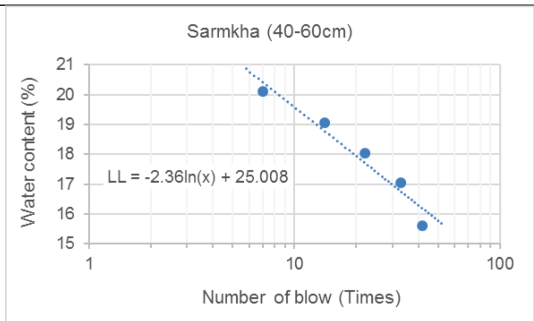

Thadarn Village (0-10cm)
Water content (%)
LL = -3.177ln(x) + 32.432
Number of blow (Times)

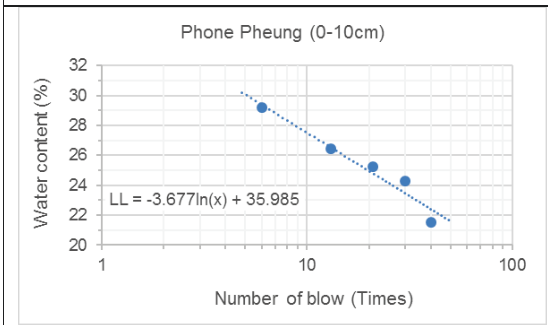

Thadarn Village (10-40cm)
Water content (%)
LL = -3.586ln(x) + 25.462
Number of blow (Times)

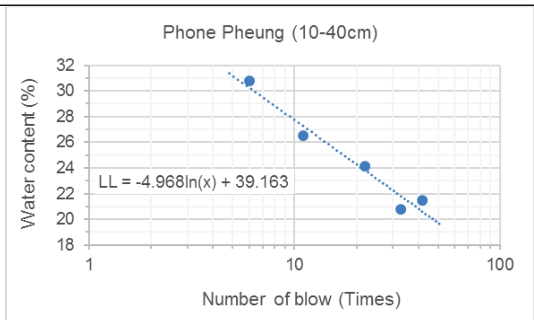

Thadarn Village (40-60cm)
LL = -7.007ln(x) + 74.109
Water content (%)
Number of blow (Times)

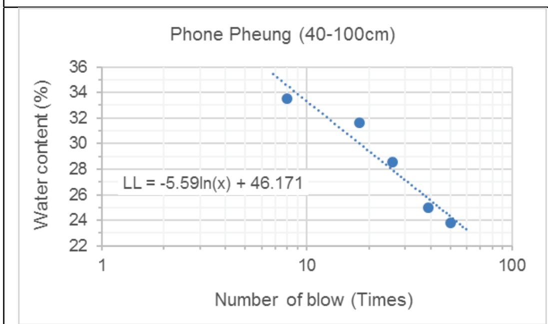

Sarmkha (0-10cm)
LL = -4.019ln(x) + 33.816
Water content (%)
Number of blow (Times)

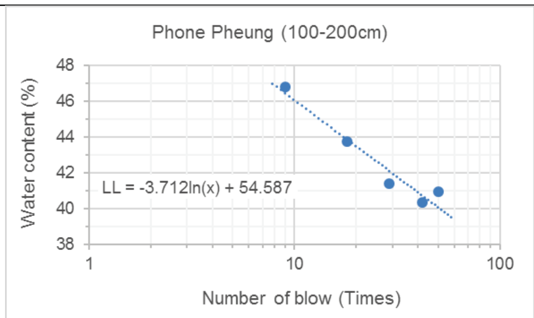

Sarmkha (10-40cm)
LL = -2.645ln(x) + 21.396
Water content (%)
Number of blow (Times)

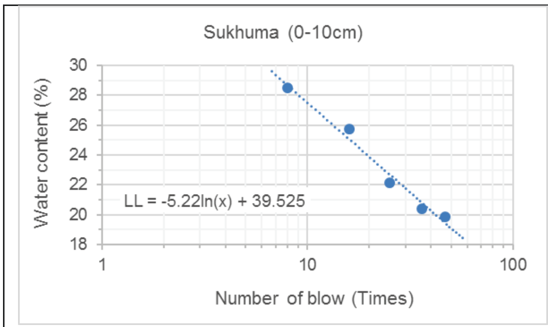

Sarmkha (40-60cm)
LL = -2.36ln(x) + 25.008
Water content (%)
Number of blow (Times)

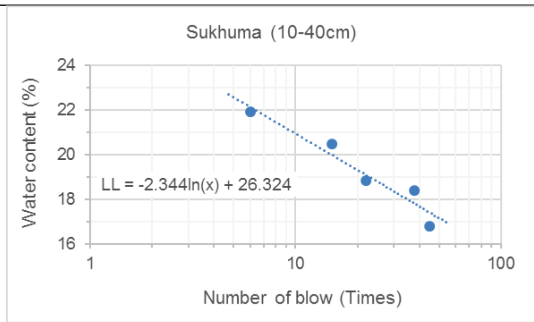

Phone Pheung (0-10cm)
LL = -3.677ln(x) + 35.985
Water content (%)
Number of blow (Times)

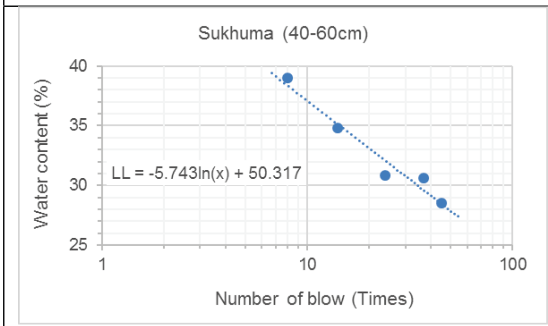

Phone Pheung (10-40cm)
LL = -4.968ln(x) + 39.163
Water content (%)
Number of blow (Times)

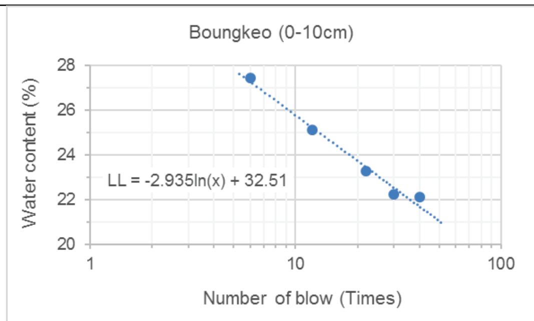

Phone Pheung (40-100cm)
LL = -5.59ln(x) + 46.171
Water content (%)
Number of blow (Times)

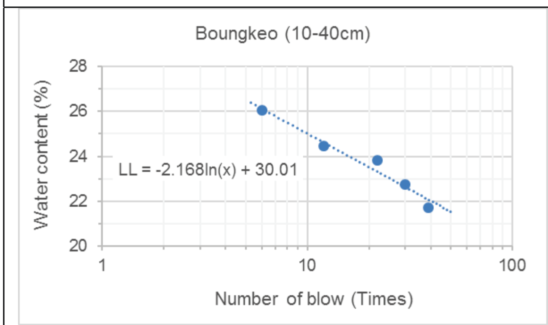

Phone Pheung (100-200cm)
LL = -3.712ln(x) + 54.587
Water content (%)
Number of blow (Times)

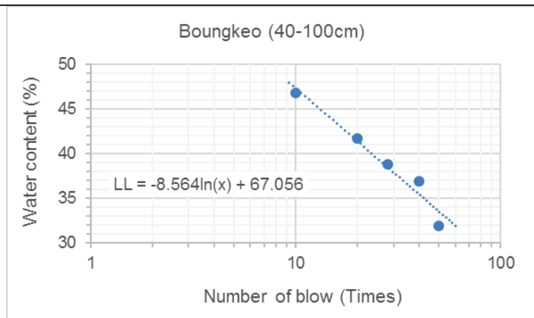

Sukhuma (0-10cm)
Water content (%)
LL = -5.22ln(x) + 39.525
Number of blow (Times)

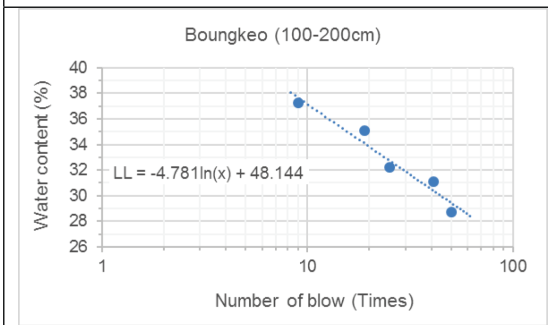

Sukhuma (10-40cm)
Water content (%)
LL = -2.344ln(x) + 26.324
Number of blow (Times)

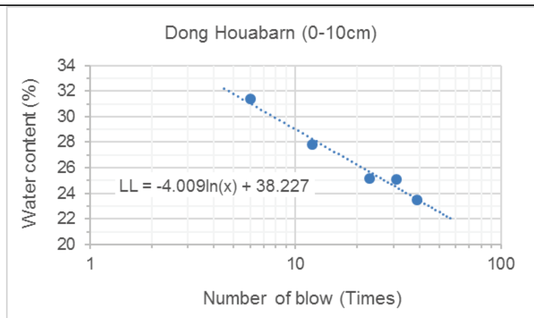

Sukhuma (40-60cm)
Water content (%)
LL = -5.743ln(x) + 50.317
Number of blow (Times)

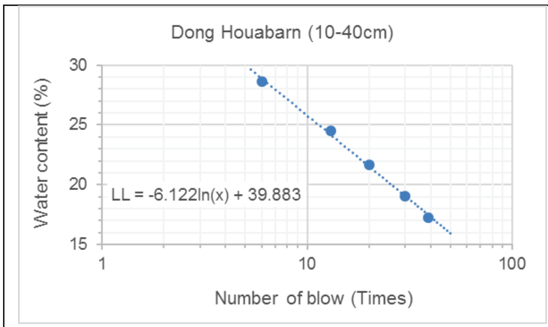

Boungkeo (0-10cm)
Water content (%)
LL = -2.935ln(x) + 32.51
Number of blow (Times)

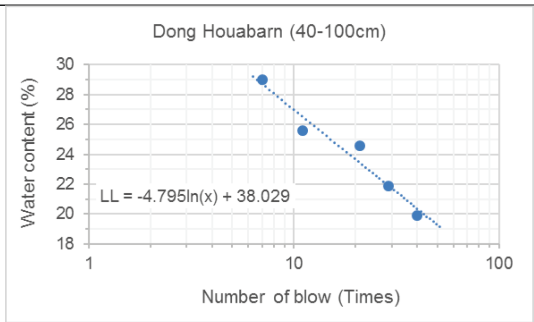

Boungkeo (10-40cm)
Water content (%)
LL = -2.168ln(x) + 30.01
Number of blow (Times)

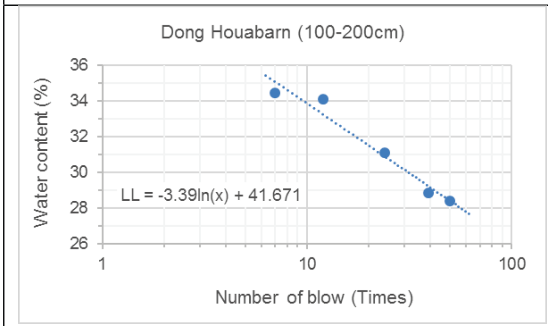

Boungkeo (40-100cm)
Water content (%)
LL = -8.564ln(x) + 67.056
Number of blow (Times)

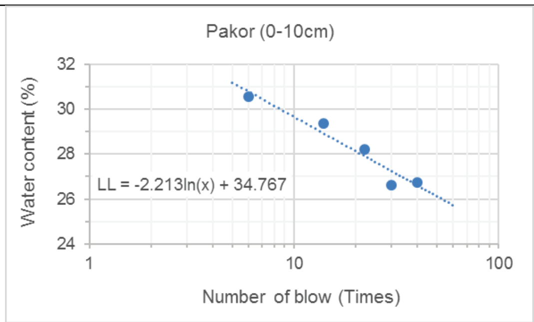

Boungkeo (100-200cm)
Water content (%)
LL = -4.781ln(x) + 48.144
Number of blow (Times)

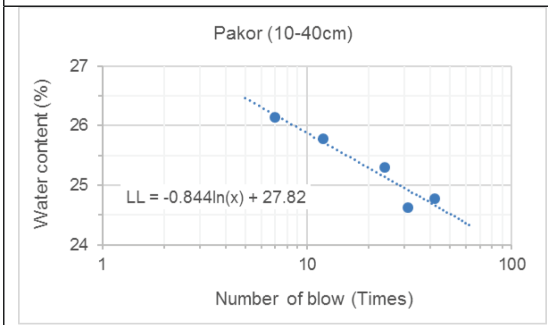

Dong Houabarn (0-10cm)
Water content (%)
LL = -4.009ln(x) + 38.227
Number of blow (Times)

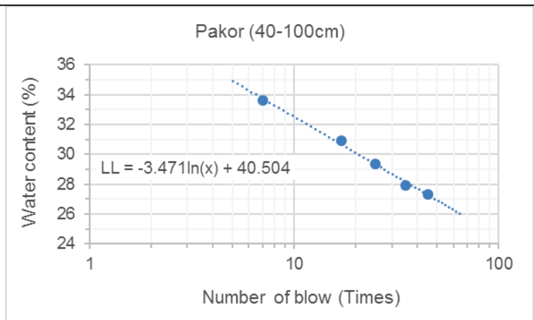

Dong Houabarn (10-40cm)
Water content (%)
30
25
20
15
LL = -6.122ln(x) + 39.883
1
10
100
Number of blow (Times)

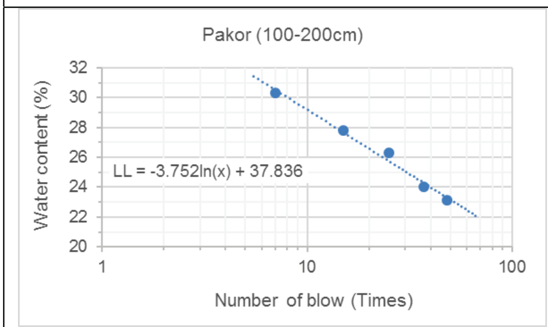

Dong Houabarn (40-100cm)
Water content (%)
30
28
26
24
22
20
18
LL = -4.795ln(x) + 38.029
1
10
100
Number of blow (Times)


Dong Houabarn (100-200cm)
Water content (%)
36
34
32
30
28
26
LL = -3.39ln(x) + 41.671
1
10
100
Number of blow (Times)


Pakor (0-10cm)
Water content (%)
32
30
28
26
24
LL = -2.213ln(x) + 34.767
1
10
100
Number of blow (Times)


Pakor (10-40cm)
Water content (%)
27
26
25
24
LL = -0.844ln(x) + 27.82
1
10
100
Number of blow (Times)


Pakor (40-100cm)
Water content (%)
36
34
32
30
28
26
24
LL = -3.471ln(x) + 40.504
1
10
100
Number of blow (Times)


Pakor (100-200cm)
Water content (%)
32
30
28
26
24
22
20
LL = -3.752ln(x) + 37.836
1
10
100
Number of blow (Times)

2.2.5. Summary of atterberg limits (LL, PL, PI), percentage of sand, silt and clay contents, and soil type classification for the 47 soil samples

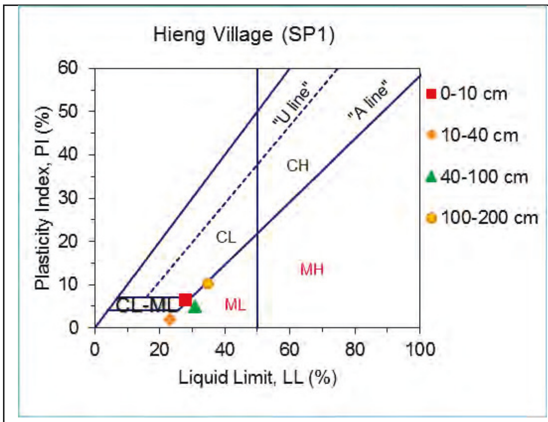
Sample name	Soil layer depth (cm)	Depth	Gravel	Relative %sand	Equation of Keller and Dexter (2012)	Relative %Silt	Atterberg Limits			USCS Classification Plasticity Chart	Soil type class based on USDA triangle method	
		(m)	(%)	(%)	Relative %Clay content	(%)	LL (%)	PL (%)	PI (%)		(Name with gravel)	(Only Soil)
Hieng Village (SP1)	0 - 10	0.1	3.38	40.18	21.19	38.64	27.76	21.13	6.62	CL-ML	Gravelly Loam	Loam
	10 - 40	0.3	1.34	39.30	13.13	47.57	23.28	21.35	1.93	ML	Gravelly Loam	Loam
	40 - 100	0.6	15.74	13.51	18.40	68.09	30.83	25.84	5	ML	Gravelly Silt loam	Silt loam
	100 - 200	1	2.78	8.43	27.63	63.94	34.62	24.25	10.37	CL	Gravelly silty clay loam	Silty clay loam
Hieng domestic well (SP2)	0 - 10	0.1	5.52	20.07	20.96	58.97	28.02	21.54	6.49	CL-ML	Gravelly silt loam	Silt loam
	10 - 40	0.3	2.60	7.72	24.43	67.85	43.08	34.57	8.51	ML	Gravelly silt loam	Silt loam
	40 - 100	0.6	0.04	11.46	28.18	60.36	39.71	29.02	10.69	ML	Gravelly silty clay loam	Silty clay loam
	100 - 200	1	0.04	9.38	23.44	67.18	33.27	25.34	7.93	ML	Gravelly silt loam	Silt loam
Nong Deng-Nua (SP3)	0 - 10	0.1	4.52	55.30	17.10	27.60	30.82	26.58	4.24	ML	Gravelly sandy loam	Sandy loam
	10 - 40	0.3	1.46	56.77	15.22	28.01	19.18	16.04	3.15	ML	Gravelly sandy loam	Sandy loam
	40 - 100	0.6	12.30	17.35	14.64	68.01	22.65	19.84	2.81	ML	Gravelly silt loam	Silt loam
	100 - 200						na	na	na			
Parkxang (SP4)	0 - 10	0.1	0.04	36.31	17.30	46.38	20.32	15.95	4.36	CL-ML	Gravelly loam	Loam
	10 - 40	0.3	1.94	18.34	14.48	67.18	17.48	14.76	2.72	ML	Gravelly silt loam	Silt loam
	40 - 100	0.6	22.58	17.33	23.78	58.89	51.39	43.25	8.13	MH	Gravelly silt loam	Silt loam
	100 - 200	1	0.38	31.08	20.53	48.39	30.07	23.83	6.24	ML	Gravelly loam	Loam

Sample name	Soil layer depth (cm)	Depth	Gravel	Relative %sand	Equation of Keller and Dexter (2012)	Relative %Silt	Atterberg Limits			USCS Classification Plasticity Chart	Soil type class based on USDA triangle method	
		(m)	(%)	(%)	Relative %Clay content	(%)	LL (%)	PL (%)	PI (%)		(Name with gravel)	(Only Soil)
Khamouan Riverside (SP5)	0 - 10	0.1	1.00	56.36	19.54	24.10	26.63	20.97	5.66	CL-ML	Gravelly sandy loam	Sandy loam
	10 - 40	0.3	0.38	49.13	15.19	35.68	18.79	15.66	3.13	ML	Gravelly loam	Loam
	40 - 100	0.6	0.58	41.88	24.07	34.04	28.12	19.82	8.3	CL	Gravelly loam	Loam
	100 - 200	1	0.16	31.01	13.01	55.98	19.19	17.33	1.86	ML	Gravelly silt loam	Silt loam
Thadarn domestic well (SP6)	0 - 10	0.1	0.24	29.51	15.57	54.92	19.06	15.7	3.35	ML	Gravelly silt loam	Silt loam
	10 - 40	0.3	1.36	37.90	18.38	43.72	16	11.01	4.99	CL-ML	Gravelly loam	Loam
	40 - 100	0.6	7.48	20.15	12.73	67.12	19.22	17.53	1.7	ML	Gravelly silt loam	Silt loam
	100 - 200											
Thadarn Village (SP7)	0 - 10	0.1	0.14	29.52	23.75	46.73	22.21	14.1	8.11	CL	Gravelly loam	Loam
	10 - 40	0.3	12.92	25.68	10.57	63.76	13.92	13.48	0.44	ML	Gravelly silt loam	Silt loam
	40 - 100	0.6	0.70	7.49	18.04	74.47	55.55	46.76	4.79	MH	Gravelly silt loam	Silt loam
	100 - 200						na	na	na			
Sarmkha (SP8)	0 - 10	0.1	0.36	39.46	24.26	36.28	20.88	12.47	8.41	CL	Gravelly loam	Loam
	10 - 40	0.3	0.86	40.02	13.47	46.51	12.88	10.75	2.13	ML	Gravelly loam	Loam
	40 - 100	0.6	8.82	40.25	11.17	48.58	17.41	16.62	0.79	ML	Gravelly loam	Loam
	100 - 200						na	na	na			
Phone Pheung (SP9)	0 - 10	0.1	0.04	40.66	21.91	37.44	24.15	17.11	7.04	CL	Gravelly loam	Loam
	10 - 40	0.3	0.40	10.56	21.91	67.53	23.17	16.13	7.04	CL	Gravelly silt loam	Silt loam
	40 - 100	0.6	10.56	20.55	19.36	60.09	28.18	22.62	5.56	ML	Gravelly silt loam	Silt loam

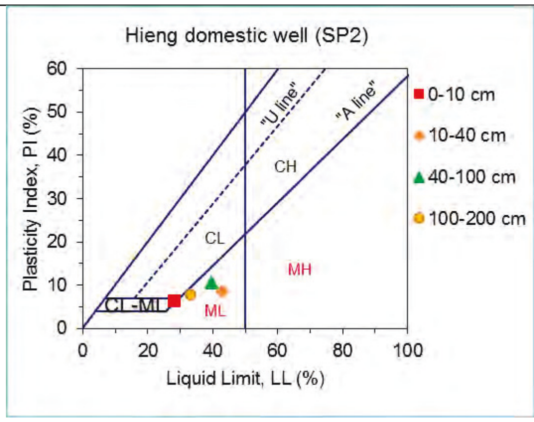
Sample name	Soil layer depth (cm)	Depth	Gravel	Relative %sand	Equation of Keller and Dexter (2012)	Relative %Silt	Atterberg Limits			USCS Classification Plasticity Chart	Soil type class based on USDA triangle method	
		(m)	(%)	(%)	Relative %Clay content	(%)	LL (%)	PL (%)	PI (%)		(Name with gravel)	(Only Soil)
	100 - 200	1	5.76	19.27	17.06	63.67	42.64	38.42	4.22	ML	Gravelly silt loam	Silt loam
Sukhuma DAFO (SP10)	0 - 10	0.1	13.28	11.28	20.36	68.36	22.72	16.59	6.14	CL-ML	Gravelly silt loam	Silt loam
	10 - 40	0.3	22.74	0.03	13.78	86.19	18.78	16.47	2.31	ML	Gravelly silt loam	Silt loam
	40 - 100	0.6	29.46	3.69	31.96	64.36	31.83	18.95	12.89	CL	Gravelly silty clay loam	Silty clay loam
	100 - 200						na	na	na			
Boungkeo (SP11)	0 - 10	0.1	0.00	20.60	17.42	61.98	23.06	18.63	4.43	CL-ML	Silt loam	Silt loam
	10 - 40	0.3	33.72	9.54	16.98	73.49	23.03	18.86	4.17	CL-ML	Gravelly silt loam	Silt loam
	40 - 100	0.6	24.82	9.63	38.21	52.16	39.49	22.96	16.53	CL	Gravelly silty clay loam	Silty clay loam
	100 - 200	1	2.34	3.40	20.33	76.27	32.75	26.64	6.12	ML	Gravelly silt loam	Silt loam
Donghouabarn (SP12)	0 - 10	0.1	0.32	51.75	17.54	30.71	25.32	20.81	4.5	CL-ML	Gravelly loam	Loam
	10 - 40	0.3	0.50	54.87	17.13	28.00	20.18	15.92	4.26	CL	Gravelly sandy loam	Sandy loam
	40 - 100	0.6	21.52	34.17	22.58	43.25	22.59	15.17	7.43	CL	Gravelly loam	Loam
	100 - 200	1	5.60	31.95	13.26	54.79	30.76	28.75	2.01	ML	Gravelly silt loam	Silt loam
Pakor (SP13)	0 - 10	0.1	0.18	51.95	19.24	28.80	27.64	22.15	5.49	ML	Gravelly loam	Loam
	10 - 40	0.3	0.00	33.94	18.08	47.98	25.1	20.3	4.81	CL-ML	Loam	Loam
	40 - 100	0.6	0.12	42.35	20.55	37.10	29.33	23.08	6.25	ML	Gravelly loam	Loam
	100 - 200	1	0.12	31.04	19.21	49.75	25.76	20.29	5.47	CL-ML	Gravelly loam	Loam

2.2.6. Fine grain size classification based on the USCS Plasticity Chart

Note: Legend shows depth soil layers. Note: CL = Low clay, CH = High clay, CL-ML = Medium clay and silt, ML = Low silt, and MH = High silt



a.



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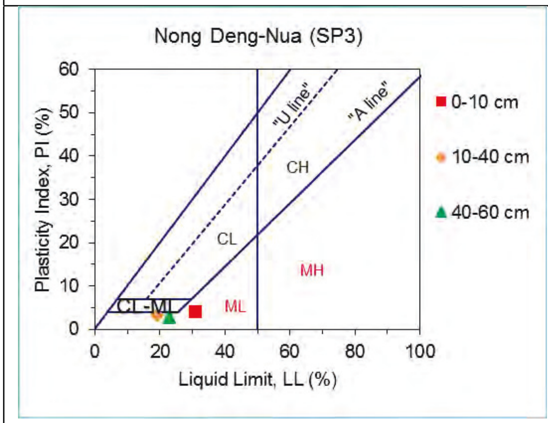

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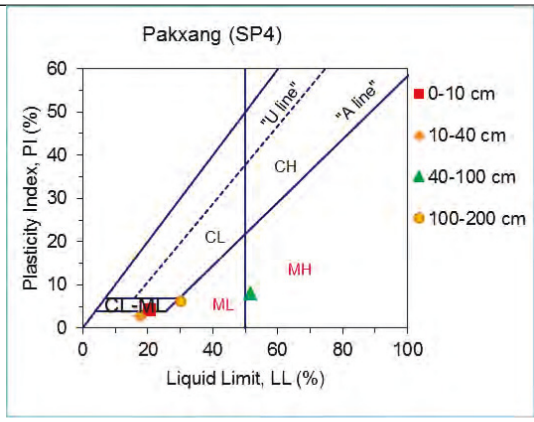

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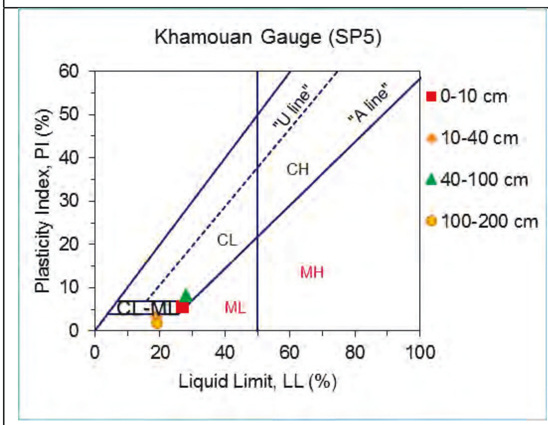

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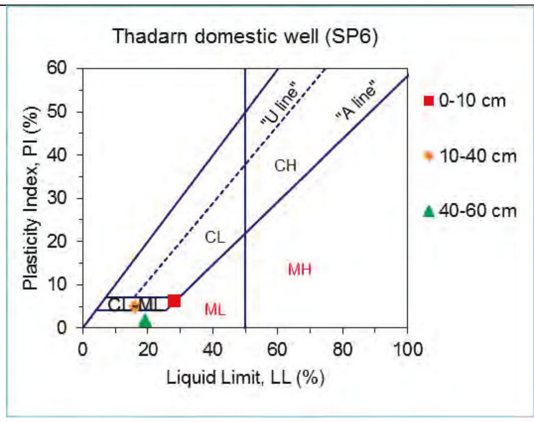

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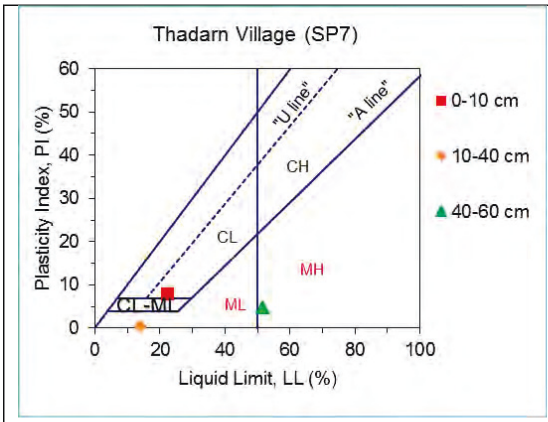
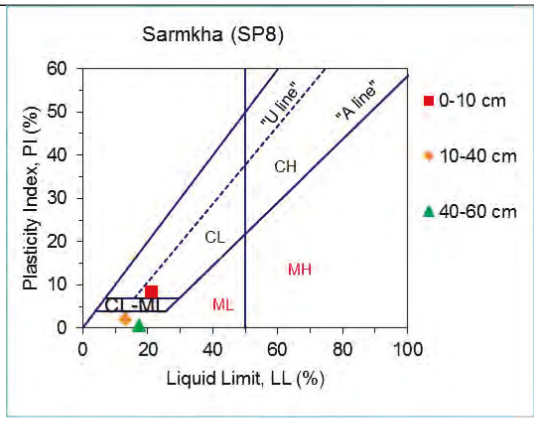
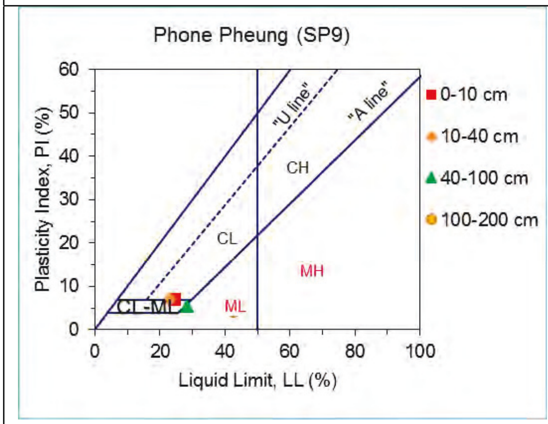

Thadarn Village (SP7)
Plasticity Index, PI (%)
Liquid Limit, LL (%)
"U line"
"A line"
CH
CL
MH
ML
CL-ML
0-10 cm
10-40 cm
40-60 cm

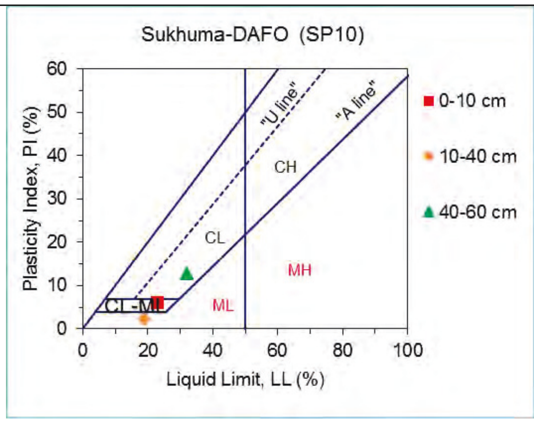
g.


Sarmkha (SP8)
Plasticity Index, PI (%)
Liquid Limit, LL (%)
"U line"
"A line"
CH
CL
MH
ML
CL-ML
0-10 cm
10-40 cm
40-60 cm

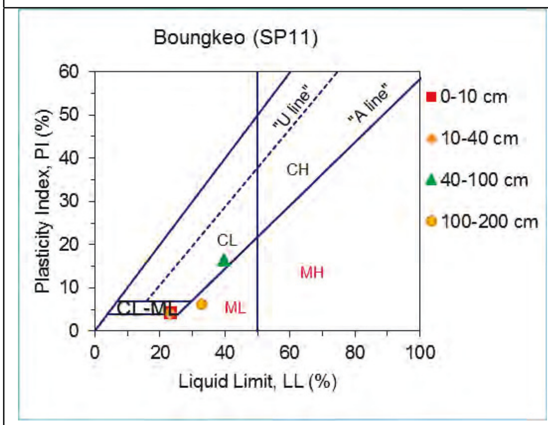
h.


Phone Pheung (SP9)
Plasticity Index, PI (%)
Liquid Limit, LL (%)
"U line"
"A line"
CH
CL
MH
ML
CL-ML
0-10 cm
10-40 cm
40-100 cm
100-200 cm

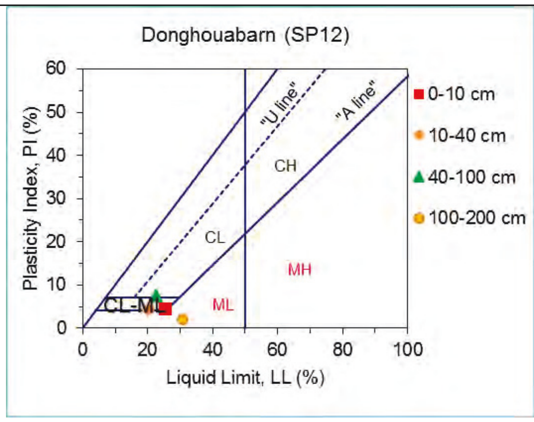
i.


Sukhuma-DAFO (SP10)
Plasticity Index, PI (%)
Liquid Limit, LL (%)
"U line"
"A line"
CH
CL
MH
ML
CL-ML
0-10 cm
10-40 cm
40-60 cm

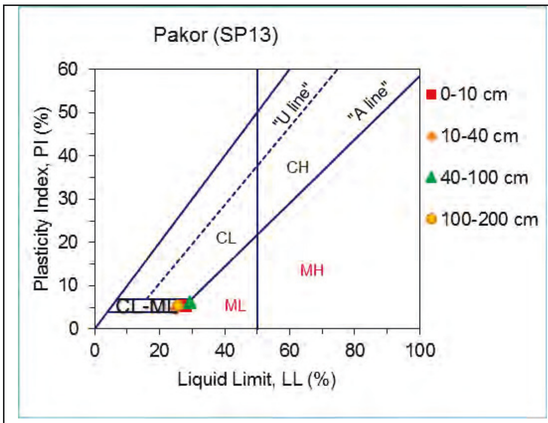
j.


Boungkeo (SP11)
Plasticity Index, PI (%)
Liquid Limit, LL (%)
"U line"
"A line"
CH
CL
MH
ML
CL-ML
0-10 cm
10-40 cm
40-100 cm
100-200 cm

k.


Donghouabarn (SP12)
Plasticity Index, PI (%)
Liquid Limit, LL (%)
"U line"
"A line"
CH
CL
MH
ML
CL-ML
0-10 cm
10-40 cm
40-100 cm
100-200 cm

l.

Pakor (SP13) Plasticity Index, PI (%) Liquid Limit, LL (%) "U line" "A line" CH CL MH ML CL-ML 0-10 cm 10-40 cm 40-100 cm 100-200 cm	
m.	

2.2.7. Estimated values of van Genuchten's parameters and soil hydraulic properties for soil samples in Sukhuma District

Sample name	Soil layer depth (cm)	Soil type class based on USDA triangle method		Observed ψ (kPa)	Water content (cm^3/cm^3)						Hydraulic conductivity using Saxton et al. (1986) method		Depth to WT in DS (cm bgl)	Depth to WT in WS (cm bgl)	$\acute{S}_y$ (Nachabe, 2002)
		(Soil type with gravel)	(Only Soil)		Observed θ	θ_s	$\theta_{(10\ kPa)}$	$\theta_{(33\ kPa)}$	$\theta_{(1500\ kPa)}$	θ_r	K_u (cm/d)	K_s (cm/d)			
Hieng Village (SP1)	0 - 10	Gravelly Loam	Loam	102.13	0.22	0.472	0.333	0.270	0.130	0.086	2.97E-04	18.403	858.00	293.00	0.200
	10 - 40	Gravelly Loam	Loam	215.06	0.16	0.446	0.333	0.250	0.100	0.062	1.57E-05	45.593	848.00	283.00	0.228
	40 - 100	Gravelly Silt loam	Silt loam	108.19	0.22	0.484	0.403	0.300	0.120	0.069	1.38E-04	35.074	818.00	253.00	0.208
	100 - 200	Gravelly silty clay loam	Silty clay loam	144.03	0.25	0.510	0.426	0.330	0.150	0.090	6.85E-05	17.350	758.00	193.00	0.174
Hieng domestic well (SP2)	0 - 10	Gravelly silt loam	Silt loam	7.42	0.42	0.486	0.390	0.300	0.130	0.078	4.46E+00	24.826	858.00	293.00	0.206
	10 - 40	Gravelly silt loam	Silt loam	16.59	0.37	0.504	0.419	0.320	0.140	0.083	4.30E-01	22.646	848.00	283.00	0.196
	40 - 100	Gravelly silty clay loam	Silty clay loam	10.66	0.42	0.509	0.423	0.330	0.160	0.092	1.25E+00	15.669	818.00	253.00	0.181
	100 - 200	Gravelly silt loam	Silt loam	5.90	0.47	0.500	0.415	0.320	0.130	0.081	1.08E+01	23.858	758.00	193.00	0.185
Nong Deng-Nua (SP3)	0 - 10	Gravelly sandy loam	Sandy loam	36.62	0.23	0.449	0.285	0.230	0.120	0.081	1.16E-02	25.415	858.00	293.00	0.210
	10 - 40	Gravelly sandy loam	Sandy loam	32.88	0.22	0.442	0.279	0.220	0.110	0.076	2.17E-02	31.887	848.00	283.00	0.217
	40 - 100	Gravelly silt loam	Silt loam	31.59	0.29	0.468	0.398	0.290	0.110	0.059	1.22E-01	48.043	818.00	253.00	0.220

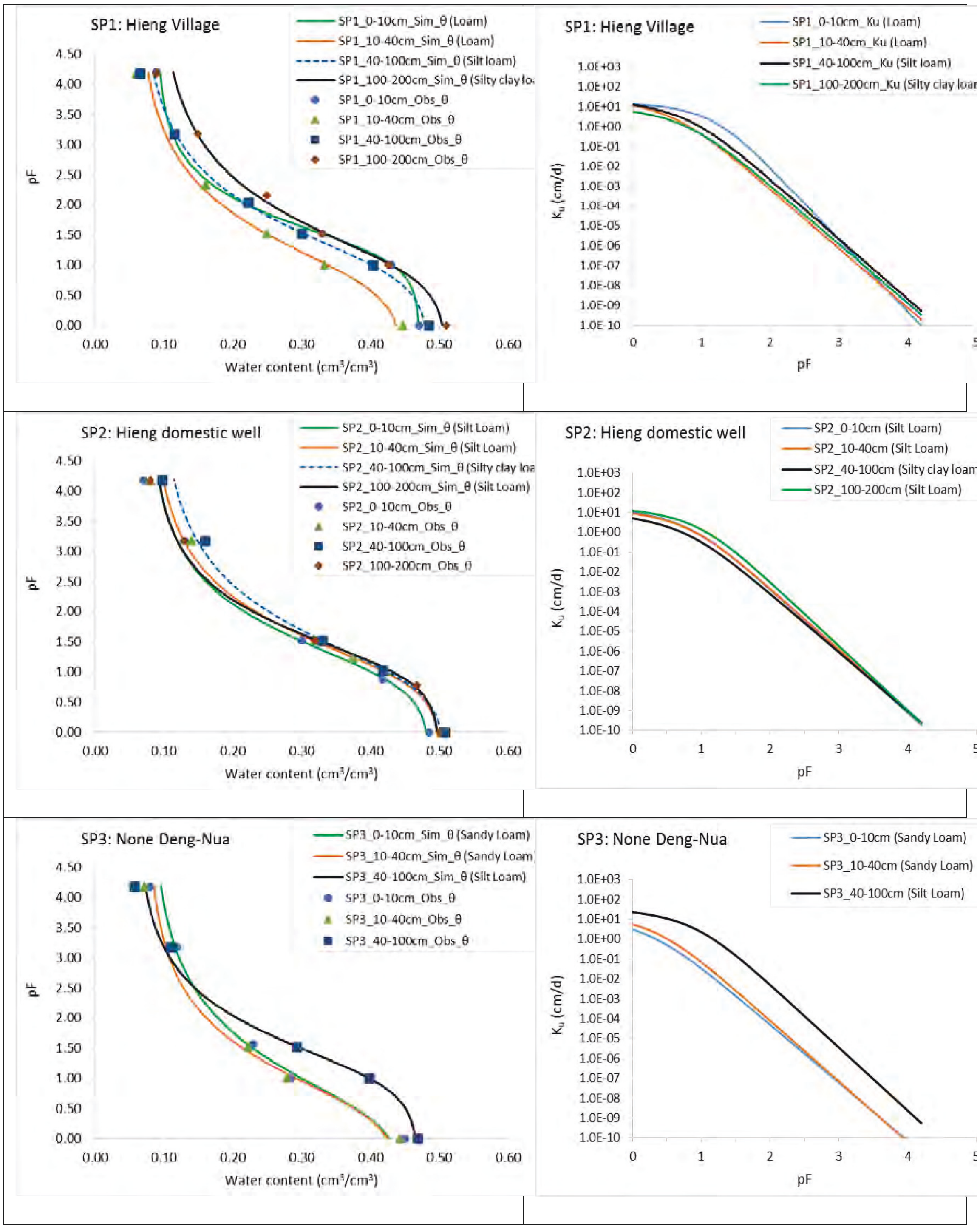
Sample name	Soil layer depth (cm)	Soil type class based on USDA triangle method		Observed ψ (kPa)	Water content (cm^3/cm^3)						Hydraulic conductivity using Saxton et al. (1986) method		Depth to WT in DS (cm bgl)	Depth to WT in WS (cm bgl)	$\acute{S}_y$ (Nachabe, 2002)
		(Soil type with gravel)	(Only Soil)		Observed θ	θ_s	$\theta_{(10\ kPa)}$	$\theta_{(33\ kPa)}$	$\theta_{(1500\ kPa)}$	θ_r	K_u (cm/d)	K_s (cm/d)			
	100 - 200														
Parkxang (SP4)	0 - 10	Gravelly loam	Loam	123.72	0.20	0.464	0.341	0.260	0.110	0.074	1.38E-04	29.138	667.00	108.00	0.184
	10 - 40	Gravelly silt loam	Silt loam	119.34	0.21	0.467	0.396	0.290	0.100	0.059	1.51E-04	48.202	657.00	98.00	0.190
	40 - 100	Gravelly silt loam	Silt loam	86.54	0.25	0.495	0.401	0.310	0.140	0.084	5.49E-04	20.091	627.00	68.00	0.153
	100 - 200	Gravelly loam	Loam	34.15	0.28	0.477	0.359	0.280	0.130	0.081	2.00E-02	22.074	567.00	8.00	0.131
Khamouan Riverside (SP5)	0 - 10	Gravelly sandy loam	Sandy loam	1.52	0.39	0.456	0.286	0.240	0.130	0.087	4.67E+00	18.821	730.00	320.00	0.196
	10 - 40	Gravelly loam	Loam	2.92	0.39	0.447	0.300	0.240	0.110	0.073	9.34E+00	33.393	720.00	310.00	0.215
	40 - 100	Gravelly loam	Loam	4.07	0.39	0.478	0.333	0.270	0.140	0.093	1.52E+00	13.475	690.00	280.00	0.181
	100 - 200	Gravelly silt loam	Silt loam	7.42	0.39	0.452	0.361	0.270	0.100	0.059	1.17E+01	49.281	630.00	220.00	0.212
Thadarn domestic well (SP6)	0 - 10	Gravelly silt loam	Silt loam	16.30	0.32	0.463	0.362	0.270	0.110	0.066	6.47E-01	37.848	1201.00	510.00	0.245
	10 - 40	Gravelly loam	Loam	14.39	0.31	0.466	0.336	0.260	0.120	0.077	2.86E-01	25.450	1191.00	500.00	0.233

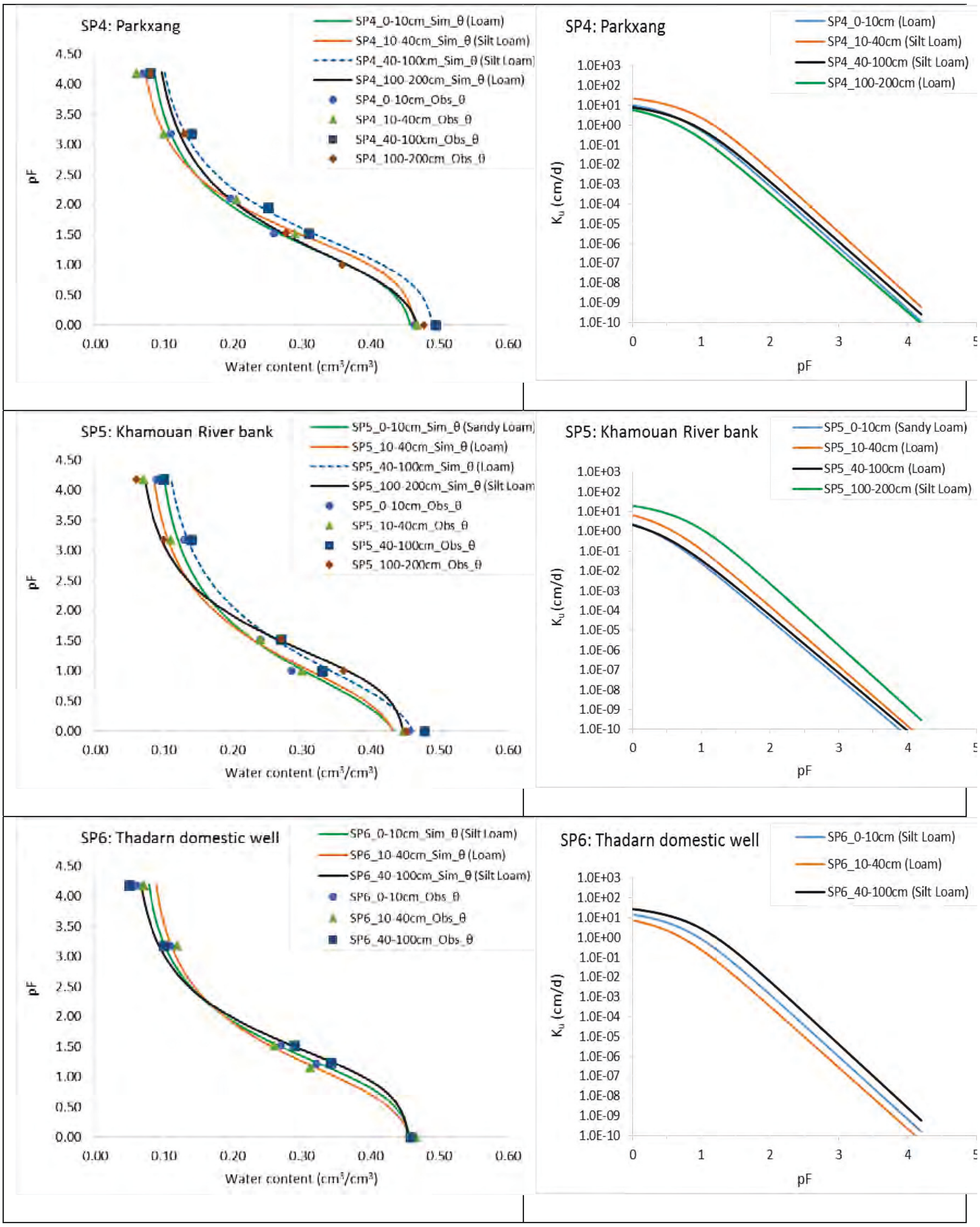
Sample name	Soil layer depth (cm)	Soil type class based on USDA triangle method		Observed ψ (kPa)	Water content (cm^3/cm^3)						Hydraulic conductivity using Saxton et al. (1986) method		Depth to WT in DS (cm bgl)	Depth to WT in WS (cm bgl)	$\acute{S}_y$ (Nachabe, 2002)
		(Soil type with gravel)	(Only Soil)		Observed θ	θ_s	$\theta_{(10\ kPa)}$	$\theta_{(33\ kPa)}$	$\theta_{(1500\ kPa)}$	θ_r	K_u (cm/d)	K_s (cm/d)			
	40 - 100	Gravelly silt loam	Silt loam	16.86	0.34	0.458	0.395	0.290	0.100	0.054	2.14E+00	56.320	1161.00	470.00	0.252
	100 - 200														
Thadarn Village (SP7)	0 - 10	Gravelly loam	Loam	18.79	0.33	0.486	0.369	0.290	0.140	0.088	1.12E-01	16.540	1201.00	510.00	0.219
	10 - 40	Gravelly silt loam	Silt loam	14.94	0.34	0.444	0.385	0.280	0.100	0.048	4.84E+00	66.541	1191.00	500.00	0.260
	40 - 100	Gravelly silt loam	Silt loam	26.47	0.32	0.487	0.412	0.300	0.110	0.066	1.41E-01	39.936	1161.00	470.00	0.237
	100 - 200														
Sarmkha (SP8)	0 - 10	Gravelly loam	Loam	27.58	0.29	0.480	0.341	0.280	0.140	0.093	1.99E-02	13.664	829.00	315.00	0.190
	10 - 40	Gravelly loam	Loam	59.87	0.22	0.447	0.330	0.250	0.100	0.064	6.17E-03	43.586	819.00	305.00	0.227
	40 - 100	Gravelly loam	Loam	11.60	0.32	0.437	0.332	0.250	0.100	0.056	3.01E+00	56.928	789.00	275.00	0.232
	100 - 200										0.00E+00	0.000			
Phone Pheung (SP9)	0 - 10	Gravelly loam	Loam	16800.13	0.09	0.474	0.333	0.270	0.130	0.087	8.34E-18	16.985	630.00	343.00	0.190

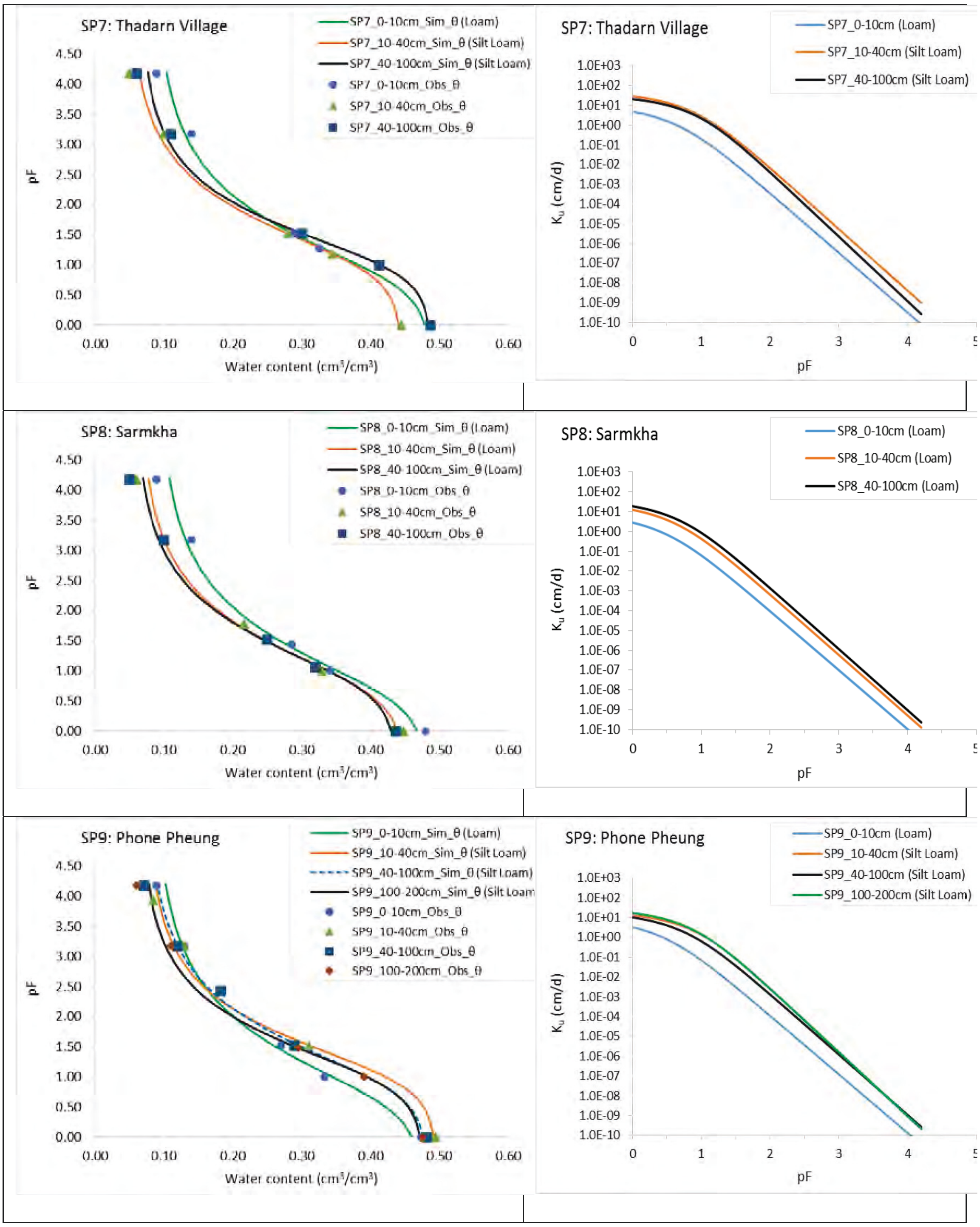
Sample name	Soil layer depth (cm)	Soil type class based on USDA triangle method		Observed ψ (kPa)	Water content (cm^3/cm^3)						Hydraulic conductivity using Saxton et al. (1986) method		Depth to WT in DS (cm bgl)	Depth to WT in WS (cm bgl)	$\acute{S}_y$ (Nachabe, 2002)
		(Soil type with gravel)	(Only Soil)		Observed θ	θ_s	$\theta_{(10\ kPa)}$	$\theta_{(33\ kPa)}$	$\theta_{(1500\ kPa)}$	θ_r	K_u (cm/d)	K_s (cm/d)			
	10 - 40	Gravelly silt loam	Silt loam	8640.62	0.08	0.495	0.411	0.310	0.130	0.077	1.28E-22	26.670	620.00	333.00	0.194
	40 - 100	Gravelly silt loam	Silt loam	247.44	0.18	0.481	0.388	0.290	0.120	0.074	1.39E-06	28.735	590.00	303.00	0.196
	100 - 200	Gravelly silt loam	Silt loam	30.46	0.30	0.475	0.391	0.290	0.110	0.067	7.90E-02	36.748	530.00	243.00	0.193
Sukhuma DAFO (SP10)	0 - 10	Gravelly silt loam	Silt loam	9.22	0.42	0.491	0.408	0.310	0.120	0.073	4.23E+00	30.278	445.00	114.00	0.153
	10 - 40	Gravelly silt loam	Silt loam	7.73	0.45	0.477	0.421	0.280	0.100	0.050	3.66E+01	54.825	435.00	104.00	0.165
	40 - 100	Gravelly silty clay loam	Silty clay loam	12.44	0.43	0.521	0.444	0.360	0.180	0.097	9.27E-01	14.200	405.00	74.00	0.108
	100 - 200														
Boungkeo (SP11)	0 - 10	Silt loam	Silt loam	57.46	0.25	0.475	0.387	0.290	0.110	0.068	4.56E-03	34.804	816.00	513.00	0.228
	10 - 40	Gravelly silt loam	Silt loam	13.24	0.38	0.482	0.410	0.300	0.110	0.063	2.50E+00	42.713	806.00	503.00	0.229
	40 - 100	Gravelly silty clay loam	Silty clay loam	12.57	0.45	0.527	0.462	0.380	0.210	0.109	9.42E-01	8.747	776.00	473.00	0.169
	100 - 200	Gravelly silt loam	Silt loam	9.96	0.42	0.496	0.416	0.310	0.120	0.071	3.95E+00	34.866	716.00	413.00	0.210

Sample name	Soil layer depth (cm)	Soil type class based on USDA triangle method		Observed ψ (kPa)	Water content (cm^3/cm^3)						Hydraulic conductivity using Saxton et al. (1986) method		Depth to WT in DS (cm bgl)	Depth to WT in WS (cm bgl)	$\acute{S}_y$ (Nachabe, 2002)
		(Soil type with gravel)	(Only Soil)		Observed θ	θ_s	$\theta_{(10\ kPa)}$	$\theta_{(33\ kPa)}$	$\theta_{(1500\ kPa)}$	θ_r	K_u (cm/d)	K_s (cm/d)			
Donghouabarn (SP12)	0 - 10	Gravelly loam	Loam	25.60	0.25	0.453	0.295	0.240	0.120	0.080	3.13E-02	24.674	759.00	183.00	0.196
	10 - 40	Gravelly sandy loam	Sandy loam	5.16	0.32	0.450	0.286	0.230	0.120	0.080	1.14E+00	25.377	749.00	173.00	0.196
	40 - 100	Gravelly loam	Loam	86.36	0.23	0.480	0.353	0.280	0.130	0.087	5.50E-04	17.281	719.00	143.00	0.176
	100 - 200	Gravelly silt loam	Silt loam	13.67	0.33	0.452	0.357	0.270	0.100	0.060	1.78E+00	47.521	659.00	83.00	0.193
Pakor (SP13)	0 - 10	Gravelly loam	Loam	653.63	0.14	0.458	0.297	0.240	0.120	0.085	2.89E-07	20.177	1175.00	545.00	0.225
	10 - 40	Loam	Loam	21.47	0.30	0.468	0.348	0.270	0.120	0.075	1.18E-01	27.502	1165.00	535.00	0.236
	40 - 100	Gravelly loam	Loam	13.92	0.31	0.469	0.326	0.260	0.130	0.085	1.57E-01	19.188	1135.00	505.00	0.223
	100 - 200	Gravelly loam	Loam	19.13	0.31	0.473	0.358	0.280	0.120	0.077	1.66E-01	25.279	1075.00	445.00	0.227

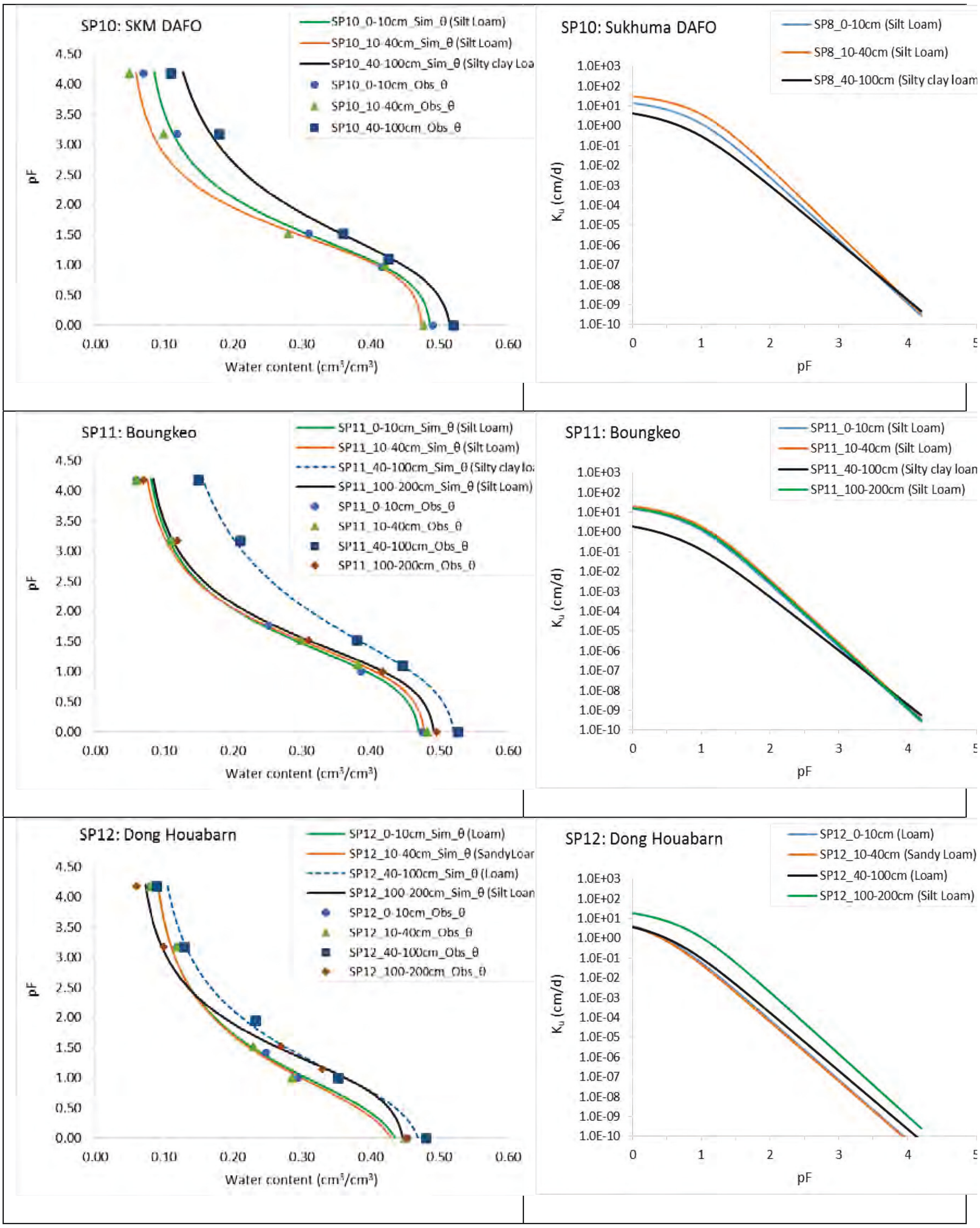
2.2.8. Soil water retention curves and hydraulic conductivity curves of the 47 soil samples collected in Sukhuma District

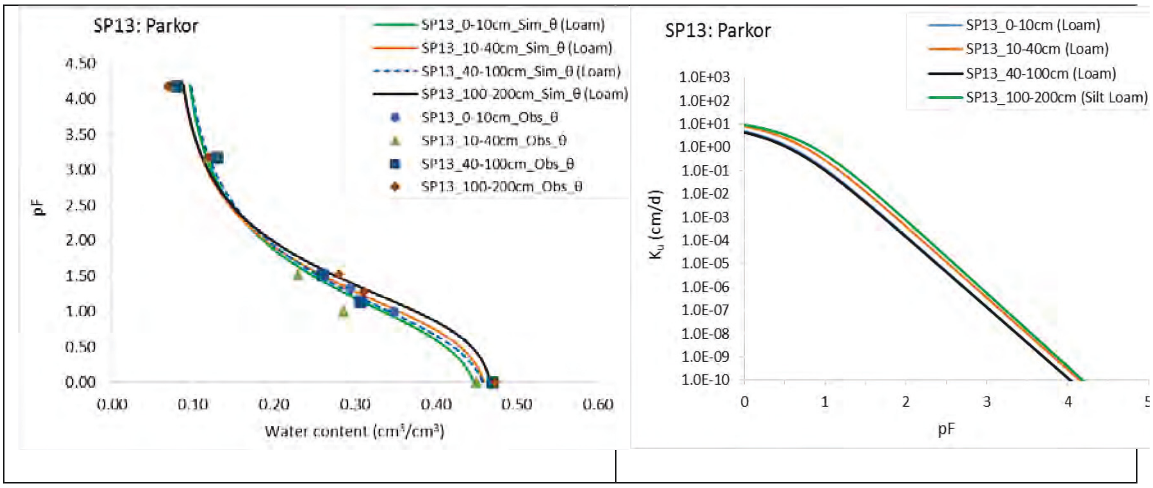



SP4: Parkxang
SP4_0-10cm_Sim_θ (Loam)
SP4_10-40cm_Sim_θ (Silt Loam)
SP4_40-100cm_Sim_θ (Silt Loam)
SP4_100-200cm_Sim_θ (Loam)
SP4_0-10cm_Obs_θ
SP4_10-40cm_Obs_θ
SP4_40-100cm_Obs_θ
SP4_100-200cm_Obs_θ
pF
Water content (cm³/cm³)
SP4: Parkxang
SP4_0-10cm (Loam)
SP4_10-40cm (Silt Loam)
SP4_40-100cm (Silt Loam)
SP4_100-200cm (Loam)
Ku (cm/d)
pF
SP5: Khamouan River bank
SP5_0-10cm_Sim_θ (Sandy Loam)
SP5_10-40cm_Sim_θ (Loam)
SP5_40-100cm_Sim_θ (Loam)
SP5_100-200cm_Sim_θ (Silt Loam)
SP5_0-10cm_Obs_θ
SP5_10-40cm_Obs_θ
SP5_40-100cm_Obs_θ
SP5_100-200cm_Obs_θ
pF
Water content (cm³/cm³)
SP5: Khamouan River bank
SP5_0-10cm (Sandy Loam)
SP5_10-40cm (Loam)
SP5_40-100cm (Loam)
SP5_100-200cm (Silt Loam)
Ku (cm/d)
pF
SP6: Thadarn domestic well
SP6_0-10cm_Sim_θ (Silt Loam)
SP6_10-40cm_Sim_θ (Loam)
SP6_40-100cm_Sim_θ (Silt Loam)
SP6_0-10cm_Obs_θ
SP6_10-40cm_Obs_θ
SP6_40-100cm_Obs_θ
pF
Water content (cm³/cm³)
SP6: Thadarn domestic well
SP6_0-10cm (Silt Loam)
SP6_10-40cm (Loam)
SP6_40-100cm (Silt Loam)
Ku (cm/d)
pF



SP7: Thadarn Village
SP7_0-10cm_Sim_θ (Loam)
SP7_10-40cm_Sim_θ (Silt Loam)
SP7_40-100cm_Sim_θ (Silt Loam)
SP7_0-10cm_Obs_θ
SP7_10-40cm_Obs_θ
SP7_40-100cm_Obs_θ
pF
Water content (cm³/cm³)
SP7: Thadarn Village
SP7_0-10cm (Loam)
SP7_10-40cm (Silt Loam)
SP7_40-100cm (Silt Loam)
Ku (cm/d)
pF
SP8: Sarmkha
SP8_0-10cm_Sim_θ (Loam)
SP8_10-40cm_Sim_θ (Loam)
SP8_40-100cm_Sim_θ (Loam)
SP8_0-10cm_Obs_θ
SP8_10-40cm_Obs_θ
SP8_40-100cm_Obs_θ
pF
Water content (cm³/cm³)
SP8: Sarmkha
SP8_0-10cm (Loam)
SP8_10-40cm (Loam)
SP8_40-100cm (Loam)
Ku (cm/d)
pF
SP9: Phone Pheung
SP9_0-10cm_Sim_θ (Loam)
SP9_10-40cm_Sim_θ (Silt Loam)
SP9_40-100cm_Sim_θ (Silt Loam)
SP9_100-200cm_Sim_θ (Silt Loam
SP9_0-10cm_Obs_θ
SP9_10-40cm_Obs_θ
SP9_40-100cm_Obs_θ
SP9_100-200cm_Obs_θ
pF
Water content (cm³/cm³)
SP9: Phone Pheung
SP9_0-10cm (Loam)
SP9_10-40cm (Silt Loam)
SP9_40-100cm (Silt Loam)
SP9_100-200cm (Silt Loam)
Ku (cm/d)
pF


SP10: SKM DAFO
SP10_0-10cm_Sim_θ (Silt Loam)
SP10_10-40cm_Sim_θ (Silt Loam)
SP10_40-100cm_Sim_θ (Silty clay Loa
SP10_0-10cm_Obs_θ
SP10_10-40cm_Obs_θ
SP10_40-100cm_Obs_θ
pF
Water content (cm³/cm³)
SP10: Sukhuma DAFO
SP8_0-10cm (Silt Loam)
SP8_10-40cm (Silt Loam)
SP8_40-100cm (Silty clay loam
Ku (cm/d)
pF
SP11: Boungkeo
SP11_0-10cm_Sim_θ (Silt Loam)
SP11_10-40cm_Sim_θ (Silt Loam)
SP11_40-100cm_Sim_θ (Silty clay lo
SP11_100-200cm_Sim_θ (Silt Loam)
SP11_0-10cm_Obs_θ
SP11_10-40cm_Obs_θ
SP11_40-100cm_Obs_θ
SP11_100-200cm_Obs_θ
pF
Water content (cm³/cm³)
SP11: Boungkeo
SP11_0-10cm (Silt Loam)
SP11_10-40cm (Silt Loam)
SP11_40-100cm (Silty clay loam
SP11_100-200cm (Silt Loam)
Ku (cm/d)
pF
SP12: Dong Houabarn
SP12_0-10cm_Sim_θ (Loam)
SP12_10-40cm_Sim_θ (SandyLoar
SP12_40-100cm_Sim_θ (Loam)
SP12_100-200cm_Sim_θ (Silt Loan
SP12_0-10cm_Obs_θ
SP12_10-40cm_Obs_θ
SP12_40-100cm_Obs_θ
SP12_100-200cm_Obs_θ
pF
Water content (cm³/cm³)
SP12: Dong Houabarn
SP12_0-10cm (Loam)
SP12_10-40cm (Sandy Loam)
SP12_40-100cm (Loam)
SP12_100-200cm (Silt Loam)
Ku (cm/d)
pF


SP13: Parkor
SP13_0-10cm_Sim_θ (Loam)
SP13_10-40cm_Sim_θ (Loam)
SP13_40-100cm_Sim_θ (Loam)
SP13_100-200cm_Sim_θ (Loam)
SP13_0-10cm_Obs_θ
SP13_10-40cm_Obs_θ
SP13_40-100cm_Obs_θ
SP13_100-200cm_Obs_θ
pF
Water content (cm³/cm³)
SP13: Parkor
SP13_0-10cm (Loam)
SP13_10-40cm (Loam)
SP13_40-100cm (Loam)
SP13_100-200cm (Silt Loam)
Ku (cm/d)
pF

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Appendix 6: Daily rainfall at the Sukhuma District rain gauge from 1993 to 2016

Station name	Location	Latitude (°)	Longitude (°)	Ground elevation (m AMSL)
Sukhuma District Public rain gauge station	Sukhuma District	14.65	105.79	98

Station : Sukhuma Daily Rainfall in mm Year : 1993

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	40.5	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.5	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.8	0.0	53.6	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	14.5	0.0	11.9	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	17.3	0.0	21.0	19.4	1.8	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	70.5	1.6	0.0	0.0	0.2	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	20.7	0.0	4.9	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	49.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	9.1	0.0	68.3	25.5	8.6	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	60.5	21.5	0.0	0.0	10.2	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.7	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	15.2	0.0	0.0
14	0.0	0.0	0.0	0.0	9.0	0.0	0.0	34.7	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2
16	0.0	0.0	0.0	0.0	0.0	0.0	59.5	37.7	0.0	6.7	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	29.5	20.0	0.0	1.8	55.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	61.8	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	20.5	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	10.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	7.0	20.7	0.0	10.5	1.1	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	140.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	5.0	20.8	2.8	0.0	3.5	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	10.5	7.6	0.0	20.0	6.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	8.1	6.5	4.1	1.7	0.0	0.0
29	0.0		0.0	0.0	0.0	0.0	11.2	0.0	10.5	2.0	0.0	0.0
30	0.0		0.0	0.0	29.5	0.0	33.8	0.0	30.0	0.4	0.0	0.0
31	0.0		0.0		3.5		24.6	0.0		0.0		0.0

Station : Sukhuma   Daily Rainfall in mm   Year : 1994

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5	18.9	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5	150.0	0.0	2.8	0.0
3	0.0	0.0	0.0	0.0	0.0	24.3	0.0	26.5	19.3	0.0	3.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	15.2	35.1	20.8	0.0	1.4	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	42.8	0.0	0.0	10.4	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	35.9	0.7	4.7	22.8	27.4	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	10.0	2.3	51.5	36.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	11.4	35.0	0.0	12.9	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	29.2	36.5	0.0	1.7	32.3	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	3.3	58.0	0.0	3.5	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	12.0	3.2	14.9	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	74.0	71.8	47.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	22.0	25.8	23.2	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.8	4.0	30.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	2.4	4.7	52.4	0.0	22.8	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.4	20.0	10.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	21.2	1.0	80.9	0.0	13.2	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.4	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	22.0	46.4	22.8	17.5	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	0.0	0.0	11.0	0.0
22	0.0	0.0	0.0	0.0	0.0	24.6	0.0	25.7	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	14.5	0.0	28.4	20.2	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	31.9	2.7	19.5	7.4	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	4.3	29.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	14.0	5.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	20.4	0.0	9.0	0.0	0.0	0.0	0.0
29	0.0		0.0	0.0	0.0	6.5	9.1	10.4	0.0	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	0.0	34.0	50.0	16.5	0.0	0.0	0.0
31	0.0		0.0		0.0		10.5	19.9		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 1995

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	51.6	0.0	4.6	24.6	10.4	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	9.7	0.8	15.2	15.2	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	12.2	0.0	33.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	4.8	8.6	2.0	34.5	24.4	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	10.2	70.9	26.4	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	14.4	0.0	15.2	22.9	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	37.1	0.0	9.7	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	3.0	32.5	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	6.5	0.0	0.0	9.7	0.0	9.9	0.0	10.2	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	4.3	34.8	0.0	39.9	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	7.4	12.4	0.0	48.8	10.9	0.0	0.0	0.0
12	0.0	0.0	0.0	1.8	0.0	0.0	4.3	7.4	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.4	0.0	7.9	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	53.6	35.6	84.5	0.0	52.6	0.0	0.0
15	0.0	0.0	0.0	0.0	22.6	40.6	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	37.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	5.1	24.1	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	9.1	57.2	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	66.5	0.0	0.0	38.1	0.0	0.0	0.0
20	0.0	0.0	0.0	0.5	0.0	21.6	0.0	43.2	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	12.7	16.5	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	5.1	10.7	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	11.2	2.3	2.5	37.3	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	122.2	0.0	11.7	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.2	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	8.1	2.8	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	4.3	50.8	0.0	0.0	7.6	0.0	28.2	0.0	0.0	0.0
29	0.0		0.0	21.4	0.0	0.0	8.1	0.0	0.0	0.0	0.0	0.0
30	0.0		0.0	6.1	8.6	0.0	11.2	2.5	0.0	0.0	0.0	0.0
31	0.0		0.0		1.5		33.8	0.0		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 1996

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.6	17.8	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	7.1	14.2	8.6	2.5	21.1	0.0	0.0
3	0.0	0.0	0.0	0.0	8.4	6.6	66.5	75.8	6.1	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	16.8	0.0	17.5	0.0	62.5	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	49.7	15.0	99.7	14.5	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	1.3	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	20.9	14.0	0.0	0.0	40.6	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	19.3	6.1	0.0	0.0	20.3	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	9.2	0.0	5.4	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	4.7	31.8	10.9	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	28.7	78.8	55.4	50.5	15.5	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	12.3	41.4	20.6	0.0	0.0	0.0	9.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	30.5	0.0	15.2	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0	61.0	0.0
15	0.0	0.0	0.0	0.0	0.0	43.4	4.8	8.9	0.0	0.0	53.0	0.0
16	0.0	0.0	0.0	0.0	61.8	41.7	173.8	8.8	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	74.9	0.0	13.0	13.8	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	28.0	0.0	20.8	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	37.1	35.3	57.7	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	100.3	0.0	13.0	54.7	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	11.9	0.0	21.6	47.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	50.8	37.3	0.0	0.0	8.6	0.0	64.5	0.0	0.0
23	0.0	0.0	0.0	0.0	33.8	34.8	79.0	10.2	40.1	12.7	0.0	0.0
24	0.0	0.0	0.0	0.0	10.4	63.8	4.3	38.8	14.4	14.4	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	20.3	17.8	76.2	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	42.4	9.9	0.0	44.5	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	49.8	25.4	0.0	36.3	20.6	13.2	0.0	0.0
28	0.0	0.0	0.0	0.0	37.1	0.0	53.3	17.2	13.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5	7.6	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	0.0	19.2	0.0	10.1	0.0	0.0	0.0
31	0.0		0.0		0.0		0.0	0.0		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 1997

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	38.6	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	8.9	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	7.9	0.0	0.0	0.0
4	0.0	0.0	0.0	71.1	36.6	5.1	44.5	0.0	21.6	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	53.8	0.0	0.0	30.5	50.3	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.5	17.3	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9	24.9	0.0	0.0
8	0.0	0.0	0.0	0.0	7.6	0.0	0.0	0.0	0.0	2.5	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	11.4	0.0	0.0	41.9	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	20.1	0.0	20.3	0.0	35.8	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	11.4	0.0	0.0	42.7	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	36.8	0.0	13.0	10.2	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	20.8	0.0	0.0	39.6	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	18.8	0.0	15.7	0.0	41.1	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	36.8	50.8	0.0	3.1	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	22.6	15.5	51.6	15.7	8.9	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	29.7	0.0	19.3	0.0	0.0	0.0	0.0
18	0.0	0.0	15.7	0.0	0.0	11.9	0.0	43.7	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	21.3	0.0	0.0	20.3	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	14.2	45.7	49.5	0.0	25.4	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	98.0	0.0	27.2	0.0	0.0	0.0	0.0
22	0.0	0.0	18.0	0.0	0.0	0.0	0.0	24.7	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.1	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	19.8	90.9	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	13.2	0.0	0.0	7.9	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	8.1	0.0	0.0	0.0	4.6	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	7.1	0.0	7.9	79.5	31.8	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	20.1	0.0	22.6	0.0	0.0	0.0	0.0
29	0.0		0.0	0.0	7.4	21.3	5.1	0.0	0.0	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	27.7	0.0	11.7	0.0	0.0	0.0	0.0
31	0.0		0.0		0.0		0.0	20.3		17.8		0.0

Station : Sukhuma Daily Rainfall in mm Year : 1998

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	14.5	0.0	16.0	0.0	0.0	0.0
2	0.0	0.0	0.0	40.5	0.0	0.0	9.5	8.5	0.0	5.0	0.1	0.0
3	0.0	0.0	0.0	0.0	0.0	1.5	14.5	34.0	0.0	1.6	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	50.9	45.0	0.0	0.1	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.8	30.9	0.0	0.5	34.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.5	1.9	10.5	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.3	16.7	10.8	0.8	4.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	1.5	26.0	50.0	24.0	26.0	0.0	0.0
10	0.0	4.5	0.0	0.0	5.0	2.2	8.0	19.5	25.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.1	0.0	0.0	1.4	12.3	8.2	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	3.9	0.0	1.3	8.3	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	37.0	44.4	0.0	0.0	0.0	0.5	0.0
14	0.0	0.0	0.0	0.0	1.5	1.7	0.9	0.0	0.0	34.0	0.8	8.0
15	0.0	0.0	0.0	0.0	10.5	1.2	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.1	4.5	4.2	0.0	0.0
17	0.0	0.0	0.0	0.0	20.5	0.0	0.0	0.0	3.0	9.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	6.0	0.0	5.5	65.0	0.0	0.0	0.0
19	0.0	0.0	0.0	7.5	0.0	0.0	0.0	75.0	11.5	0.0	5.0	0.0
20	0.0	0.0	0.0	8.5	14.0	0.0	0.0	14.2	17.5	0.1	12.3	0.0
21	0.0	0.0	0.0	0.6	12.5	12.0	10.0	60.0	27.0	0.0	8.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.5	15.5	0.0	4.1	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0	1.7	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	74.0	0.0	0.0	0.0	9.5	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	13.4	0.0	0.0	2.5	0.0	15.0	0.0
26	0.0	0.0	0.0	0.0	23.0	25.0	0.0	0.0	0.5	0.0	32.4	0.0
27	0.0	1.5	0.0	0.0	13.0	15.0	35.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	51.0	4.5	23.0	3.5	0.0	13.0	4.7	0.0
29	0.0		0.0	0.0	13.5	0.2	2.5	0.0	0.8	0.0	0.0	0.0
30	0.0		0.0	0.0	19.0	0.1	0.5	25.5	0.1	0.0	0.0	0.0
31	0.0		0.0		25.0		0.0	2.5		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 1999

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3.5	0.0	0.0	0.0	1.5	6.0	0.1	20.0	48.0	4.3	2.5	0.0
2	0.0	0.0	0.0	0.0	10.0	0.0	98.0	2.1	14.0	2.5	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	9.3	8.0	40.0	0.0	1.3	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	14.9	1.3	6.9	2.8	0.0	2.7	6.5
5	0.0	0.0	0.0	0.9	10.0	13.6	10.1	2.0	40.8	16.0	2.0	0.0
6	0.0	0.0	0.0	4.0	2.5	40.2	14.2	2.5	3.5	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	19.0	3.5	0.0	2.0	15.9	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	5.1	1.7	0.0	6.3	0.0	1.4	0.0
9	0.0	0.0	0.0	0.0	0.0	14.1	1.5	0.1	0.0	43.0	0.0	0.0
10	0.0	0.0	0.0	29.0	1.0	9.1	5.0	0.0	0.3	0.0	0.0	0.0
11	0.0	0.0	0.0	1.7	2.5	0.0	10.5	45.5	8.3	0.0	1.0	0.0
12	0.0	0.0	0.0	8.2	67.0	0.0	13.0	0.0	0.1	1.1	12.0	0.0
13	0.0	0.0	0.0	52.0	0.0	1.4	1.0	0.0	6.0	0.0	4.0	0.0
14	0.0	0.0	0.0	1.0	0.0	13.0	0.0	0.0	51.0	31.0	0.0	0.0
15	0.0	0.0	0.0	19.0	0.0	4.5	0.0	9.0	9.0	7.5	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	18.0	12.5	16.3	12.5	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	4.0	0.0	5.0	16.2	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	2.0	40.5	50.0	0.0	23.5	1.2	0.2	0.0	0.0
19	0.0	0.0	0.0	0.0	24.2	45.0	3.9	13.0	0.0	0.0	0.0	0.0
20	8.0	0.0	0.0	20.0	4.0	0.0	1.0	0.0	9.0	0.0	0.0	0.0
21	0.0	0.0	2.5	11.0	20.0	1.4	0.0	0.0	18.5	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	3.5	1.5	11.3	0.0	3.0	2.3	13.0	0.0
23	0.0	0.0	0.0	0.0	1.3	0.0	28.5	1.5	35.0	0.0	2.5	0.0
24	0.0	0.0	0.0	0.0	7.0	0.0	86.0	0.0	17.5	13.7	2.0	0.0
25	0.0	0.0	0.0	0.0	14.0	0.0	19.5	1.5	0.0	2.5	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	13.0	1.6	0.0	0.0	0.0	0.0
27	0.0	0.0	12.0	1.0	0.0	0.0	7.5	0.0	24.5	0.0	0.0	0.0
28	0.0	0.0	0.5	0.0	20.0	19.0	37.0	42.0	1.5	10.0	0.0	0.0
29	0.0		0.0	0.0	0.0	0.0	16.9	0.0	13.0	24.0	0.0	0.0
30	0.0		0.0	27.0	0.1	15.0	31.3	0.0	44.0	22.0	0.0	0.0
31	5.0		0.0		10.0		6.0	10.0		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 2000

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	22.2	5.2	0.0	0.0	60.6	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	14.0	0.0	56.0	1.2	0.0	6.0	25.3	0.0	0.0	0.0
4	0.0	0.0	0.0	7.0	65.0	8.5	27.2	0.4	7.8	50.0	0.0	0.0
5	0.0	0.0	0.0	17.0	0.0	0.0	11.3	9.5	14.2	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	70.2	0.0	13.5	19.3	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	40.0	5.0	4.2	5.3	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	14.7	0.0	35.3	0.0	0.0	0.0
9	0.0	0.0	0.0	3.0	12.2	0.0	35.0	0.6	0.0	2.9	0.0	0.0
10	0.0	0.0	0.0	1.5	9.5	3.4	41.5	4.5	36.0	1.0	0.0	0.0
11	0.0	0.0	0.0	0.0	5.6	0.0	100.7	16.0	37.5	25.0	0.0	0.0
12	0.0	0.0	0.0	20.0	0.0	2.5	45.8	3.7	39.2	0.0	0.0	0.0
13	0.0	0.0	0.0	19.0	50.5	7.5	17.5	0.3	0.0	0.0	0.0	0.0
14	0.0	0.0	6.0	1.5	11.0	25.0	50.6	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	11.5	5.9	14.8	8.5	0.5	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	3.2	24.0	11.5	25.9	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	1.5	11.2	6.0	0.0	0.0	0.0	0.0	0.0
18	42.0	0.0	0.0	0.0	4.5	4.5	0.2	8.5	8.0	1.8	0.0	0.0
19	0.0	0.0	0.0	10.5	6.8	4.5	4.0	0.0	8.5	0.0	0.0	0.0
20	0.0	0.0	0.0	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	129.3	0.0	24.0	41.0	5.5	35.0	0.0	0.0
22	0.0	0.0	0.0	0.0	28.0	0.1	0.0	148.0	0.0	37.5	0.0	0.0
23	0.0	0.0	8.5	0.0	7.8	50.5	11.0	10.5	2.2	1.5	0.0	0.0
24	0.0	0.0	0.0	0.0	4.2	143.2	19.5	30.0	1.3	0.0	0.0	0.0
25	0.0	0.0	0.0	5.5	1.5	1.2	11.9	0.0	51.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	110.0	20.0	25.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	43.0	4.0	15.0	65.7	46.0	8.6	0.0	0.0	0.0
28	0.0	0.0	0.0	0.7	0.0	0.0	0.0	2.0	0.1	0.0	1.0	0.0
29	0.0	0.0	0.0	0.0	1.0	0.0	0.0	54.0	0.0	1.9	0.0	0.0
30	0.0		0.0	0.0	32.0	0.0	0.0	30.5	0.0	0.0	0.0	0.0
31	0.0		0.0		20.0		18.0	24.0		0.0		0.0

Station : Sukhuma　　　Daily Rainfall in mm　　　Year : 2001

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	5.5	0.0	0.2	6.5	15.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	28.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	33.0	5.7	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	40.0	7.5	0.0	0.0
5	0.0	0.0	0.0	0.0	6.5	40.0	10.5	7.5	20.0	0.0	0.0	9.0
6	0.0	0.0	0.0	0.0	0.0	0.0	16.8	12.5	0.0	0.7	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	15.0	15.3	1.2	0.0	42.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	12.5	35.5	12.3	0.0	25.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	1.5	50.0	13.7	0.0	0.0	0.0
10	0.0	0.0	0.0	5.5	5.0	1.8	0.0	70.4	0.0	6.5	0.0	0.0
11	0.0	0.0	0.0	0.0	60.0	13.5	0.0	13.8	40.0	1.5	1.5	0.0
12	0.0	0.0	0.0	0.0	17.0	3.7	34.0	10.6	0.0	0.0	10.8	0.0
13	0.0	0.0	0.5	0.0	41.0	0.0	0.0	41.0	7.0	0.0	0.6	0.0
14	0.0	0.0	0.0	0.0	45.0	30.0	29.0	11.5	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	85.0	0.0	0.0	19.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	25.2	0.0	0.0	10.0	13.0	12.0	0.0	0.0
17	0.0	0.0	0.0	0.0	10.0	4.5	0.0	91.1	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	3.5	2.0	0.0	10.6	14.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.2	0.0	50.0	39.0	0.0	0.0	0.0	0.0
20	0.0	0.0	2.8	0.0	10.0	10.0	25.0	0.5	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	12.0	20.0	3.0	35.0	12.0	0.0	0.0
22	0.0	0.0	0.0	0.0	18.0	25.0	0.0	0.0	0.0	1.2	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	2.5	15.0	0.0	45.0	1.9	0.0	0.0
24	0.0	0.0	0.0	0.0	10.0	68.8	15.0	73.0	0.0	0.0	0.0	0.0
25	0.0	12.0	13.0	0.0	0.0	15.0	4.5	40.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	17.5	4.5	85.3	15.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	7.5	42.0	1.0	33.5	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	24.5	0.0	13.0	1.5	33.0	0.0	0.0
29	0.0		40.0	0.0	5.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
30	0.0		0.0	0.0	1.7	0.0	21.0	7.0	10.0	0.0	0.0	0.0
31	0.0		0.0		0.0		3.7	0.0		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 2002

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	4.0	16.7	9.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	10.5	50.5	50.0	0.0	1.0	65.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	24.0	1.7	0.0	2.3	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	23.5	18.0	0.0	46.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.5	5.0	25.8	9.0	23.0	25.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	18.0	1.8	11.0	40.0	15.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	14.2	65.0	11.2	44.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	34.5	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	30.0	23.0	15.2	77.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	8.5	10.0	20.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	70.0	10.0	0.0	23.1	4.5	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.0	10.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.5	62.2	92.5	17.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	2.5	13.0	19.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	20.2	0.0	0.2	0.0	46.1	0.1	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.5	0.0	13.5	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	2.0	4.5	42.4	13.5	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	1.3	40.5	0.0	48.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	55.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	102.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	4.0	13.2	0.0	6.0	20.0	12.0	0.0	0.0
23	0.0	0.0	0.0	15.8	0.0	29.0	0.0	0.0	0.0	1.8	0.0	0.0
24	0.0	0.0	0.0	4.0	0.0	1.8	48.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	45.0	0.0	0.0	6.0	0.0	8.5	13.0	0.0	0.0
26	0.0	0.0	0.0	0.0	25.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	1.5	12.0	0.0	0.0	12.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	63.0	0.0	40.0	0.3	0.0	0.0
29	0.0		0.0	0.0	0.0	0.0	11.0	0.0	0.0	40.0	0.0	0.0
30	0.0		0.0	0.0	0.0	0.0	6.5	2.4	10.0	1.9	0.0	0.0
31	0.0		0.0		0.0		0.0	0.0		21.0		0.0

Station : Sukhuma　　　　Daily Rainfall in mm　　　　Year : 2003

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	10.0	5.0	0.0	3.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	16.0	1.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	13.5	0.0	30.3	22.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	3.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	3.0	0.0	33.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	1.7	30.5	18.0	0.3	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	13.7	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0
9	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.7	11.4	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	75.2	30.7	1.2	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	36.2	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	43.0	0.0	0.0	0.0	25.0	25.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	4.8	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	11.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	25.5	3.4	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	25.0	0.0	25.0	31.0	0.0	0.0	0.0
18	0.0	0.0	9.0	0.0	0.0	17.5	0.0	0.0	19.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	3.5	0.0	0.0	3.8	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	50.0	5.0	6.1	1.1	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	6.0	0.0	3.5	1.2	0.0	1.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	50.0	0.7	35.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	18.5	0.0	0.0	27.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	17.5	21.0	16.0	34.0	19.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	10.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	25.0	0.0	27.0	11.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	8.2	25.0	37.0	0.0	2.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	25.0	0.0	0.0	0.0
29	0.0		0.0	0.0	26.0	26.0	19.9	0.0	8.4	0.0	0.0	0.0
30	0.0		1.5	0.0	2.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0
31	0.0		4.7		10.0		0.0	0.5		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 2004

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	98.0	0.0	0.0	0.0
2	0.0	0.0	0.0	25.0	0.0	13.0	0.0	3.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	20.6	3.0	20.5	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	8.0	50.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	6.5	0.0	11.0	0.0	130.2	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	16.2	0.0	15.0	50.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	25.0	52.0	0.0	12.9	87.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	23.5	0.0	30.2	8.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	4.5	0.0	47.0	8.5	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	10.3	18.8	0.0	50.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	25.0	0.0	7.0	33.5	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	15.5	0.0	0.0	18.2	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	10.0	16.0	3.0	70.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	2.1	0.0	8.0	5.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	52.5	9.6	25.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	27.0	0.0	0.0	0.0	41.2	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	21.0	37.0	17.5	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	32.0	2.7	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.8	17.6	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	59.0	19.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	20.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	17.5	0.0	0.0	23.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.8	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	29.5	0.0	21.0	11.0	0.0	0.0	6.2	0.0
26	0.0	0.0	0.0	23.0	5.0	0.0	2.5	18.2	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	75.0	29.0	15.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	8.0	27.0	12.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0		0.0		0.0		0.0	0.0		0.0		0.0

Station : Sukhuma   Daily Rainfall in mm   Year : 2005

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	45.0	0.0	30.0	0.0	0.0	0.0	1.0
3	0.0	0.0	0.0	0.0	0.0	0.0	23.0	18.0	0.0	3.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
6	0.0	0.0	0.0	0.0	0.0	21.0	0.0	53.0	0.0	0.0	10.0	0.0
7	0.0	0.0	0.0	0.0	0.0	50.2	30.0	50.2	12.0	0.0	2.0	0.0
8	0.0	0.0	0.0	0.0	23.0	58.0	0.0	18.0	46.8	0.0	8.0	0.0
9	0.0	0.0	0.0	0.0	3.8	0.0	0.0	67.0	10.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	44.0	2.5	0.0	17.0	6.0	55.5	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	6.5	0.0	7.0	0.0	12.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.2	10.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	15.5	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	19.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	21.0	81.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	2.5	0.0	0.0	16.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0
20	0.0	0.0	17.0	0.0	0.0	0.0	0.0	27.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	41.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	20.0	7.0	26.1	0.0	0.0	9.0	0.0	0.0
23	0.0	0.0	0.0	0.0	18.0	2.0	25.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	47.8	0.0	0.0	0.0	0.0	10.0
26	0.0	0.0	0.0	2.5	0.0	24.0	0.0	0.0	25.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	15.0	11.0	62.6	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	31.0	17.3	0.0	15.0	0.0	0.0	0.0	0.0
29	0.0		0.0	0.0	12.2	10.0	0.0	13.0	0.0	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	0.0	0.0	0.0	31.5	0.0	0.0	0.0
31	0.0		0.0		0.0		23.5	32.5		0.0		0.0

Station : Sukhuma   Daily Rainfall in mm   Year : 2006

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	2.0	0.0	23.0	0.0	50.0	68.7	0.0	88.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	90.4	0.0	0.0	10.0	0.0	0.0
3	0.0	0.0	0.0	27.0	0.0	15.0	3.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	18.0	0.0	0.0	40.0	12.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	14.0	0.0	0.0	80.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	17.0	0.0	0.0	69.6	22.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	15.0	0.0	0.0	38.0	12.0	65.1	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	25.0	17.0	0.0	0.0
11	0.0	0.0	1.0	0.0	0.0	27.0	3.0	15.0	25.0	0.0	0.0	0.0
12	0.0	0.0	8.0	50.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	28.0	60.3	24.6	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.5	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.8	75.0	0.0	36.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.6	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.4	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	39.5	9.0	15.0	50.0	1.8	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	25.5	0.0	0.0	15.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	25.0	13.0	82.0	30.0	45.4	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	23.5	23.0	10.0	30.0	13.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	120.4	50.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	14.0	0.0	0.0	0.8	0.1	11.9	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	93.5	50.0	0.4	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	17.0	35.0	11.9	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	1.5	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0	1.3	0.0	0.0	0.0
29	0.0		0.0	0.0	31.0	0.0	0.0	78.0	75.2	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	0.0	60.6	28.4	52.2	0.0	0.0	0.0
31	0.0		0.0		35.0		0.0	0.0		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 2007

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	22.2	0.0	70.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	13.5	35.2	0.0	5.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	45.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.5	20.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	30.0	0.0	61.0	186.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	1.0	0.0	0.0	14.0	0.0	15.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.5	2.3	7.0	0.0	0.0
9	0.0	0.0	0.0	0.0	9.0	0.0	0.2	0.0	14.2	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	47.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.0	0.0	16.0	0.0	0.0
13	0.0	0.0	0.0	0.0	38.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	3.0	0.0	50.0	0.0	26.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	16.0	25.0	0.0	25.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.6	0.0	63.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.2	2.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	97.0	17.0	0.0	0.7	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	10.0	0.0	82.0	2.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	15.0	0.6	0.0	71.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	5.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	13.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	35.0	0.0	18.0	48.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	36.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
29	0.0		0.0	89.2	33.0	45.0	50.3	10.7	0.0	21.9	0.0	0.0
30	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0		0.0		0.0		2.2	0.0		0.0		0.0

Station : Sukhuma　　Daily Rainfall in mm　　Year : 2008

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	2.5	0.0	0.1	0.0	9.5	53.0	0.0	60.0	0.0
2	0.0	0.0	0.0	0.0	25.0	66.0	0.0	9.3	0.0	78.0	25.0	0.0
3	0.0	0.0	0.0	0.0	0.5	0.0	0.0	25.0	62.0	0.0	15.0	0.0
4	0.0	0.0	0.0	0.0	12.0	14.2	0.0	48.0	0.0	47.1	0.0	0.0
5	0.0	0.0	0.0	0.0	1.0	0.0	0.0	72.0	0.0	0.0	0.7	0.0
6	0.0	0.0	0.0	8.0	1.8	0.0	0.0	30.3	0.0	16.0	0.0	0.0
7	0.0	0.0	0.0	0.0	28.9	0.0	0.0	41.0	2.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	14.5	0.0	51.7	0.0	4.0	80.5	0.0	0.0
9	0.0	0.0	0.0	0.0	4.8	0.0	26.0	0.0	0.0	47.0	0.0	0.0
10	0.0	0.0	0.0	10.5	0.0	57.2	0.0	75.0	42.2	1.5	0.0	0.0
11	0.0	0.0	0.0	0.0	13.0	0.0	0.0	50.4	23.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	14.5	0.0	9.0	41.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	27.0	0.0	26.0	0.0	52.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.7	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	8.0	0.0	16.8	0.0	150.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	20.0	3.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	40.0	37.0	75.0	32.5	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	75.0	25.9	10.0	0.0	25.3	37.0	0.0	0.0
19	0.0	0.0	0.0	0.0	75.2	25.0	0.0	0.0	63.0	30.0	0.0	0.0
20	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	25.3	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	68.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	30.2	0.0	0.0	10.6	1.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	26.0	0.0	0.0	40.7	13.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.7	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.6	10.0	0.0	1.1	1.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.5	0.0	0.0	9.5	13.6	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.5	56.7	0.0	0.0	0.0
28	0.0	0.0	0.0	74.0	0.0	0.0	28.5	17.0	16.6	0.0	0.0	0.0
29	0.0	0.0	0.0	5.9	16.7	0.0	88.0	0.0	1.0	0.8	0.0	0.0
30	0.0		0.0	0.0	0.3	10.3	0.0	56.0	0.0	0.0	0.0	0.0
31	0.0		0.0		0.0		0.0	0.0		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 2009

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	48.0	0.0	27.0	70.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	23.0	0.0	0.0	25.0	30.3	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	25.0	42.0	0.0	50.0	0.0	0.0
5	0.0	0.0	0.0	4.0	0.0	20.0	25.0	48.0	0.0	25.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	24.0	0.0	25.0	50.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	27.0	0.0	0.0	35.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	10.3	25.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	25.0	32.0	0.0	0.0
10	0.0	0.0	0.0	0.0	25.3	7.0	0.0	10.0	0.0	12.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	2.0	25.4	0.0	0.0	4.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	11.0	0.0	35.0	24.0	40.0	0.0	0.0	0.0
14	0.0	0.0	0.0	45.0	0.0	0.0	50.0	0.0	48.0	42.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	22.5	4.6	0.0	25.5	0.0	0.0	0.0
16	0.0	59.0	0.0	0.0	0.0	43.0	107.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	75.0	0.0	11.5	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	80.0	1.0	0.0	43.0	5.0	0.0	25.0	0.0	0.0
19	0.0	0.0	0.0	0.0	3.0	0.0	0.0	25.0	0.0	14.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	25.0	0.0	16.6	14.0	0.0	17.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	65.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	75.0	30.0	0.0	37.0	0.6	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	23.2	0.0	0.0	0.0
27	0.0	0.0	0.0	2.0	0.0	0.0	57.0	75.0	25.0	0.0	0.0	0.0
28	0.0	0.0	0.0	11.0	0.0	0.0	50.0	0.0	37.0	0.0	0.0	0.0
29	0.0		0.0	3.0	0.0	42.0	25.0	0.0	70.0	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	20.0	15.0	0.0	2.1	0.0	0.0	0.0
31	0.0		0.0		0.0		59.0	0.0		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 2010

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	82.0	0.0	41.2	18.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.3	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	30.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	50.6	0.0	49.9	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	44.0	0.0	0.0	12.5	32.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	46.0	0.0	25.0	15.0	25.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.9	1.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	32.8	25.5	54.0	0.0	0.0	0.0
14	0.0	0.0	0.0	20.0	17.0	0.0	10.9	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.3	8.0	0.0	0.0	0.0
17	0.0	0.0	0.0	47.0	0.0	0.0	0.0	3.0	0.0	50.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.3	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.0	41.5	50.0	0.0	0.0
20	0.0	0.0	0.0	0.0	37.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	25.3	0.0	0.0	25.6	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	36.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.5	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	2.0	48.0	0.0	39.3	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	39.0	7.0	19.0	0.0	0.0	49.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	28.3	0.0	0.0	25.0	3.0	0.0	0.0	0.0
29	0.0		0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0
31	0.0		0.0		0.0		0.0	0.0		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 2011

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	14.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	23.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.8	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	118.8	0.0	9.4	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	26.2	16.0	25.7	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	27.8	18.8	0.0	16.5	17.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.9	53.6	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	25.3	14.0	0.0	14.6	0.0	25.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	16.0	25.2	0.0	100.2	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	25.0	0.0	2.4	0.0	50.3	0.0	0.0
12	0.0	0.0	0.0	0.0	2.0	18.3	0.0	0.3	0.0	50.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	52.5	0.0	0.0	22.3	0.0	0.0
14	0.0	0.0	0.0	0.0	75.0	0.0	44.0	10.6	10.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	41.0	6.0	14.7	125.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	27.0	7.0	64.6	17.4	0.0	9.3	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	12.5	17.3	0.0	75.2	0.0	0.0
18	0.0	0.0	0.0	0.0	5.0	0.0	0.0	24.6	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	12.4	0.0	9.4	0.0	0.1	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	25.3	10.3	0.0	0.0	31.2	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	21.0	0.0	32.0	1.7	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	82.0	29.0	11.5	11.7	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	47.5	0.0	26.1	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	16.0	13.0	12.7	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	24.0	0.0	12.8	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	27.0	0.0	27.0	0.0	4.5	0.0	0.0	0.0	0.0
29	0.0		0.0	13.0	0.0	0.0	0.0	13.6	0.0	0.0	0.0	0.0
30	0.0		0.0	18.3	0.0	0.0	49.8	12.0	0.0	0.0	0.0	0.0
31	0.0		0.0		16.0		0.0	6.2		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 2012

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	38.0	55.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	25.5	15.3	67.0	75.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	95.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	25.0	44.0	14.8	28.0	0.0	0.0
7	0.0	0.0	0.0	25.3	56.0	14.2	0.0	0.0	62.0	0.0	0.0	0.0
8	0.0	0.0	79.0	12.6	0.0	0.0	52.0	0.0	50.0	0.0	0.0	0.0
9	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	100.2	0.0	75.0	25.0	0.0	181.0	0.0	0.0	0.0
11	0.0	0.0	0.0	50.3	0.0	0.0	0.0	0.0	16.4	0.0	0.0	0.0
12	0.0	0.0	0.0	50.0	0.0	27.8	0.0	0.0	12.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	14.2	65.0	0.0	120.5	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	19.5	0.0	0.0	49.7	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	22.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	68.5	0.0	10.9	25.1	0.0	0.0	0.0
17	0.0	0.0	0.0	22.2	0.0	66.3	0.0	0.0	41.0	0.0	0.0	0.0
18	0.0	0.0	22.0	25.0	0.0	5.2	95.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	7.2	0.0	0.0	0.0	6.0	0.0	0.0
20	0.0	0.0	25.0	0.0	11.5	0.0	14.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	46.5	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	35.0	0.0	50.6	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	31.4	0.0	33.5	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	43.0	36.0	35.0	18.5	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	36.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	28.2	0.0	100.5	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	34.0	25.3	70.0	40.3	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	14.0	32.0	0.0	12.0	7.2	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	68.0	39.0	40.2	0.0	0.0	0.0	0.0
30	0.0		0.0	0.0	12.0	25.0	25.0	0.0	37.0	0.0	0.0	0.0
31	0.0		0.0		0.0		0.0	48.0		0.0		0.0

Station : Sukhuma　　　　Daily Rainfall in mm　　　　Year : 2013

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	31.0	0.0	0.0	68.0	32.4	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.1	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.8	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	50.5	25.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0	31.0	0.0	0.0
8	0.0	0.0	0.0	0.0	84.0	0.0	70.0	0.0	50.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	75.5	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.7	31.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	72.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	25.0	0.0	81.0	0.0	25.3	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	21.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	71.0	33.3	10.0	35.1	0.0	25.0
16	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	100.7	0.0	0.0	42.0
17	0.0	0.0	0.0	0.0	0.0	0.0	25.3	0.0	80.7	15.5	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.0	8.5	0.0	0.0
19	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	58.5	18.5	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	48.3	0.0	0.0	10.0	0.0	0.0
21	0.0	0.0	0.0	75.0	0.0	78.5	47.2	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	17.0	0.0	168.5	73.0	0.0	15.0	0.0	0.0	0.0
23	0.0	0.0	0.0	40.0	0.0	50.5	63.5	32.3	50.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	22.3	62.5	63.3	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	11.0	0.0	80.0	23.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	25.6	53.5	0.0	0.0	0.0	0.0
29	0.0		0.0	0.0	0.0	0.0	62.8	38.5	0.0	0.0	0.0	0.0
30	0.0		0.0	25.5	0.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0
31	0.0		0.0		0.0		0.0	0.0		0.0		0.0

Station : Sukhuma Daily Rainfall in mm Year : 2014

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	24.3	0.0	107.0	75.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	25.0	0.0	40.5	72.7	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	38.0	81.7	35.3	0.0	0.0	0.0
4	0.0	0.0	0.0	23.0	0.0	0.0	30.0	56.3	90.5	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	45.2	114.2	0.0	10.2	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	51.9	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	98.8	0.0	31.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	25.0	61.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	41.0	0.0	0.0	11.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	28.9	0.0	0.1	0.0
11	0.0	0.0	0.0	0.0	0.0	35.4	12.0	0.5	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	42.3	1.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	25.0	68.0	14.0	50.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	25.0	33.0	3.0	25.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	50.3	0.0	0.0	2.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	12.5	0.0	11.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	13.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	28.0	0.0	0.0	27.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	35.4	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	47.0	0.0	0.0	56.0	24.6	7.0	20.0	3.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	75.3	0.0	0.0	50.0	30.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	41.5	0.0	0.0	0.0	45.5	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0	0.0	75.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.8	6.7	26.5	0.0	0.0
26	0.0	0.0	0.0	0.0	56.0	0.0	35.2	14.5	0.0	24.5	0.0	0.0
27	0.0	0.0	0.0	25.0	0.0	0.0	69.9	3.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	25.3	0.0	85.3	75.8	0.0	25.0	0.0	0.0	0.0
29	0.0		0.0	0.0	0.0	144.0	0.0	0.0	14.0	0.0	0.0	0.0
30	0.0		0.0	21.0	0.0	0.0	104.6	24.0	0.0	0.0	0.0	0.0
31	0.0		0.0		27.6		165.6	25.0		0.0		0.0

Station : Sukhuma | Daily Rainfall in mm | Year : 2015

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	25.0	100.0	0.0	0.0	12.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	83.0	25.3	22.0	12.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	18.2	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	23.2	0.0	0.0	23.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	2.0	22.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.6	72.0	0.0	0.0	61.0	0.0
8	0.0	0.0	0.0	0.0	0.0	25.0	51.8	0.0	0.0	0.0	0.8	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	75.0	11.0	0.0	71.0	15.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	25.3	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.7	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.8	0.0	8.5	44.5	2.3	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	62.3	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	1.0	12.2	0.0	112.8	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	17.0	10.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	12.0	75.9	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	25.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	38.3	12.0	25.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	85.3	100.5	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	50.0	0.2	0.0	18.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	25.3	0.8	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	80.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	10.7	0.0	60.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	10.0	0.0	50.3	14.0	0.0	30.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	31.0	32.2	0.0	50.3	70.2	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	32.3	12.0	87.5	0.9	0.0	0.0	0.0
29	0.0		0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.4	0.0
30	0.0		0.0	0.0	0.0	0.0	1.4	61.0	0.0	0.0	0.0	0.0
31	0.0		0.0		0.0		42.5	24.0		0.0		0.0

Station : Sukhuma　　Daily Rainfall in mm　　Year : 2016

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	28.3	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	10.0	98.2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	55.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	2.0	0.0	22.0	33.0	0.0	30.3	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0	0.0	71.0	23.5	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.0	0.0	64.0	25.0	0.0
8	0.0	0.0	0.0	0.0	0.0	28.3	57.3	50.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	70.0	60.6	49.3	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	66.2	0.0	10.2	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	105.5	31.0	25.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	50.2	0.0	193.0	0.0	0.0	4.0
13	0.0	0.0	0.0	0.0	10.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.2	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	87.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	10.0	65.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	29.0	0.0	37.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.6	18.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	32.0	0.0
20	0.0	0.0	0.0	0.0	0.0	10.9	0.0	0.0	0.0	0.0	0.0	27.3
21	0.0	0.0	0.0	0.0	0.0	30.5	0.0	25.0	38.0	0.0	39.0	0.0
22	0.0	0.0	0.0	10.0	60.3	60.5	0.0	75.0	0.0	50.3	4.0	0.0
23	0.0	0.0	0.0	0.0	0.0	42.5	0.0	25.0	0.0	80.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	41.0	12.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	75.0	10.0	0.0	68.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	125.0	15.7	62.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	10.0	0.0	29.0	110.0	39.0	0.0	0.0
28	0.0	0.0	0.0	0.0	70.0	0.0	0.0	29.0	96.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	35.0	0.0	22.0	50.0	0.0	0.0	0.0	0.0
30	0.0		0.0	0.0	30.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0		0.0		0.0		4.0	0.0		0.0		0.0

Appendix 7: Locations and rainfall data at 16 rain gauges in Sukhuma District from 2012-2016

1. Location of rain gauges

No.	Station name	Latitude (°)	Longitude (°)	Easting (m)	Northing (m)	Elevation (m AMSL)
1	Sukhuma	14.65	105.79	585069.8	1619763	98
2	Lakbeng	14.78	105.84	589922.0	1633861	104
3	Parkor	14.67	105.74	579678.2	1621957	107
4	Nonyang	14.68	105.72	577521.1	1623057	109
5	Khoknongboua	14.61	105.79	585085.2	1615339	99
6	Thubcharn	14.63	105.79	585077.5	1617551	97
7	BoungKeo	14.63	105.84	590462.5	1617571	98
8	Phonphueng	14.64	105.78	583996.8	1618654	103
9	Pakxang	14.69	105.67	572134.2	1624146	111
10	Hieng	14.69	105.58	562444.2	1624119	125
11	Nongphanvong	14.76	105.74	579645.5	1631912	111
12	Bark	14.7	105.79	585050.5	1625294	114
13	None Uang	14.52	105.72	577577.1	1605359	105
14	None DengNua	14.75	105.61	565656.2	1630764	120
15	HouayPhueng	14.66	105.57	561375.9	1620798	136
16	None DengTai	14.55	105.73	578644	1608681	109

2. Rainfall data for 2012

Month	Sukhuma	Lakbeng	Nong Phanvong	Bark	Parkor	None Yang	Parkxang	Phone Pheung	Thubcharn	Khok Nongboua	Boungkeo	None Deng-Tai	None Uang	None Deng-Nua	Hieng	Houay Pheung
1-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31-Jan-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

13-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Feb-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Mar-12	NA	30.50	15.00	5.00	8.00	9.00	3.00	0.00	7.00	9.00	4.00	3.50	11.00	6.00	5.80	3.00
2-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Mar-12	NA	87.00	35.00	23.00	35.00	20.00	18.00	42.00	34.00	24.00	39.00	23.00	12.00	17.00	21.00	23.00
9-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Mar-12	NA	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Mar-12	NA	19.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Mar-12	NA	5.00	7.00	23.00	21.00	17.00	19.00	20.00	23.00	29.00	32.00	12.00	7.00	9.00	17.00	18.00
19-Mar-12	NA	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Mar-12	NA	8.20	8.00	20.00	18.00	13.00	13.00	35.00	28.00	25.00	38.00	12.00	26.00	12.00	23.00	20.00
21-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

30-Mar-12	NA	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31-Mar-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Apr-12	NA	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Apr-12	NA	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
10-Apr-12	NA	56.00	22.00	89.00	69.00	80.00	78.00	49.00	50.00	42.00	59.00	33.70	50.00	33.70	25.50	50.00
11-Apr-12	NA	45.00	34.00	24.00	21.00	34.00	23.00	45.00	40.00	48.00	55.00	25.00	13.00	11.00	10.00	18.00
12-Apr-12	NA	5.00	59.00	10.00	8.20	16.71	16.00	19.55	28.91	34.00	24.47	50.00	15.50	50.00	55.50	3.50
13-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Apr-12	NA	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Apr-12	NA	0.00	14.50	10.00	7.00	5.00	8.00	10.00	8.00	7.00	4.00	11.00	12.00	10.50	5.50	6.00
18-Apr-12	NA	23.00	12.00	25.00	13.00	15.00	20.00	18.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00
19-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Apr-12	NA	14.50	5.00	3.00	0.00	0.00	0.00	5.00	0.00	0.00	10.00	0.00	0.00	4.00	0.00	0.00
24-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Apr-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-May-12	NA	40.00	7.50	7.50	23.00	20.00	18.00	39.00	28.00	26.00	30.00	37.00	32.00	7.50	18.00	7.50
8-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-May-12	NA	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-May-12	NA	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

15-May-12	NA	0.00	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30
16-May-12	NA	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-May-12	NA	12.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-May-12	NA	13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-May-12	NA	0.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00
21-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-May-12	NA	18.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-May-12	NA	0.00	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30
25-May-12	NA	10.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-May-12	NA	29.50	29.50	29.50	29.50	29.50	29.50	29.50	29.50	29.50	29.50	29.50	29.50	29.50	29.50	29.50
28-May-12	NA	1.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
29-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31-May-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Jun-12	NA	18.00	12.00	22.00	16.00	17.00	12.00	27.00	25.00	22.00	37.00	13.00	12.00	11.00	12.00	10.00
3-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Jun-12	NA	4.30	3.20	4.00	6.00	2.00	3.20	5.00	3.00	12.00	12.00	10.00	17.00	8.00	3.00	6.00
8-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Jun-12	NA	25.00	21.00	45.00	35.00	30.50	36.00	45.00	39.00	35.00	30.00	31.00	26.00	38.00	38.00	25.00
11-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Jun-12	NA	7.00	9.00	15.00	12.00	10.00	18.00	20.00	12.00	11.00	8.00	3.00	2.00	5.00	2.00	1.00
13-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Jun-12	NA	0.00	0.00	0.00	0.00	6.00	5.00	12.00	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
15-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Jun-12	NA	79.00	50.00	49.00	35.00	32.00	29.00	30.00	36.00	22.00	37.00	21.00	22.00	22.00	23.00	26.00
17-Jun-12	NA	65.00	45.00	23.00	21.00	34.00	32.00	25.00	23.00	37.00	37.00	65.00	55.00	34.00	45.00	41.00
18-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Jun-12	NA	23.00	34.00	25.00	31.00	24.00	28.00	37.00	32.00	26.00	39.00	31.00	23.00	21.00	17.00	14.00
22-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Jun-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Jun-12	NA	3.00	6.00	32.00	12.00	21.00	16.00	26.00	18.00	12.00	27.00	21.00	27.00	13.00	15.00	11.00
25-Jun-12	NA	0.00	16.37	15.00	15.26	15.23	15.00	15.24	15.24	15.24	15.24	3.50	3.50	3.50	2.50	4.00
26-Jun-12	NA	0.00	2.00	15.50	13.39	13.50	16.00	13.84	24.90	32.50	22.88	1.20	7.00	1.20	6.50	25.00
27-Jun-12	NA	18.50	4.00	15.00	50.00	41.77	15.00	27.11	19.59	15.50	21.11	3.50	12.50	3.50	2.50	4.00
28-Jun-12	NA	4.00	2.00	15.50	25.00	22.06	16.00	30.45	41.82	32.50	35.18	1.20	7.00	1.20	6.50	25.00
29-Jun-12	NA	5.50	4.00	18.50	50.00	23.92	0.00	21.01	14.20	15.50	18.07	12.50	0.00	12.50	4.50	3.00

30-Jun-12	NA	30.50	41.00	9.00	25.00	21.61	15.00	39.77	50.60	48.00	46.00	19.00	40.50	19.00	11.50	21.50
1-Jul-12	NA	30.00	14.00	33.00	25.00	20.27	25.00	14.05	17.06	10.50	15.32	0.00	61.00	0.00	27.50	29.00
2-Jul-12	NA	46.50	18.00	33.00	23.00	14.56	21.00	12.17	7.53	56.50	10.62	22.70	25.00	22.70	39.00	25.00
3-Jul-12	NA	20.00	25.00	8.50	12.50	0.00	27.00	0.00	0.00	18.70	0.00	8.60	7.00	8.60	7.00	8.50
4-Jul-12	NA	35.50	22.00	9.00	0.00	0.00	6.00	0.00	0.00	42.00	0.00	33.70	50.00	33.70	25.50	50.00
5-Jul-12	NA	1.00	16.00	24.00	11.80	0.00	17.00	0.00	0.00	5.00	0.00	8.90	14.50	8.90	0.00	16.50
6-Jul-12	NA	32.00	38.00	12.00	20.00	29.43	37.00	17.04	17.66	18.00	16.81	25.00	25.00	25.00	15.50	2.00
7-Jul-12	NA	22.50	59.00	10.00	8.20	0.00	16.00	0.00	0.00	34.00	0.00	50.00	15.50	50.00	55.50	3.50
8-Jul-12	NA	0.00	0.00	20.00	0.00	20.00	0.00	20.00	20.00	0.00	20.00	0.00	0.00	0.00	0.00	60.00
9-Jul-12	NA	1.50	13.00	0.00	0.00	9.34	0.00	10.84	12.79	14.50	12.04	9.00	25.00	9.00	3.50	0.00
10-Jul-12	NA	4.00	0.00	27.00	15.60	17.63	0.00	12.47	5.04	1.00	9.44	0.00	0.00	0.00	0.00	14.50
11-Jul-12	NA	6.00	7.00	2.00	0.00	9.46	10.00	4.48	5.22	6.00	4.80	23.00	1.50	23.00	0.00	7.50
12-Jul-12	NA	14.00	42.00	5.00	13.60	29.65	43.00	40.86	68.60	83.70	54.49	32.00	58.00	32.00	29.50	8.00
13-Jul-12	NA	0.50	0.00	48.00	30.00	18.00	6.00	22.55	8.59	1.00	16.63	4.00	0.00	4.00	0.00	19.00
14-Jul-12	NA	6.50	17.00	1.50	5.00	9.33	12.00	10.60	17.01	20.50	13.65	35.80	12.00	35.80	0.00	0.00
15-Jul-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Jul-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Jul-12	NA	0.00	0.00	0.00	50.00	46.91	0.00	23.42	13.11	7.50	17.38	0.00	25.00	0.00	0.00	0.00
18-Jul-12	NA	0.00	16.00	1.50	25.00	15.10	5.00	22.35	29.57	33.50	24.45	0.00	2.00	0.00	0.00	0.00
19-Jul-12	NA	31.50	31.00	18.00	17.20	36.05	56.00	23.02	27.86	30.50	25.55	10.90	8.50	10.90	25.50	0.00
20-Jul-12	NA	0.00	2.00	50.00	32.00	33.00	25.00	41.25	41.91	0.00	42.52	0.00	0.00	0.00	0.00	22.50
21-Jul-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Jul-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Jul-12	NA	0.00	0.00	1.00	10.00	15.00	8.00	13.00	14.00	16.00	23.00	4.00	11.00	8.00	4.00	3.00
24-Jul-12	NA	25.00	23.00	20.00	35.20	21.29	7.00	23.08	18.49	16.00	19.70	12.50	16.50	12.50	0.00	0.00
25-Jul-12	NA	0.00	16.00	18.00	10.40	13.48	16.00	12.25	10.79	10.00	12.02	17.40	13.00	17.40	0.00	10.50
26-Jul-12	NA	0.00	3.00	25.00	0.00	18.67	0.00	21.84	21.96	2.00	16.71	2.50	3.00	2.50	33.00	16.50
27-Jul-12	NA	37.50	25.00	45.00	22.50	24.32	26.00	24.04	16.24	12.00	21.58	10.50	17.50	10.50	0.00	4.50
28-Jul-12	NA	37.00	10.00	28.50	0.00	18.21	20.00	25.73	25.98	3.50	20.09	44.50	4.00	44.50	0.00	16.50
29-Jul-12	NA	4.50	18.00	14.50	10.00	14.84	19.00	18.78	24.75	28.00	22.14	35.00	22.00	35.00	17.50	2.00
30-Jul-12	NA	2.50	0.00	3.50	25.00	18.45	0.00	12.13	9.46	8.00	9.30	1.00	25.00	1.00	0.00	14.00
31-Jul-12	NA	12.50	20.00	9.50	0.00	12.50	0.00	10.95	10.89	9.50	10.41	10.00	13.50	10.00	0.00	5.50
1-Aug-12	NA	2.50	0.00	0.00	0.00	2.50	31.00	2.50	2.50	0.00	2.50	0.00	0.00	0.00	5.50	9.50
2-Aug-12	NA	6.00	0.00	25.00	20.00	20.34	0.00	13.53	5.74	1.50	9.88	2.00	4.50	2.00	15.50	0.00
3-Aug-12	NA	25.00	17.00	24.00	35.00	31.78	0.00	25.34	21.23	19.00	22.49	11.50	50.00	11.50	30.50	0.00
4-Aug-12	NA	8.50	7.00	50.00	10.00	9.46	0.00	19.76	12.15	8.00	18.59	7.70	25.00	7.70	13.50	42.00
5-Aug-12	NA	0.00	0.00	24.50	23.00	24.54	0.00	24.52	24.52	0.00	24.52	0.00	0.00	0.00	25.50	0.00
6-Aug-12	NA	0.00	19.00	30.00	12.00	26.83	25.00	28.42	28.48	0.00	28.58	3.70	0.00	3.70	0.00	0.00
7-Aug-12	NA	5.50	0.00	20.00	25.00	18.20	6.00	18.82	18.84	4.00	14.81	6.00	0.00	6.00	0.00	0.00
8-Aug-12	NA	2.00	9.00	25.00	12.00	20.17	2.00	22.22	22.29	1.50	16.73	0.00	0.00	0.00	0.00	8.50
9-Aug-12	NA	14.50	22.50	2.50	0.00	8.30	0.00	5.46	5.35	0.00	5.17	7.80	0.00	7.80	14.00	2.50
10-Aug-12	NA	22.00	9.00	8.50	0.00	8.84	0.00	8.98	8.99	3.00	7.37	15.50	3.00	15.50	0.00	0.00
11-Aug-12	NA	12.00	8.00	32.00	30.00	26.06	0.00	30.92	30.93	0.00	31.25	12.50	0.00	12.50	0.00	9.50
12-Aug-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Aug-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Aug-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

15-Aug-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Aug-12	NA	2.00	0.00	0.00	11.00	7.00	3.00	4.75	2.32	1.00	3.47	1.00	0.00	1.00	0.00	0.00
17-Aug-12	NA	25.00	10.00	15.50	0.00	2.61	1.00	13.69	14.03	77.00	31.48	16.50	43.00	16.50	0.00	9.00
18-Aug-12	NA	23.00	24.00	18.00	10.00	14.98	18.00	13.67	13.88	14.00	14.37	19.40	0.00	19.40	22.50	43.50
19-Aug-12	NA	11.50	0.00	0.00	0.00	4.00	4.00	13.50	13.50	13.50	13.50	0.00	0.00	0.00	10.50	0.00
20-Aug-12	NA	0.00	0.00	10.00	3.00	11.22	0.00	10.72	10.70	0.00	10.64	19.50	0.00	19.50	16.50	5.00
21-Aug-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Aug-12	NA	3.00	8.00	23.00	25.00	23.96	40.00	23.45	23.41	21.00	23.20	18.00	23.00	19.00	12.00	10.00
23-Aug-12	NA	21.00	27.00	0.00	3.50	7.70	0.00	15.70	20.43	23.00	18.18	65.00	50.00	65.00	0.00	50.00
24-Aug-12	NA	6.50	25.00	17.50	4.00	20.04	35.00	7.58	5.26	4.00	7.31	22.30	21.00	22.30	49.50	50.00
25-Aug-12	NA	10.00	0.00	20.00	10.00	22.00	34.00	19.10	23.12	25.30	21.84	6.50	18.00	6.50	0.00	5.00
26-Aug-12	NA	0.00	0.00	2.00	30.00	20.50	55.00	14.15	11.46	10.00	10.86	3.50	17.00	3.50	51.00	40.00
27-Aug-12	NA	44.00	83.00	38.50	30.00	30.25	19.00	30.44	27.37	25.70	29.45	20.40	47.00	20.40	8.30	38.00
28-Aug-12	NA	39.00	25.00	25.00	0.00	15.15	13.00	23.94	24.21	9.00	20.16	44.00	3.00	44.00	50.50	23.50
29-Aug-12	NA	13.50	3.00	4.50	4.00	5.71	8.00	4.34	4.44	4.50	4.43	13.30	7.00	13.30	37.50	24.00
30-Aug-12	NA	12.50	31.00	5.00	50.00	36.86	25.00	26.48	23.90	22.50	22.09	17.70	55.00	17.70	42.50	30.00
31-Aug-12	NA	18.50	0.00	0.00	0.00	16.93	24.00	6.59	7.95	8.00	7.45	4.50	17.00	4.50	17.50	15.00
1-Sep-12	NA	4.00	7.00	13.00	10.00	9.46	0.00	8.06	5.11	3.50	6.75	5.00	11.00	5.00	10.50	0.00
2-Sep-12	NA	27.00	25.00	2.00	17.50	18.84	0.00	7.91	5.70	4.50	5.72	17.30	7.00	17.30	13.50	0.00
3-Sep-12	NA	5.00	18.00	30.00	36.00	32.78	0.00	24.72	28.14	30.00	24.23	3.50	25.00	3.50	27.50	8.50
4-Sep-12	NA	25.00	48.00	8.00	30.00	34.02	35.00	31.25	31.74	32.00	29.10	13.40	10.00	13.40	0.00	0.00
5-Sep-12	NA	0.00	0.00	25.00	23.00	22.41	5.50	23.71	23.76	0.00	23.84	0.00	0.00	0.00	0.00	5.50
6-Sep-12	NA	4.50	20.00	2.00	0.00	7.10	25.00	4.41	4.31	7.50	4.99	21.50	0.00	21.50	47.50	45.00
7-Sep-12	NA	25.00	5.00	14.50	17.00	21.42	25.00	14.74	14.55	5.00	11.95	5.40	19.00	5.40	0.00	3.50
8-Sep-12	NA	12.00	15.00	2.00	10.00	10.89	0.00	13.78	20.40	24.00	16.62	2.50	0.00	2.50	0.00	11.50
9-Sep-12	NA	1.50	50.00	10.00	25.00	29.47	0.00	59.84	60.33	0.00	72.50	0.00	0.00	0.00	25.50	6.50
10-Sep-12	NA	32.00	29.00	22.00	50.00	89.00	99.00	79.00	83.00	76.00	15.92	73.00	11.00	73.00	50.50	34.00
11-Sep-12	NA	38.50	36.00	15.00	30.00	31.07	0.00	68.77	83.82	92.00	74.19	25.70	25.00	25.70	0.00	0.00
12-Sep-12	NA	89.00	24.00	22.00	25.00	24.82	0.00	19.15	15.17	13.00	16.90	0.00	25.00	0.00	0.00	0.00
13-Sep-12	NA	20.50	12.00	13.50	35.00	32.00	45.00	29.00	21.00	16.00	14.24	12.00	25.00	9.00	35.50	8.00
14-Sep-12	NA	0.00	25.00	44.00	10.00	12.68	0.00	53.58	78.46	92.00	68.63	31.50	43.00	31.50	31.50	36.00
15-Sep-12	NA	17.50	11.00	0.00	10.00	10.18	0.00	5.00	3.06	2.00	4.66	0.00	7.00	0.00	0.00	0.00
16-Sep-12	NA	6.00	7.00	9.00	11.00	8.83	18.00	9.17	9.18	1.50	7.10	6.50	4.00	6.50	0.00	0.00
17-Sep-12	NA	27.00	25.00	4.00	0.00	10.24	0.00	7.43	7.32	31.00	13.63	27.50	9.00	27.50	10.50	8.00
18-Sep-12	NA	0.00	0.00	0.00	0.00	23.50	0.00	23.50	23.50	0.00	22.00	0.00	0.00	0.00	23.50	12.00
19-Sep-12	NA	0.00	0.00	2.00	10.00	7.97	0.00	6.19	6.07	6.00	5.58	9.50	0.00	9.50	37.50	34.00
20-Sep-12	NA	0.00	0.00	0.00	0.00	17.00	0.00	17.00	17.00	0.00	17.00	0.00	17.00	0.00	0.00	0.00
21-Sep-12	NA	16.00	23.00	0.00	0.00	20.77	15.00	20.25	20.23	8.00	16.84	9.00	0.00	9.00	0.00	0.00
22-Sep-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Sep-12	NA	35.00	15.00	2.50	17.00	17.00	23.00	5.12	5.07	12.00	6.89	10.00	8.00	10.00	9.50	3.00
24-Sep-12	NA	3.50	9.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	12.00	25.00	12.00	0.00	0.00
25-Sep-12	NA	1.50	5.00	22.00	25.00	34.00	21.00	45.00	43.00	23.00	25.00	66.00	23.00	66.00	42.50	34.00
26-Sep-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Sep-12	NA	7.00	7.00	9.50	2.00	3.87	0.00	5.44	5.49	0.00	6.69	30.40	25.00	30.40	39.50	26.00
28-Sep-12	NA	0.00	5.00	0.00	0.00	3.00	2.00	3.00	3.00	3.00	0.00	7.50	7.00	7.50	0.00	0.00
29-Sep-12	NA	15.50	3.00	50.00	35.00	36.29	15.00	42.85	43.09	3.00	32.55	11.00	0.00	11.00	0.00	0.00

30-Sep-12	NA	25.00	12.00	16.00	8.00	15.01	20.00	15.76	15.79	7.00	13.44	5.70	0.00	5.70	0.00	0.00
1-Oct-12	NA	2.00	2.00	6.00	11.00	8.43	0.00	13.50	14.47	15.00	14.38	12.50	0.00	12.50	0.00	0.00
2-Oct-12	NA	0.00	0.00	3.00	4.00	7.84	11.00	8.02	8.02	0.00	8.03	15.20	0.00	15.20	2.50	2.00
3-Oct-12	NA	6.50	38.00	34.00	50.00	44.42	41.15	31.24	23.96	20.00	24.68	44.00	25.00	44.00	45.50	38.00
4-Oct-12	NA	0.00	0.00	0.00	0.00	3.50	3.50	3.50	3.50	0.00	3.50	0.00	14.00	0.00	3.50	1.00
5-Oct-12	NA	0.00	0.00	0.00	0.00	23.00	23.00	23.00	23.00	0.00	23.00	23.00	0.00	23.00	0.00	0.00
6-Oct-12	NA	29.00	31.00	7.50	15.00	11.00	17.00	12.00	12.00	59.00	25.00	5.00	25.00	5.00	47.00	47.00
7-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Oct-12	NA	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Oct-12	NA	0.00	0.00	2.00	3.00	0.00	2.00	2.50	1.00	3.00	6.00	2.00	1.00	0.00	0.00	3.00
20-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31-Oct-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Nov-12	NA	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

15-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Nov-12	NA	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Nov-12	NA	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Nov-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Dec-12	NA	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

31-Dec-12	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**1908.10**	**1826.17**	**1909.60**	**1926.95**	**2215.63**	**1751.45**	**2347.90**	**2337.13**	**2065.74**	**2322.59**	**1801.10**	**1774.10**	**1711.60**	**1690.70**	**1596.60**

3. Rainfall data for 2013

Month	Sukhuma	Lakbeng	Nong Phanvong	Bark	Parkor	None Yang	Parkxang	Phone Pheung	Thubcharn	Khok Nongboua	Boungkeo	None Deng-Tai	None Uang	None Deng-Nua	Hieng	Houay Pheung
1-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31-Jan-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

13-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Feb-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00
4-Mar-13	NA	0.00	0.00	0.00	0.50	0.00	0.70	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.80	0.00
5-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Mar-13	NA	18.00	15.00	26.00	25.00	20.00	22.50	19.00	18.00	16.00	19.40	22.00	21.00	20.00	22.10	18.00
7-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.00	2.80	0.00	0.00	0.00	0.00	0.00
13-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Mar-13	NA	72.00	66.00	68.00	50.00	50.00	51.30	58.00	55.00	45.00	48.60	34.00	40.00	45.00	50.80	55.00
15-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Mar-13	NA	11.00	8.00	12.00	0.00	8.00	10.60	5.00	2.50	3.00	0.20	12.00	13.00	2.00	8.00	1.00
30-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

31-Mar-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Apr-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Apr-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Apr-13	NA	18.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Apr-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Apr-13	NA	20.00	0.00	0.00	47.90	0.00	50.40	5.00	0.00	0.00	37.50	0.00	0.00	23.00	47.90	8.00
6-Apr-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Apr-13	NA	0.00	21.00	20.00	0.80	0.00	3.60	0.00	0.00	0.00	0.60	22.00	16.00	8.00	15.40	3.00
8-Apr-13	NA	0.00	0.00	0.00	15.40	0.00	15.90	0.00	0.00	0.00	13.40	0.00	0.00	0.00	0.00	0.00
9-Apr-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00
10-Apr-13	NA	3.00	0.00	0.00	5.20	0.00	5.70	5.00	5.00	0.00	5.90	2.00	5.00	20.00	5.20	8.00
11-Apr-13	NA	0.00	0.00	0.00	4.00	0.00	3.70	0.00	0.00	0.00	1.90	0.00	0.00	7.00	4.00	4.00
12-Apr-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Apr-13	NA	0.00	0.00	0.00	2.00	0.00	2.00	0.00	0.00	0.00	4.50	0.00	0.00	0.00	2.00	1.50
14-Apr-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Apr-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Apr-13	NA	0.00	8.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00
17-Apr-13	NA	0.00	7.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	7.80	15.00	0.00	0.00	0.00
18-Apr-13	NA	0.00	31.00	25.00	46.80	0.00	31.80	5.00	5.00	0.00	33.50	44.00	0.00	54.00	31.50	60.00
19-Apr-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	27.00	29.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Apr-13	NA	0.00	0.00	0.00	1.00	30.00	2.80	0.00	0.00	0.00	2.90	0.00	0.00	19.00	21.00	16.00
21-Apr-13	NA	5.00	57.00	11.00	10.10	14.00	11.70	10.00	14.00	12.00	10.80	25.00	3.00	8.00	10.30	14.50
22-Apr-13	NA	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00
23-Apr-13	NA	0.00	34.00	0.00	0.00	0.00	0.00	38.00	44.00	0.00	0.00	36.00	0.00	0.00	0.00	0.00
24-Apr-13	NA	0.00	8.00	0.00	3.00	0.00	3.00	10.50	12.50	0.00	3.70	2.00	0.00	0.00	3.00	6.00
25-Apr-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00
26-Apr-13	NA	0.00	0.00	0.00	0.00	25.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Apr-13	NA	0.00	0.00	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00
28-Apr-13	NA	0.00	0.00	0.00	0.70	0.00	0.70	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.70	0.00
29-Apr-13	NA	0.00	7.00	0.00	5.40	15.00	5.40	0.00	0.00	1.00	5.90	3.00	0.00	0.00	5.40	7.50
30-Apr-13	NA	0.00	14.00	0.00	28.70	0.00	25.50	23.00	23.00	0.00	33.70	0.00	4.00	12.00	35.50	33.00
1-May-13	NA	0.00	0.00	0.00	22.40	0.00	25.00	0.00	0.00	16.00	21.40	0.00	0.00	0.00	22.30	0.00
2-May-13	NA	0.00	0.00	20.00	21.30	2.00	20.90	0.00	0.00	0.00	21.60	0.00	0.00	13.00	20.40	18.00
3-May-13	NA	28.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-May-13	NA	0.00	0.00	0.00	15.30	0.00	11.80	0.00	0.00	4.50	18.30	0.00	4.00	8.00	12.80	0.00
5-May-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.00
6-May-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-May-13	NA	45.00	0.00	0.00	0.00	35.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.00	12.00	0.00
8-May-13	NA	10.50	0.00	18.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	18.50
9-May-13	NA	5.50	0.00	8.00	0.00	50.00	0.00	12.50	12.50	0.00	0.00	0.00	14.00	50.50	32.00	0.00
10-May-13	NA	40.00	0.00	19.50	0.00	10.00	0.00	0.00	0.00	6.50	0.00	0.00	0.00	0.00	0.00	7.50
11-May-13	NA	10.00	0.00	4.50	0.00	5.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00	44.00	12.00	4.00
12-May-13	NA	2.50	0.00	6.50	0.40	0.00	16.90	0.00	0.00	0.00	0.90	0.00	16.00	8.50	14.90	0.00
13-May-13	NA	0.00	0.00	0.00	51.00	0.00	0.00	0.00	0.00	0.00	50.40	0.00	0.00	0.00	0.00	7.50
14-May-13	NA	0.00	0.00	0.00	6.90	0.00	0.00	0.00	0.00	0.00	5.40	0.00	0.00	0.00	0.00	0.00
15-May-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

16-May-13	NA	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00
17-May-13	NA	30.00	12.00	0.00	0.00	0.00	2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30	0.00
18-May-13	NA	8.00	0.00	74.00	8.20	58.00	5.30	50.50	69.00	64.00	8.70	0.00	48.00	1.00	5.20	51.00
19-May-13	NA	18.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	4.00	0.00	0.00	9.00	0.00	0.00	0.00
20-May-13	NA	0.00	0.00	2.50	0.00	0.00	0.00	8.00	8.00	4.00	0.00	0.00	0.00	0.00	0.00	2.00
21-May-13	NA	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.50
22-May-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-May-13	NA	8.00	0.00	25.00	2.10	42.00	7.60	13.20	11.00	7.00	2.80	3.50	5.00	1.50	2.60	0.00
24-May-13	NA	12.50	0.00	9.50	0.00	0.00	3.80	0.00	0.00	1.50	0.00	7.50	0.00	0.00	2.80	6.00
25-May-13	NA	0.00	3.00	2.50	0.00	0.00	0.00	2.00	2.00	1.50	0.00	0.00	14.00	0.00	0.00	0.00
26-May-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.50	0.00	0.00	0.00	0.00
27-May-13	NA	0.00	0.00	0.00	13.20	0.00	0.00	2.00	0.00	0.00	14.30	0.00	0.00	0.00	0.00	6.00
28-May-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-May-13	NA	4.00	6.00	0.00	0.00	35.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.50
30-May-13	NA	0.00	0.00	0.00	0.00	0.00	3.20	30.00	29.00	32.50	0.00	0.00	13.00	0.00	2.20	33.00
31-May-13	NA	0.00	0.00	8.50	0.10	3.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00
1-Jun-13	NA	46.00	0.00	0.00	0.50	0.00	18.00	1.50	1.50	0.00	0.90	0.00	0.00	0.00	0.00	30.00
2-Jun-13	NA	41.50	16.00	18.50	0.00	0.00	5.20	2.00	2.00	0.00	0.00	0.00	0.00	5.00	10.10	25.50
3-Jun-13	NA	4.00	0.00	0.00	0.00	10.00	0.60	1.00	1.00	0.00	0.30	16.50	0.00	0.00	0.00	0.00
4-Jun-13	NA	0.00	2.00	2.00	0.00	4.00	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	17.50
5-Jun-13	NA	0.00	0.00	9.50	2.10	0.00	0.00	0.00	0.00	0.00	2.60	0.00	7.00	0.00	2.80	0.00
6-Jun-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Jun-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	0.00	0.00	0.00	0.00
8-Jun-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.50	0.00	0.00
9-Jun-13	NA	5.00	0.00	0.00	15.20	0.00	12.30	0.00	0.00	0.00	15.80	0.00	0.00	0.00	14.60	0.00
10-Jun-13	NA	125.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
11-Jun-13	NA	7.00	30.00	25.00	0.00	29.00	0.00	1.50	1.00	2.00	0.00	45.50	0.00	44.00	80.00	0.00
12-Jun-13	NA	17.00	38.00	70.00	22.10	40.00	2.60	43.50	40.50	24.50	20.40	0.00	38.00	8.50	6.20	25.50
13-Jun-13	NA	18.50	28.00	31.50	0.00	0.00	0.00	22.00	22.00	42.00	0.00	0.00	41.00	0.00	0.00	51.00
14-Jun-13	NA	0.00	56.00	55.00	0.00	15.00	0.00	2.00	2.00	1.00	0.00	0.00	0.00	0.00	0.00	120.00
15-Jun-13	NA	0.00	0.00	0.00	0.30	0.00	1.90	0.00	0.00	0.00	0.00	14.50	0.00	0.00	0.00	0.00
16-Jun-13	NA	0.00	0.00	0.00	6.20	0.00	0.00	0.00	0.00	0.00	6.90	0.00	0.00	0.00	0.00	0.00
17-Jun-13	NA	0.00	0.00	0.00	0.00	0.00	6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Jun-13	NA	0.00	0.00	0.00	1.80	0.00	3.80	0.00	0.00	0.00	2.50	0.00	0.00	0.00	0.00	18.50
19-Jun-13	NA	22.00	0.00	17.50	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	30.50	23.00	0.00
20-Jun-13	NA	7.00	11.00	0.00	0.00	0.00	0.00	6.50	3.50	3.00	0.00	0.00	0.00	0.00	4.30	2.50
21-Jun-13	NA	51.00	9.00	0.00	0.00	5.00	0.00	4.50	4.50	4.50	2.40	0.00	0.00	0.00	2.40	0.00
22-Jun-13	NA	23.00	42.00	44.50	0.00	60.00	20.00	52.00	56.00	41.00	0.00	10.00	74.00	40.50	26.00	33.00
23-Jun-13	NA	5.00	13.00	0.00	0.00	10.00	3.00	0.00	0.00	19.00	0.00	3.50	10.00	2.50	11.00	0.00
24-Jun-13	NA	9.00	6.00	11.50	2.50	0.00	0.00	7.50	7.50	10.00	0.00	0.00	0.00	9.00	14.50	10.50
25-Jun-13	NA	3.50	11.00	17.50	0.00	0.00	25.00	0.00	0.00	0.00	0.00	45.50	16.00	0.00	18.50	0.00
26-Jun-13	NA	0.00	5.00	0.00	0.00	0.00	44.00	5.80	5.50	20.00	34.00	0.00	7.00	15.00	10.50	8.50
27-Jun-13	NA	39.50	0.00	5.20	9.50	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.50	0.00
28-Jun-13	NA	0.00	41.00	23.00	0.00	0.00	25.00	0.00	0.00	1.50	0.00	0.00	0.00	43.50	13.50	25.50
29-Jun-13	NA	5.00	0.00	47.00	19.50	0.00	5.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Jun-13	NA	0.00	5.00	0.00	0.00	0.00	25.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00

1-Jul-13	NA	0.00	0.00	0.00	7.50	5.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	2.00	22.00	0.00
2-Jul-13	NA	0.00	0.00	0.00	25.50	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	3.00	19.50	0.00
3-Jul-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.50
4-Jul-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Jul-13	NA	0.00	0.00	0.00	25.50	43.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	75.50	52.50	0.00
6-Jul-13	NA	0.00	0.00	31.00	0.00	32.00	0.00	35.00	33.00	0.00	10.00	3.50	8.00	0.00	0.00	75.60
7-Jul-13	NA	0.00	35.00	6.00	5.50	0.00	64.00	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Jul-13	NA	0.00	9.00	18.00	50.00	15.00	20.00	0.50	0.50	0.00	0.00	45.50	0.00	15.00	0.00	5.50
9-Jul-13	NA	23.00	13.00	35.50	19.50	5.00	60.00	36.50	35.50	0.00	40.50	0.00	0.00	0.00	0.00	25.50
10-Jul-13	NA	0.00	32.00	24.50	6.50	0.00	0.00	39.50	39.50	10.00	0.00	0.00	0.00	24.90	10.00	0.00
11-Jul-13	NA	0.00	23.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	5.10	0.00	23.00	0.00	10.50	4.50
12-Jul-13	NA	0.00	21.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00	0.00	0.00	33.00	0.00	0.00	0.00
13-Jul-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.50
14-Jul-13	NA	0.00	0.00	0.00	0.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.50	0.00
15-Jul-13	NA	0.00	0.00	0.00	0.00	10.00	0.00	2.00	2.00	1.00	3.50	0.00	0.00	0.00	0.00	29.50
16-Jul-13	NA	0.00	52.00	57.00	25.50	0.00	0.00	4.00	4.00	54.00	60.00	0.00	40.00	0.00	18.00	34.50
17-Jul-13	NA	0.00	0.00	5.00	19.50	0.00	0.00	5.00	5.00	1.00	0.00	0.00	25.00	19.20	0.00	0.00
18-Jul-13	NA	37.00	3.00	0.00	20.50	0.00	0.00	0.00	0.00	2.00	0.00	0.00	38.00	50.00	2.00	0.00
19-Jul-13	NA	190.00	9.00	39.00	46.00	130.00	25.00	111.00	121.00	3.00	130.00	0.00	47.00	100.00	17.50	40.00
20-Jul-13	NA	3.50	187.00	119.00	100.00	0.00	25.00	2.00	2.00	95.00	63.50	0.00	0.00	28.00	22.50	75.60
21-Jul-13	NA	27.00	0.00	0.00	0.00	60.00	3.00	0.00	0.00	2.00	0.00	6.00	0.00	25.00	22.50	0.00
22-Jul-13	NA	38.00	9.00	17.00	50.00	35.00	50.00	50.50	62.50	60.00	80.10	70.00	13.00	14.80	0.00	0.00
23-Jul-13	NA	19.00	38.00	38.00	50.00	10.00	75.00	78.50	78.50	30.00	78.50	25.00	25.00	46.50	20.00	25.50
24-Jul-13	NA	25.00	20.00	23.50	46.00	30.00	10.00	108.00	102.00	59.50	102.50	23.00	15.00	17.50	22.50	75.60
25-Jul-13	NA	5.00	22.00	15.00	0.00	5.00	25.00	105.20	107.50	7.00	109.50	54.00	0.00	3.50	19.00	25.50
26-Jul-13	NA	33.00	6.00	19.00	6.50	60.00	35.00	101.50	103.50	2.00	103.50	80.00	0.00	14.50	0.00	51.00
27-Jul-13	NA	25.00	15.00	33.00	2.50	29.00	25.00	127.00	130.00	17.50	130.50	0.00	0.00	40.00	14.50	25.50
28-Jul-13	NA	15.00	36.00	33.50	19.00	13.00	25.00	90.50	88.50	35.00	90.50	25.30	38.00	20.80	25.50	51.00
29-Jul-13	NA	39.00	24.00	26.50	44.50	0.00	25.00	134.50	128.50	13.50	128.50	10.00	30.00	25.00	12.50	0.00
30-Jul-13	NA	15.00	15.00	4.00	2.50	22.00	25.00	52.50	51.50	54.10	52.50	23.00	71.00	0.00	0.00	57.60
31-Jul-13	NA	1.00	12.00	8.50	1.50	0.00	18.00	42.50	38.00	13.00	38.50	95.00	28.00	0.00	0.00	33.00
1-Aug-13	NA	25.00	20.00	12.00	9.50	35.00	9.50	0.00	0.00	50.00	3.50	23.00	75.00	73.00	0.00	0.00
2-Aug-13	NA	24.00	56.00	23.00	0.00	0.00	0.00	0.00	0.00	36.00	50.00	92.00	83.00	76.50	0.00	25.50
3-Aug-13	NA	22.00	38.00	5.00	7.00	24.00	7.00	22.50	21.50	22.00	4.50	0.00	39.00	41.00	23.00	9.50
4-Aug-13	NA	2.00	20.00	0.00	17.00	0.00	17.00	11.50	11.00	12.00	10.50	50.00	0.00	0.00	0.00	25.50
5-Aug-13	NA	4.50	0.00	0.00	0.00	60.00	0.00	6.00	5.00	0.00	0.00	0.00	35.00	36.00	49.50	7.00
6-Aug-13	NA	7.50	0.00	0.00	40.00	20.00	40.00	0.00	0.00	10.00	3.00	28.00	0.00	0.00	0.00	0.00
7-Aug-13	NA	10.00	8.00	5.00	22.00	27.00	22.00	2.50	1.00	19.00	9.50	10.50	0.00	0.00	0.00	0.00
8-Aug-13	NA	19.00	4.00	3.00	0.00	0.00	0.00	2.00	3.50	6.00	0.00	0.00	32.00	32.50	30.00	10.00
9-Aug-13	NA	25.00	6.00	0.00	22.00	0.00	22.00	12.50	12.50	0.00	0.00	28.00	0.00	0.00	25.00	9.00
10-Aug-13	NA	8.50	4.90	25.00	23.00	0.00	23.00	70.50	70.00	12.50	50.00	15.50	0.00	0.00	0.00	17.50
11-Aug-13	NA	45.50	113.00	36.50	10.50	22.00	10.50	13.50	13.00	62.50	50.00	0.00	59.00	57.00	38.00	7.50
12-Aug-13	NA	23.50	40.00	0.00	0.00	0.00	0.00	17.50	12.50	28.00	22.50	60.00	0.00	0.00	3.00	17.50
13-Aug-13	NA	0.00	22.00	40.50	22.50	0.00	23.50	11.50	18.50	36.00	0.00	39.50	98.00	98.00	50.00	42.50
14-Aug-13	NA	37.50	0.00	2.00	25.50	5.00	24.50	3.50	12.50	10.50	0.00	10.00	0.00	0.00	2.00	0.00
15-Aug-13	NA	1.50	9.00	0.00	21.50	10.00	21.50	5.50	2.50	2.50	0.00	0.00	47.00	49.00	12.00	7.50

16-Aug-13	NA	2.00	0.00	0.00	75.50	0.00	75.80	0.50	4.50	7.00	75.00	0.00	0.00	0.00	0.00	0.00
17-Aug-13	NA	0.00	0.00	0.00	80.00	0.00	85.00	0.00	0.50	0.00	50.00	32.00	0.00	0.00	7.00	0.00
18-Aug-13	NA	0.00	5.00	6.00	50.50	0.00	50.50	6.50	0.00	0.00	75.00	0.00	37.00	37.00	30.00	12.00
19-Aug-13	NA	0.00	10.00	0.00	148.00	8.00	148.00	0.00	4.50	0.00	11.50	25.00	0.00	0.00	2.50	0.00
20-Aug-13	NA	0.00	0.00	7.00	6.50	0.00	6.50	5.00	0.00	2.00	0.00	31.50	0.00	0.00	0.00	0.00
21-Aug-13	NA	18.50	0.00	0.00	12.50	0.00	12.50	4.50	5.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00
22-Aug-13	NA	43.50	14.00	20.00	22.50	60.00	22.50	0.00	4.50	4.00	0.00	78.50	0.00	0.00	5.00	15.50
23-Aug-13	NA	13.50	36.00	0.00	32.00	25.00	32.00	21.00	0.00	27.00	0.00	0.00	37.00	39.50	10.00	25.50
24-Aug-13	NA	17.50	11.00	38.00	37.50	10.00	37.50	5.50	21.00	0.00	0.00	0.00	48.00	48.00	29.00	75.50
25-Aug-13	NA	53.00	5.00	0.00	18.50	5.00	18.50	37.00	5.50	0.00	0.00	0.00	65.00	62.00	16.00	0.00
26-Aug-13	NA	27.00	84.00	44.00	22.50	0.00	22.80	3.00	37.00	42.00	0.00	0.00	0.00	0.00	5.00	41.00
27-Aug-13	NA	18.00	9.00	17.00	6.50	7.00	6.50	3.50	3.00	3.00	75.00	28.00	0.00	0.00	3.00	5.50
28-Aug-13	NA	1.50	19.00	25.00	4.50	16.00	4.50	12.50	3.50	3.50	0.00	0.00	0.00	0.00	1.00	18.50
29-Aug-13	NA	2.50	41.00	25.00	22.50	0.00	22.50	0.00	10.00	12.00	0.00	72.50	87.00	87.50	30.00	18.00
30-Aug-13	NA	0.00	5.00	7.00	1.50	35.00	1.50	0.00	0.00	26.00	0.00	43.50	64.00	66.50	54.00	15.50
31-Aug-13	NA	0.00	0.00	0.00	0.00	22.00	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.00	0.00	19.00
1-Sep-13	NA	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	75.00	10.50	0.00	0.00	9.00	0.00
2-Sep-13	NA	0.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	17.00	50.00	0.00	13.00	15.00	14.00	25.50
3-Sep-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.50	0.00	0.00	0.00	0.00	0.00
4-Sep-13	NA	13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.50	18.50	0.00	0.00	32.50	0.00
5-Sep-13	NA	0.00	18.00	56.00	2.50	59.00	2.50	5.50	5.50	3.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Sep-13	NA	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	3.00	0.00	0.00	5.00	20.00	41.00
7-Sep-13	NA	25.00	24.00	0.00	0.00	0.00	0.00	25.00	25.00	30.00	9.50	0.00	11.00	10.50	24.00	13.00
8-Sep-13	NA	12.00	65.00	39.50	18.50	39.00	20.50	23.50	23.50	12.50	0.00	25.00	0.00	0.00	0.00	0.00
9-Sep-13	NA	8.00	25.00	16.00	25.00	16.00	25.50	27.50	27.50	11.00	0.00	13.00	0.00	0.00	0.00	7.00
10-Sep-13	NA	0.00	0.00	26.50	0.00	29.00	0.00	0.00	0.00	7.50	50.00	18.00	21.00	20.00	18.00	25.00
11-Sep-13	NA	0.00	10.00	0.00	33.00	0.00	33.00	5.00	5.00	33.50	50.00	24.00	25.00	24.50	30.00	14.50
12-Sep-13	NA	0.00	7.00	0.00	4.50	0.00	4.50	4.50	5.00	3.50	22.50	0.00	14.00	14.00	5.00	2.00
13-Sep-13	NA	0.00	0.00	6.00	5.20	6.00	5.20	21.00	4.50	1.00	0.00	21.00	21.00	23.00	22.00	18.00
14-Sep-13	NA	25.00	0.00	0.00	23.00	0.00	23.00	0.00	21.00	18.00	0.00	0.00	0.00	0.00	2.00	14.50
15-Sep-13	NA	65.50	19.00	0.00	0.00	0.00	0.00	42.50	0.00	3.00	0.00	20.00	0.00	0.00	0.00	23.50
16-Sep-13	NA	69.00	50.00	16.00	28.00	16.00	28.00	64.50	40.50	32.50	75.00	35.50	0.00	0.00	5.00	0.00
17-Sep-13	NA	29.50	158.00	56.00	40.00	57.00	40.00	55.00	69.50	75.00	50.00	32.00	21.00	21.50	10.00	12.00
18-Sep-13	NA	58.00	73.00	92.00	38.50	92.00	38.50	122.00	59.00	100.00	75.00	19.00	45.00	46.50	30.00	75.15
19-Sep-13	NA	8.00	117.00	81.00	50.00	81.00	75.00	6.50	124.00	100.00	36.50	25.00	24.00	25.50	40.00	75.00
20-Sep-13	NA	33.00	23.00	96.00	6.50	96.00	6.50	21.00	5.50	6.00	0.00	0.00	95.00	95.50	20.00	25.50
21-Sep-13	NA	17.00	12.00	25.40	25.00	25.40	25.00	18.00	20.00	20.50	1.50	0.00	80.00	80.50	10.00	19.50
22-Sep-13	NA	25.00	15.00	17.50	18.00	17.50	18.00	34.50	17.00	20.50	5.00	10.50	49.00	46.50	50.00	45.00
23-Sep-13	NA	10.00	13.00	36.50	28.50	36.00	28.00	27.50	33.50	22.50	8.00	22.00	55.00	58.00	2.00	0.00
24-Sep-13	NA	14.50	19.00	30.50	29.50	30.50	33.50	16.50	31.50	35.00	26.00	50.00	49.00	49.50	27.00	20.00
25-Sep-13	NA	21.50	17.00	11.50	10.00	11.50	10.00	16.50	16.00	17.00	0.00	16.50	0.00	0.00	0.00	0.00
26-Sep-13	NA	25.00	32.00	15.50	15.50	15.50	17.50	13.00	16.50	28.50	15.00	50.00	18.00	19.50	11.00	11.50
27-Sep-13	NA	3.50	5.00	12.40	15.50	12.40	16.50	0.00	14.00	12.50	100.00	25.00	0.00	0.00	3.00	24.50
28-Sep-13	NA	15.00	38.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	0.00	10.50	0.00	0.00	0.00	25.50
29-Sep-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	32.00	15.00	0.00	0.00	11.00	20.00	19.50
30-Sep-13	NA	0.00	0.00	3.50	1.50	3.50	2.50	0.00	0.50	0.00	0.00	0.00	0.00	0.00	4.00	0.00

1-Oct-13	NA	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00	3.10	0.00	0.00	0.00	10.00	0.00
2-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	3.00	16.50
3-Oct-13	NA	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	23.00	34.00	0.00
4-Oct-13	NA	0.00	0.00	0.00	0.00	23.00	0.00	3.50	0.00	14.00	2.50	0.00	16.00	15.50	27.00	17.50
5-Oct-13	NA	0.00	15.00	4.50	4.50	15.00	5.50	2.50	0.00	2.00	3.50	3.50	0.00	0.00	0.00	16.50
6-Oct-13	NA	2.00	0.00	15.50	12.50	0.00	13.50	13.50	0.00	0.00	13.50	6.00	0.00	0.00	5.00	0.00
7-Oct-13	NA	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	0.00	0.00	0.00	0.00	4.00	0.00
8-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	8.00	12.50	5.00
9-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	22.50	32.00
11-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00
13-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Oct-13	NA	4.50	0.00	0.00	0.00	0.00	0.00	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Oct-13	NA	92.00	0.00	9.50	7.50	75.00	9.50	85.00	5.50	6.00	8.00	12.00	73.00	70.00	34.00	28.00
16-Oct-13	NA	13.50	0.00	58.00	60.00	62.00	62.00	12.50	79.00	23.00	12.00	50.00	74.00	72.00	53.00	38.00
17-Oct-13	NA	0.00	0.00	17.50	15.50	0.00	13.50	0.00	11.50	10.00	36.00	83.00	0.00	0.00	0.00	0.00
18-Oct-13	NA	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.50	0.00	0.00	0.00	0.00
19-Oct-13	NA	0.00	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Oct-13	NA	0.00	0.00	7.20	4.20	0.00	6.20	23.00	20.00	20.00	23.00	16.00	12.00	23.00	38.00	34.00
23-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Oct-13	NA	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00
25-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
26-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	5.00	1.00
27-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	20.00	3.00
29-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.50	0.00
30-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00
31-Oct-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	21.00	11.00
1-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Nov-13	NA	0.00	0.00	0.00	9.50	0.00	11.50	38.00	7.50	0.00	0.00	4.50	0.00	0.00	0.00	0.00
15-Nov-13	NA	0.00	0.00	39.00	37.00	0.00	40.00	0.00	42.00	6.00	45.00	0.00	0.00	12.00	21.00	51.00

16-Nov-13	NA	15.00	0.00	74.00	0.00	0.00	0.00	0.00	0.00	9.00	0.00	10.50	0.00	0.00	0.00	0.00
17-Nov-13	NA	18.50	0.00	22.00	0.00	15.20	0.00	0.00	0.00	34.00	0.00	5.00	22.00	24.00	12.00	21.00
18-Nov-13	NA	0.00	0.00	0.00	0.00	18.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00
20-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Nov-13	NA	0.00	17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	8.00	23.00	22.50	12.00	13.00
25-Nov-13	NA	15.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Nov-13	NA	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Nov-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.00
14-Dec-13	NA	0.00	98.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	76.50
15-Dec-13	NA	0.00	35.00	8.00	0.00	28.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Dec-13	NA	48.00	0.00	25.00	27.50	107.00	25.00	23.50	25.50	18.00	125.00	105.50	30.00	35.00	29.50	23.00
17-Dec-13	NA	0.00	0.00	0.00	102.50	100.00	101.50	150.00	154.50	89.00	175.00	52.00	60.00	60.00	113.00	76.00
18-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00
20-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31-Dec-13	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total	**2482.00**	**2731.90**	**2572.70**	**2501.50**	**2704.50**	**2587.70**	**2817.70**	**2851.50**	**2218.60**	**3337.20**	**2404.10**	**2589.00**	**2873.70**	**2333.90**	**2965.55**

4. No rainfall data for 2014

5. Rainfall data for 2015

Month	Sukhuma	Lakbeng	Nong Phanvong	Bark	Parkor	None Yang	Parkxang	Phone Pheung	Thubcharn	Khok Nongboua	Boungkeo	None Deng-Tai	None Uang	None Deng-Nua	Hieng	Houay Pheung
1-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
16-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
19-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
25-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
31-Jan-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

13-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
16-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
19-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
25-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28-Feb-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
16-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
19-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
25-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

31-Mar-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
16-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
19-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
25-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30-Apr-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

16-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
19-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
25-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
31-May-15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1-Jun-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Jun-15	70.00	70.00	75.00	62.50	74.00	74.00	45.00	74.00	50.00	42.50	17.50	0.00	7.00	25.00	45.00	4.00
3-Jun-15	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00
4-Jun-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Jun-15	0.00	37.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	37.00	0.00	0.00	0.00
6-Jun-15	1.50	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Jun-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Jun-15	19.00	12.00	0.00	15.50	16.50	16.50	5.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	3.50
9-Jun-15	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.50
10-Jun-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Jun-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Jun-15	6.00	8.50	0.00	0.00	0.00	0.00	4.00	10.00	0.00	0.00	0.00	0.00	0.00	29.00	4.00	12.00
13-Jun-15	0.00	20.00	0.00	0.00	7.50	7.50	20.00	0.00	0.00	0.00	0.00	14.00	12.00	0.00	20.00	17.00
14-Jun-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	23.00	0.00	0.00	0.00
15-Jun-15	0.00	0.00	0.00	0.00	1.50	1.50	0.00	0.00	4.00	1.00	5.50	0.00	0.00	0.00	0.00	0.00
16-Jun-15	0.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.50	0.00	0.00	11.00	0.00	4.00
17-Jun-15	0.00	25.00	0.00	4.50	0.00	0.00	1.00	0.00	3.00	0.50	0.00	0.00	0.00	0.00	1.00	0.00
18-Jun-15	5.00	4.00	0.00	0.00	8.50	8.50	4.00	8.00	0.00	0.00	1.50	15.00	0.00	0.00	4.00	0.00
19-Jun-15	11.00	9.00	12.00	7.00	0.00	0.00	6.00	11.00	17.00	16.00	8.50	0.00	15.00	7.00	6.00	5.00
20-Jun-15	0.00	39.00	4.00	18.50	10.50	10.50	9.00	0.00	5.00	4.50	0.00	0.00	0.00	8.00	9.00	7.50
21-Jun-15	55.00	5.00	19.00	13.50	10.00	11.00	4.00	55.00	0.00	0.00	0.00	0.00	0.00	2.00	4.00	0.00
22-Jun-15	2.00	75.00	25.00	35.00	42.00	55.00	27.00	20.00	47.00	42.00	30.00	40.00	38.00	25.00	27.00	46.00
23-Jun-15	0.00	2.00	3.00	0.00	0.00	0.00	2.00	0.00	16.00	15.50	30.00	0.00	0.00	0.00	2.00	0.00
24-Jun-15	0.00	0.00	5.00	0.00	0.00	0.00	1.00	0.00	3.00	2.50	9.50	0.00	0.00	0.00	1.00	14.00
25-Jun-15	5.00	38.00	0.00	36.50	34.00	34.00	16.00	8.00	0.00	0.00	0.00	20.00	0.00	25.00	16.00	0.00
26-Jun-15	22.00	0.00	0.00	36.50	21.00	25.00	16.00	25.00	5.00	3.00	0.00	5.00	0.00	0.00	16.00	8.00
27-Jun-15	24.00	36.00	25.00	13.50	17.00	17.00	18.00	24.00	7.00	5.50	0.00	0.00	0.00	50.00	18.00	30.00
28-Jun-15	4.00	8.00	12.00	0.00	6.50	6.50	8.00	6.00	0.00	0.00	0.00	0.00	0.00	37.00	8.00	0.00
29-Jun-15	0.00	2.50	25.00	0.00	0.00	0.00	1.00	0.00	37.00	30.50	0.00	0.00	33.00	0.00	1.00	0.00
30-Jun-15	11.50	22.00	13.00	0.00	4.50	2.00	0.00	9.50	25.00	23.50	34.00	46.00	4.00	0.00	0.00	2.00

1-Jul-15	2.00	10.00	0.00	0.00	0.00	2.00	0.00	3.00	6.50	8.50	0.00	0.00	0.00	0.00	0.00	3.00
2-Jul-15	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	4.50	6.00	2.00	0.00	0.00	0.00	0.00	2.00
3-Jul-15	3.00	0.00	0.00	0.00	2.50	5.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Jul-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Jul-15	10.50	3.00	0.00	0.00	0.00	0.00	0.00	11.00	7.50	10.50	38.00	0.00	22.00	0.00	11.50	20.00
6-Jul-15	10.00	32.50	14.00	0.00	8.50	10.50	6.00	13.00	0.00	0.00	0.00	20.00	24.00	0.00	0.00	0.00
7-Jul-15	0.00	6.50	17.00	0.00	0.00	0.00	3.00	0.00	58.00	50.50	40.00	55.00	62.00	18.00	19.50	21.00
8-Jul-15	7.50	25.00	9.00	0.00	30.00	34.00	10.00	9.00	12.50	10.50	0.00	35.00	48.00	0.00	21.00	19.00
9-Jul-15	70.00	75.00	72.00	110.00	90.00	97.00	19.00	80.00	14.50	12.50	22.00	35.00	98.00	50.00	0.00	0.00
10-Jul-15	9.50	0.00	0.00	0.00	40.00	48.00	55.00	12.00	0.00	0.00	0.00	55.00	0.00	3.00	72.00	94.00
11-Jul-15	7.50	50.00	9.00	10.50	68.50	80.00	4.00	8.00	70.00	68.50	48.00	45.00	15.00	73.00	35.50	37.00
12-Jul-15	60.00	19.50	68.00	85.00	22.50	24.50	64.00	67.00	0.00	0.00	0.00	18.50	70.00	16.00	10.50	18.00
13-Jul-15	60.00	15.50	75.00	1.00	10.00	14.00	1.00	63.00	0.00	0.00	0.00	0.00	43.00	32.00	3.00	7.00
14-Jul-15	5.00	11.00	26.00	33.50	12.50	13.50	31.00	7.00	93.00	79.50	80.00	20.00	0.00	10.00	0.00	0.00
15-Jul-15	10.00	7.00	19.00	16.50	7.50	9.50	28.00	13.00	0.00	0.00	0.00	0.00	0.00	15.00	22.00	23.00
16-Jul-15	15.00	0.00	3.00	6.00	0.00	0.00	2.00	18.00	9.50	10.50	0.00	0.00	0.00	15.50	0.00	0.00
17-Jul-15	7.00	6.00	0.00	0.00	2.00	4.50	2.00	5.00	36.00	29.50	38.00	20.00	0.00	6.00	8.00	10.00
18-Jul-15	13.00	3.50	11.00	0.00	3.50	5.00	8.00	11.00	4.50	3.50	0.00	0.00	0.00	6.50	0.00	0.00
19-Jul-15	0.00	25.00	14.00	25.00	19.50	21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	7.00	9.00
20-Jul-15	23.00	4.00	24.00	0.00	8.50	12.00	5.00	22.00	24.00	21.00	18.00	0.00	0.00	0.00	10.50	11.00
21-Jul-15	0.00	2.00	11.00	0.00	0.00	0.00	38.00	0.00	2.50	4.50	0.00	0.00	23.00	0.00	3.00	2.00
22-Jul-15	0.00	11.50	0.00	0.00	0.00	0.00	4.00	0.00	5.50	7.00	10.00	0.00	0.00	0.00	18.00	19.00
23-Jul-15	3.50	0.00	0.00	0.00	8.50	10.00	2.00	2.00	0.00	0.00	0.00	7.50	14.00	0.00	32.50	41.00
24-Jul-15	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	12.00	9.00	0.00	0.00	0.00	19.00	16.50	17.00
25-Jul-15	4.50	2.50	2.00	0.00	7.50	9.50	12.00	7.00	25.00	20.50	40.00	0.00	0.00	0.00	0.00	0.00
26-Jul-15	10.00	4.50	4.00	0.00	0.00	0.00	3.00	8.50	0.00	0.00	0.00	5.50	0.00	9.00	3.50	5.50
27-Jul-15	11.00	7.00	10.00	0.00	3.50	5.50	1.00	15.00	2.00	3.00	8.00	0.00	0.00	3.00	9.00	11.00
28-Jul-15	9.50	7.50	7.00	21.00	11.50	13.50	11.00	11.00	6.50	4.50	0.00	3.50	0.00	0.00	7.00	6.00
29-Jul-15	3.00	6.50	11.00	0.00	4.50	6.00	2.00	2.00	11.00	6.50	35.00	15.00	0.00	0.00	3.00	2.00
30-Jul-15	5.00	0.00	9.00	8.50	5.00	8.50	6.00	6.00	8.00	6.50	13.00	20.00	38.00	16.00	0.00	0.00
31-Jul-15	6.50	8.50	0.00	14.50	7.00	10.50	8.00	9.50	0.00	0.00	50.00	45.00	0.00	0.00	14.50	18.50
1-Aug-15	2.00	17.00	18.00	2.00	12.00	16.00	26.00	4.00	6.50	8.00	2.00	30.00	0.00	25.00	39.00	47.00
2-Aug-15	0.00	8.00	63.00	0.00	3.50	5.50	0.00	0.00	5.50	7.00	0.00	25.00	25.00	0.00	32.50	52.00
3-Aug-15	2.00	0.00	6.00	0.00	0.00	1.00	5.00	3.00	7.00	1.00	14.00	0.00	0.00	14.00	5.50	6.50
4-Aug-15	1.00	19.00	3.00	0.00	2.50	3.00	2.00	3.00	10.00	5.50	0.00	10.00	16.00	0.00	3.00	5.00
5-Aug-15	4.50	0.00	7.00	11.50	3.50	2.00	0.00	7.00	5.00	2.00	7.50	0.00	0.00	0.00	0.00	0.00
6-Aug-15	0.00	1.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
7-Aug-15	64.00	7.00	0.00	0.00	63.00	53.00	0.00	83.00	13.50	10.50	0.00	30.00	0.00	83.00	74.50	83.00
8-Aug-15	2.00	0.00	0.00	49.50	0.00	0.00	41.00	11.00	87.00	77.00	24.50	25.00	42.00	0.00	5.00	7.00
9-Aug-15	0.00	11.50	6.00	6.00	4.00	9.00	0.00	0.00	0.00	0.00	1.50	15.00	48.00	4.00	0.00	0.00
10-Aug-15	10.50	0.00	7.00	6.50	0.00	0.00	4.00	15.00	12.50	9.50	0.00	20.00	24.00	12.00	0.00	1.00
11-Aug-15	0.00	88.50	39.00	3.50	33.50	52.00	12.00	0.00	8.00	2.50	0.00	10.00	25.00	34.50	53.50	60.00
12-Aug-15	0.00	1.50	7.00	12.50	0.00	2.00	51.00	2.00	6.00	2.00	3.00	0.00	0.00	10.00	0.00	0.00
13-Aug-15	0.00	13.00	6.00	22.00	0.00	0.00	6.00	0.00	8.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Aug-15	8.50	9.00	1.00	2.30	0.00	1.50	0.00	9.00	0.00	0.00	24.00	9.00	17.00	0.00	15.50	18.00
15-Aug-15	0.00	11.00	0.00	0.00	0.00	0.00	6.00	0.00	20.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00

16-Aug-15	20.00	0.00	0.00	0.00	13.50	14.50	0.00	23.00	0.00	0.00	0.00	25.00	38.00	0.00	0.00	0.00
17-Aug-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
18-Aug-15	2.50	6.00	0.00	0.00	0.00	0.00	0.00	7.00	25.00	23.50	0.00	0.00	0.00	0.00	0.00	3.00
19-Aug-15	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	32.50	25.70	22.50	0.00	0.00	0.00	0.00	0.00
20-Aug-15	4.00	6.50	0.00	1.50	0.00	0.00	0.00	8.00	7.50	4.50	16.50	5.00	0.00	13.50	0.00	0.00
21-Aug-15	6.00	27.00	11.00	13.50	10.00	12.00	2.00	11.00	6.50	4.50	4.00	6.00	0.00	0.00	10.00	17.00
22-Aug-15	4.00	3.50	6.00	5.50	2.50	1.50	0.00	7.00	0.00	0.00	7.00	25.00	36.00	0.00	12.50	14.00
23-Aug-15	9.00	1.50	0.00	1.50	1.50	2.50	0.00	10.00	19.00	15.00	1.00	7.00	0.00	0.00	0.00	0.00
24-Aug-15	7.00	23.00	0.00	7.00	1.50	3.50	14.00	5.00	8.00	5.00	11.00	0.00	0.00	0.00	0.00	0.00
25-Aug-15	10.50	25.00	0.00	0.00	18.00	20.00	17.00	14.00	21.50	18.00	3.00	30.00	13.00	25.00	0.00	1.00
26-Aug-15	60.00	31.50	21.00	18.50	55.50	62.00	21.00	72.00	24.50	21.00	92.00	10.00	0.00	50.00	30.00	33.50
27-Aug-15	10.00	19.50	30.00	44.50	8.50	13.00	0.00	11.50	3.00	1.50	22.00	35.00	36.00	0.00	14.50	10.00
28-Aug-15	5.50	1.00	33.00	8.50	5.50	7.50	2.00	7.50	4.00	2.00	15.00	23.00	0.00	0.00	1.50	4.00
29-Aug-15	20.00	14.50	3.00	10.50	1.00	3.00	1.50	23.00	53.00	2.50	40.00	15.00	28.00	15.00	6.00	10.00
30-Aug-15	74.00	14.50	17.00	33.50	65.50	71.00	55.00	84.00	86.00	25.00	62.00	15.00	7.00	20.00	48.00	64.00
31-Aug-15	40.00	28.50	32.00	25.00	53.50	65.00	22.00	71.00	48.00	35.00	67.00	50.00	48.00	28.00	13.00	15.00
1-Sep-15	30.00	14.00	31.00	23.50	67.50	43.64	23.00	35.60	40.19	51.00	20.00	70.00	73.00	0.00	3.50	5.50
2-Sep-15	10.00	11.50	14.00	16.50	25.00	16.96	10.00	14.37	21.30	32.00	15.00	0.00	0.00	0.00	40.00	52.00
3-Sep-15	1.00	6.50	10.00	0.00	4.00	2.39	1.00	2.31	4.68	8.00	0.00	0.00	0.00	0.00	10.50	8.00
4-Sep-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50
5-Sep-15	0.00	4.00	0.00	0.00	20.00	9.28	0.00	1.88	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Sep-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.50	0.00	0.00	0.00	1.00
7-Sep-15	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Sep-15	0.00	29.00	7.00	32.50	0.00	4.29	8.00	2.50	8.63	16.50	0.00	0.00	0.00	0.00	24.00	25.00
9-Sep-15	20.00	0.00	25.00	12.50	7.50	21.71	34.00	16.88	14.34	12.00	20.00	0.00	0.00	50.00	20.00	23.00
10-Sep-15	18.00	37.00	62.00	2.50	15.50	7.19	0.00	14.45	7.74	0.50	0.00	60.00	24.00	25.00	5.50	4.50
11-Sep-15	10.00	0.00	0.00	2.00	0.50	0.23	0.00	8.13	7.09	6.00	0.00	0.00	0.00	8.00	0.00	1.00
12-Sep-15	60.00	12.00	3.00	0.00	0.00	0.00	0.00	43.06	23.62	0.00	0.00	30.00	0.00	0.00	2.50	3.50
13-Sep-15	62.00	0.00	5.00	0.00	0.00	0.00	0.00	49.84	41.63	31.00	17.50	0.00	0.00	0.00	6.50	8.00
14-Sep-15	16.00	62.00	21.00	95.00	90.00	71.24	55.00	20.47	9.58	0.50	12.50	62.00	0.00	0.00	60.00	63.00
15-Sep-15	0.00	0.00	63.00	2.00	25.00	11.60	0.00	3.03	2.99	4.50	5.00	0.00	68.00	50.00	2.50	4.00
16-Sep-15	0.00	0.00	0.00	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.00
17-Sep-15	0.00	0.00	3.00	0.00	0.00	1.61	3.00	0.57	0.90	0.00	15.50	0.00	0.00	0.00	1.50	2.50
18-Sep-15	18.00	14.00	0.00	3.00	10.50	4.87	0.00	13.90	7.35	0.00	0.00	0.00	0.00	25.00	0.00	0.00
19-Sep-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	1.57	3.00	0.00	0.00	23.00	0.00	0.00	0.00
20-Sep-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
21-Sep-15	2.00	27.00	0.00	12.50	1.00	3.14	5.00	2.75	2.73	0.00	33.00	0.00	0.00	0.00	1.50	0.00
22-Sep-15	0.00	0.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00
23-Sep-15	1.00	0.00	0.00	0.00	1.50	2.84	4.00	0.86	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Sep-15	24.00	0.00	0.00	0.00	20.00	11.42	4.00	21.91	19.63	18.50	20.00	0.00	0.00	0.00	10.50	14.00
25-Sep-15	4.50	10.00	0.00	30.00	1.50	2.30	3.00	3.37	1.81	0.00	5.00	0.00	0.00	0.00	0.00	0.00
26-Sep-15	2.50	3.50	0.00	15.50	0.00	5.90	11.00	2.59	2.52	1.00	17.50	0.00	0.00	19.00	0.00	2.50
27-Sep-15	30.00	2.00	18.00	2.50	6.50	3.02	0.00	22.81	13.02	0.00	18.00	15.50	63.00	0.00	0.00	0.00
28-Sep-15	12.00	9.00	26.00	8.00	3.00	1.39	0.00	11.32	13.17	16.00	5.00	0.00	44.00	0.00	0.00	0.00
29-Sep-15	0.00	45.00	10.00	0.00	8.00	5.86	4.00	2.11	4.91	9.00	0.00	0.00	0.00	37.00	40.00	49.00
30-Sep-15	0.00	0.00	12.00	20.50	0.00	3.22	6.00	1.14	3.92	7.50	0.00	120.00	24.00	0.00	6.00	4.00

1-Oct-15	85.50	65.00	0.00	80.00	99.00	45.93	0.00	71.34	37.25	0.00	18.50	120.00	0.00	0.00	0.00	2.00
2-Oct-15	6.00	0.00	4.00	0.00	2.50	19.92	35.00	14.78	37.02	65.00	10.50	20.00	73.00	46.00	82.00	78.00
3-Oct-15	10.00	51.00	0.00	5.00	16.00	7.42	0.00	8.91	5.13	1.50	0.00	0.00	0.00	57.00	0.00	0.00
4-Oct-15	20.00	10.50	0.00	30.50	5.50	24.00	40.00	16.24	11.88	6.00	12.50	0.00	0.00	20.00	42.00	49.00
5-Oct-15	6.50	5.50	0.00	11.00	10.50	16.13	21.00	8.92	9.97	7.00	60.00	0.00	0.00	0.00	6.50	7.50
6-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.43	12.52	19.50	40.00	0.00	9.00	0.00	3.50	5.00
7-Oct-15	5.00	4.00	8.00	0.00	1.00	4.75	8.00	5.10	4.23	0.00	38.50	15.00	23.00	0.00	0.00	0.00
8-Oct-15	10.50	0.00	12.00	0.00	0.00	4.29	8.00	11.70	18.51	27.50	0.00	30.00	9.00	0.00	46.00	51.00
9-Oct-15	16.50	6.00	0.00	8.00	30.00	20.35	12.00	14.66	7.26	0.00	0.00	0.00	31.00	0.00	3.50	5.00
10-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.77	16.47	31.50	0.00	0.00	0.00	0.00	33.00	37.00
11-Oct-15	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Oct-15	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Oct-15	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
14-Oct-15	6.50	0.00	12.00	9.00	0.00	0.00	0.00	4.67	2.56	0.00	0.00	0.00	0.00	27.00	0.00	0.00
15-Oct-15	0.00	2.00	0.00	0.00	9.00	9.54	10.00	1.00	0.75	1.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	1.05	2.00	0.00	20.00	0.00	0.00	0.00	0.00
17-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Oct-15	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83	2.88	5.50	0.00	0.00	0.00	0.00	0.00	0.00
23-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	0.00	0.00	0.00
26-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00
28-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.26	0.50	0.00	0.00	0.00	0.00	0.00	0.00
29-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31-Oct-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.26	0.50	0.00	0.00	0.00	0.00	0.00	0.00
2-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.68	2.50	6.50	0.00	0.00	0.00	0.00	0.00
3-Nov-15	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Nov-15	6.50	0.00	0.00	0.00	9.50	4.41	0.00	5.56	2.80	0.00	0.00	0.00	0.00	48.00	44.00	0.00
5-Nov-15	0.00	14.00	0.00	18.50	0.00	24.12	45.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	21.50	0.00
6-Nov-15	0.00	24.00	0.00	19.20	0.00	21.44	40.00	1.64	4.15	5.50	22.00	0.00	29.00	0.00	0.00	0.00
7-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.01	8.29	12.50	30.20	0.00	0.00	0.00	0.00	39.00
8-Nov-15	0.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Nov-15	20.00	0.00	0.00	9.50	30.00	13.92	0.00	17.25	8.90	0.50	0.00	0.00	7.00	27.00	32.00	0.00
10-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.47	4.59	8.00	7.00	30.00	0.00	0.00	0.00	0.00
11-Nov-15	0.00	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Nov-15	0.00	0.00	4.00	0.00	0.00	1.61	3.00	0.15	0.52	1.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Nov-15	0.00	30.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	0.00	0.00	0.00	0.00
14-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00

16-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00
18-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.50
19-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.52	1.00	0.00	30.00	0.00	1.00	0.00	0.00
20-Nov-15	2.50	0.00	0.00	0.00	0.00	0.00	0.00	1.79	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	1.65	1.00	19.50	0.00	0.00	5.00	4.00	0.00
28-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Nov-15	0.00	0.00	0.00	0.00	0.00	0.27	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50
30-Nov-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.26	0.50	0.00	0.00	0.00	1.50	0.00	0.00
1-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Dec-15	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31-Dec-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total	**1488.00**	**1689.00**	**1373.00**	**1332.50**	**1505.00**	**1590.18**	**1202.00**	**1668.19**	**1618.09**	**1301.70**	**1499.20**	**1667.00**	**1567.00**	**1330.00**	**1436.50**	**1565.50**

6. Rainfall data for 2016

Month	Sukhuma	Lakbeng	Nong Phanvong	Bark	Parkor	None Yang	Parkxang	Phone Pheung	Thubcharn	Khok Nongboua	Boungkeo	None Deng-Tai	None Uang	None Deng-Nua	Hieng	Houay Pheung
1-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.50	0.00
5-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Jan-16	13.50	18.50	6.50	3.50	14.50	12.50	5.50	9.50	11.50	2.00	1.50	1.50	1.00	15.50	17.50	11.00
17-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31-Jan-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

12-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Feb-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

28-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31-Mar-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23-Apr-16	39	28.00	2.50	7.00	1.50	2.00	14.00	38.00	44.00	5.00	34.00	0.00	0.00	0.50	1.50	1.00
24-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29-Apr-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-Apr-16	0.00	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00
1-May-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-May-16	0.00	6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.50	7.50	5.50
3-May-16	0.00	11.00	3.50	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	52.50	49.50	50.50
4-May-16	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
5-May-16	1	33.50	0.00	2.00	6.00	0.00	2.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00
6-May-16	0.00	8.00	0.00	3.50	4.50	3.00	11.00	2.50	5.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00
7-May-16	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	41.00	2.00	0.00	0.00
8-May-16	0.00	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9-May-16	0.00	0.00	0.00	1.00	0.00	1.50	0.00	0.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-May-16	0.00	17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	1.00	30.00	23.00	6.50	4.00	6.00
11-May-16	0.00	0.00	43.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

12-May-16	0.00	64.50	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.00	2.00	0.00	0.00	0.00
13-May-16	0.00	0.00	0.00	7.50	11.50	0.00	21.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14-May-16	0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00
15-May-16	64.5	2.00	0.00	30.00	55.00	54.50	62.50	65.00	72.00	0.00	44.00	0.00	3.50	12.00	7.50	10.50
16-May-16	0.00	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17-May-16	6.5	15.00	5.50	6.50	16.00	17.50	7.50	4.50	18.00	13.50	2.00	40.00	54.00	15.50	12.50	10.50
18-May-16	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	3.00	0.00
19-May-16	24.5	3.50	0.00	24.50	33.50	35.50	31.50	32.00	41.00	0.00	5.50	0.00	3.50	0.00	0.00	0.00
20-May-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	0.00	0.00	0.00	63.50	54.50	61.50
21-May-16	3.5	6.50	4.50	0.00	0.00	0.00	0.00	6.50	7.50	4.00	0.50	0.00	0.00	1.00	0.00	0.00
22-May-16	10.5	0.00	0.00	0.00	16.00	14.00	0.00	13.00	23.00	0.50	7.50	35.00	30.00	8.50	11.50	4.00
23-May-16	0.00	15.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	10.50	0.00	60.00	62.50	0.00	0.00	0.00
24-May-16	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-May-16	0.00	3.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	11.50	15.50	8.50
26-May-16	2	53.00	5.00	0.00	0.50	2.00	4.50	1.00	0.00	0.00	1.50	0.00	2.50	0.00	0.00	1.00
27-May-16	4	8.50	16.00	0.00	6.50	8.00	0.00	1.50	3.00	2.00	0.00	0.00	0.00	3.50	5.50	3.50
28-May-16	0.00	2.00	0.00	13.00	45.50	50.00	0.00	0.00	5.00	3.50	0.00	66.00	60.00	0.00	0.00	0.00
29-May-16	63.5	11.00	21.00	4.00	0.00	0.00	24.00	65.00	46.00	30.00	34.00	40.00	0.00	14.00	12.50	20.00
30-May-16	23.5	30.00	53.50	21.00	52.50	60.00	18.00	24.50	22.00	21.00	13.00	39.00	45.00	2.50	5.50	3.50
31-May-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**256.00**	**377.00**	**197.50**	**125.00**	**263.50**	**260.50**	**204.50**	**263.00**	**314.00**	**139.00**	**156.50**	**341.50**	**328.00**	**223.50**	**212.50**	**197.00**

Appendix 8: Climate data at the Pakse climate station and Mekong River flow data at the Pakse hydromet station

Date	Min. T (°C)	Max. T (°C)	Min. RH (%)	Max. RH (%)	Rainfall (mm/day)	Wind speed (m/s)	Sunshine duration (hr)	Pan Evaporation (mm/day)
01-Jan-00	19.60	33.90	33.00	86.00	0.00		9.60	4.50
02-Jan-00	20.00	33.20	37.00	82.00	0.00		10.10	5.80
03-Jan-00	19.20	33.70	36.00	88.00	0.00		10.40	4.50
04-Jan-00	20.00	34.00	38.00	90.00	0.00		10.20	3.90
05-Jan-00	20.10	33.90	32.00	96.00	0.00		9.80	5.00
06-Jan-00	18.50	35.00	25.00	90.00	0.00		9.80	4.90
07-Jan-00	19.80	34.40	40.00	89.00	0.00		9.30	5.00
08-Jan-00	21.80	33.30	40.00	87.00	0.00		9.40	4.30
09-Jan-00	22.90	34.40	42.00	86.00	0.00		9.70	5.00
10-Jan-00	23.00	34.80	39.00	84.00	0.00		9.70	4.60
11-Jan-00	23.50	36.00	38.00	86.00	0.00		9.70	4.50
12-Jan-00	23.50	35.60	41.00	86.00	0.00		9.20	4.30
13-Jan-00	23.00	34.80	45.00	86.00	0.00		7.40	4.60
14-Jan-00	24.10	35.50	32.00	85.00	0.00		9.30	4.90
15-Jan-00	22.80	35.20	34.00	85.00	0.00		9.60	5.20
16-Jan-00	21.50	35.20	34.00	87.00	0.00		9.80	4.80
17-Jan-00	21.40	34.40	35.00	86.00	0.00		7.90	4.00
18-Jan-00	22.20	32.00	41.00	83.00	0.00		5.30	4.50
19-Jan-00	19.40	28.90	43.00	76.00	0.00		3.50	4.50
20-Jan-00	16.40	30.80	36.00	76.00	0.00		9.60	3.50
21-Jan-00	16.80	32.70	36.00	88.00	0.00		10.00	4.00
22-Jan-00	18.30	33.50	33.00	77.00	0.00		10.10	3.80
23-Jan-00	19.40	34.00	35.00	85.00	0.30		8.40	4.00
24-Jan-00	24.00	33.00	44.00	79.00	0.00		2.70	3.90
25-Jan-00	22.60	32.80	44.00	82.00	0.00		6.30	4.50
26-Jan-00	20.40	30.60	38.00	71.00	0.00		9.50	4.50

27-Jan-00	17.10	28.60	38.00	70.00	0.00	10.60	6.00
28-Jan-00	14.50	30.80	30.00	79.00	0.00	10.00	6.30
29-Jan-00	15.40	31.20	35.00	83.00	0.00	10.40	6.40
30-Jan-00	18.40	30.50	38.00	69.00	0.00	8.50	6.50
31-Jan-00	17.00	30.40	38.00	77.00	0.00	10.60	6.00
01-Feb-00	15.00	28.70	36.00	77.00	0.00	10.40	6.90
02-Feb-00	14.10	30.50	29.00	83.00	0.00	10.00	6.30
03-Feb-00	15.00	31.00	28.00	85.00	0.00	9.70	5.80
04-Feb-00	16.40	33.00	28.00	83.00	0.00	9.50	6.50
05-Feb-00	18.20	33.50	30.00	83.00	0.00	10.20	7.60
06-Feb-00	18.40	32.00	30.00	79.00	0.00	7.40	5.90
07-Feb-00	17.70	32.30	33.00	85.00	0.00	9.50	6.80
08-Feb-00	17.10	33.00	37.00	78.00	0.00	10.50	5.80
09-Feb-00	16.50	32.00	35.00	82.00	0.00	9.40	4.30
10-Feb-00	18.00	33.80	29.00	86.00	0.00	9.50	5.80
11-Feb-00	16.80	34.80	24.00	89.00	0.00	9.80	5.70
12-Feb-00	21.00	35.30	28.00	78.00	0.00	9.50	6.30
13-Feb-00	21.50	34.80	32.00	79.00	0.00	9.80	6.50
14-Feb-00	21.70	36.00	38.00	77.00	0.00	9.00	6.50
15-Feb-00	21.70	33.60	41.00	82.00	0.00	8.90	5.90
16-Feb-00	20.00	33.90	37.00	81.00	0.00	9.80	6.70
17-Feb-00	22.50	34.10	40.00	77.00	0.00	9.20	5.50
18-Feb-00	23.30	33.90	47.00	76.00	0.00	9.40	6.40
19-Feb-00	25.30	31.80	57.00	78.00	3.40	3.90	3.80
20-Feb-00	23.90	33.10	54.00	95.00	3.60	6.50	3.30
21-Feb-00	25.30	34.00	48.00	83.00	0.00	7.60	4.30
22-Feb-00	24.80	33.80	46.00	88.00	0.00	5.30	4.40
23-Feb-00	24.40	37.70	40.00	88.00	0.00	7.40	5.60
24-Feb-00	24.60	34.00	52.00	84.00	0.00	10.00	5.00

25-Feb-00	23.40	35.20	45.00	91.00	0.00	8.50	6.50
26-Feb-00	20.00	30.00	45.00	86.00	0.00	7.60	7.50
27-Feb-00	16.50	33.00	39.00	75.00	0.00	10.20	6.20
28-Feb-00	19.90	32.50	40.00	78.00	0.00	4.00	4.80
29-Feb-00	20.40	30.30	38.00	76.00	0.00	7.80	7.20
01-Mar-00	19.00	34.00	36.00	66.00	0.00	6.70	7.30
02-Mar-00	18.80	34.50	34.00	73.00	0.00	8.50	7.20
03-Mar-00	23.00	35.50	34.00	77.00	0.00	9.50	6.10
04-Mar-00	25.10	36.60	32.00	74.00	0.00	9.50	6.90
05-Mar-00	25.20	37.40	28.00	71.00	0.00	9.90	7.00
06-Mar-00	25.30	36.20	38.00	70.00	0.00	8.60	4.20
07-Mar-00	24.80	35.70	40.00	82.00	0.00	8.10	3.90
08-Mar-00	25.00	33.70	44.00	74.00	0.00	8.20	3.70
09-Mar-00	25.20	31.50	52.00	81.00	0.00	3.80	3.50
10-Mar-00	24.30	36.00	32.00	80.00	0.00	7.10	2.80
11-Mar-00	24.40	34.80	42.00	72.00	0.00	9.20	4.10
12-Mar-00	25.50	32.60	55.00	82.00	8.60	5.40	2.70
13-Mar-00	25.90	34.60	47.00	81.00	0.00	9.10	3.90
14-Mar-00	25.50	36.70	37.00	80.00	0.00	9.40	3.90
15-Mar-00	25.40	32.00	50.00	85.00	0.00	3.90	3.50
16-Mar-00	25.00	35.40	43.00	81.00	3.10	7.70	4.00
17-Mar-00	25.10	35.00	45.00	82.00	0.00	7.80	3.70
18-Mar-00	25.20	34.00	48.00	80.00	0.00	9.50	3.70
19-Mar-00	25.10	35.90	43.00	83.00	0.20	8.30	4.30
20-Mar-00	26.00	36.00	42.00	78.00	0.00	6.70	3.50
21-Mar-00	25.60	36.80	37.00	72.00	0.00	7.60	4.00
22-Mar-00	26.70	36.50	37.00	71.00	0.00	9.00	4.10
23-Mar-00	26.50	36.30	36.00	70.00	0.00	6.80	4.40
24-Mar-00	24.00	36.30	31.00	74.00	0.00	8.80	4.10

25-Mar-00	22.90	36.60	31.00	72.00	0.00	9.10	4.30
26-Mar-00	22.80	35.80	33.00	64.00	0.00	8.50	8.40
27-Mar-00	20.90	35.60	28.00	78.00	0.00	9.90	7.60
28-Mar-00	22.20	36.60	31.00	78.00	0.00	9.40	8.60
29-Mar-00	24.70	36.80	30.00	68.00	0.00	9.20	8.40
30-Mar-00	25.00	35.70	36.00	64.00	0.00	9.00	6.50
31-Mar-00	25.60	34.90	48.00	72.00	0.00	6.30	5.80
01-Apr-00	26.80	35.80	41.00	77.00	0.00	5.30	5.70
02-Apr-00	26.60	35.00	50.00	78.00	0.00	5.20	5.20
03-Apr-00	27.00	36.50	46.00	79.00	0.00	8.50	6.30
04-Apr-00	26.50	36.50	41.00	80.00	0.00	3.10	5.10
05-Apr-00	25.80	36.70	40.00	73.00	2.20	7.40	6.40
06-Apr-00	24.70	36.50	34.00	81.00	0.00	9.10	5.30
07-Apr-00	26.20	38.00	33.00	78.00	3.40	9.30	5.20
08-Apr-00	26.00	37.50	31.00	74.00	0.00	8.40	5.00
09-Apr-00	25.80	36.70	35.00	77.00	0.10	7.80	5.10
10-Apr-00	25.80	36.70	41.00	78.00	1.20	6.20	3.10
11-Apr-00	25.30	32.80	55.00	81.00	0.00	4.50	3.30
12-Apr-00	24.80	35.00	45.00	88.00	17.50	7.00	3.70
13-Apr-00	23.50	29.30	74.00	95.00	37.40	1.00	0.90
14-Apr-00	23.50	33.20	56.00	92.00	14.60	7.80	2.80
15-Apr-00	24.50	29.90	68.00	94.00	3.80	1.00	1.50
16-Apr-00	23.30	27.00	74.00	94.00	12.00	2.40	1.40
17-Apr-00	22.90	33.50	51.00	81.00	0.00	7.40	3.00
18-Apr-00	25.70	32.70	58.00	88.00	3.00	5.70	2.00
19-Apr-00	25.30	33.50	54.00	91.00	0.20	6.30	2.20
20-Apr-00	24.80	31.20	55.00	87.00	1.90	4.50	1.80
21-Apr-00	24.20	34.30	40.00	91.00	0.00	10.30	3.10
22-Apr-00	26.20	32.00	62.00	87.00	0.40	1.80	1.50

23-Apr-00	24.70	32.60	62.00	94.00	6.00		3.70	1.50
24-Apr-00	25.40	33.60	56.00	94.00	0.00		6.70	3.80
25-Apr-00	26.20	33.50	57.00	91.00	4.70		6.00	3.80
26-Apr-00	26.60	32.80	63.00	90.00	0.00		4.90	4.10
27-Apr-00	27.20	35.70	52.00	88.00	5.40		8.00	3.40
28-Apr-00	23.50	28.80	73.00	92.00	3.00		0.90	1.90
29-Apr-00	24.30	35.20	53.00	90.00	0.00		9.90	3.60
30-Apr-00	26.50	31.20	68.00	94.00	4.30		2.90	1.90
01-May-00	25.00	34.80	52.00	89.00	0.00		9.60	4.20
02-May-00	25.10	34.90	51.00	85.00	0.00		7.20	3.30
03-May-00	25.80	33.00	60.00	90.00	6.00		4.20	3.00
04-May-00	23.00	33.80	51.00	92.00	0.00		9.60	3.00
05-May-00	25.10	33.00	60.00	92.00	1.20		5.20	2.40
06-May-00	25.50	34.50	52.00	91.00	53.00		8.60	3.60
07-May-00	23.40	32.60	60.00	93.00	34.30		5.70	2.20
08-May-00	25.20	34.80	56.00	90.00	42.00		10.60	3.50
09-May-00	22.80	33.20	61.00	92.00	0.00		5.30	2.80
10-May-00	25.10	33.70	58.00	92.00	64.40		5.10	2.80
11-May-00	21.90	31.10	68.00	98.00	8.40		1.70	1.70
12-May-00	24.20	31.50	64.00	94.00	7.40		4.50	2.30
13-May-00	24.40	32.70	61.00	91.00	26.20		5.40	2.10
14-May-00	23.80	31.20	66.00	93.00	29.90		5.60	2.00
15-May-00	24.80	31.50	71.00	94.00	12.50		4.10	2.00
16-May-00	24.70	31.40	65.00	91.00	30.40		5.80	2.20
17-May-00	24.20	30.80	68.00	93.00	0.80		5.60	3.20
18-May-00	24.40	32.80	62.00	92.00	4.00		3.30	2.10
19-May-00	25.80	30.00	69.00	93.00	1.90		1.90	2.10
20-May-00	23.90	31.80	66.00	94.00	26.80		1.90	1.30
21-May-00	24.20	29.90	72.00	92.00	28.10		2.10	1.20

22-May-00	23.50	30.00	68.00	93.00	11.20	4.40	1.10
23-May-00	25.30	30.30	77.00	97.00	7.50	3.00	1.20
24-May-00	25.50	29.40	77.00	92.00	10.60	3.50	1.10
25-May-00	24.80	32.00	68.00	91.00	11.70	2.80	1.60
26-May-00	25.20	34.40	56.00	93.00	14.70	6.80	2.10
27-May-00	24.80	31.80	68.00	87.00	0.00	5.70	2.20
28-May-00	27.00	35.00	56.00	91.00	1.10	11.00	2.20
29-May-00	27.00	35.00	57.00	79.00	34.60	8.80	2.80
30-May-00	25.50	32.40	59.00	95.00	48.00	5.60	2.10
31-May-00	24.60	32.00	67.00	93.00	16.80	3.80	1.20
01-Jun-00	23.60	26.00	82.00	94.00	25.90	0.00	0.50
02-Jun-00	24.50	30.00	66.00	97.00	14.20	6.40	1.80
03-Jun-00	24.30	31.00	63.00	94.00	0.00	8.80	2.40
04-Jun-00	26.20	34.00	66.00	86.00	0.00	11.30	2.60
05-Jun-00	24.70	32.30	68.00	89.00	1.50	4.40	1.50
06-Jun-00	25.80	33.40	57.00	89.00	0.80	9.00	1.70
07-Jun-00	26.20	34.50	54.00	90.00	0.00	11.40	2.40
08-Jun-00	26.10	32.10	65.00	89.00	0.40	4.70	2.00
09-Jun-00	25.80	31.50	62.00	92.00	0.90	8.20	2.10
10-Jun-00	25.00	30.50	72.00	88.00	0.00	7.70	1.90
11-Jun-00	25.70	32.50	61.00	88.00	4.40	7.50	2.60
12-Jun-00	25.70	32.50	60.00	93.00	2.30	4.90	2.10
13-Jun-00	26.10	30.40	66.00	87.00	9.40	0.00	1.80
14-Jun-00	25.90	32.20	64.00	93.00	56.80	1.80	1.30
15-Jun-00	24.00	32.00	68.00	95.00	82.40	3.60	1.00
16-Jun-00	23.60	31.40	62.00	97.00	11.80	4.10	1.60
17-Jun-00	24.80	30.00	72.00	93.00	2.70	0.50	1.30
18-Jun-00	24.30	26.20	89.00	95.00	7.60	0.00	0.50
19-Jun-00	24.90	30.80	64.00	92.00	11.00	3.20	1.20

20-Jun-00	23.70	31.00	67.00	94.00	0.00	5.50	1.60
21-Jun-00	25.90	31.00	74.00	90.00	0.00	4.20	2.10
22-Jun-00	25.20	31.80	64.00	88.00	2.10	7.80	1.50
23-Jun-00	25.10	30.50	70.00	91.00	22.10	3.40	1.30
24-Jun-00	23.80	29.40	76.00	95.00	6.00	2.20	1.20
25-Jun-00	23.50	31.70	62.00	94.00	7.70	4.80	1.30
26-Jun-00	25.20	30.30	68.00	89.00	14.90	3.60	1.20
27-Jun-00	23.50	33.80	53.00	95.00	0.00	6.50	1.80
28-Jun-00	25.40	32.50	60.00	88.00	0.00	5.80	1.80
29-Jun-00	25.80	33.10	54.00	88.00	0.20	7.60	1.70
30-Jun-00	25.40	32.40	62.00	90.00	1.80	5.90	1.70
01-Jul-00	21.80	34.60	50.00	93.00	69.10	8.20	1.40
02-Jul-00	24.00	32.70	60.00	89.00	0.00	5.80	1.70
03-Jul-00	24.80	32.30	62.00	91.00	0.70	8.20	1.50
04-Jul-00	25.30	32.20	65.00	90.00	0.00	5.30	1.80
05-Jul-00	25.20	29.70	82.00	92.00	25.70	1.70	1.20
06-Jul-00	24.00	28.70	76.00	97.00	93.70	0.40	0.80
07-Jul-00	23.80	31.20	66.00	97.00	40.20	3.20	1.00
08-Jul-00	24.40	30.20	70.00	86.00	4.90	2.00	2.00
09-Jul-00	24.50	29.50	77.00	93.00	30.80	0.20	1.00
10-Jul-00	24.00	31.80	65.00	94.00	65.70	2.00	0.90
11-Jul-00	24.10	25.10	88.00	98.00	40.20	0.00	0.70
12-Jul-00	23.20	24.90	87.00	95.00	28.00	0.00	0.50
13-Jul-00	23.60	29.20	73.00	92.00	25.40	2.60	0.80
14-Jul-00	23.70	32.00	63.00	96.00	31.90	5.10	1.70
15-Jul-00	24.60	28.40	81.00	95.00	11.40	0.80	0.80
16-Jul-00	24.50	27.00	84.00	97.00	52.70	0.00	0.40
17-Jul-00	23.70	29.10	79.00	96.00	16.20	0.00	1.00
18-Jul-00	24.70	31.60	66.00	94.00	1.00	3.70	1.60

19-Jul-00	24.10	31.70	64.00	92.00	22.40		4.90	1.60
20-Jul-00	23.30	29.50	79.00	97.00	36.10		0.10	1.20
21-Jul-00	24.30	31.60	69.00	91.00	8.80		7.40	1.40
22-Jul-00	24.80	32.90	64.00	95.00	0.00		7.00	1.40
23-Jul-00	25.00	33.00	64.00	95.00	0.00		8.20	1.80
24-Jul-00	24.60	33.60	58.00	90.00	0.40		6.80	1.60
25-Jul-00	23.10	29.70	72.00	99.00	75.20		4.10	1.00
26-Jul-00	24.40	32.70	60.00	94.00	16.50		10.10	1.50
27-Jul-00	23.80	29.80	74.00	97.00	20.30		1.20	0.80
28-Jul-00	23.40	30.60	70.00	96.00	2.30		4.50	1.30
29-Jul-00	24.80	30.60	66.00	90.00	0.20		3.50	1.20
30-Jul-00	24.90	31.20	65.00	95.00	0.00		6.80	1.70
31-Jul-00	25.20	32.70	62.00	90.00	5.90		7.30	1.40
01-Aug-00	24.80	33.10	66.00	90.00	0.00		8.00	1.70
02-Aug-00	25.20	32.80	62.00	92.00	0.00		7.70	1.70
03-Aug-00	24.90	33.40	61.00	91.00	0.50		6.00	1.80
04-Aug-00	25.10	33.00	63.00	89.00	2.90		6.30	1.70
05-Aug-00	24.80	31.60	69.00	90.00	8.60		4.20	2.00
06-Aug-00	24.10	31.30	64.00	91.00	0.00		6.40	1.60
07-Aug-00	25.10	30.80	66.00	91.00	2.40		1.70	1.50
08-Aug-00	23.90	31.00	64.00	92.00	2.00		7.40	1.50
09-Aug-00	24.30	33.80	58.00	87.00	0.00		6.20	1.50
10-Aug-00	25.40	34.40	57.00	94.00	14.60		6.60	1.30
11-Aug-00	23.80	34.60	58.00	93.00	0.00		10.60	1.70
12-Aug-00	25.30	34.50	58.00	91.00	2.00		9.50	1.80
13-Aug-00	23.20	32.00	62.00	95.00	1.40		6.60	1.60
14-Aug-00	25.40	34.70	54.00	90.00	2.50		11.40	1.70
15-Aug-00	23.80	33.50	57.00	95.00	0.00		10.10	1.80
16-Aug-00	25.70	32.30	61.00	92.00	0.00		6.50	1.80

17-Aug-00	25.70	32.70	61.00	91.00	0.00	8.70	1.60
18-Aug-00	25.00	34.00	57.00	93.00	8.00	8.30	1.50
19-Aug-00	23.30	31.80	64.00	93.00	0.00	9.40	1.60
20-Aug-00	25.00	32.80	61.00	92.00	2.20	4.60	1.30
21-Aug-00	26.00	31.80	62.00	94.00	32.40	0.60	1.00
22-Aug-00	24.20	24.80	94.00	97.00	133.40	0.00	0.60
23-Aug-00	23.00	24.70	93.00	97.00	21.20	0.00	0.60
24-Aug-00	23.50	28.90	71.00	94.00	5.80	0.10	1.10
25-Aug-00	24.00	31.00	76.00	97.00	12.60	3.60	1.00
26-Aug-00	25.30	31.50	70.00	93.00	30.00	4.90	1.00
27-Aug-00	23.60	31.20	69.00	94.00	2.20	2.70	1.10
28-Aug-00	25.00	29.50	76.00	96.00	6.50	0.10	0.80
29-Aug-00	25.40	29.80	72.00	92.00	27.00	0.10	1.30
30-Aug-00	24.20	26.30	89.00	93.00	21.00	0.10	0.60
31-Aug-00	24.30	30.20	70.00	97.00	168.60	0.20	1.00
01-Sep-00	23.20	27.80	81.00	98.00	9.10	0.00	0.70
02-Sep-00	24.50	29.40	71.00	94.00	3.50	0.30	1.00
03-Sep-00	24.70	30.80	76.00	94.00	8.90	1.60	0.90
04-Sep-00	24.90	30.50	71.00	93.00	3.70	0.90	1.10
05-Sep-00	24.30	29.70	66.00	94.00	35.80	0.00	1.30
06-Sep-00	23.10	25.00	88.00	94.00	10.50	0.00	0.70
07-Sep-00	23.60	30.50	75.00	92.00	0.60	2.70	0.90
08-Sep-00	24.40	31.00	68.00	95.00	10.50	3.30	0.90
09-Sep-00	24.00	30.50	68.00	98.00	11.90	1.50	1.10
10-Sep-00	25.20	27.90	82.00	95.00	3.40	0.00	1.20
11-Sep-00	24.70	29.20	75.00	94.00	1.10	1.20	0.60
12-Sep-00	24.40	30.60	70.00	91.00	32.00	5.70	1.50
13-Sep-00	23.80	30.80	67.00	96.00	0.20	3.60	1.00
14-Sep-00	24.70	31.60	56.00	94.00	0.00	8.50	2.90

15-Sep-00	21.30	31.80	43.00	89.00	0.00	10.00	3.20
16-Sep-00	23.10	31.10	59.00	89.00	0.00	5.30	2.20
17-Sep-00	22.90	32.60	58.00	94.00	0.00	9.10	3.30
18-Sep-00	24.90	30.70	71.00	94.00	0.30	3.70	2.10
19-Sep-00	25.00	31.20	45.00	91.00	0.90	4.40	2.50
20-Sep-00	23.70	33.50	56.00	93.00	0.00	5.40	2.00
21-Sep-00	23.90	33.40	53.00	94.00	0.00	6.60	2.70
22-Sep-00	24.50	31.50	62.00	94.00	27.20	3.10	1.80
23-Sep-00	23.50	34.20	58.00	97.00	0.00	9.00	2.40
24-Sep-00	25.00	32.30	61.00	90.00	0.00	8.60	2.10
25-Sep-00	24.90	33.50	58.00	89.00	31.40	7.40	1.50
26-Sep-00	23.80	33.70	58.00	92.00	6.60	9.90	1.70
27-Sep-00	25.30	32.70	63.00	93.00	13.70	7.10	1.50
28-Sep-00	23.40	33.50	60.00	95.00	7.40	7.50	1.20
29-Sep-00	24.10	33.00	65.00	93.00	13.60	6.30	1.20
30-Sep-00	24.80	33.00	59.00	93.00	0.20	4.00	2.10
01-Oct-00	23.60	32.60	64.00	94.00	47.50	9.40	1.30
02-Oct-00	23.60	33.60	54.00	97.00	9.70	10.60	1.90
03-Oct-00	23.60	32.00	60.00	97.00	0.00	6.20	2.00
04-Oct-00	24.20	30.90	62.00	87.00	0.00	3.70	1.30
05-Oct-00	24.30	31.60	62.00	95.00	11.70	6.60	1.20
06-Oct-00	23.40	30.50	67.00	95.00	0.00	2.80	0.80
07-Oct-00	24.70	31.90	55.00	96.00	0.00	5.80	1.50
08-Oct-00	23.70	32.50	55.00	96.00	0.00	7.20	2.40
09-Oct-00	24.20	27.50	76.00	91.00	0.60	0.00	1.30
10-Oct-00	24.20	26.00	88.00	98.00	9.90	0.00	0.40
11-Oct-00	24.70	27.40	88.00	98.00	4.30	0.00	0.50
12-Oct-00	25.00	31.80	62.00	96.00	1.20	2.80	1.40
13-Oct-00	24.80	28.30	73.00	95.00	0.00	0.00	0.90

14-Oct-00	23.00	28.60	62.00	94.00	0.00	1.40	2.20
15-Oct-00	22.20	30.20	57.00	88.00	0.00	8.10	2.50
16-Oct-00	22.20	30.00	68.00	90.00	0.20	4.90	1.30
17-Oct-00	22.80	27.40	76.00	92.00	0.00	0.00	1.50
18-Oct-00	23.70	27.80	68.00	88.00	13.30	0.00	1.70
19-Oct-00	21.60	27.80	73.00	96.00	0.00	1.60	1.10
20-Oct-00	23.80	31.00	65.00	96.00	5.90	6.10	1.00
21-Oct-00	24.50	32.80	60.00	97.00	12.30	8.50	1.80
22-Oct-00	24.90	31.00	72.00	95.00	30.10	5.50	1.00
23-Oct-00	23.50	32.00	60.00	95.00	0.00	9.20	1.20
24-Oct-00	24.10	31.80	62.00	92.00	18.10	5.80	1.10
25-Oct-00	23.10	33.90	56.00	97.00	0.00	9.70	1.50
26-Oct-00	23.00	33.60	52.00	94.00	0.30	9.80	1.90
27-Oct-00	23.00	32.00	61.00	94.00	0.70	7.00	1.60
28-Oct-00	23.00	29.70	70.00	93.00	0.00	2.30	1.30
29-Oct-00	23.80	32.00	57.00	92.00	0.00	9.60	3.00
30-Oct-00	22.70	30.60	61.00	87.00	0.00	8.60	2.40
31-Oct-00	20.60	29.70	50.00	87.00	0.00	7.50	2.90
01-Nov-00	20.50	28.80	54.00	69.00	0.00	8.80	4.60
02-Nov-00	16.80	28.80	49.00	74.00	0.00	10.50	3.30
03-Nov-00	16.20	29.50	44.00	80.00	0.00	10.50	2.00
04-Nov-00	17.50	29.20	44.00	83.00	0.00	10.50	2.90
05-Nov-00	17.00	31.20	43.00	77.00	0.00	10.40	1.80
06-Nov-00	18.50	31.70	36.00	90.00	0.00	10.10	2.10
07-Nov-00	17.50	31.20	37.00	93.00	0.00	10.10	2.80
08-Nov-00	17.80	31.70	45.00	83.00	0.00	10.30	2.20
09-Nov-00	18.40	32.50	38.00	87.00	0.00	10.50	2.00
10-Nov-00	20.10	31.50	51.00	88.00	0.00	7.80	2.80
11-Nov-00	21.50	31.90	56.00	82.00	0.00	8.80	3.70

12-Nov-00	22.30	29.80	67.00	82.00	0.00	2.30	2.80
13-Nov-00	21.50	30.00	55.00	78.00	0.00	7.40	3.20
14-Nov-00	20.30	32.10	57.00	88.00	0.00	10.50	2.90
15-Nov-00	22.10	32.00	53.00	85.00	0.00	8.70	2.70
16-Nov-00	21.80	32.00	68.00	90.00	0.10	0.70	2.20
17-Nov-00	22.70	30.70	65.00	83.00	0.00	4.80	2.60
18-Nov-00	22.10	30.80	55.00	85.00	0.00	4.40	2.10
19-Nov-00	22.00	33.20	60.00	85.00	0.00	9.30	2.70
20-Nov-00	22.00	32.60	63.00	84.00	0.00	8.20	4.50
21-Nov-00	19.40	28.50	55.00	75.00	0.00	10.40	3.60
22-Nov-00	17.60	29.50	60.00	79.00	0.00	9.90	3.30
23-Nov-00	18.60	29.80	65.00	88.00	0.00	5.80	2.70
24-Nov-00	20.40	29.90	55.00	86.00	3.40	3.50	1.50
25-Nov-00	23.30	32.60	56.00	96.00	1.00	3.70	1.50
26-Nov-00	22.70	34.40	60.00	91.00	0.00	9.50	2.40
27-Nov-00	22.50	34.00	47.00	82.00	0.60	9.50	2.40
28-Nov-00	22.50	33.80	46.00	85.00	0.00	9.00	2.90
29-Nov-00	21.20	34.00	60.00	88.00	0.00	9.70	2.80
30-Nov-00	22.10	34.70	41.00	85.00	0.00	10.50	2.30
01-Dec-00	22.50	34.00	47.00	94.00	0.00	8.70	2.90
02-Dec-00	23.40	33.80	47.00	83.00	0.00	8.90	3.50
03-Dec-00	20.20	32.00	55.00	91.00	0.00	8.20	3.50
04-Dec-00	19.30	30.60	53.00	88.00	0.00	1.00	3.10
05-Dec-00	17.70	31.60	48.00	90.00	0.00	9.20	2.60
06-Dec-00	19.30	32.00	50.00	95.00	0.00	9.30	2.80
07-Dec-00	21.70	30.20	63.00	89.00	0.00	2.20	3.00
08-Dec-00	22.80	32.00	47.00	80.00	0.00	3.90	2.70
09-Dec-00	20.10	34.40	42.00	88.00	0.00	8.90	2.40
10-Dec-00	21.80	33.00	47.00	90.00	0.00	9.90	3.00

11-Dec-00	22.00	32.20	45.00	88.00	0.00	6.80	3.80
12-Dec-00	22.50	30.90	49.00	83.00	0.00	6.00	3.40
13-Dec-00	23.40	29.40	53.00	73.00	0.00	0.00	3.00
14-Dec-00	19.80	31.80	42.00	82.00	0.00	7.80	3.00
15-Dec-00	19.20	32.50	45.00	81.00	0.00	6.80	2.10
16-Dec-00	20.70	33.20	41.00	84.00	0.00	8.80	3.00
17-Dec-00	21.70	33.80	41.00	83.00	0.00	8.20	2.70
18-Dec-00	20.60	34.10	35.00	84.00	0.00	10.00	2.60
19-Dec-00	21.70	34.50	37.00	87.00	0.00	7.90	2.70
20-Dec-00	22.30	34.40	37.00	88.00	0.30	8.70	3.20
21-Dec-00	23.30	30.80	45.00	76.00	0.00	9.20	3.60
22-Dec-00	18.70	31.40	36.00	78.00	0.00	10.20	2.80
23-Dec-00	17.80	29.20	38.00	83.00	0.00	9.30	3.40
24-Dec-00	16.20	29.10	35.00	82.00	0.00	9.60	2.80
25-Dec-00	16.00	30.50	39.00	81.00	0.00	8.60	2.40
26-Dec-00	18.50	31.60	41.00	85.00	0.00	10.00	3.20
27-Dec-00	20.50	32.60	43.00	80.00	0.50	7.40	3.10
28-Dec-00	22.00	32.00	44.00	78.00	0.00	8.20	3.20
29-Dec-00	22.20	32.40	42.00	77.00	0.00	3.90	2.80
30-Dec-00	21.50	33.20	35.00	89.00	0.00	9.20	3.20
31-Dec-00	19.30	30.00	38.00	83.00	0.00	10.00	3.60
01-Jan-01	16.00	30.00	37.00	87.00	0.00	9.20	2.40
02-Jan-01	17.60	32.40	34.00	87.00	0.00	9.50	2.80
03-Jan-01	17.90	32.50	34.00	91.00	0.00	7.80	3.30
04-Jan-01	20.10	33.40	32.00	77.00	0.00	8.20	3.60
05-Jan-01	20.40	28.00	55.00	86.00	0.00	1.10	1.60
06-Jan-01	21.90	32.50	36.00	88.00	0.00	4.30	2.50
07-Jan-01	20.90	34.40	32.00	87.00	0.00	9.40	3.30
08-Jan-01	21.00	34.40	35.00	83.00	0.00	9.50	3.10

09-Jan-01	21.80	34.60	37.00	85.00	0.00	9.30	2.80
10-Jan-01	22.00	32.30	46.00	83.00	0.00	6.50	2.90
11-Jan-01	22.00	33.40	33.00	84.00	0.00	7.80	3.10
12-Jan-01	21.80	33.20	40.00	82.00	0.00	9.60	3.10
13-Jan-01	21.90	33.00	43.00	85.00	0.00	8.80	3.10
14-Jan-01	21.40	34.20	38.00	84.00	0.00	8.80	3.10
15-Jan-01	22.60	33.10	35.00	80.00	0.00	8.10	4.30
16-Jan-01	18.60	32.00	39.00	70.00	0.00	9.70	5.10
17-Jan-01	18.00	32.60	36.00	82.00	0.00	10.00	4.10
18-Jan-01	21.00	33.30	36.00	75.00	0.00	5.10	3.70
19-Jan-01	21.70	33.00	40.00	80.00	0.00	3.70	4.80
20-Jan-01	23.90	36.20	33.00	84.00	0.00	5.40	3.80
21-Jan-01	22.30	34.40	35.00	89.00	0.00	10.30	5.70
22-Jan-01	24.80	36.10	33.00	76.00	0.00	9.60	4.50
23-Jan-01	24.60	36.10	35.00	74.00	0.00	10.30	4.60
24-Jan-01	23.50	35.00	39.00	77.00	0.00	8.60	3.60
25-Jan-01	24.30	33.50	49.00	80.00	0.00	10.00	3.90
26-Jan-01	24.10	35.60	39.00	81.00	0.00	7.70	3.30
27-Jan-01	25.30	34.10	47.00	83.00	0.00	8.40	2.60
28-Jan-01	24.40	31.90	46.00	83.00	0.00	7.00	3.30
29-Jan-01	20.20	31.40	36.00	70.00	0.00	9.50	3.00
30-Jan-01	17.70	33.80	36.00	86.00	0.00	10.00	2.90
31-Jan-01	21.60	35.10	28.00	79.00	0.00	10.40	3.50
01-Feb-01	22.60	34.90	35.00	81.00	0.00	9.70	3.60
02-Feb-01	23.40	35.10	31.00	76.00	0.00	8.70	3.70
03-Feb-01	23.30	35.20	25.00	71.00	0.00	9.80	3.80
04-Feb-01	23.50	35.20	36.00	78.00	0.00	9.50	3.40
05-Feb-01	22.80	34.80	35.00	75.00	0.00	9.80	3.70
06-Feb-01	22.30	35.20	30.00	71.00	0.00	9.70	3.60

07-Feb-01	22.40	36.60	27.00	75.00	0.00	9.00	4.00
08-Feb-01	21.70	34.30	33.00	77.00	0.00	9.50	5.10
09-Feb-01	21.00	34.10	31.00	76.00	0.00	8.00	7.10
10-Feb-01	19.30	34.00	27.00	69.00	0.00	9.80	6.90
11-Feb-01	17.70	34.20	30.00	80.00	0.00	8.30	5.00
12-Feb-01	19.30	34.40	19.00	81.00	0.00	9.30	7.30
13-Feb-01	22.10	35.70	33.00	77.00	0.00	8.20	7.80
14-Feb-01	22.60	31.50	35.00	63.00	0.00	9.20	9.50
15-Feb-01	16.60	32.20	28.00	77.00	0.00	10.40	7.50
16-Feb-01	17.60	30.90	32.00	73.00	0.00	9.70	7.00
17-Feb-01	17.00	34.00	20.00	78.00	0.00	10.50	6.70
18-Feb-01	18.20	34.00	25.00	81.00	0.00	10.00	6.30
19-Feb-01	19.80	34.50	24.00	76.00	0.00	9.80	6.10
20-Feb-01	21.70	34.00	32.00	72.00	0.00	9.70	6.50
21-Feb-01	22.50	34.80	32.00	76.00	0.00	9.30	6.50
22-Feb-01	22.80	33.70	39.00	75.00	0.00	9.20	6.80
23-Feb-01	23.90	33.70	44.00	75.00	0.00	9.00	6.70
24-Feb-01	24.60	35.80	36.00	75.00	0.00	7.10	6.00
25-Feb-01	24.60	35.30	41.00	76.00	13.70	7.60	5.50
26-Feb-01	23.30	31.10	52.00	91.00	1.40	6.50	3.80
27-Feb-01	23.70	34.70	38.00	83.00	0.00	9.10	4.70
28-Feb-01	24.40	36.00	33.00	80.00	0.00	9.90	6.50
01-Mar-01	20.80	34.50	34.00	79.00	0.00	10.00	6.60
02-Mar-01	20.80	35.20	31.00	80.00	0.00	10.00	5.80
03-Mar-01	23.70	36.90	29.00	75.00	0.00	9.10	7.50
04-Mar-01	22.60	35.10	29.00	73.00	0.00	8.70	8.00
05-Mar-01	20.40	34.20	31.00	82.00	0.00	8.10	6.00
06-Mar-01	24.20	37.60	18.00	71.00	0.00	8.70	8.00
07-Mar-01	24.80	37.40	31.00	69.00	0.70	9.10	9.00

08-Mar-01	26.10	34.80	43.00	76.00	14.40		5.70	4.70
09-Mar-01	23.50	36.60	29.00	89.00	0.00		10.20	5.80
10-Mar-01	22.50	34.60	34.00	77.00	0.00		7.40	6.00
11-Mar-01	23.20	36.00	38.00	82.00	0.00		9.50	7.10
12-Mar-01	23.50	33.50	39.00	71.00	0.00		4.60	7.70
13-Mar-01	21.20	34.60	35.00	72.00	0.00		8.10	5.70
14-Mar-01	25.10	35.80	38.00	77.00	0.00		9.10	6.00
15-Mar-01	26.00	37.80	33.00	71.00	0.00		10.10	7.40
16-Mar-01	26.50	35.90	37.00	73.00	0.00		8.10	6.10
17-Mar-01	26.90	37.70	34.00	79.00	0.00		7.80	5.70
18-Mar-01	25.10	34.30	48.00	87.00	0.00		4.60	5.00
19-Mar-01	24.10	32.80	43.00	86.00	0.00		1.90	4.40
20-Mar-01	22.50	34.50	46.00	83.00	3.20		2.20	3.50
21-Mar-01	25.00	33.70	51.00	89.00	0.00		7.30	4.20
22-Mar-01	26.00	35.60	38.00	84.00	0.00		7.40	5.30
23-Mar-01	24.70	36.50	39.00	84.00	0.00		8.20	6.00
24-Mar-01	26.80	36.40	41.00	80.00	5.40		7.10	5.10
25-Mar-01	25.60	31.20	67.00	91.00	6.20		1.50	1.30
26-Mar-01	24.40	34.20	46.00	94.00	0.00		6.80	4.80
27-Mar-01	25.60	33.60	53.00	87.00	6.30		3.00	2.50
28-Mar-01	24.40	34.00	46.00	93.00	65.40		9.00	4.80
29-Mar-01	23.00	30.60	58.00	98.00	4.50		2.10	3.00
30-Mar-01	22.30	35.00	40.00	86.00	0.00		10.60	3.50
31-Mar-01	26.00	36.40	40.00	85.00	0.00		8.40	4.70
01-Apr-01	26.20	34.80	44.00	82.00	0.60		9.40	5.30
02-Apr-01	25.80	36.40	41.00	87.00	0.00		10.60	5.50
03-Apr-01	27.10	36.00	33.00	76.00	0.00		8.80	5.10
04-Apr-01	26.80	36.60	49.00	86.00	0.00		9.60	5.50
05-Apr-01	27.50	36.00	50.00	81.00	0.00		8.80	4.80

06-Apr-01	26.50	35.90	48.00	87.00	0.00	9.60	5.20
07-Apr-01	27.60	35.80	49.00	79.00	0.00	9.90	5.80
08-Apr-01	27.70	36.70	43.00	79.00	0.00	10.50	6.90
09-Apr-01	28.20	38.10	38.00	74.00	0.00	10.60	7.60
10-Apr-01	28.30	39.40	35.00	78.00	0.00	10.40	7.30
11-Apr-01	28.00	38.30	39.00	82.00	0.00	6.90	6.20
12-Apr-01	22.70	34.40	44.00	75.00	0.00	7.80	5.30
13-Apr-01	23.00	37.00	39.00	80.00	0.00	9.70	5.80
14-Apr-01	27.50	37.40	42.00	75.00	0.10	5.20	5.60
15-Apr-01	25.70	37.30	34.00	88.00	0.00	8.40	5.80
16-Apr-01	27.40	38.50	37.00	75.00	0.00	8.10	7.10
17-Apr-01	28.80	32.90	62.00	74.00	0.00	0.00	5.10
18-Apr-01	27.30	36.60	46.00	82.00	0.00	7.70	5.80
19-Apr-01	28.00	37.00	46.00	80.00	0.00	5.90	7.00
20-Apr-01	28.80	36.40	48.00	73.00	0.00	10.90	8.40
21-Apr-01	28.50	36.70	41.00	73.00	0.00	10.00	8.50
22-Apr-01	29.20	38.30	38.00	73.00	0.00	10.20	8.20
23-Apr-01	27.90	36.60	43.00	77.00	0.00	6.30	5.70
24-Apr-01	27.40	36.70	42.00	77.00	0.00	10.80	6.60
25-Apr-01	25.80	36.90	42.00	79.00	2.70	8.20	4.10
26-Apr-01	25.30	35.70	39.00	88.00	0.00	8.90	4.30
27-Apr-01	26.10	37.90	26.00	84.00	0.00	11.40	7.50
28-Apr-01	26.80	36.90	36.00	75.00	0.00	6.70	6.80
29-Apr-01	26.60	36.70	42.00	82.00	16.30	6.90	4.40
30-Apr-01	23.80	35.40	50.00	93.00	0.00	10.80	3.80
01-May-01	27.00	33.70	55.00	83.00	0.00	7.20	4.80
02-May-01	25.40	33.40	48.00	85.00	0.00	7.60	6.00
03-May-01	26.50	33.00	55.00	91.00	1.50	5.80	4.50
04-May-01	26.30	35.00	47.00	79.00	0.00	9.90	6.00

05-May-01	27.00	36.10	44.00	85.00	5.00	7.90	3.70
06-May-01	25.80	35.50	46.00	90.00	0.00	7.40	4.20
07-May-01	27.50	37.80	41.00	89.00	2.00	10.50	5.20
08-May-01	25.70	37.50	42.00	91.00	0.80	9.00	5.00
09-May-01	26.80	37.30	39.00	90.00	0.00	10.60	7.60
10-May-01	27.90	36.60	38.00	77.00	6.50	8.10	5.70
11-May-01	25.70	33.00	53.00	92.00	7.20	7.00	2.50
12-May-01	24.20	28.80	77.00	96.00	18.40	0.40	1.10
13-May-01	24.60	33.20	57.00	94.00	1.80	5.40	2.90
14-May-01	24.70	33.90	57.00	93.00	2.50	3.90	2.50
15-May-01	24.50	32.00	57.00	93.00	8.50	2.90	4.20
16-May-01	24.10	28.50	77.00	95.00	10.90	1.00	1.30
17-May-01	24.00	30.60	71.00	96.00	54.60	5.00	1.70
18-May-01	23.60	31.00	64.00	94.00	32.70	3.40	1.50
19-May-01	24.70	33.50	57.00	93.00	1.80	7.70	4.40
20-May-01	24.80	32.50	66.00	91.00	2.00	8.00	2.00
21-May-01	25.10	31.50	64.00	87.00	1.20	6.10	2.10
22-May-01	26.20	33.10	55.00	87.00	0.00	9.50	2.80
23-May-01	26.20	32.60	60.00	87.00	0.30	8.70	2.50
24-May-01	26.30	32.50	63.00	88.00	0.00	6.60	2.40
25-May-01	26.20	33.50	53.00	91.00	0.10	10.70	3.30
26-May-01	26.50	32.60	63.00	84.00	0.00	3.30	2.20
27-May-01	24.80	32.10	60.00	88.00	21.00	5.00	1.40
28-May-01	24.00	31.40	66.00	94.00	2.20	3.40	1.70
29-May-01	24.70	31.20	69.00	93.00	2.00	3.50	1.50
30-May-01	25.60	32.30	64.00	92.00	0.20	6.00	2.10
31-May-01	24.70	33.40	50.00	90.00	0.00	7.80	2.90
01-Jun-01	26.40	34.70	46.00	87.00	12.90	10.40	3.00
02-Jun-01	24.20	34.00	54.00	95.00	0.30	7.50	2.30

03-Jun-01	25.00	34.00	56.00	90.00	0.10	9.50	2.70
04-Jun-01	25.00	34.60	55.00	90.00	0.00	10.40	2.20
05-Jun-01	25.20	32.00	61.00	88.00	15.00	5.40	1.90
06-Jun-01	23.20	31.70	63.00	97.00	8.20	3.30	1.70
07-Jun-01	24.30	32.20	63.00	94.00	0.10	7.70	2.30
08-Jun-01	24.80	31.50	61.00	91.00	19.80	8.30	2.00
09-Jun-01	24.20	32.40	58.00	95.00	0.00	7.50	2.30
10-Jun-01	26.90	30.80	70.00	89.00	16.70	1.50	1.10
11-Jun-01	24.50	31.50	60.00	89.00	7.90	8.40	2.00
12-Jun-01	24.30	32.30	59.00	92.00	0.00	7.30	2.10
13-Jun-01	26.40	32.80	56.00	91.00	7.40	3.00	2.00
14-Jun-01	25.20	28.00	77.00	89.00	17.70	0.00	0.80
15-Jun-01	23.90	31.30	63.00	94.00	0.00	5.30	1.50
16-Jun-01	25.40	32.40	62.00	91.00	0.00	4.80	2.40
17-Jun-01	25.80	32.00	61.00	90.00	0.00	2.90	1.90
18-Jun-01	26.30	35.00	50.00	89.00	0.00	8.10	2.90
19-Jun-01	27.70	34.30	53.00	85.00	6.70	7.30	2.40
20-Jun-01	26.80	33.70	51.00	88.00	7.70	9.70	2.70
21-Jun-01	26.00	30.60	66.00	93.00	5.70	1.60	1.90
22-Jun-01	23.80	31.10	69.00	92.00	114.80	1.10	0.90
23-Jun-01	24.30	28.00	83.00	97.00	31.10	0.00	0.60
24-Jun-01	24.10	28.30	82.00	96.00	18.60	0.00	0.70
25-Jun-01	24.70	31.10	69.00	94.00	2.10	0.70	1.10
26-Jun-01	24.40	29.50	76.00	94.00	39.90	1.00	0.90
27-Jun-01	24.80	29.30	75.00	96.00	46.80	0.40	1.10
28-Jun-01	23.70	29.60	70.00	94.00	23.80	0.90	1.10
29-Jun-01	23.50	28.80	73.00	94.00	41.90	1.00	1.00
30-Jun-01	23.80	29.50	76.00	95.00	30.60	0.00	1.60
01-Jul-01	23.20	29.20	78.00	95.00	8.60	3.30	1.70

02-Jul-01	24.40	30.60	68.00	93.00	0.30	1.80	2.30
03-Jul-01	25.50	31.50	64.00	88.00	6.40	2.20	2.70
04-Jul-01	25.40	32.10	61.00	93.00	43.30	5.30	2.40
05-Jul-01	24.00	30.70	63.00	88.00	0.50	0.60	2.20
06-Jul-01	26.10	31.50	66.00	95.00	36.90	0.60	2.10
07-Jul-01	24.70	29.70	73.00	93.00	37.10	0.30	1.60
08-Jul-01	24.00	26.40	90.00	97.00	27.00	0.00	0.70
09-Jul-01	24.00	28.90	77.00	92.00	3.80	1.00	1.00
10-Jul-01	24.50	33.80	56.00	94.00	0.00	9.10	2.80
11-Jul-01	26.20	34.40	49.00	92.00	0.10	11.40	3.60
12-Jul-01	26.90	32.90	65.00	92.00	1.50	3.80	2.20
13-Jul-01	24.60	31.40	66.00	88.00	0.10	7.10	2.90
14-Jul-01	25.30	31.00	69.00	83.00	4.80	4.60	2.50
15-Jul-01	25.80	32.00	65.00	89.00	4.90	7.00	2.80
16-Jul-01	25.00	31.30	67.00	91.00	1.20	5.30	2.10
17-Jul-01	25.60	32.40	57.00	90.00	0.00	0.50	3.30
18-Jul-01	27.00	33.10	55.00	87.00	0.90	3.60	3.20
19-Jul-01	26.50	33.10	54.00	89.00	16.80	6.40	3.20
20-Jul-01	23.60	30.80	73.00	96.00	51.20	1.20	1.10
21-Jul-01	23.00	28.20	75.00	96.00	26.50	0.00	1.60
22-Jul-01	23.20	30.30	70.00	93.00	1.50	5.80	2.60
23-Jul-01	24.30	32.60	59.00	89.00	0.30	9.40	2.90
24-Jul-01	25.30	33.70	60.00	91.00	0.00	7.70	3.20
25-Jul-01	25.40	32.80	58.00	93.00	33.00	6.00	2.70
26-Jul-01	24.50	32.50	69.00	92.00	24.50	5.60	2.50
27-Jul-01	24.10	29.70	74.00	90.00	3.80	3.50	2.50
28-Jul-01	24.10	32.10	66.00	95.00	10.80	3.80	3.30
29-Jul-01	24.20	32.60	74.00	93.00	0.70	7.70	2.40
30-Jul-01	25.50	32.50	63.00	91.00	4.80	6.60	2.70

31-Jul-01	25.00	34.10	56.00	93.00	1.10	11.00	2.70
01-Aug-01	25.50	32.40	60.00	91.00	0.00	10.80	3.70
02-Aug-01	24.70	32.00	63.00	90.00	38.30	5.60	2.40
03-Aug-01	23.70	32.50	61.00	93.00	0.00	6.40	0.90
04-Aug-01	25.40	32.80	65.00	95.00	9.30	7.30	2.10
05-Aug-01	24.10	29.00	75.00	98.00	17.30	0.30	2.00
06-Aug-01	23.70	31.20	68.00	95.00	18.70	3.50	2.00
07-Aug-01	24.00	32.00	62.00	93.00	3.40	5.50	2.50
08-Aug-01	25.60	32.50	62.00	90.00	21.90	7.40	2.80
09-Aug-01	25.00	27.80	84.00	95.00	47.60	0.00	0.90
10-Aug-01	24.00	26.00	91.00	96.00	12.20	0.00	0.90
11-Aug-01	24.30	27.70	79.00	89.00	28.60	0.00	1.70
12-Aug-01	23.80	32.00	60.00	91.00	26.10	9.30	2.50
13-Aug-01	25.00	30.60	63.00	91.00	41.90	8.40	2.30
14-Aug-01	23.80	31.10	69.00	97.00	6.70	4.20	1.80
15-Aug-01	24.60	32.20	65.00	93.00	4.10	5.40	2.00
16-Aug-01	24.60	28.50	77.00	95.00	61.10	0.30	0.70
17-Aug-01	23.90	27.00	83.00	98.00	21.20	0.00	0.90
18-Aug-01	24.40	27.40	84.00	97.00	38.80	0.30	0.70
19-Aug-01	25.20	32.00	66.00	97.00	22.40	5.10	1.10
20-Aug-01	24.90	31.70	66.00	96.00	21.80	6.30	2.10
21-Aug-01	25.30	32.40	67.00	90.00	15.40	9.50	2.20
22-Aug-01	24.30	33.00	63.00	97.00	54.30	4.70	2.10
23-Aug-01	24.60	31.70	76.00	97.00	5.60	3.50	1.70
24-Aug-01	26.10	33.30	65.00	93.00	0.00	10.20	2.90
25-Aug-01	27.20	33.50	61.00	90.00	39.30	8.30	3.30
26-Aug-01	23.90	25.90	80.00	96.00	52.30	0.00	0.90
27-Aug-01	23.40	27.60	83.00	97.00	9.20	0.40	1.10
28-Aug-01	24.30	27.50	83.00	95.00	22.90	0.00	0.90

29-Aug-01	25.10	29.00	79.00	98.00	10.90	0.00	1.10
30-Aug-01	25.20	29.80	71.00	92.00	13.80	0.40	1.00
31-Aug-01	24.90	30.10	63.00	94.00	0.00	1.20	1.00
01-Sep-01	25.80	32.10	71.00	93.00	1.00	2.50	1.60
02-Sep-01	25.50	32.20	66.00	96.00	0.00	3.80	1.50
03-Sep-01	26.00	30.40	76.00	93.00	30.40	1.30	0.60
04-Sep-01	23.90	28.60	78.00	88.00	10.90	0.50	1.10
05-Sep-01	23.50	31.00	66.00	91.00	0.00	9.40	1.60
06-Sep-01	24.90	32.50	66.00	90.00	2.30	8.60	1.50
07-Sep-01	25.10	31.60	71.00	90.00	16.10	6.70	1.20
08-Sep-01	24.80	29.70	73.00	96.00	66.10	0.50	0.70
09-Sep-01	23.50	27.30	84.00	96.00	51.90	0.00	0.40
10-Sep-01	23.50	28.90	75.00	94.00	4.80	0.00	0.80
11-Sep-01	23.70	27.10	82.00	97.00	20.80	0.00	0.50
12-Sep-01	24.30	28.30	84.00	97.00	52.00	0.90	0.40
13-Sep-01	23.20	32.10	64.00	94.00	0.00	6.90	1.40
14-Sep-01	24.50	33.10	60.00	87.00	0.00	9.70	1.70
15-Sep-01	25.00	33.70	59.00	91.00	0.00	8.20	1.70
16-Sep-01	26.00	31.30	69.00	88.00	0.20	5.00	1.70
17-Sep-01	23.70	32.50	65.00	93.00	0.00	7.80	1.50
18-Sep-01	25.50	32.60	69.00	91.00	0.00	6.60	1.30
19-Sep-01	25.00	33.20	62.00	91.00	0.40	7.80	1.90
20-Sep-01	24.70	32.80	60.00	90.00	0.00	6.90	1.60
21-Sep-01	24.00	30.60	66.00	92.00	6.80	1.80	1.00
22-Sep-01	24.40	31.80	68.00	89.00	44.80	4.90	1.30
23-Sep-01	23.40	31.70	65.00	97.00	0.60	8.20	1.40
24-Sep-01	24.40	31.80	59.00	94.00	20.90	5.50	1.10
25-Sep-01	24.20	31.80	61.00	93.00	0.00	8.70	1.80
26-Sep-01	25.20	33.50	55.00	85.00	0.00	9.70	1.60

27-Sep-01	24.60	33.50	55.00	90.00	0.00	8.80	1.70
28-Sep-01	24.50	33.40	59.00	85.00	2.70	8.80	1.90
29-Sep-01	24.10	32.40	61.00	91.00	0.00	5.30	1.40
30-Sep-01	25.20	32.00	63.00	88.00	41.40	3.60	1.30
01-Oct-01	24.10	33.20	58.00	91.00	14.40	8.20	2.20
02-Oct-01	24.40	33.50	63.00	93.00	0.00	8.70	1.80
03-Oct-01	23.80	31.00	69.00	93.00	6.20	4.80	1.00
04-Oct-01	23.20	32.90	59.00	92.00	9.20	8.60	1.90
05-Oct-01	24.20	31.90	65.00	93.00	11.20	5.90	1.40
06-Oct-01	24.00	31.80	60.00	90.00	0.00	6.10	1.00
07-Oct-01	24.00	32.40	60.00	86.00	5.00	6.40	1.70
08-Oct-01	23.50	31.80	62.00	91.00	7.00	7.70	1.50
09-Oct-01	23.90	31.00	67.00	90.00	0.00	6.90	1.20
10-Oct-01	24.00	31.90	68.00	92.00	0.00	6.10	1.30
11-Oct-01	24.40	32.40	59.00	92.00	6.90	8.30	1.30
12-Oct-01	23.80	32.80	59.00	95.00	0.60	7.60	1.00
13-Oct-01	24.90	32.00	71.00	93.00	2.20	4.20	1.10
14-Oct-01	24.60	33.20	55.00	94.00	0.00	7.40	1.30
15-Oct-01	25.50	33.80	55.00	90.00	0.00	9.00	1.70
16-Oct-01	23.60	33.60	53.00	86.00	0.00	8.90	1.80
17-Oct-01	23.70	33.40	41.00	88.00	0.00	10.40	1.80
18-Oct-01	22.00	33.70	48.00	87.00	0.00	9.60	1.50
19-Oct-01	23.40	31.20	61.00	85.00	0.00	6.20	1.70
20-Oct-01	23.00	28.60	72.00	83.00	0.00	0.00	1.10
21-Oct-01	23.40	30.00	64.00	89.00	10.00	1.80	0.90
22-Oct-01	22.50	27.70	87.00	96.00	15.40	0.00	0.60
23-Oct-01	24.00	32.20	62.00	92.00	0.10	6.00	0.60
24-Oct-01	23.80	33.20	61.00	97.00	0.00	7.10	0.90
25-Oct-01	24.00	33.10	55.00	92.00	0.00	7.90	1.40

26-Oct-01	23.60	33.70	57.00	92.00	0.00	9.10	1.40
27-Oct-01	24.60	34.00	56.00	90.00	10.00	9.60	1.20
28-Oct-01	24.20	33.80	65.00	92.00	0.80	7.10	1.20
29-Oct-01	22.30	33.30	46.00	91.00	0.00	9.90	1.60
30-Oct-01	23.10	33.50	46.00	89.00	0.20	10.30	1.40
31-Oct-01	24.40	33.70	56.00	93.00	17.00	8.20	1.20
01-Nov-01	24.40	33.40	62.00	93.00	2.70	8.20	1.20
02-Nov-01	24.80	32.80	59.00	88.00	12.10	8.00	0.90
03-Nov-01	24.40	33.60	53.00	91.00	0.00	9.80	1.60
04-Nov-01	24.60	34.40	48.00	87.00	0.00	10.50	1.50
05-Nov-01	22.70	34.50	55.00	89.00	0.00	9.50	1.60
06-Nov-01	23.50	32.60	55.00	84.00	0.00	8.30	2.20
07-Nov-01	23.20	31.40	55.00	87.00	0.00	7.10	2.30
08-Nov-01	22.00	31.80	53.00	87.00	0.00	7.30	2.00
09-Nov-01	21.90	29.70	54.00	81.00	0.00	7.20	2.70
10-Nov-01	21.60	29.20	54.00	81.00	0.00	6.90	1.90
11-Nov-01	18.80	27.70	52.00	83.00	0.00	7.60	3.00
12-Nov-01	20.20	21.80	77.00	90.00	12.20	0.00	0.50
13-Nov-01	19.20	22.90	84.00	94.00	7.80	0.00	0.50
14-Nov-01	21.00	26.80	55.00	95.00	0.30	2.70	4.10
15-Nov-01	20.20	27.40	49.00	67.00	0.00	6.70	7.00
16-Nov-01	18.60	28.70	49.00	79.00	0.00	9.20	5.80
17-Nov-01	17.40	30.10	50.00	77.00	0.00	9.10	5.40
18-Nov-01	17.60	28.70	47.00	83.00	0.00	6.40	5.80
19-Nov-01	18.40	29.30	45.00	72.00	0.00	8.70	5.90
20-Nov-01	17.80	27.80	47.00	78.00	0.00	7.70	6.50
21-Nov-01	17.60	28.70	40.00	80.00	0.00	8.60	5.20
22-Nov-01	16.30	29.10	40.00	75.00	0.00	9.40	4.50
23-Nov-01	17.70	29.60	45.00	83.00	0.00	7.60	3.30

24-Nov-01	19.60	30.00	52.00	85.00	0.00	5.00	3.70
25-Nov-01	18.50	30.20	33.00	87.00	0.00	9.30	4.30
26-Nov-01	16.50	29.30	35.00	77.00	0.00	8.70	4.70
27-Nov-01	18.40	29.20	48.00	80.00	0.00	8.30	4.60
28-Nov-01	18.10	31.70	38.00	90.00	0.00	10.20	3.70
29-Nov-01	17.40	32.20	33.00	94.00	0.00	9.70	3.70
30-Nov-01	18.90	33.60	39.00	95.00	0.00	10.00	4.00
01-Dec-01	21.50	33.20	40.00	89.00	0.00	9.90	3.80
02-Dec-01	21.70	33.50	37.00	85.00	0.00	9.40	4.30
03-Dec-01	19.70	32.90	38.00	91.00	0.00	9.00	5.30
04-Dec-01	19.80	32.70	44.00	86.00	0.00	10.20	3.10
05-Dec-01	20.80	33.60	43.00	94.00	0.00	9.90	3.50
06-Dec-01	21.70	33.80	40.00	90.00	0.00	10.40	4.90
07-Dec-01	20.00	32.50	42.00	90.00	0.00	9.00	4.50
08-Dec-01	19.70	30.70	47.00	81.00	0.00	8.00	6.20
09-Dec-01	19.80	29.60	55.00	90.00	0.00	8.40	4.90
10-Dec-01	22.00	25.70	67.00	89.00	0.20	0.00	1.90
11-Dec-01	20.50	30.80	59.00	95.00	1.80	3.30	1.90
12-Dec-01	23.10	33.80	52.00	95.00	3.60	7.80	3.00
13-Dec-01	22.40	32.30	53.00	91.00	0.00	5.00	4.60
14-Dec-01	21.60	30.50	48.00	78.00	0.00	10.20	6.70
15-Dec-01	18.50	31.50	47.00	84.00	0.00	8.80	5.90
16-Dec-01	21.00	27.90	62.00	81.00	0.00	0.10	2.00
17-Dec-01	21.40	34.20	44.00	92.00	0.00	8.30	4.10
18-Dec-01	22.70	34.40	50.00	85.00	0.20	7.70	3.50
19-Dec-01	21.50	32.00	46.00	86.00	0.00	7.30	6.40
20-Dec-01	21.50	31.50	48.00	78.00	0.00	6.70	5.60
21-Dec-01	20.90	29.20	54.00	78.00	0.00	9.50	7.10
22-Dec-01	17.20	25.70	53.00	68.00	0.00	8.90	7.30

23-Dec-01	14.50	26.80	52.00	73.00	0.00	7.80	5.00
24-Dec-01	14.10	28.20	41.00	85.00	0.00	9.60	4.60
25-Dec-01	14.80	28.70	44.00	89.00	0.00	9.20	5.00
26-Dec-01	16.80	30.70	47.00	82.00	0.00	9.20	4.70
27-Dec-01	16.90	31.70	45.00	90.00	0.00	9.20	5.70
28-Dec-01	18.00	31.30	44.00	90.00	0.00	9.90	6.30
29-Dec-01	17.80	27.50	48.00	78.00	0.00	10.30	6.50
30-Dec-01	14.20	28.10	37.00	91.00	0.00	10.00	3.80
31-Dec-01	14.70	29.40	35.00	94.00	0.00	9.70	3.90
01-Jan-02	15.20	30.50	34.00	88.00	0.00	9.40	5.70
02-Jan-02	16.40	28.70	36.00	85.00	0.00	7.00	7.80
03-Jan-02	15.60	29.00	41.00	80.00	0.00	6.90	5.00
04-Jan-02	16.50	30.50	40.00	86.00	0.00	8.30	5.40
05-Jan-02	16.00	30.50	36.00	90.00	0.00	9.90	5.00
06-Jan-02	15.70	30.20	36.00	89.00	0.00	10.10	5.00
07-Jan-02	17.00	30.80	35.00	85.00	0.00	9.80	5.40
08-Jan-02	16.40	30.80	34.00	85.00	0.00	10.20	5.90
09-Jan-02	16.20	30.50	30.00	87.00	0.00	10.00	4.70
10-Jan-02	17.00	32.00	32.00	80.00	0.00	9.60	4.70
11-Jan-02	20.10	32.00	35.00	85.00	0.00	9.80	4.60
12-Jan-02	18.70	32.90	33.00	86.00	0.00	10.00	4.70
13-Jan-02	19.40	32.50	37.00	87.00	0.00	8.90	5.20
14-Jan-02	21.00	29.00	52.00	77.00	0.00	4.90	3.10
15-Jan-02	18.00	33.30	37.00	91.00	0.00	9.80	4.30
16-Jan-02	18.90	35.00	27.00	95.00	0.00	9.60	5.50
17-Jan-02	19.10	35.00	28.00	96.00	0.00	9.50	5.70
18-Jan-02	19.60	35.50	27.00	90.00	0.00	9.80	5.20
19-Jan-02	20.50	36.20	35.00	75.00	0.00	9.80	5.30
20-Jan-02	22.80	35.70	34.00	88.00	0.00	9.60	6.60

21-Jan-02	21.80	33.80	39.00	85.00	0.00		9.60	5.50
22-Jan-02	18.40	33.20	39.00	81.00	0.00		9.90	6.10
23-Jan-02	17.40	32.50	33.00	89.00	0.00		10.20	5.20
24-Jan-02	18.20	33.10	34.00	88.00	0.00		10.30	5.20
25-Jan-02	18.80	35.20	31.00	91.00	0.00		9.90	5.60
26-Jan-02	19.50	36.40	24.00	78.00	0.00		10.00	7.30
27-Jan-02	20.60	33.70	36.00	80.00	0.00		10.00	6.80
28-Jan-02	19.70	34.30	37.00	82.00	0.00		10.00	6.20
29-Jan-02	18.30	32.70	35.00	77.00	0.00		8.10	6.60
30-Jan-02	17.90	33.00	33.00	78.00	0.00		9.70	6.00
31-Jan-02	18.50	32.60	33.00	81.00	0.00		9.50	6.00
01-Feb-02	18.10	32.20	35.00	81.00	0.00		10.30	5.80
02-Feb-02	18.00	31.80	35.00	80.00	0.00		9.40	4.60
03-Feb-02	17.10	33.00	36.00	90.00	0.00		9.50	4.90
04-Feb-02	19.70	33.60	36.00	82.00	0.00		9.50	4.90
05-Feb-02	21.90	33.00	40.00	78.00	0.00		8.50	5.50
06-Feb-02	21.00	31.50	42.00	81.00	0.00		8.70	5.10
07-Feb-02	21.70	34.30	38.00	75.00	0.00		8.90	6.30
08-Feb-02	21.70	33.60	39.00	71.00	0.00		8.40	6.40
09-Feb-02	23.30	33.50	41.00	74.00	0.00		8.30	6.70
10-Feb-02	22.30	34.20	38.00	76.00	0.00		8.20	6.60
11-Feb-02	20.40	34.80	31.00	82.00	0.00		10.20	6.50
12-Feb-02	21.20	34.60	26.00	73.00	0.00		10.10	7.40
13-Feb-02	21.00	34.40	29.00	69.00	0.00		10.50	6.90
14-Feb-02	21.00	35.80	26.00	72.00	0.00		10.10	6.90
15-Feb-02	20.70	34.60	27.00	68.00	0.00		10.40	7.50
16-Feb-02	19.80	35.00	28.00	80.00	0.00		10.20	6.80
17-Feb-02	20.00	34.20	22.00	81.00	0.00		10.10	7.40
18-Feb-02	19.00	33.60	31.00	79.00	0.00		9.50	6.60

19-Feb-02	19.20	33.40	34.00	83.00	0.00	10.00	6.30
20-Feb-02	19.70	35.10	28.00	72.00	0.00	9.30	7.40
21-Feb-02	21.50	35.20	29.00	82.00	0.00	10.10	6.60
22-Feb-02	24.10	36.20	20.00	70.00	0.00	9.80	6.00
23-Feb-02	23.70	36.00	29.00	70.00	0.00	9.70	6.50
24-Feb-02	24.40	36.20	33.00	68.00	0.00	9.00	7.60
25-Feb-02	23.00	34.80	35.00	71.00	0.00	9.20	6.20
26-Feb-02	23.90	36.00	32.00	69.00	0.00	8.80	6.90
27-Feb-02	24.00	34.60	35.00	71.00	0.00	8.60	8.30
28-Feb-02	24.20	35.50	42.00	64.00	0.00	8.20	6.60
01-Mar-02	25.20	35.00	36.00	58.00	0.00	8.20	8.10
02-Mar-02	25.20	33.20	43.00	60.00	0.00	3.50	6.00
03-Mar-02	24.20	34.80	37.00	73.00	0.00	8.80	5.30
04-Mar-02	23.20	34.70	35.00	72.00	0.00	8.50	6.60
05-Mar-02	23.80	35.90	35.00	68.00	0.00	9.10	7.80
06-Mar-02	23.80	34.40	34.00	67.00	0.00	6.30	7.40
07-Mar-02	18.60	30.80	39.00	59.00	0.00	4.50	8.00
08-Mar-02	20.10	31.00	35.00	66.00	0.00	3.70	6.70
09-Mar-02	20.40	34.60	33.00	74.00	0.00	8.70	7.60
10-Mar-02	24.20	35.60	31.00	67.00	0.00	9.30	6.90
11-Mar-02	24.90	36.40	30.00	64.00	0.00	9.00	6.80
12-Mar-02	24.20	36.10	35.00	70.00	0.00	8.90	7.50
13-Mar-02	25.30	35.30	40.00	69.00	0.00	8.20	6.60
14-Mar-02	26.30	36.30	40.00	74.00	0.00	7.60	6.30
15-Mar-02	26.20	38.80	32.00	75.00	0.00	8.70	7.90
16-Mar-02	26.70	37.10	42.00	70.00	0.00	8.50	6.60
17-Mar-02	27.10	35.50	46.00	76.00	0.00	4.50	6.60
18-Mar-02	24.70	36.30	29.00	70.00	0.00	8.10	8.20
19-Mar-02	23.00	36.50	29.00	72.00	0.00	9.60	6.60

20-Mar-02	24.00	37.30	30.00	70.00	0.00	9.10	7.90
21-Mar-02	25.30	37.70	30.00	62.00	0.00	9.30	7.10
22-Mar-02	26.20	35.30	45.00	69.00	0.00	8.30	6.50
23-Mar-02	27.10	37.40	41.00	73.00	12.00	7.30	6.60
24-Mar-02	24.20	32.60	58.00	92.00	0.00	3.10	4.10
25-Mar-02	24.50	35.50	43.00	83.00	0.00	7.10	4.30
26-Mar-02	25.80	35.90	44.00	96.00	0.00	8.50	6.20
27-Mar-02	27.30	33.30	60.00	78.00	0.00	6.30	5.90
28-Mar-02	27.40	36.50	42.00	74.00	0.00	8.30	6.00
29-Mar-02	26.70	37.00	45.00	76.00	14.30	6.40	6.00
30-Mar-02	23.60	37.50	42.00	86.00	0.00	8.40	5.40
31-Mar-02	24.10	34.00	52.00	93.00	8.70	7.20	5.00
01-Apr-02	23.90	36.20	44.00	81.00	0.00	10.50	5.50
02-Apr-02	27.00	36.70	35.00	60.00	0.00	9.50	7.00
03-Apr-02	26.20	37.60	37.00	64.00	0.00	10.40	6.40
04-Apr-02	26.30	37.80	32.00	67.00	0.00	9.40	7.60
05-Apr-02	27.00	37.00	39.00	73.00	0.00	8.60	6.50
06-Apr-02	27.50	38.00	32.00	70.00	0.00	9.90	7.80
07-Apr-02	27.40	39.50	23.00	70.00	0.00	9.40	9.10
08-Apr-02	27.70	33.50	53.00	71.00	0.00	6.00	5.30
09-Apr-02	26.20	37.00	41.00	83.00	0.00	6.10	6.30
10-Apr-02	26.20	35.50	44.00	77.00	0.70	8.60	6.60
11-Apr-02	26.00	31.60	58.00	83.00	1.30	1.90	3.70
12-Apr-02	21.90	32.50	44.00	72.00	0.00	1.80	6.10
13-Apr-02	21.80	36.60	33.00	72.00	0.00	10.40	6.80
14-Apr-02	26.00	37.30	35.00	69.00	0.00	10.90	7.90
15-Apr-02	25.90	36.20	42.00	67.00	0.00	6.70	6.20
16-Apr-02	27.30	37.80	39.00	76.00	0.00	8.30	6.50
17-Apr-02	27.70	34.40	52.00	70.00	0.00	5.00	4.70

18-Apr-02	24.80	36.80	38.00	78.00	0.00	9.90	7.90
19-Apr-02	26.20	38.80	37.00	65.00	0.00	8.80	6.20
20-Apr-02	27.20	38.70	34.00	65.00	0.00	10.00	7.20
21-Apr-02	27.10	38.50	35.00	62.00	0.00	8.20	7.30
22-Apr-02	27.60	38.40	39.00	68.00	0.00	9.90	7.50
23-Apr-02	26.70	37.90	36.00	67.00	6.20	7.90	6.00
24-Apr-02	25.00	37.30	35.00	79.00	0.00	9.00	5.50
25-Apr-02	24.80	35.70	51.00	86.00	14.70	3.60	2.70
26-Apr-02	24.00	33.20	50.00	86.00	0.10	5.30	3.40
27-Apr-02	25.30	36.00	44.00	77.00	0.00	11.00	5.60
28-Apr-02	26.20	36.20	45.00	75.00	0.00	8.20	5.90
29-Apr-02	27.30	35.00	52.00	75.00	0.00	6.10	5.40
30-Apr-02	25.90	37.00	35.00	79.00	0.00	10.50	8.20
01-May-02	27.00	36.00	47.00	78.00	0.00	6.40	5.40
02-May-02	25.80	38.40	36.00	74.00	0.00	10.70	8.30
03-May-02	26.60	37.20	40.00	73.00	0.00	10.70	6.60
04-May-02	27.50	36.60	39.00	62.00	0.00	8.00	6.00
05-May-02	26.80	38.20	38.00	62.00	0.00	8.80	6.70
06-May-02	26.80	38.00	39.00	73.00	0.00	9.80	7.10
07-May-02	28.40	32.20	54.00	76.00	0.50	3.30	4.20
08-May-02	25.70	37.00	43.00	82.00	8.40	7.10	5.10
09-May-02	26.70	34.50	54.00	84.00	0.00	6.60	5.00
10-May-02	27.50	37.20	44.00	78.00	30.80	7.80	4.50
11-May-02	24.30	33.70	50.00	79.00	0.00	6.20	3.70
12-May-02	26.80	33.60	51.00	82.00	20.80	9.40	2.80
13-May-02	25.00	34.40	53.00	89.00	0.80	8.60	2.20
14-May-02	26.00	33.00	65.00	87.00	3.30	5.30	1.60
15-May-02	25.60	35.00	49.00	87.00	0.00	9.60	2.50
16-May-02	27.50	33.30	75.00	83.00	6.40	4.10	1.60

17-May-02	25.00	34.00	49.00	90.00	0.70	9.50	2.30
18-May-02	25.50	34.20	51.00	87.00	3.00	6.00	2.30
19-May-02	26.40	33.70	50.00	81.00	0.20	8.80	3.50
20-May-02	26.00	33.30	59.00	84.00	0.40	4.60	2.20
21-May-02	25.20	33.60	56.00	86.00	0.00	6.70	2.30
22-May-02	27.00	34.60	56.00	85.00	1.20	6.50	2.30
23-May-02	26.50	35.20	50.00	87.00	12.60	8.60	2.30
24-May-02	25.00	32.90	60.00	94.00	14.00	1.30	1.30
25-May-02	24.70	32.80	68.00	90.00	6.10	5.10	1.20
26-May-02	23.70	30.80	67.00	91.00	0.00	5.80	1.50
27-May-02	25.00	33.00	55.00	92.00	3.90	6.00	1.70
28-May-02	23.80	32.60	66.00	91.00	0.00	6.40	1.80
29-May-02	25.00	32.40	64.00	87.00	1.90	5.70	1.40
30-May-02	25.90	32.10	66.00	85.00	10.80	5.10	1.40
31-May-02	25.50	32.50	61.00	87.00	0.00	4.30	2.50
01-Jun-02	26.40	32.20	69.00	88.00	1.10	1.60	1.80
02-Jun-02	25.20	34.90	54.00	85.00	15.10	8.80	2.00
03-Jun-02	24.20	30.50	76.00	92.00	6.30	3.40	1.40
04-Jun-02	25.10	31.80	65.00	88.00	0.00	4.70	1.80
05-Jun-02	25.90	32.40	66.00	88.00	2.60	6.60	2.00
06-Jun-02	26.00	31.70	64.00	86.00	1.40	4.00	1.60
07-Jun-02	25.20	32.40	64.00	88.00	2.20	8.10	2.20
08-Jun-02	25.80	32.90	63.00	82.00	0.00	7.80	2.70
09-Jun-02	25.60	32.20	64.00	85.00	0.00	4.80	2.30
10-Jun-02	24.50	31.40	65.00	85.00	1.70	1.50	1.50
11-Jun-02	24.60	31.30	63.00	91.00	0.00	1.20	2.30
12-Jun-02	26.50	32.80	56.00	82.00	7.80	2.70	1.60
13-Jun-02	24.40	32.40	63.00	92.00	0.00	1.90	1.80
14-Jun-02	25.00	33.50	56.00	88.00	3.20	4.20	2.40

15-Jun-02	26.80	35.00	54.00	86.00	0.00	8.50	2.70
16-Jun-02	25.40	34.40	55.00	88.00	0.70	9.10	2.40
17-Jun-02	25.90	32.00	57.00	94.00	6.60	7.00	1.10
18-Jun-02	26.70	33.70	54.00	90.00	1.20	3.80	1.40
19-Jun-02	25.40	30.50	74.00	93.00	1.40	6.70	0.80
20-Jun-02	24.70	33.20	62.00	92.00	81.10	2.00	1.10
21-Jun-02	24.20	33.00	70.00	96.00	59.10	3.40	0.70
22-Jun-02	23.50	30.50	71.00	96.00	203.30	4.40	0.50
23-Jun-02	24.00	24.70	95.00	100.00	174.80	4.10	0.30
24-Jun-02	24.50	31.00	67.00	93.00	21.70	0.00	0.80
25-Jun-02	23.80	32.30	59.00	94.00	1.40	4.80	0.90
26-Jun-02	25.00	33.50	59.00	92.00	0.00	5.80	1.60
27-Jun-02	25.80	33.00	63.00	86.00	1.50	10.20	1.40
28-Jun-02	26.00	30.20	74.00	91.00	10.50	8.90	0.60
29-Jun-02	25.30	33.30	61.00	91.00	0.10	0.30	1.50
30-Jun-02	26.00	34.20	63.00	89.00	0.50	8.10	1.40
01-Jul-02	26.60	33.50	64.00	88.00	2.70	3.40	1.20
02-Jul-02	25.90	32.00	72.00	97.00	58.00	1.70	0.70
03-Jul-02	23.60	27.70	84.00	97.00	6.60	0.00	0.40
04-Jul-02	25.20	30.70	78.00	93.00	46.50	1.70	0.60
05-Jul-02	24.50	32.50	64.00	96.00	78.60	4.50	1.60
06-Jul-02	24.00	30.40	74.00	93.00	22.80	0.50	1.80
07-Jul-02	24.40	30.30	75.00	90.00	43.00	0.50	1.30
08-Jul-02	25.20	32.80	62.00	95.00	50.60	6.10	2.70
09-Jul-02	24.00	28.30	79.00	93.00	11.40	0.00	1.20
10-Jul-02	25.80	30.70	78.00	92.00	32.90	2.00	1.40
11-Jul-02	25.80	33.80	67.00	92.00	2.70	7.20	3.10
12-Jul-02	24.40	32.50	55.00	89.00	1.90	7.60	4.10
13-Jul-02	25.50	33.50	56.00	90.00	23.40	8.60	2.60

14-Jul-02	25.40	32.70	67.00	93.00	53.60	5.60	2.10
15-Jul-02	24.10	30.00	76.00	96.00	15.50	1.30	1.70
16-Jul-02	24.70	30.30	79.00	92.00	10.40	1.30	1.50
17-Jul-02	24.00	30.50	70.00	87.00	6.40	6.60	2.50
18-Jul-02	25.10	30.80	62.00	88.00	10.40	9.70	3.20
19-Jul-02	24.90	33.80	52.00	90.00	0.00	9.90	4.20
20-Jul-02	25.00	33.50	55.00	84.00	0.00	5.30	3.00
21-Jul-02	26.00	33.30	49.00	84.00	0.00	10.10	3.60
22-Jul-02	24.40	33.70	50.00	94.00	6.70	9.70	3.30
23-Jul-02	24.00	32.20	60.00	95.00	2.60	4.90	2.90
24-Jul-02	24.40	30.60	71.00	88.00	2.20	7.10	2.50
25-Jul-02	25.10	33.80	54.00	92.00	0.00	9.70	4.30
26-Jul-02	25.50	32.80	60.00	88.00	13.40	6.80	3.40
27-Jul-02	25.60	32.50	64.00	92.00	36.00	4.70	1.90
28-Jul-02	23.50	28.10	85.00	96.00	50.30	0.00	1.00
29-Jul-02	24.20	27.50	89.00	97.00	26.30	0.00	1.00
30-Jul-02	23.70	29.50	75.00	91.00	4.20	1.90	1.70
31-Jul-02	23.90	32.10	66.00	90.00	4.70	6.30	2.80
01-Aug-02	25.00	32.50	63.00	94.00	2.80	7.20	2.50
02-Aug-02	24.60	32.70	62.00	88.00	7.40	9.40	3.10
03-Aug-02	23.50	31.40	65.00	96.00	0.20	4.60	3.00
04-Aug-02	25.50	32.50	67.00	92.00	12.10	4.40	2.20
05-Aug-02	25.00	31.30	64.00	87.00	1.40	2.50	2.50
06-Aug-02	25.20	31.00	66.00	88.00	0.10	2.10	3.40
07-Aug-02	25.20	31.70	62.00	90.00	0.70	1.60	2.90
08-Aug-02	24.50	31.30	65.00	91.00	3.70	4.10	2.20
09-Aug-02	24.60	31.00	65.00	93.00	3.40	3.30	2.90
10-Aug-02	24.20	32.50	62.00	93.00	0.00	5.40	3.10
11-Aug-02	24.80	31.00	65.00	92.00	7.50	3.00	2.30

12-Aug-02	24.50	30.60	77.00	97.00	55.20	1.40	1.70
13-Aug-02	23.50	29.50	79.00	99.00	108.80	1.60	1.00
14-Aug-02	24.30	25.90	92.00	96.00	61.90	0.00	0.50
15-Aug-02	24.50	28.50	85.00	96.00	14.60	0.00	0.60
16-Aug-02	24.50	30.50	70.00	91.00	7.20	0.80	2.50
17-Aug-02	25.00	26.80	83.00	90.00	127.40	0.00	1.10
18-Aug-02	23.90	25.40	89.00	96.00	13.20	0.00	0.70
19-Aug-02	24.00	27.00	80.00	98.00	21.80	0.60	1.00
20-Aug-02	24.00	29.50	77.00	96.00	75.40	2.20	1.30
21-Aug-02	23.50	28.90	75.00	96.00	0.70	2.00	1.10
22-Aug-02	24.50	31.00	60.00	92.00	0.00	3.40	2.30
23-Aug-02	25.30	32.50	63.00	90.00	14.70	5.00	2.00
24-Aug-02	25.00	33.00	64.00	90.00	0.00	9.20	2.70
25-Aug-02	25.50	32.40	60.00	92.00	6.90	6.60	3.40
26-Aug-02	24.30	31.80	63.00	93.00	0.00	5.80	2.90
27-Aug-02	25.50	33.30	66.00	89.00	78.00	10.50	4.10
28-Aug-02	24.80	31.30	66.00	98.00	9.50	5.50	1.60
29-Aug-02	25.00	32.80	59.00	91.00	4.50	7.70	2.80
30-Aug-02	24.50	27.50	82.00	96.00	6.60	0.00	1.20
31-Aug-02	25.40	30.50	73.00	93.00	3.60	2.00	2.30
01-Sep-02	24.60	29.00	71.00	94.00	3.40	1.70	1.90
02-Sep-02	24.00	31.00	72.00	95.00	0.30	3.40	1.50
03-Sep-02	25.20	30.00	78.00	92.00	2.50	1.70	0.90
04-Sep-02	24.70	31.80	65.00	93.00	5.00	4.40	0.80
05-Sep-02	24.00	30.50	68.00	96.00	0.20	3.70	1.00
06-Sep-02	25.00	30.00	74.00	92.00	0.20	1.70	0.80
07-Sep-02	25.20	31.30	68.00	97.00	42.50	3.30	1.00
08-Sep-02	23.70	31.90	63.00	97.00	10.20	8.40	1.10
09-Sep-02	24.50	28.70	82.00	97.00	7.70	1.30	0.40

10-Sep-02	24.00	30.60	74.00	97.00	20.70	1.80	0.60
11-Sep-02	24.00	29.00	70.00	98.00	4.40	0.40	0.50
12-Sep-02	24.50	28.80	79.00	94.00	0.40	0.50	0.70
13-Sep-02	25.00	30.70	75.00	89.00	11.50	4.00	1.00
14-Sep-02	25.40	30.20	72.00	94.00	0.00	0.80	0.90
15-Sep-02	25.50	30.50	64.00	89.00	0.40	0.20	1.10
16-Sep-02	24.50	28.30	85.00	95.00	10.30	0.00	0.50
17-Sep-02	24.00	29.60	70.00	96.00	16.70	2.20	0.60
18-Sep-02	24.70	30.50	66.00	95.00	14.60	3.20	0.60
19-Sep-02	24.80	29.20	77.00	92.00	52.00	1.50	0.50
20-Sep-02	23.90	27.70	86.00	98.00	9.40	0.00	0.30
21-Sep-02	24.40	30.30	71.00	94.00	0.20	1.70	0.80
22-Sep-02	24.20	32.70	61.00	94.00	8.90	7.40	0.90
23-Sep-02	24.40	30.50	68.00	97.00	0.00	0.60	1.20
24-Sep-02	24.50	30.50	70.00	87.00	0.00	1.70	1.00
25-Sep-02	25.00	31.70	58.00	92.00	3.10	6.60	1.10
26-Sep-02	24.80	30.80	67.00	93.00	3.60	3.50	0.90
27-Sep-02	24.70	32.80	66.00	91.00	1.00	7.30	1.20
28-Sep-02	24.00	32.70	62.00	94.00	2.00	6.80	1.10
29-Sep-02	22.60	32.50	60.00	96.00	4.00	9.70	0.90
30-Sep-02	24.00	32.50	64.00	84.00	0.00	10.10	1.30
01-Oct-02	25.50	32.30	62.00	87.00	0.00	9.50	1.20
02-Oct-02	24.50	32.60	63.00	91.00	0.00	8.30	1.00
03-Oct-02	24.30	32.30	60.00	95.00	28.80	7.70	1.30
04-Oct-02	24.40	31.70	59.00	93.00	0.00	5.20	0.90
05-Oct-02	24.50	33.80	60.00	85.00	0.00	5.20	1.20
06-Oct-02	24.60	31.50	72.00	95.00	65.20	9.80	0.60
07-Oct-02	23.20	29.20	62.00	89.00	0.00	5.00	2.10
08-Oct-02	22.20	29.80	58.00	74.00	0.00	2.90	2.10

09-Oct-02	20.10	31.20	46.00	71.00	0.00	5.10	2.90
10-Oct-02	19.00	30.70	46.00	76.00	0.00	9.40	1.90
11-Oct-02	20.00	31.40	55.00	83.00	0.00	10.20	1.30
12-Oct-02	21.50	31.60	50.00	87.00	0.00	10.20	1.90
13-Oct-02	21.30	32.30	46.00	86.00	0.00	10.10	1.90
14-Oct-02	22.40	32.80	50.00	89.00	0.00	8.60	1.70
15-Oct-02	23.80	30.80	68.00	89.00	0.00	1.40	1.20
16-Oct-02	24.20	32.10	61.00	92.00	0.00	4.10	1.20
17-Oct-02	24.70	33.50	60.00	90.00	0.00	7.70	1.70
18-Oct-02	25.50	33.40	62.00	90.00	33.30	9.20	1.60
19-Oct-02	24.60	33.30	64.00	88.00	0.00	5.90	1.20
20-Oct-02	25.40	34.30	60.00	94.00	1.50	7.00	5.40
21-Oct-02	24.50	33.20	65.00	92.00	0.00	7.60	1.40
22-Oct-02	25.00	34.60	57.00	92.00	0.00	9.50	1.60
23-Oct-02	25.00	34.50	61.00	88.00	0.00	8.20	1.50
24-Oct-02	23.80	31.80	58.00	91.00	0.00	7.00	2.20
25-Oct-02	23.00	27.80	77.00	92.00	21.10	2.40	0.70
26-Oct-02	23.60	32.90	58.00	95.00	0.00	5.30	0.90
27-Oct-02	23.50	33.20	55.00	93.00	0.00	8.50	1.40
28-Oct-02	23.60	33.80	55.00	88.00	0.00	9.40	1.70
29-Oct-02	24.50	34.20	53.00	85.00	15.70	8.80	1.30
30-Oct-02	24.00	33.40	58.00	91.00	0.00	10.00	1.60
31-Oct-02	24.20	33.30	61.00	86.00	11.10	7.30	1.10
01-Nov-02	23.50	32.30	66.00	96.00	0.00	5.80	1.10
02-Nov-02	22.80	32.30	55.00	87.00	0.00	5.80	2.40
03-Nov-02	21.60	30.50	55.00	78.00	0.00	6.00	2.20
04-Nov-02	20.40	28.50	49.00	67.00	0.00	9.00	3.40
05-Nov-02	19.00	30.30	49.00	77.00	0.00	9.60	2.80
06-Nov-02	18.40	31.40	53.00	85.00	0.00	7.90	2.30

07-Nov-02	21.50	30.20	54.00	82.00	0.00	7.20	2.20
08-Nov-02	21.50	29.30	60.00	77.00	0.00	1.50	2.40
09-Nov-02	19.80	32.00	53.00	85.00	0.00	8.80	2.20
10-Nov-02	19.50	32.00	52.00	88.00	0.00	6.80	1.70
11-Nov-02	23.20	33.30	53.00	89.00	0.80	5.30	1.10
12-Nov-02	24.20	34.70	53.00	92.00	0.50	9.60	1.40
13-Nov-02	23.60	34.50	56.00	93.00	0.00	8.90	1.60
14-Nov-02	24.40	34.50	53.00	96.00	0.00	9.80	2.10
15-Nov-02	25.00	34.00	53.00	89.00	0.00	7.50	1.60
16-Nov-02	24.90	33.60	61.00	88.00	0.00	6.40	1.50
17-Nov-02	23.40	32.50	56.00	86.00	0.00	10.70	2.50
18-Nov-02	21.80	33.20	53.00	77.00	0.00	9.70	1.90
19-Nov-02	21.40	33.00	55.00	89.00	0.00	8.20	1.80
20-Nov-02	22.60	34.40	50.00	87.00	0.00	9.40	1.90
21-Nov-02	22.50	33.00	55.00	87.00	0.00	4.90	2.00
22-Nov-02	22.30	33.10	50.00	85.00	0.00	7.40	2.20
23-Nov-02	22.20	33.80	42.00	83.00	0.00	9.80	2.40
24-Nov-02	21.50	33.70	40.00	90.00	0.00	9.40	2.20
25-Nov-02	21.80	32.50	50.00	80.00	0.00	6.90	2.30
26-Nov-02	21.50	31.20	48.00	81.00	0.00	6.90	2.50
27-Nov-02	19.50	32.40	45.00	90.00	0.00	10.00	2.20
28-Nov-02	20.20	33.40	40.00	88.00	0.00	8.40	2.10
29-Nov-02	21.00	34.50	45.00	92.00	0.00	9.00	1.90
30-Nov-02	23.80	33.70	57.00	91.00	0.00	7.30	1.80
01-Dec-02	24.50	33.40	60.00	89.00	0.00	4.50	1.40
02-Dec-02	24.40	34.50	54.00	91.00	0.40	9.10	1.70
03-Dec-02	23.50	35.00	50.00	94.00	0.00	9.80	1.90
04-Dec-02	23.50	35.60	42.00	91.00	0.00	9.00	2.20
05-Dec-02	24.30	35.70	42.00	86.00	0.00	9.50	2.30

06-Dec-02	25.00	36.20	49.00	89.00	0.00	8.80	2.20
07-Dec-02	24.90	35.50	51.00	85.00	0.00	9.70	1.90
08-Dec-02	24.50	34.20	54.00	87.00	0.30	4.90	2.20
09-Dec-02	22.50	29.00	44.00	62.00	0.00	7.70	3.10
10-Dec-02	17.40	32.40	43.00	84.00	0.00	9.70	2.20
11-Dec-02	19.80	33.70	42.00	86.00	0.00	10.60	2.30
12-Dec-02	19.90	32.20	45.00	81.00	0.00	10.20	2.00
13-Dec-02	18.10	32.50	46.00	83.00	0.00	8.70	2.00
14-Dec-02	19.60	33.50	48.00	86.00	0.00	6.30	2.00
15-Dec-02	20.60	34.40	41.00	89.00	0.00	9.10	2.00
16-Dec-02	21.30	34.00	45.00	87.00	0.00	6.70	2.00
17-Dec-02	21.40	35.00	44.00	92.00	0.00	9.20	2.30
18-Dec-02	22.70	35.70	42.00	89.00	0.00	9.80	2.30
19-Dec-02	23.00	36.00	41.00	83.00	0.00	9.50	2.40
20-Dec-02	23.80	35.00	48.00	85.00	0.00	10.00	2.30
21-Dec-02	24.00	28.80	70.00	89.00	1.90	2.00	0.80
22-Dec-02	20.90	34.20	44.00	92.00	0.00	9.60	2.20
23-Dec-02	21.50	33.60	45.00	87.00	0.00	9.80	2.60
24-Dec-02	20.50	33.50	40.00	90.00	0.00	10.20	2.40
25-Dec-02	22.20	34.50	43.00	85.00	0.00	5.90	2.10
26-Dec-02	21.50	34.40	45.00	88.00	0.00	10.30	2.90
27-Dec-02	19.00	31.00	46.00	79.00	0.00	9.20	2.90
28-Dec-02	17.40	31.60	42.00	84.00	0.00	8.80	2.40
29-Dec-02	19.00	32.70	42.00	83.00	0.00	7.50	2.40
30-Dec-02	20.70	30.80	52.00	78.00	0.00	2.10	1.70
31-Dec-02	19.90	33.50	38.00	86.00	0.00	10.20	2.50
01-Jan-03	20.70	33.50	47.00	82.00	0.00	9.50	3.00
02-Jan-03	22.00	33.50	39.00	78.00	0.00	10.50	3.10
03-Jan-03	20.70	30.80	43.00	77.00	0.00	9.70	3.70

04-Jan-03	17.10	32.40	43.00	83.00	0.00	9.10	2.80
05-Jan-03	18.50	32.80	42.00	88.00	0.00	10.30	2.90
06-Jan-03	19.80	33.50	42.00	90.00	0.00	9.20	3.20
07-Jan-03	16.00	29.80	37.00	78.00	0.00	10.20	3.90
08-Jan-03	15.30	30.20	33.00	78.00	0.00	10.00	2.90
09-Jan-03	15.90	29.50	34.00	84.00	0.00	9.70	3.40
10-Jan-03	16.50	29.40	39.00	74.00	0.00	6.60	3.00
11-Jan-03	14.90	28.20	35.00	85.00	0.00	8.60	3.10
12-Jan-03	13.80	28.10	34.00	80.00	0.00	9.70	2.90
13-Jan-03	13.90	29.10	36.00	84.00	0.00	8.60	2.70
14-Jan-03	14.90	31.20	38.00	92.00	0.00	9.10	2.40
15-Jan-03	17.30	32.00	34.00	91.00	0.00	8.60	4.00
16-Jan-03	18.50	31.40	34.00	77.00	0.00	8.30	3.70
17-Jan-03	17.30	32.20	31.00	86.00	0.00	9.90	2.80
18-Jan-03	18.50	32.20	33.00	81.00	0.00	9.70	3.40
19-Jan-03	18.10	30.90	30.00	78.00	0.00	9.80	3.30
20-Jan-03	17.00	30.20	30.00	87.00	0.00	10.00	3.50
21-Jan-03	17.00	31.20	28.00	80.00	0.00	10.30	2.80
22-Jan-03	15.40	31.50	37.00	85.00	0.00	9.30	3.60
23-Jan-03	19.80	30.50	49.00	81.00	0.00	7.90	3.00
24-Jan-03	21.20	30.00	49.00	77.00	0.00	8.20	3.30
25-Jan-03	21.40	31.70	44.00	80.00	0.00	9.10	2.90
26-Jan-03	20.00	33.20	39.00	90.00	0.00	8.50	2.40
27-Jan-03	21.80	34.00	28.00	82.00	0.00	9.10	4.60
28-Jan-03	18.00	32.20	35.00	74.00	0.00	10.00	3.30
29-Jan-03	17.80	31.80	30.00	83.00	0.00	9.70	3.20
30-Jan-03	18.00	32.40	30.00	83.00	0.00	9.90	2.70
31-Jan-03	19.30	33.80	30.00	82.00	0.00	9.90	3.10
01-Feb-03	19.50	34.60	29.00	80.00	0.00	9.70	3.40

02-Feb-03	20.90	33.80	33.00	84.00	0.00	9.90	3.40
03-Feb-03	19.60	33.40	32.00	79.00	0.00	9.10	3.70
04-Feb-03	19.50	28.20	49.00	70.00	0.00	10.20	4.00
05-Feb-03	17.50	26.50	42.00	72.00	0.00	10.40	4.10
06-Feb-03	16.10	29.50	33.00	78.00	0.00	10.30	3.60
07-Feb-03	15.80	31.70	30.00	75.00	0.00	10.10	2.80
08-Feb-03	17.90	33.10	34.00	74.00	0.00	9.80	3.00
09-Feb-03	19.30	34.80	30.00	72.00	0.00	9.50	4.40
10-Feb-03	21.60	35.20	36.00	81.00	0.00	8.90	3.50
11-Feb-03	24.30	36.50	34.00	74.00	0.00	9.70	4.10
12-Feb-03	25.00	35.70	40.00	71.00	0.00	9.00	3.70
13-Feb-03	22.00	36.00	35.00	86.00	0.00	9.60	3.30
14-Feb-03	22.50	35.80	35.00	80.00	0.00	10.40	5.10
15-Feb-03	24.00	35.60	38.00	73.00	0.00	8.00	4.40
16-Feb-03	24.60	36.00	35.00	77.00	0.00	9.20	5.10
17-Feb-03	26.00	33.10	50.00	79.00	0.00	7.20	4.50
18-Feb-03	24.20	33.80	40.00	77.00	0.00	5.90	4.00
19-Feb-03	25.00	35.80	39.00	76.00	2.20	8.90	4.00
20-Feb-03	23.60	33.50	48.00	83.00	0.00	9.20	4.60
21-Feb-03	24.00	35.40	33.00	77.00	0.00	8.50	5.30
22-Feb-03	24.40	35.00	40.00	64.00	0.00	7.20	5.00
23-Feb-03	25.50	33.10	48.00	72.00	0.00	7.90	3.40
24-Feb-03	25.00	36.00	42.00	76.00	0.00	8.90	4.90
25-Feb-03	25.90	34.00	46.00	68.00	0.00	5.90	4.40
26-Feb-03	25.00	34.10	39.00	68.00	0.00	3.60	3.80
27-Feb-03	24.50	36.00	41.00	79.00	0.00	8.50	4.90
28-Feb-03	24.80	36.00	38.00	62.00	0.00	9.50	4.60
01-Mar-03	25.50	36.80	48.00	71.00	0.00	7.80	5.00
02-Mar-03	27.00	33.50	51.00	75.00	0.00	7.00	4.20

03-Mar-03	26.50	34.90	48.00	78.00	0.00	4.60	4.60
04-Mar-03	26.50	34.20	43.00	78.00	0.20	5.60	2.50
05-Mar-03	26.80	35.50	42.00	76.00	0.00	8.20	3.90
06-Mar-03	26.90	37.30	38.00	77.00	0.00	9.50	3.80
07-Mar-03	27.50	36.50	44.00	73.00	0.00	8.50	4.00
08-Mar-03	22.80	32.60	41.00	70.00	0.00	4.60	3.40
09-Mar-03	21.30	33.50	38.00	73.00	0.00	8.00	4.00
10-Mar-03	20.20	34.40	34.00	72.00	0.00	9.50	3.60
11-Mar-03	20.80	35.50	33.00	73.00	0.00	9.20	3.40
12-Mar-03	25.50	36.50	33.00	68.00	6.50	9.50	3.20
13-Mar-03	24.40	35.70	28.00	72.00	0.00	9.70	3.30
14-Mar-03	23.70	32.40	39.00	76.00	0.00	4.90	3.10
15-Mar-03	24.40	35.00	33.00	75.00	0.00	7.70	3.60
16-Mar-03	21.80	36.00	36.00	72.00	0.00	9.60	5.10
17-Mar-03	25.20	37.00	35.00	76.00	0.00	8.40	4.60
18-Mar-03	25.30	36.70	37.00	81.00	5.00	8.80	5.50
19-Mar-03	23.10	34.80	42.00	86.00	0.00	8.00	3.70
20-Mar-03	20.10	35.60	48.00	94.00	3.00	8.70	4.10
21-Mar-03	23.50	33.40	45.00	91.00	0.00	6.60	3.10
22-Mar-03	22.50	35.40	44.00	90.00	6.30	8.50	2.60
23-Mar-03	23.00	35.50	37.00	83.00	0.00	10.10	2.60
24-Mar-03	22.50	35.80	45.00	87.00	0.00	8.10	3.00
25-Mar-03	23.10	35.50	39.00	95.00	1.90	8.50	2.70
26-Mar-03	24.00	35.00	44.00	89.00	0.00	6.40	3.60
27-Mar-03	25.30	37.00	39.00	95.00	0.00	8.80	4.10
28-Mar-03	25.20	36.70	41.00	89.00	1.00	10.00	3.90
29-Mar-03	23.00	32.00	55.00	95.00	0.00	5.40	3.20
30-Mar-03	24.90	34.50	45.00	89.00	11.70	9.00	4.00
31-Mar-03	24.20	30.50	67.00	88.00	1.10	4.00	2.00

01-Apr-03	25.30	33.90	53.00	89.00	0.00	4.10	3.00
02-Apr-03	24.00	34.00	56.00	92.00	1.60	5.70	1.90
03-Apr-03	25.60	37.00	41.00	83.00	0.00	8.10	4.90
04-Apr-03	26.50	38.20	41.00	82.00	0.10	10.50	4.40
05-Apr-03	26.00	37.00	51.00	78.00	0.00	6.70	3.30
06-Apr-03	25.60	35.50	49.00	78.00	0.00	9.10	4.80
07-Apr-03	27.00	37.70	45.00	80.00	0.00	9.20	4.00
08-Apr-03	28.00	37.70	46.00	75.00	0.00	8.80	4.50
09-Apr-03	27.50	31.70	64.00	78.00	0.00	1.20	2.90
10-Apr-03	27.20	34.50	51.00	79.00	0.00	5.50	3.60
11-Apr-03	26.70	37.30	41.00	80.00	0.00	8.80	4.20
12-Apr-03	27.50	37.50	37.00	71.00	0.00	9.70	6.10
13-Apr-03	28.10	37.70	43.00	72.00	0.00	9.90	5.90
14-Apr-03	27.80	37.90	39.00	74.00	0.00	8.60	4.50
15-Apr-03	27.00	33.10	40.00	70.00	0.00	10.00	4.70
16-Apr-03	26.30	37.20	37.00	73.00	0.00	9.20	5.80
17-Apr-03	27.00	37.70	35.00	67.00	0.00	8.30	5.50
18-Apr-03	26.50	37.40	35.00	69.00	0.00	10.70	5.80
19-Apr-03	26.00	36.00	46.00	78.00	0.00	5.60	4.90
20-Apr-03	24.00	35.40	46.00	87.00	2.50	8.20	4.40
21-Apr-03	24.00	38.50	36.00	88.00	0.00	9.90	6.10
22-Apr-03	26.50	35.90	41.00	77.00	0.00	7.50	4.40
23-Apr-03	26.20	37.90	35.00	74.00	7.60	10.10	5.60
24-Apr-03	24.40	29.10	70.00	94.00	3.30	0.10	1.70
25-Apr-03	24.20	36.00	39.00	92.00	0.00	8.80	4.50
26-Apr-03	24.50	34.40	58.00	92.00	0.00	8.70	5.10
27-Apr-03	25.00	36.20	38.00	80.00	0.00	9.10	7.20
28-Apr-03	25.80	36.30	42.00	82.00	0.00	7.20	5.10
29-Apr-03	24.50	37.30	38.00	87.00	4.90	8.30	4.90

30-Apr-03	24.20	36.20	39.00	88.00	0.00	11.10	6.30
01-May-03	23.50	36.50	39.00	71.00	0.00	9.30	4.40
02-May-03	26.50	34.70	49.00	77.00	0.70	8.40	8.60
03-May-03	24.80	28.60	74.00	96.00	100.00	0.80	1.30
04-May-03	23.70	33.40	58.00	88.00	0.00	10.50	3.10
05-May-03	24.60	34.60	54.00	83.00	0.00	10.30	6.50
06-May-03	28.00	36.30	48.00	77.00	0.00	11.10	3.60
07-May-03	28.30	37.70	45.00	84.00	0.00	10.80	4.20
08-May-03	26.00	36.00	47.00	78.00	0.00	10.60	6.40
09-May-03	25.50	36.20	44.00	82.00	0.00	7.90	3.20
10-May-03	27.50	36.80	43.00	81.00	0.00	9.20	3.70
11-May-03	27.20	36.20	44.00	88.00	0.30	7.90	2.20
12-May-03	25.50	35.80	41.00	93.00	5.40	5.30	3.30
13-May-03	25.50	35.90	50.00	96.00	28.40	7.40	2.80
14-May-03	24.30	33.30	58.00	94.00	0.00	9.70	2.40
15-May-03	26.60	34.50	59.00	88.00	3.60	9.30	3.10
16-May-03	26.50	34.30	59.00	93.00	3.30	5.60	2.60
17-May-03	26.00	34.20	56.00	92.00	0.00	3.30	2.40
18-May-03	26.00	35.30	48.00	81.00	0.00	7.50	3.30
19-May-03	27.00	37.00	40.00	96.00	47.00	8.90	4.10
20-May-03	23.00	34.00	56.00	92.00	27.30	5.80	1.80
21-May-03	23.50	34.10	58.00	90.00	7.80	9.20	3.90
22-May-03	25.60	33.50	61.00	94.00	5.40	4.20	2.00
23-May-03	25.30	33.00	58.00	88.00	0.00	7.60	2.70
24-May-03	25.00	30.50	72.00	93.00	92.20	2.40	1.40
25-May-03	23.10	30.40	74.00	93.00	8.00	1.60	1.20
26-May-03	25.20	32.00	67.00	92.00	4.90	3.40	1.70
27-May-03	24.90	32.50	69.00	95.00	66.50	6.50	2.10
28-May-03	22.50	31.50	70.00	95.00	7.70	7.10	1.80

29-May-03	24.40	30.70	71.00	91.00	0.00	0.30	1.80
30-May-03	24.90	29.20	81.00	94.00	5.50	0.80	1.00
31-May-03	24.50	30.30	72.00	97.00	48.70	2.20	0.80
01-Jun-03	23.40	27.70	79.00	96.00	11.20	0.00	0.50
02-Jun-03	25.00	29.30	78.00	96.00	14.20	1.90	1.30
03-Jun-03	24.30	30.20	73.00	94.00	0.60	3.90	1.50
04-Jun-03	24.80	31.70	62.00	91.00	2.00	6.90	2.20
05-Jun-03	25.40	33.20	55.00	94.00	14.50	8.50	1.90
06-Jun-03	26.00	32.50	65.00	90.00	2.90	4.10	2.00
07-Jun-03	26.50	33.80	54.00	86.00	0.00	10.40	2.70
08-Jun-03	26.50	34.50	56.00	81.00	0.00	7.80	2.40
09-Jun-03	27.10	34.50	61.00	84.00	0.50	7.50	2.80
10-Jun-03	27.50	34.00	58.00	90.00	8.50	4.40	2.30
11-Jun-03	25.50	32.40	68.00	90.00	21.30	3.30	1.70
12-Jun-03	24.00	33.60	61.00	92.00	1.40	5.50	2.30
13-Jun-03	25.50	33.00	64.00	88.00	1.50	8.00	2.40
14-Jun-03	26.40	33.30	62.00	94.00	0.00	6.80	2.60
15-Jun-03	27.20	31.50	67.00	89.00	2.20	2.40	1.70
16-Jun-03	25.40	31.50	67.00	98.00	21.20	5.20	1.00
17-Jun-03	24.50	31.90	63.00	94.00	6.50	6.70	1.90
18-Jun-03	23.00	31.10	75.00	96.00	40.90	2.10	0.80
19-Jun-03	23.30	28.70	77.00	97.00	13.70	0.00	1.00
20-Jun-03	25.00	31.50	62.00	92.00	8.40	3.70	2.00
21-Jun-03	24.30	31.00	68.00	94.00	0.00	4.40	1.60
22-Jun-03	25.00	27.30	83.00	93.00	18.00	0.00	0.90
23-Jun-03	24.80	30.10	71.00	98.00	6.00	5.20	1.50
24-Jun-03	26.00	31.90	76.00	89.00	9.30	4.90	1.40
25-Jun-03	26.40	33.00	67.00	88.00	0.00	7.40	2.00
26-Jun-03	25.60	32.60	59.00	96.00	16.50	8.30	1.90

27-Jun-03	23.70	31.00	67.00	96.00	14.30	1.80	1.80
28-Jun-03	24.80	31.60	67.00	93.00	0.00	3.30	1.70
29-Jun-03	26.00	31.30	65.00	92.00	4.60	1.00	1.70
30-Jun-03	24.70	28.30	75.00	96.00	0.00	0.00	1.00
01-Jul-03	24.30	31.70	60.00	96.00	7.10	4.50	1.30
02-Jul-03	22.40	29.20	72.00	94.00	5.80	4.40	1.30
03-Jul-03	24.20	33.60	63.00	92.00	0.00	8.10	2.00
04-Jul-03	23.70	33.00	63.00	88.00	6.70	6.60	1.80
05-Jul-03	24.50	31.30	70.00	89.00	4.60	6.60	1.70
06-Jul-03	23.40	31.50	67.00	87.00	0.00	8.60	2.60
07-Jul-03	25.70	31.70	68.00	84.00	1.80	2.30	2.30
08-Jul-03	25.50	32.80	62.00	87.00	0.00	10.00	3.10
09-Jul-03	26.20	32.70	61.00	85.00	0.00	7.30	2.70
10-Jul-03	26.00	32.40	66.00	92.00	23.90	3.20	1.40
11-Jul-03	25.00	29.80	76.00	94.00	31.30	0.00	0.60
12-Jul-03	22.80	30.40	70.00	93.00	1.40	2.40	1.40
13-Jul-03	26.00	32.80	62.00	93.00	3.80	8.30	1.80
14-Jul-03	25.00	30.80	67.00	96.00	12.60	3.00	1.40
15-Jul-03	24.50	32.00	66.00	92.00	0.00	6.90	1.90
16-Jul-03	25.40	34.50	57.00	86.00	0.00	11.80	2.70
17-Jul-03	25.50	33.60	56.00	86.00	0.00	7.10	2.30
18-Jul-03	26.70	34.70	56.00	85.00	0.00	9.90	2.40
19-Jul-03	27.00	32.20	71.00	89.00	1.00	0.70	1.80
20-Jul-03	24.90	31.00	73.00	93.00	4.70	0.20	1.70
21-Jul-03	25.20	30.00	75.00	95.00	69.00	0.70	1.30
22-Jul-03	23.50	29.70	78.00	96.00	1.80	0.30	0.80
23-Jul-03	24.00	30.80	75.00	93.00	10.70	2.30	0.50
24-Jul-03	23.90	28.50	82.00	96.00	40.50	0.50	0.80
25-Jul-03	23.90	29.50	77.00	93.00	0.90	1.30	1.40

26-Jul-03	22.60	31.00	66.00	95.00	0.40	4.90	1.50
27-Jul-03	24.30	32.50	64.00	92.00	0.00	7.80	1.90
28-Jul-03	24.50	32.00	66.00	90.00	0.00	3.60	1.60
29-Jul-03	25.50	31.80	68.00	92.00	0.00	4.10	1.70
30-Jul-03	24.20	30.50	81.00	96.00	5.10	3.70	1.30
31-Jul-03	25.00	32.00	61.00	93.00	0.00	7.10	0.90
01-Aug-03	26.40	32.50	63.00	91.00	1.40	1.40	1.70
02-Aug-03	24.00	33.00	64.00	95.00	1.20	5.50	1.70
03-Aug-03	24.00	30.50	71.00	95.00	3.80	2.30	1.30
04-Aug-03	25.10	32.80	65.00	89.00	6.20	6.40	1.90
05-Aug-03	25.00	30.00	76.00	96.00	22.20	0.40	1.00
06-Aug-03	25.00	29.00	88.00	97.00	22.90	0.30	0.20
07-Aug-03	25.50	32.00	63.00	92.00	0.00	3.40	1.60
08-Aug-03	26.00	32.50	73.00	94.00	8.60	4.80	1.50
09-Aug-03	27.40	32.20	71.00	90.00	0.60	6.60	1.50
10-Aug-03	23.00	30.80	77.00	91.00	28.10	0.90	1.10
11-Aug-03	24.20	31.60	72.00	97.00	17.20	2.70	1.00
12-Aug-03	24.50	32.00	75.00	93.00	0.40	1.10	2.20
13-Aug-03	25.20	31.50	67.00	93.00	2.30	6.80	2.10
14-Aug-03	26.80	32.60	67.00	91.00	0.00	8.10	2.10
15-Aug-03	24.90	33.50	63.00	90.00	26.20	7.00	2.20
16-Aug-03	24.50	32.40	65.00	92.00	6.80	7.80	2.80
17-Aug-03	24.40	30.50	71.00	96.00	25.30	0.80	1.50
18-Aug-03	24.60	31.50	72.00	96.00	4.30	2.80	1.00
19-Aug-03	24.30	30.00	77.00	94.00	9.80	0.40	0.90
20-Aug-03	23.20	28.50	84.00	96.00	35.20	0.00	0.70
21-Aug-03	23.40	29.00	73.00	98.00	97.10	1.20	0.90
22-Aug-03	23.60	28.00	81.00	96.00	25.40	0.00	0.60
23-Aug-03	23.20	24.00	93.00	97.00	90.30	0.00	0.30

24-Aug-03	23.50	26.70	91.00	97.00	37.30		0.00	0.30
25-Aug-03	24.60	28.00	78.00	97.00	2.60		0.20	1.00
26-Aug-03	24.50	30.50	75.00	92.00	1.50		1.20	1.50
27-Aug-03	25.00	32.80	59.00	95.00	2.70		10.00	3.30
28-Aug-03	25.10	33.00	57.00	97.00	0.00		8.30	1.60
29-Aug-03	24.50	33.00	59.00	90.00	0.00		6.60	1.70
30-Aug-03	25.00	31.00	67.00	96.00	0.00		1.30	1.90
31-Aug-03	24.70	31.70	66.00	92.00	0.80		6.30	1.50
01-Sep-03	25.00	32.20	63.00	94.00	1.30		5.70	1.70
02-Sep-03	23.10	29.50	78.00	97.00	47.50		1.40	0.70
03-Sep-03	23.60	26.00	88.00	96.00	28.10		0.00	0.50
04-Sep-03	24.60	28.50	79.00	97.00	8.90		0.90	1.10
05-Sep-03	24.00	29.50	81.00	97.00	16.10		2.30	0.80
06-Sep-03	24.00	30.30	70.00	98.00	47.50		3.50	0.80
07-Sep-03	24.50	27.40	93.00	97.00	48.50		0.30	0.40
08-Sep-03	24.40	30.20	78.00	97.00	2.60		0.00	0.80
09-Sep-03	24.50	30.50	74.00	93.00	0.60		3.10	1.50
10-Sep-03	24.40	29.20	77.00	95.00	3.30		3.80	1.30
11-Sep-03	23.30	27.80	87.00	96.00	39.60		2.40	0.50
12-Sep-03	24.40	28.60	83.00	97.00	20.20		0.20	0.70
13-Sep-03	24.00	29.00	80.00	97.00	39.60		1.90	0.90
14-Sep-03	23.80	26.50	82.00	97.00	4.90		0.30	0.60
15-Sep-03	24.60	29.60	72.00	96.00	1.00		0.20	1.20
16-Sep-03	23.80	27.70	87.00	94.00	6.60		3.00	0.70
17-Sep-03	23.50	32.00	71.00	97.00	47.50		0.10	1.00
18-Sep-03	23.00	32.70	62.00	95.00	89.50		5.90	1.40
19-Sep-03	23.90	31.70	66.00	96.00	0.50		8.30	1.30
20-Sep-03	25.10	32.30	60.00	92.00	0.10		6.80	2.30
21-Sep-03	22.60	32.00	59.00	95.00	23.40		9.00	2.00

22-Sep-03	24.10	31.00	68.00	96.00	5.00	9.30	1.60
23-Sep-03	24.40	32.00	67.00	94.00	3.20	5.20	1.90
24-Sep-03	23.70	31.60	66.00	96.00	0.00	5.20	1.10
25-Sep-03	23.50	30.40	67.00	96.00	0.00	5.60	1.90
26-Sep-03	24.60	31.80	65.00	91.00	0.00	0.30	2.00
27-Sep-03	24.50	31.60	62.00	93.00	0.00	8.70	1.40
28-Sep-03	25.00	31.90	70.00	95.00	0.00	5.30	1.70
29-Sep-03	24.60	31.50	68.00	95.00	13.20	4.80	1.50
30-Sep-03	24.30	30.00	73.00	93.00	0.00	0.90	1.10
01-Oct-03	24.50	32.60	55.00	92.00	0.00	9.70	2.60
02-Oct-03	23.60	31.20	74.00	91.00	0.00	8.10	2.20
03-Oct-03	23.40	31.20	68.00	88.00	0.00	1.70	2.70
04-Oct-03	22.50	31.70	61.00	91.00	0.50	3.60	3.20
05-Oct-03	22.70	33.50	56.00	94.00	19.00	9.20	1.70
06-Oct-03	24.20	33.10	58.00	96.00	0.00	9.20	1.50
07-Oct-03	24.50	33.00	57.00	92.00	0.00	9.00	1.70
08-Oct-03	24.60	33.80	56.00	92.00	0.00	9.50	2.30
09-Oct-03	24.40	33.40	59.00	90.00	26.30	9.50	1.40
10-Oct-03	24.80	31.50	69.00	95.00	0.00	5.70	1.10
11-Oct-03	25.50	32.50	66.00	96.00	0.00	7.70	1.70
12-Oct-03	24.50	33.00	62.00	95.00	0.00	6.50	1.60
13-Oct-03	25.00	33.50	60.00	91.00	1.40	6.90	1.70
14-Oct-03	24.00	32.60	66.00	93.00	2.30	7.60	1.50
15-Oct-03	22.50	29.10	66.00	91.00	0.00	1.40	2.00
16-Oct-03	22.50	30.50	61.00	91.00	1.70	4.00	1.40
17-Oct-03	22.00	28.70	68.00	93.00	0.00	0.00	1.70
18-Oct-03	22.20	31.60	58.00	90.00	0.00	6.90	2.60
19-Oct-03	22.50	32.40	53.00	87.00	0.00	9.40	2.70
20-Oct-03	21.60	31.50	55.00	83.00	0.00	4.60	2.70

21-Oct-03	21.70	32.50	47.00	88.00	0.00	9.30	2.40
22-Oct-03	22.20	32.40	42.00	89.00	0.00	9.50	2.10
23-Oct-03	22.80	31.90	44.00	95.00	0.00	8.90	2.10
24-Oct-03	22.50	32.50	49.00	91.00	0.00	8.20	2.00
25-Oct-03	22.70	33.00	44.00	91.00	0.00	9.50	2.40
26-Oct-03	21.90	32.40	35.00	87.00	0.00	9.30	2.40
27-Oct-03	21.90	31.70	42.00	86.00	0.00	9.80	3.00
28-Oct-03	21.50	33.00	45.00	83.00	0.00	9.40	3.40
29-Oct-03	21.50	32.80	43.00	83.00	0.00	10.10	3.80
30-Oct-03	21.00	32.80	48.00	79.00	0.00	9.40	5.10
31-Oct-03	21.30	33.00	42.00	86.00	0.00	9.90	3.30
01-Nov-03	20.40	33.20	44.00	84.00	0.00	10.10	3.30
02-Nov-03	19.90	33.10	47.00	87.00	0.00	9.80	3.10
03-Nov-03	20.70	33.60	36.00	91.00	0.00	10.30	3.10
04-Nov-03	19.90	34.00	35.00	82.00	0.00	10.30	2.70
05-Nov-03	21.00	33.50	37.00	83.00	0.00	10.20	4.00
06-Nov-03	21.30	33.50	43.00	94.00	0.00	9.90	3.40
07-Nov-03	21.50	34.00	36.00	93.00	0.00	9.50	3.10
08-Nov-03	20.10	35.00	34.00	86.00	0.00	10.50	3.70
09-Nov-03	20.30	34.80	35.00	92.00	0.00	10.30	3.30
10-Nov-03	20.50	33.70	43.00	84.00	0.00	7.80	2.60
11-Nov-03	22.50	30.80	58.00	86.00	0.00	7.60	2.70
12-Nov-03	22.00	30.20	50.00	83.00	0.00	6.30	3.70
13-Nov-03	21.70	26.30	70.00	88.00	0.00	0.00	1.50
14-Nov-03	22.30	33.80	51.00	93.00	1.30	7.60	1.70
15-Nov-03	22.20	33.80	46.00	93.00	0.00	0.70	2.00
16-Nov-03	20.60	32.20	41.00	87.00	0.00	9.50	3.30
17-Nov-03	22.50	31.20	54.00	88.00	0.00	8.20	2.40
18-Nov-03	22.90	33.10	48.00	90.00	0.00	8.50	2.10

19-Nov-03	23.10	34.30	41.00	91.00	0.00	9.80	2.50
20-Nov-03	22.00	35.10	38.00	93.00	0.00	10.50	2.30
21-Nov-03	22.40	34.50	38.00	89.00	0.00	9.40	2.90
22-Nov-03	21.00	33.20	36.00	82.00	0.00	10.00	3.20
23-Nov-03	22.00	33.00	44.00	87.00	0.00	8.60	2.70
24-Nov-03	22.50	31.80	52.00	75.00	0.80	6.30	3.10
25-Nov-03	22.00	31.80	54.00	89.00	1.20	4.20	1.80
26-Nov-03	21.60	32.70	43.00	86.00	0.00	10.70	3.50
27-Nov-03	18.10	30.60	44.00	79.00	0.00	8.00	3.70
28-Nov-03	19.70	30.70	41.00	86.00	0.00	8.20	3.20
29-Nov-03	17.80	29.30	45.00	80.00	0.00	9.10	3.40
30-Nov-03	18.10	30.20	38.00	83.00	0.00	10.10	2.80
01-Dec-03	19.40	30.70	34.00	84.00	0.00	10.00	7.00
02-Dec-03	19.50	30.70	39.00	76.00	0.00	9.30	5.00
03-Dec-03	18.60	31.50	33.00	83.00	0.00	6.10	6.00
04-Dec-03	19.90	32.40	35.00	86.00	0.00	10.00	6.00
05-Dec-03	20.80	32.40	33.00	86.00	0.00	8.80	6.00
06-Dec-03	20.00	32.50	37.00	85.00	0.00	7.30	7.00
07-Dec-03	20.20	30.70	46.00	87.00	0.00	6.80	6.00
08-Dec-03	22.00	33.40	40.00	88.00	0.00	9.60	6.00
09-Dec-03	22.60	31.00	55.00	84.00	0.80	7.50	5.80
10-Dec-03	23.00	32.60	47.00	78.00	0.00	6.00	7.00
11-Dec-03	21.30	32.10	43.00	81.00	0.00	7.60	8.00
12-Dec-03	20.00	30.30	42.00	74.00	0.00	9.40	9.00
13-Dec-03	17.30	28.50	44.00	79.00	0.00	9.20	8.00
14-Dec-03	17.20	29.00	40.00	79.00	0.00	8.00	8.00
15-Dec-03	16.60	27.20	42.00	81.00	0.00	8.30	8.00
16-Dec-03	17.50	29.20	39.00	84.00	0.00	8.30	7.00
17-Dec-03	19.50	30.50	43.00	81.00	0.00	9.30	7.00

18-Dec-03	21.40	31.20	41.00	78.00	0.00		4.40	7.00
19-Dec-03	15.50	26.00	42.00	67.00	0.00		8.90	8.00
20-Dec-03	14.50	25.50	41.00	76.00	0.00		9.80	8.00
21-Dec-03	16.10	27.90	39.00	81.00	0.00		9.40	7.00
22-Dec-03	16.70	30.30	40.00	81.00	0.00		9.80	7.00
23-Dec-03	17.50	30.60	34.00	85.00	0.00		10.20	7.00
24-Dec-03	18.40	31.70	35.00	90.00	0.00		9.60	6.00
25-Dec-03	20.00	32.20	41.00	86.00	0.00		9.50	6.00
26-Dec-03	17.90	30.00	38.00	81.00	0.00		9.40	9.00
27-Dec-03	17.60	28.60	44.00	78.00	0.00		6.50	6.00
28-Dec-03	19.60	30.70	38.00	78.00	0.00		9.40	6.00
29-Dec-03	18.00	32.10	34.00	81.00	0.00		6.60	6.00
30-Dec-03	18.50	32.30	31.00	85.00	0.00		10.30	6.00
31-Dec-03	18.00	33.00	31.00	85.00	0.00		10.30	6.00
01-Jan-04	18.00	32.90	33.00	86.00	0.00		10.20	2.90
02-Jan-04	19.00	32.70	34.00	85.00	0.00		9.20	3.30
03-Jan-04	19.10	33.20	33.00	82.00	0.00		9.90	3.00
04-Jan-04	19.30	33.00	36.00	88.00	0.00		10.20	2.90
05-Jan-04	19.20	32.80	36.00	89.00	0.00		9.70	3.50
06-Jan-04	19.10	32.70	37.00	85.00	0.00		8.00	3.40
07-Jan-04	19.00	32.50	37.00	83.00	0.00		9.90	3.30
08-Jan-04	18.80	33.50	32.00	84.00	0.00		9.80	3.20
09-Jan-04	22.20	33.60	41.00	84.00	0.00		5.90	2.90
10-Jan-04	22.10	34.40	42.00	88.00	0.00		6.10	2.70
11-Jan-04	24.00	32.60	45.00	83.00	0.00		6.30	2.20
12-Jan-04	22.90	28.30	57.00	88.00	0.00		0.00	2.10
13-Jan-04	22.00	32.00	45.00	82.00	0.00		6.40	3.00
14-Jan-04	20.90	33.00	38.00	89.00	0.00		10.20	3.90
15-Jan-04	21.90	34.00	29.00	76.00	0.00		9.00	4.10

16-Jan-04	22.80	34.00	34.00	79.00	0.00	9.50	3.40
17-Jan-04	22.60	33.90	38.00	76.00	0.00	9.40	3.40
18-Jan-04	21.30	32.20	39.00	83.00	0.00	9.30	3.70
19-Jan-04	22.50	28.60	55.00	86.00	0.00	1.10	1.60
20-Jan-04	20.00	33.20	39.00	90.00	0.00	10.20	3.40
21-Jan-04	19.30	31.00	40.00	79.00	0.00	9.20	3.90
22-Jan-04	16.00	30.00	38.00	85.00	0.00	10.40	3.10
23-Jan-04	16.40	31.70	32.00	90.00	0.00	9.70	4.10
24-Jan-04	17.10	28.00	36.00	73.00	0.00	10.10	5.60
25-Jan-04	14.60	29.80	34.00	78.00	0.00	10.50	3.60
26-Jan-04	15.50	30.70	32.00	83.00	0.00	10.40	3.40
27-Jan-04	17.20	31.60	36.00	83.00	0.00	10.10	3.90
28-Jan-04	18.70	33.30	32.00	82.00	0.00	10.00	3.70
29-Jan-04	21.00	34.20	35.00	82.00	0.00	10.00	4.00
30-Jan-04	20.70	35.00	36.00	85.00	0.00	9.10	4.50
31-Jan-04	23.00	33.60	38.00	78.00	0.00	9.00	3.80
01-Feb-04	23.80	35.20	37.00	75.00	0.00	8.30	4.00
02-Feb-04	24.00	35.60	41.00	79.00	0.00	8.90	5.10
03-Feb-04	26.10	34.50	39.00	78.00	0.00	7.70	4.70
04-Feb-04	23.20	28.70	80.00	89.00	2.10	2.10	1.60
05-Feb-04	21.20	30.20	53.00	89.00	0.00	6.60	4.00
06-Feb-04	18.00	32.00	42.00	78.00	0.00	9.10	3.70
07-Feb-04	18.00	31.80	39.00	82.00	0.00	10.20	3.60
08-Feb-04	17.40	28.50	47.00	80.00	0.00	8.00	4.80
09-Feb-04	17.60	27.00	45.00	79.00	0.00	6.10	4.50
10-Feb-04	14.80	30.60	39.00	79.00	0.00	10.00	4.00
11-Feb-04	16.20	31.80	28.00	88.00	0.00	10.70	4.90
12-Feb-04	17.20	32.10	28.00	86.00	0.00	10.40	6.10
13-Feb-04	18.80	28.20	42.00	69.00	0.00	10.40	6.20

14-Feb-04	15.90	29.60	31.00	81.00	0.00	9.70	4.30
15-Feb-04	18.20	30.60	32.00	70.00	0.00	9.20	3.90
16-Feb-04	18.00	31.90	28.00	72.00	0.00	9.60	5.30
17-Feb-04	17.40	30.90	36.00	80.00	0.00	9.10	4.20
18-Feb-04	18.60	32.50	34.00	83.00	0.00	9.50	3.90
19-Feb-04	20.50	33.70	28.00	74.00	0.00	9.40	4.50
20-Feb-04	20.60	34.10	26.00	68.00	0.00	8.70	4.80
21-Feb-04	21.50	34.50	26.00	71.00	0.00	9.20	4.50
22-Feb-04	21.90	34.30	35.00	66.00	0.00	9.00	4.80
23-Feb-04	23.30	34.30	30.00	71.00	0.00	9.30	5.10
24-Feb-04	22.80	35.30	34.00	68.00	0.00	9.00	5.50
25-Feb-04	24.90	33.40	44.00	85.00	0.00	8.40	5.70
26-Feb-04	24.90	28.40	64.00	89.00	0.00	3.90	3.30
27-Feb-04	22.00	33.20	42.00	88.00	0.00	6.30	5.30
28-Feb-04	23.50	34.00	43.00	73.00	0.00	8.20	5.20
29-Feb-04	25.10	34.90	41.00	76.00	0.00	8.80	5.70
01-Mar-04	26.00	35.80	40.00	76.00	0.00	9.10	6.00
02-Mar-04	26.50	38.70	21.00	72.00	0.00	10.00	6.70
03-Mar-04	23.20	36.70	36.00	69.00	0.00	6.80	6.30
04-Mar-04	20.70	32.00	43.00	77.00	0.00	5.20	4.00
05-Mar-04	22.00	34.50	37.00	78.00	0.00	8.40	4.50
06-Mar-04	22.80	35.00	30.00	74.00	0.00	7.80	6.20
07-Mar-04	20.20	34.20	32.00	73.00	0.00	8.70	6.70
08-Mar-04	20.80	33.50	32.00	71.00	0.00	8.50	7.40
09-Mar-04	19.00	34.20	23.00	67.00	0.00	8.60	5.20
10-Mar-04	20.70	36.30	24.00	76.00	0.00	8.00	5.00
11-Mar-04	22.50	37.00	34.00	63.00	0.00	9.10	6.70
12-Mar-04	25.80	36.20	46.00	75.00	0.00	8.40	4.70
13-Mar-04	26.50	37.00	37.00	71.00	0.00	6.20	5.80

14-Mar-04	26.80	37.20	40.00	65.00	0.00	8.70	5.40
15-Mar-04	24.50	35.30	32.00	63.00	0.00	8.50	5.80
16-Mar-04	23.40	36.50	28.00	64.00	0.00	9.90	7.40
17-Mar-04	24.30	37.20	33.00	67.00	12.80	8.90	7.30
18-Mar-04	26.00	37.70	31.00	84.00	0.00	6.20	6.90
19-Mar-04	24.20	30.00	62.00	91.00	0.00	3.10	5.80
20-Mar-04	23.60	34.40	48.00	83.00	0.00	4.20	4.70
21-Mar-04	26.50	34.20	45.00	85.00	0.00	4.30	4.50
22-Mar-04	25.30	33.50	53.00	84.00	0.00	3.90	4.50
23-Mar-04	26.00	33.80	57.00	82.00	57.00	5.10	4.50
24-Mar-04	27.00	32.70	36.00	78.00	9.80	3.20	4.30
25-Mar-04	27.30	35.50	56.00	77.00	0.00	7.50	6.00
26-Mar-04	27.00	36.80	35.00	81.00	0.00	9.20	5.00
27-Mar-04	26.00	31.30	66.00	88.00	0.00	3.30	3.50
28-Mar-04	25.30	35.80	48.00	84.00	0.00	7.00	4.70
29-Mar-04	26.60	36.70	45.00	70.00	0.00	6.70	5.60
30-Mar-04	26.30	36.10	46.00	72.00	0.00	8.00	6.50
31-Mar-04	27.30	36.20	44.00	75.00	0.00	8.30	7.00
01-Apr-04	26.00	36.70	38.00	79.00	0.00	8.00	5.00
02-Apr-04	25.30	35.60	45.00	88.00	5.70	9.40	5.40
03-Apr-04	25.00	35.00	44.00	84.00	3.30	5.10	3.30
04-Apr-04	23.40	34.30	48.00	92.00	0.00	7.30	3.30
05-Apr-04	24.30	34.80	45.00	78.00	0.00	8.20	5.40
06-Apr-04	25.80	34.50	46.00	83.00	0.00	7.00	5.60
07-Apr-04	26.90	36.30	40.00	73.00	0.30	9.00	5.60
08-Apr-04	27.70	35.70	48.00	76.00	0.00	5.00	4.40
09-Apr-04	22.90	31.50	63.00	76.00	0.00	3.80	3.20
10-Apr-04	25.30	35.00	47.00	86.00	0.00	8.10	4.40
11-Apr-04	26.60	33.60	58.00	77.00	0.00	8.20	5.00

12-Apr-04	26.80	37.20	44.00	80.00	0.00	9.20	5.50
13-Apr-04	27.80	37.00	42.00	74.00	2.50	9.10	6.10
14-Apr-04	26.80	35.30	55.00	74.00	0.00	8.50	5.80
15-Apr-04	26.50	37.50	48.00	79.00	0.00	8.20	5.90
16-Apr-04	25.70	36.60	44.00	79.00	0.00	10.30	7.00
17-Apr-04	27.60	35.30	59.00	80.00	0.00	8.90	7.20
18-Apr-04	27.60	36.20	55.00	79.00	0.00	6.70	6.40
19-Apr-04	26.50	35.00	56.00	79.00	4.60	6.20	4.50
20-Apr-04	25.30	37.10	52.00	83.00	0.00	8.40	4.10
21-Apr-04	25.70	37.50	40.00	88.00	0.00	9.50	5.50
22-Apr-04	27.50	37.10	45.00	74.00	1.60	10.00	5.20
23-Apr-04	24.70	38.90	44.00	80.00	3.70	9.90	4.50
24-Apr-04	27.50	36.50	42.00	77.00	0.00	7.40	4.80
25-Apr-04	26.50	35.70	50.00	89.00	0.00	6.30	3.30
26-Apr-04	25.50	37.50	35.00	89.00	0.00	11.10	4.80
27-Apr-04	27.10	36.50	48.00	74.00	0.00	5.60	5.30
28-Apr-04	27.10	36.70	42.00	73.00	0.00	8.10	5.90
29-Apr-04	25.30	38.40	42.00	83.00	0.00	11.10	5.90
30-Apr-04	28.50	38.00	44.00	68.00	0.00	8.10	5.40
01-May-04	27.00	37.00	40.00	80.00	0.00	9.60	5.50
02-May-04	26.50	37.20	41.00	81.00	3.50	6.50	4.90
03-May-04	28.10	38.20	46.00	78.00	3.50	5.40	3.40
04-May-04	27.00	36.20	49.00	86.00	0.00	6.40	3.30
05-May-04	25.00	34.70	47.00	81.00	0.00	7.00	4.60
06-May-04	24.70	37.70	37.00	75.00	51.80	10.70	4.70
07-May-04	26.30	37.50	39.00	82.00	1.20	7.90	4.00
08-May-04	24.00	29.30	76.00	94.00	2.00	0.50	1.30
09-May-04	25.50	32.20	60.00	93.00	9.20	0.30	1.90
10-May-04	26.50	33.00	61.00	87.00	0.00	5.50	2.30

11-May-04	25.50	34.50	54.00	92.00	0.00	7.20	3.00
12-May-04	26.10	35.00	47.00	86.00	0.00	9.40	3.90
13-May-04	28.50	35.50	50.00	78.00	28.10	7.40	3.80
14-May-04	27.00	33.70	56.00	81.00	6.20	2.80	2.70
15-May-04	24.30	31.60	59.00	96.00	7.20	2.40	1.90
16-May-04	25.60	34.10	58.00	96.00	19.10	8.30	2.80
17-May-04	25.10	32.50	63.00	96.00	0.00	3.80	1.60
18-May-04	24.70	32.30	60.00	86.00	0.00	6.80	3.10
19-May-04	27.20	34.50	49.00	84.00	7.10	8.20	4.30
20-May-04	26.50	32.80	55.00	83.00	7.10	4.10	3.80
21-May-04	25.50	32.00	65.00	90.00	4.00	1.80	1.90
22-May-04	25.00	32.00	62.00	94.00	0.00	7.20	2.00
23-May-04	24.50	33.10	55.00	91.00	5.40	9.50	3.10
24-May-04	26.00	32.00	66.00	88.00	2.00	3.70	2.50
25-May-04	26.00	28.20	81.00	92.00	0.00	0.00	1.30
26-May-04	24.30	31.20	68.00	90.00	0.00	6.00	2.50
27-May-04	25.80	33.00	56.00	91.00	0.00	5.80	2.50
28-May-04	26.80	34.20	54.00	83.00	0.00	7.90	2.60
29-May-04	26.30	34.30	58.00	88.00	3.30	4.90	3.50
30-May-04	26.00	34.50	51.00	85.00	26.80	7.50	3.60
31-May-04	25.00	34.70	46.00	90.00	0.00	8.60	3.30
01-Jun-04	26.80	31.90	63.00	94.00	0.00	2.60	2.20
02-Jun-04	25.60	33.60	64.00	80.00	30.40	7.40	2.80
03-Jun-04	25.50	33.50	61.00	90.00	4.60	7.60	2.70
04-Jun-04	24.30	32.00	69.00	88.00	0.00	4.90	2.00
05-Jun-04	24.90	32.60	67.00	89.00	23.00	6.00	2.20
06-Jun-04	25.50	33.20	66.00	90.00	20.00	5.90	2.30
07-Jun-04	23.50	30.60	74.00	94.00	1.50	3.30	1.40
08-Jun-04	23.70	31.00	64.00	96.00	7.70	4.00	1.80

09-Jun-04	24.50	30.50	68.00	93.00	35.60	3.80	2.20
10-Jun-04	24.50	31.20	63.00	95.00	13.50	4.10	1.00
11-Jun-04	24.00	29.50	74.00	96.00	9.40	2.10	0.90
12-Jun-04	24.50	29.50	73.00	92.00	39.70	3.20	1.80
13-Jun-04	24.30	26.40	71.00	95.00	7.20	0.00	0.70
14-Jun-04	23.80	27.00	84.00	95.00	28.70	0.00	1.30
15-Jun-04	24.50	28.50	79.00	93.00	1.10	0.10	1.40
16-Jun-04	23.50	29.60	70.00	93.00	14.60	4.10	2.30
17-Jun-04	24.50	31.00	63.00	92.00	9.00	3.10	1.80
18-Jun-04	23.00	32.50	56.00	97.00	39.30	10.20	2.30
19-Jun-04	24.00	31.60	62.00	93.00	30.30	8.90	2.80
20-Jun-04	23.50	30.50	73.00	96.00	37.90	4.20	1.50
21-Jun-04	23.80	31.70	69.00	92.00	0.80	4.10	1.90
22-Jun-04	24.70	32.20	62.00	92.00	11.70	4.90	2.70
23-Jun-04	26.50	30.20	67.00	91.00	3.40	1.20	2.40
24-Jun-04	24.00	29.50	69.00	94.00	5.90	1.40	1.80
25-Jun-04	24.30	32.30	57.00	93.00	0.80	10.20	2.70
26-Jun-04	25.60	31.50	63.00	92.00	39.10	2.60	2.20
27-Jun-04	20.30	29.20	76.00	94.00	28.50	1.30	1.10
28-Jun-04	23.30	30.80	71.00	95.00	0.00	6.70	1.60
29-Jun-04	24.10	32.20	64.00	92.00	0.00	6.60	2.30
30-Jun-04	27.00	33.50	60.00	87.00	9.30	9.30	3.00
01-Jul-04	26.30	31.30	71.00	91.00	19.00	5.40	2.20
02-Jul-04	26.30	33.00	64.00	91.00	0.40	6.50	1.90
03-Jul-04	24.30	31.70	68.00	94.00	2.20	3.20	1.80
04-Jul-04	26.50	30.30	80.00	94.00	11.10	0.50	1.40
05-Jul-04	24.60	33.50	57.00	96.00	0.00	8.50	2.10
06-Jul-04	23.50	32.40	65.00	92.00	0.00	5.30	2.30
07-Jul-04	25.70	32.30	60.00	88.00	0.00	8.10	2.50

08-Jul-04	25.80	29.80	77.00	92.00	6.10	0.90	1.10
09-Jul-04	25.60	31.70	64.00	88.00	0.80	2.20	2.10
10-Jul-04	23.80	31.10	66.00	92.00	6.20	5.10	1.80
11-Jul-04	24.20	30.60	68.00	93.00	8.80	1.60	1.50
12-Jul-04	25.00	31.00	71.00	88.00	1.20	1.40	2.00
13-Jul-04	24.30	31.90	64.00	95.00	0.00	5.70	1.80
14-Jul-04	25.20	30.50	65.00	90.00	0.00	6.00	2.00
15-Jul-04	25.00	32.20	61.00	90.00	1.30	7.90	1.90
16-Jul-04	25.50	31.80	64.00	89.00	0.00	4.00	1.80
17-Jul-04	25.30	33.00	62.00	94.00	0.00	3.60	2.30
18-Jul-04	25.10	30.40	68.00	91.00	46.90	1.70	2.70
19-Jul-04	24.50	31.30	68.00	94.00	0.00	6.30	1.90
20-Jul-04	24.60	29.50	75.00	93.00	3.00	3.70	1.50
21-Jul-04	24.80	30.50	73.00	93.00	6.90	3.10	1.70
22-Jul-04	24.00	28.60	79.00	94.00	28.90	1.30	1.10
23-Jul-04	23.90	29.20	72.00	96.00	29.10	0.30	1.00
24-Jul-04	23.80	31.50	72.00	94.00	54.00	4.20	1.50
25-Jul-04	23.30	28.40	82.00	96.00	63.20	0.60	0.60
26-Jul-04	23.70	26.80	90.00	96.00	16.10	0.00	0.70
27-Jul-04	23.60	26.30	85.00	97.00	44.30	0.00	0.70
28-Jul-04	23.80	31.00	65.00	95.00	32.30	2.00	1.30
29-Jul-04	23.90	27.70	83.00	97.00	0.70	0.00	0.90
30-Jul-04	23.50	28.20	80.00	97.00	6.90	1.70	0.90
31-Jul-04	24.30	31.10	71.00	96.00	13.90	4.70	2.00
01-Aug-04	24.20	30.10	71.00	95.00	8.40	5.00	1.40
02-Aug-04	24.50	30.20	75.00	97.00	48.90	4.80	1.30
03-Aug-04	23.40	29.80	69.00	97.00	20.00	2.30	1.00
04-Aug-04	23.50	30.50	71.00	96.00	13.90	4.70	1.30
05-Aug-04	23.80	30.70	71.00	96.00	15.10	3.90	1.40

06-Aug-04	24.80	31.00	68.00	95.00	75.50	7.00	1.50
07-Aug-04	24.20	31.00	70.00	96.00	22.60	4.00	1.40
08-Aug-04	23.50	29.30	76.00	98.00	90.80	2.30	1.10
09-Aug-04	24.00	29.50	72.00	97.00	4.60	2.60	0.70
10-Aug-04	23.60	28.00	83.00	93.00	9.30	0.90	1.00
11-Aug-04	25.00	30.50	69.00	90.00	0.00	3.00	1.40
12-Aug-04	24.30	29.30	78.00	93.00	1.00	0.70	1.40
13-Aug-04	25.50	30.50	68.00	93.00	0.00	2.90	1.70
14-Aug-04	24.90	30.90	65.00	88.00	11.30	5.20	2.30
15-Aug-04	26.40	29.40	68.00	86.00	19.00	0.00	1.60
16-Aug-04	24.20	31.00	67.00	96.00	40.30	5.10	1.60
17-Aug-04	24.90	29.60	85.00	96.00	23.00	1.00	1.00
18-Aug-04	23.50	31.00	74.00	96.00	50.70	3.70	1.10
19-Aug-04	24.00	27.00	88.00	97.00	3.40	0.00	0.70
20-Aug-04	22.80	29.50	78.00	96.00	5.90	3.70	1.10
21-Aug-04	24.80	30.60	75.00	96.00	14.00	3.00	1.10
22-Aug-04	24.70	28.40	85.00	97.00	8.70	0.00	0.70
23-Aug-04	24.80	31.20	72.00	96.00	6.10	3.30	1.60
24-Aug-04	25.50	31.20	78.00	94.00	0.00	0.60	1.30
25-Aug-04	26.40	32.50	67.00	92.00	39.40	6.60	2.10
26-Aug-04	26.50	32.00	73.00	97.00	8.00	2.80	1.10
27-Aug-04	23.20	32.30	67.00	96.00	17.00	5.90	2.00
28-Aug-04	24.80	31.20	79.00	94.00	9.50	1.90	1.50
29-Aug-04	26.00	29.40	80.00	96.00	3.40	0.00	1.30
30-Aug-04	25.30	29.60	74.00	96.00	0.00	0.00	1.50
31-Aug-04	25.10	31.40	78.00	94.00	29.80	4.00	1.90
01-Sep-04	25.20	31.60	72.00	96.00	8.30	5.60	1.30
02-Sep-04	23.70	28.90	78.00	96.00	14.20	0.00	1.00
03-Sep-04	23.60	28.20	77.00	96.00	4.20	0.00	1.20

04-Sep-04	23.50	31.70	75.00	96.00	0.00	5.60	1.80
05-Sep-04	23.40	32.30	75.00	94.00	2.00	10.10	2.40
06-Sep-04	24.60	32.30	68.00	96.00	28.40	7.60	1.80
07-Sep-04	24.00	29.00	81.00	96.00	1.80	1.90	1.30
08-Sep-04	24.30	28.90	80.00	93.00	3.70	0.40	1.30
09-Sep-04	24.60	29.60	78.00	92.00	0.00	1.10	1.60
10-Sep-04	24.00	31.50	70.00	95.00	33.90	5.90	1.70
11-Sep-04	24.50	27.60	86.00	96.00	0.00	0.80	0.80
12-Sep-04	23.40	30.10	74.00	95.00	17.20	3.90	1.50
13-Sep-04	25.00	29.20	82.00	96.00	0.00	1.30	1.20
14-Sep-04	23.50	29.90	74.00	97.00	9.20	2.60	1.30
15-Sep-04	24.50	31.60	65.00	96.00	9.00	8.50	2.10
16-Sep-04	25.00	29.30	83.00	96.00	0.20	1.50	1.00
17-Sep-04	24.70	32.50	69.00	93.00	42.40	6.50	2.20
18-Sep-04	24.90	30.80	69.00	96.00	31.10	5.60	1.40
19-Sep-04	23.50	27.70	76.00	98.00	0.70	0.80	1.00
20-Sep-04	23.80	30.90	68.00	96.00	0.00	5.20	1.90
21-Sep-04	24.50	30.90	69.00	92.00	0.00	3.90	1.80
22-Sep-04	24.20	32.80	54.00	94.00	0.00	12.00	2.70
23-Sep-04	23.50	33.20	58.00	86.00	0.00	10.10	1.80
24-Sep-04	25.20	32.60	65.00	92.00	3.90	7.50	2.40
25-Sep-04	23.50	33.50	55.00	95.00	0.00	9.50	2.70
26-Sep-04	23.70	33.90	51.00	92.00	0.00	8.30	3.60
27-Sep-04	23.90	32.80	53.00	90.00	0.00	10.30	4.40
28-Sep-04	22.50	32.00	56.00	90.00	5.30	8.70	3.40
29-Sep-04	25.00	32.30	59.00	92.00	0.10	10.50	3.60
30-Sep-04	24.30	33.00	58.00	93.00	0.00	8.00	2.80
01-Oct-04	24.30	33.20	48.00	91.00	0.30	11.20	4.60
02-Oct-04	24.50	30.10	74.00	90.00	0.00	5.00	3.70

03-Oct-04	22.70	30.00	68.00	87.00	0.00	3.70	4.60
04-Oct-04	22.40	32.00	58.00	89.00	0.00	8.90	4.70
05-Oct-04	22.30	31.50	59.00	86.00	0.00	5.50	3.20
06-Oct-04	23.30	31.90	52.00	96.00	0.00	9.70	4.10
07-Oct-04	22.80	32.00	59.00	92.00	0.00	9.80	3.00
08-Oct-04	22.50	32.70	44.00	90.00	0.00	9.80	4.40
09-Oct-04	22.50	32.90	65.00	83.00	0.00	9.90	3.50
10-Oct-04	25.60	30.50	66.00	88.00	0.00	4.10	3.20
11-Oct-04	24.50	32.60	47.00	94.00	0.00	8.20	4.70
12-Oct-04	21.40	32.50	38.00	80.00	0.00	10.00	4.50
13-Oct-04	21.50	32.80	39.00	86.00	0.00	10.80	3.80
14-Oct-04	22.20	33.10	44.00	91.00	0.00	9.40	5.00
15-Oct-04	22.00	33.00	42.00	82.00	0.00	10.10	6.30
16-Oct-04	21.50	32.30	42.00	85.00	0.00	10.70	5.20
17-Oct-04	20.00	31.90	44.00	86.00	0.00	9.30	4.50
18-Oct-04	21.00	32.00	38.00	88.00	0.00	9.70	5.20
19-Oct-04	20.00	32.30	40.00	87.00	0.00	9.50	4.50
20-Oct-04	20.80	32.80	39.00	91.00	0.00	7.30	4.50
21-Oct-04	21.70	33.00	45.00	94.00	0.00	7.80	5.50
22-Oct-04	21.40	33.20	43.00	83.00	0.00	9.60	6.10
23-Oct-04	21.30	32.80	41.00	83.00	0.00	4.60	6.50
24-Oct-04	23.00	33.20	46.00	87.00	0.00	9.60	5.80
25-Oct-04	22.00	32.40	47.00	82.00	0.00	10.20	7.70
26-Oct-04	20.30	31.50	42.00	78.00	0.00	8.60	7.40
27-Oct-04	18.70	32.50	49.00	76.00	0.00	9.80	6.70
28-Oct-04	22.50	33.50	43.00	87.00	0.00	8.10	4.90
29-Oct-04	22.30	34.00	39.00	86.00	0.00	9.90	6.30
30-Oct-04	21.50	33.40	45.00	86.00	0.00	10.10	5.30
31-Oct-04	21.50	33.20	42.00	85.00	0.00	7.50	4.60

01-Nov-04	21.80	33.60	39.00	80.00	0.00	9.60	8.00
02-Nov-04	20.50	33.20	35.00	78.00	0.00	10.00	5.50
03-Nov-04	20.80	33.50	38.00	87.00	0.00	10.30	4.70
04-Nov-04	21.50	34.30	36.00	88.00	0.00	10.30	6.50
05-Nov-04	22.10	35.00	35.00	83.00	0.00	10.10	6.70
06-Nov-04	23.40	34.70	37.00	83.00	0.00	9.90	6.00
07-Nov-04	22.30	34.80	37.00	86.00	0.00	10.20	5.20
08-Nov-04	22.10	34.80	42.00	85.00	0.00	9.90	5.00
09-Nov-04	23.00	34.70	40.00	89.00	0.00	10.40	5.00
10-Nov-04	24.00	35.00	38.00	85.00	0.00	10.40	5.20
11-Nov-04	23.00	36.40	30.00	86.00	0.00	9.20	5.70
12-Nov-04	24.00	36.00	31.00	90.00	0.00	10.50	6.30
13-Nov-04	22.30	35.20	34.00	81.00	0.00	10.40	5.10
14-Nov-04	23.10	35.00	42.00	80.00	0.00	7.10	4.80
15-Nov-04	25.40	35.50	46.00	81.00	0.00	9.00	4.60
16-Nov-04	23.00	33.50	47.00	84.00	0.00	7.30	7.20
17-Nov-04	22.60	31.40	46.00	81.00	0.00	5.50	6.50
18-Nov-04	20.00	31.70	43.00	84.00	0.00	10.40	7.00
19-Nov-04	19.50	32.40	41.00	86.00	0.00	9.80	5.80
20-Nov-04	19.10	31.30	31.00	79.00	0.00	9.50	5.40
21-Nov-04	18.50	30.20	37.00	76.00	0.00	10.00	9.10
22-Nov-04	17.40	31.70	35.00	81.00	0.00	9.50	9.40
23-Nov-04	20.70	31.50	41.00	74.00	0.00	7.00	7.90
24-Nov-04	22.00	30.80	49.00	85.00	11.80	0.80	6.80
25-Nov-04	22.70	32.60	49.00	97.00	0.00	5.90	3.00
26-Nov-04	22.50	34.00	46.00	87.00	3.40	8.60	6.60
27-Nov-04	23.50	31.60	48.00	80.00	0.00	9.10	6.30
28-Nov-04	20.50	31.90	46.00	83.00	0.00	7.00	5.50
29-Nov-04	20.60	32.30	40.00	84.00	0.00	9.60	6.00

30-Nov-04	19.40	31.80	41.00	86.00	0.00	9.50	5.50
01-Dec-04	19.30	31.90	42.00	88.00	0.00	7.70	7.20
02-Dec-04	21.30	33.30	43.00	82.00	0.00	8.80	7.40
03-Dec-04	20.30	31.60	46.00	84.00	0.00	9.20	3.90
04-Dec-04	19.00	30.50	34.00	88.00	0.00	8.90	5.80
05-Dec-04	19.30	30.80	39.00	76.00	0.00	6.30	4.90
06-Dec-04	19.60	31.80	31.00	79.00	0.00	7.90	4.90
07-Dec-04	19.00	30.40	41.00	80.00	0.00	8.00	7.20
08-Dec-04	19.00	29.50	38.00	79.00	0.00	8.80	6.10
09-Dec-04	16.50	30.50	41.00	78.00	0.00	7.50	4.70
10-Dec-04	18.30	31.70	38.00	81.00	0.00	8.20	4.80
11-Dec-04	18.40	31.60	36.00	90.00	0.00	10.00	4.80
12-Dec-04	19.40	31.50	43.00	83.00	0.00	9.10	5.00
13-Dec-04	18.00	30.60	43.00	79.00	0.00	9.30	4.70
14-Dec-04	16.50	31.00	41.00	86.00	0.00	8.90	3.70
15-Dec-04	18.50	32.30	34.00	85.00	0.00	9.60	3.90
16-Dec-04	18.80	32.80	26.00	87.00	0.00	8.60	3.90
17-Dec-04	18.40	33.30	32.00	85.00	0.00	9.80	4.30
18-Dec-04	19.80	32.30	26.00	88.00	0.00	9.90	4.60
19-Dec-04	17.50	32.20	26.00	83.00	0.00	9.80	4.80
20-Dec-04	16.80	31.80	31.00	79.00	0.00	9.10	4.60
21-Dec-04	18.40	31.30	32.00	85.00	0.00	9.60	4.70
22-Dec-04	19.50	31.20	33.00	87.00	0.00	9.30	4.70
23-Dec-04	17.50	31.80	31.00	86.00	0.00	9.90	4.10
24-Dec-04	16.50	32.40	28.00	85.00	0.00	10.30	3.70
25-Dec-04	16.80	32.10	34.00	88.00	0.00	9.00	3.40
26-Dec-04	17.10	32.00	33.00	88.00	0.00	9.80	3.20
27-Dec-04	17.70	30.80	31.00	85.00	0.00	6.40	3.20
28-Dec-04	17.00	31.50	25.00	88.00	0.00	9.80	5.30

29-Dec-04	17.20	31.50	30.00	81.00	0.00	9.60	4.30
30-Dec-04	18.00	31.50	30.00	85.00	0.00	9.90	6.10
31-Dec-04	19.80	27.80	37.00	73.00	0.00	5.70	4.10
01-Jan-05	15.20	27.50	33.00	79.00	0.00	9.90	7.50
02-Jan-05	13.00	28.20	36.00	86.00	0.00	10.00	4.70
03-Jan-05	14.00	30.40	31.00	92.00	0.00	9.90	4.10
04-Jan-05	15.90	31.70	34.00	84.00	0.00	9.80	6.40
05-Jan-05	16.80	31.60	31.00	86.00	0.00	10.30	5.70
06-Jan-05	18.80	31.60	37.00	82.00	0.00	7.80	5.10
07-Jan-05	18.10	32.40	37.00	87.00	0.00	9.20	5.70
08-Jan-05	18.40	32.30	32.00	86.00	0.00	9.10	6.70
09-Jan-05	19.00	32.40	31.00	72.00	0.00	8.30	6.80
10-Jan-05	19.90	31.20	30.00	78.00	0.00	5.60	5.10
11-Jan-05	18.40	33.30	30.00	81.00	0.00	10.50	6.10
12-Jan-05	17.50	32.60	32.00	81.00	0.00	8.30	4.60
13-Jan-05	17.00	33.40	29.00	80.00	0.00	9.20	5.80
14-Jan-05	17.80	28.50	39.00	74.00	0.00	7.80	5.20
15-Jan-05	16.50	26.70	47.00	74.00	0.00	3.80	5.90
16-Jan-05	17.60	28.80	42.00	80.00	0.00	6.10	4.50
17-Jan-05	16.80	30.70	39.00	84.00	0.00	9.50	5.00
18-Jan-05	19.00	32.70	37.00	80.00	0.00	9.30	5.70
19-Jan-05	19.60	32.60	39.00	82.00	0.00	9.50	5.30
20-Jan-05	20.80	32.50	39.00	79.00	0.00	9.10	5.10
21-Jan-05	20.50	31.60	43.00	84.00	0.00	9.00	5.10
22-Jan-05	19.40	32.70	38.00	86.00	0.00	9.40	6.20
23-Jan-05	20.50	33.70	35.00	82.00	0.00	10.00	6.20
24-Jan-05	21.30	33.60	29.00	74.00	0.00	9.30	7.10
25-Jan-05	22.30	33.00	38.00	75.00	0.00	8.30	7.70
26-Jan-05	23.50	32.40	49.00	78.00	0.00	7.50	5.80

27-Jan-05	23.70	32.30	52.00	81.00	0.00	8.70	6.20
28-Jan-05	23.10	34.20	46.00	82.00	0.00	8.00	6.10
29-Jan-05	24.00	35.50	38.00	81.00	0.00	9.30	5.80
30-Jan-05	22.50	35.80	38.00	84.00	0.00	9.00	7.30
31-Jan-05	22.50	34.00	49.00	80.00	0.00	8.20	6.40
01-Feb-05	24.00	34.70	39.00	75.00	0.00	8.70	5.70
02-Feb-05	24.00	32.60	46.00	83.00	0.00	7.50	5.50
03-Feb-05	22.90	32.20	46.00	83.00	0.00	8.50	5.10
04-Feb-05	22.00	35.20	38.00	77.00	0.00	9.60	5.90
05-Feb-05	23.50	35.00	39.00	68.00	0.00	8.30	5.80
06-Feb-05	24.10	35.30	36.00	76.00	0.00	9.00	7.40
07-Feb-05	24.00	34.70	39.00	72.00	0.00	9.30	6.90
08-Feb-05	24.00	35.20	38.00	71.00	0.00	9.00	9.00
09-Feb-05	23.40	35.80	34.00	70.00	0.00	9.80	7.70
10-Feb-05	23.60	35.30	38.00	73.00	0.00	9.50	7.50
11-Feb-05	21.50	34.20	34.00	75.00	0.00	9.50	7.00
12-Feb-05	21.40	35.50	26.00	73.00	0.00	8.70	8.10
13-Feb-05	23.80	35.70	29.00	69.00	0.00	9.90	7.60
14-Feb-05	24.80	33.50	41.00	69.00	0.00	9.50	8.00
15-Feb-05	23.60	34.50	40.00	77.00	0.00	9.00	8.40
16-Feb-05	25.00	35.30	37.00	77.00	0.00	8.70	8.20
17-Feb-05	26.30	35.90	38.00	73.00	0.00	9.10	7.10
18-Feb-05	25.40	38.00	26.00	71.00	0.00	9.40	6.40
19-Feb-05	25.40	35.00	43.00	70.00	0.00	9.10	6.70
20-Feb-05	21.00	32.40	41.00	73.00	0.00	7.10	5.00
21-Feb-05	19.50	33.80	35.00	75.00	0.00	9.10	5.20
22-Feb-05	22.50	35.30	33.00	71.00	0.00	9.30	4.90
23-Feb-05	23.30	35.60	34.00	70.00	0.00	9.00	8.20
24-Feb-05	26.50	34.40	40.00	62.00	0.00	7.30	7.60

25-Feb-05	26.30	35.50	42.00	71.00	0.00	8.60	7.30
26-Feb-05	26.30	37.30	33.00	66.00	0.00	9.00	6.70
27-Feb-05	26.80	36.70	37.00	63.00	0.00	8.30	5.80
28-Feb-05	26.60	35.30	40.00	72.00	0.00	7.70	5.50
01-Mar-05	25.70	35.60	38.00	70.00	0.00	8.80	5.70
02-Mar-05	25.10	36.70	34.00	70.00	0.00	9.30	5.00
03-Mar-05	20.00	26.20	62.00	73.00	0.00	0.00	3.60
04-Mar-05	18.30	28.70	42.00	69.00	0.00	5.90	6.30
05-Mar-05	17.20	26.10	36.00	69.00	0.00	9.60	5.80
06-Mar-05	14.50	29.30	33.00	78.00	0.00	9.60	4.20
07-Mar-05	16.00	31.00	32.00	84.00	0.00	8.50	4.70
08-Mar-05	18.60	34.50	30.00	69.00	0.00	9.20	4.70
09-Mar-05	21.00	35.30	30.00	66.00	0.00	8.70	5.90
10-Mar-05	23.70	33.80	44.00	67.00	0.00	8.20	6.00
11-Mar-05	25.40	35.30	38.00	70.00	0.00	8.80	8.20
12-Mar-05	26.50	37.00	36.00	68.00	0.00	8.70	5.60
13-Mar-05	27.00	36.60	41.00	66.00	0.00	4.00	6.20
14-Mar-05	20.80	33.50	35.00	67.00	0.00	7.70	5.40
15-Mar-05	24.20	36.30	37.00	70.00	0.00	9.20	5.40
16-Mar-05	25.50	36.70	32.00	67.00	0.00	8.10	6.30
17-Mar-05	25.50	36.20	37.00	66.00	0.00	6.60	6.30
18-Mar-05	25.80	35.80	41.00	70.00	0.00	8.50	8.80
19-Mar-05	22.30	37.30	25.00	70.00	0.00	9.60	9.30
20-Mar-05	25.20	37.40	34.00	76.00	0.00	8.00	9.50
21-Mar-05	25.40	36.40	35.00	77.00	10.50	5.20	8.80
22-Mar-05	25.10	36.70	37.00	76.00	4.30	9.20	7.00
23-Mar-05	25.30	36.00	48.00	92.00	0.00	8.10	5.60
24-Mar-05	23.90	34.70	52.00	79.00	0.00	6.40	7.20
25-Mar-05	20.60	32.40	43.00	74.00	0.00	5.60	6.60

26-Mar-05	21.60	35.80	36.00	78.00	0.00	10.60	6.70
27-Mar-05	26.00	36.20	40.00	81.00	0.00	8.10	7.20
28-Mar-05	27.30	37.50	36.00	69.00	0.00	9.10	8.00
29-Mar-05	27.90	37.90	37.00	70.00	0.00	9.30	8.60
30-Mar-05	28.30	38.30	37.00	68.00	0.00	8.60	9.00
31-Mar-05	28.80	38.80	35.00	68.00	0.00	9.30	9.40
01-Apr-05	28.10	33.50	56.00	77.00	0.00	1.80	6.20
02-Apr-05	27.80	37.30	44.00	81.00	0.00	8.20	7.00
03-Apr-05	26.50	35.40	44.00	78.00	0.00	8.10	7.90
04-Apr-05	23.00	35.50	34.00	73.00	0.00	8.00	8.30
05-Apr-05	23.00	33.80	40.00	69.00	0.00	6.80	7.00
06-Apr-05	25.50	36.50	34.00	73.00	0.80	8.80	7.40
07-Apr-05	27.10	34.00	48.00	70.00	16.70	4.90	6.80
08-Apr-05	27.90	34.50	54.00	88.00	0.00	5.40	4.20
09-Apr-05	26.80	35.10	51.00	78.00	0.00	7.80	6.30
10-Apr-05	27.10	38.20	44.00	77.00	0.00	9.30	9.20
11-Apr-05	27.50	38.70	38.00	73.00	0.00	10.20	9.90
12-Apr-05	28.00	36.80	46.00	77.00	0.00	5.90	6.50
13-Apr-05	24.50	32.00	57.00	84.00	0.00	0.20	5.20
14-Apr-05	22.50	34.70	40.00	75.00	0.00	4.70	5.10
15-Apr-05	26.30	36.20	45.00	75.00	0.00	10.00	7.40
16-Apr-05	26.60	35.30	42.00	75.00	3.70	8.40	6.60
17-Apr-05	27.50	37.30	38.00	84.00	0.00	9.10	4.30
18-Apr-05	25.00	36.20	48.00	84.00	0.00	5.30	5.50
19-Apr-05	26.60	36.30	38.00	70.00	0.00	10.10	5.90
20-Apr-05	27.00	37.50	32.00	70.00	0.00	10.30	6.70
21-Apr-05	27.00	37.70	30.00	69.00	0.00	10.10	7.40
22-Apr-05	28.00	37.20	40.00	69.00	1.70	9.70	6.80
23-Apr-05	28.00	36.80	44.00	84.00	0.00	7.00	9.60

24-Apr-05	26.20	36.00	45.00	86.00	0.00	4.00	7.30
25-Apr-05	25.60	36.90	42.00	89.00	27.00	7.00	5.60
26-Apr-05	23.30	32.00	65.00	96.00	0.00	2.60	2.00
27-Apr-05	23.50	34.80	53.00	92.00	3.20	7.40	7.00
28-Apr-05	26.70	35.30	52.00	96.00	0.00	8.50	6.80
29-Apr-05	24.30	35.20	50.00	93.00	0.00	11.20	7.80
30-Apr-05	28.00	36.80	45.00	76.00	2.80	8.50	6.30
01-May-05	27.80	36.80	41.00	73.00	0.00	9.70	6.10
02-May-05	27.30	38.20	36.00	74.00	0.00	11.10	5.00
03-May-05	28.20	39.30	33.00	66.00	3.00	9.90	8.70
04-May-05	28.30	37.00	48.00	66.00	0.00	8.20	7.20
05-May-05	28.50	36.50	45.00	69.00	0.00	8.40	8.20
06-May-05	29.50	39.00	35.00	69.00	2.70	7.90	8.90
07-May-05	27.10	34.80	59.00	80.00	28.40	5.50	6.90
08-May-05	25.00	35.70	46.00	94.00	2.40	8.50	5.20
09-May-05	23.50	32.40	60.00	92.00	0.00	2.40	3.10
10-May-05	26.10	33.30	61.00	92.00	15.50	6.00	4.10
11-May-05	26.50	30.00	77.00	86.00	29.10	2.00	2.20
12-May-05	25.20	33.40	66.00	92.00	0.00	8.70	3.60
13-May-05	24.00	33.00	59.00	95.00	0.00	8.60	2.40
14-May-05	26.90	33.20	60.00	84.00	0.00	4.70	4.20
15-May-05	26.90	34.00	58.00	90.00	0.00	8.10	4.30
16-May-05	27.50	34.20	57.00	85.00	0.00	7.80	3.60
17-May-05	26.70	33.40	67.00	88.00	56.40	3.50	2.20
18-May-05	25.70	34.00	61.00	93.00	0.90	1.80	2.80
19-May-05	23.20	32.00	57.00	98.00	0.00	6.70	2.70
20-May-05	25.60	35.00	54.00	88.00	0.00	10.80	3.00
21-May-05	26.40	33.80	54.00	92.00	25.00	8.90	2.50
22-May-05	25.50	32.30	59.00	88.00	0.00	5.90	2.60

23-May-05	24.10	31.30	72.00	97.00	2.70	4.50	1.50
24-May-05	25.00	32.00	74.00	92.00	0.00	3.20	1.10
25-May-05	24.60	33.60	57.00	96.00	0.00	6.90	2.10
26-May-05	26.50	34.80	62.00	87.00	0.00	8.80	2.60
27-May-05	26.40	35.00	55.00	83.00	40.70	7.90	3.40
28-May-05	24.90	34.50	58.00	95.00	7.80	7.40	2.80
29-May-05	24.60	31.50	70.00	96.00	8.60	3.80	1.20
30-May-05	24.80	31.80	66.00	95.00	4.80	3.80	1.80
31-May-05	25.00	32.60	67.00	92.00	0.00	6.00	2.40
01-Jun-05	26.00	33.20	61.00	92.00	0.00	10.40	2.70
02-Jun-05	25.30	32.90	62.00	92.00	3.00	8.10	3.10
03-Jun-05	26.70	33.10	61.00	84.00	10.60	8.60	2.50
04-Jun-05	26.50	33.40	61.00	91.00	0.00	7.90	1.80
05-Jun-05	25.00	32.20	68.00	90.00	0.00	6.10	2.00
06-Jun-05	27.20	33.70	61.00	84.00	16.60	6.30	1.60
07-Jun-05	26.80	34.50	60.00	90.00	15.10	6.00	1.50
08-Jun-05	24.20	28.30	86.00	96.00	0.30	0.20	0.70
09-Jun-05	24.30	31.60	67.00	95.00	17.40	2.30	1.60
10-Jun-05	25.30	31.30	66.00	92.00	0.80	4.90	2.30
11-Jun-05	24.50	31.60	76.00	90.00	0.00	0.80	1.80
12-Jun-05	27.10	33.50	57.00	89.00	13.00	1.90	2.80
13-Jun-05	25.80	33.10	63.00	89.00	2.20	3.00	2.20
14-Jun-05	25.30	30.80	73.00	90.00	12.50	0.20	4.50
15-Jun-05	24.50	31.80	66.00	95.00	2.00	0.40	4.10
16-Jun-05	24.00	30.60	71.00	92.00	2.50	4.90	2.40
17-Jun-05	24.70	32.00	68.00	93.00	0.00	5.70	2.20
18-Jun-05	25.50	31.50	69.00	91.00	0.00	5.00	2.90
19-Jun-05	27.00	32.50	68.00	86.00	0.00	5.40	3.00
20-Jun-05	27.30	31.80	66.00	90.00	25.50	2.60	1.80

21-Jun-05	26.50	32.50	63.00	91.00	0.00		5.50	2.50
22-Jun-05	24.50	32.20	67.00	96.00	18.90		2.50	1.30
23-Jun-05	25.30	30.90	72.00	90.00	30.00		1.80	1.00
24-Jun-05	24.90	29.20	77.00	96.00	1.80		0.30	0.60
25-Jun-05	23.50	31.00	68.00	94.00	15.60		6.00	1.30
26-Jun-05	24.50	29.50	72.00	92.00	34.50		2.60	1.00
27-Jun-05	23.50	28.60	82.00	96.00	25.60		0.00	0.50
28-Jun-05	23.90	28.20	81.00	98.00	34.30		0.30	0.60
29-Jun-05	24.00	30.00	77.00	98.00	8.50		1.90	0.90
30-Jun-05	24.30	28.80	77.00	96.00	3.40		0.30	1.00
01-Jul-05	25.10	29.30	81.00	94.00	0.00		0.40	0.90
02-Jul-05	24.30	28.40	82.00	94.00	0.80		1.30	1.00
03-Jul-05	24.60	27.10	79.00	96.00	5.20		0.00	0.60
04-Jul-05	24.90	30.00	70.00	96.00	0.00		3.40	1.20
05-Jul-05	24.30	31.60	65.00	95.00	20.90		7.10	1.60
06-Jul-05	26.20	28.80	79.00	97.00	0.70		1.50	0.50
07-Jul-05	24.00	30.30	75.00	97.00	24.20		4.00	1.30
08-Jul-05	24.70	30.50	72.00	95.00	5.00		2.10	0.90
09-Jul-05	24.50	28.30	80.00	95.00	0.00		0.70	1.00
10-Jul-05	24.80	31.00	70.00	96.00	0.60		6.20	2.20
11-Jul-05	25.40	32.40	71.00	89.00	0.70		8.40	3.40
12-Jul-05	25.30	29.50	83.00	96.00	0.00		3.80	2.70
13-Jul-05	25.00	31.70	66.00	96.00	0.00		5.90	3.50
14-Jul-05	25.70	33.10	60.00	94.00	0.50		8.00	3.60
15-Jul-05	25.70	33.00	64.00	91.00	2.60		6.90	2.60
16-Jul-05	24.60	33.70	67.00	92.00	1.40		10.50	3.90
17-Jul-05	24.30	32.60	71.00	94.00	2.00		6.90	2.30
18-Jul-05	24.00	31.00	76.00	95.00	0.00		2.20	2.60
19-Jul-05	24.10	32.50	66.00	95.00	10.10		10.10	4.60

20-Jul-05	26.00	32.00	69.00	93.00	0.00	6.90	3.80
21-Jul-05	25.50	31.10	74.00	96.00	16.00	1.50	3.40
22-Jul-05	25.50	29.70	78.00	98.00	43.60	1.30	2.00
23-Jul-05	24.80	29.20	85.00	98.00	25.40	1.10	1.30
24-Jul-05	23.60	26.50	94.00	98.00	106.80	0.00	1.10
25-Jul-05	24.40	29.70	77.00	98.00	24.20	0.50	1.60
26-Jul-05	24.00	28.30	83.00	98.00	99.70	0.00	1.90
27-Jul-05	24.50	27.20	89.00	97.00	30.60	0.00	0.90
28-Jul-05	23.40	28.70	84.00	99.00	9.30	0.20	1.10
29-Jul-05	24.70	28.10	84.00	98.00	0.60	0.00	1.80
30-Jul-05	25.50	27.60	87.00	94.00	0.00	0.00	2.80
31-Jul-05	25.50	29.20	78.00	96.00	4.20	0.00	2.90
01-Aug-05	24.40	30.80	71.00	96.00	5.00	4.60	2.90
02-Aug-05	23.90	31.80	72.00	97.00	1.20	5.00	3.20
03-Aug-05	24.00	31.50	69.00	96.00	30.60	5.30	3.30
04-Aug-05	25.00	30.90	81.00	98.00	14.00	0.60	1.20
05-Aug-05	24.50	31.20	66.00	98.00	3.50	2.10	1.90
06-Aug-05	24.00	28.00	80.00	97.00	49.60	0.00	1.60
07-Aug-05	25.00	27.70	84.00	98.00	60.20	0.20	1.20
08-Aug-05	24.70	28.60	78.00	96.00	44.50	0.00	1.10
09-Aug-05	22.50	25.80	90.00	96.00	2.80	0.00	0.60
10-Aug-05	23.30	27.70	84.00	94.00	4.40	0.00	1.00
11-Aug-05	23.00	27.60	80.00	95.00	0.80	0.00	2.00
12-Aug-05	25.50	29.20	76.00	93.00	10.00	1.00	3.40
13-Aug-05	25.50	30.00	82.00	93.00	2.00	0.90	2.40
14-Aug-05	25.00	31.00	67.00	91.00	2.80	1.40	2.60
15-Aug-05	25.00	31.80	60.00	93.00	11.70	5.60	2.30
16-Aug-05	25.30	29.70	76.00	96.00	37.00	1.20	1.60
17-Aug-05	23.30	27.20	88.00	97.00	33.00	0.00	1.00

18-Aug-05	22.80	28.70	80.00	98.00	0.00	0.70	1.20
19-Aug-05	24.00	29.60	71.00	98.00	3.40	0.50	2.20
20-Aug-05	23.50	31.30	70.00	94.00	55.90	3.10	1.80
21-Aug-05	23.30	30.00	74.00	96.00	3.90	1.70	1.80
22-Aug-05	24.00	31.00	69.00	96.00	0.00	5.40	2.00
23-Aug-05	24.80	33.60	53.00	94.00	0.00	10.50	3.40
24-Aug-05	25.50	33.80	61.00	90.00	0.00	9.90	3.60
25-Aug-05	27.00	33.70	63.00	86.00	0.00	6.60	3.30
26-Aug-05	25.00	32.20	62.00	89.00	0.00	8.50	3.70
27-Aug-05	24.80	32.50	69.00	91.00	6.10	6.00	2.40
28-Aug-05	25.00	32.20	66.00	90.00	45.60	5.50	2.70
29-Aug-05	24.40	25.70	88.00	96.00	63.40	0.00	0.80
30-Aug-05	23.50	28.30	82.00	96.00	16.10	1.20	1.30
31-Aug-05	23.70	29.70	77.00	96.00	2.00	0.70	1.40
01-Sep-05	24.60	31.60	68.00	94.00	13.10	4.80	2.10
02-Sep-05	24.50	33.20	71.00	95.00	0.00	6.90	1.80
03-Sep-05	24.70	31.00	71.00	94.00	1.50	1.70	1.80
04-Sep-05	25.20	31.30	70.00	96.00	0.20	5.20	2.50
05-Sep-05	25.00	31.50	67.00	92.00	27.10	6.70	2.00
06-Sep-05	25.70	30.50	80.00	98.00	97.80	2.40	1.30
07-Sep-05	25.20	30.00	78.00	98.00	20.30	4.10	1.20
08-Sep-05	23.60	31.00	71.00	96.00	36.60	4.90	1.40
09-Sep-05	24.80	30.10	72.00	98.00	58.00	3.10	1.30
10-Sep-05	24.50	28.00	81.00	96.00	0.00	0.10	0.90
11-Sep-05	21.40	31.80	76.00	94.00	3.70	5.00	1.50
12-Sep-05	24.80	31.40	68.00	94.00	11.50	4.90	2.50
13-Sep-05	24.50	27.10	84.00	94.00	2.10	0.00	1.80
14-Sep-05	24.10	29.70	65.00	96.00	0.80	3.60	3.30
15-Sep-05	24.30	31.60	65.00	97.00	0.00	6.30	2.00

16-Sep-05	25.00	32.50	65.00	94.00	1.80	6.90	2.50
17-Sep-05	24.50	33.80	55.00	88.00	11.30	10.80	5.50
18-Sep-05	25.00	26.10	88.00	95.00	9.30	0.00	1.60
19-Sep-05	24.90	31.10	73.00	94.00	2.20	5.70	2.90
20-Sep-05	24.80	30.30	73.00	96.00	0.00	3.30	1.90
21-Sep-05	24.40	31.10	77.00	95.00	0.00	8.80	2.30
22-Sep-05	25.00	32.00	61.00	94.00	0.00	8.50	2.70
23-Sep-05	25.20	32.60	64.00	92.00	0.00	7.10	2.80
24-Sep-05	25.40	32.60	63.00	91.00	51.00	6.90	2.90
25-Sep-05	25.60	32.00	80.00	96.00	0.00	4.50	2.20
26-Sep-05	23.20	30.00	75.00	94.00	5.90	0.00	2.10
27-Sep-05	25.00	31.00	74.00	94.00	0.00	4.10	3.10
28-Sep-05	24.80	31.10	63.00	92.00	0.00	8.00	3.20
29-Sep-05	25.00	32.30	63.00	96.00	0.70	6.40	2.40
30-Sep-05	25.30	31.50	77.00	96.00	0.00	5.50	1.90
01-Oct-05	24.90	32.80	58.00	91.00	0.00	8.50	2.10
02-Oct-05	24.70	32.00	56.00	93.00	0.00	10.10	3.20
03-Oct-05	25.00	32.30	59.00	91.00	0.00	8.50	3.80
04-Oct-05	24.50	32.50	56.00	91.00	0.00	7.10	3.30
05-Oct-05	25.00	33.00	59.00	94.00	0.60	8.00	3.20
06-Oct-05	25.00	31.50	65.00	94.00	1.20	5.00	2.80
07-Oct-05	24.50	32.60	57.00	96.00	0.10	5.10	4.10
08-Oct-05	24.00	32.30	64.00	94.00	0.00	6.20	3.20
09-Oct-05	24.30	30.30	62.00	90.00	0.00	2.80	4.30
10-Oct-05	23.50	32.50	59.00	91.00	0.20	5.50	4.60
11-Oct-05	24.50	30.50	72.00	96.00	0.00	4.80	1.80
12-Oct-05	24.30	33.10	56.00	94.00	0.00	5.80	2.30
13-Oct-05	24.50	33.20	77.00	94.00	0.00	1.60	2.00
14-Oct-05	24.30	32.80	55.00	96.00	0.00	9.40	3.80

15-Oct-05	23.00	33.00	48.00	92.00	0.00	9.90	3.30
16-Oct-05	24.30	33.30	42.00	91.00	0.00	9.70	3.70
17-Oct-05	23.30	33.30	52.00	91.00	0.00	8.40	3.50
18-Oct-05	23.50	33.50	49.00	96.00	0.20	8.30	3.80
19-Oct-05	22.60	32.60	47.00	89.00	0.00	9.00	6.30
20-Oct-05	24.00	33.20	51.00	85.00	0.00	7.90	5.90
21-Oct-05	22.30	32.00	52.00	80.00	3.30	8.50	7.70
22-Oct-05	21.20	32.10	46.00	87.00	0.00	9.10	7.30
23-Oct-05	23.30	32.50	55.00	87.00	0.00	5.10	5.90
24-Oct-05	24.00	32.70	59.00	89.00	0.00	5.60	3.60
25-Oct-05	23.40	33.10	55.00	94.00	2.50	6.50	3.10
26-Oct-05	23.40	32.70	53.00	95.00	0.10	6.30	3.20
27-Oct-05	23.30	33.10	54.00	87.00	0.00	8.40	4.40
28-Oct-05	22.10	32.70	51.00	86.00	0.00	9.60	4.00
29-Oct-05	23.50	33.80	52.00	84.00	0.00	6.10	5.00
30-Oct-05	23.80	31.70	54.00	83.00	0.00	8.20	5.60
31-Oct-05	21.70	29.90	55.00	93.00	0.00	3.80	4.30
01-Nov-05	21.50	26.50	70.00	88.00	0.00	0.00	2.80
02-Nov-05	21.80	30.50	55.00	92.00	0.00	5.30	3.10
03-Nov-05	23.20	34.10	47.00	93.00	0.60	8.60	3.50
04-Nov-05	26.40	33.50	54.00	92.00	0.00	1.80	2.30
05-Nov-05	25.30	33.20	54.00	94.00	10.70	5.80	2.80
06-Nov-05	25.60	34.40	61.00	94.00	14.10	9.40	2.80
07-Nov-05	25.60	33.30	60.00	96.00	27.00	5.30	1.70
08-Nov-05	23.80	32.70	61.00	96.00	0.00	8.20	1.70
09-Nov-05	22.50	31.70	66.00	95.00	0.00	9.30	2.60
10-Nov-05	24.30	33.30	72.00	96.00	0.00	8.20	3.20
11-Nov-05	25.10	33.60	68.00	89.00	3.20	8.60	3.20
12-Nov-05	25.20	32.30	75.00	91.00	0.00	6.30	2.50

13-Nov-05	24.20	33.70	58.00	94.00	0.00	8.20	2.90
14-Nov-05	25.20	32.60	62.00	96.00	0.00	6.80	2.50
15-Nov-05	24.50	32.80	59.00	96.00	0.00	8.90	3.50
16-Nov-05	23.30	33.00	53.00	92.00	0.00	10.40	5.30
17-Nov-05	24.00	30.50	64.00	86.00	0.00	1.40	4.80
18-Nov-05	23.80	30.50	61.00	78.00	0.00	2.40	5.10
19-Nov-05	22.30	31.00	49.00	82.00	0.00	5.70	5.10
20-Nov-05	20.50	28.60	52.00	81.00	0.00	7.70	6.50
21-Nov-05	18.60	27.50	49.00	76.00	0.00	9.20	5.30
22-Nov-05	17.50	29.30	48.00	84.00	0.00	9.40	4.80
23-Nov-05	19.00	27.60	54.00	86.00	0.00	2.80	3.90
24-Nov-05	18.20	30.50	50.00	88.00	0.00	7.20	4.20
25-Nov-05	21.00	30.30	61.00	85.00	0.00	2.80	2.60
26-Nov-05	21.00	31.50	51.00	84.00	0.00	5.00	3.30
27-Nov-05	21.50	31.60	53.00	87.00	0.00	5.40	3.20
28-Nov-05	21.00	33.30	46.00	91.00	0.00	8.20	4.00
29-Nov-05	21.30	32.40	50.00	88.00	0.00	9.40	5.00
30-Nov-05	21.20	32.30	41.00	87.00	0.00	9.90	3.80
01-Dec-05	21.60	31.50	52.00	90.00	0.00	1.70	3.00
02-Dec-05	22.00	33.60	42.00	93.00	0.00	9.50	4.50
03-Dec-05	22.50	34.50	47.00	86.00	0.00	9.20	4.00
04-Dec-05	23.10	33.70	47.00	89.00	0.00	9.30	4.40
05-Dec-05	22.30	31.60	51.00	87.00	0.00	6.50	6.50
06-Dec-05	22.90	30.50	48.00	80.00	0.00	5.00	9.30
07-Dec-05	19.00	29.70	43.00	79.00	0.00	10.00	8.00
08-Dec-05	18.50	30.40	46.00	79.00	0.00	9.50	6.70
09-Dec-05	18.10	31.30	48.00	88.00	0.00	7.70	4.50
10-Dec-05	19.60	31.50	47.00	87.00	0.00	5.00	4.20
11-Dec-05	20.80	31.60	51.00	85.00	0.00	5.00	9.00

12-Dec-05	22.40	29.50	46.00	76.00	0.00		6.60	10.00
13-Dec-05	19.00	29.00	45.00	81.00	0.00		8.30	8.30
14-Dec-05	19.00	28.10	48.00	80.00	0.00		0.00	8.90
15-Dec-05	20.90	29.90	46.00	74.00	0.00		4.50	9.30
16-Dec-05	18.00	29.30	45.00	81.00	0.00		9.20	6.70
17-Dec-05	17.80	27.20	45.00	78.00	0.00		8.50	9.20
18-Dec-05	17.30	25.00	40.00	78.00	0.00		9.20	8.40
19-Dec-05	15.00	28.00	44.00	84.00	0.00		5.40	5.30
20-Dec-05	18.30	27.60	49.00	76.00	0.00		0.90	6.50
21-Dec-05	19.10	23.90	49.00	72.00	0.00		0.10	9.50
22-Dec-05	18.00	24.30	44.00	67.00	0.00		1.60	8.10
23-Dec-05	16.00	24.80	48.00	86.00	0.00		0.60	8.10
24-Dec-05	19.10	31.80	37.00	82.00	0.00		8.80	4.60
25-Dec-05	20.30	32.50	46.00	89.00	0.00		5.90	4.30
26-Dec-05	22.30	30.90	58.00	95.00	0.00		2.20	2.70
27-Dec-05	22.10	31.50	56.00	91.00	0.00		4.90	3.10
28-Dec-05	20.30	31.50	49.00	88.00	0.00		7.00	6.50
29-Dec-05	19.90	31.40	44.00	82.00	0.00		9.30	6.90
30-Dec-05	18.90	32.50	40.00	83.00	0.00		9.60	5.20
31-Dec-05	20.50	32.30	50.00	85.00	0.00		5.90	5.20
01-Jan-06	21.00	33.70	41.00	84.00	0.00	4.00	9.00	5.40
02-Jan-06	21.50	32.20	46.00	87.00	0.00	2.00	7.30	5.00
03-Jan-06	20.80	33.60	42.00	87.00	0.00	2.00	8.60	4.80
04-Jan-06	23.50	33.30	47.00	89.00	0.00	3.00	5.10	4.30
05-Jan-06	23.10	35.20	38.00	91.00	0.00	4.00	8.30	5.70
06-Jan-06	24.50	33.00	46.00	79.00	0.00	10.00	9.50	6.60
07-Jan-06	18.10	29.50	40.00	82.00	0.00	9.00	8.90	5.70
08-Jan-06	16.30	30.50	37.00	80.00	0.00	5.00	9.50	5.70
09-Jan-06	17.50	28.30	44.00	78.00	0.00	6.00	9.80	5.90

10-Jan-06	14.50	29.80	37.00	86.00	0.00	5.00	10.00	5.50
11-Jan-06	15.80	30.60	39.00	89.00	0.00	3.00	10.10	3.80
12-Jan-06	17.10	32.40	35.00	95.00	0.00	4.00	8.60	4.30
13-Jan-06	16.90	33.20	33.00	90.00	0.00	2.00	9.30	4.00
14-Jan-06	19.00	33.80	37.00	78.00	0.00	3.00	9.80	4.80
15-Jan-06	19.30	34.50	32.00	90.00	0.00	4.00	9.60	4.90
16-Jan-06	21.80	34.20	39.00	91.00	0.00	4.00	9.30	4.70
17-Jan-06	22.50	34.00	43.00	83.00	0.00	3.00	9.30	5.00
18-Jan-06	22.80	31.90	54.00	84.00	0.00	6.00	5.50	4.30
19-Jan-06	22.30	34.20	41.00	91.00	0.00	4.00	8.90	4.70
20-Jan-06	22.50	35.00	35.00	94.00	0.00	3.00	7.90	5.10
21-Jan-06	21.00	34.80	33.00	89.00	0.00	1.00	9.10	5.60
22-Jan-06	21.50	31.50	48.00	87.00	0.00	5.00	8.60	6.10
23-Jan-06	19.50	31.00	38.00	78.00	0.00	6.00	9.10	7.10
24-Jan-06	16.00	29.70	35.00	81.00	0.00	5.00	9.70	6.90
25-Jan-06	15.40	28.80	40.00	84.00	0.00	3.00	7.90	7.40
26-Jan-06	17.00	29.00	42.00	75.00	0.00	5.00	7.90	8.00
27-Jan-06	17.80	26.80	51.00	75.00	0.00	3.00	0.10	4.60
28-Jan-06	20.00	31.40	44.00	84.00	0.00	3.00	5.60	5.50
29-Jan-06	20.60	34.30	40.00	78.00	0.00	4.00	10.10	6.00
30-Jan-06	23.50	35.00	37.00	91.00	0.00	2.00	9.50	5.80
31-Jan-06	24.00	35.30	40.00	80.00	0.00	6.00	9.60	7.50
01-Feb-06	22.50	34.50	35.00	82.00	0.00	4.00	9.60	7.00
02-Feb-06	23.00	34.70	32.00	71.00	0.00	2.00	10.40	6.30
03-Feb-06	22.00	35.60	33.00	74.00	0.00	4.00	9.60	7.20
04-Feb-06	21.50	33.90	30.00	68.00	0.00	4.00	9.80	8.30
05-Feb-06	19.00	33.20	30.00	81.00	0.00	5.00	10.10	6.80
06-Feb-06	18.80	33.80	31.00	85.00	0.00	3.00	10.20	7.90
07-Feb-06	20.00	33.20	34.00	81.00	0.00	4.00	9.50	6.70

08-Feb-06	19.80	33.60	30.00	73.00	0.00	8.00	9.40	7.00
09-Feb-06	19.70	33.60	36.00	77.00	0.00	6.00	9.20	6.70
10-Feb-06	21.50	34.80	31.00	79.00	0.00	5.00	7.60	7.10
11-Feb-06	22.20	34.30	33.00	72.00	0.00	4.00	8.30	7.70
12-Feb-06	24.50	33.00	41.00	68.00	0.00	5.00	3.20	5.80
13-Feb-06	23.00	31.50	45.00	81.00	0.00	5.00	3.70	5.30
14-Feb-06	22.00	36.00	36.00	82.00	0.00	3.00	9.00	6.00
15-Feb-06	25.80	35.20	41.00	73.00	0.00	5.00	8.10	6.20
16-Feb-06	25.70	34.70	44.00	75.00	0.00	5.00	8.20	6.00
17-Feb-06	26.00	35.00	42.00	80.00	0.00	5.00	4.00	5.20
18-Feb-06	24.50	34.00	44.00	81.00	0.00	2.00	6.50	5.40
19-Feb-06	21.40	34.70	40.00	74.00	0.00	5.00	8.50	6.30
20-Feb-06	21.40	35.30	35.00	75.00	0.00	4.00	10.30	7.50
21-Feb-06	21.00	35.50	32.00	80.00	0.00	4.00	10.40	8.80
22-Feb-06	22.50	35.50	36.00	77.00	0.00	3.00	9.50	8.00
23-Feb-06	21.80	35.80	30.00	72.00	0.00	3.00	7.50	7.70
24-Feb-06	22.00	36.70	28.00	76.00	0.00	5.00	10.60	8.80
25-Feb-06	22.50	35.70	33.00	78.00	0.00	4.00	10.00	7.30
26-Feb-06	24.20	36.00	37.00	72.00	0.00	6.00	8.60	9.10
27-Feb-06	25.50	31.70	57.00	79.00	0.00	6.00	5.70	5.90
28-Feb-06	25.00	32.50	62.00	80.00	0.00	6.00	0.50	4.10
01-Mar-06	18.40	31.80	41.00	71.00	0.00	5.00	8.60	7.70
02-Mar-06	17.40	31.80	34.00	71.00	0.00	5.00	7.50	7.50
03-Mar-06	17.50	31.60	41.00	75.00	0.00	3.00	9.50	4.50
04-Mar-06	21.20	35.00	35.00	78.00	0.00	4.00	9.30	6.60
05-Mar-06	21.50	36.20	31.00	82.00	0.00	6.00	10.70	8.00
06-Mar-06	25.00	36.00	34.00	76.00	0.00	5.00	9.10	6.70
07-Mar-06	24.40	35.50	45.00	76.00	0.00	5.00	9.00	6.70
08-Mar-06	24.80	37.10	40.00	77.00	0.00	5.00	9.10	7.50

09-Mar-06	26.50	37.30	40.00	73.00	0.00	5.00	7.00	7.80
10-Mar-06	26.80	35.50	42.00	70.00	0.00	7.00	8.20	6.80
11-Mar-06	26.50	35.80	46.00	70.00	6.40	5.00	7.70	8.30
12-Mar-06	24.20	37.50	34.00	76.00	0.00	10.00	9.10	6.40
13-Mar-06	20.60	33.70	49.00	76.00	0.00	5.00	4.70	6.70
14-Mar-06	21.00	32.40	40.00	69.00	0.00	3.00	6.70	7.80
15-Mar-06	21.00	34.00	37.00	72.00	0.00	4.00	4.80	5.90
16-Mar-06	24.70	36.70	34.00	74.00	0.00	4.00	10.10	8.20
17-Mar-06	27.00	37.10	38.00	70.00	0.00	5.00	10.00	8.60
18-Mar-06	25.30	36.70	39.00	72.00	0.00	5.00	8.70	7.70
19-Mar-06	25.80	36.70	35.00	74.00	0.00	7.00	9.20	9.50
20-Mar-06	26.20	37.50	32.00	68.00	0.00	4.00	10.60	8.10
21-Mar-06	27.20	37.60	35.00	63.00	0.00	4.00	9.60	8.40
22-Mar-06	25.50	37.50	35.00	63.00	0.00	5.00	9.00	7.30
23-Mar-06	25.60	37.30	37.00	67.00	0.00	5.00	9.00	8.20
24-Mar-06	27.50	37.00	40.00	68.00	0.00	4.00	8.50	7.80
25-Mar-06	28.00	36.80	41.00	74.00	0.00	5.00	9.00	7.70
26-Mar-06	27.10	37.00	43.00	69.00	0.00	5.00	10.40	8.20
27-Mar-06	27.30	38.30	37.00	72.00	0.00	4.00	9.50	8.50
28-Mar-06	25.30	33.00	57.00	78.00	0.00	5.00	0.80	4.30
29-Mar-06	26.00	34.80	43.00	79.00	0.00	5.00	6.50	5.80
30-Mar-06	23.80	32.00	61.00	84.00	0.00	6.00	4.40	4.60
31-Mar-06	24.30	34.70	43.00	86.00	4.90	1.00	8.10	5.50
01-Apr-06	24.70	33.30	52.00	91.00	0.00	6.00	2.80	3.30
02-Apr-06	24.80	31.70	54.00	89.00	0.00	6.00	2.50	5.10
03-Apr-06	25.00	35.50	45.00	87.00	6.60	5.00	8.40	6.20
04-Apr-06	24.90	34.60	51.00	86.00	0.00	10.00	5.80	3.60
05-Apr-06	25.10	37.00	43.00	87.00	0.50	4.00	10.20	6.30
06-Apr-06	26.90	38.30	42.00	73.00	6.60	5.00	9.50	8.10

07-Apr-06	24.00	37.50	40.00	92.00	33.50	5.00	9.60	6.40
08-Apr-06	24.00	33.50	63.00	92.00	0.00	3.00	4.60	2.40
09-Apr-06	24.60	31.80	59.00	91.00	0.00	3.00	2.80	4.10
10-Apr-06	26.00	33.50	52.00	83.00	0.00	13.00	5.60	7.30
11-Apr-06	27.00	35.80	49.00	81.00	0.00	9.00	8.70	6.70
12-Apr-06	27.20	36.40	44.00	79.00	0.00	5.00	10.10	6.80
13-Apr-06	27.50	36.90	42.00	77.00	68.00	5.00	9.80	7.80
14-Apr-06	23.00	36.50	49.00	92.00	0.00	5.00	4.60	4.80
15-Apr-06	22.60	31.80	60.00	94.00	0.00	5.00	6.20	3.70
16-Apr-06	22.80	33.30	51.00	80.00	0.00	5.00	10.50	5.00
17-Apr-06	23.00	35.30	40.00	81.00	0.00	5.00	11.30	6.20
18-Apr-06	26.50	35.10	43.00	75.00	0.00	5.00	10.00	6.70
19-Apr-06	25.60	35.40	49.00	84.00	0.00	8.00	9.80	5.40
20-Apr-06	26.00	35.60	43.00	85.00	0.00	4.00	9.90	5.50
21-Apr-06	26.50	35.70	39.00	77.00	0.00	6.00	10.50	8.50
22-Apr-06	27.00	36.30	39.00	71.00	0.00	5.00	9.90	7.50
23-Apr-06	26.50	36.90	45.00	74.00	1.40	3.00	9.90	7.20
24-Apr-06	24.50	27.30	78.00	96.00	0.00	6.00	0.00	1.50
25-Apr-06	24.80	34.80	48.00	93.00	6.70	4.00	9.20	4.70
26-Apr-06	26.60	35.00	56.00	88.00	0.00	6.00	7.20	3.90
27-Apr-06	27.00	36.00	47.00	88.00	0.00	2.00	9.70	5.70
28-Apr-06	26.40	34.00	51.00	79.00	10.70	12.00	4.60	5.60
29-Apr-06	24.30	31.30	69.00	91.00	16.40	10.00	4.80	2.50
30-Apr-06	25.00	26.60	86.00	95.00	0.00	8.00	0.10	1.70
01-May-06	26.50	33.00	59.00	86.00	0.00	6.00	8.00	4.40
02-May-06	26.60	34.00	54.00	92.00	0.00	2.00	8.20	4.10
03-May-06	26.30	33.80	58.00	84.00	0.00	5.00	7.50	4.20
04-May-06	26.60	33.10	58.00	87.00	0.00	4.00	5.90	3.90
05-May-06	26.80	35.70	55.00	82.00	0.00	5.00	9.10	4.90

06-May-06	27.00	34.70	57.00	85.00	0.00	5.00	8.60	5.10
07-May-06	27.20	34.30	52.00	80.00	35.40	5.00	5.30	5.60
08-May-06	27.30	35.80	45.00	91.00	9.20	7.00	7.30	5.70
09-May-06	23.20	29.50	59.00	96.00	0.00	5.00	1.90	2.00
10-May-06	25.60	34.60	49.00	91.00	0.00	3.00	10.10	5.10
11-May-06	25.70	34.80	54.00	84.00	0.00	6.00	10.80	5.60
12-May-06	25.60	35.20	48.00	80.00	0.00	5.00	9.60	5.30
13-May-06	25.60	35.50	46.00	86.00	0.00	5.00	10.50	7.20
14-May-06	25.70	33.20	38.00	78.00	0.00	10.00	11.20	10.30
15-May-06	22.00	32.20	40.00	80.00	0.00	7.00	5.00	10.10
16-May-06	22.50	34.50	28.00	64.00	0.00	4.00	10.90	9.70
17-May-06	24.00	36.00	29.00	71.00	9.90	1.00	11.30	8.00
18-May-06	26.20	30.90	61.00	96.00	58.30	5.00	0.00	3.30
19-May-06	23.50	29.30	83.00	96.00	63.40	5.00	3.00	1.10
20-May-06	23.60	27.80	89.00	99.00	2.20	8.00	0.70	0.90
21-May-06	24.50	31.00	64.00	96.00	0.00	9.00	6.10	3.00
22-May-06	24.50	30.40	66.00	89.00	0.00	6.00	4.50	4.10
23-May-06	25.30	32.80	57.00	86.00	2.30	4.00	6.80	3.90
24-May-06	25.50	32.50	57.00	90.00	0.00	5.00	6.00	3.90
25-May-06	26.00	31.60	61.00	88.00	0.00	5.00	7.20	4.60
26-May-06	26.20	32.70	57.00	89.00	8.70	2.00	5.80	4.10
27-May-06	25.00	32.80	60.00	88.00	23.40	5.00	6.30	3.90
28-May-06	25.20	31.10	63.00	96.00	1.50	4.00	2.00	2.40
29-May-06	25.30	32.00	69.00	89.00	0.00	9.00	3.60	2.30
30-May-06	25.40	30.70	64.00	92.00	17.60	5.00	2.90	2.40
31-May-06	25.60	29.80	77.00	93.00	5.30	6.00	2.10	1.60
01-Jun-06	24.70	31.80	67.00	92.00	0.70	4.00	5.70	2.10
02-Jun-06	24.90	32.80	61.00	92.00	18.80	5.00	6.80	3.30
03-Jun-06	26.50	32.90	59.00	95.00	0.00	5.00	7.30	3.10

04-Jun-06	25.00	33.30	59.00	94.00	2.80	4.00	9.20	3.40
05-Jun-06	26.00	33.70	60.00	87.00	3.60	4.00	11.10	3.40
06-Jun-06	26.20	33.00	59.00	88.00	10.20	3.00	8.40	3.30
07-Jun-06	26.60	33.70	62.00	88.00	0.00	3.00	8.50	3.30
08-Jun-06	26.80	33.50	62.00	84.00	0.00	6.00	9.20	4.00
09-Jun-06	27.60	33.80	57.00	84.00	0.40	4.00	6.90	4.40
10-Jun-06	26.80	33.50	56.00	86.00	0.00	5.00	5.90	4.10
11-Jun-06	26.50	34.50	54.00	86.00	0.00	2.00	7.80	4.60
12-Jun-06	27.00	34.30	59.00	79.00	0.00	5.00	7.50	3.50
13-Jun-06	27.60	34.90	56.00	83.00	0.00	4.00	6.20	4.20
14-Jun-06	26.50	33.70	59.00	82.00	0.00	5.00	7.60	3.90
15-Jun-06	26.80	33.70	65.00	84.00	0.00	4.00	3.50	3.50
16-Jun-06	26.30	33.00	61.00	88.00	0.70	5.00	5.40	4.00
17-Jun-06	26.20	32.00	63.00	92.00	0.00	4.00	2.10	3.40
18-Jun-06	26.20	33.80	49.00	89.00	0.00	8.00	7.10	3.60
19-Jun-06	25.80	33.80	55.00	86.00	0.00	5.00	8.50	4.50
20-Jun-06	24.30	33.20	58.00	91.00	32.70	8.00	7.00	3.70
21-Jun-06	24.00	33.30	57.00	93.00	0.70	10.00	5.40	3.10
22-Jun-06	25.00	31.50	72.00	93.00	50.00	2.00	3.80	2.20
23-Jun-06	23.80	32.60	61.00	92.00	0.00	8.00	6.30	3.40
24-Jun-06	26.00	32.30	67.00	95.00	0.00	5.00	8.10	3.50
25-Jun-06	25.60	33.00	67.00	88.00	0.00	4.00	4.40	3.30
26-Jun-06	25.60	31.70	64.00	89.00	0.00	5.00	3.10	3.60
27-Jun-06	26.30	33.00	61.00	90.00	3.60	5.00	7.90	4.10
28-Jun-06	25.50	31.50	66.00	88.00	66.30	4.00	4.10	3.20
29-Jun-06	24.30	28.20	81.00	96.00	9.80	2.00	0.00	1.10
30-Jun-06	24.30	26.50	90.00	98.00	112.00	5.00	0.00	0.90
01-Jul-06	23.50	27.80	83.00	98.00	26.10	7.00	0.00	0.90
02-Jul-06	24.50	28.20	85.00	98.00	48.90	4.00	0.00	0.90

03-Jul-06	23.40	29.60	77.00	96.00	56.60	5.00	0.90	1.30
04-Jul-06	24.50	28.00	87.00	98.00	4.70	5.00	0.00	0.80
05-Jul-06	24.50	29.70	74.00	97.00	6.60	5.00	0.40	1.40
06-Jul-06	24.50	30.30	75.00	95.00	0.00	5.00	2.40	2.10
07-Jul-06	25.70	32.00	72.00	92.00	2.10	4.00	7.60	3.10
08-Jul-06	26.50	31.20	73.00	90.00	5.30	3.00	1.00	2.90
09-Jul-06	25.60	32.00	68.00	94.00	69.00	4.00	6.40	3.60
10-Jul-06	24.00	32.00	73.00	98.00	0.50	13.00	2.60	1.60
11-Jul-06	24.00	27.30	83.00	96.00	20.10	4.00	0.00	1.50
12-Jul-06	24.50	31.70	72.00	94.00	2.00	9.00	4.50	2.30
13-Jul-06	25.00	31.30	73.00	93.00	0.00	4.00	3.60	2.40
14-Jul-06	25.40	31.80	68.00	90.00	0.00	5.00	6.90	2.90
15-Jul-06	26.00	32.20	65.00	89.00	10.40	1.00	4.80	2.90
16-Jul-06	25.30	32.20	70.00	92.00	21.40	3.00	4.80	2.50
17-Jul-06	24.50	30.80	72.00	95.00	22.00	15.00	0.80	2.50
18-Jul-06	23.60	29.00	74.00	96.00	2.20	6.00	0.00	5.00
19-Jul-06	23.80	29.30	80.00	96.00	11.10	6.00	0.30	1.10
20-Jul-06	24.00	32.30	59.00	93.00	20.30	4.00	9.60	2.90
21-Jul-06	23.50	31.40	65.00	97.00	147.90	8.00	4.90	2.20
22-Jul-06	23.50	30.00	79.00	97.00	7.70	6.00	2.90	1.00
23-Jul-06	23.80	28.70	78.00	98.00	36.50	2.00	0.80	0.90
24-Jul-06	23.80	27.80	85.00	96.00	62.70	3.00	0.00	1.20
25-Jul-06	24.00	30.20	82.00	97.00	45.70	3.00	1.40	1.00
26-Jul-06	23.60	29.20	74.00	97.00	7.80	10.00	0.50	1.50
27-Jul-06	23.80	29.20	71.00	95.00	0.00	3.00	0.00	1.40
28-Jul-06	24.00	29.20	76.00	97.00	45.60	3.00	0.50	1.90
29-Jul-06	23.90	30.60	73.00	97.00	16.10	5.00	1.70	1.60
30-Jul-06	23.50	28.60	81.00	98.00	35.00	4.00	0.00	1.20
31-Jul-06	23.50	29.70	71.00	96.00	9.50	2.00	2.60	1.40

01-Aug-06	23.50	25.80	88.00	97.00	9.00	5.00	0.00	0.80
02-Aug-06	23.80	28.40	76.00	97.00	5.40	4.00	0.00	1.00
03-Aug-06	25.00	29.50	71.00	96.00	7.60	6.00	0.00	1.60
04-Aug-06	24.00	27.40	81.00	93.00	2.40	3.00	0.00	2.00
05-Aug-06	24.50	28.70	77.00	92.00	5.60	4.00	3.30	2.30
06-Aug-06	24.90	30.20	81.00	94.00	0.00	4.00	1.30	2.30
07-Aug-06	25.10	32.00	63.00	92.00	127.90	5.00	6.20	2.80
08-Aug-06	23.50	30.80	71.00	96.00	4.00	2.00	3.20	1.60
09-Aug-06	24.00	31.50	67.00	96.00	18.80	3.00	5.30	2.00
10-Aug-06	25.00	32.00	59.00	96.00	79.90	8.00	5.00	2.50
11-Aug-06	24.80	30.60	74.00	97.00	30.00	8.00	1.90	1.30
12-Aug-06	24.60	28.60	77.00	94.00	22.00	1.00	0.00	1.20
13-Aug-06	25.00	28.00	91.00	97.00	18.60	2.00	0.40	0.70
14-Aug-06	25.20	27.20	86.00	97.00	77.00	5.00	0.00	1.00
15-Aug-06	24.00	25.10	95.00	97.00	3.80	5.00	0.00	0.60
16-Aug-06	24.00	29.90	79.00	95.00	0.00	4.00	3.20	1.50
17-Aug-06	25.30	31.50	70.00	95.00	1.40	4.00	8.60	3.30
18-Aug-06	25.80	32.50	66.00	92.00	14.40	3.00	4.60	2.50
19-Aug-06	24.40	31.50	74.00	96.00	1.00	5.00	4.60	2.40
20-Aug-06	24.50	31.60	67.00	93.00	31.60	3.00	7.70	2.40
21-Aug-06	23.50	31.50	72.00	96.00	86.10	8.00	2.70	2.00
22-Aug-06	23.80	29.00	79.00	96.00	22.40	7.00	0.50	1.00
23-Aug-06	22.50	27.50	81.00	97.00	7.00	1.00	2.40	0.90
24-Aug-06	24.50	30.20	74.00	97.00	39.40	2.00	3.40	1.60
25-Aug-06	22.80	29.00	76.00	98.00	12.40	3.00	1.90	1.70
26-Aug-06	23.50	30.50	72.00	96.00	4.50	2.00	4.10	1.80
27-Aug-06	24.50	31.70	61.00	95.00	3.70	2.00	7.30	3.10
28-Aug-06	24.00	32.40	62.00	93.00	84.20	3.00	5.80	2.10
29-Aug-06	23.50	30.00	75.00	96.00	10.10	3.00	3.00	1.20

30-Aug-06	24.00	26.50	76.00	93.00	0.00	6.00	0.00	1.80
31-Aug-06	24.00	31.10	56.00	95.00	0.00	5.00	7.20	1.80
01-Sep-06	25.20	32.40	57.00	96.00	0.00	2.00	10.30	3.20
02-Sep-06	25.50	33.20	56.00	91.00	0.00	3.00	10.10	3.60
03-Sep-06	25.80	33.50	63.00	91.00	0.00	1.00	8.30	2.70
04-Sep-06	25.50	33.80	64.00	88.00	3.90	4.00	7.30	3.30
05-Sep-06	24.70	32.10	64.00	96.00	0.00	8.00	8.40	3.00
06-Sep-06	24.00	32.50	57.00	91.00	0.00	8.00	10.50	3.80
07-Sep-06	26.00	33.00	64.00	92.00	0.00	1.00	9.80	3.10
08-Sep-06	24.80	32.50	68.00	92.00	0.00	6.00	7.60	3.20
09-Sep-06	25.40	32.40	63.00	91.00	5.20	5.00	5.90	2.40
10-Sep-06	23.30	29.60	78.00	98.00	0.00	8.00	1.80	1.60
11-Sep-06	23.50	32.20	60.00	92.00	0.00	1.00	8.00	2.60
12-Sep-06	24.00	32.30	54.00	91.00	12.20	4.00	5.90	2.80
13-Sep-06	24.30	32.40	59.00	95.00	1.80	3.00	6.80	2.60
14-Sep-06	24.00	29.80	71.00	94.00	0.00	4.00	2.50	1.80
15-Sep-06	24.70	32.40	59.00	94.00	41.00	5.00	8.10	2.70
16-Sep-06	23.00	31.70	62.00	96.00	0.10	2.00	4.10	2.00
17-Sep-06	25.00	31.90	64.00	96.00	36.10	3.00	6.00	2.60
18-Sep-06	23.30	30.90	74.00	96.00	22.00	7.00	3.30	2.00
19-Sep-06	23.00	31.20	67.00	96.00	4.60	5.00	5.50	1.60
20-Sep-06	25.00	27.90	81.00	94.00	20.00	3.00	0.50	0.80
21-Sep-06	24.20	31.30	65.00	97.00	0.00	3.00	5.80	2.10
22-Sep-06	23.00	32.30	63.00	96.00	0.00	4.00	6.70	3.60
23-Sep-06	24.40	31.80	56.00	85.00	31.60	5.00	6.40	4.10
24-Sep-06	21.40	26.00	78.00	96.00	11.60	3.00	0.00	1.20
25-Sep-06	22.10	22.90	94.00	97.00	0.50	3.00	0.00	0.62
26-Sep-06	24.00	30.00	68.00	95.00	11.10	2.00	7.60	2.90
27-Sep-06	24.30	31.50	65.00	99.00	6.40	3.00	6.60	1.60

28-Sep-06	25.20	30.80	71.00	93.00	16.20	3.00	6.80	1.50
29-Sep-06	22.00	30.50	74.00	95.00	16.30	3.00	6.10	3.20
30-Sep-06	24.00	31.00	60.00	96.00	90.90	6.00	5.40	0.20
01-Oct-06	23.50	26.30	86.00	98.00	2.60	7.00	0.00	0.70
02-Oct-06	24.40	27.50	88.00	96.00	1.50	7.00	1.90	1.20
03-Oct-06	24.30	30.60	65.00	93.00	37.90	6.00	4.80	2.10
04-Oct-06	24.00	32.00	67.00	96.00	28.40	5.00	6.20	1.90
05-Oct-06	24.00	31.00	71.00	95.00	35.00	3.00	5.80	2.00
06-Oct-06	24.20	29.20	78.00	97.00	8.90	2.00	3.20	1.40
07-Oct-06	24.30	29.10	83.00	95.00	0.00	3.00	2.80	1.50
08-Oct-06	24.50	30.60	70.00	95.00	0.60	3.00	2.00	1.60
09-Oct-06	23.50	30.80	68.00	95.00	34.00	3.00	4.50	1.50
10-Oct-06	23.00	31.80	60.00	99.00	7.90	2.00	9.30	1.80
11-Oct-06	23.50	31.60	62.00	96.00	6.00	3.00	9.20	2.40
12-Oct-06	23.20	31.70	60.00	96.00	0.00	8.00	7.70	1.70
13-Oct-06	24.30	31.80	54.00	93.00	0.00	3.00	5.50	1.90
14-Oct-06	25.10	32.70	61.00	90.00	0.00	2.00	9.80	2.60
15-Oct-06	24.50	33.10	58.00	90.00	0.00	5.00	8.50	2.80
16-Oct-06	25.10	33.40	58.00	88.00	0.00	5.00	7.60	2.80
17-Oct-06	24.70	33.70	64.00	90.00	3.00	3.00	9.10	2.30
18-Oct-06	25.10	33.70	55.00	92.00	0.80	2.00	9.80	2.40
19-Oct-06	23.00	32.70	65.00	94.00	0.00	2.00	7.90	1.80
20-Oct-06	21.80	33.10	52.00	91.00	0.00	3.00	9.60	3.20
21-Oct-06	22.30	32.70	47.00	88.00	0.00	2.00	9.80	3.20
22-Oct-06	22.50	33.20	47.00	89.00	0.00	1.00	10.30	3.30
23-Oct-06	22.90	32.80	50.00	91.00	0.00	2.00	10.20	3.60
24-Oct-06	22.50	33.50	48.00	98.00	0.00	4.00	10.10	4.10
25-Oct-06	22.70	33.50	47.00	87.00	0.00	5.00	10.10	4.40
26-Oct-06	24.10	32.60	54.00	83.00	0.00	5.00	8.90	4.90

27-Oct-06	23.10	32.40	52.00	83.00	0.00	5.00	6.30	4.90
28-Oct-06	22.20	33.00	49.00	83.00	0.00	5.00	8.70	5.00
29-Oct-06	21.00	32.70	47.00	85.00	0.00	6.00	8.10	5.30
30-Oct-06	21.40	31.00	57.00	90.00	0.00	1.00	4.30	3.80
31-Oct-06	22.30	30.00	58.00	84.00	0.00	4.00	0.50	4.10
01-Nov-06	20.50	31.50	49.00	83.00	0.00	10.00	6.00	5.20
02-Nov-06	19.70	31.30	45.00	81.00	0.00	7.00	8.50	5.50
03-Nov-06	19.40	36.00	43.00	88.00	0.00	2.00	8.80	4.20
04-Nov-06	20.20	31.80	47.00	90.00	0.00	2.00	9.10	3.20
05-Nov-06	21.20	32.10	41.00	89.00	0.00	3.00	9.10	3.10
06-Nov-06	21.30	32.50	51.00	87.00	0.00	8.00	8.10	5.40
07-Nov-06	21.80	31.20	47.00	80.00	0.00	8.00	5.80	5.80
08-Nov-06	22.00	31.10	57.00	88.00	0.00	6.00	4.50	3.90
09-Nov-06	22.70	33.10	48.00	91.00	4.00	1.00	7.80	3.20
10-Nov-06	21.80	34.00	45.00	91.00	0.00	7.00	9.30	2.90
11-Nov-06	21.50	33.60	42.00	94.00	0.00	3.00	10.10	5.00
12-Nov-06	20.00	32.30	42.00	96.00	0.00	3.00	8.50	3.80
13-Nov-06	20.80	32.50	41.00	91.00	0.00	3.00	9.10	3.40
14-Nov-06	22.40	33.50	43.00	91.00	0.00	3.00	9.20	3.50
15-Nov-06	22.60	34.00	43.00	91.00	0.00	1.00	9.40	3.90
16-Nov-06	23.50	34.70	43.00	91.00	0.00	2.00	9.40	3.60
17-Nov-06	25.20	35.00	50.00	90.00	7.20	5.00	8.70	3.50
18-Nov-06	23.50	35.40	51.00	91.00	0.00	12.00	8.30	2.90
19-Nov-06	24.00	34.00	53.00	91.00	0.00	5.00	9.10	2.80
20-Nov-06	23.50	33.60	51.00	88.00	0.00	4.00	9.10	3.30
21-Nov-06	24.20	33.00	53.00	91.00	0.00	3.00	7.90	3.20
22-Nov-06	25.00	33.60	55.00	96.00	0.00	3.00	9.90	2.80
23-Nov-06	25.00	34.00	54.00	90.00	0.00	5.00	9.80	3.30
24-Nov-06	24.00	34.20	50.00	91.00	0.00	3.00	8.50	3.20

25-Nov-06	24.00	34.50	50.00	92.00	0.00	3.00	9.60	3.30
26-Nov-06	24.00	35.00	46.00	93.00	0.00	1.00	9.50	3.40
27-Nov-06	24.60	35.30	40.00	92.00	0.00	2.00	10.20	3.50
28-Nov-06	24.90	35.10	46.00	90.00	0.00	2.00	9.10	4.10
29-Nov-06	23.80	35.00	44.00	88.00	0.00	3.00	10.00	3.70
30-Nov-06	22.30	34.70	47.00	92.00	0.00	5.00	9.70	3.50
01-Dec-06	23.50	34.50	40.00	88.00	0.00	3.00	9.60	3.60
02-Dec-06	23.10	31.10	62.00	88.00	0.00	2.00	2.30	2.90
03-Dec-06	19.80	32.70	48.00	85.00	0.00	10.00	9.00	5.10
04-Dec-06	22.00	31.50	46.00	86.00	0.00	10.00	10.00	7.10
05-Dec-06	23.30	30.50	57.00	82.00	0.00	6.00	3.00	4.40
06-Dec-06	24.50	34.10	47.00	84.00	0.00	2.00	9.00	3.80
07-Dec-06	23.50	35.50	47.00	88.00	0.00	4.00	8.10	4.00
08-Dec-06	21.50	34.50	38.00	83.00	0.00	3.00	9.80	4.90
09-Dec-06	23.60	34.50	46.00	82.00	0.00	2.00	7.00	5.20
10-Dec-06	21.90	32.80	52.00	83.00	0.00	4.00	7.10	5.30
11-Dec-06	21.40	33.50	43.00	85.00	0.00	5.00	9.10	4.20
12-Dec-06	20.80	32.50	41.00	85.00	0.00	4.00	8.20	4.00
13-Dec-06	20.30	32.10	45.00	86.00	0.00	5.00	8.50	4.90
14-Dec-06	19.20	32.50	44.00	83.00	0.00	4.00	6.60	4.70
15-Dec-06	21.70	32.50	44.00	81.00	0.00	2.10	9.60	4.50
16-Dec-06	19.00	29.80	42.00	71.00	0.00	12.00	8.60	7.40
17-Dec-06	17.40	29.80	44.00	82.00	0.00	6.00	8.70	5.90
18-Dec-06	17.90	29.50	37.00	84.00	0.00	5.00	8.20	5.60
19-Dec-06	17.00	28.50	48.00	81.00	0.00	15.00	9.00	6.90
20-Dec-06	16.50	27.80	44.00	78.00	0.00	10.00	9.80	6.50
21-Dec-06	15.00	28.20	40.00	70.00	0.00	10.00	8.90	6.90
22-Dec-06	15.90	28.50	32.00	75.00	0.00	5.00	9.80	6.30
23-Dec-06	16.00	29.00	34.00	84.00	0.00	3.00	9.70	4.50

24-Dec-06	17.80	30.30	29.00	85.00	0.00	3.00	9.20	5.40
25-Dec-06	18.40	32.10	33.00	86.00	0.00	2.00	6.60	4.00
26-Dec-06	18.40	32.00	36.00	85.00	0.00	2.00	8.50	4.10
27-Dec-06	19.30	32.50	37.00	83.00	0.00	3.00	9.60	4.00
28-Dec-06	17.50	32.10	26.00	88.00	0.00	2.00	7.90	4.70
29-Dec-06	17.70	30.80	33.00	85.00	0.00	3.00	9.00	5.20
30-Dec-06	19.40	32.00	42.00	86.00	0.00	4.00	8.90	4.80
31-Dec-06	20.50	33.00	40.00	85.00	0.00	4.00	8.90	4.70
01-Jan-07	20.50	34.00	39.00	86.00	0.00	3.00	8.90	3.90
02-Jan-07	21.00	34.20	40.00	86.00	0.00	3.00	10.10	4.90
03-Jan-07	21.50	34.00	34.00	84.00	0.00	2.00	7.50	5.20
04-Jan-07	22.00	34.20	39.00	88.00	0.00	4.00	7.00	5.30
05-Jan-07	20.00	32.30	43.00	76.00	0.00	8.00	8.30	7.20
06-Jan-07	19.80	30.00	44.00	77.00	0.00	9.00	7.90	8.80
07-Jan-07	18.50	29.80	41.00	70.00	0.00	6.00	8.60	7.10
08-Jan-07	16.60	27.20	48.00	79.00	0.00	5.00	0.60	5.90
09-Jan-07	16.40	29.50	42.00	81.00	0.00	5.00	10.00	6.40
10-Jan-07	16.50	31.00	39.00	82.00	0.00	2.00	10.00	5.40
11-Jan-07	18.00	31.30	33.00	83.00	0.00	5.00	9.60	5.80
12-Jan-07	18.60	33.00	37.00	88.00	0.00	4.00	9.50	6.10
13-Jan-07	19.30	33.30	34.00	87.00	0.00	3.00	10.30	6.10
14-Jan-07	19.10	33.20	29.00	84.00	0.00	2.00	10.00	5.10
15-Jan-07	19.20	33.30	38.00	89.00	0.00	3.00	9.60	4.50
16-Jan-07	20.50	33.50	41.00	84.00	0.00	3.00	7.50	4.20
17-Jan-07	21.70	35.00	41.00	83.00	0.00	3.00	8.70	5.10
18-Jan-07	21.50	35.00	41.00	87.00	0.00	1.00	9.30	5.40
19-Jan-07	21.50	31.70	50.00	75.00	0.00	3.00	4.80	4.60
20-Jan-07	21.70	34.60	40.00	81.00	0.00	3.00	9.40	4.70
21-Jan-07	21.00	35.30	41.00	81.00	0.00	3.00	9.80	5.60

22-Jan-07	20.40	33.80	43.00	82.00	0.00	4.00	8.90	4.70
23-Jan-07	19.00	33.10	40.00	83.00	0.00	5.00	9.10	6.50
24-Jan-07	17.80	33.00	37.00	78.00	0.00	5.00	9.80	6.60
25-Jan-07	16.80	32.20	31.00	85.00	0.00	5.00	10.20	6.80
26-Jan-07	17.00	31.50	33.00	87.00	0.00	6.00	10.00	7.40
27-Jan-07	17.40	28.50	42.00	70.00	0.00	7.00	9.70	8.00
28-Jan-07	17.50	25.70	39.00	66.00	0.00	10.00	8.40	7.50
29-Jan-07	14.80	28.50	29.00	68.00	0.00	6.00	9.40	6.30
30-Jan-07	15.00	29.10	29.00	74.00	0.00	2.00	9.40	5.60
31-Jan-07	15.30	29.10	25.00	72.00	0.00	3.00	9.90	7.00
01-Feb-07	15.50	29.00	27.00	64.00	0.00	7.00	9.70	9.60
02-Feb-07	15.40	29.60	26.00	66.00	0.00	8.00	9.20	8.40
03-Feb-07	15.60	29.70	28.00	75.00	0.00	2.00	9.00	5.00
04-Feb-07	15.20	31.10	29.00	82.00	0.00	2.00	9.00	4.80
05-Feb-07	17.10	31.70	31.00	83.00	0.00	2.00	9.00	5.30
06-Feb-07	19.00	33.00	30.00	70.00	0.00	4.00	8.20	6.20
07-Feb-07	20.80	33.80	25.00	65.00	0.00	2.00	8.40	6.20
08-Feb-07	19.50	34.40	24.00	70.00	0.00	3.00	9.60	6.10
09-Feb-07	19.50	35.30	18.00	72.00	0.00	4.00	9.90	7.10
10-Feb-07	22.70	36.20	16.00	64.00	0.00	5.00	10.10	7.90
11-Feb-07	22.00	34.70	30.00	72.00	0.00	2.00	9.60	5.90
12-Feb-07	22.50	35.10	30.00	71.00	0.00	4.00	9.80	6.70
13-Feb-07	23.00	36.00	32.00	70.00	0.00	4.00	9.20	6.50
14-Feb-07	23.80	36.30	23.00	64.00	0.00	9.00	9.60	7.80
15-Feb-07	23.40	35.40	28.00	61.00	0.00	6.00	10.00	9.60
16-Feb-07	23.30	34.00	42.00	70.00	0.00	5.00	8.90	7.80
17-Feb-07	23.80	35.70	36.00	74.00	0.00	5.00	9.70	7.70
18-Feb-07	23.00	37.00	31.00	81.00	0.00	5.00	9.70	6.70
19-Feb-07	25.50	36.00	35.00	72.00	0.00	5.00	8.30	8.00

20-Feb-07	25.50	35.60	42.00	76.00	0.00	5.00	9.00	7.00
21-Feb-07	25.70	36.00	40.00	76.00	0.00	5.00	9.40	7.00
22-Feb-07	25.50	32.80	55.00	78.00	0.00	7.00	6.20	5.50
23-Feb-07	25.40	34.10	46.00	78.00	0.00	5.00	7.90	5.80
24-Feb-07	25.50	35.60	40.00	78.00	0.00	6.00	9.00	6.70
25-Feb-07	24.40	36.60	36.00	72.00	0.00	2.00	9.00	6.00
26-Feb-07	24.50	34.30	37.00	88.00	0.00	5.00	5.20	7.10
27-Feb-07	24.90	34.60	39.00	73.00	0.00	5.00	6.40	6.90
28-Feb-07	25.00	34.50	42.00	75.00	0.00	9.00	8.60	7.80
01-Mar-07	25.90	33.60	54.00	78.00	0.00	6.00	6.80	5.40
02-Mar-07	25.50	34.70	44.00	76.00	0.00	6.00	9.90	7.20
03-Mar-07	25.70	36.20	36.00	71.00	0.00	5.00	8.60	6.80
04-Mar-07	26.90	35.20	43.00	70.00	0.00	7.00	8.80	7.00
05-Mar-07	26.50	36.00	44.00	72.00	5.60	4.00	7.50	6.60
06-Mar-07	25.00	34.50	50.00	92.00	17.70	5.00	4.00	4.10
07-Mar-07	22.40	26.00	84.00	96.00	0.00	7.00	0.00	1.00
08-Mar-07	22.50	32.90	53.00	96.00	0.00	4.00	8.70	3.90
09-Mar-07	23.60	28.00	65.00	84.00	0.00	9.00	0.30	3.30
10-Mar-07	24.20	35.50	39.00	83.00	0.00	6.00	10.40	6.20
11-Mar-07	24.50	35.70	39.00	72.00	0.00	5.00	9.60	8.40
12-Mar-07	24.60	36.00	30.00	68.00	0.00	2.00	9.80	6.40
13-Mar-07	25.50	35.60	41.00	69.00	0.00	11.00	9.50	7.40
14-Mar-07	26.50	35.00	47.00	70.00	0.00	5.00	9.10	6.40
15-Mar-07	27.00	35.50	45.00	73.00	0.00	7.00	8.30	6.40
16-Mar-07	27.80	35.60	48.00	77.00	5.60	5.00	8.40	6.30
17-Mar-07	28.00	35.60	47.00	95.00	41.90	15.00	8.00	7.00
18-Mar-07	22.50	31.50	57.00	96.00	0.00	2.00	4.90	2.80
19-Mar-07	22.30	33.90	56.00	85.00	0.00	5.00	8.80	4.50
20-Mar-07	20.50	29.00	53.00	80.00	0.00	7.00	0.90	4.70

21-Mar-07	20.70	31.50	47.00	81.00	0.00	3.00	4.20	3.80
22-Mar-07	23.50	35.00	46.00	83.00	0.00	4.00	9.40	5.10
23-Mar-07	26.00	35.00	44.00	73.00	0.00	5.00	7.30	5.50
24-Mar-07	24.70	33.10	53.00	82.00	0.00	3.00	5.40	3.30
25-Mar-07	25.10	35.10	48.00	84.00	0.00	3.00	8.90	4.60
26-Mar-07	26.00	33.50	48.00	84.00	0.00	5.00	9.40	5.30
27-Mar-07	28.00	36.50	46.00	77.00	0.00	4.00	9.00	5.30
28-Mar-07	26.50	35.80	47.00	88.00	0.00	2.00	6.20	4.50
29-Mar-07	26.50	36.50	43.00	74.00	0.00	5.00	9.50	6.20
30-Mar-07	26.70	36.60	42.00	81.00	0.00	6.00	8.80	5.60
31-Mar-07	26.90	38.00	35.00	78.00	0.00	6.00	9.60	7.00
01-Apr-07	28.50	36.70	43.00	68.00	0.00	5.00	10.20	6.20
02-Apr-07	27.30	37.00	38.00	69.00	0.00	5.00	9.70	7.10
03-Apr-07	22.30	38.30	28.00	74.00	0.00	4.00	9.40	7.10
04-Apr-07	21.80	33.80	42.00	78.00	1.60	5.00	9.30	5.70
05-Apr-07	22.20	33.50	42.00	80.00	0.00	9.00	8.10	4.20
06-Apr-07	23.40	34.00	41.00	84.00	0.00	5.00	8.70	5.20
07-Apr-07	24.20	34.70	40.00	81.00	0.00	2.00	9.30	5.20
08-Apr-07	22.80	35.00	41.00	72.00	0.00	5.00	9.10	6.80
09-Apr-07	23.00	35.10	37.00	79.00	0.00	2.00	9.30	6.30
10-Apr-07	26.00	36.00	38.00	71.00	0.20	5.00	9.00	7.30
11-Apr-07	24.00	35.20	40.00	80.00	1.90	4.00	9.30	5.20
12-Apr-07	25.30	34.70	45.00	86.00	0.00	3.00	3.20	3.70
13-Apr-07	25.70	34.70	46.00	75.00	0.70	7.00	7.50	5.90
14-Apr-07	25.00	36.00	44.00	89.00	0.00	5.00	10.60	6.70
15-Apr-07	25.40	36.30	46.00	88.00	0.00	1.00	11.10	5.40
16-Apr-07	26.50	37.50	38.00	80.00	0.00	6.00	9.90	7.70
17-Apr-07	26.60	35.70	47.00	80.00	0.00	6.00	4.50	6.30
18-Apr-07	24.50	34.50	58.00	86.00	0.00	3.00	4.00	3.60

19-Apr-07	25.00	32.60	60.00	84.00	0.00	1.00	0.30	3.80
20-Apr-07	27.00	35.70	46.00	77.00	0.00	6.00	8.00	7.30
21-Apr-07	27.60	35.70	50.00	74.00	0.00	5.00	9.80	7.20
22-Apr-07	28.50	37.60	43.00	74.00	0.00	5.00	9.60	6.50
23-Apr-07	27.30	38.30	45.00	74.00	0.00	5.00	10.10	7.60
24-Apr-07	26.50	38.00	44.00	76.00	0.00	5.00	10.70	8.90
25-Apr-07	24.70	33.50	56.00	79.00	0.00	5.00	0.50	4.70
26-Apr-07	25.00	38.00	44.00	80.00	4.00	4.00	9.80	7.00
27-Apr-07	25.50	37.50	36.00	87.00	26.20	6.00	9.30	6.10
28-Apr-07	24.30	35.90	42.00	91.00	0.00	9.00	5.70	5.20
29-Apr-07	23.70	33.00	65.00	96.00	0.00	2.00	3.40	2.10
30-Apr-07	23.50	31.00	64.00	94.00	0.00	2.00	0.30	3.50
01-May-07	24.00	31.80	57.00	89.00	0.01	3.00	3.80	2.90
02-May-07	25.20	32.80	61.00	95.00	0.00	5.00	4.30	2.70
03-May-07	25.20	35.60	50.00	88.00	20.70	5.00	9.80	4.80
04-May-07	24.30	32.20	64.00	90.00	17.38	4.00	3.90	3.20
05-May-07	24.50	31.00	72.00	97.00	19.60	2.00	2.70	2.00
06-May-07	24.50	29.00	76.00	98.00	0.00	2.00	2.10	1.10
07-May-07	24.80	31.00	63.00	96.00	0.00	4.00	2.90	2.20
08-May-07	25.00	30.00	68.00	93.00	0.00	6.00	3.80	2.10
09-May-07	25.30	32.60	65.00	94.00	23.40	5.00	7.00	2.40
10-May-07	24.50	31.40	69.00	98.00	8.10	3.00	0.70	2.30
11-May-07	23.90	30.50	73.00	98.00	4.70	3.00	1.20	1.30
12-May-07	24.00	32.30	65.00	96.00	0.00	5.00	8.50	1.90
13-May-07	25.00	31.30	68.00	96.00	4.80	3.00	5.10	2.00
14-May-07	25.00	31.60	67.00	96.00	3.60	4.00	4.10	1.70
15-May-07	25.20	32.60	59.00	94.00	0.80	5.00	9.30	4.00
16-May-07	25.60	32.80	63.00	89.00	0.00	3.00	8.80	3.90
17-May-07	25.80	33.50	63.00	86.00	0.00	4.00	8.80	4.10

18-May-07	25.00	31.50	66.00	89.00	0.00	6.00	5.30	3.30
19-May-07	25.50	32.70	63.00	87.00	0.00	4.00	7.50	4.20
20-May-07	25.90	34.40	59.00	87.00	0.00	4.00	10.30	4.10
21-May-07	26.10	34.00	60.00	87.00	0.00	3.00	10.70	3.80
22-May-07	26.40	34.80	51.00	86.00	2.40	6.00	11.40	4.70
23-May-07	26.20	33.70	63.00	89.00	0.00	5.00	10.70	4.10
24-May-07	27.00	35.00	54.00	85.00	1.40	5.00	11.00	4.20
25-May-07	27.00	34.50	69.00	88.00	0.00	2.00	6.80	3.90
26-May-07	25.00	34.50	60.00	85.00	5.90	5.00	8.00	5.30
27-May-07	23.00	32.10	70.00	98.00	3.40	5.00	2.20	2.70
28-May-07	24.00	31.20	70.00	96.00	2.20	5.00	3.10	2.00
29-May-07	23.60	31.20	70.00	97.00	0.00	5.00	5.20	2.50
30-May-07	25.30	32.00	69.00	88.00	4.00	3.00	8.40	3.10
31-May-07	25.00	32.00	69.00	91.00	0.10	6.00	4.90	2.80
01-Jun-07	26.20	32.50	63.00	88.00	3.30	4.00	7.80	3.00
02-Jun-07	25.00	32.00	78.00	92.00	0.70	4.00	4.10	1.70
03-Jun-07	26.00	32.50	62.00	92.00	23.00	3.00	8.10	3.20
04-Jun-07	23.50	32.50	67.00	90.00	2.50	5.00	5.30	3.60
05-Jun-07	24.70	32.50	67.00	97.00	2.80	8.00	5.00	2.00
06-Jun-07	25.00	33.00	72.00	95.00	0.00	5.00	8.20	2.40
07-Jun-07	26.80	33.50	64.00	83.00	0.00	5.00	6.90	4.10
08-Jun-07	27.30	32.90	64.00	85.00	0.00	3.00	8.30	4.00
09-Jun-07	26.60	34.80	67.00	90.00	0.00	10.00	6.30	3.60
10-Jun-07	26.60	34.00	67.00	89.00	4.80	4.00	9.00	4.40
11-Jun-07	25.90	34.20	65.00	88.00	0.00	7.00	9.70	4.10
12-Jun-07	26.00	32.00	71.00	92.00	1.00	5.00	1.00	3.10
13-Jun-07	26.60	31.70	71.00	87.00	0.00	4.00	4.90	3.10
14-Jun-07	26.80	33.50	66.00	89.00	4.00	3.00	3.90	3.10
15-Jun-07	24.40	31.20	78.00	92.00	0.00	12.00	2.60	2.20

16-Jun-07	24.90	32.80	68.00	89.00	0.20	4.00	6.50	2.70
17-Jun-07	26.10	32.30	68.00	90.00	0.00	7.00	6.00	2.60
18-Jun-07	26.00	32.30	70.00	88.00	0.00	5.00	5.70	3.30
19-Jun-07	26.20	33.20	61.00	86.00	2.30	3.00	8.00	4.00
20-Jun-07	24.70	33.00	65.00	96.00	1.00	6.00	8.30	2.60
21-Jun-07	24.80	32.60	65.00	93.00	0.00	3.00	5.80	3.10
22-Jun-07	25.50	32.80	68.00	92.00	0.00	3.00	5.00	2.60
23-Jun-07	26.10	34.50	61.00	88.00	0.20	4.00	9.00	4.10
24-Jun-07	25.00	32.50	65.00	92.00	0.00	3.00	4.50	2.90
25-Jun-07	24.50	31.70	70.00	92.00	36.50	6.00	4.00	3.30
26-Jun-07	23.30	31.20	73.00	96.00	13.20	7.00	3.40	2.20
27-Jun-07	24.50	31.30	76.00	92.00	2.30	7.00	3.60	2.10
28-Jun-07	24.40	31.00	67.00	93.00	2.60	4.00	2.40	2.50
29-Jun-07	24.70	28.10	81.00	92.00	114.60	5.00	0.20	1.80
30-Jun-07	24.30	32.00	67.00	97.00	21.50	5.00	3.50	1.90
01-Jul-07	24.50	30.00	79.00	97.00	9.00	5.00	0.60	1.50
02-Jul-07	24.90	31.40	68.00	97.00	25.60	5.00	1.80	2.30
03-Jul-07	24.50	26.80	83.00	96.00	4.40	3.00	0.00	1.10
04-Jul-07	25.20	28.80	77.00	94.00	27.40	7.00	1.00	2.20
05-Jul-07	23.60	28.00	82.00	97.00	16.00	15.00	0.00	1.40
06-Jul-07	24.40	29.70	76.00	97.00	28.80	5.00	3.90	1.50
07-Jul-07	24.00	31.30	66.00	98.00	0.00	4.00	5.40	1.90
08-Jul-07	24.50	31.00	68.00	95.00	0.00	2.00	5.30	2.20
09-Jul-07	25.70	32.00	69.00	92.00	7.00	3.00	5.20	2.50
10-Jul-07	25.30	31.90	69.00	94.00	1.20	3.00	6.60	2.60
11-Jul-07	25.50	31.80	71.00	90.00	0.80	4.00	9.30	2.80
12-Jul-07	25.50	32.50	62.00	93.00	1.00	6.00	5.70	3.20
13-Jul-07	25.80	31.60	70.00	89.00	59.00	4.00	4.00	3.60
14-Jul-07	24.00	32.60	63.00	93.00	0.40	1.80	4.30	2.70

15-Jul-07	24.80	31.00	72.00	94.00	4.00	4.00	6.20	2.60
16-Jul-07	25.10	31.80	69.00	94.00	0.00	4.00	2.40	1.50
17-Jul-07	25.30	31.50	71.00	94.00	0.00	5.00	6.10	2.70
18-Jul-07	26.30	32.40	66.00	92.00	3.20	5.00	10.30	3.60
19-Jul-07	25.90	32.10	70.00	92.00	82.00	3.00	7.30	3.00
20-Jul-07	24.00	33.00	68.00	92.00	3.00	5.00	8.70	3.10
21-Jul-07	24.10	29.00	78.00	99.00	0.00	5.00	0.00	1.50
22-Jul-07	25.20	33.00	63.00	93.00	0.00	4.00	9.00	2.90
23-Jul-07	25.00	33.00	64.00	92.00	0.00	5.00	7.40	2.70
24-Jul-07	23.80	32.30	70.00	93.00	28.50	7.00	7.60	2.10
25-Jul-07	22.40	32.60	67.00	96.00	0.00	2.00	9.30	2.40
26-Jul-07	24.00	32.30	66.00	93.00	0.00	3.00	5.60	2.90
27-Jul-07	26.00	31.30	71.00	92.00	0.60	2.00	3.30	1.90
28-Jul-07	25.30	30.80	74.00	95.00	45.40	4.00	3.80	1.60
29-Jul-07	23.00	33.00	67.00	98.00	1.20	7.00	8.00	2.20
30-Jul-07	23.20	32.00	69.00	96.00	0.00	4.00	7.70	2.20
31-Jul-07	24.60	30.00	76.00	92.00	1.00	4.00	3.40	2.60
01-Aug-07	25.30	30.80	68.00	92.00	6.00	6.00	5.10	2.10
02-Aug-07	25.20	29.40	79.00	95.00	1.20	4.00	0.00	1.30
03-Aug-07	25.50	31.30	68.00	93.00	17.70	4.00	2.80	0.90
04-Aug-07	24.80	27.00	91.00	96.00	40.40	1.00	0.00	0.70
05-Aug-07	24.60	28.40	84.00	97.00	68.30	8.00	0.00	1.10
06-Aug-07	23.00	25.00	93.00	99.00	4.20	7.00	0.00	0.50
07-Aug-07	24.30	26.00	88.00	94.00	23.00	7.00	0.00	1.00
08-Aug-07	24.60	28.50	83.00	96.00	18.50	10.00	0.80	1.30
09-Aug-07	24.70	29.90	81.00	96.00	0.00	13.00	1.50	1.80
10-Aug-07	24.50	31.00	67.00	90.00	5.60	7.00	3.60	3.20
11-Aug-07	24.80	30.00	73.00	94.00	1.40	6.00	0.00	1.80
12-Aug-07	25.50	32.30	66.00	94.00	0.00	5.00	4.90	2.30

13-Aug-07	26.00	32.00	66.00	93.00	0.00	3.00	6.60	2.50
14-Aug-07	26.30	33.00	65.00	92.00	3.50	5.00	6.30	2.30
15-Aug-07	24.00	30.70	72.00	95.00	22.20	3.00	0.50	1.90
16-Aug-07	22.80	31.30	71.00	96.00	86.20	12.00	3.60	1.60
17-Aug-07	23.50	27.00	84.00	97.00	8.50	5.00	0.90	0.80
18-Aug-07	24.50	30.10	76.00	98.00	3.00	4.00	2.60	1.50
19-Aug-07	25.30	31.00	71.00	94.00	10.00	6.00	3.80	1.70
20-Aug-07	24.80	31.00	73.00	97.00	18.50	1.00	3.50	1.90
21-Aug-07	23.60	31.00	71.00	95.00	4.00	10.00	4.50	2.50
22-Aug-07	24.30	29.80	77.00	96.00	0.00	10.00	2.90	2.20
23-Aug-07	24.50	30.30	76.00	93.00	6.30	4.00	5.10	1.90
24-Aug-07	24.90	31.80	68.00	94.00	0.00	3.00	4.70	1.40
25-Aug-07	24.20	31.60	69.00	96.00	0.00	4.00	6.20	2.20
26-Aug-07	24.20	32.00	72.00	91.00	9.00	1.00	8.90	2.20
27-Aug-07	25.00	31.80	72.00	92.00	3.40	4.00	4.60	1.80
28-Aug-07	24.30	30.80	67.00	97.00	0.40	3.00	2.30	1.30
29-Aug-07	24.50	27.70	84.00	95.00	12.80	5.00	1.20	1.60
30-Aug-07	23.20	31.10	70.00	96.00	0.00	4.00	5.40	2.50
31-Aug-07	24.30	30.50	74.00	93.00	0.00	4.00	4.00	2.30
01-Sep-07	25.20	33.00	63.00	94.00	9.00	5.00	4.70	2.50
02-Sep-07	23.50	30.00	76.00	94.00	15.80	9.00	3.30	1.40
03-Sep-07	23.50	31.60	66.00	96.00	0.00	5.00	4.50	1.90
04-Sep-07	23.80	31.00	66.00	96.00	0.00	5.00	8.40	2.80
05-Sep-07	25.00	30.60	68.00	93.00	0.00	2.00	2.50	2.70
06-Sep-07	25.50	33.10	60.00	92.00	0.00	3.00	8.20	2.70
07-Sep-07	25.60	31.40	67.00	94.00	10.70	2.00	3.70	2.10
08-Sep-07	24.50	33.10	65.00	88.00	16.20	5.00	5.00	2.80
09-Sep-07	24.40	27.50	89.00	97.00	24.30	7.00	0.10	0.60
10-Sep-07	24.60	31.50	73.00	96.00	0.00	10.00	5.20	1.50

11-Sep-07	25.30	32.40	63.00	93.00	46.00	3.00	7.30	2.50
12-Sep-07	23.20	32.00	65.00	96.00	15.00	1.00	4.70	2.30
13-Sep-07	23.50	30.50	69.00	95.00	16.00	1.00	2.40	1.40
14-Sep-07	24.00	32.10	63.00	96.00	24.40	2.00	7.80	2.20
15-Sep-07	24.00	31.50	68.00	96.00	0.00	2.00	6.40	1.90
16-Sep-07	24.50	31.30	70.00	94.00	0.00	2.00	5.90	2.00
17-Sep-07	25.00	32.50	65.00	94.00	26.40	4.00	8.00	2.80
18-Sep-07	23.50	31.60	69.00	96.00	0.00	12.00	3.60	1.30
19-Sep-07	24.00	31.00	66.00	96.00	0.00	2.00	5.90	1.70
20-Sep-07	21.50	31.60	54.00	93.00	0.00	3.00	9.20	4.20
21-Sep-07	22.70	31.50	49.00	86.00	1.80	3.00	9.00	3.40
22-Sep-07	22.80	32.00	56.00	87.00	0.00	6.00	9.00	3.50
23-Sep-07	23.50	31.50	59.00	92.00	0.00	3.00	2.20	2.40
24-Sep-07	25.30	32.00	63.00	94.00	0.00	3.00	3.40	2.60
25-Sep-07	25.30	32.50	63.00	92.00	0.00	7.00	6.60	3.00
26-Sep-07	25.50	33.10	61.00	91.00	13.20	3.00	7.20	2.90
27-Sep-07	23.80	33.50	59.00	96.00	0.00	6.00	8.30	2.40
28-Sep-07	24.00	31.30	67.00	95.00	0.00	5.00	5.90	4.00
29-Sep-07	24.60	31.70	64.00	95.00	0.00	4.00	5.50	2.40
30-Sep-07	24.60	31.20	65.00	93.00	0.00	4.00	0.70	2.00
01-Oct-07	25.90	29.80	76.00	94.00	70.50	2.00	0.00	1.30
02-Oct-07	23.00	26.50	96.00	99.00	141.00	6.00	0.00	0.30
03-Oct-07	23.50	26.00	92.00	98.00	16.00	12.00	0.00	0.60
04-Oct-07	24.50	29.00	84.00	96.00	4.00	5.00	0.00	1.30
05-Oct-07	24.50	30.70	72.00	96.00	27.00	4.00	5.10	2.10
06-Oct-07	23.40	30.50	78.00	98.00	5.00	7.00	1.50	1.10
07-Oct-07	23.70	30.20	74.00	97.00	9.00	1.00	2.60	1.60
08-Oct-07	24.50	30.50	74.00	96.00	2.00	3.00	2.70	1.30
09-Oct-07	24.30	31.60	68.00	96.00	4.60	7.00	6.80	1.60

10-Oct-07	23.60	29.50	75.00	96.00	0.00	3.00	3.10	1.40
11-Oct-07	23.60	30.70	71.00	95.00	0.00	4.00	2.90	1.80
12-Oct-07	24.10	32.00	66.00	93.00	0.00	5.00	7.70	1.70
13-Oct-07	24.00	30.50	71.00	93.00	0.00	5.00	4.30	1.50
14-Oct-07	23.00	29.60	74.00	97.00	1.40	4.00	2.50	1.20
15-Oct-07	22.90	31.30	68.00	97.00	0.60	6.00	5.30	2.20
16-Oct-07	22.50	27.30	77.00	95.00	0.00	6.00	0.10	2.00
17-Oct-07	21.50	28.10	70.00	88.00	0.00	5.00	1.70	3.10
18-Oct-07	22.00	31.60	60.00	90.00	0.00	7.00	9.40	3.90
19-Oct-07	21.80	30.50	59.00	90.00	0.00	8.00	9.40	5.20
20-Oct-07	20.40	30.70	55.00	85.00	0.00	6.00	8.60	4.10
21-Oct-07	22.00	30.60	62.00	87.00	0.00	3.00	7.10	3.70
22-Oct-07	22.50	31.50	58.00	86.00	0.00	3.00	7.90	3.80
23-Oct-07	21.00	31.50	52.00	86.00	0.00	3.00	7.60	4.20
24-Oct-07	21.10	32.80	50.00	85.00	0.00	6.00	9.50	4.30
25-Oct-07	23.00	31.50	56.00	89.00	0.00	10.00	6.90	3.80
26-Oct-07	22.50	29.10	70.00	87.00	0.00	6.00	0.30	2.70
27-Oct-07	22.80	33.30	52.00	92.00	0.00	3.00	10.10	3.30
28-Oct-07	23.00	32.80	51.00	91.00	0.00	2.00	9.10	2.70
29-Oct-07	20.90	32.70	51.00	91.00	9.50	5.00	8.80	5.30
30-Oct-07	21.70	23.00	80.00	91.00	0.00	1.00	0.00	0.80
31-Oct-07	21.80	31.50	62.00	97.00	9.30	1.00	5.80	1.70
01-Nov-07	21.60	32.50	59.00	97.00	0.00	3.00	6.30	1.90
02-Nov-07	20.50	30.20	60.00	88.00	0.00	10.00	3.50	4.70
03-Nov-07	20.80	30.30	56.00	82.00	0.00	10.00	7.30	5.60
04-Nov-07	19.50	27.80	63.00	88.00	0.00	8.00	1.10	4.50
05-Nov-07	19.00	30.00	53.00	86.00	0.00	7.00	10.00	4.30
06-Nov-07	18.80	29.60	52.00	81.00	0.00	5.00	9.20	4.40
07-Nov-07	17.90	29.70	48.00	80.00	0.00	6.00	9.40	5.00

08-Nov-07	18.40	29.50	44.00	79.00	0.00	7.00	9.70	6.40
09-Nov-07	19.00	30.50	52.00	80.00	0.00	5.00	8.80	5.70
10-Nov-07	21.00	29.70	60.00	89.00	0.00	7.00	1.60	3.90
11-Nov-07	22.10	29.30	66.00	92.00	4.00	8.00	3.00	3.10
12-Nov-07	22.30	29.80	69.00	95.00	0.00	4.00	2.60	1.80
13-Nov-07	22.60	31.20	61.00	93.00	0.40	3.00	7.10	3.20
14-Nov-07	20.80	33.50	55.00	87.00	0.00	5.00	9.00	3.90
15-Nov-07	20.50	32.30	50.00	87.00	0.00	5.00	9.70	5.30
16-Nov-07	21.00	29.00	58.00	79.00	1.40	9.00	7.00	5.40
17-Nov-07	21.80	26.20	76.00	96.00	11.00	3.00	5.00	1.60
18-Nov-07	21.30	28.50	76.00	94.00	0.00	2.00	3.60	1.10
19-Nov-07	20.90	28.50	66.00	87.00	0.00	5.00	0.50	3.60
20-Nov-07	20.00	30.70	53.00	86.00	0.00	10.00	9.70	4.90
21-Nov-07	19.40	29.50	55.00	95.00	0.00	6.00	6.80	4.10
22-Nov-07	19.80	28.70	62.00	87.00	0.00	6.00	2.20	3.60
23-Nov-07	21.00	27.00	54.00	78.00	0.00	12.00	2.10	4.20
24-Nov-07	18.00	28.50	50.00	83.00	0.00	10.00	6.40	7.70
25-Nov-07	18.50	29.80	50.00	88.00	0.00	5.00	7.30	4.60
26-Nov-07	17.70	29.70	53.00	83.00	0.00	8.00	6.90	6.20
27-Nov-07	14.70	28.00	40.00	78.00	0.00	8.00	8.80	6.90
28-Nov-07	15.10	27.80	39.00	76.00	0.00	5.00	9.50	4.00
29-Nov-07	14.60	27.00	38.00	89.00	0.00	3.00	9.40	4.00
30-Nov-07	14.80	27.80	36.00	90.00	0.00	3.00	9.40	3.80
01-Dec-07	15.20	29.70	39.00	87.00	0.00	4.00	9.80	3.40
02-Dec-07	16.80	30.50	39.00	90.00	0.00	2.00	9.40	3.40
03-Dec-07	17.20	31.50	38.00	93.00	0.00	4.00	9.50	3.90
04-Dec-07	18.70	31.00	43.00	84.00	0.00	3.00	8.40	5.60
05-Dec-07	21.00	31.50	51.00	78.00	0.00	8.00	9.70	7.10
06-Dec-07	21.40	31.30	51.00	87.00	0.00	8.00	9.40	6.80

07-Dec-07	20.00	32.00	46.00	90.00	0.00	2.00	9.30	4.90
08-Dec-07	20.00	32.30	41.00	86.00	0.00	2.00	9.70	4.00
09-Dec-07	21.30	32.50	37.00	85.00	0.00	5.00	9.70	4.00
10-Dec-07	20.50	33.10	40.00	90.00	0.00	2.00	9.10	3.90
11-Dec-07	21.10	33.30	45.00	88.00	0.00	4.00	8.80	3.20
12-Dec-07	21.10	34.00	44.00	94.00	0.00	4.00	9.30	3.70
13-Dec-07	22.90	33.50	50.00	89.00	0.00	2.00	4.50	3.30
14-Dec-07	22.50	32.50	48.00	89.00	0.00	1.00	3.60	3.20
15-Dec-07	21.80	33.50	47.00	89.00	0.00	2.00	7.30	3.70
16-Dec-07	22.30	34.60	33.00	83.00	0.00	2.00	8.90	4.90
17-Dec-07	22.50	34.80	40.00	85.00	0.00	2.00	9.70	3.90
18-Dec-07	22.50	35.50	41.00	83.00	0.00	5.00	8.00	4.60
19-Dec-07	21.00	33.00	45.00	85.00	0.00	2.00	7.70	4.10
20-Dec-07	22.10	33.20	46.00	75.00	0.00	2.00	8.60	4.10
21-Dec-07	23.00	34.00	43.00	83.00	0.00	3.00	9.80	4.10
22-Dec-07	23.00	34.50	40.00	87.00	0.00	4.00	6.70	4.40
23-Dec-07	21.00	35.20	30.00	86.00	0.00	2.00	9.70	4.70
24-Dec-07	21.60	34.20	35.00	85.00	0.00	4.00	9.70	4.40
25-Dec-07	20.90	32.50	44.00	87.00	0.00	2.00	8.10	3.80
26-Dec-07	19.50	33.00	37.00	86.00	0.00	3.00	8.50	4.20
27-Dec-07	19.00	32.70	33.00	90.00	0.00	2.00	9.30	3.90
28-Dec-07	19.00	32.10	31.00	88.00	0.00	3.00	7.60	5.90
29-Dec-07	19.30	31.50	33.00	80.00	0.00	4.00	7.10	4.60
30-Dec-07	18.80	31.50	44.00	79.00	0.00	7.00	8.80	5.00
31-Dec-07	17.30	29.00	43.00	81.00	0.00	8.00	9.00	5.60
01-Jan-08	15.70	26.60	41.00	76.00	0.00	10.00	8.80	6.50
02-Jan-08	15.10	26.70	42.00	82.00	0.00	6.00	7.40	5.60
03-Jan-08	15.10	28.70	40.00	83.00	0.00	4.00	2.80	4.00
04-Jan-08	17.00	30.00	43.00	82.00	0.00	2.00	5.80	3.70

05-Jan-08	18.00	31.20	37.00	85.00	0.00	3.00	8.30	4.40
06-Jan-08	17.30	31.00	38.00	85.00	0.00	2.00	9.90	3.80
07-Jan-08	18.00	31.30	37.00	85.00	0.00	3.00	9.70	3.80
08-Jan-08	17.60	32.00	42.00	85.00	0.00	1.00	9.50	3.70
09-Jan-08	17.80	32.30	37.00	88.00	0.00	3.00	9.10	3.90
10-Jan-08	19.20	33.40	39.00	92.00	0.00	4.00	9.30	4.40
11-Jan-08	20.70	34.30	39.00	87.00	0.00	4.00	9.10	4.60
12-Jan-08	20.30	34.70	33.00	89.00	0.00	2.00	9.00	4.50
13-Jan-08	20.00	34.50	29.00	90.00	0.00	4.00	9.40	5.70
14-Jan-08	19.50	32.80	34.00	83.00	0.00	2.00	9.50	4.80
15-Jan-08	19.50	32.70	30.00	81.00	0.00	6.00	9.70	7.70
16-Jan-08	18.00	29.50	42.00	79.00	0.00	10.00	9.60	6.90
17-Jan-08	17.00	31.00	38.00	85.00	0.00	8.00	10.50	5.90
18-Jan-08	17.00	33.70	32.00	85.00	0.00	2.00	10.60	5.10
19-Jan-08	18.30	33.20	32.00	84.00	0.00	2.00	10.20	4.80
20-Jan-08	17.00	34.20	29.00	85.00	0.00	2.00	10.10	4.30
21-Jan-08	18.20	34.30	21.00	90.00	0.00	3.00	10.00	5.40
22-Jan-08	18.00	33.30	30.00	81.00	0.00	4.00	10.20	7.40
23-Jan-08	18.00	33.50	32.00	77.00	0.00	5.00	9.90	7.20
24-Jan-08	19.50	28.60	46.00	70.00	0.00	7.00	1.60	6.10
25-Jan-08	19.00	31.50	46.00	79.00	0.00	5.00	5.60	5.60
26-Jan-08	19.10	34.30	34.00	80.00	0.00	1.00	8.60	5.80
27-Jan-08	20.40	34.50	36.00	81.00	0.00	3.00	9.40	5.30
28-Jan-08	20.40	33.60	34.00	82.00	0.00	5.00	9.80	7.70
29-Jan-08	22.80	33.70	43.00	79.00	0.00	6.00	9.20	6.70
30-Jan-08	21.10	33.80	43.00	82.00	0.00	5.00	9.60	5.50
31-Jan-08	19.00	34.50	40.00	74.00	0.00	6.00	9.80	6.40
01-Feb-08	19.30	34.00	36.00	76.00	0.00	5.00	10.10	8.60
02-Feb-08	18.20	28.20	53.00	73.00	0.00	2.00	1.10	4.70

03-Feb-08	18.50	31.30	49.00	75.00	0.00	5.00	6.70	5.40
04-Feb-08	18.50	31.70	43.00	77.00	0.00	4.00	9.60	4.80
05-Feb-08	19.00	33.00	40.00	80.00	0.00	4.00	9.40	5.10
06-Feb-08	19.00	33.50	41.00	78.00	0.00	2.00	9.60	5.40
07-Feb-08	17.50	33.20	35.00	76.00	0.00	6.00	9.80	5.50
08-Feb-08	15.90	33.00	33.00	74.00	0.00	4.00	10.20	5.70
09-Feb-08	15.70	31.30	39.00	77.00	0.00	3.00	10.10	5.00
10-Feb-08	16.20	31.70	41.00	82.00	0.00	4.00	8.50	5.10
11-Feb-08	16.40	31.80	40.00	85.00	0.00	4.00	8.70	5.20
12-Feb-08	16.40	29.60	39.00	74.00	0.00	5.00	6.60	6.60
13-Feb-08	15.50	30.00	37.00	72.00	0.00	4.00	8.90	5.30
14-Feb-08	14.70	29.50	38.00	84.00	0.00	8.00	9.00	5.90
15-Feb-08	15.50	30.30	34.00	74.00	0.00	3.00	9.40	5.10
16-Feb-08	16.20	31.70	35.00	79.00	0.00	3.00	8.00	4.10
17-Feb-08	18.30	31.50	39.00	80.00	0.00	3.00	6.40	4.80
18-Feb-08	17.50	31.60	34.00	76.00	0.00	1.00	7.20	6.00
19-Feb-08	16.50	31.50	32.00	73.00	0.00	9.00	10.30	7.00
20-Feb-08	16.00	30.50	34.00	76.00	0.00	6.00	8.90	7.00
21-Feb-08	16.10	31.80	26.00	76.00	0.00	4.00	7.20	5.80
22-Feb-08	19.40	31.60	39.00	73.00	0.00	5.00	1.90	5.30
23-Feb-08	21.80	31.50	61.00	79.00	0.00	2.00	0.00	2.70
24-Feb-08	23.00	32.30	45.00	76.00	0.00	3.00	0.90	4.70
25-Feb-08	23.50	34.20	45.00	83.00	0.00	4.00	6.50	5.10
26-Feb-08	22.60	31.80	53.00	80.00	0.00	3.00	1.40	4.70
27-Feb-08	17.50	32.60	28.00	67.00	0.00	12.00	10.00	6.70
28-Feb-08	17.50	31.50	33.00	76.00	0.00	4.00	7.70	5.60
29-Feb-08	16.40	32.00	35.00	73.00	0.00	2.00	7.20	6.10
01-Mar-08	16.50	31.80	34.00	74.00	0.00	5.00	9.10	6.40
02-Mar-08	15.50	32.40	24.00	71.00	0.00	7.00	9.30	9.80

03-Mar-08	15.80	31.00	23.00	76.00	0.00	3.00	9.20	6.30
04-Mar-08	17.50	32.50	25.00	75.00	0.00	5.00	8.80	8.00
05-Mar-08	18.70	34.00	30.00	67.00	0.00	2.00	8.30	7.40
06-Mar-08	20.60	34.00	30.00	72.00	6.00	4.00	6.40	6.20
07-Mar-08	21.30	33.50	38.00	91.00	0.00	6.00	4.80	4.80
08-Mar-08	21.00	32.00	49.00	87.00	0.00	5.00	5.70	4.30
09-Mar-08	21.00	34.10	32.00	78.00	0.00	3.00	8.50	5.90
10-Mar-08	21.40	35.60	26.00	79.00	0.00	3.00	10.10	7.00
11-Mar-08	21.80	34.50	30.00	81.00	0.00	1.00	8.30	5.80
12-Mar-08	23.60	35.00	36.00	70.00	0.00	3.00	9.20	6.30
13-Mar-08	24.60	36.60	28.00	69.00	0.00	5.00	9.10	7.80
14-Mar-08	24.70	35.50	38.00	72.00	0.00	5.00	8.80	8.20
15-Mar-08	24.80	36.50	31.00	72.00	0.00	4.00	8.80	8.70
16-Mar-08	25.00	36.80	30.00	68.00	0.00	5.00	8.00	9.10
17-Mar-08	25.00	36.40	37.00	72.00	0.00	5.00	7.80	8.70
18-Mar-08	25.00	35.80	37.00	67.00	0.00	5.00	6.70	6.80
19-Mar-08	25.30	36.20	39.00	69.00	0.00	6.00	7.40	7.00
20-Mar-08	25.50	36.50	37.00	72.00	0.50	3.00	7.70	8.00
21-Mar-08	24.00	35.70	43.00	90.00	9.00	10.00	4.70	5.20
22-Mar-08	24.80	36.50	36.00	85.00	0.00	4.00	9.20	6.50
23-Mar-08	22.00	34.70	53.00	86.00	0.00	13.00	4.10	3.80
24-Mar-08	22.30	34.20	46.00	84.00	0.00	3.00	8.10	4.10
25-Mar-08	26.40	35.80	36.00	80.00	0.00	5.00	8.10	5.90
26-Mar-08	23.70	36.30	38.00	85.00	1.70	5.00	7.00	6.20
27-Mar-08	22.90	25.40	77.00	92.00	0.00	5.00	0.00	1.60
28-Mar-08	23.20	35.00	45.00	87.00	0.00	4.00	10.10	5.30
29-Mar-08	25.50	34.80	51.00	82.00	26.00	5.00	7.80	5.30
30-Mar-08	24.80	36.50	43.00	87.00	9.80	2.00	8.80	5.70
31-Mar-08	23.30	25.20	87.00	95.00	0.00	6.00	0.50	0.90

01-Apr-08	23.30	34.80	44.00	93.00	0.00	3.00	10.70	4.20
02-Apr-08	25.00	33.50	49.00	85.00	0.00	5.00	6.70	4.20
03-Apr-08	25.50	34.00	51.00	76.00	0.00	5.00	4.30	4.10
04-Apr-08	25.30	34.80	46.00	83.00	0.00	5.00	9.00	5.20
05-Apr-08	26.00	35.00	43.00	79.00	5.00	8.00	3.70	5.60
06-Apr-08	25.00	36.50	39.00	93.00	0.00	10.00	9.20	5.40
07-Apr-08	24.20	35.00	55.00	92.00	0.00	5.00	7.00	3.40
08-Apr-08	26.30	35.60	47.00	80.00	0.00	3.00	8.60	4.80
09-Apr-08	27.10	36.50	45.00	74.00	0.00	3.00	8.40	5.90
10-Apr-08	27.30	36.60	46.00	75.00	0.00	10.00	7.00	6.10
11-Apr-08	27.30	35.50	49.00	76.00	0.00	5.00	7.50	5.10
12-Apr-08	28.00	35.20	50.00	79.00	0.00	7.00	5.90	5.70
13-Apr-08	28.00	32.80	60.00	74.00	0.00	10.00	4.10	4.60
14-Apr-08	26.50	35.50	46.00	78.00	0.00	4.00	7.80	6.00
15-Apr-08	27.50	36.00	42.00	77.00	0.00	6.00	9.00	6.90
16-Apr-08	26.50	37.00	45.00	73.00	0.00	9.00	6.20	6.10
17-Apr-08	25.00	36.20	41.00	78.00	0.00	5.00	8.80	7.30
18-Apr-08	26.50	36.80	35.00	77.00	0.00	7.00	10.80	7.50
19-Apr-08	27.00	35.70	47.00	79.00	0.00	8.00	9.50	6.20
20-Apr-08	27.50	37.00	43.00	74.00	0.00	5.00	8.80	6.90
21-Apr-08	28.00	37.00	45.00	74.00	0.00	5.00	7.90	6.90
22-Apr-08	24.20	36.70	42.00	72.00	0.00	6.00	9.00	4.90
23-Apr-08	24.60	35.50	42.00	90.00	0.00	3.00	8.40	4.80
24-Apr-08	25.50	34.70	46.00	88.00	0.00	8.00	9.70	6.90
25-Apr-08	23.80	35.50	39.00	79.00	0.00	8.00	8.70	6.90
26-Apr-08	24.40	35.00	43.00	76.00	32.50	6.00	9.60	6.60
27-Apr-08	26.50	37.00	36.00	77.00	9.20	5.00	10.60	7.00
28-Apr-08	24.80	26.80	84.00	97.00	7.60	4.00	0.00	1.00
29-Apr-08	25.30	33.10	56.00	95.00	4.30	3.00	5.00	3.10

30-Apr-08	23.50	30.20	61.00	96.00	11.00	6.00	3.80	2.20
01-May-08	25.00	31.60	74.00	88.00	25.20	9.00	4.20	2.00
02-May-08	24.00	30.00	70.00	96.00	0.00	5.00	1.00	1.50
03-May-08	23.60	33.00	54.00	91.00	6.00	3.00	10.00	3.70
04-May-08	25.00	32.00	62.00	92.00	1.40	5.00	6.80	3.30
05-May-08	24.80	32.60	65.00	93.00	5.40	5.00	8.70	3.20
06-May-08	24.40	33.50	59.00	91.00	0.00	4.00	8.20	2.80
07-May-08	24.70	30.70	68.00	91.00	1.80	5.00	5.50	2.50
08-May-08	24.40	32.00	60.00	91.00	19.00	4.00	5.70	3.40
09-May-08	25.00	33.50	59.00	90.00	0.00	6.00	7.00	3.40
10-May-08	23.40	27.30	81.00	92.00	4.80	5.00	0.00	1.60
11-May-08	24.00	32.00	59.00	92.00	2.00	4.00	3.30	2.70
12-May-08	24.10	29.70	67.00	95.00	0.00	5.00	3.10	1.60
13-May-08	24.50	29.00	74.00	94.00	0.00	3.00	0.90	1.70
14-May-08	24.00	31.50	54.00	90.00	4.00	5.00	6.80	3.60
15-May-08	25.40	31.80	58.00	88.00	3.40	4.00	5.10	3.40
16-May-08	24.50	31.80	62.00	96.00	7.00	5.00	6.60	3.00
17-May-08	24.40	31.50	63.00	90.00	12.80	5.00	2.90	2.30
18-May-08	24.50	31.00	71.00	89.00	31.00	8.00	7.60	2.90
19-May-08	23.50	30.30	75.00	93.00	8.00	7.00	2.00	2.20
20-May-08	22.50	30.00	70.00	96.00	6.00	4.00	1.40	1.70
21-May-08	23.80	26.50	84.00	95.00	13.00	5.00	1.20	1.20
22-May-08	24.00	30.50	68.00	94.00	0.30	5.00	1.90	1.80
23-May-08	23.50	28.80	82.00	93.00	0.00	3.00	0.40	1.20
24-May-08	22.60	31.00	71.00	93.00	0.00	3.00	4.90	2.90
25-May-08	25.50	32.30	64.00	90.00	0.00	6.00	9.00	3.60
26-May-08	25.80	32.80	56.00	88.00	0.00	3.00	10.90	3.90
27-May-08	26.60	33.20	58.00	86.00	19.00	2.00	9.00	3.90
28-May-08	26.70	32.80	57.00	86.00	11.50	8.00	6.50	3.00

29-May-08	24.00	31.00	72.00	93.00	0.00	6.00	2.90	1.70
30-May-08	23.50	31.50	68.00	92.00	0.00	8.00	3.60	3.20
31-May-08	25.30	31.80	65.00	88.00	0.00	4.00	4.20	2.60
01-Jun-08	25.00	32.10	65.00	86.00	9.00	5.00	6.50	2.90
02-Jun-08	23.50	31.40	72.00	93.00	0.00	15.00	4.00	2.40
03-Jun-08	24.20	31.00	67.00	94.00	29.00	7.00	4.80	2.70
04-Jun-08	22.50	30.50	75.00	90.00	3.40	10.00	2.30	1.90
05-Jun-08	23.70	31.70	68.00	97.00	4.80	5.00	6.30	2.40
06-Jun-08	25.00	30.70	78.00	88.00	0.00	15.00	3.00	1.70
07-Jun-08	25.00	32.10	66.00	91.00	0.00	1.00	8.20	2.30
08-Jun-08	25.30	32.60	62.00	89.00	0.00	10.00	5.40	2.50
09-Jun-08	25.60	33.50	48.00	91.00	0.00	4.00	8.10	2.50
10-Jun-08	24.80	32.10	65.00	88.00	52.10	3.00	5.80	2.70
11-Jun-08	23.50	32.50	59.00	94.00	11.80	15.00	3.80	1.90
12-Jun-08	23.20	31.00	70.00	96.00	14.40	10.00	3.10	1.60
13-Jun-08	24.10	29.60	80.00	93.00	5.00	5.00	0.60	1.40
14-Jun-08	24.30	30.00	78.00	92.00	0.00	12.00	3.40	2.00
15-Jun-08	24.50	30.00	71.00	91.00	13.20	6.00	3.60	2.80
16-Jun-08	23.40	31.90	62.00	96.00	14.30	10.00	5.80	2.70
17-Jun-08	23.30	28.50	81.00	97.00	5.40	5.00	0.00	1.40
18-Jun-08	23.50	29.30	74.00	96.00	12.00	10.00	0.50	1.20
19-Jun-08	23.30	30.10	68.00	96.00	0.00	10.00	5.30	2.00
20-Jun-08	23.60	31.60	64.00	98.00	30.00	3.00	7.90	2.30
21-Jun-08	25.50	32.60	65.00	92.00	0.00	12.00	5.20	2.00
22-Jun-08	25.50	32.80	59.00	92.00	0.00	2.00	9.40	2.80
23-Jun-08	26.40	32.80	64.00	88.00	0.00	5.00	7.10	2.80
24-Jun-08	26.80	32.50	66.00	84.00	9.50	4.00	5.40	3.00
25-Jun-08	24.40	32.00	66.00	92.00	9.00	3.00	3.90	2.00
26-Jun-08	24.30	31.50	74.00	92.00	0.00	5.00	3.30	1.90

27-Jun-08	24.30	31.50	69.00	94.00	0.00	4.00	6.50	2.70
28-Jun-08	26.20	31.00	74.00	87.00	0.00	2.00	1.00	2.00
29-Jun-08	26.00	31.50	67.00	88.00	12.20	2.00	0.80	1.80
30-Jun-08	23.80	31.30	66.00	92.00	2.80	4.00	5.10	1.50
01-Jul-08	24.20	31.70	64.00	94.00	2.00	2.00	7.80	2.00
02-Jul-08	23.80	29.80	76.00	93.00	5.00	5.00	2.00	1.50
03-Jul-08	23.80	31.90	62.00	93.00	3.20	5.00	6.50	2.10
04-Jul-08	26.00	33.20	59.00	87.00	3.00	7.00	10.30	2.60
05-Jul-08	24.70	32.00	67.00	90.00	8.00	6.00	8.20	2.90
06-Jul-08	24.50	30.50	73.00	91.00	27.20	6.00	2.40	1.80
07-Jul-08	23.70	29.80	71.00	96.00	6.00	4.00	0.60	1.80
08-Jul-08	23.50	29.80	71.00	96.00	39.00	10.00	1.30	1.40
09-Jul-08	23.40	31.00	72.00	96.00	0.00	5.00	3.80	1.40
10-Jul-08	24.40	31.20	63.00	96.00	0.00	3.00	4.90	2.20
11-Jul-08	24.80	31.50	69.00	93.00	0.40	4.00	10.20	2.50
12-Jul-08	26.00	31.50	72.00	88.00	7.60	2.00	5.20	2.40
13-Jul-08	26.30	32.00	64.00	90.00	0.00	8.00	5.30	2.80
14-Jul-08	26.30	32.00	71.00	90.00	0.00	3.00	6.60	2.60
15-Jul-08	26.50	33.30	63.00	85.00	8.00	4.00	6.60	3.20
16-Jul-08	26.00	32.10	62.00	89.00	3.20	5.00	4.00	2.30
17-Jul-08	24.00	31.20	71.00	92.00	0.00	10.00	5.70	2.40
18-Jul-08	24.50	32.00	63.00	92.00	0.00	7.00	9.30	3.30
19-Jul-08	25.00	31.70	69.00	88.00	0.00	10.00	5.60	2.50
20-Jul-08	25.20	32.20	67.00	88.00	0.00	2.00	5.50	2.20
21-Jul-08	25.50	33.30	58.00	89.00	0.00	2.00	10.70	2.70
22-Jul-08	25.20	32.00	71.00	87.00	10.40	3.00	8.70	2.30
23-Jul-08	23.00	34.20	52.00	93.00	16.60	12.00	9.40	2.80
24-Jul-08	23.80	33.00	59.00	94.00	9.60	8.00	8.20	2.00
25-Jul-08	24.60	33.00	56.00	92.00	2.00	3.00	8.00	2.50

26-Jul-08	25.00	32.50	63.00	92.00	5.70	2.00	5.60	2.20
27-Jul-08	24.80	28.00	83.00	93.00	12.00	1.00	0.00	0.90
28-Jul-08	25.30	30.00	73.00	94.00	1.20	7.00	1.70	1.60
29-Jul-08	25.50	31.30	64.00	92.00	0.00	4.00	2.80	2.00
30-Jul-08	23.70	30.50	75.00	92.00	0.00	8.00	2.80	1.70
31-Jul-08	24.30	29.60	70.00	91.00	75.00	3.00	2.00	2.10
01-Aug-08	23.50	30.80	65.00	93.00	57.00	3.00	5.50	1.90
02-Aug-08	22.80	27.10	86.00	97.00	49.00	1.00	0.10	0.40
03-Aug-08	24.40	28.40	82.00	98.00	51.00	3.00	0.80	0.50
04-Aug-08	23.00	29.30	78.00	97.00	39.00	10.00	1.40	0.70
05-Aug-08	23.50	30.70	75.00	96.00	13.40	10.00	3.40	1.10
06-Aug-08	24.10	28.60	75.00	97.00	74.80	6.00	1.40	1.30
07-Aug-08	23.20	26.50	88.00	97.00	10.20	5.00	0.00	0.60
08-Aug-08	23.60	27.00	92.00	96.00	13.50	6.00	0.00	0.90
09-Aug-08	23.00	31.20	67.00	94.00	47.00	3.00	6.50	1.90
10-Aug-08	23.50	28.70	77.00	96.00	8.00	5.00	1.20	1.00
11-Aug-08	23.50	27.60	82.00	97.00	19.00	5.00	0.00	1.00
12-Aug-08	23.60	31.00	70.00	96.00	4.20	7.00	6.40	2.30
13-Aug-08	24.90	31.60	59.00	95.00	0.00	1.00	9.30	3.00
14-Aug-08	25.60	32.60	59.00	96.00	0.00	1.00	6.30	1.90
15-Aug-08	25.70	32.40	63.00	89.00	0.00	5.00	8.70	2.50
16-Aug-08	25.30	33.20	58.00	92.00	4.00	5.00	9.10	2.80
17-Aug-08	24.50	32.00	68.00	90.00	75.50	5.00	5.90	2.10
18-Aug-08	23.20	29.60	76.00	96.00	0.00	8.00	1.90	1.40
19-Aug-08	25.30	30.20	73.00	93.00	0.00	1.00	7.60	1.50
20-Aug-08	25.30	30.50	70.00	93.00	0.00	1.00	5.60	2.00
21-Aug-08	25.50	30.80	72.00	90.00	0.00	5.00	4.70	1.70
22-Aug-08	24.50	31.30	70.00	93.00	12.00	5.00	6.50	2.10
23-Aug-08	24.60	31.50	72.00	96.00	15.30	6.00	2.70	1.90

24-Aug-08	23.50	31.40	67.00	93.00	0.00	5.00	5.10	1.60
25-Aug-08	24.90	32.40	65.00	96.00	0.00	1.00	7.20	2.40
26-Aug-08	25.20	33.40	58.00	91.00	0.80	4.00	8.40	2.40
27-Aug-08	24.60	31.80	68.00	89.00	5.00	5.00	9.00	2.20
28-Aug-08	24.30	30.30	66.00	97.00	13.70	4.00	3.90	1.90
29-Aug-08	22.90	32.00	71.00	97.00	104.00	2.00	3.50	1.40
30-Aug-08	22.80	31.70	66.00	95.00	0.00	4.00	7.40	1.90
31-Aug-08	22.00	31.70	62.00	98.00	13.00	3.00	5.60	1.60
01-Sep-08	25.00	31.50	70.00	95.00	0.00	3.00	4.30	1.10
02-Sep-08	24.20	30.90	68.00	94.00	52.80	2.00	3.90	1.70
03-Sep-08	23.80	33.70	62.00	96.00	0.00	15.00	8.70	1.90
04-Sep-08	23.80	31.60	66.00	96.00	0.00	2.00	6.00	2.30
05-Sep-08	24.60	32.50	69.00	91.00	0.00	2.00	5.40	2.40
06-Sep-08	24.50	31.00	69.00	90.00	1.00	2.00	4.50	1.80
07-Sep-08	25.70	31.00	64.00	92.00	0.00	2.00	4.80	1.80
08-Sep-08	24.70	32.10	66.00	94.00	0.00	5.00	4.70	2.00
09-Sep-08	25.20	33.20	59.00	93.00	18.30	4.00	7.10	2.00
10-Sep-08	25.00	31.20	66.00	93.00	4.30	4.00	0.60	1.60
11-Sep-08	24.50	30.60	65.00	96.00	19.00	6.00	5.70	2.70
12-Sep-08	24.50	29.00	75.00	96.00	22.60	5.00	0.40	1.00
13-Sep-08	23.90	29.50	82.00	94.00	49.00	7.00	1.40	1.10
14-Sep-08	24.50	30.30	77.00	98.00	19.10	5.00	1.50	1.30
15-Sep-08	23.80	30.30	81.00	97.00	42.30	10.00	0.10	0.70
16-Sep-08	23.50	28.50	81.00	96.00	6.00	4.00	0.20	1.00
17-Sep-08	23.60	29.60	72.00	97.00	0.00	2.00	4.30	1.40
18-Sep-08	23.80	29.40	68.00	96.00	0.00	2.00	2.80	1.70
19-Sep-08	23.50	30.20	68.00	94.00	56.40	6.00	1.90	1.80
20-Sep-08	23.50	29.00	73.00	96.00	3.20	3.00	0.90	1.30
21-Sep-08	24.00	28.20	81.00	98.00	10.00	6.00	0.60	0.70

22-Sep-08	23.60	30.00	71.00	96.00	0.00	3.00	5.00	1.10
23-Sep-08	23.60	32.10	68.00	96.00	0.00	4.00	6.70	2.10
24-Sep-08	26.20	30.80	71.00	90.00	0.00	5.00	1.40	2.30
25-Sep-08	25.70	30.20	68.00	90.00	6.00	5.00	0.60	2.30
26-Sep-08	24.70	32.00	64.00	96.00	43.00	2.00	5.70	2.20
27-Sep-08	23.50	31.20	72.00	95.00	0.00	7.00	7.10	1.50
28-Sep-08	24.20	30.20	76.00	96.00	0.00	6.00	2.20	1.20
29-Sep-08	24.00	30.10	72.00	94.00	0.00	3.00	0.00	1.80
30-Sep-08	23.10	27.50	80.00	93.00	0.00	5.00	0.00	1.10
01-Oct-08	23.30	31.50	66.00	97.00	0.00	1.00	6.70	1.60
02-Oct-08	24.50	31.60	66.00	96.00	0.00	1.00	4.80	1.60
03-Oct-08	23.90	31.60	60.00	94.00	1.00	3.00	4.50	2.00
04-Oct-08	24.80	32.10	81.00	89.00	0.00	6.00	4.20	1.70
05-Oct-08	24.30	32.70	65.00	95.00	0.00	3.00	7.40	2.80
06-Oct-08	24.30	32.30	60.00	90.00	0.00	7.00	9.30	3.20
07-Oct-08	23.80	33.30	53.00	92.00	3.00	2.00	8.90	2.80
08-Oct-08	25.00	32.80	57.00	94.00	0.00	3.00	6.90	2.60
09-Oct-08	23.80	32.00	63.00	92.00	0.00	2.00	5.60	2.00
10-Oct-08	24.80	34.30	52.00	93.00	0.00	2.00	9.60	3.70
11-Oct-08	24.50	30.40	61.00	93.00	0.00	3.00	1.10	3.50
12-Oct-08	24.00	30.80	68.00	87.00	0.00	3.00	0.20	2.20
13-Oct-08	24.30	30.00	70.00	92.00	0.00	5.00	1.90	2.60
14-Oct-08	23.50	32.80	56.00	91.00	0.00	2.00	7.30	2.90
15-Oct-08	24.20	32.50	61.00	91.00	0.00	3.00	5.80	2.50
16-Oct-08	25.00	32.00	63.00	93.00	1.50	6.00	3.70	3.20
17-Oct-08	24.00	30.80	70.00	96.00	4.00	6.00	3.10	2.50
18-Oct-08	25.00	33.20	59.00	96.00	0.00	5.00	7.70	2.30
19-Oct-08	24.50	32.60	62.00	92.00	0.20	1.00	5.80	1.80
20-Oct-08	24.40	33.00	60.00	96.00	0.00	3.00	5.70	1.70

21-Oct-08	24.00	33.20	55.00	93.00	28.00	3.00	5.40	2.20
22-Oct-08	24.00	35.40	59.00	96.00	43.00	4.00	10.60	2.70
23-Oct-08	24.00	33.20	58.00	96.00	0.00	5.00	7.70	2.00
24-Oct-08	23.80	31.50	66.00	97.00	0.00	3.00	4.90	2.10
25-Oct-08	24.50	31.90	62.00	93.00	6.00	7.00	5.20	2.00
26-Oct-08	24.30	33.20	56.00	96.00	0.00	12.00	8.00	1.80
27-Oct-08	24.00	33.50	56.00	96.00	3.00	7.00	6.60	2.30
28-Oct-08	24.10	32.00	63.00	96.00	0.30	6.00	4.70	1.70
29-Oct-08	24.00	30.00	77.00	96.00	0.00	2.00	1.00	1.30
30-Oct-08	24.50	30.50	69.00	96.00	0.00	7.00	4.30	1.80
31-Oct-08	25.00	31.50	66.00	96.00	10.00	4.00	6.80	2.30
01-Nov-08	23.40	31.70	61.00	92.00	0.00	4.00	5.10	2.30
02-Nov-08	24.00	32.80	57.00	92.00	25.00	10.00	8.40	3.10
03-Nov-08	24.00	33.00	56.00	94.00	13.00	6.00	7.20	1.90
04-Nov-08	23.50	31.80	68.00	96.00	0.00	7.00	4.90	1.60
05-Nov-08	23.80	33.00	57.00	96.00	0.00	1.00	7.60	2.30
06-Nov-08	24.00	32.10	62.00	96.00	0.00	5.00	8.40	2.50
07-Nov-08	24.20	33.80	55.00	91.00	0.00	4.00	8.70	2.60
08-Nov-08	22.30	32.80	53.00	92.00	0.00	10.00	8.90	5.40
09-Nov-08	20.50	29.50	53.00	89.00	0.00	10.00	9.20	6.10
10-Nov-08	18.00	29.10	55.00	82.00	0.00	12.00	6.30	5.90
11-Nov-08	17.70	30.50	43.00	80.00	0.00	7.00	9.30	5.10
12-Nov-08	17.30	29.30	42.00	81.00	0.00	5.00	9.00	4.40
13-Nov-08	17.50	29.50	44.00	82.00	0.00	4.00	8.30	3.00
14-Nov-08	19.10	29.00	58.00	84.00	0.00	7.00	3.40	4.40
15-Nov-08	22.00	31.50	62.00	89.00	0.00	4.00	6.70	2.40
16-Nov-08	21.50	33.20	49.00	92.00	0.00	4.00	7.70	3.10
17-Nov-08	21.70	31.70	49.00	85.00	0.00	6.00	6.90	5.10
18-Nov-08	23.00	29.50	55.00	79.00	0.00	8.00	0.80	5.10

19-Nov-08	21.60	28.70	58.00	75.00	0.00	8.00	1.30	5.20
20-Nov-08	20.00	30.00	54.00	78.00	0.00	8.00	9.30	5.20
21-Nov-08	19.50	31.50	56.00	88.00	0.00	5.00	8.40	3.70
22-Nov-08	21.00	31.00	60.00	89.00	0.00	3.00	6.20	3.10
23-Nov-08	23.00	33.00	53.00	87.00	0.00	6.00	7.80	5.90
24-Nov-08	22.50	31.60	53.00	86.00	0.00	5.00	4.80	5.50
25-Nov-08	21.30	28.50	60.00	80.00	0.00	5.00	0.00	5.00
26-Nov-08	21.50	30.50	53.00	87.00	0.00	10.00	9.00	5.10
27-Nov-08	18.00	28.00	45.00	83.00	0.00	15.00	8.20	6.70
28-Nov-08	17.90	28.80	43.00	80.00	0.00	5.00	9.00	5.90
29-Nov-08	17.50	29.00	47.00	84.00	0.00	7.00	9.90	5.90
30-Nov-08	16.00	29.20	43.00	76.00	0.00	5.00	10.20	5.10
01-Dec-08	16.20	29.30	42.00	83.00	0.00	2.00	10.00	4.80
02-Dec-08	16.70	30.00	41.00	84.00	0.00	2.00	9.40	3.20
03-Dec-08	17.00	29.50	46.00	90.00	0.00	2.00	7.80	3.10
04-Dec-08	18.00	31.00	44.00	91.00	0.00	4.00	9.70	4.70
05-Dec-08	21.20	31.60	48.00	81.00	0.00	10.00	9.20	6.80
06-Dec-08	19.50	29.50	48.00	81.00	0.00	7.00	9.80	6.50
07-Dec-08	18.80	31.50	45.00	82.00	0.00	2.00	9.10	4.30
08-Dec-08	16.60	29.00	46.00	86.00	0.00	8.00	9.70	6.80
09-Dec-08	16.50	28.30	45.00	85.00	0.00	3.00	7.80	3.70
10-Dec-08	16.80	30.00	39.00	86.00	0.00	2.00	9.20	3.20
11-Dec-08	17.70	30.50	45.00	89.00	0.00	2.00	9.20	4.00
12-Dec-08	17.80	31.00	44.00	85.00	0.00	2.00	9.40	3.00
13-Dec-08	18.30	31.50	47.00	93.00	0.00	2.00	9.40	4.00
14-Dec-08	19.00	31.50	43.00	86.00	0.00	7.00	8.80	5.20
15-Dec-08	17.50	30.00	52.00	89.00	0.00	6.00	7.70	5.30
16-Dec-08	17.70	30.50	48.00	87.00	0.00	2.00	9.40	4.70
17-Dec-08	17.30	29.00	45.00	81.00	0.00	5.00	7.80	5.80

18-Dec-08	17.00	29.50	37.00	77.00	0.00	4.00	7.30	4.40
19-Dec-08	17.00	29.70	38.00	79.00	0.00	3.00	4.80	5.00
20-Dec-08	18.20	30.50	43.00	83.00	0.00	3.00	8.40	3.80
21-Dec-08	18.80	31.80	40.00	89.00	0.00	3.00	9.70	3.80
22-Dec-08	19.10	31.80	37.00	86.00	0.00	2.00	9.60	4.40
23-Dec-08	19.30	32.00	40.00	81.00	0.00	5.00	8.70	6.00
24-Dec-08	18.50	30.80	42.00	79.00	0.00	5.00	9.40	6.00
25-Dec-08	18.50	30.70	48.00	85.00	0.00	3.00	5.50	4.80
26-Dec-08	20.30	26.20	62.00	78.00	0.00	6.00	0.60	3.10
27-Dec-08	20.80	27.30	56.00	83.00	0.00	7.00	0.00	3.30
28-Dec-08	21.00	27.60	63.00	85.00	0.00	3.00	0.00	2.70
29-Dec-08	22.00	31.20	52.00	82.00	0.00	2.00	5.30	4.80
30-Dec-08	22.80	31.30	51.00	75.00	0.00	7.00	2.90	5.50
31-Dec-08	22.30	28.60	48.00	72.00	0.00	8.00	1.50	3.40
01-Jan-09	20.50	28.20	47.00	70.00	0.00	10.00	1.00	6.20
02-Jan-09	19.00	28.30	50.00	74.00	0.00	6.00	2.80	5.40
03-Jan-09	19.00	30.20	44.00	79.00	0.00	2.00	6.50	4.70
04-Jan-09	17.00	31.30	41.00	88.00	0.00	3.00	9.70	4.20
05-Jan-09	18.30	31.50	41.00	87.00	0.00	2.00	9.50	4.10
06-Jan-09	19.00	32.30	38.00	85.00	0.00	3.00	8.80	4.20
07-Jan-09	19.80	32.50	37.00	86.00	0.00	4.00	10.10	4.80
08-Jan-09	19.00	30.00	44.00	81.00	0.00	9.00	9.00	6.10
09-Jan-09	16.80	24.70	47.00	79.00	0.00	10.00	5.70	6.00
10-Jan-09	13.90	29.00	42.00	78.00	0.00	12.00	8.00	6.70
11-Jan-09	12.70	27.00	30.00	73.00	0.00	5.00	8.60	4.20
12-Jan-09	13.30	28.10	32.00	79.00	0.00	3.00	9.50	6.70
13-Jan-09	16.10	28.20	34.00	69.00	0.00	8.00	9.40	7.00
14-Jan-09	14.40	27.00	36.00	79.00	0.00	5.00	9.00	5.50
15-Jan-09	15.30	26.10	41.00	77.00	0.00	5.00	9.10	5.40

16-Jan-09	13.60	29.20	36.00	80.00	0.00	3.00	9.70	4.50
17-Jan-09	15.30	31.30	35.00	84.00	0.00	2.00	10.10	4.00
18-Jan-09	17.50	31.50	30.00	88.00	0.00	3.00	10.00	4.10
19-Jan-09	18.00	31.00	30.00	78.00	0.00	3.00	9.70	4.70
20-Jan-09	15.50	31.80	29.00	89.00	0.00	2.00	10.00	4.30
21-Jan-09	16.00	32.60	27.00	89.00	0.00	2.00	9.90	5.10
22-Jan-09	18.10	32.20	32.00	85.00	0.00	1.00	9.90	4.20
23-Jan-09	16.90	33.20	31.00	88.00	0.00	2.00	9.70	4.90
24-Jan-09	19.60	33.20	38.00	83.00	0.00	6.00	8.80	7.00
25-Jan-09	18.00	31.10	37.00	73.00	0.00	5.00	9.00	4.40
26-Jan-09	20.40	32.60	34.00	82.00	0.00	1.00	9.30	5.20
27-Jan-09	18.00	31.50	30.00	76.00	0.00	3.00	9.70	5.10
28-Jan-09	16.80	32.50	31.00	81.00	0.00	3.00	9.90	4.10
29-Jan-09	18.00	33.00	30.00	85.00	0.00	3.00	9.70	6.20
30-Jan-09	18.40	32.00	29.00	82.00	0.00	3.00	9.70	5.50
31-Jan-09	17.50	32.00	35.00	85.00	0.00	2.00	8.40	4.20
01-Feb-09	20.00	32.40	33.00	80.00	0.00	3.00	8.20	5.90
02-Feb-09	20.50	31.50	30.00	67.00	0.00	3.00	6.90	5.20
03-Feb-09	17.10	32.30	32.00	86.00	0.00	1.00	9.60	4.60
04-Feb-09	19.00	33.20	31.00	80.00	0.00	1.00	9.80	5.30
05-Feb-09	19.90	33.50	27.00	77.00	0.00	3.00	10.10	7.20
06-Feb-09	17.90	32.70	27.00	81.00	0.00	3.00	10.10	5.60
07-Feb-09	17.80	33.00	29.00	81.00	0.00	4.00	10.10	5.30
08-Feb-09	18.70	33.20	20.00	77.00	0.00	5.00	10.40	6.50
09-Feb-09	18.00	33.20	25.00	76.00	0.00	4.00	9.90	5.50
10-Feb-09	20.00	35.20	33.00	80.00	0.00	1.00	9.50	5.80
11-Feb-09	22.40	33.00	40.00	81.00	0.00	3.00	5.70	5.00
12-Feb-09	25.00	31.50	51.00	68.00	0.00	4.00	7.00	5.10
13-Feb-09	23.50	31.80	54.00	85.00	0.00	5.00	6.00	4.90

14-Feb-09	24.00	33.20	48.00	83.00	0.00	7.00	8.30	5.30
15-Feb-09	24.20	34.50	41.00	81.00	0.40	3.00	6.30	5.30
16-Feb-09	25.80	33.20	52.00	82.00	0.00	5.00	3.40	3.20
17-Feb-09	25.20	34.40	48.00	86.00	0.00	6.00	5.30	3.90
18-Feb-09	24.30	36.40	36.00	80.00	0.00	3.00	10.10	5.40
19-Feb-09	25.00	37.00	36.00	80.00	12.30	4.00	10.20	5.50
20-Feb-09	25.50	37.10	37.00	87.00	0.00	10.00	8.00	5.40
21-Feb-09	24.50	35.80	41.00	85.00	0.00	1.00	7.30	5.20
22-Feb-09	25.00	37.10	36.00	73.00	0.00	5.00	10.50	6.20
23-Feb-09	26.00	37.00	39.00	79.00	0.00	3.00	9.00	7.10
24-Feb-09	26.30	36.70	36.00	73.00	0.00	3.00	9.70	7.20
25-Feb-09	25.80	37.00	35.00	73.00	0.00	4.00	9.40	6.30
26-Feb-09	27.00	35.00	46.00	70.00	0.00	4.00	7.70	6.20
27-Feb-09	25.70	35.80	42.00	76.00	0.00	4.00	9.30	6.80
28-Feb-09	25.60	36.20	43.00	73.00	0.00	3.00	7.90	4.90
01-Mar-09	23.70	34.70	40.00	85.00	0.00	8.00	2.50	3.90
02-Mar-09	23.80	35.70	39.00	81.00	0.00	3.00	6.90	4.60
03-Mar-09	24.80	36.50	38.00	75.00	0.00	5.00	9.30	5.70
04-Mar-09	25.80	35.00	44.00	72.00	0.00	6.00	7.20	6.00
05-Mar-09	26.10	33.50	49.00	81.00	4.00	3.00	6.90	5.20
06-Mar-09	25.60	36.00	44.00	77.00	12.50	5.00	8.30	5.80
07-Mar-09	26.00	32.50	60.00	91.00	0.00	8.00	4.10	2.90
08-Mar-09	26.00	35.20	44.00	81.00	0.00	5.00	7.50	5.20
09-Mar-09	26.30	36.50	40.00	78.00	0.00	6.00	9.10	5.60
10-Mar-09	26.20	36.00	39.00	71.00	0.00	4.00	9.20	5.60
11-Mar-09	26.20	36.30	36.00	74.00	0.00	3.00	8.10	5.60
12-Mar-09	25.70	35.50	43.00	79.00	6.80	5.00	8.40	6.40
13-Mar-09	24.80	36.00	54.00	83.00	0.00	15.00	7.30	6.40
14-Mar-09	20.30	29.00	40.00	79.00	0.00	7.00	5.10	6.50

15-Mar-09	17.30	32.70	38.00	77.00	0.00	4.00	9.60	4.90
16-Mar-09	21.50	35.00	33.00	80.00	0.00	2.00	7.70	5.20
17-Mar-09	24.50	36.60	30.00	72.00	0.00	2.00	8.50	6.30
18-Mar-09	27.30	34.80	47.00	75.00	0.00	5.00	4.20	4.50
19-Mar-09	26.00	35.20	45.00	80.00	0.00	2.00	5.20	4.90
20-Mar-09	25.20	34.20	48.00	82.00	0.00	6.00	2.90	4.00
21-Mar-09	24.80	35.70	47.00	85.00	0.00	5.00	7.40	4.90
22-Mar-09	26.00	36.20	42.00	80.00	0.00	3.00	9.10	5.10
23-Mar-09	27.30	35.70	51.00	79.00	1.40	2.00	4.70	5.10
24-Mar-09	27.50	36.60	59.00	80.00	3.50	6.00	1.50	5.20
25-Mar-09	23.20	30.70	55.00	93.00	0.00	7.00	3.50	3.60
26-Mar-09	23.30	35.50	41.00	85.00	11.50	5.00	10.80	6.70
27-Mar-09	26.20	33.00	55.00	80.00	0.00	5.00	6.20	3.60
28-Mar-09	24.80	35.70	45.00	92.00	0.00	6.00	9.50	4.80
29-Mar-09	24.00	35.30	48.00	85.00	0.00	8.00	6.30	5.10
30-Mar-09	23.50	35.60	37.00	83.00	13.00	1.00	8.20	5.50
31-Mar-09	25.50	35.50	41.00	88.00	0.00	8.00	7.60	3.80
01-Apr-09	24.10	32.30	48.00	91.00	0.00	3.00	0.80	4.20
02-Apr-09	23.00	35.50	37.00	80.00	0.00	6.00	9.00	5.00
03-Apr-09	24.80	34.20	52.00	85.00	0.00	3.00	3.70	4.80
04-Apr-09	25.50	36.20	38.00	78.00	0.00	2.00	9.50	6.70
05-Apr-09	26.00	35.70	42.00	76.00	0.00	1.00	5.30	5.10
06-Apr-09	25.00	36.40	34.00	80.00	0.00	5.00	7.90	5.40
07-Apr-09	24.40	35.30	39.00	82.00	0.00	3.00	9.10	5.70
08-Apr-09	25.50	36.20	41.00	80.00	1.50	7.00	9.40	5.70
09-Apr-09	25.90	35.70	44.00	91.00	0.00	5.00	7.30	3.30
10-Apr-09	25.10	36.30	47.00	91.00	0.00	8.00	10.40	5.50
11-Apr-09	26.70	32.50	55.00	80.00	0.00	3.00	3.20	3.30
12-Apr-09	26.20	36.30	49.00	86.00	0.00	5.00	8.10	5.40

13-Apr-09	26.00	35.20	46.00	82.00	2.00	6.00	6.90	4.70
14-Apr-09	27.00	35.70	55.00	88.00	2.00	6.00	6.30	5.00
15-Apr-09	25.00	31.60	65.00	94.00	0.00	2.00	4.50	2.40
16-Apr-09	26.00	34.80	57.00	86.00	0.00	7.00	3.80	5.20
17-Apr-09	26.30	36.00	48.00	82.00	0.00	3.00	10.80	6.00
18-Apr-09	26.50	35.00	57.00	81.00	0.00	5.00	5.60	4.30
19-Apr-09	25.00	38.00	39.00	87.00	30.10	5.00	11.50	6.10
20-Apr-09	27.00	38.20	36.00	81.00	0.10	10.00	10.10	5.10
21-Apr-09	24.00	34.80	51.00	94.00	0.00	2.00	8.20	6.50
22-Apr-09	25.80	34.70	52.00	88.00	0.00	2.00	8.70	5.00
23-Apr-09	26.50	34.20	60.00	81.00	0.00	5.00	5.50	4.50
24-Apr-09	27.00	35.60	56.00	89.00	0.00	8.00	6.80	5.40
25-Apr-09	26.00	35.00	52.00	86.00	0.00	12.00	6.80	4.10
26-Apr-09	25.50	32.60	57.00	92.00	79.00	2.00	6.80	2.80
27-Apr-09	24.40	33.50	59.00	97.00	0.00	3.00	4.50	1.50
28-Apr-09	24.50	33.50	57.00	94.00	8.80	2.00	6.20	3.10
29-Apr-09	25.00	32.50	62.00	92.00	0.00	8.00	4.10	2.90
30-Apr-09	24.50	32.70	59.00	94.00	2.80	3.00	8.00	3.00
01-May-09	24.50	32.00	60.00	92.00	0.00	4.00	4.90	2.30
02-May-09	23.50	34.70	47.00	92.00	0.00	5.00	11.20	6.20
03-May-09	23.00	33.60	46.00	79.00	0.00	8.00	10.80	7.30
04-May-09	21.70	34.00	43.00	73.00	0.00	1.00	7.70	5.20
05-May-09	23.30	34.50	39.00	79.00	0.00	1.00	10.00	5.00
06-May-09	25.30	34.50	46.00	81.00	0.00	2.00	4.80	4.00
07-May-09	25.70	35.00	53.00	79.00	0.00	6.00	10.60	5.80
08-May-09	26.50	34.20	54.00	82.00	0.00	10.00	9.80	5.40
09-May-09	26.30	32.20	62.00	82.00	0.00	4.00	7.00	4.60
10-May-09	24.70	33.80	54.00	85.00	0.10	3.00	7.40	4.50
11-May-09	24.90	32.20	59.00	88.00	0.00	7.00	7.70	4.70

12-May-09	26.00	28.30	77.00	87.00	21.00	4.00	0.00	2.00
13-May-09	24.20	32.50	55.00	92.00	0.00	5.00	4.90	3.60
14-May-09	24.00	33.50	48.00	92.00	0.00	4.00	8.00	3.70
15-May-09	25.00	35.30	49.00	85.00	0.00	6.00	10.80	4.40
16-May-09	24.80	35.00	41.00	87.00	45.00	1.00	10.20	4.60
17-May-09	26.80	35.50	55.00	81.00	2.40	5.00	6.60	3.60
18-May-09	23.00	33.20	56.00	95.00	0.00	3.00	7.70	3.10
19-May-09	26.20	32.00	60.00	90.00	4.30	6.00	4.80	3.80
20-May-09	26.00	31.60	63.00	90.00	19.40	6.00	4.90	2.40
21-May-09	23.80	32.50	61.00	96.00	56.50	1.00	6.80	2.70
22-May-09	24.20	32.50	73.00	95.00	33.00	2.00	3.40	1.90
23-May-09	23.00	30.80	67.00	96.00	4.30	7.00	4.80	1.40
24-May-09	24.60	33.60	56.00	96.00	76.00	3.00	6.80	2.60
25-May-09	24.80	32.80	65.00	95.00	0.00	3.00	7.10	2.40
26-May-09	22.70	32.10	60.00	98.00	0.00	1.00	6.00	2.40
27-May-09	25.60	30.90	73.00	90.00	3.00	4.00	2.70	2.30
28-May-09	25.20	31.40	69.00	92.00	0.00	5.00	5.20	2.80
29-May-09	24.70	33.20	60.00	90.00	20.00	5.00	7.90	3.40
30-May-09	26.50	29.00	80.00	90.00	0.00	2.00	0.20	1.50
31-May-09	24.40	31.60	65.00	96.00	10.60	3.00	1.10	2.30
01-Jun-09	24.00	32.30	68.00	92.00	1.00	14.00	2.60	2.10
02-Jun-09	23.40	31.80	66.00	93.00	22.50	3.00	4.50	2.70
03-Jun-09	25.00	30.20	82.00	96.00	6.00	14.00	1.70	1.80
04-Jun-09	24.20	30.70	71.00	96.00	0.00	14.00	5.20	2.10
05-Jun-09	25.00	30.50	73.00	91.00	0.00	3.00	4.90	2.10
06-Jun-09	24.50	33.30	54.00	91.00	0.00	5.00	8.40	4.30
07-Jun-09	26.50	32.50	62.00	83.00	0.00	4.00	8.60	3.50
08-Jun-09	25.50	34.00	54.00	89.00	31.50	6.00	9.70	4.60
09-Jun-09	27.00	33.70	63.00	84.00	30.50	15.00	6.20	2.90

10-Jun-09	24.20	30.50	74.00	94.00	11.20	14.00	1.40	2.20
11-Jun-09	22.80	30.00	75.00	96.00	8.70	4.00	1.30	1.40
12-Jun-09	23.60	32.00	69.00	91.00	0.00	10.00	9.50	2.60
13-Jun-09	24.00	33.80	58.00	94.00	2.30	5.00	7.80	3.40
14-Jun-09	27.30	33.20	64.00	92.00	64.20	7.00	6.10	2.80
15-Jun-09	25.00	31.50	73.00	92.00	0.70	4.00	2.30	2.30
16-Jun-09	23.50	29.70	74.00	94.00	0.00	6.00	1.50	2.30
17-Jun-09	25.60	31.00	73.00	91.00	18.00	4.00	4.60	2.90
18-Jun-09	24.50	31.00	69.00	93.00	15.00	6.00	5.60	2.10
19-Jun-09	25.00	31.00	72.00	94.00	4.80	10.00	3.00	2.60
20-Jun-09	24.00	30.60	73.00	96.00	14.60	7.00	3.10	2.60
21-Jun-09	24.00	31.80	71.00	95.00	0.00	6.00	5.40	4.50
22-Jun-09	24.00	30.60	71.00	93.00	5.00	3.00	3.70	2.60
23-Jun-09	25.20	31.70	65.00	92.00	0.00	4.00	6.40	2.40
24-Jun-09	25.30	33.50	61.00	94.00	0.50	3.00	11.50	3.20
25-Jun-09	27.00	34.00	59.00	88.00	3.80	4.00	8.80	3.70
26-Jun-09	26.60	31.60	71.00	90.00	25.00	3.00	1.70	2.70
27-Jun-09	24.00	29.50	71.00	96.00	22.40	4.00	0.00	1.80
28-Jun-09	24.20	30.80	72.00	96.00	4.70	14.00	2.80	1.70
29-Jun-09	24.40	32.50	62.00	93.00	11.50	3.00	7.30	3.20
30-Jun-09	25.80	33.10	56.00	93.00	1.80	7.00	7.80	3.80
01-Jul-09	24.50	33.00	60.00	94.00	0.00	3.00	7.90	3.70
02-Jul-09	24.00	32.00	65.00	90.00	42.00	3.00	7.20	3.40
03-Jul-09	24.30	31.70	68.00	94.00	10.00	5.00	5.60	3.40
04-Jul-09	23.70	32.40	61.00	92.00	43.00	6.00	6.00	4.00
05-Jul-09	24.70	29.80	73.00	94.00	13.00	5.00	2.30	2.00
06-Jul-09	23.20	30.00	69.00	92.00	0.00	5.00	3.20	2.90
07-Jul-09	23.00	29.30	73.00	95.00	0.00	2.00	0.00	2.20
08-Jul-09	24.60	32.60	62.00	90.00	4.00	4.00	10.80	3.40

09-Jul-09	24.60	33.80	56.00	91.00	8.00	3.00	10.90	3.70
10-Jul-09	25.50	33.20	63.00	86.00	0.00	1.00	8.60	3.70
11-Jul-09	25.50	33.30	64.00	93.00	6.60	1.00	6.00	3.30
12-Jul-09	24.40	30.00	74.00	92.00	27.50	5.00	1.50	2.60
13-Jul-09	24.50	30.30	77.00	96.00	27.70	10.00	3.00	1.90
14-Jul-09	23.50	29.00	84.00	96.00	30.80	8.00	1.40	0.90
15-Jul-09	24.50	27.50	84.00	97.00	91.00	1.00	0.00	1.00
16-Jul-09	23.50	26.90	88.00	97.00	21.50	2.00	0.00	0.50
17-Jul-09	22.00	26.30	90.00	97.00	11.30	3.00	0.00	0.80
18-Jul-09	24.40	31.50	78.00	96.00	0.00	4.00	4.30	2.10
19-Jul-09	24.50	31.50	68.00	94.00	89.80	4.00	5.10	3.00
20-Jul-09	25.80	31.60	73.00	96.00	20.00	4.00	1.60	1.90
21-Jul-09	22.40	29.00	81.00	97.00	20.20	1.00	0.50	1.20
22-Jul-09	24.80	30.60	68.00	92.00	4.80	1.00	2.30	1.70
23-Jul-09	23.50	30.50	67.00	96.00	1.30	4.00	3.50	1.50
24-Jul-09	25.00	32.00	69.00	93.00	0.00	4.00	8.10	3.10
25-Jul-09	26.00	32.70	58.00	90.00	17.00	3.00	6.80	3.10
26-Jul-09	25.50	33.20	58.00	92.00	18.00	4.00	10.60	1.80
27-Jul-09	24.00	32.30	63.00	96.00	11.00	4.00	4.90	2.30
28-Jul-09	23.00	31.30	72.00	96.00	13.30	2.00	2.10	2.00
29-Jul-09	24.60	29.50	82.00	95.00	41.50	4.00	0.80	1.10
30-Jul-09	24.10	29.80	72.00	96.00	36.50	11.00	0.50	1.80
31-Jul-09	23.00	27.70	84.00	98.00	30.80	4.00	0.00	0.90
01-Aug-09	24.00	28.20	81.00	96.00	11.30	3.00	0.30	0.70
02-Aug-09	24.50	27.70	85.00	96.00	10.00	9.00	0.00	0.90
03-Aug-09	25.00	29.00	79.00	96.00	39.80	8.00	0.30	1.40
04-Aug-09	25.00	30.70	75.00	96.00	2.50	10.00	3.70	1.80
05-Aug-09	23.90	32.30	69.00	96.00	11.70	8.00	3.80	1.80
06-Aug-09	25.30	32.00	69.00	94.00	0.00	10.00	4.90	2.10

07-Aug-09	24.00	29.60	77.00	93.00	6.00	5.00	0.00	2.20
08-Aug-09	26.30	29.80	68.00	93.00	0.00	8.00	0.00	1.70
09-Aug-09	24.80	29.00	76.00	93.00	0.00	5.00	0.00	1.60
10-Aug-09	25.00	30.30	71.00	94.00	0.00	3.00	1.00	1.40
11-Aug-09	25.60	31.20	69.00	94.00	7.30	3.00	1.30	1.90
12-Aug-09	26.00	31.30	72.00	96.00	13.00	10.00	0.50	1.60
13-Aug-09	25.50	30.50	75.00	94.00	0.00	5.00	1.80	2.00
14-Aug-09	23.50	32.90	66.00	97.00	2.00	2.00	6.30	2.00
15-Aug-09	25.80	31.20	77.00	96.00	5.00	7.00	4.80	1.60
16-Aug-09	24.30	32.50	63.00	91.00	23.00	2.00	8.90	2.40
17-Aug-09	26.00	31.20	63.00	97.00	11.00	10.00	4.50	1.60
18-Aug-09	25.30	31.50	58.00	98.00	0.00	6.00	9.60	2.70
19-Aug-09	25.00	32.60	58.00	88.00	1.80	4.00	8.80	2.80
20-Aug-09	25.00	31.90	68.00	92.00	0.20	4.00	5.00	1.80
21-Aug-09	25.50	32.40	64.00	92.00	16.00	3.00	8.40	2.60
22-Aug-09	25.00	33.50	69.00	96.00	0.00	5.00	7.40	2.70
23-Aug-09	22.80	31.50	67.00	96.00	26.60	2.00	3.00	1.90
24-Aug-09	25.50	32.70	67.00	89.00	10.30	7.00	7.10	2.20
25-Aug-09	23.30	32.50	67.00	93.00	0.00	10.00	10.10	2.20
26-Aug-09	23.40	33.50	61.00	96.00	3.00	1.00	8.30	1.90
27-Aug-09	24.50	32.20	69.00	91.00	1.20	6.00	5.40	2.00
28-Aug-09	25.50	31.00	72.00	92.00	8.80	3.00	3.10	1.90
29-Aug-09	26.00	32.50	66.00	90.00	16.80	3.00	4.20	2.70
30-Aug-09	24.00	32.30	63.00	92.00	2.30	6.00	8.80	2.40
31-Aug-09	23.80	32.00	65.00	94.00	0.00	3.00	4.50	2.20
01-Sep-09	24.00	31.50	63.00	92.00	17.00	5.00	6.90	2.10
02-Sep-09	25.30	32.30	62.00	94.00	13.00	5.00	4.90	2.40
03-Sep-09	23.60	28.80	79.00	94.00	5.00	2.00	0.00	0.90
04-Sep-09	24.20	27.80	88.00	97.00	9.80	2.00	0.00	0.70

05-Sep-09	24.00	29.00	81.00	96.00	0.80	3.00	0.00	0.70
06-Sep-09	25.20	32.80	69.00	96.00	25.80	7.00	4.10	1.70
07-Sep-09	24.00	30.50	76.00	96.00	16.50	10.00	0.80	1.20
08-Sep-09	24.00	28.00	84.00	96.00	19.50	4.00	0.00	0.70
09-Sep-09	22.50	30.00	76.00	96.00	0.00	13.00	0.00	1.10
10-Sep-09	24.00	33.00	50.00	96.00	0.00	3.00	9.70	2.70
11-Sep-09	25.50	32.70	63.00	93.00	0.00	1.00	7.00	2.50
12-Sep-09	25.50	32.30	65.00	92.00	10.00	1.00	5.50	2.80
13-Sep-09	25.80	32.20	63.00	90.00	1.50	7.00	5.20	2.70
14-Sep-09	25.00	32.30	66.00	96.00	31.00	5.00	4.20	2.10
15-Sep-09	25.00	30.00	76.00	96.00	3.50	15.00	3.00	2.50
16-Sep-09	24.40	29.80	75.00	93.00	0.50	4.00	1.30	2.00
17-Sep-09	25.00	32.70	62.00	94.00	0.00	5.00	8.70	2.30
18-Sep-09	25.00	34.20	52.00	96.00	0.00	3.00	8.10	2.60
19-Sep-09	22.60	33.00	63.00	93.00	0.00	4.00	6.80	2.40
20-Sep-09	25.70	34.20	59.00	96.00	24.00	3.00	8.00	2.90
21-Sep-09	25.50	33.70	63.00	87.00	0.00	10.00	7.00	3.40
22-Sep-09	25.50	32.00	61.00	96.00	1.00	2.00	9.00	2.30
23-Sep-09	24.00	28.70	74.00	94.00	25.50	2.00	0.00	1.50
24-Sep-09	24.00	26.80	87.00	96.00	12.00	1.00	0.00	0.70
25-Sep-09	24.40	29.30	76.00	96.00	27.00	7.00	1.40	1.30
26-Sep-09	24.30	31.00	65.00	95.00	5.00	5.00	3.00	1.70
27-Sep-09	24.00	30.70	68.00	96.00	15.50	8.00	3.70	1.80
28-Sep-09	24.40	29.30	75.00	95.00	171.50	7.00	0.00	1.30
29-Sep-09	23.50	24.30	91.00	95.00	13.00	10.00	0.00	1.30
30-Sep-09	22.00	24.10	96.00	97.00	0.00	5.00	0.00	0.30
01-Oct-09	22.50	29.90	71.00	93.00	6.00	8.00	6.10	2.80
02-Oct-09	25.10	31.80	64.00	92.00	2.00	3.00	2.90	2.00
03-Oct-09	24.10	30.50	71.00	96.00	48.70	4.00	3.40	1.80

04-Oct-09	24.90	32.70	64.00	96.00	0.00	8.00	6.50	1.90
05-Oct-09	23.50	32.80	54.00	96.00	0.00	2.00	6.70	2.40
06-Oct-09	24.00	32.00	62.00	88.00	0.00	3.00	6.80	3.20
07-Oct-09	24.40	32.60	58.00	92.00	0.00	3.00	7.70	2.50
08-Oct-09	25.00	29.10	68.00	95.00	0.00	6.00	1.50	2.50
09-Oct-09	25.00	32.30	61.00	93.00	1.80	4.00	6.70	3.20
10-Oct-09	24.80	29.70	64.00	90.00	0.00	4.00	3.30	1.90
11-Oct-09	24.00	31.30	65.00	92.00	0.00	5.00	3.90	2.40
12-Oct-09	24.60	32.00	62.00	93.00	0.00	3.00	5.00	2.60
13-Oct-09	24.50	31.20	63.00	89.00	0.00	3.00	1.50	2.30
14-Oct-09	24.50	32.80	59.00	95.00	1.70	3.00	8.00	2.50
15-Oct-09	25.00	27.40	84.00	95.00	0.00	3.00	0.00	1.00
16-Oct-09	23.40	31.80	65.00	95.00	0.00	2.00	5.40	2.10
17-Oct-09	23.50	31.60	65.00	93.00	1.30	5.00	0.30	2.40
18-Oct-09	23.60	26.80	77.00	93.00	11.00	2.00	0.00	1.10
19-Oct-09	23.50	26.50	78.00	96.00	0.00	2.00	0.00	0.90
20-Oct-09	23.50	32.00	65.00	95.00	0.00	4.00	5.10	1.90
21-Oct-09	24.00	30.00	73.00	94.00	1.00	2.00	0.20	1.40
22-Oct-09	24.00	32.20	63.00	93.00	0.00	6.00	5.60	2.40
23-Oct-09	24.00	28.70	74.00	93.00	0.00	4.00	0.10	1.80
24-Oct-09	24.30	32.50	59.00	93.00	0.00	2.00	9.80	2.80
25-Oct-09	24.00	34.00	53.00	96.00	0.00	2.00	9.70	3.50
26-Oct-09	24.00	33.60	55.00	92.00	0.00	4.00	9.70	3.50
27-Oct-09	23.60	32.90	54.00	94.00	0.00	4.00	9.70	4.10
28-Oct-09	23.00	32.20	52.00	85.00	0.00	1.00	5.80	3.40
29-Oct-09	22.50	33.50	46.00	87.00	0.00	3.00	10.60	4.80
30-Oct-09	21.60	32.80	42.00	85.00	0.00	3.00	9.80	4.40
31-Oct-09	21.00	33.00	49.00	83.00	0.00	5.00	10.00	3.90
01-Nov-09	22.40	31.60	41.00	80.00	2.00	9.00	9.90	7.00

02-Nov-09	22.60	30.50	58.00	83.00	0.00	7.00	5.90	4.20
03-Nov-09	21.50	28.80	59.00	84.00	0.00	7.00	1.50	4.30
04-Nov-09	21.00	30.50	56.00	85.00	0.00	5.00	3.50	3.90
05-Nov-09	20.80	30.80	58.00	89.00	0.00	9.00	8.40	5.60
06-Nov-09	21.30	32.50	55.00	90.00	0.00	4.00	8.30	3.30
07-Nov-09	22.80	32.50	56.00	88.00	0.00	5.00	5.50	3.10
08-Nov-09	23.50	35.20	41.00	94.00	0.00	2.00	9.90	4.50
09-Nov-09	25.50	35.70	47.00	89.00	0.00	3.00	10.80	4.70
10-Nov-09	25.40	35.30	42.00	82.00	0.00	3.00	10.70	4.80
11-Nov-09	25.50	35.50	46.00	86.00	0.00	2.00	8.30	3.90
12-Nov-09	25.40	35.80	42.00	88.00	0.00	4.00	10.10	3.90
13-Nov-09	24.80	35.70	42.00	93.00	0.00	3.00	10.30	5.00
14-Nov-09	24.80	35.70	50.00	89.00	0.00	3.00	7.50	3.10
15-Nov-09	24.20	33.70	55.00	92.00	0.00	3.00	7.50	3.90
16-Nov-09	23.80	33.50	53.00	92.00	0.00	4.00	4.60	3.60
17-Nov-09	18.60	29.90	48.00	89.00	0.00	7.00	8.00	7.20
18-Nov-09	18.60	30.20	43.00	72.00	0.00	6.00	9.90	5.80
19-Nov-09	18.10	29.40	45.00	78.00	0.00	9.00	10.30	7.00
20-Nov-09	18.00	29.00	48.00	78.00	0.00	10.00	9.70	8.00
21-Nov-09	16.80	27.80	44.00	72.00	0.00	10.00	9.60	8.10
22-Nov-09	16.00	28.50	43.00	76.00	0.00	7.00	10.20	6.10
23-Nov-09	16.20	30.70	40.00	88.00	0.00	3.00	9.70	4.40
24-Nov-09	17.60	31.40	38.00	88.00	0.00	2.00	9.70	4.30
25-Nov-09	18.70	32.60	39.00	88.00	0.00	2.00	8.90	4.50
26-Nov-09	20.80	33.20	43.00	88.00	0.00	1.00	9.30	3.00
27-Nov-09	21.00	34.00	40.00	89.00	0.00	2.00	10.00	5.10
28-Nov-09	20.50	34.20	36.00	88.00	0.00	2.00	9.70	5.00
29-Nov-09	19.70	33.20	39.00	92.00	0.00	3.00	8.40	5.30
30-Nov-09	19.10	32.80	36.00	76.00	0.00	3.00	9.40	5.70

01-Dec-09	18.60	32.40	35.00	74.00	0.00	3.00	7.60	5.00
02-Dec-09	18.80	32.60	36.00	87.00	0.00	4.00	8.80	5.40
03-Dec-09	18.80	29.50	43.00	78.00	0.00	9.00	8.60	7.30
04-Dec-09	18.50	30.20	37.00	80.00	0.00	4.00	5.10	4.30
05-Dec-09	17.70	30.40	37.00	82.00	0.00	4.00	9.40	5.20
06-Dec-09	18.00	31.60	36.00	87.00	0.00	3.00	8.40	3.70
07-Dec-09	18.70	31.90	40.00	85.00	0.00	2.00	9.10	3.60
08-Dec-09	18.80	32.50	39.00	92.00	0.00	3.00	8.20	3.80
09-Dec-09	20.50	32.50	35.00	86.00	0.00	3.00	8.50	4.10
10-Dec-09	19.50	33.00	39.00	89.00	0.00	3.00	9.10	4.00
11-Dec-09	20.00	31.50	44.00	90.00	0.00	3.00	7.10	3.50
12-Dec-09	20.50	33.00	44.00	90.00	0.00	2.00	8.90	3.90
13-Dec-09	22.50	35.00	38.00	85.00	0.00	2.00	8.80	5.00
14-Dec-09	22.50	34.60	40.00	87.00	0.00	3.00	10.00	5.60
15-Dec-09	22.00	34.50	41.00	84.00	0.00	1.00	8.10	4.90
16-Dec-09	22.00	35.00	35.00	86.00	22.50	1.00	9.80	5.60
17-Dec-09	20.50	33.00	47.00	84.00	0.00	7.00	6.10	3.70
18-Dec-09	20.80	32.00	46.00	80.00	0.00	3.00	9.20	5.90
19-Dec-09	19.60	31.50	45.00	79.00	0.00	7.00	6.60	7.10
20-Dec-09	17.40	30.50	45.00	74.00	0.00	8.00	9.70	6.50
21-Dec-09	17.50	30.20	43.00	84.00	0.00	2.00	9.20	5.30
22-Dec-09	17.30	32.50	40.00	85.00	0.00	2.00	9.80	4.40
23-Dec-09	19.50	32.20	37.00	88.00	0.00	2.00	10.00	4.00
24-Dec-09	19.00	32.60	37.00	90.00	0.00	3.00	10.30	4.50
25-Dec-09	19.00	33.50	32.00	95.00	0.00	3.00	10.00	4.50
26-Dec-09	21.50	33.60	37.00	86.00	0.00	2.00	9.70	4.60
27-Dec-09	21.70	34.00	38.00	85.00	0.00	4.00	9.20	4.50
28-Dec-09	21.80	33.40	43.00	84.00	0.00	1.00	8.70	4.00
29-Dec-09	22.00	33.00	45.00	82.00	0.00	4.00	9.40	4.30

30-Dec-09	22.80	34.50	35.00	83.00	0.00	1.00	9.00	4.70
31-Dec-09	22.60	33.80	42.00	79.00	0.00	1.00	8.70	4.20
01-Jan-10	22.60	34.00	44.00	88.00	0.00	1.00	9.20	5.00
02-Jan-10	22.80	33.70	40.00	79.00	0.00	2.00	9.70	4.50
03-Jan-10	21.30	34.20	38.00	88.00	0.00	3.00	9.70	5.00
04-Jan-10	22.00	33.20	47.00	83.00	0.00	3.00	9.60	4.40
05-Jan-10	22.50	34.50	37.00	84.00	0.00	2.00	9.70	4.90
06-Jan-10	22.00	34.90	38.00	85.00	7.50	1.00	9.60	4.40
07-Jan-10	23.00	33.50	42.00	83.00	0.00	2.00	7.30	3.70
08-Jan-10	23.50	26.20	72.00	82.00	0.00	1.00	0.00	2.30
09-Jan-10	19.20	31.80	42.00	87.00	0.00	3.00	9.70	3.40
10-Jan-10	19.30	32.80	32.00	90.00	0.00	2.00	9.60	4.40
11-Jan-10	19.50	34.00	27.00	85.00	0.00	2.00	10.20	4.90
12-Jan-10	19.00	32.50	35.00	82.00	0.00	5.00	8.80	5.50
13-Jan-10	18.50	32.30	35.00	74.00	0.00	3.00	9.70	5.70
14-Jan-10	18.00	31.90	34.00	77.00	0.00	2.00	9.30	5.00
15-Jan-10	18.10	31.80	32.00	78.00	0.00	4.00	9.40	6.00
16-Jan-10	19.90	31.60	32.00	77.00	0.00	4.00	6.10	5.80
17-Jan-10	18.30	30.80	34.00	78.00	0.00	4.00	9.80	6.40
18-Jan-10	17.40	31.50	29.00	74.00	0.00	2.00	9.70	5.20
19-Jan-10	19.00	30.50	44.00	80.00	0.00	3.00	4.60	4.10
20-Jan-10	21.50	32.50	49.00	83.00	0.00	4.00	6.20	3.60
21-Jan-10	22.30	32.50	44.00	87.00	3.80	3.00	6.20	3.90
22-Jan-10	23.30	32.00	52.00	92.00	5.00	2.00	5.30	2.40
23-Jan-10	23.90	28.00	74.00	92.00	0.00	3.00	0.20	1.40
24-Jan-10	21.40	33.00	49.00	92.00	0.00	2.00	7.90	3.40
25-Jan-10	21.30	33.70	38.00	87.00	0.00	5.00	10.60	4.70
26-Jan-10	20.70	34.20	36.00	82.00	0.00	4.00	9.80	2.40
27-Jan-10	20.50	33.50	38.00	82.00	0.00	3.00	9.90	2.20

28-Jan-10	22.00	35.00	37.00	80.00	0.00	3.00	9.80	1.80
29-Jan-10	23.50	35.10	35.00	78.00	0.00	4.00	9.60	2.10
30-Jan-10	23.00	35.20	33.00	80.00	0.00	2.00	10.00	1.70
31-Jan-10	23.50	35.50	38.00	76.00	0.00	5.00	9.80	1.90
01-Feb-10	23.50	34.00	47.00	83.00	0.00	5.00	9.30	1.90
02-Feb-10	23.50	35.00	44.00	83.00	0.00	5.00	9.80	5.20
03-Feb-10	24.00	33.80	47.00	83.00	0.00	4.00	8.30	5.00
04-Feb-10	24.50	34.00	49.00	82.00	0.00	5.00	8.80	4.40
05-Feb-10	24.20	34.20	44.00	79.00	0.00	5.00	9.50	5.30
06-Feb-10	24.20	33.00	49.00	76.00	0.00	4.00	8.10	5.00
07-Feb-10	23.30	34.50	41.00	80.00	0.00	2.00	8.20	4.10
08-Feb-10	23.00	33.70	48.00	83.00	0.00	7.00	9.40	5.50
09-Feb-10	23.50	36.10	38.00	84.00	0.00	3.00	9.70	4.60
10-Feb-10	23.60	36.00	38.00	81.00	0.00	4.00	10.00	5.50
11-Feb-10	24.00	37.20	27.00	85.00	0.00	2.00	9.70	6.20
12-Feb-10	24.50	37.00	36.00	79.00	0.00	3.00	9.70	5.80
13-Feb-10	26.40	35.00	40.00	72.00	0.00	4.00	9.00	6.20
14-Feb-10	23.90	35.50	36.00	72.00	0.00	4.00	9.40	6.80
15-Feb-10	25.00	35.00	39.00	68.00	0.00	3.00	10.50	6.90
16-Feb-10	23.40	35.20	34.00	75.00	0.00	3.00	9.80	6.50
17-Feb-10	21.50	35.00	36.00	80.00	0.00	7.00	9.80	6.00
18-Feb-10	19.80	33.80	40.00	77.00	0.00	5.00	9.60	5.50
19-Feb-10	19.60	33.30	39.00	74.00	0.00	5.00	9.00	5.40
20-Feb-10	19.30	33.50	40.00	76.00	14.00	2.00	6.30	5.00
21-Feb-10	23.50	31.00	56.00	69.00	0.00	6.00	5.40	5.00
22-Feb-10	22.80	28.50	70.00	93.00	0.00	5.00	5.00	2.30
23-Feb-10	21.90	33.50	50.00	95.00	0.00	5.00	9.10	5.10
24-Feb-10	26.00	33.30	52.00	83.00	0.00	3.00	5.10	6.10
25-Feb-10	26.10	36.00	41.00	74.00	0.00	4.00	9.10	7.20

26-Feb-10	26.30	35.30	48.00	73.00	0.00	3.00	6.90	6.50
27-Feb-10	26.40	36.00	35.00	81.00	0.00	4.00	9.60	8.50
28-Feb-10	27.00	35.20	49.00	70.00	0.00	2.00	8.20	7.30
01-Mar-10	26.70	35.60	44.00	78.00	0.00	2.00	7.30	6.50
02-Mar-10	25.50	35.90	40.00	63.00	0.00	3.00	8.20	8.10
03-Mar-10	26.20	37.00	37.00	74.00	0.00	4.00	8.50	8.50
04-Mar-10	27.30	35.50	47.00	74.00	0.00	5.00	8.60	8.00
05-Mar-10	26.80	35.50	43.00	77.00	0.00	3.00	8.10	8.80
06-Mar-10	27.00	35.50	42.00	75.00	0.00	5.00	9.10	7.90
07-Mar-10	26.00	36.10	43.00	80.00	0.00	4.00	9.10	7.50
08-Mar-10	26.00	34.80	48.00	76.00	0.00	3.00	8.30	7.10
09-Mar-10	26.10	34.60	46.00	73.00	0.00	10.00	5.10	8.90
10-Mar-10	19.40	30.50	36.00	63.00	0.00	5.00	9.10	9.30
11-Mar-10	17.80	32.60	37.00	73.00	0.00	3.00	8.90	5.10
12-Mar-10	22.80	36.20	33.00	74.00	0.00	3.00	9.20	6.20
13-Mar-10	24.50	36.00	37.00	65.00	0.00	4.00	8.70	7.80
14-Mar-10	25.00	36.50	36.00	69.00	0.00	4.00	9.50	8.40
15-Mar-10	25.40	38.40	29.00	69.00	0.00	2.00	9.00	7.40
16-Mar-10	26.50	37.00	35.00	62.00	0.00	3.00	6.80	7.00
17-Mar-10	24.00	36.20	33.00	67.00	0.00	2.00	7.40	6.60
18-Mar-10	23.40	36.10	29.00	64.00	0.00	2.00	9.20	7.20
19-Mar-10	22.20	36.30	25.00	74.00	0.00	1.00	8.60	6.10
20-Mar-10	23.50	37.60	24.00	64.00	0.00	2.00	8.80	7.50
21-Mar-10	26.00	36.00	36.00	68.00	0.00	6.00	6.60	6.70
22-Mar-10	25.50	36.00	42.00	69.00	0.00	5.00	7.30	8.10
23-Mar-10	26.00	36.30	42.00	77.00	0.00	3.00	8.00	8.30
24-Mar-10	26.50	36.80	41.00	70.00	0.00	3.00	7.60	7.50
25-Mar-10	23.80	37.50	40.00	67.00	0.00	6.00	5.50	8.90
26-Mar-10	20.70	31.50	40.00	62.00	0.00	4.00	2.80	7.40

27-Mar-10	19.50	35.50	34.00	72.00	0.00	3.00	7.50	9.10
28-Mar-10	23.40	35.70	34.00	67.00	0.00	2.00	7.70	7.50
29-Mar-10	23.00	36.60	35.00	69.00	0.00	3.00	8.50	7.70
30-Mar-10	26.50	37.00	33.00	62.00	9.20	2.00	8.00	7.30
31-Mar-10	27.00	35.50	46.00	79.00	0.00	15.00	6.30	5.00
01-Apr-10	24.00	36.50	46.00	90.00	0.00	2.00	7.80	5.20
02-Apr-10	27.50	37.70	40.00	74.00	0.00	3.00	8.20	6.50
03-Apr-10	27.50	36.70	48.00	71.00	0.00	4.00	8.20	7.20
04-Apr-10	28.00	37.30	42.00	71.00	0.00	2.00	8.10	7.60
05-Apr-10	28.00	39.00	34.00	71.00	0.00	2.00	8.60	8.00
06-Apr-10	29.00	37.70	43.00	70.00	0.00	3.00	9.40	8.30
07-Apr-10	28.20	38.80	39.00	71.00	0.00	5.00	9.10	8.50
08-Apr-10	26.30	37.60	39.00	68.00	0.00	5.00	8.50	8.40
09-Apr-10	28.00	33.70	55.00	81.00	3.00	5.00	1.10	4.00
10-Apr-10	26.00	37.60	38.00	84.00	0.00	8.00	8.20	5.90
11-Apr-10	28.00	37.70	39.00	81.00	0.00	8.00	8.50	7.70
12-Apr-10	29.30	37.30	39.00	66.00	0.00	3.00	9.60	9.60
13-Apr-10	29.70	39.70	33.00	65.00	0.00	3.00	9.80	9.20
14-Apr-10	29.20	39.50	34.00	72.00	4.00	4.00	9.80	9.60
15-Apr-10	29.20	40.00	35.00	87.00	0.00	10.00	9.30	6.20
16-Apr-10	26.00	36.00	41.00	88.00	0.00	5.00	5.80	5.50
17-Apr-10	25.90	35.00	48.00	87.00	0.00	4.00	2.40	4.10
18-Apr-10	25.80	36.50	40.00	87.00	0.00	2.00	10.30	7.40
19-Apr-10	26.60	36.90	41.00	70.00	0.00	2.00	10.40	8.00
20-Apr-10	26.80	36.50	43.00	78.00	0.00	4.00	9.80	7.70
21-Apr-10	27.00	38.00	40.00	78.00	0.00	5.00	10.50	8.60
22-Apr-10	27.80	39.20	36.00	68.00	10.00	3.00	10.20	8.90
23-Apr-10	28.30	37.50	43.00	81.00	18.00	5.00	6.80	6.70
24-Apr-10	24.70	35.60	44.00	94.00	0.00	5.00	7.10	4.60

25-Apr-10	25.00	37.60	39.00	91.00	28.20	2.00	9.60	7.30
26-Apr-10	28.70	38.00	37.00	97.00	0.00	10.00	7.80	5.30
27-Apr-10	24.70	36.00	51.00	95.00	6.00	8.00	7.80	5.00
28-Apr-10	25.50	35.60	47.00	88.00	0.00	10.00	7.90	4.30
29-Apr-10	24.60	35.50	45.00	85.00	0.00	5.00	7.20	4.60
30-Apr-10	25.80	36.20	45.00	84.00	0.00	4.00	9.60	5.30
01-May-10	26.00	35.30	55.00	82.00	0.00	2.00	5.80	4.00
02-May-10	26.80	36.50	50.00	81.00	32.00	4.00	6.00	5.00
03-May-10	26.50	37.00	41.00	81.00	0.00	8.00	10.40	5.50
04-May-10	25.30	30.30	71.00	96.00	0.00	3.00	3.50	2.70
05-May-10	25.50	35.50	59.00	87.00	0.00	3.00	8.80	5.10
06-May-10	28.70	37.10	48.00	78.00	0.00	1.00	10.20	5.50
07-May-10	29.30	38.10	44.00	78.00	0.00	1.00	8.50	6.10
08-May-10	29.00	39.00	41.00	70.00	0.00	4.00	9.40	6.70
09-May-10	28.80	35.50	59.00	80.00	27.50	10.00	5.20	4.60
10-May-10	27.00	35.50	55.00	93.00	0.00	13.00	3.40	3.30
11-May-10	24.60	35.20	54.00	96.00	0.00	7.00	8.00	4.80
12-May-10	26.30	37.00	42.00	81.00	0.00	1.00	11.10	6.10
13-May-10	28.30	37.30	46.00	71.00	0.00	4.00	10.80	6.20
14-May-10	27.40	37.20	43.00	75.00	15.50	2.00	11.00	7.60
15-May-10	28.00	37.50	48.00	92.00	0.00	12.00	7.80	4.30
16-May-10	25.70	36.20	48.00	92.00	0.40	2.00	9.60	5.10
17-May-10	27.00	37.50	44.00	83.00	1.50	1.00	10.10	6.70
18-May-10	28.00	35.20	52.00	81.00	0.00	2.00	4.60	4.00
19-May-10	25.50	34.00	53.00	88.00	0.00	3.00	1.20	3.50
20-May-10	27.30	37.00	54.00	81.00	5.20	5.00	9.60	5.70
21-May-10	27.50	35.00	62.00	81.00	0.00	6.00	6.70	3.70
22-May-10	26.50	34.80	52.00	88.00	0.00	3.00	5.60	5.10
23-May-10	27.50	34.80	47.00	82.00	8.20	2.00	4.20	4.90

24-May-10	27.40	34.60	79.00	92.00	13.10	4.00	0.60	1.70
25-May-10	25.30	33.20	68.00	92.00	0.00	10.00	5.60	2.90
26-May-10	24.50	31.80	63.00	96.00	6.50	10.00	5.30	4.30
27-May-10	26.80	33.00	60.00	85.00	0.40	8.00	5.00	3.80
28-May-10	25.80	33.80	57.00	88.00	0.00	4.00	4.50	4.30
29-May-10	24.90	33.50	55.00	95.00	0.00	1.00	6.60	5.00
30-May-10	26.70	35.20	53.00	84.00	6.30	2.00	9.50	6.00
31-May-10	28.10	36.00	47.00	83.00	0.00	4.00	9.90	5.20
01-Jun-10	25.60	35.70	54.00	94.00	5.50	11.00	6.60	4.50
02-Jun-10	26.00	34.70	57.00	88.00	35.60	7.00	6.60	4.50
03-Jun-10	26.30	33.40	58.00	91.00	22.70	4.00	4.20	2.80
04-Jun-10	24.80	30.80	78.00	93.00	24.10	3.00	2.30	2.00
05-Jun-10	25.50	33.30	62.00	93.00	0.00	8.00	6.30	2.00
06-Jun-10	24.00	31.50	69.00	93.00	0.00	12.00	3.80	3.20
07-Jun-10	25.00	33.00	60.00	89.00	0.00	2.00	4.40	4.70
08-Jun-10	26.00	32.80	64.00	87.00	7.00	10.00	7.20	4.90
09-Jun-10	25.30	32.10	60.00	94.00	3.00	2.00	4.10	2.20
10-Jun-10	26.20	31.80	74.00	92.00	2.00	1.00	3.30	2.10
11-Jun-10	25.80	33.00	67.00	93.00	0.00	1.00	5.80	2.90
12-Jun-10	27.20	33.00	64.00	92.00	0.00	2.00	4.70	3.50
13-Jun-10	26.80	32.60	63.00	86.00	0.00	1.00	1.10	3.50
14-Jun-10	26.10	34.10	58.00	88.00	0.00	2.00	10.30	5.60
15-Jun-10	26.90	33.70	59.00	89.00	0.00	2.00	9.90	5.00
16-Jun-10	26.60	35.80	54.00	86.00	0.00	3.00	8.90	5.70
17-Jun-10	27.60	34.00	64.00	88.00	0.00	6.00	9.00	4.70
18-Jun-10	28.00	35.80	52.00	85.00	0.00	2.00	7.80	5.60
19-Jun-10	26.80	33.80	56.00	88.00	0.00	2.00	7.40	5.00
20-Jun-10	27.90	35.00	56.00	85.00	0.10	3.00	7.40	4.70
21-Jun-10	26.40	33.50	61.00	88.00	12.00	4.00	2.50	4.80

22-Jun-10	25.60	32.80	67.00	95.00	34.00	15.00	6.10	5.00
23-Jun-10	24.40	32.80	60.00	93.00	4.00	10.00	7.50	3.80
24-Jun-10	24.60	31.90	67.00	96.00	0.00	5.00	3.70	3.60
25-Jun-10	26.50	34.50	57.00	87.00	0.50	3.00	8.90	4.10
26-Jun-10	27.50	31.70	77.00	85.00	14.20	8.00	3.60	2.70
27-Jun-10	25.70	34.00	59.00	84.00	0.00	10.00	7.50	3.20
28-Jun-10	25.70	32.80	65.00	90.00	3.00	3.00	6.50	3.70
29-Jun-10	27.20	33.20	63.00	85.00	1.00	1.00	5.70	2.60
30-Jun-10	26.70	34.90	52.00	94.00	22.70	5.00	9.10	4.10
01-Jul-10	24.70	31.80	67.00	94.00	2.80	3.00	5.70	1.90
02-Jul-10	24.30	29.80	74.00	95.00	0.00	5.00	0.00	1.90
03-Jul-10	25.50	33.00	61.00	92.00	0.00	4.00	9.80	3.50
04-Jul-10	25.20	33.70	56.00	84.00	0.00	5.00	10.00	5.20
05-Jul-10	25.30	33.60	56.00	88.00	0.00	1.00	9.30	4.10
06-Jul-10	26.80	35.00	50.00	81.00	0.00	2.00	11.10	3.50
07-Jul-10	27.00	35.00	54.00	80.00	0.00	2.00	8.70	5.20
08-Jul-10	25.50	34.30	54.00	81.00	0.00	4.00	6.60	5.10
09-Jul-10	25.80	34.60	55.00	84.00	0.00	8.00	8.00	5.70
10-Jul-10	26.10	34.00	57.00	82.00	0.00	3.00	10.30	6.00
11-Jul-10	27.50	35.60	49.00	82.00	5.30	3.00	11.10	5.90
12-Jul-10	26.20	34.00	54.00	85.00	10.70	6.00	6.30	4.70
13-Jul-10	23.50	32.00	65.00	88.00	1.30	4.00	4.20	2.90
14-Jul-10	24.50	33.40	61.00	96.00	4.10	4.00	9.30	3.70
15-Jul-10	24.60	31.00	67.00	85.00	0.00	2.00	1.60	2.40
16-Jul-10	25.60	29.20	77.00	90.00	0.00	3.00	0.00	2.20
17-Jul-10	25.00	29.60	67.00	88.00	0.00	3.00	0.00	3.90
18-Jul-10	25.20	31.60	65.00	89.00	0.00	3.00	6.10	3.60
19-Jul-10	26.00	34.40	52.00	85.00	0.00	1.00	10.10	4.70
20-Jul-10	27.70	35.80	48.00	85.00	27.10	2.00	8.50	5.00

21-Jul-10	26.10	31.90	69.00	84.00	41.00	10.00	3.10	2.80
22-Jul-10	22.50	31.80	69.00	96.00	1.00	6.00	3.30	1.70
23-Jul-10	23.90	30.20	71.00	96.00	14.00	3.00	2.90	2.30
24-Jul-10	24.60	31.90	69.00	95.00	5.30	4.00	3.40	1.90
25-Jul-10	24.50	31.00	81.00	96.00	38.80	2.00	1.90	1.30
26-Jul-10	24.50	30.00	80.00	96.00	7.00	3.00	2.60	1.00
27-Jul-10	24.20	31.40	68.00	97.00	0.00	12.00	8.50	2.90
28-Jul-10	26.60	31.80	64.00	92.00	0.00	5.00	8.10	3.50
29-Jul-10	26.30	32.30	64.00	88.00	6.50	7.00	8.10	2.90
30-Jul-10	25.90	32.00	67.00	93.00	76.50	2.00	4.70	2.40
31-Jul-10	25.30	33.00	65.00	96.00	20.10	12.00	5.00	1.80
01-Aug-10	24.00	30.50	70.00	95.00	11.80	3.00	2.20	1.40
02-Aug-10	24.30	30.00	69.00	96.00	0.00	4.00	2.40	2.00
03-Aug-10	23.90	30.50	65.00	96.00	5.00	1.00	4.30	2.60
04-Aug-10	25.30	32.20	60.00	92.00	32.00	3.00	7.40	2.60
05-Aug-10	24.10	30.20	71.00	95.00	0.00	2.00	2.90	2.20
06-Aug-10	24.10	32.00	61.00	95.00	2.00	3.00	7.80	3.00
07-Aug-10	25.80	31.50	68.00	91.00	15.40	3.00	4.10	2.60
08-Aug-10	25.50	28.50	85.00	93.00	5.00	3.00	0.00	1.50
09-Aug-10	25.00	29.90	77.00	96.00	4.00	3.00	2.40	1.90
10-Aug-10	25.00	31.20	74.00	95.00	16.30	3.00	2.00	2.10
11-Aug-10	24.60	31.10	70.00	95.00	14.00	4.00	5.70	2.00
12-Aug-10	24.50	31.20	68.00	96.00	37.00	8.00	2.90	1.70
13-Aug-10	24.80	31.60	72.00	96.00	1.00	5.00	3.20	2.10
14-Aug-10	24.60	31.60	68.00	94.00	0.00	3.00	5.00	2.20
15-Aug-10	25.00	31.90	64.00	91.00	1.00	3.00	5.00	2.50
16-Aug-10	25.60	32.20	64.00	94.00	7.50	2.00	0.00	1.50
17-Aug-10	24.80	31.30	69.00	96.00	0.00	3.00	2.00	2.10
18-Aug-10	23.70	32.20	70.00	92.00	24.50	1.00	5.30	2.50

19-Aug-10	25.50	32.50	66.00	92.00	28.90	6.00	7.20	2.40
20-Aug-10	24.50	27.20	90.00	96.00	0.00	1.00	0.00	0.80
21-Aug-10	23.90	30.60	74.00	96.00	0.60	3.00	5.00	2.20
22-Aug-10	24.90	32.20	68.00	96.00	30.50	2.00	5.20	2.10
23-Aug-10	24.80	28.80	78.00	97.00	16.20	3.00	0.00	1.40
24-Aug-10	24.20	29.00	81.00	97.00	4.00	9.00	0.00	1.60
25-Aug-10	24.30	30.00	73.00	93.00	45.40	5.00	5.10	2.40
26-Aug-10	24.40	32.30	68.00	92.00	71.30	8.00	7.30	2.60
27-Aug-10	24.90	32.30	71.00	94.00	2.20	4.00	6.40	2.40
28-Aug-10	22.70	25.80	81.00	97.00	0.00	3.00	0.00	1.40
29-Aug-10	24.30	30.50	69.00	93.00	1.00	7.00	6.30	2.60
30-Aug-10	24.10	30.50	69.00	92.00	26.00	3.00	3.20	2.50
31-Aug-10	23.50	30.30	70.00	92.00	3.50	3.00	2.10	1.60
01-Sep-10	24.00	28.90	80.00	96.00	40.90	2.00	0.90	1.50
02-Sep-10	25.00	29.90	79.00	97.00	14.30	6.00	3.90	1.20
03-Sep-10	24.80	28.30	77.00	96.00	28.10	2.00	0.20	1.10
04-Sep-10	24.20	30.00	70.00	93.00	0.00	3.00	1.70	1.60
05-Sep-10	24.20	30.40	70.00	97.00	0.00	3.00	3.80	1.50
06-Sep-10	23.80	32.00	66.00	94.00	3.20	4.00	4.90	2.70
07-Sep-10	25.70	33.00	68.00	94.00	0.00	8.00	5.50	2.70
08-Sep-10	25.90	32.80	67.00	90.00	0.00	3.00	6.90	3.30
09-Sep-10	25.30	31.50	63.00	89.00	21.10	3.00	1.60	2.40
10-Sep-10	25.20	32.50	60.00	95.00	7.50	5.00	6.30	2.20
11-Sep-10	24.50	31.30	68.00	94.00	13.30	12.00	3.10	2.20
12-Sep-10	24.30	32.00	63.00	96.00	3.80	8.00	8.60	2.80
13-Sep-10	24.00	31.00	69.00	96.00	1.20	8.00	0.90	2.40
14-Sep-10	23.50	30.00	74.00	95.00	0.00	2.00	1.30	1.60
15-Sep-10	23.50	31.60	63.00	93.00	0.00	5.00	4.00	2.40
16-Sep-10	24.60	31.10	66.00	93.00	0.00	4.00	5.60	2.10

17-Sep-10	24.50	32.00	63.00	95.00	0.00	4.00	5.80	2.10
18-Sep-10	24.00	31.60	62.00	92.00	0.00	3.00	4.40	2.40
19-Sep-10	23.70	31.80	66.00	94.00	38.20	5.00	4.80	2.40
20-Sep-10	25.30	33.20	63.00	93.00	8.80	8.00	10.10	3.40
21-Sep-10	25.00	32.30	67.00	93.00	20.40	9.00	4.80	2.30
22-Sep-10	24.60	32.50	63.00	96.00	0.00	7.00	6.70	2.30
23-Sep-10	24.70	32.40	64.00	94.00	0.00	3.00	7.70	2.70
24-Sep-10	25.20	33.00	62.00	93.00	0.00	3.00	7.70	2.50
25-Sep-10	24.60	33.20	68.00	92.00	0.00	2.00	8.10	2.50
26-Sep-10	25.20	34.40	56.00	92.00	0.00	6.00	10.10	2.90
27-Sep-10	25.00	31.90	53.00	91.00	0.00	5.00	6.20	2.40
28-Sep-10	24.60	32.20	68.00	91.00	0.00	4.00	4.50	1.80
29-Sep-10	24.00	33.40	59.00	95.00	19.00	4.00	8.90	2.10
30-Sep-10	23.70	34.00	60.00	96.00	0.00	6.00	7.20	2.50
01-Oct-10	24.50	32.30	62.00	96.00	2.20	3.00	7.10	3.30
02-Oct-10	24.50	32.10	60.00	89.00	11.40	2.00	2.00	3.00
03-Oct-10	25.00	31.70	65.00	94.00	5.50	1.00	4.20	3.30
04-Oct-10	24.80	26.80	80.00	96.00	11.20	4.00	0.00	0.90
05-Oct-10	22.50	25.50	84.00	97.00	0.00	2.00	0.00	0.50
06-Oct-10	22.20	28.50	70.00	98.00	0.00	2.00	0.90	2.20
07-Oct-10	22.80	31.80	63.00	96.00	0.00	4.00	8.60	1.80
08-Oct-10	24.00	32.30	59.00	91.00	0.00	2.00	7.00	3.00
09-Oct-10	24.60	32.10	59.00	92.00	7.00	3.00	2.30	2.80
10-Oct-10	24.30	33.40	56.00	97.00	2.20	2.00	7.20	3.10
11-Oct-10	24.60	32.00	71.00	96.00	23.60	3.00	4.20	1.70
12-Oct-10	24.50	32.20	66.00	95.00	3.00	3.00	3.60	1.30
13-Oct-10	24.70	31.70	67.00	98.00	27.00	2.00	5.10	2.00
14-Oct-10	24.60	29.30	79.00	97.00	47.80	5.00	0.00	0.80
15-Oct-10	24.50	27.00	83.00	98.00	1.40	3.00	0.00	0.80

16-Oct-10	23.50	29.40	78.00	98.00	0.00	4.00	1.80	1.70
17-Oct-10	23.70	30.40	68.00	96.00	0.00	5.00	7.40	2.50
18-Oct-10	24.50	31.20	70.00	96.00	14.50	3.00	5.10	2.10
19-Oct-10	24.80	29.50	78.00	94.00	0.00	4.00	2.00	1.00
20-Oct-10	23.10	31.80	58.00	93.00	0.00	2.00	7.90	3.90
21-Oct-10	20.80	30.60	48.00	86.00	0.00	1.00	7.30	3.70
22-Oct-10	21.10	31.20	53.00	88.00	0.00	5.00	10.30	3.70
23-Oct-10	22.10	32.00	47.00	93.00	0.00	5.00	9.80	3.40
24-Oct-10	21.50	32.60	49.00	94.00	0.00	2.00	10.20	3.60
25-Oct-10	22.50	33.20	52.00	94.00	0.00	5.00	10.50	4.70
26-Oct-10	23.60	32.00	53.00	92.00	0.00	2.00	9.00	3.70
27-Oct-10	23.10	29.90	62.00	83.00	0.00	3.00	3.30	3.30
28-Oct-10	23.80	30.50	55.00	83.00	0.00	6.00	7.50	2.80
29-Oct-10	20.60	27.80	59.00	84.00	0.00	13.00	8.00	2.50
30-Oct-10	20.00	25.80	53.00	78.00	0.00	13.00	5.40	2.20
31-Oct-10	18.50	28.40	45.00	79.00	0.00	7.00	8.00	2.30
01-Nov-10	18.40	31.50	50.00	83.00	0.00	8.00	8.70	2.90
02-Nov-10	19.80	30.40	58.00	82.00	0.00	8.00	3.30	1.10
03-Nov-10	21.50	29.00	45.00	82.00	0.00	8.00	4.60	2.00
04-Nov-10	20.90	27.80	51.00	74.00	1.60	13.00	2.50	1.40
05-Nov-10	19.80	25.30	68.00	87.00	0.00	11.00	0.00	2.00
06-Nov-10	19.90	28.50	61.00	92.00	0.00	5.00	2.10	2.10
07-Nov-10	20.50	30.00	59.00	84.00	0.00	5.00	3.80	2.10
08-Nov-10	21.40	30.10	56.00	83.00	0.00	8.00	0.30	2.60
09-Nov-10	21.10	29.60	53.00	76.00	0.00	8.00	0.10	3.10
10-Nov-10	21.60	29.50	56.00	80.00	0.00	5.00	0.90	2.60
11-Nov-10	20.70	32.20	54.00	86.00	0.00	4.00	7.70	3.20
12-Nov-10	20.70	31.40	51.00	76.00	0.00	4.00	7.20	3.60
13-Nov-10	20.00	32.40	50.00	89.00	0.80	6.00	9.40	4.10

14-Nov-10	19.90	32.10	54.00	85.00	1.00	5.00	5.50	3.10
15-Nov-10	20.30	27.80	78.00	95.00	0.00	1.00	0.00	1.60
16-Nov-10	23.60	29.50	60.00	93.00	0.00	10.00	5.40	3.90
17-Nov-10	22.50	30.30	61.00	85.00	0.00	3.00	0.90	3.20
18-Nov-10	22.00	33.10	50.00	87.00	0.00	4.00	8.00	4.70
19-Nov-10	21.90	31.70	51.00	84.00	0.00	5.00	9.20	5.50
20-Nov-10	20.10	32.50	42.00	83.00	0.00	3.00	10.10	3.90
21-Nov-10	20.00	33.00	45.00	89.00	0.00	3.00	10.00	3.20
22-Nov-10	21.50	33.70	42.00	91.00	0.00	2.00	10.00	5.10
23-Nov-10	21.50	33.80	35.00	89.00	0.00	3.00	10.10	5.00
24-Nov-10	20.80	32.60	42.00	88.00	0.00	4.00	10.20	4.70
25-Nov-10	20.90	32.40	40.00	85.00	0.00	4.00	8.30	5.20
26-Nov-10	20.50	31.70	44.00	82.00	0.00	4.00	7.50	4.50
27-Nov-10	19.80	32.00	45.00	85.00	0.00	1.00	9.40	4.40
28-Nov-10	19.90	34.60	46.00	82.00	0.00	2.00	9.50	5.00
29-Nov-10	20.50	33.50	46.00	89.00	0.00	3.00	8.90	5.30
30-Nov-10	22.00	33.10	44.00	82.00	0.00	4.00	9.50	5.70
01-Dec-10	21.50	33.00	40.00	80.00	0.00	6.00	10.20	5.90
02-Dec-10	21.10	32.20	44.00	87.00	0.00	8.00	7.10	6.00
03-Dec-10	20.90	31.80	43.00	79.00	0.00	7.00	8.80	7.00
04-Dec-10	19.50	31.40	45.00	77.00	0.00	4.00	7.10	4.90
05-Dec-10	19.80	33.50	46.00	86.00	0.00	3.00	5.80	5.80
06-Dec-10	20.80	34.50	46.00	87.00	0.00	4.00	7.60	4.90
07-Dec-10	23.00	33.70	38.00	81.00	0.00	6.00	7.90	8.50
08-Dec-10	20.30	30.50	45.00	75.00	0.00	7.00	9.10	6.10
09-Dec-10	18.80	30.50	49.00	84.00	0.00	2.00	6.70	3.40
10-Dec-10	18.50	31.30	45.00	90.00	0.00	3.00	8.60	3.60
11-Dec-10	19.20	32.70	40.00	92.00	0.00	4.00	9.00	5.10
12-Dec-10	19.00	32.60	49.00	81.00	0.00	3.00	9.20	4.90

13-Dec-10	23.10	33.60	38.00	84.00	0.00	2.00	9.00	5.30
14-Dec-10	22.50	34.60	44.00	87.00	0.00	2.00	8.00	5.30
15-Dec-10	22.40	33.40	47.00	78.00	0.00	5.00	9.50	5.20
16-Dec-10	23.20	30.50	43.00	90.00	0.00	13.00	7.70	6.50
17-Dec-10	16.60	28.50	37.00	69.00	0.00	5.00	9.70	5.90
18-Dec-10	15.30	29.70	46.00	84.00	0.00	3.00	8.70	3.50
19-Dec-10	15.50	30.80	46.00	90.00	0.00	3.00	8.30	4.70
20-Dec-10	17.80	32.60	43.00	85.00	0.00	2.00	8.50	4.80
21-Dec-10	19.50	33.80	32.00	84.00	0.00	4.00	5.20	6.30
22-Dec-10	20.40	33.40	39.00	89.00	0.00	3.00	9.10	4.60
23-Dec-10	20.50	33.50	44.00	89.00	0.00	5.00	8.30	4.10
24-Dec-10	22.00	33.50	37.00	88.00	0.00	3.00	9.80	5.70
25-Dec-10	19.60	33.20	25.00	85.00	0.00	6.00	9.20	7.60
26-Dec-10	19.40	28.20	43.00	75.00	0.00	13.00	9.50	8.60
27-Dec-10	16.00	30.70	32.00	81.00	0.00	4.00	10.00	6.00
28-Dec-10	16.20	30.50	28.00	84.00	0.00	3.00	9.70	4.80
29-Dec-10	16.50	31.70	35.00	86.00	0.00	3.00	9.90	4.50
30-Dec-10	16.20	31.10	31.00	82.00	0.00	5.00	9.70	7.80
31-Dec-10	16.70	31.10	27.00	65.00	0.00	2.00	9.90	6.00
01-Jan-11	16.10	31.00	30.00	88.00	0.00	2.00	9.50	3.80
02-Jan-11	17.40	32.10	32.00	83.00	0.00	1.00	10.40	4.50
03-Jan-11	18.50	32.50	37.00	83.00	0.00	2.00	9.30	5.60
04-Jan-11	19.50	32.60	43.00	83.00	0.00	5.00	6.30	5.50
05-Jan-11	19.50	33.30	41.00	84.00	0.00	3.00	8.90	4.80
06-Jan-11	19.00	32.30	39.00	77.00	0.00	7.00	7.90	8.10
07-Jan-11	17.00	31.20	39.00	77.00	0.00	8.00	8.40	7.70
08-Jan-11	17.00	31.30	37.00	79.00	0.00	5.00	9.80	5.80
09-Jan-11	18.00	31.50	36.00	81.00	0.00	7.00	9.80	6.40
10-Jan-11	17.80	30.00	39.00	74.00	0.00	5.00	9.60	7.10

11-Jan-11	17.50	31.20	36.00	76.00	0.00	5.00	7.60	6.70
12-Jan-11	16.60	29.00	43.00	76.00	0.00	4.00	4.50	5.50
13-Jan-11	16.50	30.50	39.00	76.00	0.00	2.00	8.60	5.30
14-Jan-11	17.00	30.80	31.00	85.00	0.00	4.00	7.40	6.20
15-Jan-11	16.00	28.70	39.00	85.00	0.00	8.00	8.60	6.60
16-Jan-11	14.90	27.70	35.00	74.00	0.00	6.00	7.10	6.40
17-Jan-11	15.60	29.50	32.00	79.00	0.00	3.00	7.60	5.10
18-Jan-11	16.00	30.70	31.00	80.00	0.00	1.00	8.80	5.00
19-Jan-11	18.00	30.80	36.00	80.00	0.00	1.00	6.70	4.60
20-Jan-11	18.20	32.80	30.00	84.00	0.00	3.00	8.70	5.60
21-Jan-11	18.00	32.80	35.00	78.00	0.00	7.00	9.60	6.80
22-Jan-11	18.90	31.50	41.00	78.00	0.00	1.00	8.40	4.60
23-Jan-11	18.50	33.20	38.00	78.00	0.00	5.00	5.30	6.40
24-Jan-11	18.00	32.40	38.00	77.00	0.00	3.00	8.60	6.20
25-Jan-11	17.70	33.00	29.00	78.00	0.00	5.00	10.50	6.50
26-Jan-11	18.90	31.80	38.00	81.00	0.00	5.00	6.40	6.40
27-Jan-11	19.30	33.50	34.00	74.00	0.00	4.00	10.40	7.00
28-Jan-11	18.00	33.70	36.00	77.00	0.00	10.00	9.30	7.50
29-Jan-11	15.40	29.60	35.00	75.00	0.00	6.00	9.60	7.30
30-Jan-11	15.60	30.00	34.00	77.00	0.00	7.00	9.90	6.90
31-Jan-11	16.50	30.20	38.00	73.00	0.00	5.00	10.60	7.20
01-Feb-11	16.50	31.60	34.00	77.00	0.00	4.00	9.90	6.70
02-Feb-11	16.60	32.20	33.00	75.00	0.00	3.00	10.20	6.20
03-Feb-11	16.70	32.50	34.00	83.00	0.00	3.00	10.30	6.40
04-Feb-11	17.00	32.10	29.00	85.00	0.00	3.00	10.30	6.90
05-Feb-11	17.50	32.40	20.00	71.00	0.00	4.00	10.00	7.90
06-Feb-11	17.50	32.60	22.00	74.00	0.00	5.00	10.20	7.30
07-Feb-11	19.50	32.70	27.00	61.00	0.00	5.00	9.60	7.50
08-Feb-11	21.20	30.80	47.00	75.00	0.00	8.00	4.70	5.80

09-Feb-11	22.50	32.40	47.00	85.00	0.00	6.00	7.40	5.90
10-Feb-11	25.50	34.00	43.00	78.00	0.00	4.00	7.90	5.30
11-Feb-11	22.50	34.00	42.00	81.00	0.00	5.00	6.80	6.60
12-Feb-11	23.30	32.50	48.00	83.00	0.00	3.00	3.70	5.00
13-Feb-11	21.50	32.50	40.00	75.00	0.00	5.00	4.60	5.30
14-Feb-11	19.40	32.20	52.00	72.00	0.00	3.00	6.50	4.70
15-Feb-11	19.50	32.00	42.00	79.00	0.00	3.00	6.00	5.10
16-Feb-11	22.50	34.80	37.00	80.00	0.00	3.00	8.90	5.80
17-Feb-11	24.00	36.40	29.00	73.00	0.00	9.00	7.60	6.90
18-Feb-11	25.20	33.60	45.00	84.00	2.20	6.00	5.90	7.10
19-Feb-11	24.00	35.20	44.00	78.00	0.00	6.00	5.30	5.90
20-Feb-11	24.30	34.80	41.00	77.00	0.00	8.00	7.90	7.20
21-Feb-11	24.50	34.00	38.00	74.00	0.00	4.00	5.20	7.60
22-Feb-11	24.50	35.60	37.00	72.00	3.10	3.00	8.80	6.50
23-Feb-11	23.70	34.50	40.00	71.00	0.00	4.00	6.40	6.40
24-Feb-11	23.80	35.00	35.00	69.00	0.00	2.00	9.00	6.60
25-Feb-11	23.80	35.20	34.00	63.00	0.00	5.00	9.00	7.70
26-Feb-11	23.50	35.60	35.00	68.00	0.00	4.00	9.10	7.60
27-Feb-11	22.50	34.70	32.00	67.00	0.00	3.00	9.40	7.00
28-Feb-11	21.80	34.40	30.00	80.00	0.00	7.00	6.60	6.60
01-Mar-11	23.50	35.50	30.00	65.00	0.00	4.00	8.90	8.40
02-Mar-11	23.80	34.50	35.00	60.00	0.00	3.00	8.00	7.00
03-Mar-11	22.60	35.50	34.00	62.00	0.00	5.00	8.10	7.60
04-Mar-11	22.80	35.20	31.00	69.00	0.00	3.00	8.80	6.70
05-Mar-11	23.00	35.50	34.00	66.00	0.00	3.00	9.50	7.50
06-Mar-11	25.00	37.40	28.00	72.00	0.00	5.00	9.00	8.30
07-Mar-11	23.00	37.50	30.00	70.00	0.00	3.00	8.60	7.70
08-Mar-11	21.50	35.80	38.00	73.00	0.00	3.00	7.60	7.20
09-Mar-11	21.40	35.20	37.00	71.00	0.00	5.00	8.10	7.30

10-Mar-11	21.00	35.10	30.00	70.00	0.00	3.00	8.70	7.50
11-Mar-11	21.40	34.70	32.00	73.00	0.00	3.00	8.00	7.50
12-Mar-11	22.60	35.70	31.00	70.00	0.00	3.00	9.00	6.00
13-Mar-11	24.00	36.60	26.00	63.00	0.00	3.00	8.30	7.50
14-Mar-11	25.00	37.10	26.00	61.00	0.00	5.00	8.60	9.30
15-Mar-11	21.20	34.80	41.00	62.00	0.00	8.00	5.10	9.60
16-Mar-11	18.20	30.60	33.00	60.00	0.00	9.00	4.80	9.90
17-Mar-11	18.50	30.60	33.00	59.00	0.00	5.00	6.70	9.10
18-Mar-11	19.30	30.50	39.00	61.00	0.00	5.00	6.20	7.30
19-Mar-11	21.30	34.70	36.00	76.00	0.00	4.00	7.00	6.50
20-Mar-11	25.50	36.80	31.00	68.00	0.00	4.00	7.70	7.20
21-Mar-11	26.50	35.50	45.00	66.00	3.80	8.00	5.80	7.20
22-Mar-11	23.50	36.00	43.00	83.00	0.00	15.00	4.40	3.90
23-Mar-11	21.50	34.70	38.00	73.00	0.00	7.00	7.80	7.50
24-Mar-11	20.50	35.00	31.00	72.00	0.00	5.00	9.10	10.00
25-Mar-11	20.80	32.00	35.00	60.00	0.00	8.00	0.90	9.00
26-Mar-11	20.40	33.50	34.00	61.00	0.00	5.00	6.70	10.30
27-Mar-11	19.50	32.20	38.00	58.00	0.00	9.00	2.10	9.60
28-Mar-11	17.00	28.70	40.00	77.00	0.00	8.00	1.10	8.40
29-Mar-11	19.30	30.50	35.00	61.00	0.00	8.00	5.20	9.90
30-Mar-11	19.50	28.80	38.00	73.00	0.00	5.00	2.10	6.90
31-Mar-11	19.80	29.80	44.00	72.00	0.00	5.00	0.40	6.00
01-Apr-11	22.00	36.50	31.00	70.00	0.00	5.00	8.20	6.60
02-Apr-11	25.00	37.90	31.00	64.00	0.00	3.00	9.50	8.60
03-Apr-11	26.00	38.00	27.00	64.00	0.00	7.00	9.50	9.40
04-Apr-11	25.80	37.20	35.00	82.00	0.00	6.00	6.10	6.40
05-Apr-11	25.80	35.30	43.00	76.00	0.00	3.00	6.10	7.20
06-Apr-11	26.00	36.30	34.00	62.00	0.00	3.00	6.30	8.40
07-Apr-11	25.50	36.50	35.00	76.00	0.00	2.00	7.70	8.40

08-Apr-11	23.90	34.80	47.00	81.00	0.00	10.00	5.00	4.70
09-Apr-11	23.10	33.50	44.00	78.00	0.00	5.00	2.90	6.20
10-Apr-11	23.90	35.50	35.00	72.00	0.00	4.00	9.30	8.60
11-Apr-11	25.00	37.00	29.00	69.00	0.00	4.00	4.90	9.20
12-Apr-11	26.00	36.80	28.00	64.00	0.00	5.00	9.00	10.30
13-Apr-11	26.00	36.50	32.00	66.00	0.00	4.00	9.00	7.30
14-Apr-11	26.50	36.80	34.00	72.00	0.00	5.00	8.80	7.70
15-Apr-11	26.50	35.60	43.00	80.00	0.00	7.00	5.90	7.50
16-Apr-11	25.00	37.90	38.00	80.00	0.00	4.00	8.50	8.50
17-Apr-11	24.80	35.50	58.00	96.00	0.00	9.00	2.30	3.10
18-Apr-11	24.50	36.00	47.00	93.00	0.00	10.00	3.30	3.40
19-Apr-11	23.40	32.40	57.00	87.00	0.00	4.00	2.60	4.10
20-Apr-11	23.70	35.00	49.00	94.00	0.00	10.00	8.30	4.50
21-Apr-11	25.00	34.10	53.00	87.00	0.00	2.00	7.70	5.70
22-Apr-11	24.30	34.90	47.00	92.00	0.00	3.00	8.80	4.70
23-Apr-11	23.40	33.50	68.00	92.00	0.00	3.00	7.20	3.50
24-Apr-11	24.00	34.30	48.00	76.00	0.00	4.00	9.40	5.30
25-Apr-11	25.50	34.50	48.00	86.00	0.00	3.00	8.00	4.90
26-Apr-11	27.00	35.60	44.00	76.00	0.00	4.00	9.00	6.10
27-Apr-11	26.30	35.20	51.00	94.00	0.00	10.00	4.70	3.40
28-Apr-11	23.00	35.30	51.00	95.00	0.00	8.00	7.30	4.00
29-Apr-11	23.30	29.50	77.00	97.00	0.00	2.00	0.90	1.10
30-Apr-11	24.60	35.50	48.00	95.00	0.00	4.00	10.80	4.90
01-May-11	25.00	31.70	63.00	88.00	0.00	2.00	4.10	3.20
02-May-11	25.80	36.00	46.00	84.00	72.00	3.00	11.00	5.70
03-May-11	22.30	36.00	48.00	98.00	45.00	3.00	10.40	4.60
04-May-11	23.10	34.10	56.00	99.00	0.00	3.00	7.20	3.50
05-May-11	23.20	33.50	57.00	96.00	0.00	4.00	6.40	2.90
06-May-11	26.60	33.20	58.00	85.00	0.00	4.00	9.50	4.50

07-May-11	26.80	33.80	56.00	84.00	0.00	2.00	8.00	4.20
08-May-11	27.00	34.20	52.00	83.00	3.00	4.00	9.00	4.70
09-May-11	26.60	33.70	54.00	84.00	0.00	5.00	8.90	4.60
10-May-11	26.50	33.90	63.00	84.00	0.00	7.00	8.60	7.00
11-May-11	26.00	34.40	53.00	84.00	17.20	4.00	11.30	6.00
12-May-11	23.80	33.70	62.00	95.00	7.00	10.00	8.40	4.40
13-May-11	23.60	31.40	67.00	94.00	3.20	4.00	2.20	2.20
14-May-11	23.60	30.60	65.00	95.00	3.30	6.00	3.80	3.40
15-May-11	24.30	33.00	61.00	88.00	50.00	5.00	10.00	4.40
16-May-11	24.00	31.20	67.00	89.00	4.30	8.00	3.10	3.60
17-May-11	24.30	34.30	53.00	96.00	20.80	5.00	8.00	3.60
18-May-11	24.00	26.60	84.00	94.00	0.00	7.00	0.20	1.40
19-May-11	24.30	32.50	61.00	89.00	4.00	4.00	11.00	3.70
20-May-11	25.60	31.80	71.00	87.00	0.00	4.00	7.00	3.30
21-May-11	27.60	34.20	54.00	89.00	0.00	2.00	9.40	4.30
22-May-11	27.00	33.50	58.00	83.00	0.00	1.80	7.10	4.10
23-May-11	26.00	33.30	66.00	83.00	4.30	5.00	6.80	3.70
24-May-11	26.50	31.80	68.00	96.00	5.20	7.00	5.10	3.30
25-May-11	23.60	33.20	58.00	96.00	3.60	7.00	5.80	2.10
26-May-11	24.20	31.50	66.00	96.00	0.00	4.00	6.20	2.10
27-May-11	25.00	33.10	59.00	92.00	0.00	4.00	6.80	3.00
28-May-11	26.10	33.40	54.00	91.00	0.00	3.00	10.20	3.60
29-May-11	25.40	33.60	55.00	92.00	16.20	2.00	7.60	3.40
30-May-11	25.80	30.70	71.00	92.00	30.60	3.00	4.20	2.20
31-May-11	24.90	33.20	65.00	91.00	0.00	4.00	8.60	3.40
01-Jun-11	24.90	33.00	59.00	96.00	1.10	6.00	6.10	2.90
02-Jun-11	25.50	32.80	62.00	88.00	0.70	6.00	7.70	3.40
03-Jun-11	25.00	31.90	69.00	91.00	0.00	8.00	4.10	2.50
04-Jun-11	26.00	31.80	70.00	88.00	0.70	4.00	5.00	3.10

05-Jun-11	26.90	33.00	64.00	88.00	30.60	5.00	5.10	2.90
06-Jun-11	26.70	30.00	74.00	94.00	0.00	4.00	3.10	1.40
07-Jun-11	25.20	33.60	61.00	92.00	0.00	4.00	9.40	2.60
08-Jun-11	24.50	32.50	62.00	90.00	26.20	4.00	6.60	2.50
09-Jun-11	25.20	32.60	67.00	92.00	16.00	10.00	7.20	1.90
10-Jun-11	24.30	30.50	72.00	96.00	3.00	7.00	2.90	1.40
11-Jun-11	24.00	31.60	63.00	93.00	0.20	3.00	6.10	2.80
12-Jun-11	25.20	31.20	71.00	93.00	0.00	8.00	3.80	2.20
13-Jun-11	24.90	31.00	70.00	91.00	20.40	3.00	2.90	2.60
14-Jun-11	25.00	32.80	55.00	93.00	0.00	9.00	7.50	2.90
15-Jun-11	24.60	33.80	53.00	93.00	15.40	4.00	10.70	3.40
16-Jun-11	25.10	32.10	66.00	92.00	31.60	2.00	5.60	2.30
17-Jun-11	25.50	32.00	71.00	95.00	21.10	5.00	3.70	1.70
18-Jun-11	23.50	30.50	71.00	97.00	18.70	3.00	1.70	1.50
19-Jun-11	25.10	29.60	78.00	94.00	28.30	5.00	2.50	1.50
20-Jun-11	24.50	29.00	82.00	96.00	0.00	5.00	0.80	0.90
21-Jun-11	24.30	31.00	66.00	95.00	3.40	3.00	4.50	2.10
22-Jun-11	24.20	29.00	81.00	91.00	0.00	6.00	0.30	1.70
23-Jun-11	25.50	31.70	58.00	84.00	29.70	6.00	1.50	3.70
24-Jun-11	26.50	29.50	74.00	96.00	0.00	6.00	0.00	1.60
25-Jun-11	23.80	31.80	57.00	90.00	0.00	6.00	3.70	5.50
26-Jun-11	25.60	31.80	62.00	84.00	0.00	5.00	5.50	4.00
27-Jun-11	25.50	31.50	68.00	91.00	8.80	6.00	5.40	2.80
28-Jun-11	25.50	32.00	67.00	89.00	34.70	6.00	7.90	3.20
29-Jun-11	26.00	30.00	78.00	93.00	22.70	5.00	0.00	1.30
30-Jun-11	24.20	27.20	84.00	95.00	1.50	4.00	0.00	1.00
01-Jul-11	22.80	28.20	73.00	95.00	1.80	5.00	0.40	2.50
02-Jul-11	24.50	30.10	69.00	88.00	0.00	2.00	4.60	2.30
03-Jul-11	24.80	32.60	62.00	93.00	0.00	4.00	11.70	3.40

04-Jul-11	25.80	34.00	50.00	86.00	3.00	4.00	10.90	4.40
05-Jul-11	26.00	33.60	51.00	85.00	0.00	3.00	9.30	3.90
06-Jul-11	25.50	33.50	57.00	91.00	0.00	1.00	6.10	3.30
07-Jul-11	25.80	33.00	65.00	87.00	0.00	3.00	7.80	4.00
08-Jul-11	26.70	32.80	68.00	83.00	10.00	4.00	8.40	3.40
09-Jul-11	26.30	31.50	76.00	92.00	0.00	4.00	2.50	2.60
10-Jul-11	23.80	31.30	72.00	90.00	0.00	5.00	6.00	3.50
11-Jul-11	23.30	29.70	76.00	93.00	12.60	5.00	1.20	2.80
12-Jul-11	25.60	31.00	67.00	96.00	5.20	8.00	5.80	2.00
13-Jul-11	23.80	29.50	77.00	97.00	15.20	3.00	0.00	1.50
14-Jul-11	23.50	28.50	78.00	93.00	4.00	3.00	0.00	2.00
15-Jul-11	23.80	29.10	80.00	95.00	0.50	5.00	0.40	2.00
16-Jul-11	24.30	30.80	69.00	91.00	0.00	4.00	2.90	2.90
17-Jul-11	25.50	31.60	74.00	91.00	13.00	4.00	1.70	2.80
18-Jul-11	25.00	32.70	62.00	91.00	25.20	8.00	6.90	2.90
19-Jul-11	25.20	30.80	71.00	94.00	9.60	10.00	0.00	1.90
20-Jul-11	23.90	30.60	75.00	94.00	37.20	4.00	2.50	2.00
21-Jul-11	24.00	29.90	73.00	94.00	0.00	1.00	0.70	1.60
22-Jul-11	23.80	30.30	68.00	94.00	1.50	2.00	4.40	2.20
23-Jul-11	25.00	32.10	65.00	91.00	9.50	3.00	6.60	2.50
24-Jul-11	25.00	32.60	65.00	95.00	29.00	4.00	5.20	1.90
25-Jul-11	24.00	31.00	75.00	97.00	27.00	3.00	2.90	1.70
26-Jul-11	24.50	30.30	70.00	97.00	48.30	3.00	5.00	2.10
27-Jul-11	24.00	32.00	62.00	94.00	0.00	5.00	6.10	2.40
28-Jul-11	23.80	32.50	65.00	97.00	0.50	2.00	6.80	2.40
29-Jul-11	24.80	30.50	71.00	93.00	4.50	5.00	0.20	2.00
30-Jul-11	25.30	27.00	84.00	90.00	16.70	4.00	0.00	2.00
31-Jul-11	24.40	28.50	75.00	97.00	6.40	5.00	0.00	1.50
01-Aug-11	24.00	27.80	80.00	96.00	0.20	5.00	0.20	2.00

02-Aug-11	23.80	27.90	83.00	89.00	11.00	3.00	0.10	1.80
03-Aug-11	24.50	31.00	72.00	94.00	12.10	7.00	4.30	1.40
04-Aug-11	24.40	33.00	61.00	97.00	13.50	4.00	7.10	2.50
05-Aug-11	24.60	32.20	68.00	94.00	34.80	7.00	3.40	1.60
06-Aug-11	24.50	28.90	85.00	93.00	15.30	5.00	0.60	1.20
07-Aug-11	23.90	30.00	70.00	96.00	40.10	5.00	0.00	1.50
08-Aug-11	23.80	27.80	88.00	96.00	38.40	8.00	0.00	0.90
09-Aug-11	23.60	30.00	71.00	96.00	47.20	8.00	1.70	1.40
10-Aug-11	24.00	25.50	91.00	96.00	5.30	1.00	0.00	0.60
11-Aug-11	23.60	28.00	80.00	97.00	0.30	3.00	0.30	1.30
12-Aug-11	23.90	30.70	65.00	97.00	0.00	5.00	6.90	2.60
13-Aug-11	24.10	32.80	65.00	93.00	0.80	3.00	7.40	2.40
14-Aug-11	25.60	32.80	64.00	90.00	21.00	10.00	9.50	2.70
15-Aug-11	24.70	30.70	64.00	92.00	28.40	4.00	4.40	1.80
16-Aug-11	23.20	30.40	61.00	94.00	30.20	4.00	5.10	2.30
17-Aug-11	23.60	28.20	77.00	96.00	28.60	3.00	1.90	1.50
18-Aug-11	23.70	30.00	71.00	95.00	2.60	4.00	1.90	1.50
19-Aug-11	23.80	26.40	90.00	96.00	0.00	4.00	0.00	1.00
20-Aug-11	22.80	31.70	59.00	96.00	0.00	2.00	7.40	2.50
21-Aug-11	25.10	32.60	59.00	93.00	2.80	3.00	9.30	2.50
22-Aug-11	25.30	33.70	62.00	92.00	0.00	8.00	9.60	2.80
23-Aug-11	22.90	31.60	70.00	91.00	11.00	3.00	2.50	2.70
24-Aug-11	23.00	33.70	61.00	96.00	2.30	10.00	5.50	2.80
25-Aug-11	23.80	33.60	60.00	93.00	0.00	4.00	7.70	2.80
26-Aug-11	23.80	32.40	67.00	94.00	1.30	4.00	5.20	2.40
27-Aug-11	24.40	31.60	68.00	92.00	3.50	3.00	5.80	3.00
28-Aug-11	25.00	32.60	60.00	94.00	31.60	4.00	7.10	3.30
29-Aug-11	25.00	31.30	65.00	93.00	7.00	7.00	6.20	2.80
30-Aug-11	25.00	31.20	76.00	94.00	7.00	8.00	1.80	1.90

31-Aug-11	25.20	30.00	79.00	94.00	7.30	3.00	0.40	1.60
01-Sep-11	24.40	28.50	84.00	94.00	41.20	3.00	0.00	1.10
02-Sep-11	24.30	29.20	76.00	96.00	0.00	8.00	1.60	1.40
03-Sep-11	24.30	30.10	71.00	93.00	7.50	5.00	3.60	2.60
04-Sep-11	24.60	29.20	78.00	93.00	2.20	5.00	1.80	1.70
05-Sep-11	24.80	31.00	80.00	93.00	36.00	10.00	3.10	1.80
06-Sep-11	24.50	30.20	74.00	93.00	89.20	3.00	1.60	1.20
07-Sep-11	22.60	30.00	69.00	96.00	71.80	4.00	2.00	1.10
08-Sep-11	23.00	26.70	91.00	97.00	40.20	2.00	0.00	0.50
09-Sep-11	22.80	29.10	76.00	98.00	0.00	2.00	0.60	0.70
10-Sep-11	24.00	29.50	74.00	98.00	6.30	3.00	1.30	1.90
11-Sep-11	24.40	28.50	85.00	93.00	0.00	7.00	0.30	1.70
12-Sep-11	24.70	29.80	78.00	93.00	18.80	7.00	2.50	2.40
13-Sep-11	24.30	30.00	71.00	94.00	69.00	5.00	2.30	1.80
14-Sep-11	24.70	27.40	88.00	97.00	38.70	5.00	0.00	0.50
15-Sep-11	24.20	26.10	92.00	98.00	15.00	8.00	0.00	0.60
16-Sep-11	23.80	31.00	69.00	96.00	12.60	3.00	5.20	1.90
17-Sep-11	24.40	28.50	87.00	96.00	0.00	3.00	0.20	1.60
18-Sep-11	24.80	32.40	63.00	96.00	42.20	3.00	7.10	2.90
19-Sep-11	25.00	32.50	69.00	92.00	52.30	3.00	4.60	2.60
20-Sep-11	24.00	30.40	76.00	94.00	4.20	2.00	1.80	1.50
21-Sep-11	24.20	30.60	78.00	96.00	47.10	5.00	1.30	1.20
22-Sep-11	24.20	26.30	86.00	95.00	1.60	3.00	0.00	0.60
23-Sep-11	24.20	27.10	82.00	96.00	0.00	3.00	0.00	1.10
24-Sep-11	24.10	28.50	75.00	96.00	1.00	3.00	0.00	1.60
25-Sep-11	23.50	31.70	57.00	88.00	3.80	4.00	2.60	3.40
26-Sep-11	22.00	25.30	86.00	92.00	5.40	4.00	0.00	1.10
27-Sep-11	21.80	25.60	86.00	96.00	0.00	2.00	0.00	0.60
28-Sep-11	22.90	28.50	82.00	98.00	0.00	1.00	0.20	1.20

29-Sep-11	24.00	29.60	77.00	94.00	13.00	1.00	0.20	1.70
30-Sep-11	25.00	30.50	73.00	93.00	13.00	4.00	0.00	2.10
01-Oct-11	25.00	29.70	75.00	96.00	2.10	3.00	1.40	1.50
02-Oct-11	23.10	31.70	71.00	97.00	0.00	3.00	3.60	1.80
03-Oct-11	24.50	30.70	66.00	94.00	0.00	5.00	1.80	2.30
04-Oct-11	22.80	27.30	72.00	87.00	0.00	5.00	0.00	3.00
05-Oct-11	21.00	27.40	68.00	93.00	0.00	5.00	1.10	2.80
06-Oct-11	20.60	31.00	64.00	91.00	1.00	2.00	4.00	2.70
07-Oct-11	23.00	32.30	57.00	87.00	0.00	3.00	3.30	2.60
08-Oct-11	24.00	30.80	68.00	93.00	9.50	5.00	0.30	1.60
09-Oct-11	23.90	30.60	71.00	96.00	12.50	3.00	1.10	1.40
10-Oct-11	24.20	31.70	68.00	96.00	0.00	4.00	2.50	0.90
11-Oct-11	24.40	29.50	71.00	96.00	9.30	1.00	0.00	1.40
12-Oct-11	24.00	30.60	68.00	94.00	134.30	3.00	1.30	1.30
13-Oct-11	24.40	28.50	79.00	97.00	3.50	2.00	0.30	0.50
14-Oct-11	23.70	27.60	87.00	98.00	7.80	2.00	0.00	0.70
15-Oct-11	24.30	26.30	92.00	96.00	4.00	3.00	0.00	0.70
16-Oct-11	24.20	31.20	67.00	95.00	1.50	7.00	6.40	2.40
17-Oct-11	23.50	30.00	70.00	94.00	0.00	2.00	3.30	1.50
18-Oct-11	22.50	31.80	58.00	88.00	27.20	5.00	7.20	4.30
19-Oct-11	22.60	31.00	63.00	89.00	2.00	7.00	2.60	1.80
20-Oct-11	22.50	32.00	58.00	91.00	0.00	4.00	8.50	2.30
21-Oct-11	22.60	32.50	57.00	95.00	0.00	3.00	7.80	2.70
22-Oct-11	22.80	32.50	45.00	87.00	0.00	3.00	9.80	2.80
23-Oct-11	22.90	32.60	58.00	90.00	1.70	3.00	6.80	2.80
24-Oct-11	23.20	34.10	52.00	89.00	5.30	1.00	8.00	3.30
25-Oct-11	23.30	33.40	55.00	89.00	0.00	6.00	7.90	3.20
26-Oct-11	23.20	32.80	53.00	86.00	0.00	1.00	10.30	3.80
27-Oct-11	23.20	33.20	49.00	86.00	0.00	4.00	9.70	4.20

28-Oct-11	23.40	32.50	55.00	89.00	0.00	1.00	8.00	3.80
29-Oct-11	23.00	32.90	51.00	85.00	0.00	4.00	8.70	4.00
30-Oct-11	21.40	33.10	45.00	88.00	4.00	4.00	10.40	4.70
31-Oct-11	21.90	33.00	52.00	86.00	0.70	3.00	7.30	3.30
01-Nov-11	22.00	33.00	52.00	83.00	0.00	6.00	9.40	5.20
02-Nov-11	22.60	32.80	45.00	86.00	0.00	6.00	10.20	5.90
03-Nov-11	21.30	32.80	44.00	81.00	0.00	5.00	9.90	5.30
04-Nov-11	21.60	33.00	49.00	87.00	0.00	6.00	10.00	5.40
05-Nov-11	24.40	32.00	57.00	86.00	1.00	5.00	3.30	4.40
06-Nov-11	23.50	30.80	61.00	86.00	3.80	5.00	0.70	3.80
07-Nov-11	23.10	26.50	86.00	91.00	0.00	2.00	0.00	0.90
08-Nov-11	23.00	27.50	75.00	95.00	0.00	3.00	0.00	2.10
09-Nov-11	21.50	30.50	54.00	92.00	0.00	5.00	8.80	3.90
10-Nov-11	19.60	31.10	51.00	87.00	0.00	3.00	10.50	4.10
11-Nov-11	19.20	31.20	45.00	87.00	0.00	2.00	10.80	3.40
12-Nov-11	18.80	31.60	49.00	90.00	0.00	3.00	10.30	3.90
13-Nov-11	20.50	32.30	41.00	91.00	21.00	4.00	10.10	4.30
14-Nov-11	20.80	33.00	49.00	92.00	0.30	3.00	8.20	3.30
15-Nov-11	20.60	31.70	52.00	86.00	0.00	4.00	9.70	4.40
16-Nov-11	21.00	31.50	54.00	89.00	0.00	4.00	6.40	4.10
17-Nov-11	21.00	32.00	48.00	87.00	0.00	4.00	10.50	5.10
18-Nov-11	21.20	33.40	43.00	88.00	0.00	2.00	10.20	3.40
19-Nov-11	21.50	33.00	40.00	93.00	0.00	4.00	9.20	6.00
20-Nov-11	20.30	32.50	41.00	83.00	0.00	3.00	10.00	5.30
21-Nov-11	22.10	31.80	50.00	83.00	0.00	5.00	5.90	5.30
22-Nov-11	22.30	33.50	46.00	89.00	0.00	5.00	10.20	7.80
23-Nov-11	22.80	32.70	47.00	83.00	0.00	7.00	8.60	6.40
24-Nov-11	20.80	30.70	44.00	79.00	0.00	8.00	8.60	7.50
25-Nov-11	20.50	32.20	53.00	86.00	0.00	5.00	8.10	5.90

26-Nov-11	23.20	33.20	50.00	79.00	0.00	4.00	7.50	3.80
27-Nov-11	21.00	33.50	43.00	86.00	0.00	2.00	10.10	4.40
28-Nov-11	21.60	33.50	49.00	89.00	0.00	3.00	10.40	3.90
29-Nov-11	23.00	32.40	52.00	91.00	0.00	3.00	6.20	2.60
30-Nov-11	21.50	33.70	39.00	91.00	0.00	3.00	10.60	4.20
01-Dec-11	21.50	32.80	37.00	85.00	0.00	5.00	10.40	4.60
02-Dec-11	21.00	29.20	42.00	77.00	0.00	7.00	6.40	7.00
03-Dec-11	17.00	29.30	45.00	82.00	0.00	3.00	9.50	4.20
04-Dec-11	17.70	29.00	42.00	86.00	0.00	3.00	7.20	4.30
05-Dec-11	17.40	30.60	46.00	84.00	0.00	4.00	10.00	5.30
06-Dec-11	20.50	29.30	65.00	85.00	0.00	5.00	2.00	3.70
07-Dec-11	20.60	32.70	52.00	86.00	0.00	5.00	6.40	4.80
08-Dec-11	21.50	32.60	46.00	88.00	0.00	8.00	7.20	6.20
09-Dec-11	20.60	29.00	48.00	83.00	0.00	7.00	3.20	7.20
10-Dec-11	22.10	27.50	44.00	79.00	0.00	10.00	10.20	8.80
11-Dec-11	16.00	26.80	42.00	77.00	0.00	9.00	11.00	5.60
12-Dec-11	14.50	28.30	44.00	84.00	0.00	4.00	10.00	4.40
13-Dec-11	15.40	26.90	52.00	82.00	0.00	5.00	1.70	3.80
14-Dec-11	16.50	30.20	51.00	83.00	0.00	3.00	1.90	4.00
15-Dec-11	18.50	29.80	52.00	82.00	0.00	6.00	2.10	5.60
16-Dec-11	20.50	29.40	47.00	79.00	0.00	9.00	10.00	6.40
17-Dec-11	18.00	30.60	40.00	82.00	0.00	6.00	10.60	6.10
18-Dec-11	18.20	30.50	44.00	81.00	0.00	5.00	9.30	6.80
19-Dec-11	18.40	30.50	42.00	77.00	0.00	6.00	9.80	4.60
20-Dec-11	17.40	30.50	46.00	86.00	0.00	4.00	6.40	4.80
21-Dec-11	17.60	30.90	46.00	81.00	0.00	4.00	3.60	4.10
22-Dec-11	19.20	31.90	46.00	89.00	0.00	5.00	8.10	5.10
23-Dec-11	18.90	31.90	47.00	78.00	0.00	4.00	8.00	4.70
24-Dec-11	20.40	25.70	48.00	78.00	0.00	10.00	4.00	6.60

25-Dec-11	15.30	27.00	42.00	77.00	0.00	5.00	8.20	4.60
26-Dec-11	14.90	28.80	36.00	79.00	0.00	4.00	9.80	5.60
27-Dec-11	16.00	31.60	42.00	84.00	0.00	3.00	9.20	4.50
28-Dec-11	16.10	33.00	40.00	81.00	0.00	3.00	9.20	5.30
29-Dec-11	19.60	32.90	39.00	87.00	0.00	3.00	10.00	5.00
30-Dec-11	19.20	31.90	34.00	81.00	0.00	5.00	10.00	5.70
31-Dec-11	18.90	32.90	43.00	86.00	0.00	3.00	10.10	7.40
01-Jan-12	19.80	33.00	42.00	81.00	0.00	3.00	10.50	6.00
02-Jan-12	20.90	32.90	48.00	78.00	0.00	3.00	6.80	4.50
03-Jan-12	21.00	33.20	40.00	89.00	0.00	2.00	9.20	5.00
04-Jan-12	18.80	31.60	42.00	80.00	0.00	3.00	4.70	5.80
05-Jan-12	18.20	32.60	37.00	80.00	0.00	4.00	10.00	5.10
06-Jan-12	18.20	32.70	35.00	81.00	0.00	4.00	10.00	5.80
07-Jan-12	18.00	31.80	34.00	82.00	0.00	5.00	7.80	7.50
08-Jan-12	17.80	30.70	42.00	83.00	0.00	4.00	8.40	5.90
09-Jan-12	19.90	31.60	42.00	81.00	0.00	5.00	9.20	9.20
10-Jan-12	18.50	31.50	40.00	86.00	0.00	1.00	7.30	5.30
11-Jan-12	18.50	31.00	41.00	80.00	0.00	8.00	7.40	7.30
12-Jan-12	20.20	26.50	48.00	75.00	0.00	4.00	0.00	4.80
13-Jan-12	19.50	32.40	43.00	79.00	0.00	3.00	9.00	4.80
14-Jan-12	20.60	33.20	42.00	81.00	0.00	3.00	5.50	6.00
15-Jan-12	24.30	29.50	60.00	84.00	0.00	3.00	0.30	3.10
16-Jan-12	22.60	33.70	46.00	85.00	0.00	4.00	8.00	8.00
17-Jan-12	21.50	32.80	50.00	86.00	0.00	2.00	7.30	4.30
18-Jan-12	23.20	34.50	45.00	87.00	0.00	2.00	8.90	5.40
19-Jan-12	24.40	34.50	45.00	82.00	0.00	4.00	9.60	6.40
20-Jan-12	23.60	34.60	47.00	79.00	0.00	2.00	9.00	5.50
21-Jan-12	22.50	32.70	50.00	86.00	43.70	4.00	7.50	4.30
22-Jan-12	22.30	25.00	82.00	98.00	0.00	6.00	0.00	4.70

23-Jan-12	19.40	33.00	44.00	95.00	0.00	3.00	9.50	3.80
24-Jan-12	19.20	32.80	46.00	91.00	0.00	2.00	10.10	4.70
25-Jan-12	18.10	33.00	40.00	87.00	0.00	2.00	10.10	5.10
26-Jan-12	18.20	32.00	44.00	84.00	0.00	3.00	9.50	4.50
27-Jan-12	22.00	33.50	36.00	85.00	0.00	4.00	10.00	5.40
28-Jan-12	22.00	34.20	34.00	73.00	0.00	4.00	9.80	6.80
29-Jan-12	22.50	32.10	46.00	77.00	0.00	4.00	5.50	5.20
30-Jan-12	21.40	34.50	41.00	77.00	0.00	2.00	7.00	7.00
31-Jan-12	19.50	33.30	41.00	74.00	0.00	3.00	8.60	6.20
01-Feb-12	19.50	33.00	44.00	81.00	0.00	3.00	9.40	5.00
02-Feb-12	19.50	32.30	45.00	83.00	0.00	2.00	6.10	4.90
03-Feb-12	22.10	33.50	43.00	87.00	0.00	2.00	9.80	4.70
04-Feb-12	22.00	33.80	39.00	74.00	0.00	4.00	10.30	5.50
05-Feb-12	22.90	34.70	39.00	75.00	0.00	3.00	9.90	5.60
06-Feb-12	23.50	34.50	45.00	82.00	0.00	4.00	8.00	5.00
07-Feb-12	23.60	36.00	33.00	86.00	0.00	3.00	8.80	5.60
08-Feb-12	23.80	36.20	47.00	79.00	0.00	5.00	8.20	6.10
09-Feb-12	20.80	34.80	29.00	82.00	0.00	3.00	9.20	4.80
10-Feb-12	20.50	35.20	28.00	77.00	0.00	4.00	10.00	5.80
11-Feb-12	21.00	33.50	35.00	77.00	0.00	4.00	9.40	6.20
12-Feb-12	19.60	33.90	33.00	79.00	0.00	4.00	10.00	5.90
13-Feb-12	20.00	33.50	37.00	80.00	0.00	3.00	10.00	4.70
14-Feb-12	20.50	34.80	30.00	78.00	0.00	3.00	10.20	7.10
15-Feb-12	21.50	35.30	35.00	70.00	0.00	5.00	9.60	5.90
16-Feb-12	22.50	35.30	36.00	75.00	0.00	7.00	9.30	7.70
17-Feb-12	22.60	32.50	47.00	77.00	0.00	3.00	0.00	4.60
18-Feb-12	20.90	32.00	40.00	73.00	0.00	5.00	7.90	7.30
19-Feb-12	18.90	31.00	37.00	71.00	0.00	7.00	9.30	6.30
20-Feb-12	16.80	32.80	32.00	78.00	0.00	3.00	10.00	6.40

21-Feb-12	19.20	34.80	29.00	82.00	0.00	2.00	10.50	5.50
22-Feb-12	19.20	36.10	34.00	76.00	0.00	1.00	10.00	6.50
23-Feb-12	22.10	35.50	48.00	76.00	0.00	3.00	8.90	6.00
24-Feb-12	26.20	36.10	42.00	72.00	0.00	2.00	10.00	6.80
25-Feb-12	25.50	37.90	36.00	72.00	0.00	6.00	10.00	7.10
26-Feb-12	26.20	36.00	44.00	77.00	0.00	5.00	9.10	8.30
27-Feb-12	26.00	35.20	46.00	71.00	0.00	3.00	5.00	5.40
28-Feb-12	25.10	33.50	45.00	78.00	0.00	4.00	5.00	7.70
29-Feb-12	24.90	36.30	40.00	73.00	0.00	5.00	6.20	8.30
01-Mar-12	25.50	37.10	33.00	67.00	0.00	5.00	9.80	9.20
02-Mar-12	24.80	37.00	35.00	83.00	0.00	6.00	10.00	9.00
03-Mar-12	26.00	36.60	38.00	64.00	0.00	5.00	8.80	9.50
04-Mar-12	26.50	35.70	41.00	64.00	0.00	5.00	7.40	8.20
05-Mar-12	25.60	35.30	42.00	75.00	0.00	4.00	7.00	7.20
06-Mar-12	26.40	35.70	44.00	74.00	32.20	4.00	6.90	7.40
07-Mar-12	26.40	33.00	51.00	90.00	0.00	4.00	4.40	4.70
08-Mar-12	26.00	34.20	54.00	86.00	0.00	3.00	3.30	4.70
09-Mar-12	24.90	33.70	58.00	94.00	0.00	4.00	2.50	3.80
10-Mar-12	25.70	35.40	41.00	84.00	0.00	5.00	7.80	7.70
11-Mar-12	21.90	35.00	40.00	74.00	0.00	5.00	10.20	8.60
12-Mar-12	20.90	33.80	41.00	74.00	0.00	2.00	8.80	7.10
13-Mar-12	21.10	35.50	38.00	76.00	0.00	3.00	9.80	8.20
14-Mar-12	21.20	35.50	40.00	81.00	0.00	3.00	8.20	6.40
15-Mar-12	21.70	36.40	38.00	71.00	0.00	4.00	9.00	7.50
16-Mar-12	25.50	36.90	42.00	71.00	0.00	6.00	6.50	7.40
17-Mar-12	26.60	31.00	54.00	75.00	0.00	7.00	3.70	6.70
18-Mar-12	25.00	35.10	44.00	77.00	0.00	8.00	8.20	6.20
19-Mar-12	25.00	31.40	58.00	91.00	0.00	8.00	4.70	4.80
20-Mar-12	25.00	34.30	47.00	95.00	0.00	5.00	5.50	5.90

21-Mar-12	24.50	34.70	43.00	83.00	0.00	8.00	5.40	6.50
22-Mar-12	24.60	35.30	45.00	74.00	0.00	6.00	10.00	7.50
23-Mar-12	26.20	33.20	53.00	77.00	0.00	4.00	4.00	6.50
24-Mar-12	23.00	33.60	39.00	95.00	0.00	7.00	8.10	9.10
25-Mar-12	19.50	34.20	41.00	72.00	0.00	5.00	9.20	8.50
26-Mar-12	19.70	34.20	41.00	78.00	0.00	4.00	9.00	7.60
27-Mar-12	22.00	33.50	43.00	77.00	0.00	1.00	1.30	7.80
28-Mar-12	22.00	35.50	34.00	73.00	0.00	4.00	9.00	8.10
29-Mar-12	23.20	36.40	34.00	66.00	0.00	3.00	9.10	8.10
30-Mar-12	24.50	36.40	40.00	70.00	0.00	6.00	4.00	7.80
31-Mar-12	24.40	35.10	39.00	74.00	0.00	10.00	6.90	9.30
01-Apr-12	22.80	33.70	40.00	67.00	0.00	6.00	2.00	7.70
02-Apr-12	23.20	33.70	41.00	77.00	0.00	4.00	3.10	8.00
03-Apr-12	24.80	35.50	47.00	83.00	0.00	4.00	4.60	7.00
04-Apr-12	26.00	33.60	51.00	90.00	36.80	4.00	5.10	5.70
05-Apr-12	26.00	34.50	51.00	87.00	0.00	8.00	4.30	3.60
06-Apr-12	23.50	34.00	42.00	91.00	0.00	3.00	5.00	1.40
07-Apr-12	23.80	34.30	42.00	87.00	0.00	4.00	3.80	5.60
08-Apr-12	23.60	34.00	43.00	83.00	0.00	3.00	4.10	5.40
09-Apr-12	24.00	35.50	44.00	77.00	0.00	3.00	7.50	5.00
10-Apr-12	24.10	36.00	45.00	81.00	0.00	6.00	8.30	6.00
11-Apr-12	25.50	34.00	51.00	73.00	0.00	6.00	5.70	5.90
12-Apr-12	26.00	34.00	53.00	73.00	0.00	6.00	4.30	5.20
13-Apr-12	26.20	35.70	47.00	84.00	0.00	6.00	8.00	5.80
14-Apr-12	25.50	36.20	47.00	82.00	0.00	4.00	8.50	5.30
15-Apr-12	25.80	35.60	53.00	89.00	0.00	4.00	8.20	5.40
16-Apr-12	26.60	35.60	54.00	79.00	18.00	3.00	6.80	6.30
17-Apr-12	27.50	36.80	43.00	89.00	0.00	1.80	9.60	6.90
18-Apr-12	24.80	34.00	63.00	87.00	0.00	15.00	3.70	4.70

19-Apr-12	24.50	35.20	50.00	86.00	0.00	4.00	9.20	6.90
20-Apr-12	26.00	36.00	49.00	79.00	0.00	4.00	10.50	6.20
21-Apr-12	28.00	29.60	60.00	84.00	0.00	9.00	5.20	5.40
22-Apr-12	24.50	34.70	51.00	93.00	0.00	4.00	11.10	6.80
23-Apr-12	25.00	35.00	49.00	81.00	0.00	8.00	9.90	6.70
24-Apr-12	27.40	35.50	49.00	70.00	0.00	5.00	9.00	8.50
25-Apr-12	27.40	35.90	48.00	76.00	0.00	4.00	11.00	7.50
26-Apr-12	28.00	37.50	44.00	74.00	26.00	6.00	9.30	9.70
27-Apr-12	26.00	32.60	60.00	87.00	0.00	9.00	2.00	3.90
28-Apr-12	23.20	35.80	50.00	91.00	0.00	7.00	11.20	5.40
29-Apr-12	24.80	35.20	51.00	83.00	0.00	5.00	10.50	6.70
30-Apr-12	26.00	35.00	53.00	81.00	0.00	8.00	7.60	6.30
01-May-12	25.30	35.50	47.00	88.00	0.00	6.00	9.80	6.60
02-May-12	25.90	35.90	54.00	80.00	0.00	5.00	7.80	7.00
03-May-12	26.80	35.00	53.00	78.00	8.60	6.00	6.10	6.10
04-May-12	27.00	37.20	49.00	85.00	0.00	12.00	9.40	5.50
05-May-12	24.00	35.00	53.00	92.00	0.00	14.00	8.30	5.30
06-May-12	24.60	35.50	49.00	85.00	16.00	7.00	11.50	7.50
07-May-12	25.90	34.50	52.00	82.00	0.00	8.00	8.00	5.10
08-May-12	23.80	33.00	54.00	96.00	0.00	4.00	7.80	4.90
09-May-12	25.20	33.60	58.00	89.00	0.00	4.00	11.70	5.10
10-May-12	26.10	35.50	47.00	88.00	0.00	5.00	11.60	6.20
11-May-12	27.50	34.80	53.00	81.00	13.00	6.00	6.00	4.50
12-May-12	27.00	34.50	61.00	88.00	0.00	6.00	2.70	4.20
13-May-12	24.50	34.00	58.00	87.00	0.00	4.00	6.10	4.70
14-May-12	25.00	34.50	54.00	90.00	1.00	4.00	5.50	4.60
15-May-12	26.40	32.70	61.00	91.00	0.00	3.00	4.40	2.70
16-May-12	24.70	32.50	60.00	90.00	11.00	5.00	6.20	3.60
17-May-12	24.60	33.50	58.00	93.00	0.00	10.00	5.40	3.40

18-May-12	25.00	31.80	66.00	93.00	0.00	4.00	5.30	4.30
19-May-12	26.20	33.60	57.00	92.00	8.00	3.00	7.30	4.50
20-May-12	26.00	34.50	53.00	91.00	0.00	8.00	9.80	3.60
21-May-12	26.30	34.60	54.00	88.00	31.00	3.00	10.00	5.60
22-May-12	28.20	34.20	59.00	93.00	26.30	15.00	4.00	3.60
23-May-12	24.80	28.70	78.00	90.00	75.00	4.00	0.00	2.50
24-May-12	22.90	30.20	73.00	95.00	0.00	5.00	4.90	2.90
25-May-12	23.40	31.70	67.00	96.00	0.20	1.00	6.50	3.80
26-May-12	25.00	31.00	64.00	87.00	4.70	4.00	1.60	3.30
27-May-12	25.00	30.00	75.00	93.00	19.40	5.00	2.20	2.50
28-May-12	24.80	31.00	68.00	95.00	0.00	3.00	7.80	2.90
29-May-12	25.20	32.50	56.00	92.00	6.90	2.00	7.20	3.70
30-May-12	26.10	33.60	56.00	90.00	0.00	7.00	4.80	2.90
31-May-12	26.00	31.70	69.00	93.00	10.00	3.00	0.40	1.90
01-Jun-12	25.80	34.50	65.00	87.00	0.00	2.00	5.50	3.40
02-Jun-12	24.60	30.00	73.00	94.00	5.80	3.00	1.40	2.50
03-Jun-12	25.10	32.10	70.00	92.00	0.00	5.00	2.20	2.30
04-Jun-12	25.00	32.70	69.00	94.00	0.00	3.00	3.00	4.10
05-Jun-12	25.60	32.10	67.00	90.00	0.00	1.00	3.40	2.70
06-Jun-12	26.50	32.20	62.00	92.00	13.80	5.00	1.50	3.50
07-Jun-12	25.50	32.60	63.00	94.00	0.00	7.00	2.80	4.10
08-Jun-12	25.30	31.10	70.00	94.00	0.00	2.00	1.00	2.60
09-Jun-12	25.00	32.00	67.00	88.00	0.00	4.00	2.90	3.50
10-Jun-12	25.00	32.90	62.00	90.00	0.00	3.00	2.50	4.30
11-Jun-12	26.00	33.00	63.00	86.00	0.00	2.00	3.80	4.50
12-Jun-12	26.60	32.00	66.00	85.00	0.00	4.00	1.30	4.50
13-Jun-12	26.90	32.30	62.00	80.00	0.00	1.00	0.20	3.90
14-Jun-12	27.50	34.70	52.00	84.00	0.00	4.00	1.70	4.90
15-Jun-12	27.30	33.70	53.00	82.00	8.50	3.00	3.80	5.10

16-Jun-12	28.00	29.80	69.00	96.00	35.10	3.00	0.00	2.10
17-Jun-12	24.50	27.10	89.00	95.00	2.50	8.00	0.00	1.00
18-Jun-12	23.50	27.70	82.00	96.00	3.70	2.00	0.00	1.50
19-Jun-12	25.40	29.20	74.00	88.00	0.00	2.00	0.00	2.90
20-Jun-12	25.50	32.00	61.00	88.00	14.20	4.00	0.00	4.20
21-Jun-12	25.60	32.00	63.00	92.00	0.00	3.00	0.50	3.00
22-Jun-12	25.50	32.10	66.00	93.00	20.50	3.00	0.00	2.80
23-Jun-12	25.20	30.70	83.00	93.00	21.80	3.00	0.00	2.20
24-Jun-12	23.50	30.00	75.00	96.00	12.10	7.00	0.00	2.60
25-Jun-12	23.90	31.60	67.00	92.00	0.00	4.00	1.00	1.70
26-Jun-12	23.00	31.50	64.00	96.00	14.20	3.00	3.60	3.70
27-Jun-12	24.50	32.50	63.00	93.00	18.00	4.00	0.80	3.30
28-Jun-12	23.00	29.00	80.00	92.00	11.00	3.00	0.30	1.60
29-Jun-12	24.50	30.50	73.00	95.00	17.40	3.00	1.20	1.70
30-Jun-12	24.20	29.00	78.00	95.00	15.00	5.00	0.00	1.80
01-Jul-12	23.80	28.30	83.00	96.00	0.00	8.00	0.00	1.20
02-Jul-12	23.80	30.00	70.00	96.00	36.60	3.00	1.00	1.70
03-Jul-12	24.00	27.20	86.00	98.00	0.00	3.00	0.00	0.60
04-Jul-12	24.40	29.40	77.00	96.00	36.50	2.00	2.10	1.70
05-Jul-12	25.40	31.00	66.00	95.00	12.50	2.00	1.40	1.60
06-Jul-12	24.00	30.40	78.00	96.00	0.00	2.00	0.00	1.40
07-Jul-12	23.80	30.50	70.00	96.00	26.00	3.00	4.00	4.60
08-Jul-12	25.00	31.40	70.00	91.00	0.00	6.00	3.30	2.90
09-Jul-12	24.80	31.90	67.00	92.00	0.00	2.00	2.60	3.10
10-Jul-12	25.30	31.80	71.00	89.00	5.30	3.00	7.00	3.10
11-Jul-12	25.00	31.50	69.00	91.00	14.80	4.00	3.50	2.60
12-Jul-12	24.20	30.50	69.00	97.00	0.00	5.00	0.60	2.40
13-Jul-12	24.60	32.00	58.00	95.00	9.30	3.00	1.60	2.30
14-Jul-12	25.60	31.70	66.00	93.00	0.00	3.00	3.70	2.40

15-Jul-12	26.10	33.20	61.00	89.00	0.00	4.00	9.00	3.40
16-Jul-12	27.00	34.20	59.00	86.00	0.00	4.00	8.60	4.20
17-Jul-12	26.50	31.50	73.00	92.00	1.10	3.00	2.30	2.90
18-Jul-12	25.00	32.50	66.00	89.00	0.00	4.00	5.20	2.90
19-Jul-12	24.50	31.70	63.00	96.00	0.00	2.00	4.10	3.20
20-Jul-12	25.50	30.00	71.00	88.00	0.00	4.00	3.00	2.00
21-Jul-12	24.50	32.80	65.00	93.00	0.00	10.00	7.00	3.50
22-Jul-12	25.20	32.60	68.00	96.00	0.00	4.00	2.60	4.50
23-Jul-12	25.00	30.40	68.00	93.00	21.20	4.00	0.00	2.50
24-Jul-12	24.30	31.70	65.00	97.00	10.60	15.00	0.20	3.50
25-Jul-12	24.60	30.90	66.00	91.00	11.20	15.00	3.60	4.00
26-Jul-12	24.70	32.60	69.00	93.00	29.00	6.00	8.20	3.60
27-Jul-12	23.70	31.00	71.00	91.00	13.40	3.00	4.20	2.60
28-Jul-12	23.80	31.30	69.00	96.00	17.10	3.00	6.00	2.80
29-Jul-12	24.10	28.50	79.00	96.00	18.80	5.00	0.00	1.20
30-Jul-12	24.00	26.70	79.00	93.00	7.30	3.00	0.00	1.30
31-Jul-12	22.80	27.20	87.00	94.00	24.10	1.00	0.00	1.30
01-Aug-12	25.00	31.80	70.00	93.00	42.20	4.00	3.00	2.40
02-Aug-12	24.00	29.50	76.00	96.00	0.00	5.00	0.80	1.00
03-Aug-12	25.50	28.60	78.00	93.00	2.00	2.00	2.50	1.80
04-Aug-12	25.40	31.00	64.00	93.00	1.00	3.00	2.60	3.30
05-Aug-12	25.40	33.20	58.00	93.00	6.20	3.00	4.90	3.50
06-Aug-12	24.10	31.90	65.00	94.00	13.60	3.00	2.40	2.70
07-Aug-12	25.20	30.30	70.00	89.00	12.30	4.00	0.90	2.80
08-Aug-12	24.80	31.10	64.00	93.00	0.00	3.00	1.20	3.20
09-Aug-12	24.90	31.90	66.00	89.00	0.00	6.00	7.60	3.90
10-Aug-12	24.50	32.00	63.00	91.00	6.20	3.00	4.60	3.00
11-Aug-12	25.00	31.60	63.00	94.00	8.00	3.00	2.60	2.50
12-Aug-12	25.00	32.00	68.00	96.00	0.00	3.00	5.80	2.90

13-Aug-12	24.50	29.80	74.00	93.00	0.00	2.00	4.20	2.70
14-Aug-12	25.10	31.50	68.00	90.00	20.20	2.00	5.60	3.50
15-Aug-12	23.50	31.00	68.00	93.00	33.40	3.00	2.50	2.40
16-Aug-12	23.50	31.50	68.00	96.00	0.00	4.00	2.70	1.30
17-Aug-12	24.00	29.60	78.00	95.00	6.00	2.00	0.00	1.80
18-Aug-12	24.10	30.70	73.00	96.00	0.00	3.00	4.50	2.50
19-Aug-12	25.50	31.80	68.00	94.00	0.00	3.00	7.10	3.20
20-Aug-12	25.60	32.10	62.00	91.00	0.00	2.00	6.40	3.00
21-Aug-12	25.40	33.60	57.00	93.00	11.10	4.00	9.70	4.30
22-Aug-12	23.60	33.00	65.00	96.00	0.00	8.00	4.50	2.70
23-Aug-12	24.00	32.20	65.00	96.00	0.00	4.00	7.00	2.50
24-Aug-12	25.00	31.80	70.00	94.00	11.40	2.00	6.30	3.00
25-Aug-12	24.50	30.60	71.00	93.00	5.50	3.00	3.90	2.30
26-Aug-12	24.30	29.10	82.00	96.00	10.00	4.00	0.30	1.50
27-Aug-12	24.00	30.60	68.00	96.00	20.70	1.00	1.70	1.40
28-Aug-12	23.60	29.70	78.00	96.00	52.50	3.00	2.80	1.50
29-Aug-12	23.50	29.20	79.00	98.00	0.00	3.00	0.70	1.70
30-Aug-12	24.00	30.10	75.00	97.00	2.00	1.00	2.40	1.60
31-Aug-12	24.50	31.10	69.00	94.00	104.20	2.00	3.00	2.10
01-Sep-12	23.00	30.00	71.00	95.00	80.40	2.00	0.00	2.20
02-Sep-12	23.70	28.20	85.00	97.00	43.00	2.00	0.40	0.70
03-Sep-12	24.20	31.20	70.00	98.00	0.00	2.00	4.50	1.60
04-Sep-12	24.30	31.40	69.00	96.00	0.00	5.00	4.60	2.20
05-Sep-12	24.60	30.00	73.00	94.00	9.40	4.00	1.70	2.10
06-Sep-12	24.50	30.60	75.00	94.00	2.50	3.00	2.20	3.20
07-Sep-12	24.60	30.40	74.00	95.00	0.00	1.00	0.00	2.20
08-Sep-12	24.70	31.70	74.00	96.00	15.20	2.00	9.00	3.20
09-Sep-12	24.40	32.50	64.00	90.00	25.40	1.00	6.50	2.80
10-Sep-12	24.20	33.70	66.00	96.00	29.00	3.00	8.00	3.10

11-Sep-12	23.80	31.70	69.00	96.00	15.00	4.00	7.10	2.80
12-Sep-12	23.50	30.50	66.00	94.00	16.20	2.00	2.70	2.00
13-Sep-12	23.40	30.50	74.00	96.00	0.00	2.00	4.10	1.80
14-Sep-12	24.00	30.40	72.00	93.00	3.80	2.00	4.10	1.90
15-Sep-12	23.90	30.70	67.00	95.00	22.00	3.00	2.00	3.30
16-Sep-12	24.00	31.90	69.00	96.00	11.30	2.00	7.90	2.50
17-Sep-12	24.30	31.60	66.00	93.00	0.00	3.00	4.90	2.40
18-Sep-12	23.90	32.00	66.00	91.00	0.00	1.00	6.70	3.40
19-Sep-12	25.20	32.60	64.00	93.00	12.00	3.00	5.20	3.70
20-Sep-12	24.00	32.10	69.00	96.00	0.00	3.00	5.00	2.60
21-Sep-12	23.50	32.20	62.00	96.00	0.00	1.00	7.80	3.10
22-Sep-12	23.90	32.00	64.00	95.00	0.10	3.00	6.30	2.70
23-Sep-12	25.00	32.20	64.00	96.00	0.00	2.00	7.80	2.90
24-Sep-12	25.20	33.10	67.00	94.00	0.00	2.00	9.80	2.80
25-Sep-12	25.50	32.50	66.00	93.00	9.50	2.00	3.90	1.70
26-Sep-12	24.50	32.00	72.00	93.00	21.20	1.00	4.80	1.60
27-Sep-12	24.00	28.80	78.00	97.00	3.20	2.00	0.00	1.10
28-Sep-12	24.00	29.80	75.00	97.00	0.00	2.00	1.60	1.30
29-Sep-12	23.60	31.20	66.00	96.00	0.00	4.00	7.80	2.80
30-Sep-12	21.90	31.80	61.00	93.00	0.00	3.00	9.40	3.50
01-Oct-12	25.50	32.00	68.00	89.00	0.00	1.00	3.40	2.30
02-Oct-12	24.50	33.00	65.00	88.00	0.00	3.00	5.00	2.60
03-Oct-12	24.80	32.00	66.00	91.00	0.00	1.00	5.00	2.50
04-Oct-12	25.20	32.40	64.00	93.00	0.00	3.00	4.50	2.90
05-Oct-12	24.50	33.60	64.00	93.00	2.30	3.00	6.10	2.90
06-Oct-12	23.00	28.50	67.00	96.00	12.00	2.00	1.00	2.60
07-Oct-12	23.50	30.50	71.00	96.00	0.00	1.00	4.60	2.00
08-Oct-12	24.80	31.20	71.00	93.00	0.00	1.00	2.40	1.40
09-Oct-12	23.20	33.00	58.00	95.00	0.00	1.00	9.00	3.00

10-Oct-12	21.60	31.40	60.00	97.00	0.00	4.00	8.00	3.70
11-Oct-12	21.80	32.50	56.00	91.00	0.00	1.00	8.20	3.80
12-Oct-12	23.50	33.00	59.00	88.00	0.00	2.00	9.00	4.00
13-Oct-12	23.50	32.50	64.00	93.00	0.00	3.00	6.70	3.10
14-Oct-12	23.40	33.10	54.00	93.00	0.00	4.00	8.60	4.50
15-Oct-12	23.50	33.00	60.00	90.00	0.00	2.00	9.00	3.80
16-Oct-12	23.00	33.60	56.00	92.00	0.00	2.00	8.50	4.20
17-Oct-12	21.00	32.10	55.00	87.00	0.00	1.00	9.00	4.20
18-Oct-12	21.40	32.70	52.00	93.00	0.00	2.00	9.10	4.50
19-Oct-12	23.00	33.90	50.00	90.00	0.00	2.00	8.20	4.70
20-Oct-12	23.50	33.70	55.00	92.00	0.00	1.00	8.60	4.30
21-Oct-12	22.60	32.80	55.00	90.00	0.00	1.00	5.90	4.40
22-Oct-12	22.20	33.20	50.00	89.00	0.00	2.00	8.50	4.90
23-Oct-12	22.00	32.70	61.00	90.00	0.00	2.00	6.70	4.30
24-Oct-12	22.80	33.70	46.00	89.00	0.00	2.00	9.00	4.70
25-Oct-12	23.00	34.60	44.00	86.00	0.00	3.00	9.50	5.80
26-Oct-12	23.00	33.50	45.00	89.00	0.00	3.00	10.10	6.10
27-Oct-12	23.80	32.50	49.00	87.00	0.00	3.00	8.40	4.60
28-Oct-12	24.50	33.80	50.00	92.00	0.00	1.00	8.10	2.80
29-Oct-12	25.60	34.80	47.00	84.00	0.00	2.00	9.00	4.70
30-Oct-12	24.50	35.50	52.00	84.00	0.00	4.00	8.00	6.00
31-Oct-12	21.30	31.80	52.00	89.00	0.00	4.00	8.00	7.70
01-Nov-12	22.00	33.70	48.00	85.00	0.00	3.00	10.40	6.80
02-Nov-12	22.00	33.70	43.00	83.00	0.00	2.00	10.30	4.20
03-Nov-12	23.50	34.50	45.00	91.00	0.00	1.00	9.10	5.40
04-Nov-12	22.80	35.20	43.00	87.00	0.00	1.00	10.40	4.70
05-Nov-12	22.80	34.80	45.00	87.00	0.00	3.00	10.20	4.80
06-Nov-12	23.30	35.30	51.00	92.00	0.00	4.00	8.60	4.20
07-Nov-12	23.20	34.70	50.00	92.00	0.00	2.00	9.20	3.60

08-Nov-12	23.50	34.20	54.00	91.00	0.00	3.00	10.20	3.70
09-Nov-12	25.00	35.40	52.00	86.00	0.00	3.00	9.70	4.90
10-Nov-12	25.50	36.70	48.00	88.00	0.00	1.00	10.20	4.70
11-Nov-12	24.00	34.30	46.00	86.00	0.00	3.00	9.40	5.10
12-Nov-12	23.50	34.00	52.00	83.00	0.00	3.00	6.80	4.70
13-Nov-12	23.00	34.20	47.00	83.00	0.00	2.00	9.20	4.50
14-Nov-12	22.80	34.00	47.00	82.00	0.00	2.00	9.10	5.40
15-Nov-12	23.20	32.10	49.00	85.00	1.00	2.00	1.00	5.60
16-Nov-12	24.80	34.50	52.00	94.00	0.00	6.00	6.40	3.40
17-Nov-12	22.50	32.00	46.00	93.00	0.00	6.00	5.60	4.70
18-Nov-12	22.50	31.50	54.00	89.00	0.00	8.00	7.50	4.10
19-Nov-12	22.70	34.70	47.00	91.00	0.00	2.00	9.60	3.30
20-Nov-12	24.80	34.00	48.00	96.00	0.00	2.00	7.30	4.30
21-Nov-12	23.50	34.80	48.00	88.00	0.00	2.00	8.50	4.50
22-Nov-12	24.20	35.50	47.00	91.00	2.00	2.00	8.90	5.10
23-Nov-12	25.00	35.50	51.00	96.00	0.00	4.00	9.40	5.00
24-Nov-12	24.80	33.50	60.00	96.00	0.00	3.00	6.50	3.20
25-Nov-12	24.90	34.20	50.00	90.00	6.00	2.00	9.20	5.30
26-Nov-12	24.00	35.40	51.00	87.00	0.20	2.00	9.90	4.50
27-Nov-12	23.80	35.20	47.00	90.00	0.00	4.00	9.00	4.50
28-Nov-12	23.40	34.50	52.00	92.00	0.00	2.00	8.20	3.50
29-Nov-12	22.90	34.50	50.00	90.00	0.00	2.00	9.70	4.10
30-Nov-12	23.00	34.60	51.00	91.00	0.00	2.00	9.80	5.40
01-Dec-12	23.40	35.60	56.00	90.00	0.00	1.00	9.80	5.50
02-Dec-12	24.00	34.90	61.00	87.00	0.00	3.00	9.80	5.20
03-Dec-12	23.50	34.20	49.00	86.00	0.00	2.00	9.10	5.10
04-Dec-12	22.50	34.50	41.00	83.00	0.00	3.00	10.00	5.40
05-Dec-12	21.00	34.20	47.00	89.00	0.00	5.00	9.20	6.50
06-Dec-12	21.00	33.60	51.00	83.00	0.00	4.00	9.80	5.00

07-Dec-12	20.80	34.20	41.00	88.00	0.00	3.00	9.40	5.20
08-Dec-12	20.20	34.00	37.00	87.00	0.00	1.00	9.60	5.50
09-Dec-12	20.00	33.60	37.00	91.00	0.00	1.00	9.30	4.40
10-Dec-12	20.00	33.20	38.00	90.00	0.00	2.00	9.60	5.10
11-Dec-12	19.70	33.20	34.00	81.00	0.00	2.00	10.00	6.50
12-Dec-12	19.00	33.60	37.00	85.00	0.00	3.00	9.10	5.80
13-Dec-12	20.00	34.10	40.00	89.00	0.00	2.00	8.50	5.20
14-Dec-12	23.50	35.40	42.00	83.00	0.00	1.00	6.30	4.80
15-Dec-12	23.50	35.80	42.00	82.00	0.00	1.00	9.60	5.20
16-Dec-12	23.50	36.60	37.00	84.00	0.00	3.00	10.20	5.90
17-Dec-12	22.60	36.50	44.00	87.00	0.00	1.00	9.80	6.30
18-Dec-12	22.70	36.50	36.00	88.00	0.00	4.00	9.60	6.30
19-Dec-12	22.00	34.00	46.00	87.00	0.00	2.00	8.40	5.20
20-Dec-12	21.20	35.00	40.00	89.00	0.00	2.00	9.30	5.10
21-Dec-12	22.60	36.10	39.00	90.00	0.00	2.00	9.40	5.80
22-Dec-12	22.70	36.20	37.00	84.00	0.00	4.00	9.10	6.00
23-Dec-12	18.00	31.50	47.00	78.00	0.00	13.00	7.20	8.70
24-Dec-12	17.00	31.00	38.00	79.00	0.00	3.00	10.00	6.00
25-Dec-12	16.80	31.70	37.00	84.00	0.00	2.00	9.40	4.70
26-Dec-12	19.00	33.60	39.00	84.00	0.00	3.00	9.90	5.70
27-Dec-12	21.00	34.70	39.00	83.00	0.00	3.00	6.40	5.80
28-Dec-12	22.20	35.10	38.00	81.00	0.00	3.00	5.90	4.80
29-Dec-12	22.30	37.00	34.00	84.00	0.00	3.00	9.70	6.40
30-Dec-12	16.00	29.50	40.00	80.00	0.00	8.00	8.00	8.00
31-Dec-12	16.10	28.20	43.00	79.00	0.00	3.00	2.20	4.80
01-Jan-13	16.30	31.80	34.00	83.00	0.00	2.00	10.00	4.90
02-Jan-13	16.60	32.50	32.00	89.00	0.00	2.00	8.80	5.20
03-Jan-13	16.50	33.20	36.00	90.00	0.00	2.00	9.50	5.20
04-Jan-13	18.30	33.10	34.00	81.00	0.00	3.00	9.90	5.60

05-Jan-13	18.50	33.00	31.00	85.00	0.00	2.00	9.30	4.70
06-Jan-13	19.10	32.50	39.00	84.00	0.00	2.00	5.10	5.20
07-Jan-13	20.50	33.30	40.00	77.00	0.00	3.00	7.80	5.00
08-Jan-13	21.00	32.40	45.00	80.00	0.00	2.00	4.60	4.10
09-Jan-13	17.60	33.80	35.00	87.00	0.00	4.00	8.90	5.60
10-Jan-13	17.50	33.90	32.00	78.00	0.00	3.00	10.10	5.00
11-Jan-13	18.20	33.40	32.00	85.00	0.00	4.00	10.10	5.20
12-Jan-13	17.90	33.00	32.00	78.00	0.00	5.00	8.00	5.30
13-Jan-13	17.90	31.50	35.00	83.00	0.00	3.00	9.20	4.00
14-Jan-13	20.00	32.00	43.00	78.00	0.00	5.00	8.70	4.50
15-Jan-13	18.80	32.00	44.00	86.00	0.00	4.00	8.10	3.80
16-Jan-13	17.50	32.30	24.00	81.00	0.00	4.00	9.50	6.50
17-Jan-13	15.70	32.00	33.00	79.00	0.00	3.00	9.80	5.80
18-Jan-13	15.60	33.80	27.00	73.00	0.00	3.00	10.10	6.70
19-Jan-13	16.60	30.80	32.00	79.00	0.00	1.00	9.50	4.20
20-Jan-13	17.70	33.20	32.00	85.00	0.00	1.00	9.60	4.60
21-Jan-13	20.50	34.60	33.00	78.00	0.00	3.00	9.50	4.60
22-Jan-13	20.20	34.80	37.00	86.00	0.00	2.00	9.50	5.30
23-Jan-13	20.00	35.00	36.00	83.00	0.00	3.00	9.90	5.60
24-Jan-13	20.60	34.60	35.00	80.00	0.00	3.00	9.80	5.00
25-Jan-13	22.20	33.50	40.00	79.00	0.00	4.00	7.90	4.70
26-Jan-13	22.10	33.50	45.00	76.00	0.00	1.00	7.20	4.70
27-Jan-13	21.40	33.70	40.00	77.00	0.00	2.00	7.50	4.90
28-Jan-13	21.00	29.20	51.00	77.00	0.00	3.00	2.60	4.10
29-Jan-13	21.00	32.00	47.00	83.00	0.00	2.00	3.60	3.90
30-Jan-13	21.50	33.80	37.00	72.00	0.00	2.00	9.60	5.60
31-Jan-13	21.50	33.90	34.00	82.00	0.00	3.00	9.10	4.90
01-Feb-13	21.50	35.50	36.00	81.00	0.00	3.00	9.60	5.60
02-Feb-13	21.50	33.20	43.00	80.00	0.00	3.00	6.60	4.60

03-Feb-13	21.60	35.20	31.00	73.00	0.00	2.00	8.10	5.70
04-Feb-13	23.50	36.00	33.00	73.00	0.00	3.00	6.10	6.10
05-Feb-13	23.00	36.80	27.00	77.00	0.00	4.00	10.10	7.20
06-Feb-13	24.50	37.20	27.00	68.00	0.00	4.00	9.50	7.30
07-Feb-13	24.70	35.70	40.00	71.00	0.00	5.00	8.10	6.60
08-Feb-13	24.60	35.60	41.00	75.00	0.00	3.00	8.30	5.80
09-Feb-13	22.30	35.20	37.00	81.00	0.00	3.00	5.90	6.10
10-Feb-13	21.30	34.90	36.00	76.00	0.00	2.00	9.00	6.30
11-Feb-13	21.00	35.70	31.00	74.00	0.00	3.00	10.00	5.80
12-Feb-13	20.50	35.60	28.00	79.00	0.00	6.00	9.40	8.80
13-Feb-13	20.30	35.50	27.00	74.00	0.00	4.00	10.30	6.60
14-Feb-13	21.00	37.00	29.00	82.00	0.00	2.00	9.50	6.20
15-Feb-13	23.10	37.80	26.00	74.00	0.00	3.00	9.90	7.60
16-Feb-13	23.00	36.80	31.00	78.00	0.00	3.00	9.70	6.70
17-Feb-13	23.00	35.90	33.00	69.00	0.00	2.00	10.10	6.10
18-Feb-13	22.50	37.00	25.00	67.00	0.00	4.00	9.30	7.70
19-Feb-13	23.00	36.70	27.00	62.00	0.00	6.00	8.90	8.60
20-Feb-13	21.00	34.80	34.00	68.00	0.00	4.00	7.70	6.80
21-Feb-13	21.00	35.30	29.00	68.00	0.00	3.00	7.10	7.30
22-Feb-13	21.60	33.80	30.00	66.00	0.00	4.00	9.30	9.90
23-Feb-13	21.40	34.50	31.00	69.00	0.00	4.00	7.50	9.40
24-Feb-13	21.40	35.00	35.00	78.00	0.00	3.00	6.00	6.40
25-Feb-13	24.00	37.60	25.00	82.00	0.00	3.00	9.80	9.10
26-Feb-13	25.00	37.50	32.00	63.00	0.00	2.00	7.30	8.20
27-Feb-13	25.20	37.80	31.00	65.00	0.00	4.00	9.00	8.30
28-Feb-13	25.60	36.20	37.00	67.00	0.00	5.00	9.10	7.60
01-Mar-13	26.30	37.10	38.00	72.00	0.00	4.00	9.30	7.30
02-Mar-13	27.00	37.60	40.00	68.00	0.00	5.00	6.20	6.90
03-Mar-13	22.20	35.60	37.00	69.00	0.00	6.00	5.10	8.40

04-Mar-13	20.80	33.70	33.00	57.00	0.00	5.00	7.30	8.30
05-Mar-13	20.50	34.30	31.00	74.00	0.00	4.00	9.10	7.10
06-Mar-13	20.00	35.00	31.00	73.00	0.00	2.00	9.40	6.70
07-Mar-13	20.80	35.70	27.00	78.00	0.00	4.00	9.70	7.90
08-Mar-13	22.60	35.70	24.00	62.00	0.00	3.00	9.50	6.80
09-Mar-13	22.60	35.50	30.00	63.00	0.00	5.00	8.80	7.80
10-Mar-13	23.00	34.00	45.00	69.00	0.00	4.00	6.40	6.70
11-Mar-13	25.30	35.60	42.00	72.00	0.00	5.00	6.40	7.50
12-Mar-13	25.50	34.40	47.00	77.00	0.00	5.00	4.80	5.90
13-Mar-13	24.50	32.00	53.00	84.00	0.00	3.00	3.50	3.30
14-Mar-13	25.10	36.80	35.00	73.00	0.00	4.00	4.70	7.90
15-Mar-13	25.40	36.20	37.00	73.00	0.00	4.00	8.80	6.30
16-Mar-13	25.40	37.00	28.00	73.00	0.00	2.00	9.30	6.00
17-Mar-13	26.80	37.60	36.00	66.00	0.00	3.00	7.60	5.70
18-Mar-13	27.00	34.50	49.00	76.00	0.00	3.00	5.90	5.70
19-Mar-13	26.80	35.70	48.00	76.00	0.00	11.00	6.00	4.90
20-Mar-13	25.30	36.80	45.00	80.00	0.00	8.00	7.00	5.50
21-Mar-13	25.90	36.50	44.00	84.00	17.20	3.00	4.90	6.10
22-Mar-13	23.10	36.00	47.00	92.00	0.00	8.00	6.90	5.30
23-Mar-13	24.60	37.00	45.00	87.00	0.00	10.00	7.10	4.50
24-Mar-13	26.80	38.00	38.00	78.00	0.00	4.00	10.00	6.10
25-Mar-13	26.80	35.80	48.00	77.00	1.40	4.00	5.60	5.40
26-Mar-13	25.80	34.80	54.00	88.00	0.00	4.00	4.70	3.80
27-Mar-13	25.70	37.00	50.00	86.00	0.00	7.00	7.50	5.00
28-Mar-13	26.50	36.10	44.00	75.00	0.00	4.00	8.00	6.50
29-Mar-13	28.00	35.30	41.00	77.00	0.00	5.00	9.80	8.30
30-Mar-13	28.00	37.80	41.00	75.00	0.00	3.00	9.60	8.00
31-Mar-13	26.20	38.40	39.00	72.00	0.00	7.00	9.10	7.00
01-Apr-13	25.50	37.10	45.00	76.00	0.00	4.00	8.40	7.00

02-Apr-13	26.80	38.00	43.00	72.00	0.00	3.00	8.20	7.20
03-Apr-13	28.70	38.10	44.00	68.00	0.20	2.00	8.80	7.80
04-Apr-13	29.20	35.70	53.00	71.00	0.00	4.00	7.20	7.70
05-Apr-13	29.30	37.90	44.00	71.00	0.00	4.00	7.30	8.70
06-Apr-13	25.00	39.40	38.00	67.00	18.40	3.00	9.00	9.80
07-Apr-13	24.50	34.50	59.00	84.00	0.00	8.00	2.00	4.90
08-Apr-13	24.50	30.60	63.00	87.00	0.00	5.00	0.00	3.10
09-Apr-13	24.60	36.00	48.00	87.00	0.00	3.00	9.60	7.70
10-Apr-13	26.00	37.20	42.00	78.00	0.00	8.00	7.70	6.40
11-Apr-13	24.70	37.60	37.00	79.00	0.00	5.00	7.90	7.60
12-Apr-13	24.00	35.50	40.00	73.00	0.00	6.00	7.50	8.60
13-Apr-13	24.00	38.10	35.00	70.00	0.00	5.00	10.70	8.10
14-Apr-13	27.00	38.40	31.00	68.00	0.00	3.00	10.10	8.90
15-Apr-13	27.10	37.10	37.00	69.00	3.20	4.00	9.80	7.80
16-Apr-13	25.80	36.60	39.00	90.00	18.40	3.00	5.80	3.20
17-Apr-13	24.00	32.00	60.00	96.00	0.00	8.00	5.60	2.20
18-Apr-13	24.30	32.00	60.00	92.00	0.00	3.00	3.10	2.50
19-Apr-13	27.50	37.20	41.00	79.00	0.00	3.00	11.80	6.10
20-Apr-13	27.70	36.50	49.00	79.00	5.30	2.00	9.70	6.00
21-Apr-13	24.60	37.00	47.00	89.00	0.00	6.00	6.60	3.60
22-Apr-13	24.00	33.70	55.00	89.00	27.30	12.00	5.50	3.60
23-Apr-13	24.00	34.50	56.00	92.00	0.00	10.00	8.70	2.80
24-Apr-13	24.60	35.00	50.00	90.00	4.80	3.00	10.90	3.60
25-Apr-13	24.10	35.20	54.00	93.00	0.00	3.00	8.40	4.30
26-Apr-13	25.10	34.20	52.00	93.00	0.00	5.00	6.00	2.80
27-Apr-13	25.30	35.10	47.00	93.00	0.00	3.00	7.70	4.00
28-Apr-13	26.50	36.30	45.00	86.00	0.00	1.00	10.10	7.10
29-Apr-13	26.50	34.00	58.00	76.00	0.00	3.00	9.60	4.90
30-Apr-13	24.60	34.00	66.00	86.00	7.80	4.00	5.20	3.70

01-May-13	23.80	36.00	44.00	92.00	0.70	10.00	9.20	3.70
02-May-13	24.80	34.00	57.00	84.00	34.00	12.00	8.50	4.00
03-May-13	24.00	30.70	58.00	87.00	0.00	5.00	5.90	2.90
04-May-13	24.90	34.50	52.00	81.00	0.00	1.00	10.40	4.80
05-May-13	25.50	34.50	49.00	85.00	0.00	1.00	5.90	4.00
06-May-13	25.20	34.80	48.00	84.00	0.00	2.00	7.50	5.00
07-May-13	25.40	34.90	52.00	87.00	0.00	3.00	5.10	3.80
08-May-13	25.90	34.60	55.00	85.00	0.00	2.00	9.00	5.00
09-May-13	26.30	34.80	57.00	88.00	0.00	4.00	7.60	4.10
10-May-13	26.20	35.50	61.00	86.00	19.10	7.00	7.30	4.60
11-May-13	23.80	27.80	75.00	91.00	2.20	6.00	0.00	1.70
12-May-13	25.50	33.80	57.00	92.00	0.00	4.00	6.40	2.40
13-May-13	25.70	34.10	60.00	89.00	0.00	3.00	6.60	3.30
14-May-13	27.50	35.50	56.00	86.00	0.00	4.00	6.50	4.10
15-May-13	27.80	36.50	50.00	81.00	5.00	3.00	7.60	5.40
16-May-13	25.80	35.90	55.00	95.00	103.30	7.00	7.50	4.40
17-May-13	23.50	35.70	51.00	88.00	7.60	8.00	9.30	3.80
18-May-13	25.00	32.50	65.00	96.00	0.00	10.00	6.70	2.40
19-May-13	25.30	33.40	61.00	89.00	0.00	1.00	5.50	2.80
20-May-13	26.40	33.60	59.00	90.00	6.00	3.00	9.00	4.20
21-May-13	25.70	33.80	58.00	91.00	5.80	11.00	5.20	5.00
22-May-13	24.30	33.20	61.00	92.00	8.00	8.00	5.00	2.80
23-May-13	23.50	30.50	74.00	94.00	4.00	8.00	0.00	2.40
24-May-13	23.80	32.20	66.00	93.00	0.00	8.00	3.60	3.10
25-May-13	24.80	31.00	67.00	93.00	0.00	4.00	6.70	3.30
26-May-13	26.50	33.90	55.00	83.00	0.00	4.00	11.70	4.50
27-May-13	27.10	34.50	56.00	83.00	0.00	3.00	6.50	5.00
28-May-13	26.50	34.20	56.00	88.00	0.00	3.00	4.20	2.70
29-May-13	24.70	34.80	55.00	91.00	0.00	8.00	10.10	4.00

30-May-13	25.00	32.80	59.00	86.00	0.00	4.00	5.10	3.70
31-May-13	25.40	34.10	51.00	85.00	0.00	2.00	9.40	4.30
01-Jun-13	25.10	34.50	51.00	91.00	1.80	6.00	7.10	3.40
02-Jun-13	25.20	32.10	66.00	89.00	5.00	2.00	1.80	2.70
03-Jun-13	23.60	34.30	53.00	92.00	0.00	5.00	5.50	3.50
04-Jun-13	25.00	31.90	61.00	86.00	0.50	3.00	3.80	3.50
05-Jun-13	25.70	32.80	59.00	88.00	0.00	6.00	7.10	2.90
06-Jun-13	26.00	34.30	52.00	88.00	0.00	2.00	10.60	4.10
07-Jun-13	27.50	34.40	55.00	86.00	0.00	3.00	11.70	4.40
08-Jun-13	28.00	34.80	51.00	83.00	0.00	1.00	7.70	4.30
09-Jun-13	27.50	36.40	49.00	84.00	77.30	4.00	8.20	4.80
10-Jun-13	24.40	35.00	55.00	97.00	33.70	5.00	4.90	3.40
11-Jun-13	24.30	27.70	87.00	98.00	0.00	5.00	0.00	0.60
12-Jun-13	24.50	30.20	73.00	90.00	0.00	3.00	1.70	2.20
13-Jun-13	24.00	32.00	66.00	90.00	0.00	3.00	4.70	2.40
14-Jun-13	24.20	33.00	42.00	91.00	0.00	3.00	8.40	4.50
15-Jun-13	24.30	32.60	44.00	89.00	0.00	1.00	9.00	4.20
16-Jun-13	25.30	32.70	52.00	88.00	0.00	2.00	8.60	4.20
17-Jun-13	24.80	33.40	54.00	88.00	0.00	3.00	9.90	4.00
18-Jun-13	26.20	33.20	58.00	87.00	0.00	4.00	6.80	3.80
19-Jun-13	26.50	33.80	60.00	88.00	3.20	6.00	8.70	3.80
20-Jun-13	25.50	34.10	55.00	92.00	46.40	4.00	3.50	3.10
21-Jun-13	23.70	30.70	71.00	97.00	90.70	8.00	0.00	1.70
22-Jun-13	23.70	26.70	88.00	99.00	10.20	4.00	0.00	1.10
23-Jun-13	24.50	30.00	79.00	97.00	0.00	5.00	0.00	1.40
24-Jun-13	24.90	30.70	75.00	92.00	22.40	3.00	1.80	1.70
25-Jun-13	23.80	32.80	69.00	94.00	1.50	5.00	4.30	2.20
26-Jun-13	24.00	30.70	65.00	96.00	7.50	3.00	6.20	2.10
27-Jun-13	24.40	33.10	60.00	92.00	0.00	10.00	10.70	3.30

28-Jun-13	25.00	33.00	61.00	91.00	0.00	3.00	9.40	3.60
29-Jun-13	26.30	33.60	64.00	87.00	0.00	1.00	9.00	3.30
30-Jun-13	26.50	33.90	59.00	87.00	0.00	3.00	7.20	3.40
01-Jul-13	26.80	33.10	61.00	85.00	0.00	3.00	7.20	3.60
02-Jul-13	25.80	31.40	70.00	86.00	1.20	3.00	0.80	2.90
03-Jul-13	26.00	32.80	62.00	92.00	0.00	8.00	6.90	2.50
04-Jul-13	25.80	33.40	61.00	88.00	30.00	3.00	8.00	3.10
05-Jul-13	23.80	33.30	60.00	94.00	0.00	6.00	8.40	3.10
06-Jul-13	24.60	33.30	61.00	90.00	8.80	5.00	7.30	3.60
07-Jul-13	24.80	32.70	63.00	94.00	12.00	3.00	2.80	3.10
08-Jul-13	24.10	29.40	74.00	96.00	0.00	4.00	1.60	1.30
09-Jul-13	24.30	27.40	80.00	91.00	3.20	6.00	0.00	1.90
10-Jul-13	24.50	30.60	68.00	96.00	0.00	7.00	4.00	2.00
11-Jul-13	24.70	32.80	56.00	94.00	0.00	7.00	7.90	2.80
12-Jul-13	26.30	33.40	58.00	90.00	0.00	3.00	10.90	3.50
13-Jul-13	27.00	33.50	54.00	87.00	29.40	1.00	8.30	4.30
14-Jul-13	24.80	32.80	65.00	94.00	5.50	14.00	5.80	2.00
15-Jul-13	23.80	32.00	66.00	94.00	0.00	6.00	5.80	2.50
16-Jul-13	24.30	31.70	63.00	93.00	1.00	4.00	7.90	2.70
17-Jul-13	25.30	29.80	72.00	92.00	18.60	2.00	0.00	2.00
18-Jul-13	24.60	32.70	61.00	94.00	85.60	2.00	4.60	2.80
19-Jul-13	23.50	30.20	75.00	98.00	27.30	4.00	2.20	1.00
20-Jul-13	23.60	26.40	83.00	97.00	14.60	2.00	0.00	1.00
21-Jul-13	24.50	27.70	80.00	97.00	0.00	1.00	0.00	0.80
22-Jul-13	24.50	28.80	78.00	96.00	26.70	3.00	0.80	1.30
23-Jul-13	24.20	30.00	73.00	96.00	25.20	3.00	1.70	1.40
24-Jul-13	23.60	30.20	88.00	96.00	0.30	7.00	0.00	1.10
25-Jul-13	23.90	31.20	64.00	93.00	14.30	3.00	1.90	2.90
26-Jul-13	23.50	31.80	65.00	95.00	38.20	4.00	2.50	2.40

27-Jul-13	23.50	30.20	74.00	96.00	0.00	1.00	0.00	1.70
28-Jul-13	23.80	27.80	76.00	96.00	96.30	1.00	0.00	1.70
29-Jul-13	23.10	30.00	76.00	97.00	1.50	5.00	1.60	1.10
30-Jul-13	23.40	30.70	68.00	97.00	19.00	8.00	6.80	2.20
31-Jul-13	24.30	31.00	70.00	96.00	70.00	3.00	3.70	2.00
01-Aug-13	23.90	30.60	72.00	97.00	0.00	4.00	1.60	1.50
02-Aug-13	24.80	29.30	81.00	97.00	22.80	2.00	0.00	1.40
03-Aug-13	23.50	29.30	75.00	94.00	0.00	3.00	0.20	1.60
04-Aug-13	24.30	31.20	64.00	94.00	0.00	1.00	5.70	2.40
05-Aug-13	25.60	33.20	57.00	92.00	3.50	3.00	10.20	3.10
06-Aug-13	24.50	32.60	60.00	95.00	3.30	10.00	4.70	1.80
07-Aug-13	24.20	29.00	79.00	93.00	3.00	8.00	0.00	1.80
08-Aug-13	24.00	30.30	75.00	93.00	19.80	7.00	0.70	2.80
09-Aug-13	24.80	30.70	72.00	92.00	0.00	7.00	1.70	1.70
10-Aug-13	24.00	31.50	60.00	93.00	30.00	5.00	4.30	2.00
11-Aug-13	24.20	31.60	70.00	93.00	0.00	4.00	5.70	2.00
12-Aug-13	24.00	29.60	78.00	95.00	1.50	2.00	0.20	1.30
13-Aug-13	23.60	31.20	73.00	94.00	2.70	3.00	2.50	1.90
14-Aug-13	24.30	29.20	72.00	96.00	2.10	4.00	3.00	2.10
15-Aug-13	25.20	31.80	66.00	92.00	0.00	3.00	4.60	2.30
16-Aug-13	25.90	32.50	59.00	90.00	0.00	4.00	8.40	3.50
17-Aug-13	26.50	32.90	57.00	87.00	0.00	4.00	7.60	5.00
18-Aug-13	26.50	33.00	54.00	82.00	1.50	4.00	6.10	4.20
19-Aug-13	26.10	33.20	57.00	91.00	0.00	4.00	3.60	4.10
20-Aug-13	25.70	30.20	68.00	86.00	17.70	4.00	0.00	2.90
21-Aug-13	23.80	30.80	66.00	96.00	21.00	7.00	1.50	2.30
22-Aug-13	22.90	29.20	74.00	96.00	24.00	8.00	0.10	1.90
23-Aug-13	23.90	31.40	62.00	91.00	32.60	5.00	5.30	3.30
24-Aug-13	23.50	31.30	69.00	94.00	127.80	5.00	2.50	2.40

25-Aug-13	23.40	31.00	69.00	95.00	11.90	6.00	1.90	1.70
26-Aug-13	23.10	29.70	71.00	98.00	2.00	2.00	4.00	1.40
27-Aug-13	23.00	27.70	84.00	96.00	32.60	4.00	0.00	1.10
28-Aug-13	24.50	30.40	85.00	97.00	29.80	3.00	0.00	1.20
29-Aug-13	24.00	28.10	84.00	97.00	0.00	5.00	0.00	1.10
30-Aug-13	24.80	31.60	65.00	93.00	0.00	6.00	6.00	3.00
31-Aug-13	25.50	32.60	63.00	90.00	33.30	4.00	8.10	3.50
01-Sep-13	23.60	33.40	58.00	90.00	0.00	4.00	7.60	3.30
02-Sep-13	23.60	32.40	65.00	96.00	0.00	2.00	4.60	2.30
03-Sep-13	24.50	33.40	61.00	92.00	0.00	2.00	6.50	2.70
04-Sep-13	24.70	32.30	68.00	94.00	0.40	4.00	3.60	2.70
05-Sep-13	24.50	32.50	65.00	93.00	19.80	5.00	5.70	2.50
06-Sep-13	23.50	32.60	61.00	95.00	58.40	3.00	5.80	2.60
07-Sep-13	23.30	31.00	69.00	97.00	0.00	5.00	2.60	1.40
08-Sep-13	23.50	32.50	60.00	96.00	1.30	3.00	7.80	2.60
09-Sep-13	24.40	32.10	64.00	95.00	6.30	6.00	4.10	1.70
10-Sep-13	24.00	30.00	75.00	96.00	1.00	3.00	2.30	1.30
11-Sep-13	24.30	31.80	65.00	94.00	0.00	3.00	5.80	2.40
12-Sep-13	24.60	30.80	68.00	92.00	8.00	5.00	1.10	3.50
13-Sep-13	24.80	32.00	67.00	92.00	25.00	5.00	4.10	2.10
14-Sep-13	24.50	29.90	73.00	96.00	188.40	6.00	1.20	1.20
15-Sep-13	23.50	28.90	79.00	98.00	107.40	8.00	2.00	0.70
16-Sep-13	22.50	26.30	88.00	98.00	59.00	2.00	0.00	0.40
17-Sep-13	23.00	26.40	94.00	98.00	153.20	2.00	0.00	0.20
18-Sep-13	22.20	25.30	96.00	98.00	6.60	10.00	0.00	0.40
19-Sep-13	21.60	26.30	88.00	100.00	31.20	8.00	0.00	1.20
20-Sep-13	23.50	29.00	79.00	96.00	38.60	8.00	1.50	1.80
21-Sep-13	23.60	26.60	89.00	98.00	7.20	6.00	0.00	0.40
22-Sep-13	24.20	27.40	86.00	96.00	28.80	4.00	0.00	1.10

23-Sep-13	21.70	25.40	84.00	97.00	0.00	3.00	0.00	0.80
24-Sep-13	23.40	30.70	73.00	95.00	34.90	3.00	3.00	1.60
25-Sep-13	24.00	27.80	85.00	95.00	124.80	1.00	0.00	0.90
26-Sep-13	23.30	28.20	82.00	98.00	0.00	3.00	0.30	0.60
27-Sep-13	25.00	31.50	67.00	98.00	2.70	3.00	5.10	1.30
28-Sep-13	23.20	31.40	75.00	96.00	0.00	1.00	3.50	1.40
29-Sep-13	22.80	30.70	63.00	96.00	0.00	4.00	5.10	2.70
30-Sep-13	22.50	26.50	79.00	91.00	0.00	3.00	0.00	2.00
01-Oct-13	23.00	31.80	58.00	93.00	3.60	3.00	7.50	2.40
02-Oct-13	23.80	27.00	85.00	96.00	6.10	3.00	0.00	0.90
03-Oct-13	23.50	30.70	60.00	97.00	0.00	2.00	4.40	1.80
04-Oct-13	23.80	31.40	65.00	96.00	13.20	2.00	4.90	2.00
05-Oct-13	24.00	32.30	58.00	97.00	12.00	2.00	5.60	2.00
06-Oct-13	23.90	31.60	56.00	94.00	0.00	1.00	4.20	2.70
07-Oct-13	22.00	31.50	60.00	92.00	0.00	3.00	4.10	2.70
08-Oct-13	22.30	31.70	46.00	83.00	0.00	2.00	9.50	3.60
09-Oct-13	21.30	32.70	54.00	92.00	0.00	2.00	9.00	3.00
10-Oct-13	22.40	32.70	54.00	89.00	0.00	3.00	9.80	3.30
11-Oct-13	23.60	32.20	59.00	89.00	0.00	1.00	6.40	2.70
12-Oct-13	23.70	33.20	55.00	92.00	0.00	1.00	9.90	3.10
13-Oct-13	22.90	31.80	58.00	93.00	6.40	4.00	2.70	2.80
14-Oct-13	22.50	31.70	55.00	90.00	95.70	4.00	2.40	2.80
15-Oct-13	22.40	24.30	94.00	98.00	14.10	12.00	0.00	0.70
16-Oct-13	22.80	28.30	81.00	96.00	0.00	6.00	0.00	0.70
17-Oct-13	23.60	32.00	63.00	94.00	8.00	3.00	7.70	3.40
18-Oct-13	22.80	32.10	65.00	96.00	0.00	3.00	6.90	1.80
19-Oct-13	22.20	31.60	62.00	94.00	0.00	2.00	8.70	2.60
20-Oct-13	22.60	31.80	54.00	90.00	0.00	5.00	9.40	3.50
21-Oct-13	22.00	31.50	60.00	92.00	0.00	3.00	8.60	3.10

22-Oct-13	22.60	32.60	55.00	88.00	0.00	3.00	9.50	3.60
23-Oct-13	22.20	31.80	58.00	86.00	0.00	7.00	9.50	4.20
24-Oct-13	21.00	31.70	51.00	87.00	0.00	3.00	9.60	3.70
25-Oct-13	21.60	31.00	52.00	83.00	0.00	3.00	9.10	4.60
26-Oct-13	20.90	31.00	51.00	82.00	0.00	2.00	6.50	4.10
27-Oct-13	21.00	31.50	52.00	84.00	0.00	2.00	8.40	3.50
28-Oct-13	20.80	32.20	49.00	93.00	0.00	3.00	9.10	2.90
29-Oct-13	20.50	33.00	51.00	94.00	0.00	2.00	8.90	3.50
30-Oct-13	23.50	33.20	53.00	94.00	3.80	4.00	6.10	2.90
31-Oct-13	22.00	33.30	68.00	94.00	0.00	3.00	5.90	2.20
01-Nov-13	21.50	32.40	47.00	91.00	0.00	1.00	9.90	3.70
02-Nov-13	20.60	32.60	39.00	88.00	0.00	1.00	10.70	4.30
03-Nov-13	20.50	32.10	41.00	86.00	0.00	1.00	10.60	4.20
04-Nov-13	20.50	31.50	48.00	82.00	0.00	6.00	9.80	5.10
05-Nov-13	21.50	29.80	64.00	90.00	0.00	4.00	7.30	2.60
06-Nov-13	22.20	32.50	55.00	89.00	0.50	10.00	3.30	3.20
07-Nov-13	23.00	27.80	81.00	92.00	0.00	4.00	0.40	1.40
08-Nov-13	22.00	33.20	55.00	95.00	0.00	3.00	8.30	2.70
09-Nov-13	22.10	31.70	53.00	91.00	0.00	6.00	4.50	4.20
10-Nov-13	23.80	27.50	76.00	87.00	0.00	2.00	0.00	1.50
11-Nov-13	23.50	33.50	51.00	91.00	0.00	4.00	9.80	3.90
12-Nov-13	23.60	34.70	45.00	94.00	0.00	3.00	10.00	3.90
13-Nov-13	22.70	33.70	59.00	90.00	0.00	4.00	7.90	3.30
14-Nov-13	23.10	32.60	49.00	84.00	8.30	5.00	8.10	4.90
15-Nov-13	21.80	24.50	74.00	92.00	0.00	3.00	0.00	1.50
16-Nov-13	22.50	32.60	59.00	87.00	0.00	2.00	7.60	3.90
17-Nov-13	20.60	29.00	63.00	86.00	0.00	5.00	2.80	3.40
18-Nov-13	20.10	31.80	51.00	89.00	0.00	3.00	3.40	3.80
19-Nov-13	20.70	31.70	51.00	85.00	0.00	3.00	8.40	3.90

20-Nov-13	20.30	32.00	48.00	86.00	0.00	4.00	10.50	3.70
21-Nov-13	20.30	32.00	52.00	89.00	0.00	2.00	9.80	3.80
22-Nov-13	22.00	33.50	53.00	87.00	0.00	2.00	9.30	3.90
23-Nov-13	22.50	32.50	56.00	90.00	1.00	5.00	5.30	2.90
24-Nov-13	23.50	34.50	46.00	93.00	0.00	1.00	8.20	3.20
25-Nov-13	22.10	33.60	55.00	92.00	1.80	3.00	7.70	3.10
26-Nov-13	21.60	34.20	49.00	87.00	0.00	3.00	8.40	3.20
27-Nov-13	21.30	35.00	46.00	93.00	0.00	2.00	9.40	4.10
28-Nov-13	19.80	30.70	55.00	91.00	0.00	6.00	6.10	6.40
29-Nov-13	17.90	29.50	47.00	79.00	0.00	8.00	10.10	6.10
30-Nov-13	18.00	31.40	45.00	76.00	0.00	5.00	10.00	4.20
01-Dec-13	17.30	28.00	49.00	85.00	0.00	12.00	5.30	6.00
02-Dec-13	16.00	29.10	45.00	81.00	0.00	5.00	9.80	5.10
03-Dec-13	16.40	30.30	39.00	91.00	0.00	4.00	9.80	4.40
04-Dec-13	16.20	31.40	45.00	88.00	0.00	3.00	8.60	3.80
05-Dec-13	18.20	30.80	43.00	91.00	0.00	3.00	8.20	3.90
06-Dec-13	17.00	30.50	39.00	85.00	0.00	4.00	8.90	4.10
07-Dec-13	17.00	30.10	40.00	81.00	0.00	4.00	9.00	4.40
08-Dec-13	17.60	31.10	39.00	82.00	0.00	3.00	8.60	3.40
09-Dec-13	17.90	31.50	40.00	94.00	0.00	3.00	7.30	4.10
10-Dec-13	19.00	31.70	44.00	85.00	0.00	2.00	9.00	3.60
11-Dec-13	19.40	31.20	45.00	90.00	0.00	2.00	5.30	3.50
12-Dec-13	19.40	32.90	40.00	86.00	0.00	2.00	8.30	4.40
13-Dec-13	20.80	32.90	40.00	88.00	0.00	3.00	8.80	4.50
14-Dec-13	21.30	33.50	45.00	88.00	19.30	1.00	7.10	4.30
15-Dec-13	18.60	31.20	54.00	91.00	46.00	6.00	2.60	2.60
16-Dec-13	15.00	19.70	89.00	97.00	0.00	3.00	0.00	0.50
17-Dec-13	14.70	22.40	69.00	94.00	0.00	5.00	2.60	2.10
18-Dec-13	14.50	27.00	55.00	88.00	0.00	6.00	7.00	4.00

19-Dec-13	14.50	26.50	48.00	89.00	0.00	4.00	9.70	4.60
20-Dec-13	13.70	27.00	42.00	80.00	0.00	4.00	8.70	4.70
21-Dec-13	13.80	27.00	46.00	85.00	0.00	7.00	10.00	4.60
22-Dec-13	15.30	28.00	46.00	79.00	0.00	5.00	9.90	4.80
23-Dec-13	14.50	28.80	45.00	90.00	0.00	3.00	9.40	3.60
24-Dec-13	15.60	27.80	45.00	85.00	0.00	5.00	9.00	4.00
25-Dec-13	14.50	27.00	41.00	85.00	0.00	7.00	8.60	4.20
26-Dec-13	14.30	27.00	42.00	87.00	0.00	3.00	9.10	4.50
27-Dec-13	13.60	26.70	41.00	78.00	0.00	5.00	9.00	4.70
28-Dec-13	13.80	26.70	45.00	87.00	0.00	4.00	8.60	3.40
29-Dec-13	14.50	27.70	44.00	89.00	0.00	6.00	8.50	3.60
30-Dec-13	14.30	27.70	43.00	89.00	0.00	3.00	8.30	3.60
31-Dec-13	14.00	28.00	44.00	85.00	0.00	3.00	9.00	3.80
01-Jan-14	14.30	28.60	44.00	92.00	0.00	3.00	9.50	3.00
02-Jan-14	14.80	30.50	39.00	97.00	0.00	3.00	9.20	2.80
03-Jan-14	16.50	32.80	30.00	93.00	0.00	3.00	9.50	4.00
04-Jan-14	17.20	31.10	43.00	87.00	0.00	4.00	9.60	6.60
05-Jan-14	17.30	30.50	51.00	90.00	0.00	3.00	9.10	3.40
06-Jan-14	17.50	32.20	40.00	93.00	0.00	3.00	9.10	3.10
07-Jan-14	16.80	33.80	29.00	92.00	0.00	3.00	9.40	4.20
08-Jan-14	17.80	34.30	25.00	90.00	0.00	3.00	9.70	5.90
09-Jan-14	18.00	31.20	34.00	87.00	0.00	4.00	9.20	5.20
10-Jan-14	18.10	31.70	41.00	84.00	0.00	3.00	9.50	4.30
11-Jan-14	18.90	32.00	41.00	88.00	0.00	5.00	9.00	4.40
12-Jan-14	17.60	31.30	39.00	78.00	0.00	6.00	9.80	6.40
13-Jan-14	15.70	29.80	42.00	82.00	0.00	6.00	8.40	6.90
14-Jan-14	13.00	27.20	36.00	78.00	0.00	8.00	9.80	5.70
15-Jan-14	12.80	27.80	38.00	80.00	0.00	3.00	9.70	3.80
16-Jan-14	14.20	29.00	32.00	79.00	0.00	3.00	9.50	4.60

17-Jan-14	16.10	29.00	35.00	82.00	0.00	6.00	9.20	5.40
18-Jan-14	15.50	26.00	43.00	78.00	0.00	14.00	8.10	6.00
19-Jan-14	14.60	27.50	35.00	68.00	0.00	4.00	8.70	5.70
20-Jan-14	13.40	28.70	39.00	86.00	0.00	6.00	7.80	5.80
21-Jan-14	13.60	25.00	35.00	66.00	0.00	10.00	8.50	6.80
22-Jan-14	13.00	25.50	38.00	75.00	0.00	7.00	8.60	5.50
23-Jan-14	12.20	27.80	28.00	89.00	0.00	3.00	9.00	3.80
24-Jan-14	13.00	29.00	33.00	85.00	0.00	3.00	9.00	4.00
25-Jan-14	13.50	30.40	30.00	88.00	0.00	3.00	9.00	4.20
26-Jan-14	16.80	30.80	37.00	81.00	0.00	1.00	9.10	5.20
27-Jan-14	16.90	32.00	32.00	85.00	0.00	3.00	9.90	4.40
28-Jan-14	17.70	32.20	32.00	87.00	0.00	3.00	10.10	4.80
29-Jan-14	17.50	31.70	34.00	84.00	0.00	4.00	10.30	4.90
30-Jan-14	16.30	30.80	33.00	82.00	0.00	3.00	10.00	4.90
31-Jan-14	16.50	31.50	33.00	83.00	0.00	2.00	9.80	4.60
01-Feb-14	16.60	32.40	29.00	87.00	0.00	3.00	10.30	4.80
02-Feb-14	16.70	33.80	30.00	92.00	0.00	3.00	9.90	6.80
03-Feb-14	20.30	33.50	39.00	71.00	0.00	3.00	9.30	6.30
04-Feb-14	22.00	31.50	48.00	86.00	0.00	9.00	8.30	5.30
05-Feb-14	22.00	32.00	45.00	89.00	0.00	4.00	8.20	4.60
06-Feb-14	21.60	31.90	49.00	80.00	0.00	3.00	8.60	5.30
07-Feb-14	21.70	33.00	42.00	81.00	0.00	5.00	9.40	6.30
08-Feb-14	22.00	33.40	40.00	74.00	0.00	4.00	9.70	6.70
09-Feb-14	22.60	33.70	40.00	81.00	0.00	2.00	8.60	5.50
10-Feb-14	19.50	34.30	40.00	74.00	0.00	5.00	7.70	5.50
11-Feb-14	18.50	32.70	43.00	79.00	0.00	4.00	8.60	4.20
12-Feb-14	18.60	32.80	39.00	85.00	0.00	2.00	8.90	5.00
13-Feb-14	18.50	33.20	41.00	74.00	0.00	4.00	7.70	6.00
14-Feb-14	18.00	31.50	38.00	80.00	0.00	4.00	8.50	5.80

15-Feb-14	18.10	30.60	42.00	82.00	0.00	2.00	6.00	4.40
16-Feb-14	20.90	32.50	43.00	84.00	0.00	4.00	8.90	5.30
17-Feb-14	21.20	33.20	42.00	78.00	0.00	4.00	8.90	5.00
18-Feb-14	22.00	34.50	40.00	84.00	0.00	5.00	8.80	4.80
19-Feb-14	16.30	29.80	46.00	83.00	0.00	10.00	0.40	5.60
20-Feb-14	16.00	26.10	49.00	77.00	0.00	4.00	1.10	5.20
21-Feb-14	18.00	30.50	41.00	81.00	0.00	3.00	5.20	4.20
22-Feb-14	19.20	33.80	35.00	87.00	0.00	3.00	9.90	4.50
23-Feb-14	21.60	34.80	31.00	77.00	0.00	2.00	10.10	5.90
24-Feb-14	21.00	35.00	29.00	71.00	0.00	3.00	9.80	5.80
25-Feb-14	21.50	34.80	33.00	82.00	0.00	9.00	9.20	7.20
26-Feb-14	22.50	34.90	36.00	67.00	0.00	5.00	8.90	6.90
27-Feb-14	22.50	34.40	31.00	73.00	0.00	4.00	9.10	7.00
28-Feb-14	23.00	34.00	34.00	69.00	0.00	4.00	9.80	7.30
01-Mar-14	24.00	35.80	33.00	79.00	0.00	4.00	8.30	6.90
02-Mar-14	25.00	36.10	40.00	84.00	0.00	3.00	7.60	6.50
03-Mar-14	25.10	35.00	49.00	77.00	0.00	3.00	8.10	6.30
04-Mar-14	25.00	35.50	46.00	83.00	0.00	3.00	6.30	6.00
05-Mar-14	25.10	34.50	49.00	78.00	0.00	6.00	6.20	5.90
06-Mar-14	24.50	34.80	43.00	70.00	0.00	4.00	5.20	6.80
07-Mar-14	25.90	35.50	42.00	75.00	0.00	5.00	5.90	6.40
08-Mar-14	25.00	35.50	40.00	71.00	0.00	4.00	7.20	6.80
09-Mar-14	25.10	35.90	41.00	76.00	0.00	3.00	6.00	6.80
10-Mar-14	25.00	33.00	48.00	75.00	0.00	6.00	3.60	6.30
11-Mar-14	24.00	35.80	35.00	74.00	0.00	4.00	7.70	6.80
12-Mar-14	23.80	37.00	33.00	76.00	0.00	4.00	8.60	7.30
13-Mar-14	24.50	37.00	35.00	84.00	0.00	3.00	8.30	6.40
14-Mar-14	24.60	36.80	39.00	70.00	0.00	5.00	7.00	8.20
15-Mar-14	24.70	36.20	38.00	74.00	0.00	3.00	8.20	7.60

16-Mar-14	25.30	36.40	40.00	70.00	0.00	3.00	6.60	7.50
17-Mar-14	24.80	37.00	37.00	69.00	0.00	4.00	7.70	6.90
18-Mar-14	26.50	37.90	37.00	65.00	0.00	5.00	7.70	7.50
19-Mar-14	27.00	35.00	49.00	77.00	0.00	8.00	6.60	7.00
20-Mar-14	25.40	36.90	43.00	77.00	7.20	6.00	6.20	6.00
21-Mar-14	21.30	31.30	44.00	91.00	0.00	8.00	5.00	4.80
22-Mar-14	21.50	34.50	46.00	84.00	0.00	3.00	8.60	5.20
23-Mar-14	21.60	34.80	36.00	75.00	0.00	2.00	9.20	5.70
24-Mar-14	22.80	35.40	39.00	75.00	0.00	3.00	9.10	6.30
25-Mar-14	24.50	36.20	37.00	77.00	0.00	2.00	10.00	6.40
26-Mar-14	25.30	37.50	32.00	71.00	0.00	2.00	9.50	7.40
27-Mar-14	26.00	35.70	47.00	75.00	0.00	5.00	8.30	6.50
28-Mar-14	27.30	35.70	47.00	73.00	0.00	3.00	7.30	7.00
29-Mar-14	27.80	37.80	41.00	74.00	0.00	4.00	9.40	7.40
30-Mar-14	28.00	35.70	48.00	73.00	0.00	3.00	5.40	5.90
31-Mar-14	27.40	38.10	40.00	74.00	25.00	3.00	9.50	7.10
01-Apr-14	23.20	37.00	48.00	93.00	0.00	4.00	7.90	6.40
02-Apr-14	24.30	36.20	41.00	87.00	23.70	4.00	9.60	6.50
03-Apr-14	24.50	36.70	43.00	93.00	0.00	5.00	9.60	6.20
04-Apr-14	23.00	31.80	57.00	95.00	0.00	2.00	3.90	2.90
05-Apr-14	23.00	33.50	56.00	83.00	0.00	1.00	5.80	4.70
06-Apr-14	23.90	32.80	52.00	85.00	0.00	1.00	5.20	3.90
07-Apr-14	24.50	35.30	44.00	81.00	0.00	2.00	10.10	5.50
08-Apr-14	25.10	33.10	52.00	82.00	0.00	5.00	8.10	5.50
09-Apr-14	24.80	35.60	50.00	87.00	0.50	3.00	9.90	5.80
10-Apr-14	25.00	35.40	51.00	85.00	17.00	4.00	9.30	6.10
11-Apr-14	24.30	30.50	68.00	87.00	0.00	2.00	3.50	2.30
12-Apr-14	25.50	34.80	57.00	90.00	0.00	3.00	8.00	3.90
13-Apr-14	25.00	34.50	63.00	89.00	0.00	3.00	7.30	4.40

14-Apr-14	25.00	31.50	61.00	91.00	0.00	1.00	2.00	2.80
15-Apr-14	24.80	35.20	49.00	92.00	0.00	5.00	4.30	4.10
16-Apr-14	24.60	33.70	61.00	86.00	0.00	3.00	3.30	4.00
17-Apr-14	25.60	34.70	57.00	83.00	0.00	3.00	8.20	4.90
18-Apr-14	27.10	34.20	59.00	88.00	0.00	3.00	2.70	4.30
19-Apr-14	27.30	36.30	51.00	87.00	0.00	1.00	7.10	4.20
20-Apr-14	27.00	35.90	53.00	85.00	0.00	1.00	4.10	5.10
21-Apr-14	26.10	31.80	61.00	87.00	0.00	5.00	1.60	4.10
22-Apr-14	25.50	36.30	52.00	79.00	0.00	4.00	5.00	5.90
23-Apr-14	25.80	35.80	52.00	84.00	0.00	7.00	7.00	6.30
24-Apr-14	27.50	37.40	48.00	82.00	0.00	5.00	10.00	6.90
25-Apr-14	27.80	37.80	41.00	76.00	0.00	1.00	9.20	6.80
26-Apr-14	26.50	35.50	54.00	88.00	1.00	6.00	3.50	4.70
27-Apr-14	25.80	36.50	48.00	86.00	81.80	2.00	9.50	5.20
28-Apr-14	23.00	35.70	54.00	99.00	0.00	5.00	4.60	4.50
29-Apr-14	23.20	32.20	68.00	96.00	0.00	4.00	4.10	2.40
30-Apr-14	24.80	33.00	59.00	92.00	2.00	2.00	5.80	3.70
01-May-14	23.50	32.80	61.00	98.00	0.00	8.00	5.50	2.30
02-May-14	25.70	33.80	65.00	90.00	0.00	3.00	5.00	3.30
03-May-14	24.50	33.20	61.00	93.00	0.00	4.00	4.00	3.00
04-May-14	24.70	33.30	54.00	86.00	0.00	4.00	7.30	3.80
05-May-14	24.60	36.00	49.00	85.00	0.00	3.00	11.30	5.70
06-May-14	26.00	33.80	51.00	86.00	0.00	2.00	4.40	4.20
07-May-14	26.20	35.10	57.00	87.00	7.50	2.00	8.00	4.20
08-May-14	26.20	35.50	58.00	86.00	0.20	7.00	9.20	4.80
09-May-14	25.10	32.80	66.00	93.00	5.20	7.00	6.90	2.70
10-May-14	25.60	32.90	60.00	90.00	0.00	9.00	6.70	3.40
11-May-14	25.80	34.20	57.00	89.00	0.00	2.00	10.20	5.10
12-May-14	26.30	33.50	63.00	79.00	0.00	6.00	6.20	4.60

13-May-14	26.00	33.80	62.00	84.00	0.00	8.00	7.00	3.70
14-May-14	26.80	35.40	54.00	86.00	0.00	5.00	6.20	4.10
15-May-14	27.50	36.00	54.00	84.00	0.00	4.00	9.70	4.70
16-May-14	27.50	35.70	56.00	79.00	11.30	3.00	7.10	4.20
17-May-14	24.10	36.20	53.00	83.00	0.00	4.00	9.90	4.40
18-May-14	24.20	34.00	54.00	94.00	0.00	3.00	6.70	3.00
19-May-14	25.20	35.60	54.00	88.00	0.80	2.00	8.60	3.80
20-May-14	26.30	34.50	59.00	84.00	0.00	5.00	5.50	3.40
21-May-14	26.20	34.70	57.00	86.00	1.00	7.00	9.30	4.30
22-May-14	26.60	36.10	49.00	84.00	0.00	4.00	9.50	4.50
23-May-14	26.60	33.90	59.00	85.00	0.00	6.00	2.80	3.20
24-May-14	26.80	36.80	46.00	82.00	20.00	3.00	9.10	4.70
25-May-14	27.00	35.60	53.00	85.00	27.50	3.00	5.10	4.10
26-May-14	23.80	35.80	57.00	92.00	0.00	4.00	7.90	3.20
27-May-14	25.00	33.90	61.00	92.00	0.00	3.00	8.00	2.80
28-May-14	27.00	35.30	55.00	88.00	0.00	3.00	9.40	4.10
29-May-14	27.40	34.20	60.00	82.00	1.20	4.00	6.60	4.90
30-May-14	25.70	35.30	56.00	85.00	0.00	7.00	8.10	5.50
31-May-14	25.60	33.50	53.00	93.00	0.00	4.00	7.00	4.00
01-Jun-14	26.80	35.00	60.00	88.00	18.00	2.00	8.60	4.30
02-Jun-14	25.60	33.70	64.00	90.00	0.00	4.00	5.20	3.20
03-Jun-14	26.00	33.60	62.00	86.00	0.00	4.00	6.90	3.90
04-Jun-14	28.00	34.70	59.00	83.00	2.00	8.00	6.40	4.10
05-Jun-14	27.40	34.00	61.00	87.00	0.00	3.00	8.40	4.70
06-Jun-14	25.70	32.00	67.00	92.00	0.00	4.00	3.30	3.70
07-Jun-14	25.80	33.30	64.00	90.00	0.00	4.00	5.40	3.50
08-Jun-14	27.50	36.00	50.00	90.00	42.20	3.00	9.30	5.20
09-Jun-14	23.50	33.10	64.00	96.00	47.60	7.00	3.20	3.10
10-Jun-14	24.60	31.60	75.00	98.00	5.20	12.00	2.10	1.60

11-Jun-14	24.50	29.70	82.00	96.00	13.50	7.00	0.00	1.40
12-Jun-14	24.50	30.50	77.00	96.00	0.70	4.00	1.20	1.80
13-Jun-14	25.10	31.00	71.00	92.00	4.20	7.00	3.50	2.30
14-Jun-14	25.60	30.60	73.00	93.00	24.40	9.00	0.90	2.10
15-Jun-14	25.70	31.30	75.00	96.00	10.50	5.00	1.80	1.60
16-Jun-14	24.90	31.10	70.00	96.00	0.00	8.00	4.90	1.90
17-Jun-14	25.00	32.00	65.00	93.00	27.20	15.00	6.30	3.10
18-Jun-14	24.60	31.40	71.00	96.00	29.70	7.00	0.50	2.40
19-Jun-14	24.00	32.40	65.00	96.00	39.20	6.00	6.50	2.20
20-Jun-14	25.10	32.10	68.00	93.00	51.60	3.00	5.90	2.40
21-Jun-14	23.60	30.00	76.00	98.00	58.50	3.00	1.70	1.00
22-Jun-14	23.80	28.00	81.00	97.00	18.80	5.00	0.20	0.90
23-Jun-14	23.10	28.10	79.00	98.00	4.30	3.00	0.00	1.40
24-Jun-14	24.40	31.60	68.00	94.00	32.70	1.80	6.40	2.90
25-Jun-14	23.50	31.50	71.00	98.00	0.00	12.00	7.00	2.60
26-Jun-14	24.00	31.30	63.00	93.00	5.00	4.00	5.00	2.80
27-Jun-14	26.10	33.60	62.00	90.00	50.00	5.00	9.40	3.60
28-Jun-14	23.80	30.00	78.00	95.00	41.60	8.00	0.00	1.20
29-Jun-14	24.20	28.00	84.00	98.00	13.20	2.00	0.00	1.00
30-Jun-14	23.00	28.40	76.00	96.00	0.00	6.00	0.60	0.80
01-Jul-14	23.30	32.70	68.00	94.00	22.40	13.00	6.60	2.20
02-Jul-14	24.50	32.10	70.00	96.00	20.00	6.00	6.80	2.20
03-Jul-14	25.00	28.20	78.00	96.00	0.00	8.00	4.60	1.70
04-Jul-14	26.00	32.00	73.00	92.00	27.00	5.00	4.30	2.50
05-Jul-14	24.70	32.00	71.00	91.00	0.00	5.00	5.80	2.50
06-Jul-14	25.00	31.20	71.00	93.00	63.60	1.00	5.80	2.40
07-Jul-14	22.80	31.50	70.00	98.00	7.00	5.00	1.90	1.80
08-Jul-14	24.20	29.90	75.00	97.00	10.80	15.00	5.00	1.60
09-Jul-14	24.60	31.70	74.00	95.00	1.20	13.00	8.40	2.20

10-Jul-14	24.50	31.20	65.00	94.00	12.80	10.00	2.80	2.90
11-Jul-14	25.00	31.80	65.00	95.00	3.20	6.00	1.10	2.10
12-Jul-14	25.50	31.20	69.00	95.00	14.20	3.00	4.30	3.50
13-Jul-14	25.10	31.50	69.00	92.00	41.40	3.00	3.50	2.60
14-Jul-14	23.50	32.50	65.00	98.00	35.00	10.00	5.50	2.00
15-Jul-14	23.30	29.60	75.00	99.00	6.20	8.00	2.90	1.70
16-Jul-14	23.50	31.80	66.00	98.00	0.60	3.00	7.20	2.70
17-Jul-14	24.50	31.40	72.00	93.00	30.20	5.00	5.50	2.80
18-Jul-14	24.80	29.50	76.00	94.00	18.00	2.00	0.00	1.60
19-Jul-14	23.50	30.00	75.00	97.00	3.80	9.00	0.60	1.70
20-Jul-14	23.80	28.00	75.00	94.00	32.50	1.00	0.00	1.30
21-Jul-14	22.80	31.10	75.00	97.00	26.80	9.00	3.10	1.10
22-Jul-14	23.70	30.20	76.00	97.00	31.50	2.00	2.90	1.00
23-Jul-14	24.30	26.80	86.00	97.00	2.10	3.00	0.00	1.10
24-Jul-14	23.70	30.10	75.00	96.00	11.80	5.00	1.40	2.50
25-Jul-14	25.20	31.30	68.00	94.00	32.00	7.00	5.00	2.20
26-Jul-14	24.50	31.50	70.00	97.00	24.80	5.00	2.60	1.70
27-Jul-14	24.80	28.50	86.00	93.00	72.80	4.00	1.40	1.20
28-Jul-14	23.10	27.70	88.00	98.00	50.00	2.00	0.00	0.50
29-Jul-14	23.00	30.30	70.00	98.00	27.00	4.00	3.10	1.90
30-Jul-14	22.70	27.40	88.00	98.00	100.00	3.00	0.30	0.60
31-Jul-14	24.00	26.80	91.00	98.00	203.00	3.00	0.00	0.60
01-Aug-14	23.80	27.90	82.00	99.00	87.00	4.00	0.00	1.00
02-Aug-14	24.30	28.00	81.00	98.00	10.60	8.00	0.00	0.70
03-Aug-14	24.50	28.50	81.00	99.00	63.50	1.00	0.20	1.20
04-Aug-14	23.50	30.30	77.00	98.00	27.20	3.00	0.20	1.60
05-Aug-14	24.00	27.50	87.00	97.00	41.00	3.00	0.00	0.80
06-Aug-14	23.50	28.70	80.00	98.00	0.00	10.00	0.50	1.00
07-Aug-14	23.50	29.50	78.00	94.00	0.00	5.00	1.70	2.20

08-Aug-14	25.30	32.30	63.00	92.00	0.00	5.00	9.10	2.90
09-Aug-14	25.20	32.50	60.00	92.00	0.00	4.00	2.80	2.90
10-Aug-14	26.00	33.70	61.00	88.00	0.00	3.00	8.40	3.10
11-Aug-14	26.00	33.50	61.00	87.00	6.40	4.00	7.00	2.80
12-Aug-14	25.30	34.40	57.00	92.00	0.00	2.00	8.70	2.80
13-Aug-14	24.50	30.20	80.00	93.00	3.20	8.00	2.70	1.80
14-Aug-14	24.60	31.50	69.00	95.00	0.00	4.00	1.50	2.10
15-Aug-14	25.50	32.20	71.00	94.00	0.00	3.00	0.80	1.60
16-Aug-14	25.30	30.80	73.00	93.00	0.00	5.00	6.40	1.90
17-Aug-14	25.80	34.20	63.00	93.00	0.60	4.00	8.80	2.80
18-Aug-14	24.80	32.80	68.00	92.00	7.80	12.00	5.80	2.10
19-Aug-14	24.60	33.20	63.00	95.00	0.00	2.00	6.00	2.70
20-Aug-14	25.30	30.70	72.00	94.00	1.60	2.00	1.60	1.50
21-Aug-14	25.00	31.70	75.00	92.00	0.00	4.00	3.20	1.70
22-Aug-14	25.80	33.20	67.00	93.00	0.00	2.00	2.50	2.30
23-Aug-14	26.50	34.20	63.00	92.00	5.00	3.00	8.30	2.70
24-Aug-14	26.10	34.80	54.00	89.00	2.00	1.00	8.60	2.70
25-Aug-14	25.10	30.40	76.00	95.00	29.20	8.00	1.90	1.50
26-Aug-14	24.20	30.60	69.00	97.00	3.20	3.00	4.50	1.70
27-Aug-14	24.00	31.60	67.00	95.00	44.20	2.00	4.10	1.50
28-Aug-14	24.10	31.00	69.00	96.00	4.40	7.00	1.20	1.00
29-Aug-14	24.40	30.10	71.00	95.00	62.00	3.00	3.00	2.00
30-Aug-14	23.60	31.00	65.00	94.00	6.00	1.00	3.40	1.70
31-Aug-14	23.50	31.50	67.00	97.00	30.20	5.00	4.90	1.30
01-Sep-14	22.90	29.20	79.00	96.00	18.00	5.00	1.00	1.00
02-Sep-14	23.60	28.60	85.00	97.00	0.00	6.00	0.00	1.20
03-Sep-14	24.20	32.00	69.00	96.00	4.80	4.00	5.50	2.00
04-Sep-14	23.80	32.90	65.00	96.00	0.00	3.00	6.50	2.10
05-Sep-14	24.70	32.00	67.00	92.00	20.20	3.00	7.70	2.00

06-Sep-14	23.60	32.00	68.00	94.00	0.00	8.00	4.40	2.00
07-Sep-14	23.70	31.70	69.00	96.00	0.00	2.00	3.70	1.80
08-Sep-14	24.20	32.90	61.00	91.00	0.00	4.00	9.10	2.70
09-Sep-14	25.50	30.70	71.00	90.00	4.00	3.00	1.30	2.20
10-Sep-14	24.00	32.20	66.00	93.00	0.00	3.00	3.60	2.00
11-Sep-14	24.20	31.80	67.00	92.00	11.60	3.00	4.20	1.90
12-Sep-14	24.80	29.30	81.00	96.00	7.00	2.00	0.50	1.40
13-Sep-14	24.70	31.80	71.00	93.00	0.00	4.00	3.00	1.80
14-Sep-14	24.80	31.70	68.00	92.00	0.00	5.00	5.70	1.90
15-Sep-14	24.40	31.20	66.00	93.00	4.00	4.00	1.10	1.70
16-Sep-14	25.00	28.50	79.00	91.00	5.00	7.00	0.00	2.00
17-Sep-14	24.30	29.70	79.00	92.00	0.00	7.00	2.30	2.00
18-Sep-14	24.40	32.60	62.00	94.00	0.00	4.00	6.90	2.10
19-Sep-14	25.70	34.40	59.00	95.00	0.00	3.00	10.80	2.40
20-Sep-14	25.00	34.20	61.00	91.00	20.00	4.00	8.20	3.60
21-Sep-14	24.50	32.50	67.00	91.00	8.80	5.00	2.60	2.30
22-Sep-14	23.50	31.10	75.00	95.00	0.00	3.00	0.90	1.60
23-Sep-14	24.20	30.80	71.00	93.00	0.00	4.00	5.30	2.30
24-Sep-14	24.80	30.60	80.00	96.00	0.00	3.00	2.10	1.40
25-Sep-14	24.50	30.00	75.00	96.00	0.00	3.00	3.10	1.40
26-Sep-14	25.00	32.70	61.00	92.00	0.00	1.00	8.70	2.40
27-Sep-14	25.90	33.50	63.00	92.00	25.20	5.00	7.20	2.30
28-Sep-14	24.30	32.50	78.00	94.00	0.00	4.00	4.60	1.50
29-Sep-14	23.60	31.20	72.00	95.00	32.80	2.00	5.80	2.20
30-Sep-14	23.00	33.20	66.00	97.00	0.00	7.00	8.30	2.50
01-Oct-14	23.30	32.20	60.00	93.00	0.00	2.00	9.10	2.10
02-Oct-14	24.00	33.50	63.00	91.00	0.00	4.00	10.70	2.90
03-Oct-14	24.50	33.60	53.00	86.00	0.00	6.00	10.60	3.40
04-Oct-14	24.10	34.00	57.00	92.00	0.00	5.00	10.20	3.50

05-Oct-14	23.80	32.20	65.00	92.00	10.40	4.00	7.00	2.20
06-Oct-14	22.50	31.30	62.00	96.00	0.00	5.00	4.70	3.10
07-Oct-14	22.60	31.20	62.00	83.00	0.00	5.00	7.70	3.40
08-Oct-14	21.80	31.80	59.00	88.00	0.00	1.00	2.60	3.50
09-Oct-14	21.80	32.50	51.00	91.00	0.00	3.00	10.10	3.30
10-Oct-14	21.60	32.40	50.00	88.00	0.00	3.00	9.20	4.20
11-Oct-14	22.00	32.50	53.00	89.00	0.00	4.00	8.80	3.40
12-Oct-14	22.30	33.00	51.00	86.00	0.00	3.00	8.20	4.10
13-Oct-14	21.80	33.00	55.00	88.00	0.00	4.00	6.40	4.60
14-Oct-14	21.60	32.30	51.00	80.00	0.00	7.00	8.30	6.00
15-Oct-14	21.60	33.20	50.00	83.00	0.00	3.00	9.40	4.40
16-Oct-14	21.80	34.10	52.00	89.00	9.00	4.00	9.30	3.60
17-Oct-14	22.00	33.40	53.00	88.00	0.00	6.00	8.50	2.60
18-Oct-14	22.30	30.80	64.00	86.00	0.00	2.00	3.20	2.40
19-Oct-14	24.00	33.10	53.00	92.00	0.00	3.00	8.00	2.40
20-Oct-14	24.50	33.10	61.00	94.00	0.00	4.00	9.80	2.10
21-Oct-14	24.60	34.80	56.00	90.00	0.00	3.00	10.70	2.50
22-Oct-14	24.00	33.70	55.00	95.00	0.00	6.00	6.00	1.80
23-Oct-14	24.00	33.60	60.00	96.00	0.00	4.00	8.20	2.20
24-Oct-14	24.20	32.50	63.00	92.00	0.00	4.00	5.50	2.30
25-Oct-14	24.00	32.40	60.00	91.00	12.20	5.00	6.00	1.90
26-Oct-14	24.10	33.70	59.00	94.00	11.00	5.00	7.70	1.70
27-Oct-14	23.60	32.10	63.00	95.00	0.00	5.00	7.30	1.40
28-Oct-14	24.20	32.80	63.00	93.00	0.00	4.00	7.50	1.70
29-Oct-14	23.70	33.60	59.00	93.00	8.50	5.00	8.00	2.00
30-Oct-14	23.20	34.00	60.00	96.00	0.00	9.00	8.20	2.20
31-Oct-14	24.20	33.10	54.00	94.00	0.00	3.00	8.50	2.10
01-Nov-14	24.00	34.20	57.00	96.00	0.00	3.00	9.00	2.20
02-Nov-14	21.80	33.50	50.00	92.00	0.00	3.00	10.60	3.30

03-Nov-14	21.80	33.40	48.00	96.00	8.60	2.00	10.40	3.10
04-Nov-14	23.20	33.70	59.00	94.00	0.00	7.00	9.30	2.40
05-Nov-14	23.00	33.60	62.00	95.00	3.00	6.00	8.70	2.60
06-Nov-14	24.50	34.50	64.00	92.00	0.00	5.00	8.90	2.60
07-Nov-14	23.60	34.40	50.00	87.00	0.00	8.00	10.70	2.80
08-Nov-14	23.50	34.50	51.00	93.00	0.00	4.00	9.60	2.90
09-Nov-14	23.20	34.20	54.00	92.00	0.00	3.00	9.40	3.00
10-Nov-14	23.00	34.10	49.00	89.00	0.00	3.00	10.60	3.20
11-Nov-14	23.20	34.90	50.00	91.00	0.00	3.00	10.10	3.10
12-Nov-14	23.50	34.10	51.00	83.00	1.50	3.00	7.90	3.40
13-Nov-14	23.10	30.80	66.00	83.00	0.00	6.00	1.90	3.60
14-Nov-14	21.20	32.10	56.00	87.00	0.00	7.00	6.40	4.00
15-Nov-14	21.50	34.00	53.00	90.00	0.00	4.00	9.30	3.50
16-Nov-14	22.00	34.20	49.00	89.00	0.00	3.00	9.90	3.20
17-Nov-14	21.30	33.60	46.00	82.00	0.00	6.00	7.70	6.20
18-Nov-14	19.80	31.40	48.00	81.00	0.00	6.00	8.60	6.00
19-Nov-14	19.60	32.40	44.00	82.00	0.00	4.00	9.20	5.00
20-Nov-14	19.10	32.90	50.00	87.00	0.00	3.00	9.80	4.00
21-Nov-14	20.10	34.00	45.00	88.00	0.00	3.00	10.00	4.10
22-Nov-14	21.00	34.00	48.00	88.00	0.00	3.00	9.60	3.80
23-Nov-14	23.50	34.40	48.00	91.00	0.00	2.00	5.10	3.60
24-Nov-14	22.80	35.10	53.00	87.00	0.00	3.00	8.60	4.00
25-Nov-14	22.90	35.20	53.00	93.00	0.00	3.00	8.40	3.20
26-Nov-14	24.30	35.20	43.00	89.00	0.00	2.00	9.50	3.10
27-Nov-14	24.50	35.00	50.00	92.00	0.00	2.00	9.90	3.50
28-Nov-14	24.00	36.40	53.00	91.00	0.00	3.00	10.10	3.90
29-Nov-14	22.90	34.40	58.00	91.00	0.00	3.00	3.60	2.90
30-Nov-14	23.10	29.60	63.00	87.00	0.30	2.00	0.40	2.40
01-Dec-14	23.50	31.80	65.00	96.00	0.00	4.00	4.40	1.90

02-Dec-14	22.50	31.50	66.00	96.00	1.80	5.00	5.00	2.30
03-Dec-14	22.50	32.80	63.00	91.00	3.00	3.00	6.70	2.10
04-Dec-14	20.60	32.10	61.00	93.00	0.00	5.00	7.30	3.10
05-Dec-14	20.80	32.00	51.00	80.00	0.00	4.00	10.00	5.60
06-Dec-14	21.50	32.60	54.00	96.00	0.00	5.00	8.80	3.00
07-Dec-14	21.00	33.50	52.00	90.00	0.00	8.00	9.80	4.70
08-Dec-14	18.80	31.40	55.00	88.00	0.00	4.00	8.90	4.30
09-Dec-14	19.60	32.20	44.00	89.00	0.00	3.00	10.50	3.50
10-Dec-14	19.00	32.70	52.00	87.00	0.00	4.00	10.40	4.70
11-Dec-14	19.50	32.00	43.00	79.00	0.00	9.00	9.50	5.50
12-Dec-14	19.20	30.50	55.00	79.00	0.00	10.00	8.70	4.70
13-Dec-14	18.50	29.60	59.00	80.00	0.00	8.00	10.30	5.20
14-Dec-14	18.30	31.60	58.00	83.00	0.00	7.00	9.20	3.70
15-Dec-14	18.00	31.70	45.00	88.00	0.00	5.00	8.00	3.50
16-Dec-14	17.50	30.00	48.00	79.00	0.00	13.00	5.50	7.40
17-Dec-14	17.40	26.70	45.00	71.00	0.00	10.00	4.60	6.20
18-Dec-14	17.20	29.20	43.00	76.00	0.00	4.00	8.10	4.90
19-Dec-14	17.00	30.10	45.00	79.00	0.00	4.00	7.90	4.70
20-Dec-14	17.00	30.80	40.00	81.00	0.00	3.00	10.10	4.40
21-Dec-14	19.10	31.60	40.00	76.00	0.00	13.00	8.40	6.60
22-Dec-14	14.80	28.80	41.00	85.00	0.00	10.00	5.80	5.30
23-Dec-14	15.00	31.00	38.00	89.00	0.00	4.00	9.90	4.80
24-Dec-14	19.50	32.60	47.00	82.00	0.00	3.00	8.70	4.30
25-Dec-14	20.10	34.10	46.00	83.00	0.00	2.00	8.60	4.70
26-Dec-14	22.60	34.50	44.00	92.00	0.00	3.00	7.30	4.50
27-Dec-14	22.00	35.50	43.00	88.00	0.00	3.00	7.20	3.40
28-Dec-14	18.00	30.30	43.00	76.00	0.00	9.00	10.60	6.80
29-Dec-14	14.90	29.30	39.00	76.00	0.00	4.00	9.40	4.80
30-Dec-14	14.50	29.70	21.00	78.00	0.00	7.00	10.10	5.10

31-Dec-14	15.30	29.40	28.00	76.00	0.00	4.00	10.10	5.40
01-Jan-15	15.30	28.80	37.00	75.00	0.00	7.00	5.10	5.80
02-Jan-15	14.80	30.40	38.00	77.00	0.00	3.00	9.10	4.50
03-Jan-15	17.10	30.40	39.00	83.00	0.00	3.00	6.60	3.70
04-Jan-15	18.00	32.50	37.00	89.00	0.00	3.00	9.50	3.20
05-Jan-15	19.50	33.60	39.00	89.00	0.00	2.00	9.70	4.10
06-Jan-15	21.50	33.80	40.00	89.00	0.00	3.00	4.50	3.00
07-Jan-15	21.00	34.30	45.00	91.00	0.00	4.00	6.00	3.20
08-Jan-15	20.90	33.40	38.00	73.00	0.00	5.00	7.20	5.20
09-Jan-15	19.70	32.00	38.00	82.00	0.00	3.00	8.80	4.30
10-Jan-15	18.50	32.00	39.00	80.00	0.00	4.00	10.00	5.00
11-Jan-15	17.10	31.20	40.00	73.00	0.00	5.00	8.10	4.40
12-Jan-15	16.70	29.60	39.00	78.00	0.00	9.00	9.40	5.90
13-Jan-15	14.70	28.80	33.00	76.00	0.00	7.00	10.50	5.40
14-Jan-15	14.30	29.00	28.00	74.00	0.00	5.00	10.60	5.00
15-Jan-15	13.90	28.60	31.00	77.00	0.00	3.00	9.60	4.40
16-Jan-15	14.10	28.40	32.00	76.00	0.00	4.00	10.10	4.60
17-Jan-15	15.30	29.60	39.00	84.00	0.00	5.00	7.90	3.90
18-Jan-15	16.50	30.20	26.00	80.00	0.00	5.00	9.40	5.40
19-Jan-15	15.50	29.00	41.00	78.00	0.00	4.00	7.80	3.50
20-Jan-15	15.20	30.30	32.00	82.00	0.00	3.00	9.90	3.60
21-Jan-15	15.00	31.90	24.00	81.00	0.00	5.00	9.90	5.70
22-Jan-15	16.00	31.00	26.00	81.00	0.00	4.00	9.80	5.40
23-Jan-15	16.80	31.90	26.00	80.00	0.00	3.00	9.90	5.10
24-Jan-15	16.60	32.10	30.00	75.00	0.00	4.00	9.50	4.30
25-Jan-15	17.00	33.60	26.00	85.00	0.00	2.00	9.00	7.60
26-Jan-15	17.70	33.00	30.00	81.00	0.00	4.00	7.50	4.40
27-Jan-15	18.30	33.80	30.00	81.00	0.00	5.00	9.30	5.10
28-Jan-15	19.80	34.00	30.00	79.00	0.00	4.00	9.30	5.30

29-Jan-15	19.70	34.00	31.00	78.00	0.00	5.00	9.50	5.10
30-Jan-15	19.00	32.40	38.00	83.00	0.00	3.00	9.20	4.70
31-Jan-15	17.80	32.80	24.00	70.00	0.00	5.00	9.80	6.10
01-Feb-15	17.80	32.60	34.00	73.00	0.00	3.00	10.00	5.60
02-Feb-15	19.30	31.80	38.00	74.00	0.00	4.00	7.50	4.60
03-Feb-15	18.60	32.70	33.00	77.00	0.00	5.00	8.50	5.50
04-Feb-15	18.00	33.40	27.00	79.00	0.00	3.00	10.70	5.30
05-Feb-15	17.80	32.00	29.00	74.00	0.00	5.00	10.40	6.70
06-Feb-15	17.00	31.20	35.00	80.00	0.00	5.00	10.50	6.20
07-Feb-15	17.20	31.50	28.00	78.00	0.00	3.00	9.60	5.30
08-Feb-15	16.00	32.60	33.00	81.00	0.00	6.00	9.30	6.30
09-Feb-15	15.50	31.80	31.00	84.00	0.00	4.00	9.30	5.50
10-Feb-15	16.40	31.50	26.00	76.00	0.00	3.00	10.10	5.50
11-Feb-15	19.20	31.50	31.00	77.00	0.00	4.00	9.30	5.60
12-Feb-15	19.70	32.30	36.00	79.00	0.00	3.00	8.80	5.40
13-Feb-15	20.20	32.20	38.00	82.00	0.00	3.00	9.30	6.00
14-Feb-15	21.00	30.70	41.00	78.00	0.00	6.00	8.20	6.80
15-Feb-15	22.10	31.50	46.00	76.00	0.00	7.00	6.10	4.90
16-Feb-15	22.00	34.30	40.00	80.00	0.00	3.00	8.50	5.30
17-Feb-15	22.50	32.70	47.00	77.00	0.00	4.00	8.40	5.30
18-Feb-15	24.00	34.30	34.00	73.00	0.00	4.00	7.50	5.50
19-Feb-15	23.70	28.60	59.00	86.00	0.00	2.00	0.00	2.60
20-Feb-15	23.80	33.70	39.00	81.00	2.80	3.00	4.40	4.50
21-Feb-15	23.80	32.50	51.00	81.00	0.00	6.00	5.50	3.90
22-Feb-15	24.00	32.40	54.00	87.00	0.00	3.00	6.80	3.30
23-Feb-15	24.00	35.40	41.00	87.00	0.00	3.00	9.30	4.60
24-Feb-15	24.20	35.20	45.00	79.00	0.00	7.00	8.80	5.60
25-Feb-15	25.70	35.20	46.00	79.00	0.00	5.00	7.80	6.20
26-Feb-15	25.30	36.30	42.00	78.00	0.00	4.00	8.50	5.60

27-Feb-15	25.00	36.20	38.00	80.00	0.00	4.00	7.40	5.60
28-Feb-15	25.20	36.50	39.00	84.00	0.00	5.00	8.20	7.10
01-Mar-15	24.70	37.30	36.00	70.00	0.00	5.00	8.70	8.00
02-Mar-15	24.20	35.50	36.00	68.00	0.00	4.00	9.00	8.20
03-Mar-15	25.00	33.70	51.00	76.00	0.00	7.00	5.00	6.80
04-Mar-15	25.40	35.80	45.00	78.00	0.00	8.00	8.00	7.40
05-Mar-15	25.20	35.20	43.00	78.00	0.00	7.00	9.80	8.10
06-Mar-15	26.60	36.40	39.00	75.00	0.00	5.00	8.30	7.70
07-Mar-15	24.60	33.30	51.00	72.00	0.00	5.00	1.80	6.00
08-Mar-15	24.80	36.00	36.00	73.00	0.00	8.00	9.10	6.90
09-Mar-15	25.10	36.30	40.00	65.00	0.00	5.00	8.10	7.00
10-Mar-15	24.00	35.80	40.00	66.00	0.00	5.00	7.50	7.30
11-Mar-15	24.20	35.20	35.00	65.00	0.00	2.00	7.70	5.80
12-Mar-15	25.10	36.20	36.00	64.00	0.00	4.00	7.40	5.70
13-Mar-15	26.20	34.30	43.00	68.00	0.00	5.00	6.30	8.30
14-Mar-15	25.30	34.80	45.00	75.00	0.00	9.00	5.70	6.30
15-Mar-15	25.50	35.40	45.00	78.00	0.00	5.00	6.30	6.40
16-Mar-15	26.30	35.30	47.00	77.00	0.00	5.00	7.10	7.10
17-Mar-15	26.30	36.30	42.00	77.00	0.00	6.00	8.30	8.00
18-Mar-15	26.60	36.50	42.00	77.00	0.00	6.00	7.80	7.50
19-Mar-15	27.00	37.30	41.00	73.00	0.00	6.00	6.70	6.90
20-Mar-15	26.00	35.30	47.00	74.00	0.00	6.00	5.00	7.40
21-Mar-15	25.00	36.00	32.00	61.00	0.00	7.00	5.80	7.60
22-Mar-15	24.40	35.50	28.00	64.00	0.00	5.00	5.30	6.80
23-Mar-15	24.00	35.30	34.00	67.00	0.00	4.00	7.30	7.10
24-Mar-15	23.50	35.80	34.00	65.00	0.00	5.00	7.20	8.00
25-Mar-15	23.70	36.00	37.00	71.00	0.80	8.00	7.30	8.00
26-Mar-15	24.00	36.00	37.00	80.00	0.00	4.00	7.90	6.10
27-Mar-15	24.00	35.80	40.00	78.00	0.00	4.00	6.80	6.20

28-Mar-15	24.10	37.20	33.00	78.00	15.00	1.00	10.10	6.50
29-Mar-15	23.00	37.40	37.00	67.00	0.00	1.80	6.70	6.40
30-Mar-15	23.00	32.40	50.00	87.00	0.00	4.00	7.10	4.50
31-Mar-15	23.80	37.00	39.00	83.00	0.00	6.00	9.60	6.80
01-Apr-15	26.30	36.20	50.00	79.00	0.00	8.00	7.40	5.90
02-Apr-15	26.20	35.80	47.00	80.00	0.00	5.00	7.90	6.50
03-Apr-15	27.00	37.30	41.00	75.00	0.00	4.00	9.20	7.50
04-Apr-15	28.00	36.50	43.00	72.00	0.00	7.00	9.10	7.70
05-Apr-15	27.30	37.50	45.00	74.00	0.00	4.00	6.80	7.60
06-Apr-15	27.50	36.20	46.00	74.00	2.60	3.00	3.80	6.40
07-Apr-15	26.00	37.40	43.00	77.00	0.00	8.00	9.30	6.60
08-Apr-15	25.30	36.80	34.00	71.00	0.00	5.00	8.90	8.20
09-Apr-15	25.80	36.00	35.00	71.00	0.00	3.00	8.50	6.80
10-Apr-15	26.00	36.70	38.00	72.00	10.00	4.00	8.90	7.70
11-Apr-15	24.50	35.70	45.00	86.00	0.00	6.00	5.60	4.50
12-Apr-15	21.70	34.40	41.00	72.00	0.00	8.00	6.70	7.50
13-Apr-15	21.20	34.60	29.00	60.00	0.00	7.00	10.40	8.40
14-Apr-15	21.40	35.80	22.00	63.00	0.00	2.00	10.70	7.20
15-Apr-15	22.40	36.20	25.00	65.00	0.00	4.00	11.10	7.40
16-Apr-15	24.00	37.50	26.00	54.00	0.00	8.00	10.40	8.00
17-Apr-15	25.80	36.40	42.00	63.00	0.00	6.00	9.70	9.40
18-Apr-15	28.00	37.20	41.00	69.00	0.00	3.00	9.60	8.90
19-Apr-15	28.00	38.70	36.00	72.00	0.00	4.00	9.30	8.50
20-Apr-15	29.10	39.60	32.00	66.00	42.00	3.00	9.60	8.10
21-Apr-15	24.50	40.20	36.00	84.00	0.00	2.10	8.30	7.20
22-Apr-15	24.40	34.20	43.00	74.00	0.00	2.00	2.90	5.40
23-Apr-15	25.40	35.10	41.00	78.00	0.00	3.00	9.50	5.90
24-Apr-15	25.00	35.00	47.00	81.00	0.00	9.00	5.90	4.60
25-Apr-15	25.30	35.20	41.00	85.00	0.00	4.00	9.90	6.00

26-Apr-15	25.50	35.50	40.00	78.00	26.00	3.00	9.90	6.10
27-Apr-15	27.20	37.80	35.00	76.00	0.00	3.00	10.30	6.30
28-Apr-15	24.60	35.60	48.00	87.00	0.00	5.00	6.70	4.50
29-Apr-15	26.60	35.80	49.00	82.00	26.00	8.00	8.10	5.30
30-Apr-15	24.50	37.10	40.00	95.00	0.00	4.00	9.00	4.60
01-May-15	26.00	35.70	47.00	89.00	0.00	4.00	7.40	5.10
02-May-15	21.40	33.00	61.00	88.00	0.00	5.00	2.20	3.90
03-May-15	24.60	36.00	46.00	87.00	0.00	3.00	9.00	6.10
04-May-15	27.60	36.30	48.00	82.00	0.00	3.00	6.90	5.70
05-May-15	25.40	37.20	49.00	85.00	0.00	15.00	8.30	6.00
06-May-15	25.20	35.30	52.00	77.00	0.00	5.00	6.70	5.10
07-May-15	27.00	35.40	53.00	81.00	0.00	4.00	5.50	5.50
08-May-15	27.20	36.70	45.00	83.00	0.00	5.00	7.00	5.50
09-May-15	27.60	35.80	49.00	77.00	0.00	10.00	9.20	4.20
10-May-15	27.50	36.10	45.00	79.00	0.00	4.00	7.80	5.30
11-May-15	26.80	36.70	46.00	77.00	28.40	4.00	9.90	6.20
12-May-15	24.30	37.10	43.00	95.00	0.00	8.00	10.40	4.80
13-May-15	25.30	34.80	53.00	89.00	1.20	5.00	10.60	4.30
14-May-15	25.70	33.40	61.00	90.00	0.00	5.00	5.70	3.20
15-May-15	27.70	35.60	49.00	85.00	0.00	2.00	9.50	4.40
16-May-15	27.00	35.80	50.00	78.00	6.10	4.00	9.90	5.60
17-May-15	26.20	33.10	65.00	81.00	0.00	5.00	7.40	6.20
18-May-15	26.20	33.30	60.00	86.00	22.20	5.00	3.40	3.70
19-May-15	25.80	32.80	65.00	95.00	0.00	7.00	0.90	2.30
20-May-15	25.60	33.20	61.00	91.00	9.00	10.00	4.00	4.20
21-May-15	25.50	34.80	53.00	86.00	31.00	6.00	10.60	4.30
22-May-15	24.40	34.70	56.00	96.00	7.30	3.00	8.90	4.10
23-May-15	24.50	32.30	64.00	92.00	0.00	6.00	5.70	3.00
24-May-15	25.00	31.90	60.00	87.00	0.00	5.00	7.70	5.00

25-May-15	25.70	33.90	55.00	83.00	0.00	4.00	10.70	5.10
26-May-15	26.50	33.20	58.00	85.00	0.00	5.00	11.60	4.80
27-May-15	27.00	33.80	55.00	82.00	0.00	5.00	10.80	4.60
28-May-15	27.50	34.70	52.00	78.00	0.00	3.00	10.90	5.50
29-May-15	28.50	35.80	48.00	78.00	0.00	4.00	11.60	6.50
30-May-15	28.20	35.90	47.00	79.00	0.00	3.00	9.80	5.70
31-May-15	28.30	34.80	56.00	80.00	77.50	3.00	6.00	5.10
01-Jun-15	26.60	36.60	49.00	81.00	8.70	14.00	10.00	5.80
02-Jun-15	23.60	31.00	64.00	98.00	0.00	5.00	3.10	2.90
03-Jun-15	26.00	33.80	58.00	87.00	0.00	7.00	11.90	4.30
04-Jun-15	27.20	34.40	56.00	85.00	0.00	2.00	7.50	3.60
05-Jun-15	27.90	35.40	57.00	82.00	0.00	7.00	7.30	4.10
06-Jun-15	26.10	34.00	63.00	80.00	0.00	7.00	6.20	4.40
07-Jun-15	26.50	32.20	59.00	91.00	0.00	4.00	9.60	3.50
08-Jun-15	26.50	35.40	49.00	85.00	0.00	4.00	10.20	3.90
09-Jun-15	26.80	34.80	46.00	83.00	0.00	4.00	11.50	5.40
10-Jun-15	28.50	36.80	40.00	72.00	0.00	3.00	11.70	6.10
11-Jun-15	27.50	35.80	51.00	75.00	49.20	4.00	7.60	5.30
12-Jun-15	24.10	34.50	56.00	80.00	0.00	4.00	4.40	2.80
13-Jun-15	25.30	32.30	58.00	93.00	0.00	4.00	3.00	3.00
14-Jun-15	25.20	33.80	59.00	86.00	14.00	3.00	5.50	3.10
15-Jun-15	24.40	33.50	58.00	93.00	1.30	10.00	5.60	2.80
16-Jun-15	25.30	33.00	60.00	89.00	2.40	2.00	5.60	2.90
17-Jun-15	25.50	32.40	63.00	94.00	0.00	6.00	6.20	2.80
18-Jun-15	25.20	33.20	59.00	93.00	1.20	7.00	4.00	2.70
19-Jun-15	25.80	31.80	65.00	96.00	42.20	2.00	1.90	2.50
20-Jun-15	24.50	32.00	66.00	92.00	24.00	1.00	2.50	1.60
21-Jun-15	24.00	29.50	79.00	96.00	4.00	4.00	0.00	1.20
22-Jun-15	24.00	28.40	84.00	95.00	8.70	3.00	0.00	1.40

23-Jun-15	25.90	27.00	81.00	96.00	4.20	3.00	0.00	1.10
24-Jun-15	24.10	27.80	81.00	93.00	6.60	5.00	0.00	1.40
25-Jun-15	24.50	30.80	74.00	91.00	10.40	10.00	2.60	2.20
26-Jun-15	24.00	31.20	76.00	96.00	8.20	4.00	3.80	2.10
27-Jun-15	24.70	31.50	68.00	88.00	0.00	7.00	5.90	2.20
28-Jun-15	25.00	33.90	54.00	91.00	0.00	4.00	9.40	2.90
29-Jun-15	26.70	34.60	54.00	87.00	0.00	3.00	9.20	3.40
30-Jun-15	26.30	34.30	56.00	85.00	0.00	6.00	9.00	5.00
01-Jul-15	27.80	34.50	54.00	79.00	0.00	2.00	10.20	4.50
02-Jul-15	27.80	35.90	49.00	79.00	0.00	4.00	10.80	4.80
03-Jul-15	28.60	34.80	56.00	78.00	0.00	3.00	10.00	4.40
04-Jul-15	28.70	35.90	50.00	79.00	0.00	4.00	8.30	5.20
05-Jul-15	26.50	34.70	53.00	78.00	4.00	6.00	4.00	4.50
06-Jul-15	24.40	33.10	61.00	92.00	1.80	5.00	6.00	4.50
07-Jul-15	24.50	32.70	64.00	92.00	49.00	7.00	4.80	1.90
08-Jul-15	24.80	30.80	72.00	98.00	19.90	3.00	2.20	1.00
09-Jul-15	23.00	30.40	74.00	98.00	0.00	5.00	5.20	2.20
10-Jul-15	23.80	32.70	59.00	95.00	53.80	4.00	8.10	2.60
11-Jul-15	23.50	34.00	55.00	94.00	38.60	3.00	6.20	2.40
12-Jul-15	23.50	26.40	92.00	100.00	35.80	4.00	0.00	0.60
13-Jul-15	24.70	29.90	78.00	98.00	2.60	5.00	2.40	1.30
14-Jul-15	25.00	29.80	75.00	94.00	7.20	6.00	0.00	1.40
15-Jul-15	25.30	31.70	69.00	92.00	2.00	6.00	3.60	2.00
16-Jul-15	25.50	30.00	72.00	92.00	3.10	4.00	0.30	2.30
17-Jul-15	26.20	30.50	75.00	94.00	10.00	3.00	0.90	1.40
18-Jul-15	24.60	30.50	71.00	97.00	7.70	1.00	0.00	1.80
19-Jul-15	24.00	27.70	84.00	96.00	6.30	1.00	0.00	0.90
20-Jul-15	23.20	29.30	74.00	94.00	4.20	12.00	0.30	2.20
21-Jul-15	24.00	31.60	70.00	93.00	0.00	6.00	1.30	2.30

22-Jul-15	25.20	31.30	66.00	88.00	0.00	5.00	1.90	2.60
23-Jul-15	24.90	34.00	56.00	90.00	24.20	5.00	3.90	2.70
24-Jul-15	25.80	34.00	52.00	87.00	0.00	3.00	11.00	3.50
25-Jul-15	24.60	30.80	72.00	85.00	7.40	4.00	0.00	1.50
26-Jul-15	24.10	26.60	86.00	96.00	7.70	3.00	0.00	0.70
27-Jul-15	23.10	28.10	76.00	94.00	2.10	6.00	0.00	1.20
28-Jul-15	22.50	26.00	82.00	93.00	8.40	5.00	0.00	1.20
29-Jul-15	22.00	27.80	67.00	92.00	1.00	5.00	0.00	1.60
30-Jul-15	21.50	26.60	74.00	93.00	4.40	5.00	0.00	1.50
31-Jul-15	23.00	27.30	77.00	96.00	9.70	3.00	0.00	1.30
01-Aug-15	23.20	28.00	77.00	96.00	6.20	1.00	0.00	0.80
02-Aug-15	24.50	28.00	81.00	93.00	23.80	2.00	0.00	1.10
03-Aug-15	23.90	31.50	69.00	95.00	41.80	12.00	3.10	1.20
04-Aug-15	24.00	32.20	64.00	97.00	0.00	8.00	5.80	1.50
05-Aug-15	24.20	31.30	67.00	95.00	0.00	3.00	6.00	1.80
06-Aug-15	25.20	32.00	66.00	89.00	11.00	5.00	5.60	2.10
07-Aug-15	24.00	29.10	77.00	93.00	0.00	3.00	2.00	1.20
08-Aug-15	24.20	31.30	70.00	96.00	7.40	3.00	3.90	2.00
09-Aug-15	25.20	33.50	65.00	96.00	36.00	4.00	4.50	1.80
10-Aug-15	23.10	30.80	72.00	97.00	1.80	4.00	2.50	1.10
11-Aug-15	24.10	32.00	72.00	95.00	24.80	3.00	7.90	1.70
12-Aug-15	25.00	28.80	83.00	96.00	0.00	3.00	0.00	0.80
13-Aug-15	25.10	32.40	69.00	93.00	0.00	3.00	4.70	2.10
14-Aug-15	26.20	33.10	63.00	87.00	0.00	4.00	9.80	2.80
15-Aug-15	26.80	34.30	56.00	90.00	0.00	2.00	9.00	2.60
16-Aug-15	27.00	34.00	56.00	91.00	0.00	3.00	8.00	3.00
17-Aug-15	26.50	34.70	59.00	88.00	0.00	3.00	8.10	3.30
18-Aug-15	25.80	34.70	57.00	88.00	0.00	4.00	7.80	3.10
19-Aug-15	26.00	35.10	60.00	90.00	33.80	3.00	7.80	3.10

20-Aug-15	23.50	35.00	59.00	96.00	11.60	13.00	6.70	2.80
21-Aug-15	24.80	33.70	59.00	90.00	0.00	3.00	7.70	2.70
22-Aug-15	25.00	34.00	86.00	91.00	0.00	3.00	8.50	2.60
23-Aug-15	25.80	33.00	58.00	92.00	0.00	2.00	9.30	3.00
24-Aug-15	26.50	33.70	60.00	89.00	66.80	3.00	7.20	3.00
25-Aug-15	24.30	30.40	73.00	95.00	78.40	3.00	1.50	1.60
26-Aug-15	24.00	27.20	90.00	97.00	27.60	2.00	0.00	0.50
27-Aug-15	23.40	27.80	93.00	97.00	1.50	4.00	0.00	0.80
28-Aug-15	25.00	31.00	67.00	92.00	0.00	4.00	2.30	1.90
29-Aug-15	25.20	31.50	67.00	92.00	5.20	4.00	1.70	2.50
30-Aug-15	25.00	30.60	72.00	92.00	31.70	5.00	1.00	1.60
31-Aug-15	23.50	30.00	79.00	97.00	23.40	4.00	0.50	0.90
01-Sep-15	24.30	29.80	75.00	93.00	12.20	10.00	1.00	1.10
02-Sep-15	24.70	31.50	66.00	94.00	0.00	5.00	1.60	1.80
03-Sep-15	24.80	32.10	61.00	92.00	6.00	4.00	8.00	2.90
04-Sep-15	25.50	32.20	67.00	92.00	4.00	3.00	3.20	2.60
05-Sep-15	25.40	33.00	64.00	92.00	0.00	4.00	4.30	2.30
06-Sep-15	25.60	33.90	54.00	96.00	0.00	1.00	9.70	3.30
07-Sep-15	26.30	34.60	59.00	90.00	0.00	2.00	8.40	3.40
08-Sep-15	25.50	33.70	62.00	89.00	13.80	5.00	7.50	3.50
09-Sep-15	24.60	33.50	60.00	96.00	4.60	6.00	7.50	2.80
10-Sep-15	24.10	29.20	83.00	96.00	9.20	2.00	1.60	1.00
11-Sep-15	24.90	31.60	63.00	96.00	6.80	2.00	4.60	2.00
12-Sep-15	24.20	31.20	51.00	94.00	7.20	4.00	3.70	1.60
13-Sep-15	23.50	32.80	57.00	96.00	71.30	3.00	6.60	2.90
14-Sep-15	22.00	26.00	87.00	96.00	2.00	8.00	0.00	0.70
15-Sep-15	21.80	26.60	86.00	97.00	0.00	2.00	0.00	0.80
16-Sep-15	24.40	31.70	63.00	93.00	2.80	3.00	0.00	2.90
17-Sep-15	24.50	29.00	73.00	89.00	0.00	11.00	5.10	3.90

18-Sep-15	24.70	32.20	61.00	90.00	0.00	7.00	6.40	3.10
19-Sep-15	24.90	33.80	52.00	91.00	0.00	3.00	10.70	3.20
20-Sep-15	26.10	34.90	53.00	94.00	72.10	3.00	10.10	2.70
21-Sep-15	23.30	34.80	60.00	98.00	0.00	12.00	7.80	2.00
22-Sep-15	23.30	32.30	62.00	94.00	0.00	2.00	10.40	2.40
23-Sep-15	25.30	32.80	66.00	92.00	0.00	6.00	8.20	3.10
24-Sep-15	25.80	32.60	61.00	89.00	0.00	4.00	7.80	3.40
25-Sep-15	25.50	33.10	62.00	89.00	0.00	3.00	7.30	3.20
26-Sep-15	25.80	33.00	64.00	90.00	0.00	2.00	4.60	2.30
27-Sep-15	25.20	34.00	60.00	89.00	43.00	4.00	6.60	2.40
28-Sep-15	23.80	32.60	70.00	97.00	12.20	9.00	5.60	1.90
29-Sep-15	23.70	32.00	61.00	96.00	0.00	5.00	5.90	2.20
30-Sep-15	23.60	32.80	61.00	96.00	1.60	6.00	5.90	2.20
01-Oct-15	24.00	31.00	72.00	92.00	4.00	3.00	2.50	1.90
02-Oct-15	24.10	30.90	70.00	95.00	0.00	3.00	4.70	1.70
03-Oct-15	25.10	31.30	71.00	93.00	24.40	5.00	2.20	1.70
04-Oct-15	23.80	30.00	77.00	96.00	0.60	4.00	0.90	1.00
05-Oct-15	23.20	29.10	81.00	96.00	0.00	3.00	2.10	1.60
06-Oct-15	24.30	31.20	62.00	92.00	20.20	3.00	3.60	2.00
07-Oct-15	23.50	33.00	64.00	93.00	1.50	7.00	5.70	2.00
08-Oct-15	23.10	30.80	74.00	95.00	1.80	4.00	5.20	2.00
09-Oct-15	24.70	31.60	64.00	93.00	10.20	6.00	7.00	2.00
10-Oct-15	22.90	31.70	64.00	94.00	0.00	3.00	5.00	2.40
11-Oct-15	22.30	30.50	64.00	95.00	0.00	4.00	2.90	2.90
12-Oct-15	21.60	29.80	64.00	87.00	0.00	3.00	3.30	3.20
13-Oct-15	23.00	31.20	65.00	89.00	0.00	4.00	5.20	2.50
14-Oct-15	23.30	32.80	60.00	86.00	0.00	3.00	9.40	4.00
15-Oct-15	23.10	30.70	65.00	89.00	0.00	5.00	2.90	4.10
16-Oct-15	23.50	33.00	52.00	82.00	0.00	3.00	8.50	3.20

17-Oct-15	23.30	33.00	48.00	90.00	0.00	3.00	10.50	3.40
18-Oct-15	23.20	33.50	50.00	88.00	0.00	3.00	9.20	3.20
19-Oct-15	22.10	34.00	51.00	89.00	0.00	3.00	10.00	4.00
20-Oct-15	21.60	33.00	46.00	90.00	0.00	2.00	10.80	3.20
21-Oct-15	22.80	33.80	47.00	90.00	0.00	2.00	10.90	3.20
22-Oct-15	23.20	34.20	49.00	96.00	0.00	4.00	10.60	3.60
23-Oct-15	22.60	33.60	53.00	88.00	2.00	2.00	9.90	3.00
24-Oct-15	22.00	32.80	56.00	89.00	0.00	5.00	8.00	2.40
25-Oct-15	22.50	34.00	46.00	92.00	0.00	2.00	9.80	2.90
26-Oct-15	23.00	34.70	48.00	91.00	2.00	2.00	9.70	3.10
27-Oct-15	23.30	35.70	54.00	92.00	10.00	7.00	8.90	2.60
28-Oct-15	24.30	35.50	56.00	94.00	0.00	2.00	9.60	2.60
29-Oct-15	23.70	34.90	56.00	93.00	0.00	6.00	11.20	2.60
30-Oct-15	23.60	34.60	45.00	88.00	0.00	2.00	11.40	4.20
31-Oct-15	23.80	33.80	41.00	73.00	0.00	2.00	10.30	4.30
01-Nov-15	23.80	33.90	54.00	92.00	0.00	4.00	8.00	3.50
02-Nov-15	23.50	32.20	55.00	84.00	0.00	5.00	7.60	4.70
03-Nov-15	23.10	32.00	52.00	81.00	0.00	3.00	5.40	3.60
04-Nov-15	23.00	33.20	57.00	88.00	5.00	2.00	3.20	2.90
05-Nov-15	23.60	32.00	62.00	93.00	4.50	4.00	2.70	2.30
06-Nov-15	23.50	31.50	66.00	97.00	0.00	6.00	3.70	1.80
07-Nov-15	24.00	32.50	63.00	96.00	0.00	3.00	5.40	1.90
08-Nov-15	24.00	33.10	55.00	94.00	0.00	4.00	4.50	2.20
09-Nov-15	23.60	31.20	56.00	94.00	0.00	3.00	9.30	2.40
10-Nov-15	22.50	34.00	57.00	95.00	19.20	3.00	10.30	1.50
11-Nov-15	23.80	35.10	54.00	90.00	0.00	6.00	10.20	1.10
12-Nov-15	24.50	34.40	53.00	94.00	0.00	5.00	9.70	1.00
13-Nov-15	24.60	33.60	56.00	87.00	0.00	4.00	9.80	0.70
14-Nov-15	24.60	33.90	59.00	87.00	0.00	3.00	11.10	0.60

15-Nov-15	24.80	33.50	58.00	89.00	0.00	4.00	9.20	0.90
16-Nov-15	25.20	34.10	52.00	91.00	0.00	3.00	9.50	0.90
17-Nov-15	25.70	34.80	51.00	89.00	2.00	3.00	9.90	1.00
18-Nov-15	25.20	35.30	52.00	91.00	0.00	7.00	10.00	0.80
19-Nov-15	23.20	35.10	47.00	92.00	0.00	5.00	9.60	0.80
20-Nov-15	22.40	34.20	48.00	92.00	0.00	5.00	10.00	3.20
21-Nov-15	22.50	34.50	44.00	91.00	0.00	4.00	10.80	3.80
22-Nov-15	22.40	33.80	41.00	88.00	0.00	3.00	10.60	4.20
23-Nov-15	22.20	34.00	45.00	79.00	0.00	3.00	10.10	3.90
24-Nov-15	21.50	34.30	47.00	83.00	0.00	2.00	8.50	3.70
25-Nov-15	22.60	34.80	46.00	81.00	0.00	3.00	9.90	4.20
26-Nov-15	22.50	33.20	53.00	84.00	0.00	8.00	10.40	5.30
27-Nov-15	21.80	32.80	45.00	81.00	0.00	4.00	9.90	4.90
28-Nov-15	22.00	33.40	48.00	82.00	0.00	3.00	9.10	4.10
29-Nov-15	22.60	34.30	45.00	85.00	0.00	3.00	8.30	3.60
30-Nov-15	22.50	35.20	41.00	86.00	0.00	2.00	11.20	4.20
01-Dec-15	23.60	35.80	37.00	87.00	0.00	2.00	11.00	4.00
02-Dec-15	23.50	35.60	43.00	85.00	0.00	4.00	11.20	4.30
03-Dec-15	22.00	34.70	46.00	89.00	0.00	3.00	11.10	4.50
04-Dec-15	22.00	34.00	41.00	86.00	0.00	4.00	11.10	4.80
05-Dec-15	21.90	34.50	42.00	86.00	0.00	3.00	11.20	4.30
06-Dec-15	20.80	32.00	46.00	82.00	0.00	5.00	11.00	5.50
07-Dec-15	19.50	31.60	44.00	77.00	0.00	5.00	8.30	4.60
08-Dec-15	19.40	33.70	41.00	81.00	0.00	4.00	9.80	4.30
09-Dec-15	22.00	34.00	46.00	84.00	0.00	2.00	8.20	3.80
10-Dec-15	22.00	34.90	36.00	90.00	0.00	3.00	9.20	5.20
11-Dec-15	21.60	34.00	46.00	90.00	0.00	3.00	10.20	4.30
12-Dec-15	21.80	34.60	42.00	87.00	0.00	3.00	10.10	4.10
13-Dec-15	21.90	35.00	39.00	91.00	0.00	2.00	10.90	4.90

14-Dec-15	22.30	34.80	39.00	85.00	0.00	4.00	10.50	4.40
15-Dec-15	21.70	33.80	45.00	88.00	0.00	4.00	8.90	3.90
16-Dec-15	19.20	30.40	47.00	78.00	0.00	9.00	5.90	6.30
17-Dec-15	16.20	27.80	42.00	75.00	0.00	7.00	9.00	5.20
18-Dec-15	16.30	29.50	41.00	79.00	0.00	4.00	6.80	4.00
19-Dec-15	17.60	30.50	35.00	86.00	0.00	5.00	3.60	4.10
20-Dec-15	19.40	32.80	39.00	82.00	0.00	5.00	8.70	4.50
21-Dec-15	21.00	32.50	46.00	78.00	0.00	4.00	6.80	5.00
22-Dec-15	20.30	34.70	45.00	86.00	0.00	2.00	7.80	3.80
23-Dec-15	21.80	35.20	36.00	88.00	0.00	4.00	10.30	5.80
24-Dec-15	23.50	34.80	43.00	82.00	0.00	4.00	10.40	5.50
25-Dec-15	21.50	34.50	44.00	89.00	0.00	3.00	9.80	4.00
26-Dec-15	21.00	34.60	33.00	88.00	0.00	4.00	10.80	5.80
27-Dec-15	20.80	34.00	41.00	86.00	0.00	4.00	9.90	4.60
28-Dec-15	20.00	33.40	38.00	82.00	0.00	3.00	10.60	5.10
29-Dec-15	19.50	33.80	36.00	85.00	0.00	4.00	9.90	5.00
30-Dec-15	20.30	32.70	38.00	84.00	0.00	5.00	9.20	5.30
31-Dec-15	19.70	31.80	40.00	75.00	0.00	7.00	10.80	6.20
01-Jan-16	19.00	33.00	38.00	79.00	0.00	4.00	10.30	5.00
02-Jan-16	19.00	33.60	39.00	80.00	0.00	3.00	10.80	5.20
03-Jan-16	21.00	35.00	35.00	80.00	0.00	3.00	10.70	4.00
04-Jan-16	21.50	34.10	41.00	86.00	0.00	3.00	9.30	3.90
05-Jan-16	20.60	34.20	38.00	90.00	0.00	7.00	9.20	4.30
06-Jan-16	20.40	35.10	32.00	92.00	0.00	6.00	10.00	5.20
07-Jan-16	20.90	33.60	39.00	83.00	0.00	4.00	7.70	4.50
08-Jan-16	21.00	33.00	36.00	91.00	0.00	3.00	5.80	4.30
09-Jan-16	24.20	31.50	48.00	77.00	0.00	4.00	5.60	4.70
10-Jan-16	23.60	31.00	54.00	80.00	7.80	5.00	3.40	4.00
11-Jan-16	22.30	31.30	59.00	91.00	0.00	4.00	4.90	2.30

12-Jan-16	21.70	34.20	38.00	94.00	0.00	4.00	9.90	4.40
13-Jan-16	22.40	34.30	41.00	85.00	0.00	2.00	10.00	3.90
14-Jan-16	22.20	34.50	43.00	86.00	0.00	4.00	8.80	4.50
15-Jan-16	24.20	32.70	49.00	88.00	0.00	4.00	7.40	4.50
16-Jan-16	23.50	28.20	81.00	90.00	24.00	5.00	1.20	1.30
17-Jan-16	23.80	31.00	64.00	92.00	18.40	5.00	3.80	3.00
18-Jan-16	24.00	32.60	58.00	95.00	0.00	3.00	4.40	1.80
19-Jan-16	23.90	31.00	66.00	87.00	0.00	3.00	0.90	1.40
20-Jan-16	23.80	33.80	48.00	89.00	0.00	6.00	8.60	4.50
21-Jan-16	24.20	35.10	50.00	86.00	0.00	3.00	9.90	3.80
22-Jan-16	23.40	34.30	50.00	85.00	0.00	5.00	7.70	4.10
23-Jan-16	18.80	34.70	48.00	91.00	0.00	8.00	9.80	6.20
24-Jan-16	14.50	24.80	45.00	78.00	0.00	12.00	7.00	6.90
25-Jan-16	14.40	26.60	35.00	78.00	0.00	7.00	10.50	6.00
26-Jan-16	14.20	28.80	36.00	79.00	0.00	3.00	11.00	4.40
27-Jan-16	16.00	29.00	41.00	77.00	0.00	4.00	7.30	4.30
28-Jan-16	19.50	33.20	46.00	86.00	0.00	4.00	10.90	3.80
29-Jan-16	23.10	34.90	43.00	85.00	0.00	2.00	9.40	3.20
30-Jan-16	23.60	33.90	45.00	87.00	0.00	6.00	9.20	5.60
31-Jan-16	23.60	34.20	40.00	83.00	0.00	4.00	10.00	4.80
01-Feb-16	19.90	34.40	42.00	75.00	0.30	6.00	9.30	5.00
02-Feb-16	17.30	31.50	37.00	73.00	0.00	7.00	8.80	6.20
03-Feb-16	17.00	32.80	36.00	77.00	0.00	4.00	10.30	5.10
04-Feb-16	18.00	34.00	31.00	86.00	0.00	4.00	8.90	6.20
05-Feb-16	18.80	33.00	34.00	80.00	0.00	4.00	11.00	5.20
06-Feb-16	15.50	26.50	37.00	61.00	0.00	12.00	10.10	6.50
07-Feb-16	13.00	23.90	32.00	59.00	0.00	13.00	9.70	7.70
08-Feb-16	12.50	27.60	29.00	79.00	0.00	4.00	10.30	5.20
09-Feb-16	13.80	31.80	28.00	78.00	0.00	3.00	10.60	4.80

10-Feb-16	16.80	32.70	33.00	80.00	0.00	2.00	10.10	4.50
11-Feb-16	17.00	33.60	28.00	82.00	0.00	5.00	7.90	5.50
12-Feb-16	21.00	33.90	37.00	68.00	0.00	4.00	7.80	4.80
13-Feb-16	20.80	33.50	44.00	76.00	0.00	3.00	5.30	4.70
14-Feb-16	21.00	36.20	36.00	83.00	0.00	3.00	8.40	5.00
15-Feb-16	19.40	36.00	34.00	70.00	0.00	5.00	7.30	5.80
16-Feb-16	18.00	33.40	37.00	75.00	0.00	3.00	9.90	5.30
17-Feb-16	17.80	33.20	40.00	81.00	0.00	3.00	10.10	5.30
18-Feb-16	18.50	33.20	42.00	78.00	0.00	3.00	10.10	5.60
19-Feb-16	21.00	35.40	35.00	83.00	0.00	3.00	10.10	6.00
20-Feb-16	18.00	34.20	43.00	76.00	0.00	3.00	9.20	5.90
21-Feb-16	18.00	33.60	40.00	77.00	0.00	2.00	8.40	5.00
22-Feb-16	22.50	35.30	41.00	75.00	0.00	3.00	9.80	5.00
23-Feb-16	23.40	36.10	46.00	70.00	0.00	7.00	9.30	7.70
24-Feb-16	18.20	34.70	45.00	67.00	0.00	7.00	9.20	7.50
25-Feb-16	17.50	31.70	46.00	68.00	0.00	6.00	9.60	7.70
26-Feb-16	17.00	32.30	48.00	69.00	0.00	7.00	11.10	7.80
27-Feb-16	16.90	33.50	38.00	81.00	0.00	4.00	11.30	6.70
28-Feb-16	17.20	33.20	54.00	78.00	0.00	4.00	11.00	6.50
29-Feb-16	17.50	31.20	59.00	78.00	0.00	7.00	6.90	6.30
01-Mar-16	17.30	33.00	50.00	79.00	0.00	3.00	10.30	6.10
02-Mar-16	17.80	34.20	35.00	83.00	0.00	3.00	9.50	5.70
03-Mar-16	19.50	34.60	58.00	81.00	0.00	3.00	9.70	5.60
04-Mar-16	22.80	36.10	59.00	85.00	0.00	5.00	9.40	6.70
05-Mar-16	23.10	36.60	55.00	88.00	0.00	7.00	9.40	6.40
06-Mar-16	24.50	36.00	65.00	89.00	0.00	5.00	8.70	7.00
07-Mar-16	25.00	35.50	63.00	81.00	0.00	8.00	8.00	7.30
08-Mar-16	25.70	38.10	49.00	84.00	0.00	8.00	8.20	7.00
09-Mar-16	26.80	35.20	60.00	78.00	0.00	7.00	5.60	7.10

10-Mar-16	25.00	37.70	66.00	81.00	0.00	7.00	5.70	7.50
11-Mar-16	23.20	34.70	73.00	90.00	0.00	3.00	1.50	5.70
12-Mar-16	24.50	35.10	67.00	88.00	0.00	4.00	6.70	5.40
13-Mar-16	26.10	34.80	67.00	84.00	0.00	6.00	1.90	6.30
14-Mar-16	26.00	38.20	48.00	79.00	0.00	9.00	8.20	7.50
15-Mar-16	26.50	35.30	46.00	74.00	0.00	10.00	7.40	7.70
16-Mar-16	26.80	36.40	42.00	77.00	0.00	7.00	8.80	7.80
17-Mar-16	26.50	38.00	55.00	74.00	0.00	6.00	9.10	8.00
18-Mar-16	27.60	36.30	45.00	71.00	0.00	6.00	7.20	8.50
19-Mar-16	26.40	38.90	36.00	70.00	0.00	8.00	8.30	8.20
20-Mar-16	26.60	38.00	33.00	62.00	0.00	6.00	9.10	9.50
21-Mar-16	27.50	36.60	43.00	70.00	0.00	6.00	8.90	8.30
22-Mar-16	27.80	37.80	38.00	66.00	0.00	6.00	8.40	9.10
23-Mar-16	27.50	37.00	40.00	70.00	0.00	8.00	7.60	8.00
24-Mar-16	23.10	38.20	41.00	68.00	0.00	6.00	5.40	8.00
25-Mar-16	21.00	31.50	41.00	61.00	0.00	5.00	1.10	6.70
26-Mar-16	21.00	34.40	38.00	67.00	0.00	4.00	8.30	6.30
27-Mar-16	20.50	32.70	36.00	68.00	0.00	3.00	2.60	6.00
28-Mar-16	20.20	34.40	34.00	70.00	0.00	5.00	8.00	5.80
29-Mar-16	24.00	35.80	32.00	70.00	0.00	4.00	8.50	6.10
30-Mar-16	24.20	37.30	29.00	67.00	0.00	7.00	7.50	8.00
31-Mar-16	26.10	36.40	40.00	61.00	0.00	6.00	2.00	7.90
01-Apr-16	26.80	35.40	41.00	72.00	0.00	5.00	4.00	7.90
02-Apr-16	27.60	36.70	39.00	66.00	0.00	6.00	2.20	8.30
03-Apr-16	28.00	37.00	44.00	70.00	0.00	5.00	2.40	6.80
04-Apr-16	27.60	35.60	47.00	67.00	0.00	6.00	1.10	9.00
05-Apr-16	27.00	37.60	37.00	67.00	0.00	6.00	6.80	8.40
06-Apr-16	28.40	39.40	32.00	63.00	0.00	6.00	8.90	8.40
07-Apr-16	28.60	39.00	34.00	64.00	0.00	6.00	9.30	9.90

08-Apr-16	28.50	38.60	35.00	63.00	0.00	6.00	6.20	8.70
09-Apr-16	29.00	37.50	44.00	66.00	0.00	5.00	1.20	8.50
10-Apr-16	29.20	38.20	38.00	68.00	0.00	4.00	4.00	9.00
11-Apr-16	29.50	40.10	38.00	65.00	0.00	5.00	5.10	8.50
12-Apr-16	29.80	39.70	37.00	66.00	0.00	6.00	4.00	9.30
13-Apr-16	29.00	39.00	36.00	64.00	0.00	7.00	7.60	10.00
14-Apr-16	28.50	39.20	35.00	70.00	0.00	7.00	8.70	11.00
15-Apr-16	28.80	40.00	29.00	60.00	0.00	7.00	8.90	11.70
16-Apr-16	29.50	40.40	33.00	56.00	0.00	3.00	5.90	10.10
17-Apr-16	29.70	40.80	31.00	61.00	0.00	5.00	8.70	9.70
18-Apr-16	28.20	40.20	34.00	68.00	0.00	7.00	7.20	7.00
19-Apr-16	28.00	39.20	33.00	65.00	0.00	8.00	1.90	7.80
20-Apr-16	28.00	39.00	30.00	67.00	0.00	7.00	6.10	7.60
21-Apr-16	27.50	38.60	38.00	78.00	4.00	5.00	4.90	6.00
22-Apr-16	28.30	37.50	39.00	65.00	0.00	5.00	6.30	7.30
23-Apr-16	26.00	36.60	45.00	75.00	5.80	10.00	3.60	5.30
24-Apr-16	27.30	36.80	43.00	65.00	0.00	5.00	9.40	8.00
25-Apr-16	28.50	38.60	39.00	65.00	0.00	6.00	9.60	8.60
26-Apr-16	28.30	38.80	38.00	64.00	0.00	8.00	10.30	8.80
27-Apr-16	27.80	38.20	41.00	69.00	0.00	8.00	9.10	7.30
28-Apr-16	27.50	39.10	40.00	69.00	0.00	6.00	7.20	7.90
29-Apr-16	26.40	34.40	48.00	70.00	0.00	4.00	1.20	4.10
30-Apr-16	25.70	35.60	37.00	74.00	0.00	4.00	8.90	4.90
01-May-16	26.50	38.50	35.00	80.00	0.00	4.00	10.80	6.50
02-May-16	29.00	37.20	40.00	67.00	0.00	4.00	9.10	6.80
03-May-16	24.80	38.80	40.00	84.00	0.00	13.00	7.00	5.20
04-May-16	26.20	37.40	41.00	84.00	0.00	6.00	7.60	5.30
05-May-16	27.50	37.80	47.00	79.00	0.00	5.00	6.60	5.20
06-May-16	27.20	38.40	42.00	91.00	0.00	4.00	11.30	7.10

07-May-16	27.40	39.50	41.00	94.00	0.00	4.00	8.80	7.40
08-May-16	29.00	38.20	44.00	72.00	0.00	5.00	9.00	6.10
09-May-16	25.50	40.00	38.00	88.00	39.00	2.00	7.40	4.70
10-May-16	28.00	37.80	50.00	76.00	0.00	10.00	6.50	4.90
11-May-16	28.50	39.20	42.00	81.00	0.00	4.00	9.10	6.30
12-May-16	29.00	37.30	48.00	69.00	0.00	5.00	6.00	6.20
13-May-16	23.90	32.00	48.00	97.00	18.50	5.00	2.80	3.00
14-May-16	25.80	36.60	48.00	82.00	0.00	3.00	9.60	4.70
15-May-16	26.50	37.00	53.00	82.00	0.00	5.00	7.00	3.20
16-May-16	26.00	35.50	51.00	82.00	0.00	3.00	6.60	4.70
17-May-16	25.80	34.80	56.00	84.00	0.00	6.00	6.60	4.40
18-May-16	26.00	36.30	53.00	86.00	0.00	9.00	10.30	4.10
19-May-16	23.50	36.20	50.00	95.00	37.40	12.00	8.90	4.00
20-May-16	23.80	29.70	75.00	97.00	0.40	12.00	0.60	1.80
21-May-16	27.30	33.50	59.00	84.00	0.00	3.00	4.90	2.90
22-May-16	24.00	35.70	53.00	88.00	13.30	3.00	7.00	2.70
23-May-16	24.00	32.80	65.00	93.00	0.00	3.00	4.20	3.30
24-May-16	26.00	33.00	62.00	84.00	0.80	5.00	7.00	3.60
25-May-16	23.50	32.80	68.00	91.00	34.20	8.00	1.10	1.80
26-May-16	24.50	32.10	65.00	89.00	6.20	12.00	4.30	3.10
27-May-16	25.30	33.00	65.00	92.00	3.00	5.00	5.00	2.50
28-May-16	24.50	31.50	75.00	92.00	7.20	6.00	2.50	1.80
29-May-16	25.00	32.50	62.00	94.00	13.80	8.00	4.50	1.90
30-May-16	25.00	33.00	65.00	92.00	1.00	5.00	4.40	2.30
31-May-16	26.20	33.20	58.00	85.00	0.00	5.00	12.10	4.20
01-Jun-16	27.20	34.60	56.00	80.00	0.00	5.00	11.50	4.30
02-Jun-16	27.70	35.20	53.00	85.00	0.00	3.00	10.80	4.00
03-Jun-16	27.00	35.00	61.00	76.00	0.00	3.00	8.70	3.80
04-Jun-16	27.30	35.10	52.00	84.00	0.00	4.00	11.80	4.70

05-Jun-16	24.90	34.00	54.00	78.00	16.20	5.00	2.30	3.80
06-Jun-16	25.00	32.30	63.00	94.00	0.00	3.00	1.50	3.20
07-Jun-16	24.00	33.00	65.00	92.00	5.20	12.00	3.40	2.80
08-Jun-16	25.10	32.30	66.00	93.00	16.40	8.00	2.80	1.60
09-Jun-16	25.00	33.80	64.00	91.00	0.00	4.00	7.50	5.00
10-Jun-16	26.00	35.30	72.00	54.00	6.00	3.00	10.60	3.80
11-Jun-16	25.80	35.00	54.00	91.00	0.00	4.00	9.00	4.10
12-Jun-16	25.50	33.80	61.00	88.00	7.00	5.00	6.30	3.80
13-Jun-16	24.30	34.00	57.00	92.00	17.20	10.00	9.30	3.50
14-Jun-16	24.20	30.60	74.00	92.00	0.00	6.00	4.20	3.00
15-Jun-16	25.80	33.80	59.00	81.00	0.60	10.00	11.80	4.00
16-Jun-16	24.00	34.20	59.00	86.00	7.80	1.80	9.10	3.50
17-Jun-16	25.00	31.00	66.00	92.00	0.00	2.00	2.50	1.90
18-Jun-16	26.00	33.00	61.00	92.00	0.00	3.00	7.00	3.10
19-Jun-16	25.50	33.50	63.00	80.00	2.40	3.00	7.00	3.00
20-Jun-16	24.00	33.20	75.00	97.00	30.70	10.00	4.20	2.10
21-Jun-16	24.70	32.20	67.00	96.00	0.00	3.00	6.90	2.60
22-Jun-16	25.40	32.70	66.00	92.00	0.00	3.00	4.50	1.90
23-Jun-16	23.60	28.60	86.00	98.00	23.50	4.00	0.00	0.80
24-Jun-16	24.20	31.30	69.00	96.00	0.80	10.00	4.10	1.80
25-Jun-16	24.00	32.70	65.00	96.00	42.30	5.00	7.00	1.70
26-Jun-16	24.10	25.80	93.00	97.00	67.90	6.00	0.00	0.20
27-Jun-16	23.70	28.90	81.00	98.00	9.80	3.00	1.40	0.60
28-Jun-16	25.10	28.80	81.00	96.00	1.20	3.00	1.00	1.00
29-Jun-16	24.80	30.00	81.00	96.00	2.40	7.00	4.90	1.40
30-Jun-16	25.00	31.10	66.00	93.00	0.00	5.00	5.80	2.80
01-Jul-16	24.50	30.60	68.00	93.00	0.00	5.00	7.00	1.90
02-Jul-16	25.20	31.50	75.00	92.00	11.00	6.00	4.00	1.70
03-Jul-16	25.00	32.40	65.00	93.00	0.00	4.00	7.10	2.10

04-Jul-16	24.50	31.60	67.00	98.00	38.40	4.00	2.90	1.70
05-Jul-16	23.80	26.80	87.00	98.00	59.00	2.00	0.00	0.90
06-Jul-16	23.00	25.40	86.00	98.00	12.60	2.00	0.00	0.70
07-Jul-16	24.00	31.00	67.00	92.00	0.00	5.00	6.20	2.60
08-Jul-16	24.50	31.80	69.00	97.00	28.20	3.00	7.70	2.00
09-Jul-16	24.60	32.40	65.00	94.00	22.00	8.00	5.70	1.60
10-Jul-16	24.60	33.00	61.00	95.00	45.80	10.00	5.90	1.90
11-Jul-16	24.50	30.00	79.00	94.00	5.60	7.00	3.50	1.40
12-Jul-16	24.20	30.60	76.00	95.00	18.80	7.00	2.60	1.40
13-Jul-16	24.00	28.30	79.00	97.00	0.00	5.00	0.30	1.60
14-Jul-16	24.50	32.00	66.00	91.00	0.00	5.00	7.30	2.90
15-Jul-16	26.30	33.40	60.00	88.00	0.00	3.00	12.40	2.70
16-Jul-16	28.20	34.00	68.00	87.00	0.00	3.00	8.00	2.60
17-Jul-16	26.20	34.20	62.00	88.00	0.00	4.00	6.80	2.70
18-Jul-16	24.50	32.30	68.00	92.00	3.90	5.00	5.90	2.70
19-Jul-16	25.00	32.60	64.00	90.00	0.00	4.00	6.60	2.40
20-Jul-16	25.30	31.80	64.00	93.00	3.20	7.00	9.10	3.20
21-Jul-16	25.20	33.10	63.00	84.00	1.00	5.00	11.00	3.20
22-Jul-16	23.80	33.20	61.00	90.00	69.00	10.00	8.90	2.10
23-Jul-16	24.50	30.60	71.00	96.00	0.00	4.00	2.10	2.00
24-Jul-16	25.50	33.50	59.00	93.00	0.00	4.00	10.60	3.00
25-Jul-16	23.60	31.00	75.00	97.00	41.60	8.00	4.30	1.80
26-Jul-16	23.20	33.00	62.00	96.00	0.00	2.00	9.10	2.40
27-Jul-16	23.70	30.80	76.00	93.00	3.40	8.00	8.70	1.70
28-Jul-16	24.00	31.00	65.00	91.00	0.00	4.00	10.70	3.70
29-Jul-16	25.00	31.90	64.00	87.00	0.00	5.00	9.80	3.90
30-Jul-16	24.90	33.00	62.00	91.00	3.00	3.00	11.30	2.20
31-Jul-16	24.90	32.80	64.00	92.00	0.00	3.00	5.30	2.00
01-Aug-16	24.50	32.90	65.00	91.00	0.00	3.00	5.20	2.30

02-Aug-16	24.00	32.60	67.00	92.00	14.40	5.00	2.00	1.50
03-Aug-16	24.00	29.80	77.00	98.00	1.20	5.00	3.90	1.80
04-Aug-16	24.50	30.40	79.00	93.00	8.70	5.00	1.90	1.50
05-Aug-16	25.20	31.20	69.00	94.00	0.00	4.00	5.70	1.90
06-Aug-16	25.30	31.80	67.00	92.00	0.00	6.00	8.80	2.10
07-Aug-16	24.50	31.50	74.00	96.00	45.40	6.00	2.50	1.10
08-Aug-16	24.50	30.00	80.00	95.00	19.10	8.00	1.90	1.30
09-Aug-16	25.70	33.10	65.00	93.00	0.00	3.00	7.40	1.90
10-Aug-16	24.30	33.60	66.00	98.00	74.80	7.00	9.30	2.00
11-Aug-16	24.10	30.90	74.00	98.00	1.80	4.00	1.60	1.50
12-Aug-16	24.80	30.20	77.00	98.00	0.20	3.00	1.10	1.80
13-Aug-16	26.00	32.30	68.00	89.00	0.00	5.00	6.40	3.30
14-Aug-16	26.30	32.20	66.00	88.00	2.00	5.00	3.60	3.60
15-Aug-16	24.90	32.00	76.00	92.00	9.80	7.00	2.70	2.50
16-Aug-16	26.30	33.10	65.00	89.00	0.00	7.00	5.10	2.90
17-Aug-16	26.00	32.70	68.00	85.00	2.60	7.00	2.20	2.80
18-Aug-16	25.70	30.00	77.00	89.00	0.20	6.00	0.40	2.20
19-Aug-16	26.30	31.40	71.00	87.00	0.00	6.00	1.20	3.00
20-Aug-16	25.80	32.90	67.00	88.00	12.40	5.00	9.30	2.70
21-Aug-16	25.80	33.70	62.00	93.00	0.00	4.00	7.30	2.30
22-Aug-16	24.00	34.00	67.00	95.00	8.00	6.00	9.50	2.10
23-Aug-16	24.80	31.70	70.00	94.00	0.00	2.00	8.40	1.90
24-Aug-16	24.70	30.70	74.00	96.00	4.60	4.00	5.50	1.70
25-Aug-16	25.00	31.20	73.00	94.00	6.60	6.00	3.90	1.50
26-Aug-16	26.20	32.50	77.00	93.00	12.60	3.00	6.00	1.50
27-Aug-16	24.00	30.30	74.00	94.00	14.20	3.00	1.20	1.10
28-Aug-16	24.00	30.80	70.00	98.00	18.00	2.00	3.90	1.20
29-Aug-16	24.20	32.50	70.00	96.00	25.40	8.00	7.20	1.70
30-Aug-16	24.80	32.70	69.00	96.00	0.00	3.00	6.50	1.90

31-Aug-16	25.40	32.20	73.00	94.00	3.80	9.00	4.60	1.90
01-Sep-16	26.10	31.90	71.00	92.00	0.00	3.00	9.10	2.40
02-Sep-16	26.60	33.20	71.00	89.00	0.00	4.00	6.90	2.70
03-Sep-16	26.20	32.80	64.00	86.00	6.00	2.00	6.30	2.50
04-Sep-16	25.40	32.70	63.00	89.00	32.00	15.00	7.00	2.00
05-Sep-16	23.50	29.00	85.00	98.00	80.00	14.00	0.30	0.40
06-Sep-16	24.00	31.30	70.00	95.00	2.60	3.00	6.40	1.70
07-Sep-16	23.80	31.80	75.00	98.00	13.20	7.00	3.30	1.80
08-Sep-16	24.00	31.00	76.00	95.00	1.00	5.00	6.10	2.20
09-Sep-16	25.00	31.50	72.00	92.00	0.00	3.00	4.10	2.20
10-Sep-16	25.50	30.50	77.00	95.00	38.00	5.00	2.60	1.20
11-Sep-16	24.90	30.00	76.00	92.00	7.00	3.00	3.00	1.50
12-Sep-16	24.50	30.60	79.00	99.00	40.60	6.00	2.80	1.00
13-Sep-16	23.60	24.70	93.00	98.00	96.10	10.00	0.00	0.50
14-Sep-16	23.80	30.60	74.00	95.00	0.00	3.00	6.40	1.40
15-Sep-16	24.50	31.20	79.00	96.00	0.00	2.00	6.30	1.70
16-Sep-16	25.50	27.80	70.00	95.00	5.20	3.00	5.50	1.20
17-Sep-16	25.50	32.60	76.00	93.00	0.00	3.00	6.40	1.90
18-Sep-16	25.00	31.30	80.00	95.00	0.20	3.00	4.20	1.30
19-Sep-16	23.70	31.80	73.00	98.00	100.20	4.00	4.70	1.30
20-Sep-16	23.50	29.80	84.00	98.00	0.00	2.00	2.50	0.80
21-Sep-16	24.50	31.40	70.00	92.00	9.20	3.00	4.00	1.20
22-Sep-16	24.20	30.60	81.00	96.00	2.40	3.00	4.00	1.20
23-Sep-16	25.00	30.40	72.00	94.00	0.00	2.00	2.80	1.30
24-Sep-16	25.50	31.10	74.00	93.00	0.00	4.00	5.50	1.90
25-Sep-16	25.80	32.00	61.00	89.00	0.00	2.00	4.40	1.60
26-Sep-16	25.00	33.00	76.00	95.00	0.40	3.00	5.90	1.80
27-Sep-16	23.40	34.10	60.00	96.00	12.20	6.00	8.60	2.00
28-Sep-16	23.30	32.00	64.00	96.00	0.00	2.00	4.30	2.10

29-Sep-16	23.80	32.80	63.00	99.00	82.00	8.00	8.30	2.10
30-Sep-16	24.10	28.20	79.00	97.00	13.20	2.00	0.00	1.10
01-Oct-16	24.00	32.10	60.00	97.00	0.00	3.00	6.10	2.30
02-Oct-16	23.90	32.20	64.00	90.00	0.00	2.00	8.50	2.80
03-Oct-16	24.00	33.40	63.00	98.00	46.50	3.00	9.30	2.30
04-Oct-16	25.60	32.10	64.00	92.00	0.00	5.00	6.40	1.80
05-Oct-16	23.60	31.70	63.00	96.00	23.20	5.00	2.50	1.20
06-Oct-16	24.00	31.10	70.00	97.00	0.00	3.00	4.60	1.30
07-Oct-16	25.00	31.10	69.00	93.00	0.30	3.00	4.40	1.30
08-Oct-16	24.90	30.50	72.00	95.00	12.40	3.00	2.30	1.10
09-Oct-16	24.60	32.50	63.00	96.00	0.00	3.00	8.60	2.20
10-Oct-16	24.60	33.60	60.00	94.00	0.00	3.00	9.20	2.30
11-Oct-16	24.50	32.60	59.00	96.00	0.00	2.00	5.30	1.70
12-Oct-16	23.40	33.20	59.00	91.00	0.00	2.00	6.30	2.40
13-Oct-16	23.00	32.60	64.00	95.00	6.20	4.00	4.90	1.80
14-Oct-16	23.40	27.50	80.00	88.00	0.00	3.00	0.00	1.10
15-Oct-16	23.40	32.30	61.00	95.00	0.00	2.00	6.70	1.10
16-Oct-16	22.90	30.80	69.00	93.00	0.00	3.00	2.10	2.00
17-Oct-16	23.20	31.50	60.00	92.00	0.00	2.00	7.30	4.20
18-Oct-16	23.00	31.60	58.00	91.00	0.00	3.00	5.00	2.50
19-Oct-16	23.30	32.70	59.00	91.00	0.00	2.00	8.00	2.50
20-Oct-16	24.60	33.40	58.00	92.00	0.00	3.00	8.00	2.60
21-Oct-16	25.80	33.10	59.00	89.00	0.00	2.00	6.70	2.40
22-Oct-16	24.00	34.00	56.00	92.00	63.00	1.00	7.80	2.30
23-Oct-16	23.50	32.40	62.00	98.00	65.30	6.00	6.80	1.50
24-Oct-16	23.50	29.70	75.00	97.00	26.60	5.00	5.70	1.20
25-Oct-16	23.50	32.20	64.00	96.00	7.40	3.00	5.90	1.40
26-Oct-16	23.80	33.70	59.00	98.00	0.00	3.00	9.00	1.80
27-Oct-16	25.00	33.60	61.00	93.00	0.00	4.00	10.20	2.50

28-Oct-16	24.00	33.50	62.00	96.00	0.00	4.00	8.10	2.30
29-Oct-16	23.80	33.30	52.00	91.00	0.00	3.00	4.80	2.60
30-Oct-16	24.00	32.50	56.00	86.00	0.00	1.00	7.10	2.60
31-Oct-16	23.80	32.20	60.00	92.00	2.20	7.00	7.80	1.90
01-Nov-16	23.40	31.30	64.00	90.00	0.00	8.00	5.10	2.60
02-Nov-16	23.00	31.80	58.00	92.00	0.00	7.00	6.60	3.30
03-Nov-16	21.30	31.20	56.00	88.00	0.00	8.00	6.30	3.90
04-Nov-16	21.50	31.70	53.00	94.00	0.00	4.00	10.00	3.00
05-Nov-16	22.00	32.00	57.00	92.00	0.00	3.00	8.40	2.30
06-Nov-16	24.50	32.50	62.00	88.00	1.80	3.00	5.40	1.90
07-Nov-16	25.00	33.00	66.00	94.00	0.00	5.00	7.10	2.10
08-Nov-16	24.60	32.30	67.00	95.00	3.80	5.00	4.80	1.50
09-Nov-16	23.50	32.60	67.00	94.00	1.80	3.00	6.80	1.70
10-Nov-16	20.50	31.70	57.00	85.00	0.00	4.00	9.20	3.30
11-Nov-16	21.00	31.90	56.00	89.00	0.00	3.00	9.40	2.60
12-Nov-16	22.80	33.50	53.00	92.00	0.00	3.00	5.50	2.50
13-Nov-16	24.40	34.50	52.00	92.00	0.00	3.00	10.00	2.60
14-Nov-16	23.10	34.30	49.00	92.00	0.00	2.00	9.20	2.70
15-Nov-16	21.70	33.80	47.00	91.00	0.00	2.00	10.70	3.10
16-Nov-16	21.20	34.10	41.00	82.00	0.00	2.00	10.80	3.80
17-Nov-16	21.60	33.30	51.00	91.00	4.50	3.00	8.70	2.70
18-Nov-16	23.80	33.00	60.00	92.00	0.00	3.00	8.90	2.40
19-Nov-16	24.00	34.40	54.00	92.00	0.00	5.00	9.70	2.30
20-Nov-16	24.60	34.60	51.00	93.00	0.00	4.00	4.00	2.40
21-Nov-16	25.00	34.00	60.00	91.00	0.00	5.00	7.50	2.60
22-Nov-16	24.30	31.60	65.00	89.00	0.00	3.00	2.00	1.60
23-Nov-16	24.20	32.40	62.00	96.00	5.00	3.00	2.90	1.40
24-Nov-16	22.70	32.90	65.00	93.00	17.00	8.00	6.40	1.80
25-Nov-16	22.50	32.40	53.00	85.00	0.00	3.00	9.60	3.10

26-Nov-16	21.40	32.20	53.00	84.00	0.00	9.00	9.20	4.30
27-Nov-16	19.40	30.50	52.00	82.00	0.00	5.00	10.20	3.50
28-Nov-16	19.00	31.00	46.00	89.00	0.00	5.00	10.40	3.20
29-Nov-16	18.20	32.80	49.00	89.00	0.00	3.00	10.00	4.00
30-Nov-16	22.00	30.80	52.00	80.00	0.00	12.00	5.70	4.30
01-Dec-16	19.50	29.50	52.00	84.00	0.00	10.00	8.00	4.50
02-Dec-16	20.50	31.00	51.00	82.00	0.00	5.00	9.30	4.20
03-Dec-16	20.80	32.00	52.00	91.00	0.00	6.00	8.90	3.30
04-Dec-16	22.20	32.10	54.00	86.00	0.00	6.00	8.70	3.50
05-Dec-16	21.50	30.00	60.00	84.00	0.00	5.00	3.70	2.80
06-Dec-16	21.30	31.00	49.00	80.00	0.00	10.00	5.10	4.10
07-Dec-16	21.50	31.70	52.00	90.00	0.00	6.00	6.40	3.70
08-Dec-16	19.10	29.20	56.00	82.00	0.00	5.00	2.10	3.30
09-Dec-16	19.40	31.80	46.00	86.00	0.00	3.00	9.80	3.00
10-Dec-16	19.00	31.50	41.00	81.00	0.00	3.00	9.50	3.40
11-Dec-16	19.20	30.50	53.00	90.00	0.00	3.00	6.40	2.40
12-Dec-16	20.50	33.00	56.00	91.00	0.00	3.00	7.00	2.10
13-Dec-16	23.00	29.60	69.00	93.00	9.40	1.00	0.40	1.00
14-Dec-16	22.60	27.00	80.00	92.00	8.40	5.00	2.00	1.20
15-Dec-16	22.50	28.50	61.00	80.00	0.00	8.00	0.70	2.10
16-Dec-16	17.30	27.10	55.00	71.00	0.00	13.00	0.90	4.00
17-Dec-16	17.30	28.80	48.00	90.00	0.00	4.00	3.50	1.90
18-Dec-16	18.50	31.40	50.00	92.00	0.00	3.00	9.20	2.70
19-Dec-16	20.00	33.20	48.00	87.00	0.00	3.00	9.30	2.90
20-Dec-16	22.00	34.80	43.00	91.00	0.00	3.00	9.00	3.20
21-Dec-16	22.30	34.60	47.00	91.00	0.00	7.00	9.70	2.50
22-Dec-16	21.70	32.60	53.00	86.00	0.00	5.00	6.50	3.70
23-Dec-16	21.00	32.60	47.00	87.00	0.00	4.00	9.50	3.20
24-Dec-16	21.00	33.50	48.00	89.00	0.00	3.00	9.10	3.00

25-Dec-16	24.50	34.00	43.00	91.00	0.00	3.00	9.30	3.30
26-Dec-16	20.60	32.80	42.00	81.00	0.00	4.00	7.30	3.70
27-Dec-16	17.80	30.80	47.00	76.00	0.00	12.00	7.00	4.80
28-Dec-16	18.00	29.30	44.00	79.00	0.00	7.00	9.10	4.20
29-Dec-16	18.10	28.40	44.00	71.00	0.00	8.00	8.90	5.40
30-Dec-16	18.40	29.40	45.00	75.00	0.00	7.00	4.80	4.30
31-Dec-16	19.40	25.50	62.00	81.00	0.00	8.00	0.00	2.80

Mekong River flow data at the Pakse hydromet station

Date	Stage (m)	Discharge (m^3/s)
1-Jan-00	1.73	3476.47
2-Jan-00	1.71	3437.59
3-Jan-00	1.67	3360.30
4-Jan-00	1.63	3283.63
5-Jan-00	1.63	3283.63
6-Jan-00	1.61	3245.54
7-Jan-00	1.57	3169.83
8-Jan-00	1.56	3151.00
9-Jan-00	1.5	3038.86
10-Jan-00	1.4	2855.21
11-Jan-00	1.43	2909.88
12-Jan-00	1.39	2837.07
13-Jan-00	1.36	2782.90
14-Jan-00	1.36	2782.90
15-Jan-00	1.35	2764.92
16-Jan-00	1.35	2764.92
17-Jan-00	1.31	2693.44
18-Jan-00	1.32	2711.25
19-Jan-00	1.29	2657.94
20-Jan-00	1.24	2569.95
21-Jan-00	1.23	2552.48
22-Jan-00	1.2	2500.31
23-Jan-00	1.2	2500.31
24-Jan-00	1.21	2517.66
25-Jan-00	1.19	2483.01
26-Jan-00	1.17	2448.53
27-Jan-00	1.15	2414.23
28-Jan-00	1.11	2346.14
29-Jan-00	1.09	2312.35
30-Jan-00	1.09	2312.35
31-Jan-00	1.08	2225.81
1-Feb-00	1.07	2278.75
2-Feb-00	1.07	2278.75
3-Feb-00	1.07	2278.75
4-Feb-00	1.05	2245.31
5-Feb-00	1.06	2262.01
6-Feb-00	1.06	2262.01
7-Feb-00	1.04	2228.66
8-Feb-00	1.01	2178.97
9-Feb-00	1.04	2228.66
10-Feb-00	1.01	2178.97
11-Feb-00	1.03	2212.05
12-Feb-00	1.03	2212.05
13-Feb-00	1.07	2278.75
14-Feb-00	1.1	2329.23

15-Feb-00	1.06	2262.01
16-Feb-00	1.22	2535.04
17-Feb-00	1.18	2465.75
18-Feb-00	1.13	2380.10
19-Feb-00	1.09	2312.35
20-Feb-00	1.07	2278.75
21-Feb-00	1.06	2262.01
22-Feb-00	1.06	2262.01
23-Feb-00	1.06	2262.01
24-Feb-00	1.06	2262.01
25-Feb-00	1.07	2278.75
26-Feb-00	1.08	2295.53
27-Feb-00	0.99	2146.07
28-Feb-00	0.95	2080.80
29-Feb-00	0.99	2146.07
1-Mar-00	1.02	2195.49
2-Mar-00	1.04	2228.66
3-Mar-00	1.07	2278.75
4-Mar-00	1.05	2245.31
5-Mar-00	1.01	2178.97
6-Mar-00	0.98	2129.68
7-Mar-00	1.03	2212.05
8-Mar-00	1.06	2262.01
9-Mar-00	1.07	2278.75
10-Mar-00	1.11	2346.14
11-Mar-00	1.05	2245.31
12-Mar-00	1.2	2500.31
13-Mar-00	1.23	2552.48
14-Mar-00	1.26	2605.02
15-Mar-00	1.26	2605.02
16-Mar-00	1.24	2569.95
17-Mar-00	1.15	2414.23
18-Mar-00	1.04	2228.66
19-Mar-00	0.99	2146.07
20-Mar-00	1.02	2195.49
21-Mar-00	1.02	2195.49
22-Mar-00	0.99	2146.07
23-Mar-00	0.93	2048.43
24-Mar-00	0.9	2000.22
25-Mar-00	0.88	1968.31
26-Mar-00	0.9	2000.22
27-Mar-00	0.88	1968.31
28-Mar-00	0.88	1968.31
29-Mar-00	0.87	1952.42
30-Mar-00	0.86	1936.58
31-Mar-00	0.86	1936.58
1-Apr-00	0.86	1936.58
2-Apr-00	0.84	1905.03

3-Apr-00	0.81	1858.06
4-Apr-00	0.83	1889.33
5-Apr-00	0.84	1905.03
6-Apr-00	0.86	1936.58
7-Apr-00	0.85	1920.78
8-Apr-00	0.86	1936.58
9-Apr-00	0.88	1968.31
10-Apr-00	0.86	1936.58
11-Apr-00	0.91	2016.24
12-Apr-00	0.94	2064.59
13-Apr-00	0.98	2129.68
14-Apr-00	1.07	2278.75
15-Apr-00	1.15	2414.23
16-Apr-00	1.21	2517.66
17-Apr-00	1.23	2552.48
18-Apr-00	1.21	2517.66
19-Apr-00	1.16	2431.36
20-Apr-00	1.14	2397.14
21-Apr-00	1.09	2312.35
22-Apr-00	1.09	2312.35
23-Apr-00	1.18	2465.75
24-Apr-00	1.25	2587.46
25-Apr-00	1.27	2622.62
26-Apr-00	1.35	2764.92
27-Apr-00	1.38	2818.97
28-Apr-00	1.4	2855.21
29-Apr-00	1.38	2818.97
30-Apr-00	1.37	2800.91
1-May-00	1.41	2873.39
2-May-00	1.48	3001.81
3-May-00	1.56	3151.00
4-May-00	1.61	3245.54
5-May-00	1.6	3226.55
6-May-00	1.62	3264.57
7-May-00	1.66	3341.07
8-May-00	1.74	3495.96
9-May-00	1.84	3693.06
10-May-00	1.87	3752.94
11-May-00	2.12	4265.05
12-May-00	2.09	4202.37
13-May-00	2.2	4433.79
14-May-00	2.5	5087.01
15-May-00	2.78	5724.95
16-May-00	2.81	5794.88
17-May-00	2.72	5586.00
18-May-00	2.81	5794.88
19-May-00	2.92	6053.86
20-May-00	3.52	7535.69

21-May-00	4.68	10712.43
22-May-00	5.36	12752.66
23-May-00	5.72	13883.10
24-May-00	5.72	13883.10
25-May-00	5.51	13219.52
26-May-00	5.52	13250.86
27-May-00	5.47	13094.44
28-May-00	5.43	12969.78
29-May-00	5.39	12845.55
30-May-00	5.29	12536.83
31-May-00	5.11	11987.91
1-Jun-00	5.1	11957.67
2-Jun-00	5.3	12567.59
3-Jun-00	4.94	11477.56
4-Jun-00	4.71	10799.75
5-Jun-00	4.51	10222.38
6-Jun-00	4.44	10022.98
7-Jun-00	4.42	9966.26
8-Jun-00	4.42	9966.26
9-Jun-00	4.41	9937.95
10-Jun-00	4.31	9656.38
11-Jun-00	4.39	9881.40
12-Jun-00	4.62	10538.54
13-Jun-00	4.88	11299.33
14-Jun-00	5.12	12018.18
15-Jun-00	5.42	12938.69
16-Jun-00	5.7	13819.41
17-Jun-00	6.16	15310.50
18-Jun-00	6.79	17439.24
19-Jun-00	7.41	19628.67
20-Jun-00	7.52	20026.66
21-Jun-00	7.36	19448.71
22-Jun-00	7.22	18947.95
23-Jun-00	7.42	19664.73
24-Jun-00	7.96	21646.80
25-Jun-00	8.58	24004.74
26-Jun-00	8.68	24393.12
27-Jun-00	8.6	24082.24
28-Jun-00	8.58	24004.74
29-Jun-00	8.58	24004.74
30-Jun-00	8.59	24043.48
1-Jul-00	8.41	23349.60
2-Jul-00	8.15	22360.16
3-Jul-00	7.69	20647.31
4-Jul-00	7.34	19376.89
5-Jul-00	7.09	18487.15
6-Jul-00	7.18	18805.74
7-Jul-00	7.6	20317.89

8-Jul-00	7.76	20904.82
9-Jul-00	7.9	21423.24
10-Jul-00	8.02	21871.18
11-Jul-00	9.41	27294.67
12-Jul-00	10	29723.32
13-Jul-00	10.29	30943.83
14-Jul-00	10.31	31028.65
15-Jul-00	10.57	32138.74
16-Jul-00	10.85	33349.67
17-Jul-00	11.39	35729.63
18-Jul-00	11.67	36986.50
19-Jul-00	11.76	37393.76
20-Jul-00	11.68	37031.67
21-Jul-00	11.38	35685.02
22-Jul-00	11.04	34180.40
23-Jul-00	10.78	33045.45
24-Jul-00	10.67	32569.39
25-Jul-00	10.65	32483.10
26-Jul-00	10.65	32483.10
27-Jul-00	10.67	32569.39
28-Jul-00	10.72	32785.47
29-Jul-00	10.62	32353.81
30-Jul-00	10.52	31924.19
31-Jul-00	10.31	31028.65
1-Aug-00	10.16	30394.55
2-Aug-00	10.03	29848.77
3-Aug-00	9.94	29472.98
4-Aug-00	9.8	28891.81
5-Aug-00	9.65	28273.70
6-Aug-00	9.63	28191.65
7-Aug-00	9.61	28109.68
8-Aug-00	9.62	28150.65
9-Aug-00	9.62	28150.65
10-Aug-00	9.6	28068.73
11-Aug-00	9.48	27578.95
12-Aug-00	9.36	27092.25
13-Aug-00	9.21	26488.22
14-Aug-00	9.15	26247.97
15-Aug-00	9.16	26287.95
16-Aug-00	9.2	26448.12
17-Aug-00	9.13	26168.05
18-Aug-00	9.03	25769.80
19-Aug-00	8.97	25531.89
20-Aug-00	8.75	24666.30
21-Aug-00	8.47	23580.09
22-Aug-00	8.52	23772.78
23-Aug-00	9.61	28109.68
24-Aug-00	10.13	30268.29

25-Aug-00	10.23	30689.88
26-Aug-00	10.12	30226.24
27-Aug-00	9.96	29556.35
28-Aug-00	9.7	28479.21
29-Aug-00	9.67	28355.84
30-Aug-00	9.92	29389.71
31-Aug-00	10.42	31496.61
1-Sep-00	11.09	34400.22
2-Sep-00	11.42	35863.55
3-Sep-00	11.46	36042.40
4-Sep-00	11.34	35506.82
5-Sep-00	11.44	35952.93
6-Sep-00	11.83	37711.62
7-Sep-00	12.19	39361.37
8-Sep-00	12.38	40242.15
9-Sep-00	12.5	40802.00
10-Sep-00	12.45	40568.40
11-Sep-00	12.53	40942.39
12-Sep-00	12.83	42355.71
13-Sep-00	13.13	43786.00
14-Sep-00	13.34	44797.22
15-Sep-00	13.32	44700.56
16-Sep-00	13.2	44122.16
17-Sep-00	13.04	43355.14
18-Sep-00	12.61	41317.61
19-Sep-00	12.51	40848.78
20-Sep-00	12.15	39176.82
21-Sep-00	11.76	37393.76
22-Sep-00	11.28	35240.10
23-Sep-00	10.79	33088.84
24-Sep-00	10.17	30436.67
25-Sep-00	9.84	29057.44
26-Sep-00	9.49	27619.65
27-Sep-00	9.03	25769.80
28-Sep-00	8.82	24940.56
29-Sep-00	8.69	24432.08
30-Sep-00	8.52	23772.78
1-Oct-00	8.38	23234.66
2-Oct-00	8.25	22738.91
3-Oct-00	8.07	22058.80
4-Oct-00	7.82	21126.45
5-Oct-00	7.48	19881.61
6-Oct-00	7.29	19197.75
7-Oct-00	7.07	18416.61
8-Oct-00	6.99	18135.43
9-Oct-00	6.78	17404.69
10-Oct-00	6.65	16957.70
11-Oct-00	6.48	16379.45

12-Oct-00	6.42	16177.07
13-Oct-00	6.46	16311.89
14-Oct-00	6.62	16855.14
15-Oct-00	6.75	17301.17
16-Oct-00	6.7	17129.13
17-Oct-00	6.49	16413.27
18-Oct-00	6.11	15145.80
19-Oct-00	5.88	14396.40
20-Oct-00	5.58	13439.43
21-Oct-00	5.51	13219.52
22-Oct-00	5.3	12567.59
23-Oct-00	5.21	12291.79
24-Oct-00	5.12	12018.18
25-Oct-00	4.89	11328.96
26-Oct-00	4.81	11092.65
27-Oct-00	4.72	10828.92
28-Oct-00	4.67	10683.38
29-Oct-00	4.63	10567.45
30-Oct-00	4.63	10567.45
31-Oct-00	4.87	11269.72
1-Nov-00	4.91	11388.32
2-Nov-00	4.8	11063.23
3-Nov-00	4.63	10567.45
4-Nov-00	4.46	10079.81
5-Nov-00	4.36	9796.80
6-Nov-00	4.29	9600.41
7-Nov-00	4.22	9405.44
8-Nov-00	4.17	9267.05
9-Nov-00	4.12	9129.39
10-Nov-00	4.12	9129.39
11-Nov-00	4.11	9101.94
12-Nov-00	4.05	8937.90
13-Nov-00	3.9	8532.45
14-Nov-00	3.75	8133.74
15-Nov-00	3.59	7715.98
16-Nov-00	3.42	7280.77
17-Nov-00	3.32	7028.98
18-Nov-00	3.25	6854.61
19-Nov-00	3.13	6559.35
20-Nov-00	3.13	6559.35
21-Nov-00	3.09	6461.95
22-Nov-00	3.04	6340.94
23-Nov-00	2.96	6149.03
24-Nov-00	2.89	5982.83
25-Nov-00	2.74	5632.18
26-Nov-00	2.69	5516.98
27-Nov-00	2.75	5655.32
28-Nov-00	2.68	5494.04

29-Nov-00	2.56	5221.45
30-Nov-00	2.62	5357.13
1-Dec-00	2.48	5042.47
2-Dec-00	2.4	4865.73
3-Dec-00	2.38	4821.90
4-Dec-00	2.36	4778.20
5-Dec-00	2.33	4712.93
6-Dec-00	2.3	4647.98
7-Dec-00	2.28	4604.85
8-Dec-00	2.21	4455.05
9-Dec-00	2.14	4307.01
10-Dec-00	2.09	4202.37
11-Dec-00	2.07	4160.77
12-Dec-00	2.09	4202.37
13-Dec-00	2.13	4286.01
14-Dec-00	2.12	4265.05
15-Dec-00	2.11	4244.12
16-Dec-00	2.09	4202.37
17-Dec-00	2.06	4140.02
18-Dec-00	2.01	4036.85
19-Dec-00	1.94	3893.97
20-Dec-00	1.94	3893.97
21-Dec-00	1.93	3873.71
22-Dec-00	1.86	3732.94
23-Dec-00	1.88	3772.97
24-Dec-00	1.85	3712.98
25-Dec-00	1.83	3673.18
26-Dec-00	1.76	3535.07
27-Dec-00	1.77	3554.69
28-Dec-00	1.77	3554.69
29-Dec-00	1.73	3476.47
30-Dec-00	1.71	3437.59
31-Dec-00	1.68	3379.56
1-Jan-01	1.67	3360.30
2-Jan-01	1.64	3302.74
3-Jan-01	1.63	3283.63
4-Jan-01	1.68	3379.56
5-Jan-01	1.63	3283.63
6-Jan-01	1.61	3245.54
7-Jan-01	1.57	3169.83
8-Jan-01	1.57	3169.83
9-Jan-01	1.51	3057.45
10-Jan-01	1.43	2909.88
11-Jan-01	1.42	2891.62
12-Jan-01	1.4	2855.21
13-Jan-01	1.36	2782.90
14-Jan-01	1.35	2764.92
15-Jan-01	1.35	2764.92

16-Jan-01	1.36	2782.90
17-Jan-01	1.28	2640.26
18-Jan-01	1.26	2605.02
19-Jan-01	1.26	2605.02
20-Jan-01	1.25	2587.46
21-Jan-01	1.25	2587.46
22-Jan-01	1.28	2640.26
23-Jan-01	1.27	2622.62
24-Jan-01	1.26	2605.02
25-Jan-01	1.27	2622.62
26-Jan-01	1.28	2640.26
27-Jan-01	1.27	2622.62
28-Jan-01	1.27	2622.62
29-Jan-01	1.25	2587.46
30-Jan-01	1.24	2569.95
31-Jan-01	1.22	2535.04
1-Feb-01	1.21	2517.66
2-Feb-01	1.21	2517.66
3-Feb-01	1.22	2535.04
4-Feb-01	1.21	2517.66
5-Feb-01	1.22	2535.04
6-Feb-01	1.2	2500.31
7-Feb-01	1.21	2517.66
8-Feb-01	1.21	2517.66
9-Feb-01	1.16	2431.36
10-Feb-01	1.14	2397.14
11-Feb-01	1.12	2363.10
12-Feb-01	1.08	2295.53
13-Feb-01	1.09	2312.35
14-Feb-01	1.04	2228.66
15-Feb-01	1.05	2245.31
16-Feb-01	1.03	2212.05
17-Feb-01	1.04	2228.66
18-Feb-01	1.03	2212.05
19-Feb-01	1.02	2195.49
20-Feb-01	1.02	2195.49
21-Feb-01	1.01	2178.97
22-Feb-01	1.03	2212.05
23-Feb-01	1.03	2212.05
24-Feb-01	1.03	2212.05
25-Feb-01	1.04	2228.66
26-Feb-01	1.04	2228.66
27-Feb-01	1.05	2245.31
28-Feb-01	1.04	2228.66
1-Mar-01	1.04	2228.66
2-Mar-01	1.02	2195.49
3-Mar-01	1	2162.50
4-Mar-01	0.99	2146.07

5-Mar-01	0.99	2146.07
6-Mar-01	0.98	2129.68
7-Mar-01	1	2162.50
8-Mar-01	1.01	2178.97
9-Mar-01	0.95	2080.80
10-Mar-01	0.94	2064.59
11-Mar-01	0.95	2080.80
12-Mar-01	0.95	2080.80
13-Mar-01	0.98	2129.68
14-Mar-01	1.02	2195.49
15-Mar-01	1.06	2262.01
16-Mar-01	1.08	2295.53
17-Mar-01	1.09	2312.35
18-Mar-01	1.09	2312.35
19-Mar-01	1.11	2346.14
20-Mar-01	1.13	2380.10
21-Mar-01	1.13	2380.10
22-Mar-01	1.11	2346.14
23-Mar-01	1.16	2431.36
24-Mar-01	1.2	2500.31
25-Mar-01	1.25	2587.46
26-Mar-01	1.28	2640.26
27-Mar-01	1.33	2729.10
28-Mar-01	1.34	2746.99
29-Mar-01	1.43	2909.88
30-Mar-01	1.38	2818.97
31-Mar-01	1.32	2711.25
1-Apr-01	1.32	2711.25
2-Apr-01	1.26	2605.02
3-Apr-01	1.21	2517.66
4-Apr-01	1.17	2448.53
5-Apr-01	1.16	2431.36
6-Apr-01	1.11	2346.14
7-Apr-01	1.1	2329.23
8-Apr-01	1.09	2312.35
9-Apr-01	1.09	2312.35
10-Apr-01	0.99	2146.07
11-Apr-01	1.01	2178.97
12-Apr-01	0.96	2097.05
13-Apr-01	0.94	2064.59
14-Apr-01	0.96	2097.05
15-Apr-01	0.98	2129.68
16-Apr-01	0.96	2097.05
17-Apr-01	0.94	2064.59
18-Apr-01	0.93	2048.43
19-Apr-01	0.92	2032.31
20-Apr-01	0.89	1984.24
21-Apr-01	0.92	2032.31

22-Apr-01	0.92	2032.31
23-Apr-01	0.95	2080.80
24-Apr-01	0.97	2113.34
25-Apr-01	0.95	2080.80
26-Apr-01	0.96	2097.05
27-Apr-01	1.01	2178.97
28-Apr-01	1.01	2178.97
29-Apr-01	1.02	2195.49
30-Apr-01	1.02	2195.49
1-May-01	0.95	2080.80
2-May-01	0.91	2016.24
3-May-01	0.88	1968.31
4-May-01	0.82	1873.67
5-May-01	0.9	2000.22
6-May-01	0.93	2048.43
7-May-01	0.96	2097.05
8-May-01	0.99	2146.07
9-May-01	0.98	2129.68
10-May-01	1	2162.50
11-May-01	1.02	2195.49
12-May-01	1.01	2178.97
13-May-01	1.02	2195.49
14-May-01	1.1	2329.23
15-May-01	1.18	2465.75
16-May-01	1.29	2657.94
17-May-01	1.34	2746.99
18-May-01	1.41	2873.39
19-May-01	1.44	2928.18
20-May-01	1.49	3020.32
21-May-01	1.57	3169.83
22-May-01	1.69	3398.86
23-May-01	1.87	3752.94
24-May-01	2.11	4244.12
25-May-01	2.37	4800.03
26-May-01	2.67	5471.14
27-May-01	3.01	6268.73
28-May-01	3.17	6657.25
29-May-01	3.23	6805.08
30-May-01	3.35	7104.19
31-May-01	3.57	7664.31
1-Jun-01	3.98	8747.85
2-Jun-01	4.19	9322.32
3-Jun-01	4.39	9881.40
4-Jun-01	4.44	10022.98
5-Jun-01	4.4	9909.66
6-Jun-01	4.45	10051.38
7-Jun-01	4.71	10799.75
8-Jun-01	5.09	11927.46

9-Jun-01	5.38	12814.56
10-Jun-01	5.59	13470.95
11-Jun-01	5.87	14364.13
12-Jun-01	6.12	15178.69
13-Jun-01	6.21	15475.83
14-Jun-01	6.22	15508.97
15-Jun-01	6.27	15675.06
16-Jun-01	6.48	16379.45
17-Jun-01	6.36	15975.59
18-Jun-01	6.04	14916.29
19-Jun-01	5.66	13692.33
20-Jun-01	5.31	12598.36
21-Jun-01	5.14	12078.79
22-Jun-01	5.02	11716.74
23-Jun-01	5.12	12018.18
24-Jun-01	5.38	12814.56
25-Jun-01	5.6	13502.50
26-Jun-01	5.68	13755.82
27-Jun-01	5.8	14138.92
28-Jun-01	5.87	14364.13
29-Jun-01	6.25	15608.55
30-Jun-01	6.72	17197.87
1-Jul-01	7.23	18983.57
2-Jul-01	7.52	20026.66
3-Jul-01	7.46	19809.23
4-Jul-01	7.34	19376.89
5-Jul-01	7.37	19484.65
6-Jul-01	7.67	20573.94
7-Jul-01	8.24	22700.94
8-Jul-01	8.73	24588.14
9-Jul-01	9.28	26769.49
10-Jul-01	9.17	26327.96
11-Jul-01	9.03	25769.80
12-Jul-01	8.88	25176.50
13-Jul-01	8.65	24276.37
14-Jul-01	8.41	23349.60
15-Jul-01	8.2	22549.25
16-Jul-01	8.1	22171.64
17-Jul-01	8.1	22171.64
18-Jul-01	8.13	22284.69
19-Jul-01	8.1	22171.64
20-Jul-01	8.16	22397.94
21-Jul-01	8.52	23772.78
22-Jul-01	9.19	26408.05
23-Jul-01	9.56	27905.13
24-Jul-01	9.59	28027.79
25-Jul-01	9.52	27741.87
26-Jul-01	9.43	27375.78

27-Jul-01	9.41	27294.67
28-Jul-01	9.52	27741.87
29-Jul-01	9.77	28767.81
30-Jul-01	9.78	28809.12
31-Jul-01	9.56	27905.13
1-Aug-01	9.25	26648.82
2-Aug-01	9.21	26488.22
3-Aug-01	9.2	26448.12
4-Aug-01	9.1	26048.35
5-Aug-01	9.09	26008.49
6-Aug-01	9.12	26128.13
7-Aug-01	9.23	26568.48
8-Aug-01	9.48	27578.95
9-Aug-01	10.07	30016.32
10-Aug-01	11.02	34092.61
11-Aug-01	11.42	35863.55
12-Aug-01	11.54	36401.03
13-Aug-01	11.79	37529.87
14-Aug-01	11.97	38350.20
15-Aug-01	11.99	38441.74
16-Aug-01	12.09	38900.59
17-Aug-01	12.44	40521.73
18-Aug-01	12.67	41599.82
19-Aug-01	12.7	41741.18
20-Aug-01	12.61	41317.61
21-Aug-01	12.47	40661.78
22-Aug-01	12.08	38854.61
23-Aug-01	11.82	37666.15
24-Aug-01	11.52	36311.25
25-Aug-01	11.01	34048.75
26-Aug-01	10.78	33045.45
27-Aug-01	11.52	36311.25
28-Aug-01	11.3	35328.93
29-Aug-01	11.54	36401.03
30-Aug-01	11.43	35908.23
31-Aug-01	10.98	33917.28
1-Sep-01	10.55	32052.86
2-Sep-01	10.27	30859.10
3-Sep-01	10.18	30478.82
4-Sep-01	10.4	31411.34
5-Sep-01	10.73	32828.75
6-Sep-01	10.82	33219.17
7-Sep-01	10.77	33002.07
8-Sep-01	10.81	33175.71
9-Sep-01	11.36	35595.88
10-Sep-01	12.09	38900.59
11-Sep-01	12.61	41317.61
12-Sep-01	12.63	41411.60

13-Sep-01	12.54	40989.23
14-Sep-01	12.24	39592.48
15-Sep-01	12.04	38670.92
16-Sep-01	11.84	37757.11
17-Sep-01	11.71	37167.31
18-Sep-01	11.49	36176.73
19-Sep-01	11.14	34620.54
20-Sep-01	10.89	33523.96
21-Sep-01	10.43	31539.28
22-Sep-01	10.13	30268.29
23-Sep-01	9.82	28974.58
24-Sep-01	9.5	27660.37
25-Sep-01	9.23	26568.48
26-Sep-01	9.02	25730.09
27-Sep-01	8.89	25215.90
28-Sep-01	8.64	24237.50
29-Sep-01	8.44	23464.74
30-Sep-01	8.3	22929.13
1-Oct-01	8.16	22397.94
2-Oct-01	7.99	21758.89
3-Oct-01	7.78	20978.60
4-Oct-01	7.55	20135.70
5-Oct-01	7.31	19269.33
6-Oct-01	7.18	18805.74
7-Oct-01	7	18170.49
8-Oct-01	7.07	18416.61
9-Oct-01	7.03	18275.83
10-Oct-01	6.91	17855.79
11-Oct-01	6.81	17508.42
12-Oct-01	6.75	17301.17
13-Oct-01	6.67	17026.20
14-Oct-01	6.62	16855.14
15-Oct-01	6.63	16889.30
16-Oct-01	6.56	16650.68
17-Oct-01	6.4	16109.81
18-Oct-01	6.21	15475.83
19-Oct-01	5.96	14655.53
20-Oct-01	5.69	13787.60
21-Oct-01	5.53	13282.22
22-Oct-01	5.31	12598.36
23-Oct-01	5.2	12261.28
24-Oct-01	5.08	11897.27
25-Oct-01	5.1	11957.67
26-Oct-01	5.28	12506.11
27-Oct-01	5.5	13188.21
28-Oct-01	5.33	12660.00
29-Oct-01	5.5	13188.21
30-Oct-01	5.39	12845.55

31-Oct-01	5.3	12567.59
1-Nov-01	5.27	12475.41
2-Nov-01	5.23	12352.89
3-Nov-01	5.26	12444.74
4-Nov-01	5.53	13282.22
5-Nov-01	5.95	14623.05
6-Nov-01	6.32	15841.77
7-Nov-01	6.3	15775.01
8-Nov-01	6.15	15277.51
9-Nov-01	5.98	14720.57
10-Nov-01	5.84	14267.46
11-Nov-01	5.76	14010.81
12-Nov-01	5.68	13755.82
13-Nov-01	5.59	13470.95
14-Nov-01	5.37	12783.59
15-Nov-01	5.03	11746.76
16-Nov-01	4.86	11240.14
17-Nov-01	4.69	10741.51
18-Nov-01	4.6	10480.80
19-Nov-01	4.54	10308.27
20-Nov-01	4.48	10136.75
21-Nov-01	4.37	9824.98
22-Nov-01	4.3	9628.38
23-Nov-01	4.2	9350.00
24-Nov-01	4.12	9129.39
25-Nov-01	4.07	8992.46
26-Nov-01	4	8802.00
27-Nov-01	3.89	8505.65
28-Nov-01	3.78	8212.93
29-Nov-01	3.68	7950.00
30-Nov-01	3.57	7664.31
1-Dec-01	3.48	7433.34
2-Dec-01	3.43	7306.12
3-Dec-01	3.4	7230.16
4-Dec-01	3.26	6879.43
5-Dec-01	3.11	6510.58
6-Dec-01	3	6244.72
7-Dec-01	2.93	6077.60
8-Dec-01	2.82	5818.26
9-Dec-01	2.71	5562.96
10-Dec-01	2.6	5311.76
11-Dec-01	2.61	5334.43
12-Dec-01	2.59	5289.13
13-Dec-01	2.59	5289.13
14-Dec-01	2.62	5357.13
15-Dec-01	2.5	5087.01
16-Dec-01	2.44	4953.82
17-Dec-01	2.27	4583.34

18-Dec-01	2.21	4455.05
19-Dec-01	2.2	4433.79
20-Dec-01	2.17	4370.24
21-Dec-01	2.19	4412.57
22-Dec-01	2.18	4391.39
23-Dec-01	2.18	4391.39
24-Dec-01	2.16	4349.13
25-Dec-01	2.15	4328.05
26-Dec-01	2.13	4286.01
27-Dec-01	2.11	4244.12
28-Dec-01	2.1	4223.22
29-Dec-01	2.08	4181.55
30-Dec-01	2.06	4140.02
31-Dec-01	2.04	4098.64
1-Jan-02	1.99	3995.84
2-Jan-02	1.97	3954.98
3-Jan-02	1.94	3893.97
4-Jan-02	1.94	3893.97
5-Jan-02	1.96	3934.61
6-Jan-02	1.88	3772.97
7-Jan-02	1.84	3693.06
8-Jan-02	1.78	3574.34
9-Jan-02	1.7	3418.21
10-Jan-02	1.7	3418.21
11-Jan-02	1.74	3495.96
12-Jan-02	1.78	3574.34
13-Jan-02	1.8	3613.76
14-Jan-02	1.8	3613.76
15-Jan-02	1.78	3574.34
16-Jan-02	1.73	3476.47
17-Jan-02	1.71	3437.59
18-Jan-02	1.62	3264.57
19-Jan-02	1.58	3188.69
20-Jan-02	1.56	3151.00
21-Jan-02	1.55	3132.21
22-Jan-02	1.51	3057.45
23-Jan-02	1.52	3076.08
24-Jan-02	1.55	3132.21
25-Jan-02	1.55	3132.21
26-Jan-02	1.53	3094.75
27-Jan-02	1.53	3094.75
28-Jan-02	1.5	3038.86
29-Jan-02	1.47	2983.34
30-Jan-02	1.45	2946.53
31-Jan-02	1.43	2909.88
1-Feb-02	1.44	2928.18
2-Feb-02	1.43	2909.88
3-Feb-02	1.43	2909.88

4-Feb-02	1.43	2909.88
5-Feb-02	1.44	2928.18
6-Feb-02	1.46	2964.92
7-Feb-02	1.48	3001.81
8-Feb-02	1.48	3001.81
9-Feb-02	1.43	2909.88
10-Feb-02	1.39	2837.07
11-Feb-02	1.4	2855.21
12-Feb-02	1.4	2855.21
13-Feb-02	1.31	2693.44
14-Feb-02	1.21	2517.66
15-Feb-02	1.19	2483.01
16-Feb-02	1.19	2483.01
17-Feb-02	1.19	2483.01
18-Feb-02	1.23	2552.48
19-Feb-02	1.22	2535.04
20-Feb-02	1.21	2517.66
21-Feb-02	1.21	2517.66
22-Feb-02	1.2	2500.31
23-Feb-02	1.21	2517.66
24-Feb-02	1.22	2535.04
25-Feb-02	1.22	2535.04
26-Feb-02	1.22	2535.04
27-Feb-02	1.19	2483.01
28-Feb-02	1.17	2448.53
1-Mar-02	1.15	2414.23
2-Mar-02	1.15	2414.23
3-Mar-02	1.15	2414.23
4-Mar-02	1.15	2414.23
5-Mar-02	1.16	2431.36
6-Mar-02	1.16	2431.36
7-Mar-02	1.15	2414.23
8-Mar-02	1.12	2363.10
9-Mar-02	1.09	2312.35
10-Mar-02	1.06	2262.01
11-Mar-02	1.05	2245.31
12-Mar-02	1.06	2262.01
13-Mar-02	1.04	2228.66
14-Mar-02	1.04	2228.66
15-Mar-02	1.04	2228.66
16-Mar-02	1.04	2228.66
17-Mar-02	1.05	2245.31
18-Mar-02	1.02	2195.49
19-Mar-02	0.99	2146.07
20-Mar-02	0.96	2097.05
21-Mar-02	0.95	2080.80
22-Mar-02	0.96	2097.05
23-Mar-02	0.97	2113.34

24-Mar-02	0.98	2129.68
25-Mar-02	0.97	2113.34
26-Mar-02	1	2162.50
27-Mar-02	1.01	2178.97
28-Mar-02	0.99	2146.07
29-Mar-02	0.98	2129.68
30-Mar-02	0.98	2129.68
31-Mar-02	1	2162.50
1-Apr-02	1.01	2178.97
2-Apr-02	1.03	2212.05
3-Apr-02	0.99	2146.07
4-Apr-02	0.99	2146.07
5-Apr-02	0.97	2113.34
6-Apr-02	0.97	2113.34
7-Apr-02	0.97	2113.34
8-Apr-02	0.96	2097.05
9-Apr-02	0.97	2113.34
10-Apr-02	0.98	2129.68
11-Apr-02	0.98	2129.68
12-Apr-02	0.95	2080.80
13-Apr-02	0.95	2080.80
14-Apr-02	0.93	2048.43
15-Apr-02	0.91	2016.24
16-Apr-02	0.85	1920.78
17-Apr-02	0.81	1858.06
18-Apr-02	0.84	1905.03
19-Apr-02	0.84	1905.03
20-Apr-02	0.84	1905.03
21-Apr-02	0.84	1905.03
22-Apr-02	0.82	1873.67
23-Apr-02	0.82	1873.67
24-Apr-02	0.84	1905.03
25-Apr-02	0.87	1952.42
26-Apr-02	0.97	2113.34
27-Apr-02	1	2162.50
28-Apr-02	1.02	2195.49
29-Apr-02	1.02	2195.49
30-Apr-02	1.02	2195.49
1-May-02	1.04	2228.66
2-May-02	1.04	2228.66
3-May-02	1.08	2295.53
4-May-02	1.05	2245.31
5-May-02	1.03	2212.05
6-May-02	1.07	2278.75
7-May-02	1.02	2195.49
8-May-02	1.07	2278.75
9-May-02	1.11	2346.14
10-May-02	1.09	2312.35

11-May-02	1.11	2346.14
12-May-02	1.09	2312.35
13-May-02	1.11	2346.14
14-May-02	1.13	2380.10
15-May-02	1.21	2517.66
16-May-02	1.29	2657.94
17-May-02	1.37	2800.91
18-May-02	1.46	2964.92
19-May-02	1.69	3398.86
20-May-02	1.95	3914.27
21-May-02	2.24	4519.03
22-May-02	2.35	4756.41
23-May-02	2.56	5221.45
24-May-02	2.81	5794.88
25-May-02	3.14	6583.77
26-May-02	3.38	7179.67
27-May-02	3.45	7356.91
28-May-02	3.11	6510.58
29-May-02	3.67	7923.88
30-May-02	3.75	8133.74
31-May-02	3.8	8265.88
1-Jun-02	3.84	8372.15
2-Jun-02	3.68	7950.00
3-Jun-02	3.61	7767.77
4-Jun-02	3.55	7612.77
5-Jun-02	3.58	7690.13
6-Jun-02	3.91	8559.27
7-Jun-02	4.29	9600.41
8-Jun-02	4.59	10451.97
9-Jun-02	4.64	10596.39
10-Jun-02	4.64	10596.39
11-Jun-02	4.89	11328.96
12-Jun-02	5.19	12230.80
13-Jun-02	5.71	13851.24
14-Jun-02	6.22	15508.97
15-Jun-02	6.42	16177.07
16-Jun-02	6.46	16311.89
17-Jun-02	6.25	15608.55
18-Jun-02	5.89	14428.70
19-Jun-02	5.55	13345.03
20-Jun-02	5.46	13063.24
21-Jun-02	5.51	13219.52
22-Jun-02	5.73	13914.99
23-Jun-02	5.93	14558.16
24-Jun-02	5.83	14235.28
25-Jun-02	5.7	13819.41
26-Jun-02	5.63	13597.30
27-Jun-02	5.92	14525.76

28-Jun-02	6.21	15475.83
29-Jun-02	6.43	16210.74
30-Jun-02	6.37	16009.11
1-Jul-02	6.14	15244.54
2-Jul-02	5.98	14720.57
3-Jul-02	6.56	16650.68
4-Jul-02	7.42	19664.73
5-Jul-02	8.54	23850.01
6-Jul-02	9.77	28767.81
7-Jul-02	9.94	29472.98
8-Jul-02	10.2	30563.18
9-Jul-02	10.76	32958.71
10-Jul-02	10.94	33742.27
11-Jul-02	11.11	34488.29
12-Jul-02	11.07	34312.23
13-Jul-02	10.75	32915.37
14-Jul-02	10.39	31368.74
15-Jul-02	10.22	30647.63
16-Jul-02	9.82	28974.58
17-Jul-02	9.53	27782.65
18-Jul-02	9.49	27619.65
19-Jul-02	9.53	27782.65
20-Jul-02	9.52	27741.87
21-Jul-02	9.56	27905.13
22-Jul-02	9.56	27905.13
23-Jul-02	9.42	27335.21
24-Jul-02	9.24	26608.64
25-Jul-02	9.13	26168.05
26-Jul-02	9.1	26048.35
27-Jul-02	9.1	26048.35
28-Jul-02	9.26	26689.02
29-Jul-02	9.51	27701.11
30-Jul-02	10.23	30689.88
31-Jul-02	10.53	31967.06
1-Aug-02	10.43	31539.28
2-Aug-02	10.29	30943.83
3-Aug-02	10.31	31028.65
4-Aug-02	10.34	31156.03
5-Aug-02	10.2	30563.18
6-Aug-02	10.25	30774.45
7-Aug-02	10.45	31624.67
8-Aug-02	10.68	32612.56
9-Aug-02	10.86	33393.21
10-Aug-02	10.99	33961.08
11-Aug-02	11.02	34092.61
12-Aug-02	10.98	33917.28
13-Aug-02	11.03	34136.50
14-Aug-02	11.11	34488.29

15-Aug-02	11.35	35551.34
16-Aug-02	11.35	35551.34
17-Aug-02	11.11	34488.29
18-Aug-02	11.35	35551.34
19-Aug-02	11.59	36625.81
20-Aug-02	11.94	38213.04
21-Aug-02	12.17	39269.06
22-Aug-02	12.19	39361.37
23-Aug-02	12.14	39130.73
24-Aug-02	12.03	38625.05
25-Aug-02	11.78	37484.48
26-Aug-02	11.53	36356.13
27-Aug-02	11.4	35774.25
28-Aug-02	11.34	35506.82
29-Aug-02	11.28	35240.10
30-Aug-02	11.02	34092.61
31-Aug-02	10.94	33742.27
1-Sep-02	10.89	33523.96
2-Sep-02	10.76	32958.71
3-Sep-02	10.72	32785.47
4-Sep-02	10.74	32872.05
5-Sep-02	10.8	33132.27
6-Sep-02	10.15	30352.44
7-Sep-02	10.79	33088.84
8-Sep-02	10.77	33002.07
9-Sep-02	11.02	34092.61
10-Sep-02	11.55	36445.95
11-Sep-02	11.51	36266.39
12-Sep-02	11.01	34048.75
13-Sep-02	10.46	31667.40
14-Sep-02	10.02	29806.93
15-Sep-02	9.55	27864.28
16-Sep-02	9.55	27864.28
17-Sep-02	10.06	29974.40
18-Sep-02	10.33	31113.55
19-Sep-02	10.07	30016.32
20-Sep-02	9.98	29639.79
21-Sep-02	9.94	29472.98
22-Sep-02	10.32	31071.09
23-Sep-02	10.73	32828.75
24-Sep-02	11.01	34048.75
25-Sep-02	10.89	33523.96
26-Sep-02	10.67	32569.39
27-Sep-02	10.3	30986.23
28-Sep-02	9.82	28974.58
29-Sep-02	9.44	27416.37
30-Sep-02	9.1	26048.35
1-Oct-02	8.75	24666.30

2-Oct-02	8.43	23426.34
3-Oct-02	8.15	22360.16
4-Oct-02	7.96	21646.80
5-Oct-02	7.76	20904.82
6-Oct-02	7.65	20500.67
7-Oct-02	7.77	20941.70
8-Oct-02	7.63	20427.49
9-Oct-02	7.58	20244.94
10-Oct-02	7.54	20099.33
11-Oct-02	7.48	19881.61
12-Oct-02	7.37	19484.65
13-Oct-02	7.22	18947.95
14-Oct-02	7.01	18205.58
15-Oct-02	6.75	17301.17
16-Oct-02	6.48	16379.45
17-Oct-02	6.22	15508.97
18-Oct-02	6.01	14818.31
19-Oct-02	5.81	14171.02
20-Oct-02	5.62	13565.67
21-Oct-02	5.41	12907.61
22-Oct-02	5.37	12783.59
23-Oct-02	5.15	12109.14
24-Oct-02	5	11656.78
25-Oct-02	4.85	11210.58
26-Oct-02	4.74	10887.33
27-Oct-02	4.64	10596.39
28-Oct-02	4.6	10480.80
29-Oct-02	4.62	10538.54
30-Oct-02	4.54	10308.27
31-Oct-02	4.51	10222.38
1-Nov-02	4.49	10165.27
2-Nov-02	4.48	10136.75
3-Nov-02	4.46	10079.81
4-Nov-02	4.42	9966.26
5-Nov-02	4.34	9740.55
6-Nov-02	4.4	9909.66
7-Nov-02	4.37	9824.98
8-Nov-02	4.39	9881.40
9-Nov-02	4.34	9740.55
10-Nov-02	4.19	9322.32
11-Nov-02	4.07	8992.46
12-Nov-02	3.97	8720.82
13-Nov-02	3.95	8666.85
14-Nov-02	3.9	8532.45
15-Nov-02	3.86	8425.46
16-Nov-02	3.81	8292.40
17-Nov-02	3.73	8081.09
18-Nov-02	3.59	7715.98

19-Nov-02	3.5	7484.45
20-Nov-02	3.4	7230.16
21-Nov-02	3.31	7003.98
22-Nov-02	3.23	6805.08
23-Nov-02	3.18	6681.81
24-Nov-02	3.14	6583.77
25-Nov-02	3.11	6510.58
26-Nov-02	3.05	6365.08
27-Nov-02	3.06	6389.25
28-Nov-02	3.08	6437.69
29-Nov-02	3.02	6292.77
30-Nov-02	2.98	6196.81
1-Dec-02	2.95	6125.19
2-Dec-02	2.82	5818.26
3-Dec-02	2.82	5818.26
4-Dec-02	2.79	5748.23
5-Dec-02	2.82	5818.26
6-Dec-02	2.97	6172.90
7-Dec-02	3.32	7028.98
8-Dec-02	3.48	7433.34
9-Dec-02	3.44	7331.50
10-Dec-02	3.27	6904.27
11-Dec-02	3.09	6461.95
12-Dec-02	2.88	5959.22
13-Dec-02	2.7	5539.95
14-Dec-02	2.53	5154.07
15-Dec-02	2.41	4887.70
16-Dec-02	2.32	4691.24
17-Dec-02	2.23	4497.67
18-Dec-02	2.2	4433.79
19-Dec-02	2.16	4349.13
20-Dec-02	2.17	4370.24
21-Dec-02	2.24	4519.03
22-Dec-02	2.15	4328.05
23-Dec-02	2.28	4604.85
24-Dec-02	2.2	4433.79
25-Dec-02	2.06	4140.02
26-Dec-02	1.98	3975.39
27-Dec-02	1.99	3995.84
28-Dec-02	1.95	3914.27
29-Dec-02	1.92	3853.49
30-Dec-02	1.88	3772.97
31-Dec-02	1.86	3732.94
1-Jan-03	1.88	3772.97
2-Jan-03	1.86	3732.94
3-Jan-03	1.84	3693.06
4-Jan-03	1.87	3752.94
5-Jan-03	1.96	3934.61

6-Jan-03	2	4016.33
7-Jan-03	2.06	4140.02
8-Jan-03	2.04	4098.64
9-Jan-03	2.01	4036.85
10-Jan-03	1.93	3873.71
11-Jan-03	1.9	3813.15
12-Jan-03	1.89	3793.04
13-Jan-03	1.83	3673.18
14-Jan-03	1.86	3732.94
15-Jan-03	1.95	3914.27
16-Jan-03	2.19	4412.57
17-Jan-03	2.37	4800.03
18-Jan-03	2.44	4953.82
19-Jan-03	2.39	4843.80
20-Jan-03	2.27	4583.34
21-Jan-03	2.12	4265.05
22-Jan-03	2.01	4036.85
23-Jan-03	1.91	3833.30
24-Jan-03	1.81	3633.53
25-Jan-03	1.76	3535.07
26-Jan-03	1.7	3418.21
27-Jan-03	1.66	3341.07
28-Jan-03	1.62	3264.57
29-Jan-03	1.61	3245.54
30-Jan-03	1.59	3207.60
31-Jan-03	1.54	3136.78
1-Feb-03	1.53	3094.75
2-Feb-03	1.44	2928.18
3-Feb-03	1.44	2928.18
4-Feb-03	1.48	3001.81
5-Feb-03	1.4	2855.21
6-Feb-03	1.43	2909.88
7-Feb-03	1.41	2873.39
8-Feb-03	1.37	2800.91
9-Feb-03	1.38	2818.97
10-Feb-03	1.41	2873.39
11-Feb-03	1.36	2782.90
12-Feb-03	1.35	2764.92
13-Feb-03	1.39	2837.07
14-Feb-03	1.4	2855.21
15-Feb-03	1.32	2711.25
16-Feb-03	1.32	2711.25
17-Feb-03	1.29	2657.94
18-Feb-03	1.3	2675.67
19-Feb-03	1.37	2800.91
20-Feb-03	1.44	2928.18
21-Feb-03	1.48	3001.81
22-Feb-03	1.51	3057.45

23-Feb-03	1.5	3038.86
24-Feb-03	1.47	2983.34
25-Feb-03	1.45	2946.53
26-Feb-03	1.41	2873.39
27-Feb-03	1.38	2818.97
28-Feb-03	1.37	2800.91
1-Mar-03	1.29	2657.94
2-Mar-03	1.27	2622.62
3-Mar-03	1.24	2569.95
4-Mar-03	1.23	2552.48
5-Mar-03	1.22	2535.04
6-Mar-03	1.24	2569.95
7-Mar-03	1.23	2552.48
8-Mar-03	1.21	2517.66
9-Mar-03	1.2	2500.31
10-Mar-03	1.15	2414.23
11-Mar-03	1.14	2397.14
12-Mar-03	1.13	2380.10
13-Mar-03	1.09	2312.35
14-Mar-03	1.07	2278.75
15-Mar-03	1.06	2262.01
16-Mar-03	1.06	2262.01
17-Mar-03	1.06	2262.01
18-Mar-03	1.05	2245.31
19-Mar-03	1.14	2397.14
20-Mar-03	1.12	2363.10
21-Mar-03	1.14	2397.14
22-Mar-03	1.13	2380.10
23-Mar-03	1.15	2414.23
24-Mar-03	1.14	2397.14
25-Mar-03	1.15	2414.23
26-Mar-03	1.15	2414.23
27-Mar-03	1.16	2431.36
28-Mar-03	1.16	2431.36
29-Mar-03	1.17	2448.53
30-Mar-03	1.18	2465.75
31-Mar-03	1.2	2500.31
1-Apr-03	1.21	2517.66
2-Apr-03	1.24	2569.95
3-Apr-03	1.23	2552.48
4-Apr-03	1.2	2500.31
5-Apr-03	1.19	2483.01
6-Apr-03	1.21	2517.66
7-Apr-03	1.22	2535.04
8-Apr-03	1.21	2517.66
9-Apr-03	1.21	2517.66
10-Apr-03	1.21	2517.66
11-Apr-03	1.19	2483.01

12-Apr-03	1.18	2465.75
13-Apr-03	1.16	2431.36
14-Apr-03	1.11	2346.14
15-Apr-03	1.09	2312.35
16-Apr-03	1.07	2278.75
17-Apr-03	1.06	2262.01
18-Apr-03	1.06	2262.01
19-Apr-03	1.08	2295.53
20-Apr-03	1.09	2312.35
21-Apr-03	1.14	2397.14
22-Apr-03	1.13	2380.10
23-Apr-03	1.08	2295.53
24-Apr-03	1.04	2228.66
25-Apr-03	1.08	2295.53
26-Apr-03	1.09	2312.35
27-Apr-03	1.1	2329.23
28-Apr-03	1.13	2380.10
29-Apr-03	1.17	2448.53
30-Apr-03	1.13	2380.10
1-May-03	1.16	2431.36
2-May-03	1.18	2465.75
3-May-03	1.18	2465.75
4-May-03	1.16	2431.36
5-May-03	1.14	2397.14
6-May-03	1.13	2380.10
7-May-03	1.07	2278.75
8-May-03	1.05	2245.31
9-May-03	1.08	2295.53
10-May-03	1.08	2295.53
11-May-03	1.1	2329.23
12-May-03	1.12	2363.10
13-May-03	1.04	2228.66
14-May-03	1.08	2295.53
15-May-03	1.07	2278.75
16-May-03	1.07	2278.75
17-May-03	1.1	2329.23
18-May-03	1.13	2380.10
19-May-03	1.17	2448.53
20-May-03	1.2	2500.31
21-May-03	1.25	2587.46
22-May-03	1.39	2837.07
23-May-03	1.35	2764.92
24-May-03	1.4	2855.21
25-May-03	1.49	3020.32
26-May-03	1.45	2946.53
27-May-03	1.6	3226.55
28-May-03	1.91	3833.30
29-May-03	1.94	3893.97

30-May-03	1.84	3693.06
31-May-03	1.71	3437.59
1-Jun-03	2.07	4160.77
2-Jun-03	2.35	4756.41
3-Jun-03	2.62	5357.13
4-Jun-03	2.75	5655.32
5-Jun-03	2.83	5841.67
6-Jun-03	2.86	5912.10
7-Jun-03	3.01	6268.73
8-Jun-03	3.03	6316.84
9-Jun-03	3	6244.72
10-Jun-03	2.93	6077.60
11-Jun-03	2.73	5609.07
12-Jun-03	2.7	5539.95
13-Jun-03	2.64	5402.63
14-Jun-03	2.46	4998.08
15-Jun-03	2.29	4626.40
16-Jun-03	2.19	4412.57
17-Jun-03	2.24	4519.03
18-Jun-03	2.39	4843.80
19-Jun-03	2.27	4583.34
20-Jun-03	3.12	6534.95
21-Jun-03	3.33	7054.02
22-Jun-03	3.54	7587.04
23-Jun-03	3.64	7845.69
24-Jun-03	3.75	8133.74
25-Jun-03	4.19	9322.32
26-Jun-03	4.49	10165.27
27-Jun-03	4.61	10509.66
28-Jun-03	4.41	9937.95
29-Jun-03	4.2	9350.00
30-Jun-03	4.05	8937.90
1-Jul-03	4.06	8965.16
2-Jul-03	4.23	9433.21
3-Jul-03	4.48	10136.75
4-Jul-03	4.56	10365.66
5-Jul-03	4.42	9966.26
6-Jul-03	4.35	9768.66
7-Jul-03	4.45	10051.38
8-Jul-03	4.43	9994.60
9-Jul-03	4.32	9684.41
10-Jul-03	4.22	9405.44
11-Jul-03	4.19	9322.32
12-Jul-03	4.41	9937.95
13-Jul-03	4.63	10567.45
14-Jul-03	4.82	11122.09
15-Jul-03	4.86	11240.14
16-Jul-03	4.78	11004.49

17-Jul-03	4.67	10683.38
18-Jul-03	4.52	10250.98
19-Jul-03	4.41	9937.95
20-Jul-03	4.34	9740.55
21-Jul-03	4.25	9488.83
22-Jul-03	4.31	9656.38
23-Jul-03	4.61	10509.66
24-Jul-03	4.97	11567.05
25-Jul-03	5.9	14461.03
26-Jul-03	6.66	16991.94
27-Jul-03	6.83	17577.70
28-Jul-03	6.78	17404.69
29-Jul-03	6.71	17163.49
30-Jul-03	6.38	16042.65
31-Jul-03	6.27	15675.06
1-Aug-03	6.1	15112.94
2-Aug-03	5.98	14720.57
3-Aug-03	6.11	15145.80
4-Aug-03	6.21	15475.83
5-Aug-03	6.06	14981.74
6-Aug-03	5.89	14428.70
7-Aug-03	5.99	14753.12
8-Aug-03	6.23	15542.14
9-Aug-03	6.17	15343.51
10-Aug-03	6.16	15310.50
11-Aug-03	6.85	17647.08
12-Aug-03	7.19	18841.26
13-Aug-03	7.37	19484.65
14-Aug-03	7.35	19412.79
15-Aug-03	7.14	18663.90
16-Aug-03	6.99	18135.43
17-Aug-03	7.01	18205.58
18-Aug-03	7.27	19126.26
19-Aug-03	7.16	18734.77
20-Aug-03	7.1	18522.45
21-Aug-03	7.37	19484.65
22-Aug-03	8.05	21983.68
23-Aug-03	8.43	23426.34
24-Aug-03	9.64	28232.66
25-Aug-03	10.27	30859.10
26-Aug-03	10.14	30310.35
27-Aug-03	9.86	29140.38
28-Aug-03	9.15	26247.97
29-Aug-03	8.76	24705.42
30-Aug-03	8.37	23196.39
31-Aug-03	8.1	22171.64
1-Sep-03	7.87	21311.77
2-Sep-03	7.78	20978.60

3-Sep-03	7.96	21646.80
4-Sep-03	8.46	23541.62
5-Sep-03	8.87	25137.13
6-Sep-03	9.15	26247.97
7-Sep-03	9.48	27578.95
8-Sep-03	10.21	30605.40
9-Sep-03	10.29	30943.83
10-Sep-03	10.09	30100.23
11-Sep-03	9.95	29514.65
12-Sep-03	10.4	31411.34
13-Sep-03	10.76	32958.71
14-Sep-03	10.95	33785.99
15-Sep-03	11.04	34180.40
16-Sep-03	10.98	33917.28
17-Sep-03	10.98	33917.28
18-Sep-03	10.8	33132.27
19-Sep-03	10.75	32915.37
20-Sep-03	10.57	32138.74
21-Sep-03	9.98	29639.79
22-Sep-03	9.55	27864.28
23-Sep-03	9.33	26971.06
24-Sep-03	8.97	25531.89
25-Sep-03	8.6	24082.24
26-Sep-03	8.14	22322.41
27-Sep-03	7.78	20978.60
28-Sep-03	7.58	20244.94
29-Sep-03	7.41	19628.67
30-Sep-03	7.31	19269.33
1-Oct-03	7.12	18593.13
2-Oct-03	6.91	17855.79
3-Oct-03	6.77	17370.15
4-Oct-03	6.64	16923.49
5-Oct-03	6.47	16345.66
6-Oct-03	6.32	15841.77
7-Oct-03	6.05	14949.00
8-Oct-03	5.85	14299.65
9-Oct-03	5.77	14042.80
10-Oct-03	5.6	13502.50
11-Oct-03	5.5	13188.21
12-Oct-03	5.36	12752.66
13-Oct-03	5.23	12352.89
14-Oct-03	5.1	11957.67
15-Oct-03	4.89	11328.96
16-Oct-03	4.68	10712.43
17-Oct-03	4.48	10136.75
18-Oct-03	4.35	9768.66
19-Oct-03	4.29	9600.41
20-Oct-03	4.21	9377.70

21-Oct-03	4.08	9019.79
22-Oct-03	3.91	8559.27
23-Oct-03	3.75	8133.74
24-Oct-03	3.69	7976.16
25-Oct-03	3.66	7897.78
26-Oct-03	3.57	7664.31
27-Oct-03	3.42	7280.77
28-Oct-03	3.33	7054.02
29-Oct-03	3.17	6657.25
30-Oct-03	3.07	6413.45
31-Oct-03	2.96	6149.03
1-Nov-03	2.69	5516.98
2-Nov-03	2.7	5539.95
3-Nov-03	2.77	5701.71
4-Nov-03	2.72	5586.00
5-Nov-03	2.6	5311.76
6-Nov-03	2.56	5221.45
7-Nov-03	2.53	5154.07
8-Nov-03	2.51	5109.33
9-Nov-03	2.48	5042.47
10-Nov-03	2.44	4953.82
11-Nov-03	2.38	4821.90
12-Nov-03	2.31	4669.59
13-Nov-03	2.24	4519.03
14-Nov-03	2.13	4286.01
15-Nov-03	2.25	4540.43
16-Nov-03	2.24	4519.03
17-Nov-03	2.22	4476.34
18-Nov-03	2.17	4370.24
19-Nov-03	2.12	4265.05
20-Nov-03	2.07	4160.77
21-Nov-03	1.99	3995.84
22-Nov-03	1.93	3873.71
23-Nov-03	1.9	3813.15
24-Nov-03	1.83	3673.18
25-Nov-03	1.85	3712.98
26-Nov-03	1.81	3633.53
27-Nov-03	1.75	3515.50
28-Nov-03	1.68	3379.56
29-Nov-03	1.67	3360.30
30-Nov-03	1.66	3341.07
1-Dec-03	1.73	3476.47
2-Dec-03	1.66	3341.07
3-Dec-03	1.65	3321.89
4-Dec-03	1.64	3302.74
5-Dec-03	1.64	3302.74
6-Dec-03	1.62	3264.57
7-Dec-03	1.52	3076.08

8-Dec-03	1.5	3038.86
9-Dec-03	1.5	3038.86
10-Dec-03	1.5	3038.86
11-Dec-03	1.37	2800.91
12-Dec-03	1.36	2782.90
13-Dec-03	1.31	2693.44
14-Dec-03	1.27	2622.62
15-Dec-03	1.22	2535.04
16-Dec-03	1.19	2483.01
17-Dec-03	1.24	2569.95
18-Dec-03	1.22	2535.04
19-Dec-03	1.18	2465.75
20-Dec-03	1.16	2431.36
21-Dec-03	1.12	2363.10
22-Dec-03	1.13	2380.10
23-Dec-03	1.15	2414.23
24-Dec-03	1.16	2431.36
25-Dec-03	1.15	2414.23
26-Dec-03	1.15	2414.23
27-Dec-03	1.13	2380.10
28-Dec-03	1.13	2380.10
29-Dec-03	1.08	2295.53
30-Dec-03	1.07	2278.75
31-Dec-03	1.05	2245.31
1-Jan-04	1.05	2245.31
2-Jan-04	1	2162.50
3-Jan-04	1.08	2295.53
4-Jan-04	1.05	2245.31
5-Jan-04	1.07	2278.75
6-Jan-04	1.06	2262.01
7-Jan-04	1.07	2278.75
8-Jan-04	1.07	2278.75
9-Jan-04	1.06	2262.01
10-Jan-04	1.07	2278.75
11-Jan-04	1.08	2295.53
12-Jan-04	1.07	2278.75
13-Jan-04	1.05	2245.31
14-Jan-04	1.05	2245.31
15-Jan-04	1.03	2212.05
16-Jan-04	1.02	2195.49
17-Jan-04	1	2162.50
18-Jan-04	1.01	2178.97
19-Jan-04	1.06	2262.01
20-Jan-04	1.04	2228.66
21-Jan-04	1.03	2212.05
22-Jan-04	1.02	2195.49
23-Jan-04	1.01	2178.97
24-Jan-04	1	2162.50

25-Jan-04	0.98	2129.68
26-Jan-04	0.98	2129.68
27-Jan-04	0.97	2113.34
28-Jan-04	0.96	2097.05
29-Jan-04	0.93	2048.43
30-Jan-04	0.93	2048.43
31-Jan-04	0.89	2001.39
1-Feb-04	0.84	1905.03
2-Feb-04	0.84	1905.03
3-Feb-04	0.84	1905.03
4-Feb-04	0.85	1920.78
5-Feb-04	0.85	1920.78
6-Feb-04	0.85	1920.78
7-Feb-04	0.87	1952.42
8-Feb-04	0.96	2097.05
9-Feb-04	0.92	2032.31
10-Feb-04	0.93	2048.43
11-Feb-04	0.99	2146.07
12-Feb-04	1.03	2212.05
13-Feb-04	1.08	2295.53
14-Feb-04	1.12	2363.10
15-Feb-04	1.1	2329.23
16-Feb-04	1.05	2245.31
17-Feb-04	1.02	2195.49
18-Feb-04	0.96	2097.05
19-Feb-04	0.92	2032.31
20-Feb-04	0.9	2000.22
21-Feb-04	0.89	1984.24
22-Feb-04	0.87	1952.42
23-Feb-04	0.85	1920.78
24-Feb-04	0.83	1889.33
25-Feb-04	0.83	1889.33
26-Feb-04	0.79	1826.98
27-Feb-04	0.78	1811.51
28-Feb-04	0.73	1734.86
29-Feb-04	0.7	1689.44
1-Mar-04	0.68	1659.39
2-Mar-04	0.68	1659.39
3-Mar-04	0.69	1674.39
4-Mar-04	0.69	1674.39
5-Mar-04	0.67	1644.45
6-Mar-04	0.63	1585.13
7-Mar-04	0.6	1541.16
8-Mar-04	0.64	1599.89
9-Mar-04	0.66	1629.54
10-Mar-04	0.67	1644.45
11-Mar-04	0.7	1689.44
12-Mar-04	0.64	1599.89

13-Mar-04	0.59	1526.60
14-Mar-04	0.76	1780.71
15-Mar-04	0.71	1704.53
16-Mar-04	0.71	1704.53
17-Mar-04	0.68	1659.39
18-Mar-04	0.7	1689.44
19-Mar-04	0.72	1719.67
20-Mar-04	0.69	1674.39
21-Mar-04	0.65	1614.69
22-Mar-04	0.67	1644.45
23-Mar-04	0.65	1614.69
24-Mar-04	0.66	1629.54
25-Mar-04	0.68	1659.39
26-Mar-04	0.71	1704.53
27-Mar-04	0.67	1644.45
28-Mar-04	0.69	1674.39
29-Mar-04	0.66	1629.54
30-Mar-04	0.65	1614.69
31-Mar-04	0.62	1570.42
1-Apr-04	0.59	1526.60
2-Apr-04	0.59	1526.60
3-Apr-04	0.6	1541.16
4-Apr-04	0.6	1541.16
5-Apr-04	0.66	1629.54
6-Apr-04	0.7	1689.44
7-Apr-04	0.68	1659.39
8-Apr-04	0.67	1644.45
9-Apr-04	0.62	1570.42
10-Apr-04	0.63	1585.13
11-Apr-04	0.68	1659.39
12-Apr-04	0.67	1644.45
13-Apr-04	0.68	1659.39
14-Apr-04	0.67	1644.45
15-Apr-04	0.69	1674.39
16-Apr-04	0.74	1750.09
17-Apr-04	0.77	1796.08
18-Apr-04	0.79	1826.98
19-Apr-04	0.84	1905.03
20-Apr-04	0.87	1952.42
21-Apr-04	0.95	2080.80
22-Apr-04	0.99	2146.07
23-Apr-04	1.05	2245.31
24-Apr-04	1.1	2329.23
25-Apr-04	1.07	2278.75
26-Apr-04	1.05	2245.31
27-Apr-04	1.05	2245.31
28-Apr-04	0.99	2146.07
29-Apr-04	1.02	2195.49

30-Apr-04	0.96	2097.05
1-May-04	0.96	2097.05
2-May-04	1.01	2178.97
3-May-04	1.05	2245.31
4-May-04	1.14	2397.14
5-May-04	1.18	2465.75
6-May-04	1.19	2483.01
7-May-04	1.3	2675.67
8-May-04	1.39	2837.07
9-May-04	1.41	2873.39
10-May-04	1.35	2764.92
11-May-04	1.32	2711.25
12-May-04	1.3	2675.67
13-May-04	1.25	2587.46
14-May-04	1.28	2640.26
15-May-04	1.27	2622.62
16-May-04	1.21	2517.66
17-May-04	1.3	2675.67
18-May-04	1.29	2657.94
19-May-04	1.36	2782.90
20-May-04	1.43	2909.88
21-May-04	1.48	3001.81
22-May-04	1.61	3245.54
23-May-04	1.66	3341.07
24-May-04	1.72	3457.01
25-May-04	1.91	3833.30
26-May-04	2.08	4181.55
27-May-04	2.15	4328.05
28-May-04	2.28	4604.85
29-May-04	2.43	4931.75
30-May-04	2.7	5539.95
31-May-04	3.09	6461.95
1-Jun-04	3.37	7154.48
2-Jun-04	3.41	7255.44
3-Jun-04	3.35	7104.19
4-Jun-04	3.28	6929.15
5-Jun-04	3.17	6657.25
6-Jun-04	3.07	6413.45
7-Jun-04	3.19	6706.40
8-Jun-04	3.3	6979.00
9-Jun-04	3.49	7458.88
10-Jun-04	3.6	7741.86
11-Jun-04	3.66	7897.78
12-Jun-04	3.61	7767.77
13-Jun-04	3.37	7154.48
14-Jun-04	3.46	7382.36
15-Jun-04	3.64	7845.69
16-Jun-04	3.77	8186.50

17-Jun-04	3.93	8613.00
18-Jun-04	4.23	9433.21
19-Jun-04	4.65	10625.36
20-Jun-04	5.13	12048.47
21-Jun-04	5.53	13282.22
22-Jun-04	5.56	13376.47
23-Jun-04	5.34	12690.86
24-Jun-04	5.05	11806.89
25-Jun-04	4.72	10828.92
26-Jun-04	4.39	9881.40
27-Jun-04	4.11	9101.94
28-Jun-04	4.02	8856.27
29-Jun-04	3.94	8639.91
30-Jun-04	3.88	8478.89
1-Jul-04	3.95	8666.85
2-Jul-04	4.01	8829.12
3-Jul-04	4.03	8883.45
4-Jul-04	4.04	8910.66
5-Jul-04	4.05	8937.90
6-Jul-04	4.11	9101.94
7-Jul-04	4.29	9600.41
8-Jul-04	4.54	10308.27
9-Jul-04	4.78	11004.49
10-Jul-04	4.8	11063.23
11-Jul-04	4.74	10887.33
12-Jul-04	4.67	10683.38
13-Jul-04	4.61	10509.66
14-Jul-04	4.68	10712.43
15-Jul-04	4.83	11151.56
16-Jul-04	4.99	11626.84
17-Jul-04	5.24	12383.48
18-Jul-04	5.59	13470.95
19-Jul-04	5.89	14428.70
20-Jul-04	6.12	15178.69
21-Jul-04	6.23	15542.14
22-Jul-04	6.49	16413.27
23-Jul-04	6.86	17681.80
24-Jul-04	6.97	18065.37
25-Jul-04	7.24	19019.21
26-Jul-04	8	21796.30
27-Jul-04	9.14	26208.00
28-Jul-04	9.86	29140.38
29-Jul-04	9.98	29639.79
30-Jul-04	10.01	29765.11
31-Jul-04	9.52	27741.87
1-Aug-04	9.11	26088.23
2-Aug-04	8.8	24862.09
3-Aug-04	9.01	25690.41

4-Aug-04	9.05	25849.28
5-Aug-04	8.87	25137.13
6-Aug-04	8.76	24705.42
7-Aug-04	8.78	24783.71
8-Aug-04	8.93	25373.72
9-Aug-04	9.29	26809.76
10-Aug-04	9.62	28150.65
11-Aug-04	9.64	28232.66
12-Aug-04	9.88	29223.41
13-Aug-04	10.02	29806.93
14-Aug-04	9.81	28933.19
15-Aug-04	9.65	28273.70
16-Aug-04	9.64	28232.66
17-Aug-04	9.93	29431.34
18-Aug-04	10.13	30268.29
19-Aug-04	10.27	30859.10
20-Aug-04	10.63	32396.89
21-Aug-04	10.71	32742.22
22-Aug-04	10.74	32872.05
23-Aug-04	10.75	32915.37
24-Aug-04	10.68	32612.56
25-Aug-04	10.45	31624.67
26-Aug-04	10.19	30520.99
27-Aug-04	10.05	29932.50
28-Aug-04	10.09	30100.23
29-Aug-04	9.9	29306.52
30-Aug-04	9.87	29181.88
31-Aug-04	9.88	29223.41
1-Sep-04	10.02	29806.93
2-Sep-04	10.29	30943.83
3-Sep-04	10.73	32828.75
4-Sep-04	11.14	34620.54
5-Sep-04	11.11	34488.29
6-Sep-04	10.99	33961.08
7-Sep-04	10.85	33349.67
8-Sep-04	10.93	33698.57
9-Sep-04	11.07	34312.23
10-Sep-04	11.15	34664.67
11-Sep-04	11.51	36266.39
12-Sep-04	11.91	38076.06
13-Sep-04	12.01	38533.35
14-Sep-04	11.98	38395.96
15-Sep-04	11.81	37620.71
16-Sep-04	11.61	36715.87
17-Sep-04	11.44	35952.93
18-Sep-04	11.23	35018.38
19-Sep-04	11.16	34708.81
20-Sep-04	11.17	34752.98

21-Sep-04	10.94	33742.27
22-Sep-04	10.66	32526.23
23-Sep-04	10.46	31667.40
24-Sep-04	10.17	30436.67
25-Sep-04	9.91	29348.10
26-Sep-04	9.57	27945.99
27-Sep-04	9.19	26408.05
28-Sep-04	8.8	24862.09
29-Sep-04	8.44	23464.74
30-Sep-04	8.17	22435.73
1-Oct-04	7.87	21311.77
2-Oct-04	7.48	19881.61
3-Oct-04	7.21	18912.36
4-Oct-04	7.03	18275.83
5-Oct-04	6.89	17786.12
6-Oct-04	6.79	17439.24
7-Oct-04	6.69	17094.79
8-Oct-04	6.43	16210.74
9-Oct-04	6.16	15310.50
10-Oct-04	5.86	14331.88
11-Oct-04	5.58	13439.43
12-Oct-04	5.33	12660.00
13-Oct-04	5.13	12048.47
14-Oct-04	5.01	11686.75
15-Oct-04	4.84	11181.06
16-Oct-04	4.73	10858.11
17-Oct-04	4.65	10625.36
18-Oct-04	4.59	10451.97
19-Oct-04	4.54	10308.27
20-Oct-04	4.42	9966.26
21-Oct-04	4.28	9572.47
22-Oct-04	4.17	9267.05
23-Oct-04	4.09	9047.14
24-Oct-04	4.01	8829.12
25-Oct-04	3.95	8666.85
26-Oct-04	3.87	8452.16
27-Oct-04	3.76	8160.10
28-Oct-04	3.72	8054.81
29-Oct-04	3.6	7741.86
30-Oct-04	3.54	7587.04
31-Oct-04	3.45	7356.91
1-Nov-04	3.32	7028.98
2-Nov-04	3.21	6755.68
3-Nov-04	3.12	6534.95
4-Nov-04	3.03	6316.84
5-Nov-04	2.91	6030.15
6-Nov-04	2.84	5865.11
7-Nov-04	2.8	5771.54

8-Nov-04	2.77	5701.71
9-Nov-04	2.72	5586.00
10-Nov-04	2.69	5516.98
11-Nov-04	2.61	5334.43
12-Nov-04	2.52	5131.68
13-Nov-04	2.5	5087.01
14-Nov-04	2.41	4887.70
15-Nov-04	2.37	4800.03
16-Nov-04	2.34	4734.65
17-Nov-04	2.32	4691.24
18-Nov-04	2.28	4604.85
19-Nov-04	2.26	4561.87
20-Nov-04	2.22	4476.34
21-Nov-04	2.18	4391.39
22-Nov-04	2.15	4328.05
23-Nov-04	2.14	4307.01
24-Nov-04	2.07	4160.77
25-Nov-04	2.06	4140.02
26-Nov-04	2.04	4098.64
27-Nov-04	1.98	3975.39
28-Nov-04	1.99	3995.84
29-Nov-04	2.03	4078.01
30-Nov-04	2.19	4412.57
1-Dec-04	2.21	4455.05
2-Dec-04	2.11	4244.12
3-Dec-04	2.04	4098.64
4-Dec-04	2.01	4036.85
5-Dec-04	1.94	3893.97
6-Dec-04	1.91	3833.30
7-Dec-04	1.87	3752.94
8-Dec-04	1.84	3693.06
9-Dec-04	1.81	3633.53
10-Dec-04	1.81	3633.53
11-Dec-04	1.81	3633.53
12-Dec-04	1.74	3495.96
13-Dec-04	1.7	3418.21
14-Dec-04	1.7	3418.21
15-Dec-04	1.67	3360.30
16-Dec-04	1.63	3283.63
17-Dec-04	1.63	3283.63
18-Dec-04	1.61	3245.54
19-Dec-04	1.58	3188.69
20-Dec-04	1.55	3132.21
21-Dec-04	1.5	3038.86
22-Dec-04	1.52	3076.08
23-Dec-04	1.45	2946.53
24-Dec-04	1.44	2928.18
25-Dec-04	1.47	2983.34

26-Dec-04	1.5	3038.86
27-Dec-04	1.49	3020.32
28-Dec-04	1.48	3001.81
29-Dec-04	1.42	2891.62
30-Dec-04	1.42	2891.62
31-Dec-04	1.35	2764.92
1-Jan-05	1.33	2729.10
2-Jan-05	1.32	2711.25
3-Jan-05	1.33	2729.10
4-Jan-05	1.33	2729.10
5-Jan-05	1.31	2693.44
6-Jan-05	1.31	2693.44
7-Jan-05	1.3	2675.67
8-Jan-05	1.29	2657.94
9-Jan-05	1.28	2640.26
10-Jan-05	1.25	2587.46
11-Jan-05	1.21	2517.66
12-Jan-05	1.2	2500.31
13-Jan-05	1.2	2500.31
14-Jan-05	1.2	2500.31
15-Jan-05	1.2	2500.31
16-Jan-05	1.19	2483.01
17-Jan-05	1.17	2448.53
18-Jan-05	1.14	2397.14
19-Jan-05	1.14	2397.14
20-Jan-05	1.19	2483.01
21-Jan-05	1.16	2431.36
22-Jan-05	1.14	2397.14
23-Jan-05	1.15	2414.23
24-Jan-05	1.16	2431.36
25-Jan-05	1.15	2414.23
26-Jan-05	1.15	2414.23
27-Jan-05	1.16	2431.36
28-Jan-05	1.14	2397.14
29-Jan-05	1.14	2397.14
30-Jan-05	1.13	2380.10
31-Jan-05	1.12	2363.10
1-Feb-05	1.11	2346.14
2-Feb-05	1.07	2278.75
3-Feb-05	1.07	2278.75
4-Feb-05	1.06	2262.01
5-Feb-05	1.05	2245.31
6-Feb-05	1.04	2228.66
7-Feb-05	1.05	2245.31
8-Feb-05	1.04	2228.66
9-Feb-05	1.05	2245.31
10-Feb-05	1.05	2245.31
11-Feb-05	1.07	2278.75

12-Feb-05	1.08	2295.53
13-Feb-05	1.09	2312.35
14-Feb-05	1.07	2278.75
15-Feb-05	1.02	2195.49
16-Feb-05	0.95	2080.80
17-Feb-05	0.95	2080.80
18-Feb-05	0.91	2016.24
19-Feb-05	0.89	1984.24
20-Feb-05	0.89	1984.24
21-Feb-05	0.88	1968.31
22-Feb-05	0.86	1936.58
23-Feb-05	0.85	1920.78
24-Feb-05	0.84	1905.03
25-Feb-05	0.84	1905.03
26-Feb-05	0.83	1889.33
27-Feb-05	0.85	1920.78
28-Feb-05	0.86	1936.58
1-Mar-05	0.83	1889.33
2-Mar-05	0.84	1905.03
3-Mar-05	0.82	1873.67
4-Mar-05	0.83	1889.33
5-Mar-05	0.84	1905.03
6-Mar-05	0.85	1920.78
7-Mar-05	0.86	1936.58
8-Mar-05	0.86	1936.58
9-Mar-05	0.87	1952.42
10-Mar-05	0.86	1936.58
11-Mar-05	0.85	1920.78
12-Mar-05	0.86	1936.58
13-Mar-05	0.85	1920.78
14-Mar-05	0.84	1905.03
15-Mar-05	0.82	1873.67
16-Mar-05	0.82	1873.67
17-Mar-05	0.83	1889.33
18-Mar-05	0.85	1920.78
19-Mar-05	0.84	1905.03
20-Mar-05	0.86	1936.58
21-Mar-05	0.85	1920.78
22-Mar-05	0.85	1920.78
23-Mar-05	0.86	1936.58
24-Mar-05	0.92	2032.31
25-Mar-05	0.93	2048.43
26-Mar-05	0.95	2080.80
27-Mar-05	1.02	2195.49
28-Mar-05	1.07	2278.75
29-Mar-05	1.09	2312.35
30-Mar-05	1.12	2363.10
31-Mar-05	1.15	2414.23

1-Apr-05	1.05	2245.31
2-Apr-05	1.02	2195.49
3-Apr-05	0.97	2113.34
4-Apr-05	0.93	2048.43
5-Apr-05	0.88	1968.31
6-Apr-05	0.91	2016.24
7-Apr-05	0.99	2146.07
8-Apr-05	1.07	2278.75
9-Apr-05	1.12	2363.10
10-Apr-05	1.17	2448.53
11-Apr-05	1.19	2483.01
12-Apr-05	1.16	2431.36
13-Apr-05	1.13	2380.10
14-Apr-05	1.11	2346.14
15-Apr-05	1.11	2346.14
16-Apr-05	1.17	2448.53
17-Apr-05	1.12	2363.10
18-Apr-05	1.14	2397.14
19-Apr-05	1.15	2414.23
20-Apr-05	1.13	2380.10
21-Apr-05	1.11	2346.14
22-Apr-05	1.1	2329.23
23-Apr-05	1.11	2346.14
24-Apr-05	1.09	2312.35
25-Apr-05	1.08	2295.53
26-Apr-05	1.1	2329.23
27-Apr-05	1.09	2312.35
28-Apr-05	1.11	2346.14
29-Apr-05	1.14	2397.14
30-Apr-05	1.08	2295.53
1-May-05	1.09	2312.35
2-May-05	1.08	2295.53
3-May-05	1.08	2295.53
4-May-05	1.08	2295.53
5-May-05	1.08	2295.53
6-May-05	1.09	2312.35
7-May-05	1.07	2278.75
8-May-05	1.06	2262.01
9-May-05	1.02	2195.49
10-May-05	0.98	2129.68
11-May-05	0.93	2048.43
12-May-05	0.89	1984.24
13-May-05	0.88	1968.31
14-May-05	0.89	1984.24
15-May-05	0.92	2032.31
16-May-05	1.02	2195.49
17-May-05	1.06	2262.01
18-May-05	1.15	2414.23

19-May-05	1.22	2535.04
20-May-05	1.24	2569.95
21-May-05	1.28	2640.26
22-May-05	1.39	2837.07
23-May-05	1.39	2837.07
24-May-05	1.45	2946.53
25-May-05	1.5	3038.86
26-May-05	1.51	3057.45
27-May-05	1.48	3001.81
28-May-05	1.46	2964.92
29-May-05	1.44	2928.18
30-May-05	1.41	2873.39
31-May-05	1.33	2729.10
1-Jun-05	1.27	2622.62
2-Jun-05	1.26	2605.02
3-Jun-05	1.27	2622.62
4-Jun-05	1.31	2693.44
5-Jun-05	1.35	2764.92
6-Jun-05	1.37	2800.91
7-Jun-05	1.46	2964.92
8-Jun-05	1.59	3207.60
9-Jun-05	1.63	3283.63
10-Jun-05	1.64	3302.74
11-Jun-05	1.68	3379.56
12-Jun-05	1.81	3633.53
13-Jun-05	1.94	3893.97
14-Jun-05	2.26	4561.87
15-Jun-05	2.56	5221.45
16-Jun-05	2.66	5448.27
17-Jun-05	2.66	5448.27
18-Jun-05	2.73	5609.07
19-Jun-05	3.12	6534.95
20-Jun-05	3.68	7950.00
21-Jun-05	3.91	8559.27
22-Jun-05	3.9	8532.45
23-Jun-05	3.79	8239.39
24-Jun-05	3.67	7923.88
25-Jun-05	3.72	8054.81
26-Jun-05	3.92	8586.12
27-Jun-05	4.28	9572.47
28-Jun-05	4.9	11358.63
29-Jun-05	5.33	12660.00
30-Jun-05	5.72	13883.10
1-Jul-05	6.15	15277.51
2-Jul-05	6.61	16821.00
3-Jul-05	7.1	18522.45
4-Jul-05	7.48	19881.61
5-Jul-05	7.59	20281.41

6-Jul-05	7.38	19520.62
7-Jul-05	7.12	18593.13
8-Jul-05	6.87	17716.55
9-Jul-05	6.62	16855.14
10-Jul-05	6.36	15975.59
11-Jul-05	6.22	15508.97
12-Jul-05	6.14	15244.54
13-Jul-05	6.03	14883.61
14-Jul-05	5.78	14074.81
15-Jul-05	5.54	13313.61
16-Jul-05	5.33	12660.00
17-Jul-05	5.23	12352.89
18-Jul-05	4.97	11567.05
19-Jul-05	4.71	10799.75
20-Jul-05	4.49	10165.27
21-Jul-05	4.36	9796.80
22-Jul-05	4.35	9768.66
23-Jul-05	4.62	10538.54
24-Jul-05	5.36	12752.66
25-Jul-05	7.32	19305.16
26-Jul-05	9.12	26128.13
27-Jul-05	9.95	29514.65
28-Jul-05	10.89	33523.96
29-Jul-05	11.43	35908.23
30-Jul-05	11.22	34974.10
31-Jul-05	10.8	33132.27
1-Aug-05	10.35	31198.53
2-Aug-05	10.15	30352.44
3-Aug-05	10.31	31028.65
4-Aug-05	10.37	31283.59
5-Aug-05	10.29	30943.83
6-Aug-05	10.28	30901.46
7-Aug-05	10.19	30520.99
8-Aug-05	10.33	31113.55
9-Aug-05	10.74	32872.05
10-Aug-05	10.76	32958.71
11-Aug-05	10.63	32396.89
12-Aug-05	10.63	32396.89
13-Aug-05	10.72	32785.47
14-Aug-05	10.78	33045.45
15-Aug-05	11.13	34576.44
16-Aug-05	11.32	35417.83
17-Aug-05	11.45	35997.65
18-Aug-05	11.94	38213.04
19-Aug-05	12.23	39546.22
20-Aug-05	12.22	39499.98
21-Aug-05	12.19	39361.37
22-Aug-05	12.19	39361.37

23-Aug-05	12.14	39130.73
24-Aug-05	12.11	38992.59
25-Aug-05	12.05	38716.82
26-Aug-05	11.89	37984.83
27-Aug-05	11.49	36176.73
28-Aug-05	11.36	35595.88
29-Aug-05	11.04	34180.40
30-Aug-05	10.84	33306.15
31-Aug-05	11.19	34841.36
1-Sep-05	11.26	35151.35
2-Sep-05	11.14	34620.54
3-Sep-05	11.14	34620.54
4-Sep-05	11.13	34576.44
5-Sep-05	11.07	34312.23
6-Sep-05	10.94	33742.27
7-Sep-05	10.85	33349.67
8-Sep-05	11.07	34312.23
9-Sep-05	11.05	34224.33
10-Sep-05	10.89	33523.96
11-Sep-05	10.46	31667.40
12-Sep-05	9.92	29389.71
13-Sep-05	9.47	27538.27
14-Sep-05	9.44	27416.37
15-Sep-05	9.44	27416.37
16-Sep-05	9.4	27254.14
17-Sep-05	9.34	27011.43
18-Sep-05	9.3	26850.06
19-Sep-05	9.11	26088.23
20-Sep-05	9.32	26930.70
21-Sep-05	9.87	29181.88
22-Sep-05	10.31	31028.65
23-Sep-05	10.72	32785.47
24-Sep-05	10.69	32655.76
25-Sep-05	10.41	31453.97
26-Sep-05	10.02	29806.93
27-Sep-05	9.82	28974.58
28-Sep-05	9.49	27619.65
29-Sep-05	9.42	27335.21
30-Sep-05	9.52	27741.87
1-Oct-05	9.96	29556.35
2-Oct-05	10.09	30100.23
3-Oct-05	9.9	29306.52
4-Oct-05	9.59	28027.79
5-Oct-05	9.23	26568.48
6-Oct-05	8.84	25019.12
7-Oct-05	8.46	23541.62
8-Oct-05	8.2	22549.25
9-Oct-05	8.03	21908.66

10-Oct-05	8.08	22096.39
11-Oct-05	8.12	22246.98
12-Oct-05	7.92	21497.67
13-Oct-05	7.68	20610.61
14-Oct-05	7.44	19736.93
15-Oct-05	7.09	18487.15
16-Oct-05	6.63	16889.30
17-Oct-05	6.25	15608.55
18-Oct-05	5.94	14590.59
19-Oct-05	5.65	13660.63
20-Oct-05	5.34	12690.86
21-Oct-05	5.19	12230.80
22-Oct-05	4.97	11567.05
23-Oct-05	4.8	11063.23
24-Oct-05	4.64	10596.39
25-Oct-05	4.43	9994.60
26-Oct-05	4.28	9572.47
27-Oct-05	4.16	9239.46
28-Oct-05	4.02	8856.27
29-Oct-05	3.92	8586.12
30-Oct-05	3.81	8292.40
31-Oct-05	3.69	7976.16
1-Nov-05	3.57	7664.31
2-Nov-05	3.46	7382.36
3-Nov-05	3.33	7054.02
4-Nov-05	3.26	6879.43
5-Nov-05	3.34	7079.08
6-Nov-05	3.33	7054.02
7-Nov-05	3.35	7104.19
8-Nov-05	3.48	7433.34
9-Nov-05	3.76	8160.10
10-Nov-05	3.91	8559.27
11-Nov-05	3.91	8559.27
12-Nov-05	3.78	8212.93
13-Nov-05	3.68	7950.00
14-Nov-05	3.55	7612.77
15-Nov-05	3.5	7484.45
16-Nov-05	3.44	7331.50
17-Nov-05	3.42	7280.77
18-Nov-05	3.37	7154.48
19-Nov-05	3.35	7104.19
20-Nov-05	3.4	7230.16
21-Nov-05	3.4	7230.16
22-Nov-05	3.35	7104.19
23-Nov-05	3.27	6904.27
24-Nov-05	3.15	6608.23
25-Nov-05	3.03	6316.84
26-Nov-05	2.93	6077.60

27-Nov-05	2.81	5794.88
28-Nov-05	2.66	5448.27
29-Nov-05	2.61	5334.43
30-Nov-05	2.56	5221.45
1-Dec-05	2.48	5042.47
2-Dec-05	2.42	4909.71
3-Dec-05	2.39	4843.80
4-Dec-05	2.3	4647.98
5-Dec-05	2.27	4583.34
6-Dec-05	2.18	4391.39
7-Dec-05	2.2	4433.79
8-Dec-05	2.17	4370.24
9-Dec-05	2.1	4223.22
10-Dec-05	2.07	4160.77
11-Dec-05	2.06	4140.02
12-Dec-05	1.98	3975.39
13-Dec-05	1.92	3853.49
14-Dec-05	1.95	3914.27
15-Dec-05	1.93	3873.71
16-Dec-05	1.91	3833.30
17-Dec-05	1.89	3793.04
18-Dec-05	1.88	3772.97
19-Dec-05	2.03	4078.01
20-Dec-05	1.98	3975.39
21-Dec-05	2.01	4036.85
22-Dec-05	1.98	3975.39
23-Dec-05	1.9	3813.15
24-Dec-05	1.8	3613.76
25-Dec-05	1.77	3554.69
26-Dec-05	1.82	3653.33
27-Dec-05	1.8	3613.76
28-Dec-05	1.67	3360.30
29-Dec-05	1.63	3283.63
30-Dec-05	1.64	3302.74
31-Dec-05	1.59	3207.60
1-Jan-06	1.5	3038.86
2-Jan-06	1.475	2992.57
3-Jan-06	1.425	2900.74
4-Jan-06	1.4	2855.21
5-Jan-06	1.355	2773.90
6-Jan-06	1.31	2693.44
7-Jan-06	1.31	2693.44
8-Jan-06	1.34	2746.99
9-Jan-06	1.37	2800.91
10-Jan-06	1.41	2873.39
11-Jan-06	1.465	2974.12
12-Jan-06	1.42	2891.62
13-Jan-06	1.395	2846.14

14-Jan-06	1.37	2800.91
15-Jan-06	1.345	2755.95
16-Jan-06	1.32	2711.25
17-Jan-06	1.28	2640.26
18-Jan-06	1.265	2613.81
19-Jan-06	1.24	2569.95
20-Jan-06	1.2	2500.31
21-Jan-06	1.205	2508.98
22-Jan-06	1.195	2491.66
23-Jan-06	1.185	2474.38
24-Jan-06	1.175	2457.14
25-Jan-06	1.185	2474.38
26-Jan-06	1.17	2448.53
27-Jan-06	1.155	2422.79
28-Jan-06	1.09	2312.35
29-Jan-06	1.09	2312.35
30-Jan-06	1.085	2303.94
31-Jan-06	1.09	2312.35
1-Feb-06	1.09	2312.35
2-Feb-06	1.105	2337.68
3-Feb-06	1.105	2337.68
4-Feb-06	1.115	2354.61
5-Feb-06	1.145	2405.68
6-Feb-06	1.12	2363.10
7-Feb-06	1.095	2320.78
8-Feb-06	1.1	2329.23
9-Feb-06	1.09	2312.35
10-Feb-06	1.08	2295.53
11-Feb-06	1.055	2253.65
12-Feb-06	1.02	2195.49
13-Feb-06	0.99	2146.07
14-Feb-06	1	2162.50
15-Feb-06	1.03	2212.05
16-Feb-06	1.06	2262.01
17-Feb-06	1.01	2178.97
18-Feb-06	1.01	2178.97
19-Feb-06	1.025	2203.77
20-Feb-06	1.015	2187.22
21-Feb-06	0.99	2146.07
22-Feb-06	0.97	2113.34
23-Feb-06	0.975	2121.51
24-Feb-06	0.975	2121.51
25-Feb-06	0.965	2105.19
26-Feb-06	0.965	2105.19
27-Feb-06	0.96	2097.05
28-Feb-06	0.945	2072.69
1-Mar-06	0.915	2024.27
2-Mar-06	0.91	2016.24

3-Mar-06	0.88	1968.31
4-Mar-06	0.86	1936.58
5-Mar-06	0.855	1928.67
6-Mar-06	0.855	1928.67
7-Mar-06	0.87	1952.42
8-Mar-06	0.91	2016.24
9-Mar-06	0.925	2040.37
10-Mar-06	0.89	1984.24
11-Mar-06	0.895	1992.22
12-Mar-06	0.895	1992.22
13-Mar-06	0.87	1952.42
14-Mar-06	0.83	1889.33
15-Mar-06	0.85	1920.78
16-Mar-06	0.88	1968.31
17-Mar-06	0.91	2016.24
18-Mar-06	0.945	2072.69
19-Mar-06	0.97	2113.34
20-Mar-06	0.95	2080.80
21-Mar-06	0.915	2024.27
22-Mar-06	0.905	2008.23
23-Mar-06	0.94	2064.59
24-Mar-06	0.91	2016.24
25-Mar-06	0.895	1992.22
26-Mar-06	0.905	2008.23
27-Mar-06	0.91	2016.24
28-Mar-06	0.87	1952.42
29-Mar-06	0.845	1912.90
30-Mar-06	0.85	1920.78
31-Mar-06	0.855	1928.67
1-Apr-06	0.89	1984.24
2-Apr-06	0.92	2032.31
3-Apr-06	0.935	2056.50
4-Apr-06	0.93	2048.43
5-Apr-06	0.895	1992.22
6-Apr-06	0.87	1952.42
7-Apr-06	0.88	1968.31
8-Apr-06	0.84	1905.03
9-Apr-06	0.84	1905.03
10-Apr-06	0.83	1889.33
11-Apr-06	0.805	1850.27
12-Apr-06	0.755	1773.04
13-Apr-06	0.76	1780.71
14-Apr-06	0.78	1811.51
15-Apr-06	0.77	1796.08
16-Apr-06	0.72	1719.67
17-Apr-06	0.73	1734.86
18-Apr-06	0.74	1750.09
19-Apr-06	0.76	1780.71

20-Apr-06	0.8	1842.50
21-Apr-06	0.77	1796.08
22-Apr-06	0.79	1826.98
23-Apr-06	0.805	1850.27
24-Apr-06	0.79	1826.98
25-Apr-06	0.75	1765.38
26-Apr-06	0.765	1788.39
27-Apr-06	0.745	1757.73
28-Apr-06	0.765	1788.39
29-Apr-06	0.84	1905.03
30-Apr-06	0.93	2048.43
1-May-06	0.965	2105.19
2-May-06	0.915	2024.27
3-May-06	0.92	2032.31
4-May-06	0.99	2146.07
5-May-06	0.97	2113.34
6-May-06	1.02	2195.49
7-May-06	1.1	2329.23
8-May-06	1.16	2431.36
9-May-06	1.195	2491.66
10-May-06	1.16	2431.36
11-May-06	1.145	2405.68
12-May-06	1.13	2380.10
13-May-06	1.1	2329.23
14-May-06	1.1	2329.23
15-May-06	1.11	2346.14
16-May-06	1.15	2414.23
17-May-06	1.18	2465.75
18-May-06	1.19	2483.01
19-May-06	1.205	2508.98
20-May-06	1.26	2605.02
21-May-06	1.35	2764.92
22-May-06	1.34	2746.99
23-May-06	1.28	2640.26
24-May-06	1.3	2675.67
25-May-06	1.34	2746.99
26-May-06	1.41	2873.39
27-May-06	1.78	3574.34
28-May-06	2.12	4265.05
29-May-06	2.34	4734.65
30-May-06	2.52	5131.68
31-May-06	2.69	5516.98
1-Jun-06	2.76	5678.50
2-Jun-06	2.75	5655.32
3-Jun-06	2.72	5586.00
4-Jun-06	2.69	5516.98
5-Jun-06	2.685	5505.51
6-Jun-06	2.83	5841.67

7-Jun-06	2.89	5982.83
8-Jun-06	2.88	5959.22
9-Jun-06	2.795	5759.88
10-Jun-06	2.71	5562.96
11-Jun-06	2.64	5402.63
12-Jun-06	2.58	5266.54
13-Jun-06	2.52	5131.68
14-Jun-06	2.47	5020.26
15-Jun-06	2.46	4998.08
16-Jun-06	2.485	5053.59
17-Jun-06	2.48	5042.47
18-Jun-06	2.43	4931.75
19-Jun-06	2.42	4909.71
20-Jun-06	2.43	4931.75
21-Jun-06	2.41	4887.70
22-Jun-06	2.37	4800.03
23-Jun-06	2.35	4756.41
24-Jun-06	2.46	4998.08
25-Jun-06	2.48	5042.47
26-Jun-06	2.53	5154.07
27-Jun-06	2.6	5311.76
28-Jun-06	2.64	5402.63
29-Jun-06	2.67	5471.14
30-Jun-06	2.925	6065.73
1-Jul-06	3.18	6681.81
2-Jul-06	3.92	8586.12
3-Jul-06	4.715	10814.33
4-Jul-06	5.93	14558.16
5-Jul-06	6.37	16009.11
6-Jul-06	6.2	15442.71
7-Jul-06	6.02	14850.95
8-Jul-06	6.06	14981.74
9-Jul-06	6.03	14883.61
10-Jul-06	5.89	14428.70
11-Jul-06	5.92	14525.76
12-Jul-06	5.7	13819.41
13-Jul-06	5.48	13125.67
14-Jul-06	5.53	13282.22
15-Jul-06	5.81	14171.02
16-Jul-06	6.14	15244.54
17-Jul-06	6.28	15708.35
18-Jul-06	6.34	15908.63
19-Jul-06	6.49	16413.27
20-Jul-06	6.8	17473.82
21-Jul-06	7.26	19090.55
22-Jul-06	7.57	20208.50
23-Jul-06	8.025	21889.92
24-Jul-06	8.13	22284.69

25-Jul-06	8.185	22492.47
26-Jul-06	8.6	24082.24
27-Jul-06	8.675	24373.65
28-Jul-06	8.625	24179.24
29-Jul-06	8.63	24198.65
30-Jul-06	8.65	24276.37
31-Jul-06	8.9	25255.32
1-Aug-06	8.91	25294.77
2-Aug-06	9.085	25988.57
3-Aug-06	9.155	26267.96
4-Aug-06	9.41	27294.67
5-Aug-06	9.57	27945.99
6-Aug-06	9.28	26769.49
7-Aug-06	9.04	25809.53
8-Aug-06	8.79	24822.89
9-Aug-06	8.91	25294.77
10-Aug-06	8.96	25492.32
11-Aug-06	8.96	25492.32
12-Aug-06	9.12	26128.13
13-Aug-06	9.54	27823.46
14-Aug-06	9.715	28540.97
15-Aug-06	9.57	27945.99
16-Aug-06	10.18	30478.82
17-Aug-06	10.13	30268.29
18-Aug-06	9.745	28664.62
19-Aug-06	9.33	26971.06
20-Aug-06	9.235	26588.55
21-Aug-06	9.17	26327.96
22-Aug-06	9.37	27132.69
23-Aug-06	10.02	29806.93
24-Aug-06	10.26	30816.76
25-Aug-06	10.11	30184.22
26-Aug-06	9.91	29348.10
27-Aug-06	9.95	29514.65
28-Aug-06	9.88	29223.41
29-Aug-06	10	29723.32
30-Aug-06	10.48	31752.91
31-Aug-06	10.43	31539.28
1-Sep-06	10.285	30922.64
2-Sep-06	10.07	30016.32
3-Sep-06	9.865	29161.13
4-Sep-06	9.66	28314.76
5-Sep-06	9.435	27396.07
6-Sep-06	9.13	26168.05
7-Sep-06	8.79	24822.89
8-Sep-06	8.38	23234.66
9-Sep-06	8.22	22625.05
10-Sep-06	7.76	20904.82

11-Sep-06	7.51	19990.36
12-Sep-06	7.19	18841.26
13-Sep-06	6.88	17751.32
14-Sep-06	6.63	16889.30
15-Sep-06	6.5	16447.11
16-Sep-06	6.44	16244.43
17-Sep-06	6.36	15975.59
18-Sep-06	6.24	15575.33
19-Sep-06	6.17	15343.51
20-Sep-06	6	14785.71
21-Sep-06	5.7	13819.41
22-Sep-06	5.4	12876.57
23-Sep-06	5.56	13376.47
24-Sep-06	5.345	12706.30
25-Sep-06	5.41	12907.61
26-Sep-06	6.06	14981.74
27-Sep-06	6.29	15741.67
28-Sep-06	6.87	17716.55
29-Sep-06	7.39	19556.62
30-Sep-06	7.32	19305.16
1-Oct-06	7.12	18593.13
2-Oct-06	7.92	21497.67
3-Oct-06	8.53	23811.38
4-Oct-06	8.47	23580.09
5-Oct-06	8.655	24295.82
6-Oct-06	8.93	25373.72
7-Oct-06	9.04	25809.53
8-Oct-06	9.05	25849.28
9-Oct-06	9.03	25769.80
10-Oct-06	9.225	26548.40
11-Oct-06	8.98	25571.49
12-Oct-06	8.57	23966.02
13-Oct-06	8.28	22852.98
14-Oct-06	8.01	21833.73
15-Oct-06	7.83	21163.46
16-Oct-06	7.82	21126.45
17-Oct-06	8.02	21871.18
18-Oct-06	8.29	22891.05
19-Oct-06	8.43	23426.34
20-Oct-06	8.37	23196.39
21-Oct-06	8.13	22284.69
22-Oct-06	7.8	21052.48
23-Oct-06	7.4	19592.63
24-Oct-06	7.08	18451.86
25-Oct-06	6.73	17232.28
26-Oct-06	6.4	16109.81
27-Oct-06	6.09	15080.10
28-Oct-06	5.81	14171.02

29-Oct-06	5.58	13439.43
30-Oct-06	5.39	12845.55
31-Oct-06	5.18	12200.34
1-Nov-06	4.99	11626.84
2-Nov-06	4.74	10887.33
3-Nov-06	4.65	10625.36
4-Nov-06	4.53	10279.61
5-Nov-06	4.38	9853.18
6-Nov-06	4.27	9544.56
7-Nov-06	4.12	9129.39
8-Nov-06	4.02	8856.27
9-Nov-06	3.96	8693.82
10-Nov-06	3.83	8345.54
11-Nov-06	3.69	7976.16
12-Nov-06	3.48	7433.34
13-Nov-06	3.59	7715.98
14-Nov-06	3.39	7204.90
15-Nov-06	3.32	7028.98
16-Nov-06	3.27	6904.27
17-Nov-06	3.19	6706.40
18-Nov-06	3.12	6534.95
19-Nov-06	3.015	6280.74
20-Nov-06	2.93	6077.60
21-Nov-06	2.89	5982.83
22-Nov-06	2.85	5888.59
23-Nov-06	2.78	5724.95
24-Nov-06	2.73	5609.07
25-Nov-06	2.6	5311.76
26-Nov-06	2.51	5109.33
27-Nov-06	2.42	4909.71
28-Nov-06	2.35	4756.41
29-Nov-06	2.28	4604.85
30-Nov-06	2.15	4328.05
1-Dec-06	2.1	4223.22
2-Dec-06	2.085	4191.95
3-Dec-06	2.115	4254.58
4-Dec-06	2	4016.33
5-Dec-06	1.905	3823.22
6-Dec-06	1.8	3613.76
7-Dec-06	1.83	3673.18
8-Dec-06	1.79	3594.03
9-Dec-06	1.79	3594.03
10-Dec-06	1.71	3437.59
11-Dec-06	1.68	3379.56
12-Dec-06	1.61	3245.54
13-Dec-06	1.595	3217.07
14-Dec-06	1.57	3169.83
15-Dec-06	1.56	3151.00

16-Dec-06	1.57	3169.83
17-Dec-06	1.54	3113.46
18-Dec-06	1.52	3076.08
19-Dec-06	1.49	3020.32
20-Dec-06	1.47	2983.34
21-Dec-06	1.44	2928.18
22-Dec-06	1.41	2873.39
23-Dec-06	1.45	2946.53
24-Dec-06	1.46	2964.92
25-Dec-06	1.395	2846.14
26-Dec-06	1.34	2746.99
27-Dec-06	1.37	2800.91
28-Dec-06	1.345	2755.95
29-Dec-06	1.32	2711.25
30-Dec-06	1.3	2675.67
31-Dec-06	1.29	2657.94
1-Jan-07	1.27	2622.62
2-Jan-07	1.265	2613.81
3-Jan-07	1.25	2587.46
4-Jan-07	1.25	2587.46
5-Jan-07	1.215	2526.35
6-Jan-07	1.19	2483.01
7-Jan-07	1.18	2465.75
8-Jan-07	1.17	2448.53
9-Jan-07	1.14	2397.14
10-Jan-07	1.14	2397.14
11-Jan-07	1.07	2278.75
12-Jan-07	1.05	2245.31
13-Jan-07	1.04	2228.66
14-Jan-07	1.05	2245.31
15-Jan-07	1.05	2245.31
16-Jan-07	1.045	2236.98
17-Jan-07	1.035	2220.35
18-Jan-07	1.035	2220.35
19-Jan-07	1.01	2178.97
20-Jan-07	0.99	2146.07
21-Jan-07	0.985	2137.87
22-Jan-07	0.97	2113.34
23-Jan-07	0.99	2146.07
24-Jan-07	0.95	2080.80
25-Jan-07	0.94	2064.59
26-Jan-07	0.93	2048.43
27-Jan-07	0.93	2048.43
28-Jan-07	0.95	2080.80
29-Jan-07	0.955	2088.92
30-Jan-07	0.98	2129.68
31-Jan-07	0.955	2088.92
1-Feb-07	0.92	2032.31

2-Feb-07	0.905	2008.23
3-Feb-07	0.91	2016.24
4-Feb-07	0.93	2048.43
5-Feb-07	0.92	2032.31
6-Feb-07	0.89	1984.24
7-Feb-07	0.885	1976.27
8-Feb-07	0.87	1952.42
9-Feb-07	0.85	1920.78
10-Feb-07	0.81	1858.06
11-Feb-07	0.8	1842.50
12-Feb-07	0.77	1796.08
13-Feb-07	0.765	1788.39
14-Feb-07	0.77	1796.08
15-Feb-07	0.76	1780.71
16-Feb-07	0.83	1889.33
17-Feb-07	0.85	1920.78
18-Feb-07	0.86	1936.58
19-Feb-07	0.845	1912.90
20-Feb-07	0.83	1889.33
21-Feb-07	0.82	1873.67
22-Feb-07	0.81	1858.06
23-Feb-07	0.82	1873.67
24-Feb-07	0.82	1873.67
25-Feb-07	0.79	1826.98
26-Feb-07	0.77	1796.08
27-Feb-07	0.745	1757.73
28-Feb-07	0.75	1765.38
1-Mar-07	0.76	1780.71
2-Mar-07	0.79	1826.98
3-Mar-07	0.845	1912.90
4-Mar-07	0.855	1928.67
5-Mar-07	0.83	1889.33
6-Mar-07	0.8	1842.50
7-Mar-07	0.81	1858.06
8-Mar-07	0.8	1842.50
9-Mar-07	0.76	1780.71
10-Mar-07	0.7	1689.44
11-Mar-07	0.71	1704.53
12-Mar-07	0.67	1644.45
13-Mar-07	0.63	1585.13
14-Mar-07	0.675	1651.91
15-Mar-07	0.66	1629.54
16-Mar-07	0.65	1614.69
17-Mar-07	0.65	1614.69
18-Mar-07	0.71	1704.53
19-Mar-07	0.71	1704.53
20-Mar-07	0.68	1659.39
21-Mar-07	0.635	1592.50

22-Mar-07	0.62	1570.42
23-Mar-07	0.67	1644.45
24-Mar-07	0.65	1614.69
25-Mar-07	0.62	1570.42
26-Mar-07	0.63	1585.13
27-Mar-07	0.62	1570.42
28-Mar-07	0.615	1563.09
29-Mar-07	0.61	1555.77
30-Mar-07	0.605	1548.46
31-Mar-07	0.57	1497.63
1-Apr-07	0.65	1614.69
2-Apr-07	0.61	1555.77
3-Apr-07	0.55	1468.85
4-Apr-07	0.55	1468.85
5-Apr-07	0.52	1426.06
6-Apr-07	0.56	1483.21
7-Apr-07	0.49	1383.73
8-Apr-07	0.47	1355.76
9-Apr-07	0.47	1355.76
10-Apr-07	0.39	1245.92
11-Apr-07	0.43	1300.43
12-Apr-07	0.39	1245.92
13-Apr-07	0.37	1218.98
14-Apr-07	0.35	1192.25
15-Apr-07	0.345	1185.60
16-Apr-07	0.36	1205.59
17-Apr-07	0.41	1273.07
18-Apr-07	0.45	1327.99
19-Apr-07	0.53	1440.28
20-Apr-07	0.67	1644.45
21-Apr-07	0.77	1796.08
22-Apr-07	0.83	1889.33
23-Apr-07	0.84	1905.03
24-Apr-07	0.9	2000.22
25-Apr-07	0.97	2113.34
26-Apr-07	1	2162.50
27-Apr-07	1.07	2278.75
28-Apr-07	1.13	2380.10
29-Apr-07	1.1	2329.23
30-Apr-07	1.055	2253.65
1-May-07	1.01	2178.97
2-May-07	0.97	2113.34
3-May-07	0.94	2064.59
4-May-07	0.93	2048.43
5-May-07	0.97	2113.34
6-May-07	1.05	2245.31
7-May-07	1.155	2422.79
8-May-07	1.21	2517.66

9-May-07	1.14	2397.14
10-May-07	1.12	2363.10
11-May-07	1.24	2569.95
12-May-07	1.39	2837.07
13-May-07	1.5	3038.86
14-May-07	1.6	3226.55
15-May-07	1.57	3169.83
16-May-07	1.37	2800.91
17-May-07	1.275	2631.43
18-May-07	1.38	2818.97
19-May-07	1.4	2855.21
20-May-07	1.37	2800.91
21-May-07	1.33	2729.10
22-May-07	1.29	2657.94
23-May-07	1.275	2631.43
24-May-07	1.34	2746.99
25-May-07	1.435	2919.03
26-May-07	1.58	3188.69
27-May-07	1.67	3360.30
28-May-07	1.87	3752.94
29-May-07	2.11	4244.12
30-May-07	2.58	5266.54
31-May-07	2.89	5982.83
1-Jun-07	2.97	6172.90
2-Jun-07	2.95	6125.19
3-Jun-07	2.83	5841.67
4-Jun-07	2.68	5494.04
5-Jun-07	2.62	5357.13
6-Jun-07	2.6	5311.76
7-Jun-07	2.51	5109.33
8-Jun-07	2.34	4734.65
9-Jun-07	2.25	4540.43
10-Jun-07	2.09	4202.37
11-Jun-07	2.03	4078.01
12-Jun-07	1.98	3975.39
13-Jun-07	1.92	3853.49
14-Jun-07	1.89	3793.04
15-Jun-07	1.87	3752.94
16-Jun-07	2.05	4119.31
17-Jun-07	2.15	4328.05
18-Jun-07	2.34	4734.65
19-Jun-07	2.49	5064.72
20-Jun-07	2.59	5289.13
21-Jun-07	2.63	5379.86
22-Jun-07	2.51	5109.33
23-Jun-07	2.38	4821.90
24-Jun-07	2.29	4626.40
25-Jun-07	2.25	4540.43

26-Jun-07	2.345	4745.53
27-Jun-07	2.43	4931.75
28-Jun-07	2.52	5131.68
29-Jun-07	2.67	5471.14
30-Jun-07	2.995	6232.73
1-Jul-07	4.17	9267.05
2-Jul-07	4.62	10538.54
3-Jul-07	4.96	11537.19
4-Jul-07	5.84	14267.46
5-Jul-07	6.15	15277.51
6-Jul-07	5.955	14639.28
7-Jul-07	5.81	14171.02
8-Jul-07	5.645	13644.78
9-Jul-07	5.31	12598.36
10-Jul-07	4.89	11328.96
11-Jul-07	4.5	10193.81
12-Jul-07	4.2	9350.00
13-Jul-07	4.17	9267.05
14-Jul-07	4.2	9350.00
15-Jul-07	4.17	9267.05
16-Jul-07	3.93	8613.00
17-Jul-07	3.735	8094.24
18-Jul-07	3.59	7715.98
19-Jul-07	3.605	7754.81
20-Jul-07	3.75	8133.74
21-Jul-07	4.07	8992.46
22-Jul-07	4.19	9322.32
23-Jul-07	4.18	9294.67
24-Jul-07	4.08	9019.79
25-Jul-07	4.01	8829.12
26-Jul-07	3.95	8666.85
27-Jul-07	3.8	8265.88
28-Jul-07	3.72	8054.81
29-Jul-07	3.715	8041.68
30-Jul-07	4.13	9156.86
31-Jul-07	4.63	10567.45
1-Aug-07	5.12	12018.18
2-Aug-07	5.47	13094.44
3-Aug-07	5.77	14042.80
4-Aug-07	5.955	14639.28
5-Aug-07	5.98	14720.57
6-Aug-07	6.38	16042.65
7-Aug-07	7.73	20794.32
8-Aug-07	8.16	22397.94
9-Aug-07	8.5	23695.64
10-Aug-07	8.99	25611.11
11-Aug-07	9.23	26568.48
12-Aug-07	9.27	26729.25

13-Aug-07	9.26	26689.02
14-Aug-07	9.09	26008.49
15-Aug-07	8.79	24822.89
16-Aug-07	8.515	23753.48
17-Aug-07	8.89	25215.90
18-Aug-07	9.79	28850.45
19-Aug-07	9.55	27864.28
20-Aug-07	9.11	26088.23
21-Aug-07	8.49	23657.10
22-Aug-07	8.31	22967.25
23-Aug-07	8.18	22473.55
24-Aug-07	8.225	22644.01
25-Aug-07	8.345	23100.81
26-Aug-07	8.39	23272.95
27-Aug-07	8.34	23081.72
28-Aug-07	8.12	22246.98
29-Aug-07	7.85	21237.57
30-Aug-07	7.58	20244.94
31-Aug-07	7.4	19592.63
1-Sep-07	7.31	19269.33
2-Sep-07	7.46	19809.23
3-Sep-07	7.89	21386.06
4-Sep-07	8.25	22738.91
5-Sep-07	8.405	23330.43
6-Sep-07	8.67	24354.18
7-Sep-07	8.85	25058.43
8-Sep-07	8.84	25019.12
9-Sep-07	8.89	25215.90
10-Sep-07	9.06	25889.05
11-Sep-07	9.16	26287.95
12-Sep-07	9.35	27051.83
13-Sep-07	9.61	28109.68
14-Sep-07	9.71	28520.38
15-Sep-07	9.48	27578.95
16-Sep-07	9.5	27660.37
17-Sep-07	9.2	26448.12
18-Sep-07	9.05	25849.28
19-Sep-07	9.46	27497.62
20-Sep-07	9.32	26930.70
21-Sep-07	8.91	25294.77
22-Sep-07	8.59	24043.48
23-Sep-07	8.37	23196.39
24-Sep-07	8.19	22511.39
25-Sep-07	7.95	21609.48
26-Sep-07	7.68	20610.61
27-Sep-07	7.42	19664.73
28-Sep-07	7.26	19090.55
29-Sep-07	7.02	18240.69

30-Sep-07	6.72	17197.87
1-Oct-07	6.43	16210.74
2-Oct-07	6.185	15393.08
3-Oct-07	6.62	16855.14
4-Oct-07	8.74	24627.21
5-Oct-07	9.97	29598.06
6-Oct-07	10.42	31496.61
7-Oct-07	10.73	32828.75
8-Oct-07	10.8	33132.27
9-Oct-07	10.84	33306.15
10-Oct-07	10.85	33349.67
11-Oct-07	10.77	33002.07
12-Oct-07	10.62	32353.81
13-Oct-07	10.28	30901.46
14-Oct-07	10.03	29848.77
15-Oct-07	9.83	29016.00
16-Oct-07	9.58	27986.88
17-Oct-07	9.32	26930.70
18-Oct-07	9.27	26729.25
19-Oct-07	9.14	26208.00
20-Oct-07	8.75	24666.30
21-Oct-07	8.21	22587.14
22-Oct-07	7.72	20757.53
23-Oct-07	7.325	19323.08
24-Oct-07	6.95	17995.42
25-Oct-07	6.62	16855.14
26-Oct-07	6.33	15875.19
27-Oct-07	6.09	15080.10
28-Oct-07	5.9	14461.03
29-Oct-07	5.68	13755.82
30-Oct-07	5.54	13313.61
31-Oct-07	5.45	13032.06
1-Nov-07	5.43	12969.78
2-Nov-07	5.48	13125.67
3-Nov-07	5.55	13345.03
4-Nov-07	5.47	13094.44
5-Nov-07	5.33	12660.00
6-Nov-07	5.16	12139.51
7-Nov-07	4.95	11507.36
8-Nov-07	4.74	10887.33
9-Nov-07	4.58	10423.18
10-Nov-07	4.47	10108.26
11-Nov-07	4.43	9994.60
12-Nov-07	4.44	10022.98
13-Nov-07	4.475	10122.50
14-Nov-07	4.49	10165.27
15-Nov-07	4.62	10538.54
16-Nov-07	4.405	9923.80

17-Nov-07	4.09	9047.14
18-Nov-07	3.88	8478.89
19-Nov-07	3.695	7989.25
20-Nov-07	3.57	7664.31
21-Nov-07	3.605	7754.81
22-Nov-07	3.72	8054.81
23-Nov-07	3.66	7897.78
24-Nov-07	3.55	7612.77
25-Nov-07	3.46	7382.36
26-Nov-07	3.38	7179.67
27-Nov-07	3.3	6979.00
28-Nov-07	3.2	6731.02
29-Nov-07	3.08	6437.69
30-Nov-07	2.945	6113.28
1-Dec-07	2.775	5713.32
2-Dec-07	2.68	5494.04
3-Dec-07	2.6	5311.76
4-Dec-07	2.52	5131.68
5-Dec-07	2.39	4843.80
6-Dec-07	2.17	4370.24
7-Dec-07	2.13	4286.01
8-Dec-07	2.09	4202.37
9-Dec-07	2.05	4119.31
10-Dec-07	1.97	3954.98
11-Dec-07	1.95	3914.27
12-Dec-07	1.885	3783.00
13-Dec-07	1.825	3663.25
14-Dec-07	1.82	3653.33
15-Dec-07	1.8	3613.76
16-Dec-07	1.805	3623.64
17-Dec-07	1.79	3594.03
18-Dec-07	1.74	3495.96
19-Dec-07	1.72	3457.01
20-Dec-07	1.79	3594.03
21-Dec-07	1.66	3341.07
22-Dec-07	1.595	3217.07
23-Dec-07	1.575	3179.26
24-Dec-07	1.565	3160.41
25-Dec-07	1.6	3226.55
26-Dec-07	1.61	3245.54
27-Dec-07	1.62	3264.57
28-Dec-07	1.68	3379.56
29-Dec-07	1.52	3076.08
30-Dec-07	1.54	3113.46
31-Dec-07	1.5	3038.86
1-Jan-08	1.43	2909.88
2-Jan-08	1.42	2891.62
3-Jan-08	1.415	2882.50

4-Jan-08	1.385	2828.02
5-Jan-08	1.325	2720.17
6-Jan-08	1.28	2640.26
7-Jan-08	1.27	2622.62
8-Jan-08	1.27	2622.62
9-Jan-08	1.24	2569.95
10-Jan-08	1.19	2483.01
11-Jan-08	1.12	2363.10
12-Jan-08	1.08	2295.53
13-Jan-08	1.075	2287.13
14-Jan-08	1.11	2346.14
15-Jan-08	1.09	2312.35
16-Jan-08	1.03	2212.05
17-Jan-08	1	2162.50
18-Jan-08	0.95	2080.80
19-Jan-08	1	2162.50
20-Jan-08	0.97	2113.34
21-Jan-08	1.005	2170.73
22-Jan-08	0.925	2040.37
23-Jan-08	0.92	2032.31
24-Jan-08	0.92	2032.31
25-Jan-08	0.905	2008.23
26-Jan-08	0.88	1968.31
27-Jan-08	0.87	1952.42
28-Jan-08	0.88	1968.31
29-Jan-08	0.91	2016.24
30-Jan-08	0.905	2008.23
31-Jan-08	0.92	2032.31
1-Feb-08	0.915	2024.27
2-Feb-08	0.87	1952.42
3-Feb-08	0.89	1984.24
4-Feb-08	0.88	1968.31
5-Feb-08	1	2162.50
6-Feb-08	1.005	2170.73
7-Feb-08	1.03	2212.05
8-Feb-08	1.05	2245.31
9-Feb-08	1.065	2270.37
10-Feb-08	1.085	2303.94
11-Feb-08	1.1	2329.23
12-Feb-08	1.145	2405.68
13-Feb-08	1.155	2422.79
14-Feb-08	1.16	2431.36
15-Feb-08	1.115	2354.61
16-Feb-08	1.105	2337.68
17-Feb-08	1.035	2220.35
18-Feb-08	1	2162.50
19-Feb-08	0.97	2113.34
20-Feb-08	0.955	2088.92

21-Feb-08	0.925	2040.37
22-Feb-08	0.91	2016.24
23-Feb-08	0.85	1920.78
24-Feb-08	0.82	1873.67
25-Feb-08	0.795	1834.73
26-Feb-08	0.805	1850.27
27-Feb-08	0.82	1873.67
28-Feb-08	0.775	1803.79
29-Feb-08	0.775	1803.79
1-Mar-08	0.76	1780.71
2-Mar-08	0.78	1811.51
3-Mar-08	0.77	1796.08
4-Mar-08	0.775	1803.79
5-Mar-08	0.8	1842.50
6-Mar-08	0.8	1842.50
7-Mar-08	0.79	1826.98
8-Mar-08	0.78	1811.51
9-Mar-08	0.77	1796.08
10-Mar-08	0.745	1757.73
11-Mar-08	0.69	1674.39
12-Mar-08	0.705	1696.98
13-Mar-08	0.73	1734.86
14-Mar-08	0.72	1719.67
15-Mar-08	0.68	1659.39
16-Mar-08	0.69	1674.39
17-Mar-08	0.7	1689.44
18-Mar-08	0.71	1704.53
19-Mar-08	0.72	1719.67
20-Mar-08	0.755	1773.04
21-Mar-08	0.75	1765.38
22-Mar-08	0.77	1796.08
23-Mar-08	0.73	1734.86
24-Mar-08	0.725	1727.26
25-Mar-08	0.72	1719.67
26-Mar-08	0.715	1712.09
27-Mar-08	0.72	1719.67
28-Mar-08	0.755	1773.04
29-Mar-08	0.8	1842.50
30-Mar-08	0.75	1765.38
31-Mar-08	0.75	1765.38
1-Apr-08	0.855	1928.67
2-Apr-08	0.89	1984.24
3-Apr-08	0.845	1912.90
4-Apr-08	0.82	1873.67
5-Apr-08	0.9	2000.22
6-Apr-08	0.98	2129.68
7-Apr-08	0.97	2113.34
8-Apr-08	1.08	2295.53

9-Apr-08	1.1	2329.23
10-Apr-08	1.105	2337.68
11-Apr-08	1.05	2245.31
12-Apr-08	1.04	2228.66
13-Apr-08	1.025	2203.77
14-Apr-08	0.975	2121.51
15-Apr-08	0.945	2072.69
16-Apr-08	0.955	2088.92
17-Apr-08	0.98	2129.68
18-Apr-08	0.935	2056.50
19-Apr-08	0.9	2000.22
20-Apr-08	0.9	2000.22
21-Apr-08	0.85	1920.78
22-Apr-08	0.8	1842.50
23-Apr-08	0.76	1780.71
24-Apr-08	0.76	1780.71
25-Apr-08	0.675	1651.91
26-Apr-08	0.74	1750.09
27-Apr-08	0.77	1796.08
28-Apr-08	0.81	1858.06
29-Apr-08	0.79	1826.98
30-Apr-08	0.86	1936.58
1-May-08	0.89	1984.24
2-May-08	0.99	2146.07
3-May-08	0.97	2113.34
4-May-08	1.08	2295.53
5-May-08	1.035	2220.35
6-May-08	1.16	2431.36
7-May-08	1.28	2640.26
8-May-08	1.47	2983.34
9-May-08	1.65	3321.89
10-May-08	1.78	3574.34
11-May-08	2.06	4140.02
12-May-08	2.34	4734.65
13-May-08	2.35	4756.41
14-May-08	2.22	4476.34
15-May-08	2.19	4412.57
16-May-08	2.13	4286.01
17-May-08	2.02	4057.41
18-May-08	2.04	4098.64
19-May-08	2.125	4275.52
20-May-08	2.24	4519.03
21-May-08	2.48	5042.47
22-May-08	2.69	5516.98
23-May-08	2.71	5562.96
24-May-08	2.75	5655.32
25-May-08	2.805	5783.20
26-May-08	2.82	5818.26

27-May-08	2.865	5923.87
28-May-08	2.755	5666.91
29-May-08	2.74	5632.18
30-May-08	2.77	5701.71
31-May-08	2.91	6030.15
1-Jun-08	3	6244.72
2-Jun-08	3.19	6706.40
3-Jun-08	3.34	7079.08
4-Jun-08	3.5	7484.45
5-Jun-08	3.83	8345.54
6-Jun-08	4.2	9350.00
7-Jun-08	4.43	9994.60
8-Jun-08	4.7	10770.62
9-Jun-08	5.31	12598.36
10-Jun-08	5.66	13692.33
11-Jun-08	5.7	13819.41
12-Jun-08	5.6	13502.50
13-Jun-08	5.56	13376.47
14-Jun-08	5.56	13376.47
15-Jun-08	5.495	13172.57
16-Jun-08	5.6	13502.50
17-Jun-08	6.19	15409.62
18-Jun-08	7.28	19161.99
19-Jun-08	7.28	19161.99
20-Jun-08	7.81	21089.45
21-Jun-08	8.29	22891.05
22-Jun-08	8.31	22967.25
23-Jun-08	8.02	21871.18
24-Jun-08	7.55	20135.70
25-Jun-08	7.04	18310.99
26-Jun-08	6.49	16413.27
27-Jun-08	6.12	15178.69
28-Jun-08	5.77	14042.80
29-Jun-08	5.51	13219.52
30-Jun-08	5.37	12783.59
1-Jul-08	5.35	12721.74
2-Jul-08	5.5	13188.21
3-Jul-08	5.71	13851.24
4-Jul-08	5.87	14364.13
5-Jul-08	6.02	14850.95
6-Jul-08	6.13	15211.60
7-Jul-08	6.13	15211.60
8-Jul-08	6.19	15409.62
9-Jul-08	6.57	16684.70
10-Jul-08	7.14	18663.90
11-Jul-08	7.81	21089.45
12-Jul-08	7.96	21646.80
13-Jul-08	8.335	23062.62

14-Jul-08	8.23	22662.98
15-Jul-08	8.255	22757.91
16-Jul-08	8.22	22625.05
17-Jul-08	8.05	21983.68
18-Jul-08	7.86	21274.66
19-Jul-08	7.88	21348.90
20-Jul-08	8.23	22662.98
21-Jul-08	8.55	23888.66
22-Jul-08	8.805	24881.70
23-Jul-08	9.04	25809.53
24-Jul-08	9.18	26367.99
25-Jul-08	9.265	26709.13
26-Jul-08	9.25	26648.82
27-Jul-08	9.19	26408.05
28-Jul-08	9.26	26689.02
29-Jul-08	9.165	26307.96
30-Jul-08	9	25650.75
31-Jul-08	9.08	25968.65
1-Aug-08	9.215	26508.27
2-Aug-08	9.55	27864.28
3-Aug-08	9.845	29078.17
4-Aug-08	10.105	30163.21
5-Aug-08	10.465	31688.77
6-Aug-08	10.385	31347.44
7-Aug-08	10.305	31007.44
8-Aug-08	10.455	31646.03
9-Aug-08	10.43	31539.28
10-Aug-08	10.42	31496.61
11-Aug-08	10.575	32160.23
12-Aug-08	10.675	32590.97
13-Aug-08	10.935	33720.41
14-Aug-08	11.13	34576.44
15-Aug-08	11.23	35018.38
16-Aug-08	11.26	35151.35
17-Aug-08	11.255	35129.18
18-Aug-08	11.25	35107.01
19-Aug-08	11.235	35040.53
20-Aug-08	11.165	34730.89
21-Aug-08	10.98	33917.28
22-Aug-08	10.745	32893.71
23-Aug-08	10.41	31453.97
24-Aug-08	10.145	30331.39
25-Aug-08	9.88	29223.41
26-Aug-08	9.68	28396.94
27-Aug-08	9.6	28068.73
28-Aug-08	9.54	27823.46
29-Aug-08	9.51	27701.11
30-Aug-08	9.27	26729.25

31-Aug-08	8.935	25393.48
1-Sep-08	8.75	24666.30
2-Sep-08	8.65	24276.37
3-Sep-08	8.52	23772.78
4-Sep-08	8.405	23330.43
5-Sep-08	8.38	23234.66
6-Sep-08	8.38	23234.66
7-Sep-08	8.365	23177.26
8-Sep-08	8.35	23119.92
9-Sep-08	8.285	22872.01
10-Sep-08	8.215	22606.09
11-Sep-08	8.195	22530.32
12-Sep-08	8.25	22738.91
13-Sep-08	8.625	24179.24
14-Sep-08	8.96	25492.32
15-Sep-08	9.74	28644.00
16-Sep-08	10.125	30247.26
17-Sep-08	10.165	30415.61
18-Sep-08	9.91	29348.10
19-Sep-08	9.515	27721.48
20-Sep-08	9.29	26809.76
21-Sep-08	9.5	27660.37
22-Sep-08	10.23	30689.88
23-Sep-08	9.875	29202.64
24-Sep-08	9.275	26749.37
25-Sep-08	8.78	24783.71
26-Sep-08	8.535	23830.69
27-Sep-08	8.27	22814.93
28-Sep-08	7.91	21460.44
29-Sep-08	7.815	21107.95
30-Sep-08	7.6	20317.89
1-Oct-08	7.485	19899.72
2-Oct-08	7.67	20573.94
3-Oct-08	7.775	20960.15
4-Oct-08	7.85	21237.57
5-Oct-08	8.18	22473.55
6-Oct-08	8.17	22435.73
7-Oct-08	7.93	21534.91
8-Oct-08	7.71	20720.77
9-Oct-08	7.5	19954.09
10-Oct-08	7.27	19126.26
11-Oct-08	7.075	18434.23
12-Oct-08	6.915	17873.22
13-Oct-08	6.805	17491.12
14-Oct-08	6.695	17111.96
15-Oct-08	6.575	16701.71
16-Oct-08	6.51	16480.98
17-Oct-08	6.475	16362.55

18-Oct-08	6.205	15459.27
19-Oct-08	6	14785.71
20-Oct-08	5.935	14574.37
21-Oct-08	5.875	14380.26
22-Oct-08	5.71	13851.24
23-Oct-08	5.57	13407.94
24-Oct-08	5.42	12938.69
25-Oct-08	5.315	12613.76
26-Oct-08	5.23	12352.89
27-Oct-08	5.155	12124.32
28-Oct-08	5.08	11897.27
29-Oct-08	4.92	11418.04
30-Oct-08	4.82	11122.09
31-Oct-08	4.735	10872.71
1-Nov-08	4.88	11299.33
2-Nov-08	5.225	12337.60
3-Nov-08	5.58	13439.43
4-Nov-08	5.725	13899.04
5-Nov-08	5.84	14267.46
6-Nov-08	5.865	14348.00
7-Nov-08	5.8	14138.92
8-Nov-08	5.545	13329.32
9-Nov-08	5.625	13581.48
10-Nov-08	5.505	13203.86
11-Nov-08	5.44	13000.91
12-Nov-08	5.39	12845.55
13-Nov-08	5.48	13125.67
14-Nov-08	5.58	13439.43
15-Nov-08	5.48	13125.67
16-Nov-08	5.34	12690.86
17-Nov-08	5.22	12322.33
18-Nov-08	5.025	11731.75
19-Nov-08	4.71	10799.75
20-Nov-08	4.575	10408.79
21-Nov-08	4.44	10022.98
22-Nov-08	4.365	9810.89
23-Nov-08	4.285	9586.44
24-Nov-08	4.17	9267.05
25-Nov-08	3.92	8586.12
26-Nov-08	3.83	8345.54
27-Nov-08	3.775	8199.72
28-Nov-08	3.75	8133.74
29-Nov-08	3.675	7936.94
30-Nov-08	3.6	7741.86
1-Dec-08	3.48	7433.34
2-Dec-08	3.395	7217.52
3-Dec-08	3.355	7116.75
4-Dec-08	3.36	7129.32

5-Dec-08	3.305	6991.49
6-Dec-08	3.235	6817.45
7-Dec-08	3.165	6644.99
8-Dec-08	3.11	6510.58
9-Dec-08	3	6244.72
10-Dec-08	2.835	5853.38
11-Dec-08	2.8	5771.54
12-Dec-08	2.775	5713.32
13-Dec-08	2.745	5643.75
14-Dec-08	2.725	5597.53
15-Dec-08	2.71	5562.96
16-Dec-08	2.68	5494.04
17-Dec-08	2.625	5368.49
18-Dec-08	2.55	5198.95
19-Dec-08	2.42	4909.71
20-Dec-08	2.435	4942.78
21-Dec-08	2.43	4931.75
22-Dec-08	2.405	4876.71
23-Dec-08	2.385	4832.84
24-Dec-08	2.355	4767.30
25-Dec-08	2.2	4433.79
26-Dec-08	2.01	4036.85
27-Dec-08	1.96	3934.61
28-Dec-08	1.915	3843.39
29-Dec-08	1.865	3742.93
30-Dec-08	1.765	3544.88
31-Dec-08	1.685	3389.21
1-Jan-09	1.595	3217.07
2-Jan-09	1.59	3207.60
3-Jan-09	1.67	3360.30
4-Jan-09	1.67	3360.30
5-Jan-09	1.665	3350.68
6-Jan-09	1.64	3302.74
7-Jan-09	1.585	3198.14
8-Jan-09	1.54	3113.46
9-Jan-09	1.47	2983.34
10-Jan-09	1.41	2873.39
11-Jan-09	1.39	2837.07
12-Jan-09	1.39	2837.07
13-Jan-09	1.39	2837.07
14-Jan-09	1.385	2828.02
15-Jan-09	1.38	2818.97
16-Jan-09	1.405	2864.30
17-Jan-09	1.5	3038.86
18-Jan-09	1.5	3038.86
19-Jan-09	1.495	3029.59
20-Jan-09	1.48	3001.81
21-Jan-09	1.44	2928.18

22-Jan-09	1.37	2800.91
23-Jan-09	1.34	2746.99
24-Jan-09	1.31	2693.44
25-Jan-09	1.265	2613.81
26-Jan-09	1.235	2561.21
27-Jan-09	1.21	2517.66
28-Jan-09	1.225	2543.75
29-Jan-09	1.34	2746.99
30-Jan-09	1.34	2746.99
31-Jan-09	1.29	2642.80
1-Feb-09	1.21	2517.66
2-Feb-09	1.235	2561.21
3-Feb-09	1.11	2346.14
4-Feb-09	1.08	2295.53
5-Feb-09	1.15	2414.23
6-Feb-09	1.145	2405.68
7-Feb-09	1.065	2270.37
8-Feb-09	1.13	2380.10
9-Feb-09	1.02	2195.49
10-Feb-09	1.02	2195.49
11-Feb-09	1.07	2278.75
12-Feb-09	0.99	2146.07
13-Feb-09	1.02	2195.49
14-Feb-09	1.05	2245.31
15-Feb-09	0.93	2048.43
16-Feb-09	0.89	1984.24
17-Feb-09	1.04	2228.66
18-Feb-09	0.985	2137.87
19-Feb-09	0.96	2097.05
20-Feb-09	0.97	2113.34
21-Feb-09	0.91	2016.24
22-Feb-09	0.925	2040.37
23-Feb-09	0.94	2064.59
24-Feb-09	0.84	1905.03
25-Feb-09	0.83	1889.33
26-Feb-09	0.885	1976.27
27-Feb-09	0.9	2000.22
28-Feb-09	0.95	2080.80
1-Mar-09	0.9	2000.22
2-Mar-09	0.87	1952.42
3-Mar-09	0.905	2008.23
4-Mar-09	0.91	2016.24
5-Mar-09	0.87	1952.42
6-Mar-09	0.87	1952.42
7-Mar-09	0.83	1889.33
8-Mar-09	0.8	1842.50
9-Mar-09	0.78	1811.51
10-Mar-09	0.79	1826.98

11-Mar-09	0.75	1765.38
12-Mar-09	0.76	1780.71
13-Mar-09	0.73	1734.86
14-Mar-09	0.69	1674.39
15-Mar-09	0.665	1636.99
16-Mar-09	0.64	1599.89
17-Mar-09	0.63	1585.13
18-Mar-09	0.64	1599.89
19-Mar-09	0.64	1599.89
20-Mar-09	0.67	1644.45
21-Mar-09	0.665	1636.99
22-Mar-09	0.68	1659.39
23-Mar-09	0.685	1666.89
24-Mar-09	0.69	1674.39
25-Mar-09	0.725	1727.26
26-Mar-09	0.72	1719.67
27-Mar-09	0.74	1750.09
28-Mar-09	0.74	1750.09
29-Mar-09	0.65	1614.69
30-Mar-09	0.69	1674.39
31-Mar-09	0.79	1826.98
1-Apr-09	0.77	1796.08
2-Apr-09	0.765	1788.39
3-Apr-09	0.85	1920.78
4-Apr-09	0.855	1928.67
5-Apr-09	0.81	1858.06
6-Apr-09	0.825	1881.49
7-Apr-09	0.715	1712.09
8-Apr-09	0.71	1704.53
9-Apr-09	0.8	1842.50
10-Apr-09	0.83	1889.33
11-Apr-09	0.78	1811.51
12-Apr-09	0.865	1944.49
13-Apr-09	0.795	1834.73
14-Apr-09	0.79	1826.98
15-Apr-09	0.825	1881.49
16-Apr-09	0.84	1905.03
17-Apr-09	0.96	2097.05
18-Apr-09	1.07	2278.75
19-Apr-09	1.04	2228.66
20-Apr-09	1.075	2287.13
21-Apr-09	1.16	2431.36
22-Apr-09	1.32	2711.25
23-Apr-09	1.305	2684.55
24-Apr-09	1.24	2569.95
25-Apr-09	1.2	2500.31
26-Apr-09	1.13	2380.10
27-Apr-09	1.11	2346.14

28-Apr-09	0.96	2097.05
29-Apr-09	1.04	2228.66
30-Apr-09	1.02	2195.49
1-May-09	0.98	2129.68
2-May-09	0.93	2048.43
3-May-09	1.34	2746.99
4-May-09	1.02	2195.49
5-May-09	1.055	2253.65
6-May-09	1.105	2337.68
7-May-09	1.095	2320.78
8-May-09	1.055	2253.65
9-May-09	1.08	2295.53
10-May-09	0.94	2064.59
11-May-09	1.02	2195.49
12-May-09	1.065	2270.37
13-May-09	1.19	2483.01
14-May-09	1.285	2649.10
15-May-09	1.32	2711.25
16-May-09	1.305	2684.55
17-May-09	1.465	2974.12
18-May-09	1.585	3198.14
19-May-09	1.575	3179.26
20-May-09	1.555	3141.60
21-May-09	1.58	3188.69
22-May-09	1.835	3683.12
23-May-09	2.095	4212.79
24-May-09	2.45	4975.93
25-May-09	2.575	5255.25
26-May-09	2.605	5323.09
27-May-09	2.565	5232.71
28-May-09	2.67	5471.14
29-May-09	2.91	6030.15
30-May-09	3.225	6792.72
31-May-09	3.635	7832.68
1-Jun-09	3.785	8226.16
2-Jun-09	3.65	7871.72
3-Jun-09	3.435	7318.80
4-Jun-09	3.195	6718.71
5-Jun-09	3.255	6867.02
6-Jun-09	3.31	7003.98
7-Jun-09	3.585	7703.05
8-Jun-09	3.785	8226.16
9-Jun-09	3.735	8094.24
10-Jun-09	3.685	7963.08
11-Jun-09	3.615	7780.74
12-Jun-09	3.45	7356.91
13-Jun-09	3.455	7369.63
14-Jun-09	3.41	7255.44

15-Jun-09	3.58	7690.13
16-Jun-09	3.72	8054.81
17-Jun-09	3.795	8252.64
18-Jun-09	3.71	8028.56
19-Jun-09	3.79	8239.39
20-Jun-09	3.995	8788.45
21-Jun-09	4.425	9980.43
22-Jun-09	4.7	10770.62
23-Jun-09	4.655	10639.85
24-Jun-09	4.475	10122.50
25-Jun-09	4.295	9614.39
26-Jun-09	4.195	9336.15
27-Jun-09	4.04	8910.66
28-Jun-09	4.19	9322.32
29-Jun-09	4.295	9614.39
30-Jun-09	4.465	10094.03
1-Jul-09	4.74	10887.33
2-Jul-09	4.855	11225.36
3-Jul-09	4.795	11048.54
4-Jul-09	4.695	10756.06
5-Jul-09	4.42	9966.26
6-Jul-09	4.3	9628.38
7-Jul-09	4.49	10165.27
8-Jul-09	5.15	12109.14
9-Jul-09	6.275	15691.70
10-Jul-09	6.91	17855.79
11-Jul-09	7.345	19394.83
12-Jul-09	7.6	20317.89
13-Jul-09	7.69	20647.31
14-Jul-09	7.685	20628.96
15-Jul-09	7.755	20886.39
16-Jul-09	8.12	22246.98
17-Jul-09	8.53	23811.38
18-Jul-09	8.4	23311.26
19-Jul-09	8.2	22549.25
20-Jul-09	8.205	22568.20
21-Jul-09	8.815	24920.94
22-Jul-09	8.945	25432.99
23-Jul-09	8.935	25393.48
24-Jul-09	8.79	24822.89
25-Jul-09	8.705	24490.56
26-Jul-09	8.505	23714.91
27-Jul-09	8.295	22910.09
28-Jul-09	8.12	22246.98
29-Jul-09	7.605	20336.14
30-Jul-09	7.5	19954.09
31-Jul-09	8.405	23330.43
1-Aug-09	9.685	28417.50

2-Aug-09	9.82	28974.58
3-Aug-09	9.695	28458.64
4-Aug-09	9.55	27864.28
5-Aug-09	9.155	26267.96
6-Aug-09	8.7	24471.06
7-Aug-09	8.38	23234.66
8-Aug-09	7.91	21460.44
9-Aug-09	7.76	20904.82
10-Aug-09	8.075	22077.59
11-Aug-09	8.805	24881.70
12-Aug-09	9.4	27254.14
13-Aug-09	9.6	28068.73
14-Aug-09	9.83	29016.00
15-Aug-09	9.92	29389.71
16-Aug-09	9.78	28809.12
17-Aug-09	9.745	28664.62
18-Aug-09	9.39	27213.63
19-Aug-09	8.925	25353.98
20-Aug-09	8.465	23560.85
21-Aug-09	8.07	22058.80
22-Aug-09	7.61	20354.40
23-Aug-09	7.3	19233.53
24-Aug-09	7.065	18398.99
25-Aug-09	7.1	18522.45
26-Aug-09	6.995	18152.96
27-Aug-09	6.84	17612.38
28-Aug-09	6.68	17060.48
29-Aug-09	6.485	16396.36
30-Aug-09	6.32	15841.77
31-Aug-09	6.295	15758.33
1-Sep-09	6.655	16974.82
2-Sep-09	6.87	17716.55
3-Sep-09	6.88	17751.32
4-Sep-09	6.73	17232.28
5-Sep-09	6.665	17009.06
6-Sep-09	6.64	16923.49
7-Sep-09	6.845	17629.73
8-Sep-09	7.14	18663.90
9-Sep-09	7.485	19899.72
10-Sep-09	7.57	20208.50
11-Sep-09	7.155	18717.05
12-Sep-09	6.81	17508.42
13-Sep-09	6.53	16548.79
14-Sep-09	6.425	16193.90
15-Sep-09	6.595	16769.84
16-Sep-09	6.92	17890.66
17-Sep-09	6.86	17681.80
18-Sep-09	6.775	17387.42

19-Sep-09	6.85	17647.08
20-Sep-09	6.905	17838.36
21-Sep-09	6.795	17456.53
22-Sep-09	6.77	17370.15
23-Sep-09	6.78	17404.69
24-Sep-09	6.64	16923.49
25-Sep-09	6.59	16752.80
26-Sep-09	6.65	16957.70
27-Sep-09	7.185	18823.49
28-Sep-09	7.66	20537.29
29-Sep-09	8.02	21871.18
30-Sep-09	9.06	25889.05
1-Oct-09	9.79	28850.45
2-Oct-09	9.78	28809.12
3-Oct-09	9.43	27375.78
4-Oct-09	9.395	27233.88
5-Oct-09	8.68	24393.12
6-Oct-09	8.525	23792.08
7-Oct-09	7.77	20941.70
8-Oct-09	7.17	18770.24
9-Oct-09	6.74	17266.71
10-Oct-09	6.325	15858.47
11-Oct-09	5.995	14769.41
12-Oct-09	5.73	13914.99
13-Oct-09	5.47	13094.44
14-Oct-09	5.265	12460.07
15-Oct-09	5.07	11867.12
16-Oct-09	4.995	11641.81
17-Oct-09	4.87	11269.72
18-Oct-09	4.755	10931.21
19-Oct-09	4.685	10726.97
20-Oct-09	4.64	10596.39
21-Oct-09	4.605	10495.23
22-Oct-09	4.58	10423.18
23-Oct-09	4.585	10437.57
24-Oct-09	4.45	10051.38
25-Oct-09	4.365	9810.89
26-Oct-09	4.33	9712.46
27-Oct-09	4.29	9600.41
28-Oct-09	4.185	9308.49
29-Oct-09	3.995	8788.45
30-Oct-09	3.85	8398.79
31-Oct-09	3.795	8252.64
1-Nov-09	3.665	7910.83
2-Nov-09	3.575	7677.22
3-Nov-09	3.46	7382.36
4-Nov-09	3.42	7280.77
5-Nov-09	3.34	7079.08

6-Nov-09	3.31	7003.98
7-Nov-09	3.295	6966.53
8-Nov-09	3.25	6854.61
9-Nov-09	3.175	6669.53
10-Nov-09	3.1	6486.25
11-Nov-09	3.095	6474.10
12-Nov-09	3.115	6522.76
13-Nov-09	3.035	6328.89
14-Nov-09	2.985	6208.78
15-Nov-09	2.935	6089.48
16-Nov-09	2.8	5771.54
17-Nov-09	2.69	5516.98
18-Nov-09	2.43	4931.75
19-Nov-09	2.225	4487.00
20-Nov-09	2.18	4391.39
21-Nov-09	2.085	4191.95
22-Nov-09	2.05	4119.31
23-Nov-09	2.035	4088.32
24-Nov-09	1.985	3985.61
25-Nov-09	1.995	4006.08
26-Nov-09	1.915	3843.39
27-Nov-09	1.905	3823.22
28-Nov-09	1.81	3633.53
29-Nov-09	1.675	3369.92
30-Nov-09	1.67	3360.30
1-Dec-09	1.57	3169.83
2-Dec-09	1.55	3132.21
3-Dec-09	1.515	3066.76
4-Dec-09	1.51	3057.45
5-Dec-09	1.54	3113.46
6-Dec-09	1.435	2919.03
7-Dec-09	1.48	3001.81
8-Dec-09	1.445	2937.35
9-Dec-09	1.425	2900.74
10-Dec-09	1.35	2764.92
11-Dec-09	1.34	2746.99
12-Dec-09	1.315	2702.34
13-Dec-09	1.325	2720.17
14-Dec-09	1.335	2738.04
15-Dec-09	1.4	2855.21
16-Dec-09	1.38	2818.97
17-Dec-09	1.36	2782.90
18-Dec-09	1.375	2809.94
19-Dec-09	1.41	2873.39
20-Dec-09	1.465	2974.12
21-Dec-09	1.43	2909.88
22-Dec-09	1.385	2828.02
23-Dec-09	1.39	2837.07

24-Dec-09	1.265	2613.81
25-Dec-09	1.245	2578.70
26-Dec-09	1.235	2561.21
27-Dec-09	1.215	2526.35
28-Dec-09	1.2	2500.31
29-Dec-09	1.205	2508.98
30-Dec-09	1.16	2431.36
31-Dec-09	1.15	2414.23
1-Jan-10	1.105	2337.68
2-Jan-10	1.075	2287.13
3-Jan-10	1.055	2253.65
4-Jan-10	1.045	2236.98
5-Jan-10	1.03	2212.05
6-Jan-10	1.03	2212.05
7-Jan-10	1.05	2245.31
8-Jan-10	1.03	2212.05
9-Jan-10	1.005	2170.73
10-Jan-10	0.94	2064.59
11-Jan-10	0.91	2016.24
12-Jan-10	0.89	1984.24
13-Jan-10	0.825	1881.49
14-Jan-10	0.73	1734.86
15-Jan-10	0.735	1742.47
16-Jan-10	0.72	1719.67
17-Jan-10	0.725	1727.26
18-Jan-10	0.715	1712.09
19-Jan-10	0.725	1727.26
20-Jan-10	0.725	1727.26
21-Jan-10	0.75	1765.38
22-Jan-10	0.755	1773.04
23-Jan-10	0.74	1750.09
24-Jan-10	0.765	1788.39
25-Jan-10	0.8	1842.50
26-Jan-10	0.855	1928.67
27-Jan-10	0.93	2048.43
28-Jan-10	1	2162.50
29-Jan-10	1.1	2329.23
30-Jan-10	1.08	2295.53
31-Jan-10	1.085	2333.17
1-Feb-10	1.07	2278.75
2-Feb-10	1.075	2287.13
3-Feb-10	1.1	2329.23
4-Feb-10	1.055	2253.65
5-Feb-10	1.055	2253.65
6-Feb-10	1.01	2178.97
7-Feb-10	0.93	2048.43
8-Feb-10	0.905	2008.23
9-Feb-10	0.88	1968.31

10-Feb-10	0.835	1897.17
11-Feb-10	0.815	1865.86
12-Feb-10	0.82	1873.67
13-Feb-10	0.76	1780.71
14-Feb-10	0.755	1773.04
15-Feb-10	0.73	1734.86
16-Feb-10	0.655	1622.11
17-Feb-10	0.61	1555.77
18-Feb-10	0.545	1461.69
19-Feb-10	0.515	1418.98
20-Feb-10	0.475	1362.73
21-Feb-10	0.39	1245.92
22-Feb-10	0.4	1259.47
23-Feb-10	0.37	1218.98
24-Feb-10	0.345	1185.60
25-Feb-10	0.405	1266.26
26-Feb-10	0.4	1259.47
27-Feb-10	0.305	1132.89
28-Feb-10	0.26	1074.61
1-Mar-10	0.25	1061.80
2-Mar-10	0.24	1049.06
3-Mar-10	0.275	1093.91
4-Mar-10	0.29	1113.34
5-Mar-10	0.23	1036.37
6-Mar-10	0.205	1004.88
7-Mar-10	0.175	967.55
8-Mar-10	0.19	986.15
9-Mar-10	0.15	936.82
10-Mar-10	0.13	912.50
11-Mar-10	0.13	912.50
12-Mar-10	0.155	942.94
13-Mar-10	0.17	961.37
14-Mar-10	0.215	1017.43
15-Mar-10	0.285	1106.85
16-Mar-10	0.29	1113.34
17-Mar-10	0.355	1198.92
18-Mar-10	0.385	1239.17
19-Mar-10	0.37	1218.98
20-Mar-10	0.41	1273.07
21-Mar-10	0.42	1286.72
22-Mar-10	0.485	1376.72
23-Mar-10	0.495	1390.75
24-Mar-10	0.525	1433.16
25-Mar-10	0.58	1512.09
26-Mar-10	0.605	1548.46
27-Mar-10	0.585	1519.34
28-Mar-10	0.595	1533.87
29-Mar-10	0.585	1519.34

30-Mar-10	0.595	1533.87
31-Mar-10	0.585	1519.34
1-Apr-10	0.57	1497.63
2-Apr-10	0.57	1497.63
3-Apr-10	0.57	1497.63
4-Apr-10	0.565	1490.41
5-Apr-10	0.555	1476.03
6-Apr-10	0.595	1533.87
7-Apr-10	0.57	1497.63
8-Apr-10	0.56	1483.21
9-Apr-10	0.545	1461.69
10-Apr-10	0.53	1440.28
11-Apr-10	0.545	1461.69
12-Apr-10	0.615	1563.09
13-Apr-10	0.7	1689.44
14-Apr-10	0.695	1681.91
15-Apr-10	0.705	1696.98
16-Apr-10	0.71	1704.53
17-Apr-10	0.705	1696.98
18-Apr-10	0.7	1689.44
19-Apr-10	0.71	1704.53
20-Apr-10	0.68	1659.39
21-Apr-10	0.73	1734.86
22-Apr-10	0.7	1689.44
23-Apr-10	0.705	1696.98
24-Apr-10	0.75	1765.38
25-Apr-10	0.79	1826.98
26-Apr-10	0.815	1865.86
27-Apr-10	0.81	1858.06
28-Apr-10	0.83	1889.33
29-Apr-10	0.785	1819.24
30-Apr-10	0.795	1834.73
1-May-10	0.82	1873.67
2-May-10	0.805	1850.27
3-May-10	0.83	1889.33
4-May-10	0.89	1984.24
5-May-10	0.96	2097.05
6-May-10	0.9	2000.22
7-May-10	0.96	2097.05
8-May-10	0.975	2121.51
9-May-10	1.01	2178.97
10-May-10	1.1	2329.23
11-May-10	1.04	2228.66
12-May-10	1.085	2303.94
13-May-10	1.195	2491.66
14-May-10	1.22	2535.04
15-May-10	1.15	2414.23
16-May-10	1.1	2329.23

17-May-10	0.99	2146.07
18-May-10	0.985	2137.87
19-May-10	1	2162.50
20-May-10	1.005	2170.73
21-May-10	1.01	2178.97
22-May-10	0.96	2097.05
23-May-10	0.975	2121.51
24-May-10	1.03	2212.05
25-May-10	1.07	2278.75
26-May-10	1.15	2414.23
27-May-10	1.2	2500.31
28-May-10	1.35	2764.92
29-May-10	1.465	2974.12
30-May-10	1.48	3001.81
31-May-10	1.52	3076.08
1-Jun-10	1.535	3104.10
2-Jun-10	1.57	3169.83
3-Jun-10	1.56	3151.00
4-Jun-10	1.54	3113.46
5-Jun-10	1.56	3151.00
6-Jun-10	1.56	3151.00
7-Jun-10	1.66	3341.07
8-Jun-10	1.7	3418.21
9-Jun-10	1.68	3379.56
10-Jun-10	1.765	3544.88
11-Jun-10	1.99	3995.84
12-Jun-10	2.23	4497.67
13-Jun-10	2.37	4800.03
14-Jun-10	2.46	4998.08
15-Jun-10	2.43	4931.75
16-Jun-10	2.35	4756.41
17-Jun-10	2.36	4778.20
18-Jun-10	2.29	4626.40
19-Jun-10	2.32	4691.24
20-Jun-10	2.27	4583.34
21-Jun-10	2.07	4160.77
22-Jun-10	1.95	3914.27
23-Jun-10	1.86	3732.94
24-Jun-10	1.835	3683.12
25-Jun-10	1.79	3594.03
26-Jun-10	1.7	3418.21
27-Jun-10	1.68	3379.56
28-Jun-10	1.655	3331.48
29-Jun-10	1.655	3331.48
30-Jun-10	1.75	3515.50
1-Jul-10	2.09	4202.37
2-Jul-10	2.3	4647.98
3-Jul-10	2.495	5075.86

4-Jul-10	2.555	5210.20
5-Jul-10	2.64	5402.63
6-Jul-10	2.77	5701.71
7-Jul-10	2.895	5994.65
8-Jul-10	2.935	6089.48
9-Jul-10	2.86	5912.10
10-Jul-10	2.795	5759.88
11-Jul-10	2.74	5632.18
12-Jul-10	2.67	5471.14
13-Jul-10	2.66	5448.27
14-Jul-10	2.62	5357.13
15-Jul-10	2.54	5176.50
16-Jul-10	2.48	5042.47
17-Jul-10	2.465	5009.16
18-Jul-10	2.63	5379.86
19-Jul-10	2.94	6101.38
20-Jul-10	3.57	7664.31
21-Jul-10	4.83	11151.56
22-Jul-10	5.2	12261.28
23-Jul-10	5.14	12078.79
24-Jul-10	4.875	11284.52
25-Jul-10	4.88	11299.33
26-Jul-10	5.42	12938.69
27-Jul-10	6.175	15360.03
28-Jul-10	6.21	15475.83
29-Jul-10	6.035	14899.95
30-Jul-10	5.855	14315.76
31-Jul-10	5.91	14493.38
1-Aug-10	6.235	15558.73
2-Aug-10	6.495	16430.19
3-Aug-10	6.45	16278.15
4-Aug-10	6.16	15310.50
5-Aug-10	6.275	15691.70
6-Aug-10	6.34	15908.63
7-Aug-10	6.73	17232.28
8-Aug-10	6.995	18152.96
9-Aug-10	7.22	18947.95
10-Aug-10	7.305	19251.43
11-Aug-10	7.555	20153.89
12-Aug-10	7.675	20592.27
13-Aug-10	7.725	20775.92
14-Aug-10	7.83	21163.46
15-Aug-10	7.85	21237.57
16-Aug-10	7.785	20997.06
17-Aug-10	7.75	20867.96
18-Aug-10	7.875	21330.33
19-Aug-10	8.025	21889.92
20-Aug-10	8	21796.30

21-Aug-10	8.04	21946.16
22-Aug-10	8.005	21815.01
23-Aug-10	7.96	21646.80
24-Aug-10	8.285	22872.01
25-Aug-10	9.045	25829.40
26-Aug-10	9.33	26971.06
27-Aug-10	9.51	27701.11
28-Aug-10	9.86	29140.38
29-Aug-10	10.15	30352.44
30-Aug-10	10.23	30689.88
31-Aug-10	10.23	30689.88
1-Sep-10	10.54	32009.95
2-Sep-10	10.575	32160.23
3-Sep-10	10.675	32590.97
4-Sep-10	10.69	32655.76
5-Sep-10	10.485	31774.30
6-Sep-10	10.3	30986.23
7-Sep-10	9.81	28933.19
8-Sep-10	9.485	27599.30
9-Sep-10	9.195	26428.08
10-Sep-10	8.825	24960.20
11-Sep-10	8.52	23772.78
12-Sep-10	8.305	22948.19
13-Sep-10	8.28	22852.98
14-Sep-10	8.135	22303.55
15-Sep-10	8.135	22303.55
16-Sep-10	8.33	23043.54
17-Sep-10	8.565	23946.67
18-Sep-10	8.755	24685.86
19-Sep-10	8.935	25393.48
20-Sep-10	8.92	25334.23
21-Sep-10	8.865	25117.44
22-Sep-10	8.83	24979.83
23-Sep-10	8.775	24764.13
24-Sep-10	8.68	24393.12
25-Sep-10	8.505	23714.91
26-Sep-10	8.255	22757.91
27-Sep-10	8.075	22077.59
28-Sep-10	7.855	21256.11
29-Sep-10	7.73	20794.32
30-Sep-10	7.575	20226.72
1-Oct-10	7.39	19556.62
2-Oct-10	7.22	18947.95
3-Oct-10	7.05	18346.17
4-Oct-10	6.975	18082.88
5-Oct-10	7.55	20135.70
6-Oct-10	8.585	24024.11
7-Oct-10	8.99	25611.11

8-Oct-10	6.99	18135.43
9-Oct-10	8.72	24549.09
10-Oct-10	8.13	22284.69
11-Oct-10	7.69	20647.31
12-Oct-10	7.285	19179.87
13-Oct-10	6.88	17751.32
14-Oct-10	6.57	16684.70
15-Oct-10	6.365	15992.35
16-Oct-10	6.235	15558.73
17-Oct-10	6.445	16261.29
18-Oct-10	7.11	18557.78
19-Oct-10	7.59	20281.41
20-Oct-10	7.975	21702.82
21-Oct-10	7.9	21423.24
22-Oct-10	7.6	20317.89
23-Oct-10	7.1	18522.45
24-Oct-10	6.71	17163.49
25-Oct-10	6.31	15808.38
26-Oct-10	5.99	14753.12
27-Oct-10	5.645	13644.78
28-Oct-10	5.315	12613.76
29-Oct-10	5.12	12018.18
30-Oct-10	4.995	11641.81
31-Oct-10	4.955	11522.27
1-Nov-10	4.97	11567.05
2-Nov-10	4.95	11507.36
3-Nov-10	4.875	11284.52
4-Nov-10	4.695	10756.06
5-Nov-10	4.635	10581.92
6-Nov-10	4.53	10279.61
7-Nov-10	4.47	10108.26
8-Nov-10	4.395	9895.53
9-Nov-10	4.285	9586.44
10-Nov-10	4.195	9336.15
11-Nov-10	4.095	9060.83
12-Nov-10	3.97	8720.82
13-Nov-10	3.85	8398.79
14-Nov-10	3.79	8239.39
15-Nov-10	3.705	8015.45
16-Nov-10	3.6	7741.86
17-Nov-10	3.385	7192.28
18-Nov-10	3.515	7522.87
19-Nov-10	3.665	7910.83
20-Nov-10	3.66	7897.78
21-Nov-10	3.505	7497.25
22-Nov-10	3.375	7167.07
23-Nov-10	3.29	6954.06
24-Nov-10	3.215	6768.02

25-Nov-10	3.17	6657.25
26-Nov-10	3.135	6571.56
27-Nov-10	3.085	6449.82
28-Nov-10	3.03	6316.84
29-Nov-10	2.98	6196.81
30-Nov-10	2.9	6006.47
1-Dec-10	2.83	5841.67
2-Dec-10	2.73	5609.07
3-Dec-10	2.675	5482.59
4-Dec-10	2.595	5300.44
5-Dec-10	2.55	5198.95
6-Dec-10	2.49	5064.72
7-Dec-10	2.515	5120.50
8-Dec-10	2.455	4987.00
9-Dec-10	2.335	4723.79
10-Dec-10	2.305	4658.78
11-Dec-10	2.255	4551.15
12-Dec-10	2.11	4244.12
13-Dec-10	2.075	4171.15
14-Dec-10	2.055	4129.66
15-Dec-10	2.02	4057.41
16-Dec-10	2.005	4026.58
17-Dec-10	1.95	3914.27
18-Dec-10	1.81	3633.53
19-Dec-10	1.76	3535.07
20-Dec-10	1.735	3486.21
21-Dec-10	1.71	3437.59
22-Dec-10	1.645	3312.31
23-Dec-10	1.59	3207.60
24-Dec-10	1.54	3113.46
25-Dec-10	1.49	3020.32
26-Dec-10	1.575	3179.26
27-Dec-10	1.77	3554.69
28-Dec-10	1.785	3584.18
29-Dec-10	1.68	3379.56
30-Dec-10	1.51	3057.45
31-Dec-10	1.455	2955.72
1-Jan-11	1.365	2791.90
2-Jan-11	1.31	2693.44
3-Jan-11	1.295	2666.80
4-Jan-11	1.27	2622.62
5-Jan-11	1.23	2552.48
6-Jan-11	1.245	2578.70
7-Jan-11	1.3	2675.67
8-Jan-11	1.35	2764.92
9-Jan-11	1.27	2622.62
10-Jan-11	1.265	2613.81
11-Jan-11	1.3	2675.67

12-Jan-11	1.31	2693.44
13-Jan-11	1.32	2711.25
14-Jan-11	1.305	2684.55
15-Jan-11	1.305	2684.55
16-Jan-11	1.31	2693.44
17-Jan-11	1.305	2684.55
18-Jan-11	1.295	2666.80
19-Jan-11	1.295	2666.80
20-Jan-11	1.25	2587.46
21-Jan-11	1.2	2500.31
22-Jan-11	1.135	2388.62
23-Jan-11	1.115	2354.61
24-Jan-11	1.12	2363.10
25-Jan-11	1.2	2500.31
26-Jan-11	1.28	2640.26
27-Jan-11	1.305	2684.55
28-Jan-11	1.315	2702.34
29-Jan-11	1.295	2666.80
30-Jan-11	1.305	2684.55
31-Jan-11	1.295	2666.80
1-Feb-11	1.295	2666.80
2-Feb-11	1.285	2649.10
3-Feb-11	1.12	2363.10
4-Feb-11	1.055	2253.65
5-Feb-11	1.02	2195.49
6-Feb-11	1	2162.50
7-Feb-11	1.11	2346.14
8-Feb-11	1.065	2270.37
9-Feb-11	1.06	2262.01
10-Feb-11	1.15	2414.23
11-Feb-11	1.155	2422.79
12-Feb-11	1.085	2303.94
13-Feb-11	1.125	2371.59
14-Feb-11	1.145	2405.68
15-Feb-11	1.12	2363.10
16-Feb-11	1.115	2354.61
17-Feb-11	1.07	2278.75
18-Feb-11	0.99	2146.07
19-Feb-11	1.01	2178.97
20-Feb-11	0.975	2121.51
21-Feb-11	0.93	2048.43
22-Feb-11	0.94	2064.59
23-Feb-11	0.94	2064.59
24-Feb-11	0.96	2097.05
25-Feb-11	0.96	2097.05
26-Feb-11	0.94	2064.59
27-Feb-11	0.96	2097.05
28-Feb-11	0.97	2113.34

1-Mar-11	0.955	2088.92
2-Mar-11	0.955	2088.92
3-Mar-11	0.985	2137.87
4-Mar-11	0.99	2146.07
5-Mar-11	0.965	2105.19
6-Mar-11	0.95	2080.80
7-Mar-11	0.93	2048.43
8-Mar-11	0.89	1984.24
9-Mar-11	0.87	1952.42
10-Mar-11	0.87	1952.42
11-Mar-11	0.885	1976.27
12-Mar-11	0.875	1960.36
13-Mar-11	0.885	1976.27
14-Mar-11	0.905	2008.23
15-Mar-11	0.9	2000.22
16-Mar-11	0.915	2024.27
17-Mar-11	0.905	2008.23
18-Mar-11	0.91	2016.24
19-Mar-11	0.91	2016.24
20-Mar-11	0.99	2146.07
21-Mar-11	0.98	2129.68
22-Mar-11	0.99	2146.07
23-Mar-11	1.07	2278.75
24-Mar-11	1.06	2262.01
25-Mar-11	1.105	2337.68
26-Mar-11	1.21	2517.66
27-Mar-11	1.19	2483.01
28-Mar-11	1.22	2535.04
29-Mar-11	1.27	2622.62
30-Mar-11	1.305	2684.55
31-Mar-11	1.315	2702.34
1-Apr-11	1.125	2371.59
2-Apr-11	1.12	2363.10
3-Apr-11	1.053	2249.48
4-Apr-11	1.023	2199.63
5-Apr-11	0.993	2150.17
6-Apr-11	0.975	2121.51
7-Apr-11	1.02	2195.49
8-Apr-11	0.978	2125.59
9-Apr-11	0.965	2105.19
10-Apr-11	1.01	2178.97
11-Apr-11	1.02	2195.49
12-Apr-11	0.98	2129.68
13-Apr-11	1.005	2170.73
14-Apr-11	1.025	2203.77
15-Apr-11	1.01	2178.97
16-Apr-11	1.015	2187.22
17-Apr-11	0.988	2141.97

18-Apr-11	0.95	2080.80
19-Apr-11	0.96	2097.05
20-Apr-11	0.983	2133.77
21-Apr-11	0.955	2088.92
22-Apr-11	0.965	2105.19
23-Apr-11	1.005	2170.73
24-Apr-11	1.01	2178.97
25-Apr-11	1.033	2216.20
26-Apr-11	1.075	2287.13
27-Apr-11	1.075	2287.13
28-Apr-11	1.095	2320.78
29-Apr-11	0.635	1592.50
30-Apr-11	0.652	1618.40
1-May-11	1.025	2203.77
2-May-11	1.02	2195.49
3-May-11	1.065	2270.37
4-May-11	1.095	2320.78
5-May-11	1.24	2569.95
6-May-11	1.23	2552.48
7-May-11	1.27	2622.62
8-May-11	1.35	2764.92
9-May-11	1.455	2955.72
10-May-11	1.52	3076.08
11-May-11	1.56	3151.00
12-May-11	1.56	3151.00
13-May-11	1.72	3457.01
14-May-11	1.75	3515.50
15-May-11	1.805	3623.64
16-May-11	1.91	3833.30
17-May-11	1.99	3995.84
18-May-11	2.165	4359.68
19-May-11	2.42	4909.71
20-May-11	2.5	5087.01
21-May-11	2.535	5165.28
22-May-11	2.645	5414.03
23-May-11	2.69	5516.98
24-May-11	2.775	5713.32
25-May-11	2.885	5971.02
26-May-11	3.005	6256.72
27-May-11	3.01	6268.73
28-May-11	3.07	6413.45
29-May-11	3.015	6280.74
30-May-11	2.97	6172.90
31-May-11	2.865	5923.87
1-Jun-11	2.82	5818.26
2-Jun-11	2.865	5923.87
3-Jun-11	2.765	5690.10
4-Jun-11	2.63	5379.86

5-Jun-11	2.585	5277.83
6-Jun-11	2.685	5505.51
7-Jun-11	2.75	5655.32
8-Jun-11	2.77	5701.71
9-Jun-11	2.915	6042.00
10-Jun-11	3.16	6632.73
11-Jun-11	3.365	7141.89
12-Jun-11	3.545	7599.90
13-Jun-11	3.65	7871.72
14-Jun-11	3.695	7989.25
15-Jun-11	3.7	8002.35
16-Jun-11	3.705	8015.45
17-Jun-11	3.705	8015.45
18-Jun-11	3.905	8545.85
19-Jun-11	3.97	8720.82
20-Jun-11	3.885	8492.27
21-Jun-11	4	8802.00
22-Jun-11	4.035	8897.05
23-Jun-11	3.895	8519.05
24-Jun-11	3.935	8626.45
25-Jun-11	4.07	8992.46
26-Jun-11	4.15	9211.90
27-Jun-11	4.445	10037.17
28-Jun-11	5.17	12169.91
29-Jun-11	6.395	16093.01
30-Jun-11	6.935	17943.01
1-Jul-11	7.61	20354.40
2-Jul-11	8.11	22209.30
3-Jul-11	8.525	23792.08
4-Jul-11	8.755	24685.86
5-Jul-11	8.755	24685.86
6-Jul-11	8.575	23985.38
7-Jul-11	8.125	22265.83
8-Jul-11	7.82	21126.45
9-Jul-11	7.42	19664.73
10-Jul-11	6.97	18065.37
11-Jul-11	6.68	17060.48
12-Jul-11	6.415	16160.25
13-Jul-11	6.23	15542.14
14-Jul-11	6.105	15129.37
15-Jul-11	6.145	15261.02
16-Jul-11	6.565	16667.69
17-Jul-11	7.27	19126.26
18-Jul-11	7.78	20978.60
19-Jul-11	8.18	22473.55
20-Jul-11	8.225	22644.01
21-Jul-11	8.265	22795.92
22-Jul-11	8.54	23850.01

23-Jul-11	8.83	24979.83
24-Jul-11	8.865	25117.44
25-Jul-11	8.9	25255.32
26-Jul-11	8.895	25235.61
27-Jul-11	8.925	25353.98
28-Jul-11	8.945	25432.99
29-Jul-11	8.825	24960.20
30-Jul-11	8.695	24451.57
31-Jul-11	8.75	24666.30
1-Aug-11	9.255	26668.92
2-Aug-11	9.845	29078.17
3-Aug-11	10.385	31347.44
4-Aug-11	10.765	32980.38
5-Aug-11	11.05	34224.33
6-Aug-11	11.175	34775.07
7-Aug-11	11.62	36760.92
8-Aug-11	12.345	40079.38
9-Aug-11	12.655	41529.20
10-Aug-11	12.97	43021.08
11-Aug-11	13.125	43762.03
12-Aug-11	12.915	42759.24
13-Aug-11	12.68	41646.92
14-Aug-11	12.42	40428.46
15-Aug-11	12.2	39407.55
16-Aug-11	12.07	38808.66
17-Aug-11	12.05	38716.82
18-Aug-11	12.225	39523.09
19-Aug-11	12.075	38831.64
20-Aug-11	11.875	37916.46
21-Aug-11	11.785	37507.17
22-Aug-11	11.68	37031.67
23-Aug-11	11.545	36423.48
24-Aug-11	11.31	35373.37
25-Aug-11	11.19	34841.36
26-Aug-11	10.995	33982.99
27-Aug-11	10.765	32980.38
28-Aug-11	10.495	31817.10
29-Aug-11	10.205	30584.29
30-Aug-11	9.99	29681.54
31-Aug-11	9.93	29431.34
1-Sep-11	10.06	29974.40
2-Sep-11	10.12	30226.24
3-Sep-11	10.08	30058.27
4-Sep-11	9.885	29244.18
5-Sep-11	9.775	28788.46
6-Sep-11	9.945	29493.82
7-Sep-11	10.01	29765.11
8-Sep-11	10.35	31198.53

9-Sep-11	11.005	34026.83
10-Sep-11	11.25	35107.01
11-Sep-11	10.86	33393.21
12-Sep-11	10.45	31624.67
13-Sep-11	10.26	30816.76
14-Sep-11	10.26	30816.76
15-Sep-11	10.885	33502.15
16-Sep-11	11.495	36199.14
17-Sep-11	11.765	37416.43
18-Sep-11	12.07	38808.66
19-Sep-11	12.19	39361.37
20-Sep-11	12.405	40358.56
21-Sep-11	12.715	41811.92
22-Sep-11	12.745	41953.54
23-Sep-11	12.58	41176.76
24-Sep-11	12.185	39338.28
25-Sep-11	11.855	37825.37
26-Sep-11	11.625	36783.46
27-Sep-11	11.38	35685.02
28-Sep-11	11.195	34863.47
29-Sep-11	11.1	34444.25
30-Sep-11	10.9	33567.58
1-Oct-11	10.635	32418.43
2-Oct-11	10.595	32246.21
3-Oct-11	11.055	34246.30
4-Oct-11	11.27	35195.72
5-Oct-11	11.22	34974.10
6-Oct-11	10.965	33851.61
7-Oct-11	10.655	32504.66
8-Oct-11	10.33	31113.55
9-Oct-11	9.945	29493.82
10-Oct-11	9.41	27294.67
11-Oct-11	8.93	25373.72
12-Oct-11	8.555	23907.99
13-Oct-11	8.41	23349.60
14-Oct-11	8.63	24198.65
15-Oct-11	8.665	24334.72
16-Oct-11	8.76	24705.42
17-Oct-11	8.665	24334.72
18-Oct-11	8.715	24529.57
19-Oct-11	8.8	24862.09
20-Oct-11	8.6	24082.24
21-Oct-11	8.12	22246.98
22-Oct-11	7.71	20720.77
23-Oct-11	7.38	19520.62
24-Oct-11	7.13	18628.50
25-Oct-11	6.85	17647.08
26-Oct-11	6.635	16906.39

27-Oct-11	6.44	16244.43
28-Oct-11	6.295	15758.33
29-Oct-11	6.145	15261.02
30-Oct-11	6.025	14867.27
31-Oct-11	5.93	14558.16
1-Nov-11	5.775	14058.80
2-Nov-11	5.595	13486.72
3-Nov-11	5.36	12752.66
4-Nov-11	5.235	12368.18
5-Nov-11	5.16	12139.51
6-Nov-11	5.145	12093.96
7-Nov-11	5.19	12230.80
8-Nov-11	5.215	12307.05
9-Nov-11	5.165	12154.71
10-Nov-11	5.235	12368.18
11-Nov-11	5.315	12613.76
12-Nov-11	5.13	12048.47
13-Nov-11	4.88	11299.33
14-Nov-11	4.7	10770.62
15-Nov-11	4.56	10365.66
16-Nov-11	4.465	10094.03
17-Nov-11	4.35	9768.66
18-Nov-11	4.21	9377.70
19-Nov-11	4.165	9253.25
20-Nov-11	4.09	9047.14
21-Nov-11	3.985	8761.38
22-Nov-11	3.88	8478.89
23-Nov-11	3.745	8120.56
24-Nov-11	3.615	7780.74
25-Nov-11	3.5	7484.45
26-Nov-11	3.395	7217.52
27-Nov-11	3.315	7016.47
28-Nov-11	3.27	6904.27
29-Nov-11	3.205	6743.35
30-Nov-11	3.045	6353.01
1-Dec-11	3.035	6461.31
2-Dec-11	3.025	6436.36
3-Dec-11	2.89	6101.95
4-Dec-11	2.765	5796.24
5-Dec-11	2.69	5614.62
6-Dec-11	2.675	5578.47
7-Dec-11	2.72	5687.11
8-Dec-11	2.65	5518.32
9-Dec-11	2.695	5626.69
10-Dec-11	2.665	5554.39
11-Dec-11	2.645	5506.31
12-Dec-11	2.635	5482.31
13-Dec-11	2.51	5184.30

14-Dec-11	2.45	5042.60
15-Dec-11	2.19	4438.63
16-Dec-11	2.05	4120.18
17-Dec-11	1.955	3906.79
18-Dec-11	1.955	3906.79
19-Dec-11	1.945	3884.46
20-Dec-11	1.8	3563.32
21-Dec-11	1.75	3453.76
22-Dec-11	1.75	3453.76
23-Dec-11	1.65	3236.45
24-Dec-11	1.63	3193.28
25-Dec-11	1.625	3182.50
26-Dec-11	1.62	3171.73
27-Dec-11	1.62	3171.73
28-Dec-11	1.59	3107.23
29-Dec-11	1.585	3096.50
30-Dec-11	1.582	3090.06
31-Dec-11	1.575	3075.06
1-Jan-12	1.575	3179.26
2-Jan-12	1.645	3312.31
3-Jan-12	1.665	3350.68
4-Jan-12	1.635	3293.18
5-Jan-12	1.635	3293.18
6-Jan-12	1.68	3379.56
7-Jan-12	1.745	3505.73
8-Jan-12	1.78	3574.34
9-Jan-12	1.77	3554.69
10-Jan-12	1.71	3437.59
11-Jan-12	1.64	3302.74
12-Jan-12	1.58	3188.69
13-Jan-12	1.53	3094.75
14-Jan-12	1.505	3048.15
15-Jan-12	1.51	3057.45
16-Jan-12	1.47	2983.34
17-Jan-12	1.515	3066.76
18-Jan-12	1.46	2964.92
19-Jan-12	1.385	2828.02
20-Jan-12	1.39	2837.07
21-Jan-12	1.39	2837.07
22-Jan-12	1.455	2955.72
23-Jan-12	1.54	3113.46
24-Jan-12	1.66	3341.07
25-Jan-12	1.71	3437.59
26-Jan-12	1.73	3476.47
27-Jan-12	1.805	3623.64
28-Jan-12	1.755	3525.28
29-Jan-12	1.7	3418.21
30-Jan-12	1.57	3169.83

31-Jan-12	1.415	2886.74
1-Feb-12	1.325	2720.17
2-Feb-12	1.33	2729.10
3-Feb-12	1.265	2613.81
4-Feb-12	1.275	2631.43
5-Feb-12	1.3	2675.67
6-Feb-12	1.3	2675.67
7-Feb-12	1.295	2666.80
8-Feb-12	1.31	2693.44
9-Feb-12	1.305	2684.55
10-Feb-12	1.315	2702.34
11-Feb-12	1.325	2720.17
12-Feb-12	1.315	2702.34
13-Feb-12	1.295	2666.80
14-Feb-12	1.32	2711.25
15-Feb-12	1.285	2649.10
16-Feb-12	1.275	2631.43
17-Feb-12	1.24	2569.95
18-Feb-12	1.25	2587.46
19-Feb-12	1.245	2578.70
20-Feb-12	1.24	2569.95
21-Feb-12	1.23	2552.48
22-Feb-12	1.21	2517.66
23-Feb-12	1.14	2397.14
24-Feb-12	1.07	2278.75
25-Feb-12	1.125	2371.59
26-Feb-12	1.17	2448.53
27-Feb-12	1.205	2508.98
28-Feb-12	1.155	2422.79
29-Feb-12	1.165	2439.94
1-Mar-12	1.13	2380.10
2-Mar-12	1.13	2380.10
3-Mar-12	1.185	2474.38
4-Mar-12	1.17	2448.53
5-Mar-12	1.19	2483.01
6-Mar-12	1.17	2448.53
7-Mar-12	1.19	2483.01
8-Mar-12	1.15	2414.23
9-Mar-12	1.14	2397.14
10-Mar-12	1.165	2439.94
11-Mar-12	1.08	2295.53
12-Mar-12	1.065	2270.37
13-Mar-12	1.05	2245.31
14-Mar-12	1.035	2220.35
15-Mar-12	1.06	2262.01
16-Mar-12	1.035	2220.35
17-Mar-12	1.02	2195.49
18-Mar-12	1.075	2287.13

19-Mar-12	1.04	2228.66
20-Mar-12	1.03	2212.05
21-Mar-12	1	2162.50
22-Mar-12	0.975	2121.51
23-Mar-12	1.025	2203.77
24-Mar-12	1.065	2270.37
25-Mar-12	1.03	2212.05
26-Mar-12	1.06	2262.01
27-Mar-12	1.065	2270.37
28-Mar-12	1.065	2270.37
29-Mar-12	1	2162.50
30-Mar-12	1.005	2170.73
31-Mar-12	0.97	2113.34
1-Apr-12	0.94	2064.59
2-Apr-12	0.95	2080.80
3-Apr-12	0.94	2064.59
4-Apr-12	0.91	2016.24
5-Apr-12	0.97	2113.34
6-Apr-12	0.865	1944.49
7-Apr-12	0.87	1952.42
8-Apr-12	1.035	2220.35
9-Apr-12	1.08	2295.53
10-Apr-12	0.99	2146.07
11-Apr-12	1.035	2220.35
12-Apr-12	1.045	2236.98
13-Apr-12	1.195	2491.66
14-Apr-12	1.225	2543.75
15-Apr-12	1.205	2508.98
16-Apr-12	1.25	2587.46
17-Apr-12	1.315	2702.34
18-Apr-12	1.25	2587.46
19-Apr-12	1.22	2535.04
20-Apr-12	1.245	2578.70
21-Apr-12	1.275	2631.43
22-Apr-12	1.22	2535.04
23-Apr-12	1.23	2552.48
24-Apr-12	1.22	2535.04
25-Apr-12	1.26	2605.02
26-Apr-12	1.245	2578.70
27-Apr-12	1.205	2508.98
28-Apr-12	1.2	2500.31
29-Apr-12	1.28	2640.26
30-Apr-12	1.305	2684.55
1-May-12	1.31	2693.44
2-May-12	1.265	2613.81
3-May-12	1.235	2561.21
4-May-12	1.265	2613.81
5-May-12	1.27	2622.62

6-May-12	1.23	2552.48
7-May-12	1.23	2552.48
8-May-12	1.18	2465.75
9-May-12	1.175	2457.14
10-May-12	1.235	2561.21
11-May-12	1.29	2657.94
12-May-12	1.31	2693.44
13-May-12	1.25	2587.46
14-May-12	1.29	2657.94
15-May-12	1.325	2720.17
16-May-12	1.405	2864.30
17-May-12	1.475	2992.57
18-May-12	1.56	3151.00
19-May-12	1.68	3379.56
20-May-12	1.93	3873.71
21-May-12	2.13	4286.01
22-May-12	2.255	4551.15
23-May-12	2.29	4626.40
24-May-12	2.345	4745.53
25-May-12	2.44	4953.82
26-May-12	2.47	5020.26
27-May-12	2.415	4898.70
28-May-12	2.44	4953.82
29-May-12	2.5	5087.01
30-May-12	2.51	5109.33
31-May-12	2.58	5266.54
1-Jun-12	2.655	5436.84
2-Jun-12	2.9	6006.47
3-Jun-12	3.11	6510.58
4-Jun-12	3.44	7331.50
5-Jun-12	3.85	8398.79
6-Jun-12	4.135	9170.61
7-Jun-12	4.07	8992.46
8-Jun-12	3.97	8720.82
9-Jun-12	3.835	8358.84
10-Jun-12	3.89	8505.65
11-Jun-12	4.08	9019.79
12-Jun-12	4.24	9461.00
13-Jun-12	4.47	10108.26
14-Jun-12	4.36	9796.80
15-Jun-12	4.12	9129.39
16-Jun-12	3.945	8653.38
17-Jun-12	3.65	7871.72
18-Jun-12	3.735	8094.24
19-Jun-12	4.49	10165.27
20-Jun-12	5.335	12675.43
21-Jun-12	5.66	13692.33
22-Jun-12	5.55	13345.03

23-Jun-12	5.24	12383.48
24-Jun-12	5.105	11972.79
25-Jun-12	5.035	11761.78
26-Jun-12	4.74	10887.33
27-Jun-12	4.8	11063.23
28-Jun-12	4.725	10843.51
29-Jun-12	4.415	9952.10
30-Jun-12	4.225	9419.32
1-Jul-12	3.93	8613.00
2-Jul-12	3.905	8545.85
3-Jul-12	4.085	9033.46
4-Jul-12	5.185	12215.57
5-Jul-12	6.27	15675.06
6-Jul-12	6.46	16311.89
7-Jul-12	6.72	17197.87
8-Jul-12	6.735	17249.49
9-Jul-12	6.49	16413.27
10-Jul-12	6.29	15741.67
11-Jul-12	6.22	15508.97
12-Jul-12	6.08	15047.29
13-Jul-12	5.895	14444.86
14-Jul-12	5.745	13962.87
15-Jul-12	5.65	13660.63
16-Jul-12	5.575	13423.68
17-Jul-12	5.53	13282.22
18-Jul-12	5.445	13016.48
19-Jul-12	5.2	12261.28
20-Jul-12	5.05	11806.89
21-Jul-12	4.785	11019.16
22-Jul-12	4.565	10380.03
23-Jul-12	4.42	9966.26
24-Jul-12	4.35	9768.66
25-Jul-12	4.3	9628.38
26-Jul-12	4.38	9853.18
27-Jul-12	4.75	10916.58
28-Jul-12	5.325	12644.58
29-Jul-12	5.595	13486.72
30-Jul-12	5.775	14058.80
31-Jul-12	5.995	14769.41
1-Aug-12	6.36	15975.59
2-Aug-12	7.565	20190.30
3-Aug-12	8.655	24295.82
4-Aug-12	8.99	25611.11
5-Aug-12	8.975	25551.69
6-Aug-12	8.805	24881.70
7-Aug-12	8.6	24082.24
8-Aug-12	8.225	22644.01
9-Aug-12	7.845	21219.04

10-Aug-12	7.71	20720.77
11-Aug-12	8.03	21908.66
12-Aug-12	8.455	23522.39
13-Aug-12	8.755	24685.86
14-Aug-12	8.865	25117.44
15-Aug-12	8.81	24901.32
16-Aug-12	8.73	24588.14
17-Aug-12	8.79	24822.89
18-Aug-12	8.635	24218.07
19-Aug-12	8.42	23387.96
20-Aug-12	8.175	22454.64
21-Aug-12	8.06	22021.23
22-Aug-12	7.975	21702.82
23-Aug-12	8.02	21871.18
24-Aug-12	7.98	21721.50
25-Aug-12	7.965	21665.47
26-Aug-12	8.14	22322.41
27-Aug-12	8.38	23234.66
28-Aug-12	8.795	24842.49
29-Aug-12	9.05	25849.28
30-Aug-12	9.125	26148.09
31-Aug-12	8.91	25294.77
1-Sep-12	8.705	24490.56
2-Sep-12	8.72	24549.09
3-Sep-12	9.24	26608.64
4-Sep-12	9.41	27294.67
5-Sep-12	8.89	25215.90
6-Sep-12	8.54	23850.01
7-Sep-12	8.24	22700.94
8-Sep-12	8.235	22681.96
9-Sep-12	8.31	22967.25
10-Sep-12	8.31	22967.25
11-Sep-12	8.315	22986.31
12-Sep-12	8.3	22929.13
13-Sep-12	8.225	22644.01
14-Sep-12	8.35	23119.92
15-Sep-12	7.9	21423.24
16-Sep-12	7.44	19736.93
17-Sep-12	7.19	18841.26
18-Sep-12	7.1	18522.45
19-Sep-12	6.85	17647.08
20-Sep-12	6.87	17716.55
21-Sep-12	6.995	18152.96
22-Sep-12	7.075	18434.23
23-Sep-12	6.94	17960.47
24-Sep-12	6.73	17232.28
25-Sep-12	6.37	16009.11
26-Sep-12	6.12	15178.69

27-Sep-12	5.81	14171.02
28-Sep-12	5.56	13376.47
29-Sep-12	5.35	12721.74
30-Sep-12	5.125	12033.32
1-Oct-12	4.98	11596.93
2-Oct-12	4.585	10437.57
3-Oct-12	4.355	9782.73
4-Oct-12	4.495	10179.53
5-Oct-12	4.605	10495.23
6-Oct-12	4.495	10179.53
7-Oct-12	4.395	9895.53
8-Oct-12	4.445	10037.17
9-Oct-12	4.315	9670.39
10-Oct-12	4.15	9211.90
11-Oct-12	4.1	9074.53
12-Oct-12	4.105	9088.23
13-Oct-12	4.055	8951.53
14-Oct-12	3.955	8680.33
15-Oct-12	3.905	8545.85
16-Oct-12	3.885	8492.27
17-Oct-12	3.83	8345.54
18-Oct-12	3.765	8173.30
19-Oct-12	3.68	7950.00
20-Oct-12	3.56	7638.52
21-Oct-12	3.48	7433.34
22-Oct-12	3.37	7154.48
23-Oct-12	3.275	6916.71
24-Oct-12	3.325	7041.50
25-Oct-12	3.3	6979.00
26-Oct-12	3.225	6792.72
27-Oct-12	3.195	6718.71
28-Oct-12	3.195	6718.71
29-Oct-12	3.195	6718.71
30-Oct-12	3.12	6534.95
31-Oct-12	3.09	6461.95
1-Nov-12	3.005	6256.72
2-Nov-12	2.935	6089.48
3-Nov-12	2.89	5982.83
4-Nov-12	2.85	5888.59
5-Nov-12	2.835	5853.38
6-Nov-12	2.88	5959.22
7-Nov-12	2.865	5923.87
8-Nov-12	2.83	5841.67
9-Nov-12	2.815	5806.56
10-Nov-12	2.76	5678.50
11-Nov-12	2.72	5586.00
12-Nov-12	2.65	5425.43
13-Nov-12	2.545	5187.72

14-Nov-12	2.465	5009.16
15-Nov-12	2.31	4669.59
16-Nov-12	2.26	4561.87
17-Nov-12	2.245	4529.73
18-Nov-12	2.235	4508.35
19-Nov-12	2.215	4465.69
20-Nov-12	2.15	4328.05
21-Nov-12	2.095	4212.79
22-Nov-12	2.02	4057.41
23-Nov-12	1.955	3924.44
24-Nov-12	1.95	3914.27
25-Nov-12	1.94	3893.97
26-Nov-12	1.955	3924.44
27-Nov-12	1.94	3893.97
28-Nov-12	1.91	3833.30
29-Nov-12	1.965	3944.79
30-Nov-12	1.97	3954.98
1-Dec-12	1.955	3924.44
2-Dec-12	1.9	3813.15
3-Dec-12	1.86	3732.94
4-Dec-12	1.84	3693.06
5-Dec-12	1.83	3673.18
6-Dec-12	1.83	3673.18
7-Dec-12	1.835	3683.12
8-Dec-12	1.845	3703.02
9-Dec-12	1.865	3742.93
10-Dec-12	1.835	3683.12
11-Dec-12	1.79	3594.03
12-Dec-12	1.805	3623.64
13-Dec-12	1.84	3693.06
14-Dec-12	1.855	3722.96
15-Dec-12	1.84	3693.06
16-Dec-12	1.795	3603.89
17-Dec-12	1.75	3515.50
18-Dec-12	1.725	3466.73
19-Dec-12	1.695	3408.53
20-Dec-12	1.68	3379.56
21-Dec-12	1.63	3283.63
22-Dec-12	1.6	3226.55
23-Dec-12	1.61	3245.54
24-Dec-12	1.6	3226.55
25-Dec-12	1.6	3226.55
26-Dec-12	1.55	3132.21
27-Dec-12	1.44	2928.18
28-Dec-12	1.385	2828.02
29-Dec-12	1.38	2818.97
30-Dec-12	1.37	2800.91
31-Dec-12	1.305	2684.55

1-Jan-13	1.35	2599.04
2-Jan-13	1.36	2619.94
3-Jan-13	1.36	2619.94
4-Jan-13	1.345	2588.60
5-Jan-13	1.35	2599.04
6-Jan-13	1.36	2619.94
7-Jan-13	1.405	2714.27
8-Jan-13	1.4	2703.76
9-Jan-13	1.385	2672.28
10-Jan-13	1.295	2484.54
11-Jan-13	1.3	2494.92
12-Jan-13	1.3	2494.92
13-Jan-13	1.29	2474.17
14-Jan-13	1.305	2505.31
15-Jan-13	1.3	2494.92
16-Jan-13	1.28	2453.44
17-Jan-13	1.3	2494.92
18-Jan-13	1.29	2474.17
19-Jan-13	1.3	2494.92
20-Jan-13	1.295	2484.54
21-Jan-13	1.305	2505.31
22-Jan-13	1.31	2515.70
23-Jan-13	1.32	2536.50
24-Jan-13	1.32	2536.50
25-Jan-13	1.305	2505.31
26-Jan-13	1.38	2661.80
27-Jan-13	1.36	2619.94
28-Jan-13	1.28	2453.44
29-Jan-13	1.295	2484.54
30-Jan-13	1.31	2515.70
31-Jan-13	1.25	2391.41
1-Feb-13	1.13	2145.44
2-Feb-13	1.1	2084.49
3-Feb-13	1.1	2084.49
4-Feb-13	1.1	2084.49
5-Feb-13	1.09	2064.22
6-Feb-13	1.15	2186.19
7-Feb-13	1.2	2288.50
8-Feb-13	1.22	2329.59
9-Feb-13	1.27	2432.74
10-Feb-13	1.32	2536.50
11-Feb-13	1.325	2546.91
12-Feb-13	1.34	2578.17
13-Feb-13	1.36	2619.94
14-Feb-13	1.37	2640.86
15-Feb-13	1.385	2672.28
16-Feb-13	1.39	2682.77
17-Feb-13	1.41	2724.78

18-Feb-13	1.385	2672.28
19-Feb-13	1.33	2557.32
20-Feb-13	1.275	2443.09
21-Feb-13	1.23	2350.17
22-Feb-13	1.185	2257.74
23-Feb-13	1.165	2216.82
24-Feb-13	1.13	2145.44
25-Feb-13	1.105	2094.63
26-Feb-13	1.075	2033.87
27-Feb-13	1.055	1993.47
28-Feb-13	1.08	2043.98
1-Mar-13	1.085	2054.10
2-Mar-13	1.115	2114.94
3-Mar-13	1.15	2186.19
4-Mar-13	1.14	2165.80
5-Mar-13	1.135	2155.62
6-Mar-13	1.145	2175.99
7-Mar-13	1.16	2206.60
8-Mar-13	1.13	2145.44
9-Mar-13	1.13	2145.44
10-Mar-13	1.125	2135.26
11-Mar-13	1.125	2135.26
12-Mar-13	1.125	2135.26
13-Mar-13	1.145	2175.99
14-Mar-13	1.165	2216.82
15-Mar-13	1.22	2329.59
16-Mar-13	1.25	2391.41
17-Mar-13	1.29	2474.17
18-Mar-13	1.31	2515.70
19-Mar-13	1.305	2505.31
20-Mar-13	1.32	2536.50
21-Mar-13	1.32	2536.50
22-Mar-13	1.315	2526.09
23-Mar-13	1.28	2453.44
24-Mar-13	1.255	2401.73
25-Mar-13	1.255	2401.73
26-Mar-13	1.24	2370.78
27-Mar-13	1.185	2257.74
28-Mar-13	1.165	2216.82
29-Mar-13	1.135	2155.62
30-Mar-13	1.14	2165.80
31-Mar-13	1.13	2145.44
1-Apr-13	1.065	2013.66
2-Apr-13	0.96	1802.94
3-Apr-13	0.87	1624.45
4-Apr-13	0.84	1565.39
5-Apr-13	0.87	1624.45
6-Apr-13	0.885	1654.06

7-Apr-13	0.865	1614.59
8-Apr-13	0.865	1614.59
9-Apr-13	0.865	1614.59
10-Apr-13	0.855	1594.89
11-Apr-13	0.84	1565.39
12-Apr-13	0.85	1585.05
13-Apr-13	0.83	1545.75
14-Apr-13	0.85	1585.05
15-Apr-13	0.84	1565.39
16-Apr-13	0.85	1585.05
17-Apr-13	0.835	1555.56
18-Apr-13	0.87	1624.45
19-Apr-13	0.82	1526.13
20-Apr-13	0.815	1516.33
21-Apr-13	0.815	1516.33
22-Apr-13	0.94	1763.11
23-Apr-13	1.17	2227.04
24-Apr-13	1.32	2536.50
25-Apr-13	1.39	2682.77
26-Apr-13	1.405	2714.27
27-Apr-13	1.39	2682.77
28-Apr-13	1.39	2682.77
29-Apr-13	1.4	2703.76
30-Apr-13	1.385	2672.28
1-May-13	1.42	2745.82
2-May-13	1.445	2798.53
3-May-13	1.53	2978.87
4-May-13	1.655	3247.26
5-May-13	1.695	3333.94
6-May-13	1.74	3431.92
7-May-13	1.75	3453.76
8-May-13	1.765	3486.56
9-May-13	1.675	3290.55
10-May-13	1.65	3236.45
11-May-13	1.75	3453.76
12-May-13	1.92	3828.73
13-May-13	2.12	4278.81
14-May-13	2.1	4233.37
15-May-13	2.06	4142.77
16-May-13	2	4007.60
17-May-13	2.04	4097.62
18-May-13	2.17	4392.85
19-May-13	2.28	4645.85
20-May-13	2.13	4301.57
21-May-13	2.04	4097.62
22-May-13	1.935	3862.15
23-May-13	1.92	3828.73
24-May-13	1.985	3973.94

25-May-13	2.06	4142.77
26-May-13	2.2	4461.56
27-May-13	2.31	4715.35
28-May-13	2.405	4936.90
29-May-13	2.39	4901.77
30-May-13	2.355	4820.02
31-May-13	2.315	4726.96
1-Jun-13	2.22	4507.48
2-Jun-13	2.23	4530.48
3-Jun-13	2.125	4290.19
4-Jun-13	2.085	4199.35
5-Jun-13	2.06	4142.77
6-Jun-13	2.075	4176.70
7-Jun-13	2.13	4301.57
8-Jun-13	2.155	4358.57
9-Jun-13	2.16	4369.99
10-Jun-13	2.19	4438.63
11-Jun-13	2.31	4715.35
12-Jun-13	2.425	4983.82
13-Jun-13	2.385	4890.08
14-Jun-13	2.36	4831.68
15-Jun-13	2.385	4890.08
16-Jun-13	2.5	5160.63
17-Jun-13	2.51	5184.30
18-Jun-13	2.44	5019.07
19-Jun-13	2.43	4995.56
20-Jun-13	2.375	4866.70
21-Jun-13	2.325	4750.19
22-Jun-13	2.51	5184.30
23-Jun-13	4.17	9449.86
24-Jun-13	4.805	11257.75
25-Jun-13	4.48	10320.27
26-Jun-13	4.59	10634.71
27-Jun-13	5.345	12871.89
28-Jun-13	5.465	13240.16
29-Jun-13	5.31	12765.13
30-Jun-13	5.22	12491.97
1-Jul-13	5.005	11847.36
2-Jul-13	4.83	11330.92
3-Jul-13	4.54	10491.42
4-Jul-13	4.31	9840.07
5-Jul-13	4.115	9297.86
6-Jul-13	3.98	8927.86
7-Jul-13	3.855	8589.21
8-Jul-13	3.735	8267.65
9-Jul-13	3.56	7804.96
10-Jul-13	3.52	7700.24
11-Jul-13	3.64	8015.56

12-Jul-13	3.895	8697.17
13-Jul-13	4.305	9826.05
14-Jul-13	4.545	10505.72
15-Jul-13	4.69	10923.11
16-Jul-13	4.755	11111.86
17-Jul-13	4.855	11404.25
18-Jul-13	5.095	12115.84
19-Jul-13	5.42	13101.65
20-Jul-13	6.11	15279.27
21-Jul-13	6.515	16611.06
22-Jul-13	6.435	16344.85
23-Jul-13	6.765	17452.95
24-Jul-13	7.17	18848.88
25-Jul-13	7.46	19872.80
26-Jul-13	7.435	19783.73
27-Jul-13	7.31	19340.64
28-Jul-13	7.65	20554.67
29-Jul-13	8.255	22784.04
30-Jul-13	9.63	28179.95
31-Jul-13	10.38	31315.86
1-Aug-13	10.47	31701.31
2-Aug-13	10.43	31529.75
3-Aug-13	10.435	31551.18
4-Aug-13	10.23	30677.80
5-Aug-13	9.88	29210.14
6-Aug-13	9.67	28343.77
7-Aug-13	9.585	27996.12
8-Aug-13	9.35	27044.08
9-Aug-13	9.03	25769.15
10-Aug-13	9.17	26323.89
11-Aug-13	9.435	27386.89
12-Aug-13	9.705	28487.42
13-Aug-13	9.695	28446.35
14-Aug-13	9.535	27792.44
15-Aug-13	9.405	27265.70
16-Aug-13	9.09	26006.32
17-Aug-13	8.865	25121.45
18-Aug-13	8.59	24056.56
19-Aug-13	8.28	22878.07
20-Aug-13	7.965	21704.37
21-Aug-13	7.695	20717.44
22-Aug-13	7.645	20536.61
23-Aug-13	8.31	22991.10
24-Aug-13	8.8	24868.10
25-Aug-13	9.22	26523.16
26-Aug-13	9.665	28323.27
27-Aug-13	9.865	29147.90
28-Aug-13	9.915	29355.57

29-Aug-13	9.48	27569.09
30-Aug-13	9.065	25907.39
31-Aug-13	8.58	24018.18
1-Sep-13	8.35	23142.15
2-Sep-13	8.27	22840.44
3-Sep-13	8.205	22596.44
4-Sep-13	8.105	22223.05
5-Sep-13	7.915	21520.28
6-Sep-13	7.73	20844.39
7-Sep-13	7.64	20518.56
8-Sep-13	7.665	20608.87
9-Sep-13	7.57	20266.50
10-Sep-13	7.615	20428.41
11-Sep-13	7.635	20500.52
12-Sep-13	7.67	20626.95
13-Sep-13	7.77	20989.82
14-Sep-13	7.99	21796.65
15-Sep-13	8.545	23884.05
16-Sep-13	9.625	28159.50
17-Sep-13	10.14	30297.57
18-Sep-13	10.325	31081.27
19-Sep-13	11.315	35415.76
20-Sep-13	11.78	37533.46
21-Sep-13	11.725	37280.25
22-Sep-13	11.715	37234.29
23-Sep-13	12.125	39138.44
24-Sep-13	12.23	39632.62
25-Sep-13	11.715	37234.29
26-Sep-13	10.995	33988.79
27-Sep-13	10.185	30487.44
28-Sep-13	9.395	27225.35
29-Sep-13	8.78	24790.35
30-Sep-13	8.225	22671.41
1-Oct-13	7.86	21318.47
2-Oct-13	7.87	21355.11
3-Oct-13	8.14	22353.47
4-Oct-13	8.245	22746.48
5-Oct-13	8.24	22727.70
6-Oct-13	8.08	22130.09
7-Oct-13	7.69	20699.33
8-Oct-13	7.235	19076.61
9-Oct-13	6.815	17623.14
10-Oct-13	6.46	16427.87
11-Oct-13	6.17	15474.07
12-Oct-13	5.85	14445.20
13-Oct-13	5.57	13565.25
14-Oct-13	5.33	12826.10
15-Oct-13	5.185	12386.27

16-Oct-13	5.575	13580.80
17-Oct-13	5.79	14255.04
18-Oct-13	6.12	15311.68
19-Oct-13	6.42	16295.10
20-Oct-13	6.725	17317.23
21-Oct-13	6.505	16577.70
22-Oct-13	6.005	14940.47
23-Oct-13	5.665	13861.68
24-Oct-13	5.52	13410.11
25-Oct-13	5.39	13009.58
26-Oct-13	5.16	12310.96
27-Oct-13	4.97	11743.48
28-Oct-13	4.735	11053.68
29-Oct-13	4.585	10620.36
30-Oct-13	4.63	10749.78
31-Oct-13	4.855	11404.25
1-Nov-13	5.075	12056.01
2-Nov-13	5.205	12446.64
3-Nov-13	5.275	12658.67
4-Nov-13	5.14	12250.81
5-Nov-13	4.97	11743.48
6-Nov-13	4.725	11024.62
7-Nov-13	4.525	10448.55
8-Nov-13	4.51	10405.74
9-Nov-13	4.555	10534.35
10-Nov-13	4.855	11404.25
11-Nov-13	4.965	11728.66
12-Nov-13	4.78	11184.73
13-Nov-13	4.64	10778.61
14-Nov-13	4.57	10577.32
15-Nov-13	4.37	10008.76
16-Nov-13	4.23	9616.51
17-Nov-13	4.09	9229.01
18-Nov-13	4.03	9064.38
19-Nov-13	4.015	9023.37
20-Nov-13	3.975	8914.25
21-Nov-13	3.86	8602.68
22-Nov-13	3.735	8267.65
23-Nov-13	3.625	7975.95
24-Nov-13	3.505	7661.07
25-Nov-13	3.31	7156.81
26-Nov-13	3.18	6825.75
27-Nov-13	3.275	7067.28
28-Nov-13	3.2	6876.42
29-Nov-13	3.17	6800.45
30-Nov-13	3.135	6712.10
1-Dec-13	3.185	6838.41
2-Dec-13	3.2	6876.42

3-Dec-13	3.14	6724.71
4-Dec-13	3.02	6423.90
5-Dec-13	2.905	6138.89
6-Dec-13	2.83	5954.74
7-Dec-13	2.68	5590.51
8-Dec-13	2.615	5434.37
9-Dec-13	2.495	5148.80
10-Dec-13	2.48	5113.34
11-Dec-13	2.48	5113.34
12-Dec-13	2.49	5136.97
13-Dec-13	2.35	4808.37
14-Dec-13	2.325	4750.19
15-Dec-13	2.28	4645.85
16-Dec-13	2.3	4692.16
17-Dec-13	2.34	4785.08
18-Dec-13	2.38	4878.39
19-Dec-13	2.425	4983.82
20-Dec-13	2.46	5066.16
21-Dec-13	2.475	5101.54
22-Dec-13	2.54	5255.48
23-Dec-13	2.975	6311.99
24-Dec-13	3.61	7936.40
25-Dec-13	3.975	8914.25
26-Dec-13	3.95	8846.24
27-Dec-13	3.705	8187.81
28-Dec-13	3.365	7298.11
29-Dec-13	3.08	6573.87
30-Dec-13	2.825	5942.51
31-Dec-13	2.61	5422.40
1-Jan-14	2.44	5019.07
2-Jan-14	2.32	4738.57
3-Jan-14	2.22	4507.48
4-Jan-14	2.165	4381.42
5-Jan-14	2.13	4301.57
6-Jan-14	2.09	4210.68
7-Jan-14	2.07	4165.38
8-Jan-14	2.085	4199.35
9-Jan-14	2.06	4142.77
10-Jan-14	2.065	4154.07
11-Jan-14	2.02	4052.56
12-Jan-14	2.045	4108.90
13-Jan-14	2	4007.60
14-Jan-14	1.995	3996.38
15-Jan-14	1.92	3828.73
16-Jan-14	1.905	3795.36
17-Jan-14	1.9	3784.25
18-Jan-14	1.845	3662.44
19-Jan-14	1.82	3607.31

20-Jan-14	1.79	3541.36
21-Jan-14	1.805	3574.31
22-Jan-14	1.82	3607.31
23-Jan-14	1.865	3706.65
24-Jan-14	1.81	3585.30
25-Jan-14	1.78	3519.42
26-Jan-14	1.765	3486.56
27-Jan-14	1.725	3399.20
28-Jan-14	1.71	3366.54
29-Jan-14	1.775	3508.46
30-Jan-14	1.76	3475.62
31-Jan-14	1.8	3563.32
1-Feb-14	1.795	3552.33
2-Feb-14	1.825	3618.32
3-Feb-14	1.81	3585.30
4-Feb-14	1.75	3453.76
5-Feb-14	1.7	3344.80
6-Feb-14	1.62	3171.73
7-Feb-14	1.645	3225.65
8-Feb-14	1.69	3323.08
9-Feb-14	1.685	3312.23
10-Feb-14	1.66	3258.07
11-Feb-14	1.605	3139.45
12-Feb-14	1.54	3000.21
13-Feb-14	1.445	2798.53
14-Feb-14	1.42	2745.82
15-Feb-14	1.33	2557.32
16-Feb-14	1.345	2588.60
17-Feb-14	1.33	2557.32
18-Feb-14	1.31	2515.70
19-Feb-14	1.295	2484.54
20-Feb-14	1.31	2515.70
21-Feb-14	1.305	2505.31
22-Feb-14	1.3	2494.92
23-Feb-14	1.285	2463.80
24-Feb-14	1.305	2505.31
25-Feb-14	1.325	2546.91
26-Feb-14	1.425	2756.35
27-Feb-14	1.51	2936.28
28-Feb-14	1.615	3160.96
1-Mar-14	1.63	3193.28
2-Mar-14	1.645	3225.65
3-Mar-14	1.665	3268.89
4-Mar-14	1.67	3279.72
5-Mar-14	1.665	3268.89
6-Mar-14	1.65	3236.45
7-Mar-14	1.665	3268.89
8-Mar-14	1.74	3431.92

9-Mar-14	1.77	3497.51
10-Mar-14	1.805	3574.31
11-Mar-14	1.85	3673.48
12-Mar-14	1.82	3607.31
13-Mar-14	1.81	3585.30
14-Mar-14	1.81	3585.30
15-Mar-14	1.8	3563.32
16-Mar-14	1.825	3618.32
17-Mar-14	1.82	3607.31
18-Mar-14	1.815	3596.30
19-Mar-14	1.83	3629.34
20-Mar-14	1.865	3706.65
21-Mar-14	1.885	3750.95
22-Mar-14	1.865	3706.65
23-Mar-14	1.805	3574.31
24-Mar-14	1.79	3541.36
25-Mar-14	1.78	3519.42
26-Mar-14	1.775	3508.46
27-Mar-14	1.775	3508.46
28-Mar-14	1.77	3497.51
29-Mar-14	1.76	3475.62
30-Mar-14	1.765	3486.56
31-Mar-14	1.77	3497.51
1-Apr-14	1.77	3497.51
2-Apr-14	1.755	3464.69
3-Apr-14	1.725	3399.20
4-Apr-14	1.715	3377.42
5-Apr-14	1.77	3497.51
6-Apr-14	1.755	3464.69
7-Apr-14	1.71	3366.54
8-Apr-14	1.73	3410.10
9-Apr-14	1.685	3312.23
10-Apr-14	1.66	3258.07
11-Apr-14	1.69	3323.08
12-Apr-14	1.74	3431.92
13-Apr-14	1.7	3344.80
14-Apr-14	1.755	3464.69
15-Apr-14	1.8	3563.32
16-Apr-14	1.78	3519.42
17-Apr-14	1.75	3453.76
18-Apr-14	1.72	3388.31
19-Apr-14	1.715	3377.42
20-Apr-14	1.72	3388.31
21-Apr-14	1.735	3421.01
22-Apr-14	1.73	3410.10
23-Apr-14	1.78	3519.42
24-Apr-14	1.7	3344.80
25-Apr-14	1.665	3268.89

26-Apr-14	1.6	3128.70
27-Apr-14	1.505	2925.65
28-Apr-14	1.51	2936.28
29-Apr-14	1.525	2968.22
30-Apr-14	1.52	2957.57
1-May-14	1.6	3128.70
2-May-14	1.65	3236.45
3-May-14	1.725	3399.20
4-May-14	1.74	3431.92
5-May-14	1.75	3453.76
6-May-14	1.81	3585.30
7-May-14	1.83	3629.34
8-May-14	1.8	3563.32
9-May-14	1.8	3563.32
10-May-14	1.83	3629.34
11-May-14	1.875	3728.79
12-May-14	1.86	3695.59
13-May-14	1.84	3651.40
14-May-14	1.795	3552.33
15-May-14	1.73	3410.10
16-May-14	1.765	3486.56
17-May-14	1.875	3728.79
18-May-14	1.955	3906.79
19-May-14	2.01	4030.07
20-May-14	2.02	4052.56
21-May-14	1.93	3851.00
22-May-14	1.865	3706.65
23-May-14	1.85	3673.48
24-May-14	1.86	3695.59
25-May-14	1.855	3684.53
26-May-14	1.82	3607.31
27-May-14	1.815	3596.30
28-May-14	1.82	3607.31
29-May-14	1.88	3739.87
30-May-14	1.945	3884.46
31-May-14	2	4007.60
1-Jun-14	2.01	4030.07
2-Jun-14	2.08	4188.02
3-Jun-14	2.15	4347.16
4-Jun-14	2.185	4427.17
5-Jun-14	2.19	4438.63
6-Jun-14	2.185	4427.17
7-Jun-14	2.17	4392.85
8-Jun-14	2.15	4347.16
9-Jun-14	2.155	4358.57
10-Jun-14	2.205	4473.03
11-Jun-14	2.34	4785.08
12-Jun-14	2.73	5711.32

13-Jun-14	3.035	6461.31
14-Jun-14	3.17	6800.45
15-Jun-14	3.375	7323.88
16-Jun-14	3.59	7883.75
17-Jun-14	3.57	7831.20
18-Jun-14	3.545	7765.64
19-Jun-14	3.58	7857.46
20-Jun-14	3.675	8108.18
21-Jun-14	4.09	9229.01
22-Jun-14	4.99	11802.80
23-Jun-14	5.475	13271.00
24-Jun-14	5.445	13178.54
25-Jun-14	5.445	13178.54
26-Jun-14	5.815	14334.17
27-Jun-14	6.025	15004.80
28-Jun-14	6.09	15214.53
29-Jun-14	6.44	16361.44
30-Jun-14	7.02	18327.24
1-Jul-14	6.68	17165.01
2-Jul-14	5.87	14508.78
3-Jul-14	5.315	12780.36
4-Jul-14	4.93	11625.12
5-Jul-14	4.745	11082.76
6-Jul-14	4.65	10807.46
7-Jul-14	4.46	10263.41
8-Jul-14	4.565	10562.99
9-Jul-14	4.845	11374.90
10-Jul-14	5.17	12341.06
11-Jul-14	5.31	12765.13
12-Jul-14	5.24	12552.50
13-Jul-14	5.1	12130.81
14-Jul-14	5.24	12552.50
15-Jul-14	5.915	14652.19
16-Jul-14	6.63	16996.45
17-Jul-14	6.835	17691.38
18-Jul-14	6.705	17249.51
19-Jul-14	7.185	18901.34
20-Jul-14	8.095	22185.85
21-Jul-14	8.43	23445.41
22-Jul-14	8.8	24868.10
23-Jul-14	9.35	27044.08
24-Jul-14	9.49	27609.65
25-Jul-14	9	25650.90
26-Jul-14	8.605	24114.17
27-Jul-14	8.47	23597.61
28-Jul-14	8.69	24441.68
29-Jul-14	9.405	27265.70
30-Jul-14	10.355	31209.14

31-Jul-14	11.17	34766.10
1-Aug-14	11.525	36365.67
2-Aug-14	11.775	37510.41
3-Aug-14	11.635	36867.49
4-Aug-14	11.44	35979.90
5-Aug-14	11.59	36661.85
6-Aug-14	11.76	37441.30
7-Aug-14	11.775	37510.41
8-Aug-14	11.6	36707.50
9-Aug-14	11.255	35146.32
10-Aug-14	10.96	33834.22
11-Aug-14	10.62	32348.07
12-Aug-14	10.36	31230.47
13-Aug-14	9.99	29668.21
14-Aug-14	9.535	27792.44
15-Aug-14	9.075	25946.95
16-Aug-14	8.735	24615.77
17-Aug-14	8.535	23845.78
18-Aug-14	8.21	22615.18
19-Aug-14	7.775	21008.03
20-Aug-14	7.365	19535.14
21-Aug-14	7.215	19006.43
22-Aug-14	7.225	19041.51
23-Aug-14	7.29	19270.10
24-Aug-14	7.34	19446.64
25-Aug-14	7.27	19199.66
26-Aug-14	7.145	18761.56
27-Aug-14	7.02	18327.24
28-Aug-14	6.86	17776.83
29-Aug-14	6.99	18223.57
30-Aug-14	7.065	18483.16
31-Aug-14	7.195	18936.34
1-Sep-14	7.275	19217.26
2-Sep-14	7.535	20140.92
3-Sep-14	7.61	20410.39
4-Sep-14	7.645	20536.61
5-Sep-14	7.93	21575.44
6-Sep-14	8.175	22484.17
7-Sep-14	8.375	23236.75
8-Sep-14	8.33	23066.58
9-Sep-14	8.175	22484.17
10-Sep-14	7.985	21778.18
11-Sep-14	7.91	21501.90
12-Sep-14	7.88	21391.77
13-Sep-14	7.635	20500.52
14-Sep-14	7.395	19641.53
15-Sep-14	7.27	19199.66
16-Sep-14	7.07	18500.51

17-Sep-14	6.885	17862.42
18-Sep-14	6.685	17181.90
19-Sep-14	6.695	17215.69
20-Sep-14	7.035	18379.16
21-Sep-14	7.185	18901.34
22-Sep-14	7.115	18656.98
23-Sep-14	7.175	18866.36
24-Sep-14	7.48	19944.16
25-Sep-14	8.175	22484.17
26-Sep-14	8.465	23578.57
27-Sep-14	8.4	23331.50
28-Sep-14	8.28	22878.07
29-Sep-14	8.155	22409.45
30-Sep-14	7.895	21446.81
1-Oct-14	7.725	20826.23
2-Oct-14	7.415	19712.58
3-Oct-14	7.095	18587.38
4-Oct-14	6.75	17402.01
5-Oct-14	6.51	16594.37
6-Oct-14	6.425	16311.68
7-Oct-14	6.31	15931.99
8-Oct-14	6.14	15376.56
9-Oct-14	5.93	14700.10
10-Oct-14	5.69	13940.05
11-Oct-14	5.445	13178.54
12-Oct-14	5.21	12461.74
13-Oct-14	4.93	11625.12
14-Oct-14	4.705	10966.58
15-Oct-14	4.555	10534.35
16-Oct-14	4.295	9798.04
17-Oct-14	4.045	9105.46
18-Oct-14	3.96	8873.43
19-Oct-14	3.765	8347.71
20-Oct-14	3.64	8015.56
21-Oct-14	3.475	7582.89
22-Oct-14	3.4	7388.40
23-Oct-14	3.28	7080.05
24-Oct-14	3.275	7067.28
25-Oct-14	3.25	7003.51
26-Oct-14	3.255	7016.25
27-Oct-14	3.33	7208.11
28-Oct-14	3.345	7246.64
29-Oct-14	3.36	7285.23
30-Oct-14	3.42	7440.13
31-Oct-14	3.435	7479.00
1-Nov-14	3.515	7687.18
2-Nov-14	3.545	7765.64
3-Nov-14	3.51	7674.12

4-Nov-14	3.44	7491.96
5-Nov-14	3.335	7220.95
6-Nov-14	3.24	6978.04
7-Nov-14	3.15	6749.93
8-Nov-14	3.03	6448.83
9-Nov-14	3.025	6436.36
10-Nov-14	2.97	6299.59
11-Nov-14	3	6374.10
12-Nov-14	2.985	6336.82
13-Nov-14	3	6374.10
14-Nov-14	3	6374.10
15-Nov-14	3.085	6586.40
16-Nov-14	3.1	6624.05
17-Nov-14	3.04	6473.79
18-Nov-14	2.965	6287.19
19-Nov-14	2.83	5954.74
20-Nov-14	2.77	5808.39
21-Nov-14	2.64	5494.30
22-Nov-14	2.525	5219.86
23-Nov-14	2.37	4855.02
24-Nov-14	2.28	4645.85
25-Nov-14	2.405	4936.90
26-Nov-14	2.32	4738.57
27-Nov-14	2.34	4785.08
28-Nov-14	2.3	4692.16
29-Nov-14	2.345	4796.72
30-Nov-14	2.365	4843.35
1-Dec-14	2.42	4972.08
2-Dec-14	2.31	4715.35
3-Dec-14	2.335	4773.44
4-Dec-14	2.28	4645.85
5-Dec-14	2.23	4530.48
6-Dec-14	2.265	4611.17
7-Dec-14	2.24	4553.51
8-Dec-14	2.265	4611.17
9-Dec-14	2.245	4565.03
10-Dec-14	2.205	4473.03
11-Dec-14	2.185	4427.17
12-Dec-14	2.15	4347.16
13-Dec-14	2.125	4290.19
14-Dec-14	2.125	4290.19
15-Dec-14	2.11	4256.08
16-Dec-14	2.075	4176.70
17-Dec-14	2.08	4188.02
18-Dec-14	2.04	4097.62
19-Dec-14	2.02	4052.56
20-Dec-14	2.01	4030.07
21-Dec-14	2	4007.60

22-Dec-14	1.97	3940.34
23-Dec-14	1.935	3862.15
24-Dec-14	1.95	3895.62
25-Dec-14	1.985	3973.94
26-Dec-14	1.97	3940.34
27-Dec-14	1.94	3873.30
28-Dec-14	1.89	3762.05
29-Dec-14	1.87	3717.72
30-Dec-14	1.86	3695.59
31-Dec-14	1.84	3651.40
1-Jan-15	1.82	3607.31
2-Jan-15	1.76	3475.62
3-Jan-15	1.78	3519.42
4-Jan-15	1.72	3388.31
5-Jan-15	1.7	3344.80
6-Jan-15	1.72	3388.31
7-Jan-15	1.7	3344.80
8-Jan-15	1.75	3453.76
9-Jan-15	1.73	3410.10
10-Jan-15	1.7	3344.80
11-Jan-15	1.7	3344.80
12-Jan-15	1.67	3279.72
13-Jan-15	1.64	3214.85
14-Jan-15	1.6	3128.70
15-Jan-15	1.54	3000.21
16-Jan-15	1.49	2893.79
17-Jan-15	1.42	2745.82
18-Jan-15	1.42	2745.82
19-Jan-15	1.41	2724.78
20-Jan-15	1.46	2830.23
21-Jan-15	1.54	3000.21
22-Jan-15	1.66	3258.07
23-Jan-15	1.68	3301.39
24-Jan-15	1.74	3431.92
25-Jan-15	1.73	3410.10
26-Jan-15	1.6	3128.70
27-Jan-15	1.53	2978.87
28-Jan-15	1.54	3000.21
29-Jan-15	1.41	2724.78
30-Jan-15	1.45	2809.09
31-Jan-15	1.44	2787.98
1-Feb-15	1.4	2703.76
2-Feb-15	1.33	2557.32
3-Feb-15	1.34	2578.17
4-Feb-15	1.4	2703.76
5-Feb-15	1.3	2494.92
6-Feb-15	1.2	2288.50
7-Feb-15	1.2	2288.50

8-Feb-15	1.12	2125.10
9-Feb-15	1.21	2309.03
10-Feb-15	1.22	2329.59
11-Feb-15	1.24	2370.78
12-Feb-15	1.23	2350.17
13-Feb-15	1.23	2350.17
14-Feb-15	1.22	2329.59
15-Feb-15	1.21	2309.03
16-Feb-15	1.14	2165.80
17-Feb-15	1.16	2206.60
18-Feb-15	1.15	2186.19
19-Feb-15	1.14	2165.80
20-Feb-15	1.12	2125.10
21-Feb-15	1.16	2206.60
22-Feb-15	1.2	2288.50
23-Feb-15	1.28	2453.44
24-Feb-15	1.32	2536.50
25-Feb-15	1.33	2557.32
26-Feb-15	1.28	2453.44
27-Feb-15	1.22	2329.59
28-Feb-15	1.16	2206.60
1-Mar-15	1.18	2247.50
2-Mar-15	1.18	2247.50
3-Mar-15	1.2	2288.50
4-Mar-15	1.18	2247.50
5-Mar-15	1.15	2186.19
6-Mar-15	1.1	2084.49
7-Mar-15	1.13	2145.44
8-Mar-15	1.1	2084.49
9-Mar-15	1.12	2125.10
10-Mar-15	1.1	2084.49
11-Mar-15	1.12	2125.10
12-Mar-15	1.07	2023.76
13-Mar-15	1.08	2043.98
14-Mar-15	1.07	2023.76
15-Mar-15	1.12	2125.10
16-Mar-15	1.19	2267.99
17-Mar-15	1.31	2515.70
18-Mar-15	1.46	2830.23
19-Mar-15	1.59	3107.23
20-Mar-15	1.76	3475.62
21-Mar-15	1.78	3519.42
22-Mar-15	1.78	3519.42
23-Mar-15	1.8	3563.32
24-Mar-15	1.77	3497.51
25-Mar-15	1.74	3431.92
26-Mar-15	1.7	3344.80
27-Mar-15	1.74	3431.92

28-Mar-15	1.71	3366.54
29-Mar-15	1.72	3388.31
30-Mar-15	1.74	3431.92
31-Mar-15	1.71	3366.54
1-Apr-15	1.82	3607.31
2-Apr-15	1.82	3607.31
3-Apr-15	1.89	3762.05
4-Apr-15	1.91	3806.48
5-Apr-15	1.98	3962.74
6-Apr-15	1.95	3895.62
7-Apr-15	1.98	3962.74
8-Apr-15	1.9	3784.25
9-Apr-15	1.84	3651.40
10-Apr-15	1.79	3541.36
11-Apr-15	1.74	3431.92
12-Apr-15	1.72	3388.31
13-Apr-15	1.77	3497.51
14-Apr-15	1.77	3497.51
15-Apr-15	1.82	3607.31
16-Apr-15	1.9	3784.25
17-Apr-15	1.88	3739.87
18-Apr-15	1.87	3717.72
19-Apr-15	1.86	3695.59
20-Apr-15	1.93	3851.00
21-Apr-15	1.94	3873.30
22-Apr-15	2	4007.60
23-Apr-15	2.04	4097.62
24-Apr-15	2	4007.60
25-Apr-15	1.92	3828.73
26-Apr-15	1.82	3607.31
27-Apr-15	1.7	3344.80
28-Apr-15	1.6	3128.70
29-Apr-15	1.48	2872.58
30-Apr-15	1.45	2809.09
1-May-15	1.52	2957.57
2-May-15	1.64	3214.85
3-May-15	1.74	3431.92
4-May-15	1.8	3563.32
5-May-15	1.86	3695.59
6-May-15	1.97	3940.34
7-May-15	2	4007.60
8-May-15	2.08	4188.02
9-May-15	2.16	4369.99
10-May-15	2.11	4256.08
11-May-15	2.12	4278.81
12-May-15	2.06	4142.77
13-May-15	2	4007.60
14-May-15	1.84	3651.40

15-May-15	1.72	3388.31
16-May-15	1.64	3214.85
17-May-15	1.56	3042.94
18-May-15	1.5	2915.03
19-May-15	1.54	3000.21
20-May-15	1.55	3021.56
21-May-15	1.56	3042.94
22-May-15	1.62	3171.73
23-May-15	1.62	3171.73
24-May-15	1.63	3193.28
25-May-15	1.62	3171.73
26-May-15	1.62	3171.73
27-May-15	1.62	3171.73
28-May-15	1.63	3193.28
29-May-15	1.66	3258.07
30-May-15	1.62	3171.73
31-May-15	1.65	3236.45
1-Jun-15	1.7	3344.80
2-Jun-15	1.78	3519.42
3-Jun-15	1.76	3475.62
4-Jun-15	1.76	3475.62
5-Jun-15	1.73	3410.10
6-Jun-15	1.7	3344.80
7-Jun-15	1.71	3366.54
8-Jun-15	1.64	3214.85
9-Jun-15	1.55	3021.56
10-Jun-15	1.46	2830.23
11-Jun-15	1.47	2851.39
12-Jun-15	1.52	2957.57
13-Jun-15	1.71	3366.54
14-Jun-15	1.82	3607.31
15-Jun-15	1.92	3828.73
16-Jun-15	2.06	4142.77
17-Jun-15	2.19	4438.63
18-Jun-15	2.34	4785.08
19-Jun-15	2.52	5208.00
20-Jun-15	2.6	5398.48
21-Jun-15	2.63	5470.31
22-Jun-15	2.76	5784.09
23-Jun-15	3.24	6978.04
24-Jun-15	3.18	6825.75
25-Jun-15	3.12	6674.33
26-Jun-15	2.98	6324.40
27-Jun-15	3	6374.10
28-Jun-15	2.98	6324.40
29-Jun-15	2.82	5930.29
30-Jun-15	2.58	5350.72
1-Jul-15	2.4	4925.18

2-Jul-15	2.22	4507.48
3-Jul-15	2.05	4120.18
4-Jul-15	1.9	3784.25
5-Jul-15	1.8	3563.32
6-Jul-15	1.72	3388.31
7-Jul-15	1.64	3214.85
8-Jul-15	1.6	3128.70
9-Jul-15	1.82	3607.31
10-Jul-15	2.02	4052.56
11-Jul-15	2.2	4461.56
12-Jul-15	2.35	4808.37
13-Jul-15	3.22	6927.18
14-Jul-15	3.1	6624.05
15-Jul-15	2.75	5759.81
16-Jul-15	2.6	5398.48
17-Jul-15	2.54	5255.48
18-Jul-15	2.56	5303.05
19-Jul-15	2.84	5979.21
20-Jul-15	3.38	7336.77
21-Jul-15	4.37	10008.76
22-Jul-15	5.5	13348.23
23-Jul-15	6.14	15376.56
24-Jul-15	6.41	16261.97
25-Jul-15	6.56	16761.48
26-Jul-15	6.48	16494.40
27-Jul-15	6.47	16461.12
28-Jul-15	6.73	17334.17
29-Jul-15	7.35	19482.02
30-Jul-15	7.72	20808.09
31-Jul-15	8.04	21981.65
1-Aug-15	8.4	23331.50
2-Aug-15	8.74	24635.14
3-Aug-15	9.02	25729.71
4-Aug-15	9.33	26963.67
5-Aug-15	9.64	28220.87
6-Aug-15	9.7	28466.88
7-Aug-15	9.68	28384.78
8-Aug-15	9.66	28302.78
9-Aug-15	9.62	28139.06
10-Aug-15	9.65	28261.81
11-Aug-15	9.81	28920.16
12-Aug-15	9.88	29210.14
13-Aug-15	9.52	27731.46
14-Aug-15	9.02	25729.71
15-Aug-15	8.45	23521.46
16-Aug-15	7.92	21538.66
17-Aug-15	7.5	20015.63
18-Aug-15	7.16	18813.93

19-Aug-15	6.82	17640.19
20-Aug-15	6.48	16494.40
21-Aug-15	6.24	15702.44
22-Aug-15	6.13	15344.11
23-Aug-15	6	14924.40
24-Aug-15	5.9	14604.33
25-Aug-15	5.78	14223.44
26-Aug-15	5.77	14191.85
27-Aug-15	6.06	15117.60
28-Aug-15	6.04	15053.11
29-Aug-15	6.1	15246.89
30-Aug-15	6.24	15702.44
31-Aug-15	6.48	16494.40
1-Sep-15	7.24	19094.17
2-Sep-15	7.78	21026.24
3-Sep-15	8.68	24403.06
4-Sep-15	9.06	25887.63
5-Sep-15	9.05	25848.11
6-Sep-15	9.07	25927.17
7-Sep-15	9.05	25848.11
8-Sep-15	9	25650.90
9-Sep-15	8.7	24480.32
10-Sep-15	8.5	23712.03
11-Sep-15	8.3	22953.40
12-Sep-15	8.1	22204.45
13-Sep-15	7.89	21428.46
14-Sep-15	7.63	20482.48
15-Sep-15	7.26	19164.47
16-Sep-15	7.78	21026.24
17-Sep-15	7.89	21428.46
18-Sep-15	7.8	21099.16
19-Sep-15	7.42	19730.36
20-Sep-15	7	18258.10
21-Sep-15	6.59	16862.04
22-Sep-15	6.35	16063.69
23-Sep-15	6.03	15020.89
24-Sep-15	5.82	14350.01
25-Sep-15	5.71	14002.86
26-Sep-15	5.6	13658.62
27-Sep-15	5.62	13720.99
28-Sep-15	5.84	14413.45
29-Sep-15	5.9	14604.33
30-Sep-15	5.86	14476.98
1-Oct-15	5.67	13877.34
2-Oct-15	5.46	13224.74
3-Oct-15	5.35	12887.16
4-Oct-15	5.22	12491.97
5-Oct-15	5.33	12826.10

6-Oct-15	5.16	12310.96
7-Oct-15	5.01	11862.22
8-Oct-15	4.95	11684.25
9-Oct-15	5.22	12491.97
10-Oct-15	5.5	13348.23
11-Oct-15	5.53	13441.09
12-Oct-15	6.12	15311.68
13-Oct-15	6.29	15866.28
14-Oct-15	6.26	15767.90
15-Oct-15	6.17	15474.07
16-Oct-15	5.98	14860.19
17-Oct-15	5.82	14350.01
18-Oct-15	5.72	14034.29
19-Oct-15	5.65	13814.73
20-Oct-15	5.42	13101.65
21-Oct-15	5.34	12856.62
22-Oct-15	5.11	12160.77
23-Oct-15	4.85	11389.57
24-Oct-15	4.57	10577.32
25-Oct-15	4.3	9812.04
26-Oct-15	4.03	9064.38
27-Oct-15	3.74	8280.98
28-Oct-15	3.57	7831.20
29-Oct-15	3.35	7259.50
30-Oct-15	3.25	7003.51
31-Oct-15	3.15	6749.93
1-Nov-15	2.96	6274.80
2-Nov-15	2.95	6250.03
3-Nov-15	2.91	6151.21
4-Nov-15	2.89	6101.95
5-Nov-15	2.86	6028.23
6-Nov-15	2.84	5979.21
7-Nov-15	2.88	6077.35
8-Nov-15	2.86	6028.23
9-Nov-15	2.76	5784.09
10-Nov-15	2.72	5687.11
11-Nov-15	2.65	5518.32
12-Nov-15	2.57	5326.87
13-Nov-15	2.5	5160.63
14-Nov-15	2.4	4925.18
15-Nov-15	2.32	4738.57
16-Nov-15	2.25	4576.56
17-Nov-15	2.18	4415.73
18-Nov-15	2.09	4210.68
19-Nov-15	2	4007.60
20-Nov-15	1.97	3940.34
21-Nov-15	1.94	3873.30
22-Nov-15	1.84	3651.40

23-Nov-15	1.88	3739.87
24-Nov-15	1.96	3917.97
25-Nov-15	1.98	3962.74
26-Nov-15	2.13	4301.57
27-Nov-15	2	4007.60
28-Nov-15	1.82	3607.31
29-Nov-15	1.79	3541.36
30-Nov-15	1.82	3607.31
1-Dec-15	1.83	3629.34
2-Dec-15	1.88	3739.87
3-Dec-15	1.82	3607.31
4-Dec-15	1.73	3410.10
5-Dec-15	1.8	3563.32
6-Dec-15	1.72	3388.31
7-Dec-15	1.6	3128.70
8-Dec-15	1.5	2915.03
9-Dec-15	1.44	2787.98
10-Dec-15	1.44	2787.98
11-Dec-15	1.42	2745.82
12-Dec-15	1.44	2787.98
13-Dec-15	1.47	2851.39
14-Dec-15	1.47	2851.39
15-Dec-15	1.59	3107.23
16-Dec-15	1.52	2957.57
17-Dec-15	1.58	3085.77
18-Dec-15	1.57	3064.35
19-Dec-15	1.53	2978.87
20-Dec-15	1.47	2851.39
21-Dec-15	1.43	2766.89
22-Dec-15	1.4	2703.76
23-Dec-15	1.37	2640.86
24-Dec-15	1.37	2640.86
25-Dec-15	1.39	2682.77
26-Dec-15	1.37	2640.86
27-Dec-15	1.38	2661.80
28-Dec-15	1.34	2578.17
29-Dec-15	1.32	2536.50
30-Dec-15	1.35	2599.04
31-Dec-15	1.26	2412.06
1-Jan-16	1.26	2412.06
2-Jan-16	1.38	2661.80
3-Jan-16	1.44	2787.98
4-Jan-16	1.48	2872.58
5-Jan-16	1.49	2893.79
6-Jan-16	1.51	2936.28
7-Jan-16	1.5	2915.03
8-Jan-16	1.45	2809.09
9-Jan-16	1.4	2703.76

10-Jan-16	1.39	2682.77
11-Jan-16	1.38	2661.80
12-Jan-16	1.3	2494.92
13-Jan-16	1.28	2453.44
14-Jan-16	1.2	2288.50
15-Jan-16	1.22	2329.59
16-Jan-16	1.2	2288.50
17-Jan-16	1.29	2474.17
18-Jan-16	1.28	2453.44
19-Jan-16	1.27	2432.74
20-Jan-16	1.22	2329.59
21-Jan-16	1.19	2267.99
22-Jan-16	1.2	2288.50
23-Jan-16	1.13	2145.44
24-Jan-16	1.12	2125.10
25-Jan-16	1.13	2145.44
26-Jan-16	1.14	2165.80
27-Jan-16	1.12	2125.10
28-Jan-16	1.13	2145.44
29-Jan-16	1.09	2064.22
30-Jan-16	1.08	2043.98
31-Jan-16	1.12	2125.10
1-Feb-16	1.26	2412.06
2-Feb-16	1.42	2745.82
3-Feb-16	1.56	3042.94
4-Feb-16	1.67	3279.72
5-Feb-16	1.76	3475.62
6-Feb-16	1.9	3784.25
7-Feb-16	1.98	3962.74
8-Feb-16	2	4007.60
9-Feb-16	1.9	3784.25
10-Feb-16	1.74	3431.92
11-Feb-16	1.57	3064.35
12-Feb-16	1.45	2809.09
13-Feb-16	1.36	2619.94
14-Feb-16	1.32	2536.50
15-Feb-16	1.27	2432.74
16-Feb-16	1.1	2084.49
17-Feb-16	1.04	1963.25
18-Feb-16	0.95	1783.01
19-Feb-16	1.03	1943.12
20-Feb-16	1.02	1923.02
21-Feb-16	1	1882.90
22-Feb-16	0.97	1822.89
23-Feb-16	0.94	1763.11
24-Feb-16	0.93	1743.23
25-Feb-16	0.91	1703.54
26-Feb-16	0.89	1663.94

27-Feb-16	0.84	1565.39
28-Feb-16	0.83	1545.75
29-Feb-16	0.83	1545.75
1-Mar-16	0.82	1526.13
2-Mar-16	0.81	1506.54
3-Mar-16	0.77	1428.42
4-Mar-16	0.76	1408.95
5-Mar-16	0.78	1447.92
6-Mar-16	0.82	1526.13
7-Mar-16	0.93	1743.23
8-Mar-16	1.06	2003.56
9-Mar-16	1.21	2309.03
10-Mar-16	1.3	2494.92
11-Mar-16	1.42	2745.82
12-Mar-16	1.47	2851.39
13-Mar-16	1.4	2703.76
14-Mar-16	1.36	2619.94
15-Mar-16	1.27	2432.74
16-Mar-16	1.17	2227.04
17-Mar-16	1.14	2165.80
18-Mar-16	1.15	2186.19
19-Mar-16	1.06	2003.56
20-Mar-16	1.14	2165.80
21-Mar-16	1.15	2186.19
22-Mar-16	1.14	2165.80
23-Mar-16	1.2	2288.50
24-Mar-16	1.22	2329.59
25-Mar-16	1.18	2247.50
26-Mar-16	1.28	2453.44
27-Mar-16	1.39	2682.77
28-Mar-16	1.49	2893.79
29-Mar-16	1.58	3085.77
30-Mar-16	1.58	3085.77
31-Mar-16	1.58	3085.77
1-Apr-16	1.6	3128.70
2-Apr-16	1.62	3171.73
3-Apr-16	1.64	3214.85
4-Apr-16	1.68	3301.39
5-Apr-16	1.7	3344.80
6-Apr-16	1.67	3279.72
7-Apr-16	1.64	3214.85
8-Apr-16	1.5	2915.03
9-Apr-16	1.53	2978.87
10-Apr-16	1.57	3064.35
11-Apr-16	1.62	3171.73
12-Apr-16	1.63	3193.28
13-Apr-16	1.62	3171.73
14-Apr-16	1.66	3258.07

15-Apr-16	1.68	3301.39
16-Apr-16	1.71	3366.54
17-Apr-16	1.69	3323.08
18-Apr-16	1.66	3258.07
19-Apr-16	1.65	3236.45
20-Apr-16	1.62	3171.73
21-Apr-16	1.54	3000.21
22-Apr-16	1.6	3128.70
23-Apr-16	1.58	3085.77
24-Apr-16	1.6	3128.70
25-Apr-16	1.59	3107.23
26-Apr-16	1.52	2957.57
27-Apr-16	1.45	2809.09
28-Apr-16	1.35	2599.04
29-Apr-16	1.27	2432.74
30-Apr-16	1.16	2206.60
1-May-16	1.17	2227.04
2-May-16	1.17	2227.04
3-May-16	1.16	2206.60
4-May-16	1.18	2247.50
5-May-16	1.21	2309.03
6-May-16	1.2	2288.50
7-May-16	1.28	2453.44
8-May-16	1.34	2578.17
9-May-16	1.39	2682.77
10-May-16	1.42	2745.82
11-May-16	1.43	2766.89
12-May-16	1.43	2766.89
13-May-16	1.48	2872.58
14-May-16	1.47	2851.39
15-May-16	1.47	2851.39
16-May-16	1.5	2915.03
17-May-16	1.51	2936.28
18-May-16	1.54	3000.21
19-May-16	1.53	2978.87
20-May-16	1.45	2809.09
21-May-16	1.43	2766.89
22-May-16	1.46	2830.23
23-May-16	1.47	2851.39
24-May-16	1.58	3085.77
25-May-16	1.66	3258.07
26-May-16	1.67	3279.72
27-May-16	1.73	3410.10
28-May-16	1.8	3563.32
29-May-16	1.87	3717.72
30-May-16	2	4007.60
31-May-16	2.07	4165.38
1-Jun-16	1.97	3940.34

2-Jun-16	2	4007.60
3-Jun-16	2.02	4052.56
4-Jun-16	2	4007.60
5-Jun-16	1.96	3917.97
6-Jun-16	1.97	3940.34
7-Jun-16	1.95	3895.62
8-Jun-16	1.94	3873.30
9-Jun-16	2.1	4233.37
10-Jun-16	2.26	4599.63
11-Jun-16	2.64	5494.30
12-Jun-16	2.85	6003.71
13-Jun-16	2.89	6101.95
14-Jun-16	2.82	5930.29
15-Jun-16	2.62	5446.35
16-Jun-16	2.38	4878.39
17-Jun-16	2.2	4461.56
18-Jun-16	2.15	4347.16
19-Jun-16	2.22	4507.48
20-Jun-16	2.4	4925.18
21-Jun-16	2.72	5687.11
22-Jun-16	2.7	5638.76
23-Jun-16	2.44	5019.07
24-Jun-16	2.46	5066.16
25-Jun-16	2.39	4901.77
26-Jun-16	2.45	5042.60
27-Jun-16	2.94	6225.29
28-Jun-16	3.66	8068.45
29-Jun-16	4.07	9174.04
30-Jun-16	4.05	9119.16
1-Jul-16	3.88	8656.64
2-Jul-16	3.66	8068.45
3-Jul-16	3.61	7936.40
4-Jul-16	3.85	8575.74
5-Jul-16	4.46	10263.41
6-Jul-16	5.4	13040.24
7-Jul-16	6.22	15637.07
8-Jul-16	6.62	16962.81
9-Jul-16	6.62	16962.81
10-Jul-16	6.35	16063.69
11-Jul-16	6.15	15409.04
12-Jul-16	5.76	14160.29
13-Jul-16	5.42	13101.65
14-Jul-16	5.62	13720.99
15-Jul-16	5.86	14476.98
16-Jul-16	6.92	17982.51
17-Jul-16	6.35	16063.69
18-Jul-16	6.35	16063.69
19-Jul-16	5.98	14860.19

20-Jul-16	5.5	13348.23
21-Jul-16	5.03	11921.74
22-Jul-16	4.7	10952.08
23-Jul-16	4.6	10663.44
24-Jul-16	4.59	10634.71
25-Jul-16	4.55	10520.03
26-Jul-16	4.67	10865.24
27-Jul-16	4.36	9980.58
28-Jul-16	4.2	9533.08
29-Jul-16	4.1	9256.53
30-Jul-16	4.06	9146.59
31-Jul-16	4.03	9064.38
1-Aug-16	4.42	10149.99
2-Aug-16	4.7	10952.08
3-Aug-16	4.84	11360.24
4-Aug-16	4.82	11301.64
5-Aug-16	4.86	11418.93
6-Aug-16	4.73	11039.14
7-Aug-16	4.64	10778.61
8-Aug-16	4.76	11126.42
9-Aug-16	4.82	11301.64
10-Aug-16	4.8	11243.14
11-Aug-16	5.06	12011.20
12-Aug-16	5.78	14223.44
13-Aug-16	6.8	17572.02
14-Aug-16	7.06	18465.81
15-Aug-16	6.95	18085.67
16-Aug-16	6.98	18189.06
17-Aug-16	7.23	19059.05
18-Aug-16	7.59	20338.40
19-Aug-16	7.78	21026.24
20-Aug-16	8.27	22840.44
21-Aug-16	8.42	23407.41
22-Aug-16	8.46	23559.53
23-Aug-16	8.59	24056.56
24-Aug-16	8.62	24171.84
25-Aug-16	8.62	24171.84
26-Aug-16	8.63	24210.32
27-Aug-16	8.44	23483.42
28-Aug-16	8.32	23028.83
29-Aug-16	8.15	22390.78
30-Aug-16	8.06	22055.82
31-Aug-16	7.95	21649.08
1-Sep-16	7.88	21391.77
2-Sep-16	7.81	21135.65
3-Sep-16	7.9	21465.17
4-Sep-16	7.9	21465.17
5-Sep-16	7.86	21318.47

6-Sep-16	8.18	22502.87
7-Sep-16	8.33	23066.58
8-Sep-16	8.38	23255.69
9-Sep-16	8.16	22428.12
10-Sep-16	7.99	21796.65
11-Sep-16	8.1	22204.45
12-Sep-16	8.52	23788.42
13-Sep-16	8.66	24325.89
14-Sep-16	10	29710.00
15-Sep-16	9.82	28961.52
16-Sep-16	9.63	28179.95
17-Sep-16	9.46	27488.05
18-Sep-16	9.26	26683.00
19-Sep-16	8.98	25572.18
20-Sep-16	8.82	24945.94
21-Sep-16	8.58	24018.18
22-Sep-16	8.05	22018.72
23-Sep-16	7.64	20518.56
24-Sep-16	7.45	19837.15
25-Sep-16	7.54	20158.84
26-Sep-16	7.53	20123.00
27-Sep-16	7.3	19305.36
28-Sep-16	7.1	18604.77
29-Sep-16	6.87	17811.05
30-Sep-16	6.88	17845.29
1-Oct-16	6.95	18085.67
2-Oct-16	6.66	17097.51
3-Oct-16	6.45	16394.64
4-Oct-16	6.3	15899.12
5-Oct-16	6.14	15376.56
6-Oct-16	6.04	15053.11
7-Oct-16	6.11	15279.27
8-Oct-16	6.07	15149.89
9-Oct-16	5.94	14732.07
10-Oct-16	5.73	14065.76
11-Oct-16	5.52	13410.11
12-Oct-16	5.33	12826.10
13-Oct-16	5.21	12461.74
14-Oct-16	5.06	12011.20
15-Oct-16	4.98	11773.13
16-Oct-16	4.92	11595.59
17-Oct-16	5.3	12734.68
18-Oct-16	5.45	13193.93
19-Oct-16	5.28	12673.86
20-Oct-16	5.05	11981.35
21-Oct-16	4.85	11389.57
22-Oct-16	4.62	10720.98
23-Oct-16	4.52	10434.28

24-Oct-16	4.64	10778.61
25-Oct-16	4.56	10548.67
26-Oct-16	4.45	10235.02
27-Oct-16	4.23	9616.51
28-Oct-16	4.13	9339.24
29-Oct-16	4.02	9037.03
30-Oct-16	3.85	8575.74
31-Oct-16	3.88	8656.64
1-Nov-16	3.84	8548.82
2-Nov-16	3.82	8495.06
3-Nov-16	3.76	8334.36
4-Nov-16	4.02	9037.03
5-Nov-16	4.4	10093.42
6-Nov-16	4.47	10291.83
7-Nov-16	4.32	9868.12
8-Nov-16	4.04	9091.76
9-Nov-16	3.97	8900.63
10-Nov-16	3.88	8656.64
11-Nov-16	3.7	8174.52
12-Nov-16	3.53	7726.38
13-Nov-16	3.51	7674.12
14-Nov-16	3.8	8441.40
15-Nov-16	4.06	9146.59
16-Nov-16	4.17	9449.86
17-Nov-16	4.13	9339.24
18-Nov-16	4.1	9256.53
19-Nov-16	4.12	9311.64
20-Nov-16	4.15	9394.50
21-Nov-16	4.2	9533.08
22-Nov-16	4.11	9284.07
23-Nov-16	4.1	9256.53
24-Nov-16	4	8982.40
25-Nov-16	3.77	8361.08
26-Nov-16	3.64	8015.56
27-Nov-16	3.44	7491.96
28-Nov-16	3.26	7029.00
29-Nov-16	3.12	6674.33
30-Nov-16	3.03	6448.83
1-Dec-16	2.98	6324.40
2-Dec-16	2.85	6003.71
3-Dec-16	2.82	5930.29
4-Dec-16	2.78	5832.72
5-Dec-16	2.66	5542.36
6-Dec-16	2.6	5398.48
7-Dec-16	2.58	5350.72
8-Dec-16	2.56	5303.05
9-Dec-16	2.44	5019.07
10-Dec-16	2.52	5208.00

11-Dec-16	2.3	4692.16
12-Dec-16	2.4	4925.18
13-Dec-16	2.42	4972.08
14-Dec-16	2.5	5160.63
15-Dec-16	2.32	4738.57
16-Dec-16	2.14	4324.35
17-Dec-16	2.08	4188.02
18-Dec-16	1.94	3873.30
19-Dec-16	1.89	3762.05
20-Dec-16	1.9	3784.25
21-Dec-16	1.83	3629.34
22-Dec-16	1.7	3344.80
23-Dec-16	1.78	3519.42
24-Dec-16	1.81	3585.30
25-Dec-16	1.86	3695.59
26-Dec-16	1.95	3895.62
27-Dec-16	1.93	3851.00
28-Dec-16	1.88	3739.87
29-Dec-16	1.94	3873.30
30-Dec-16	1.95	3895.62
31-Dec-16	1.9	3784.25

Appendix 9: Stream water levels at the Khamouan River gauge

Station name	Location	Latitude (°)	Longitude (°)	Ground elevation (m AMSL)
Khamoun River gauge	Sukhuma District	14.63	105.78	94

Station : Khamouan River Daily stream water level in m Year : 1993

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2.5	4.1	2.5	0.2	0.0
2	0.0	0.0	0.0	0.0	0.0	0.3	1.4	3.1	4.8	2.4	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.3	2.0	5.5	5.2	2.3	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.3	2.2	4.5	4.7	1.6	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.4	2.2	4.2	4.1	1.4	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.4	2.2	4.4	4.1	1.2	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.4	1.7	7.0	5.8	1.2	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.5	1.5	7.4	7.1	1.1	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.4	1.8	6.1	6.7	1.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.1	2.2	6.4	5.4	1.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	3.5	3.6	4.3	0.9	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	2.8	3.5	4.4	0.9	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	1.9	3.5	5.4	0.8	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.3	10.2	3.4	5.7	0.8	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.3	3.3	2.3	5.1	0.8	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	4.3	3.8	4.7	0.7	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	4.7	3.6	4.4	0.7	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	5.0	3.7	4.3	0.6	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.1	4.2	0.6	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	4.9	6.0	5.9	0.6	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	4.9	6.5	3.9	0.5	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	4.2	5.3	3.7	0.6	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	4.3	4.3	3.6	0.7	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	1.6	3.6	4.1	3.4	0.7	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	1.7	3.3	4.8	3.1	0.8	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	1.4	3.1	4.2	2.9	0.8	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	1.7	2.7	4.2	2.8	0.6	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	2.4	2.6	5.0	2.8	0.5	0.0	0.0
29	0.0		0.0	0.0	0.0	2.3	2.4	5.0	2.4	0.4	0.0	0.0
30	0.0		0.0	0.0	0.0	1.5	2.3	4.8	2.2	0.3	0.0	0.0
31	0.0		0.0		0.0		2.3	4.1		0.3		0.0

No data from 1994 to 1996

Station : Khamouan River　　　Daily stream water level in m　　　Year : 1997

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.8	4.3	2.7	2.5	2.5	0.3	0.0
2	0.0	0.0	0.0	0.2	0.0	0.6	4.6	2.7	2.3	2.2	0.3	0.0
3	0.0	0.0	0.0	0.2	0.0	0.9	5.2	2.5	2.2	2.0	0.3	0.0
4	0.0	0.0	0.0	0.2	0.0	0.6	5.5	2.2	2.3	2.1	0.3	0.0
5	0.0	0.0	0.0	0.1	0.0	0.4	3.9	2.0	4.9	3.4	0.4	0.0
6	0.0	0.0	0.0	0.1	0.0	0.4	3.5	2.1	4.3	4.8	0.6	0.0
7	0.0	0.0	0.0	0.3	0.0	0.4	2.5	3.4	4.2	2.9	0.9	0.0
8	0.0	0.0	0.0	0.4	0.0	0.3	2.9	4.8	4.0	2.1	0.7	0.0
9	0.0	0.0	0.0	0.6	0.0	0.3	2.0	2.9	4.0	4.8	0.5	0.0
10	0.0	0.0	0.0	0.7	0.0	0.3	2.9	2.1	6.2	5.2	0.4	0.0
11	0.0	0.0	0.0	0.6	0.0	0.3	2.6	2.1	6.7	6.3	0.3	0.0
12	0.0	0.0	0.0	0.5	0.0	1.4	2.4	2.3	7.1	2.6	0.3	0.0
13	0.0	0.0	0.0	0.2	0.0	1.8	2.2	2.3	7.2	2.5	0.3	0.0
14	0.0	0.0	0.0	0.1	0.0	2.1	2.9	2.3	7.3	2.3	0.3	0.0
15	0.0	0.0	0.0	0.1	0.0	2.3	4.0	2.2	8.1	4.6	0.3	0.0
16	0.0	0.0	0.0	0.1	0.0	2.6	4.4	4.3	8.2	3.8	0.3	0.0
17	0.0	0.0	0.0	0.0	0.2	3.0	4.6	4.5	7.9	2.6	0.0	0.0
18	0.0	0.0	0.0	0.0	0.3	3.2	3.9	4.8	7.2	1.4	0.0	0.0
19	0.0	0.0	0.0	0.0	0.7	3.5	3.5	4.9	7.5	1.4	0.0	0.0
20	0.0	0.0	0.0	0.0	0.4	4.0	4.3	5.1	7.8	1.3	0.0	0.0
21	0.0	0.0	0.0	0.0	0.2	4.3	4.2	5.2	7.4	1.3	0.0	0.0
22	0.0	0.0	0.0	0.0	0.3	4.2	4.0	5.5	6.7	0.8	0.0	0.0
23	0.0	0.0	0.0	0.0	0.3	3.8	4.0	5.6	3.9	0.6	0.0	0.0
24	0.0	0.0	0.0	0.0	0.7	3.7	4.3	6.2	3.9	0.5	0.0	0.0
25	0.0	0.0	0.0	0.0	1.3	3.6	4.2	5.2	3.5	0.5	0.0	0.0
26	0.0	0.0	0.0	0.0	1.0	3.2	3.9	5.8	3.3	0.4	0.0	0.0
27	0.0	0.0	0.0	0.0	0.7	3.1	3.9	6.5	2.8	0.4	0.0	0.0
28	0.0	0.0	0.0	0.0	0.4	3.2	3.5	6.0	2.8	0.4	0.0	0.0
29	0.0		0.0	0.0	0.3	3.5	3.3	4.5	2.7	0.3	0.0	0.0
30	0.0		0.0	0.0	0.3	3.9	2.8	4.5	2.7	0.3	0.0	0.0
31	0.0		0.0		0.3		2.8	3.0		0.3		0.0

Station : Khamouan River Daily stream water level in m Year : 1998

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.3	0.5	1.6	1.4	3.0	1.5	0.0	0.0
2	0.0	0.0	0.0	0.0	0.3	0.5	1.7	2.0	3.0	1.5	0.0	0.0
3	0.0	0.0	0.0	0.0	0.3	0.5	1.9	1.4	3.0	1.4	0.0	0.0
4	0.0	0.0	0.0	0.0	0.3	0.5	2.8	1.8	3.0	1.4	0.0	0.0
5	0.0	0.0	0.0	0.0	0.3	0.5	2.4	5.5	3.1	1.3	0.0	0.0
6	0.0	0.0	0.0	0.0	0.3	0.5	3.0	3.9	3.3	1.3	0.0	0.0
7	0.0	0.0	0.0	0.0	0.3	0.5	3.6	1.9	3.4	1.3	0.0	0.0
8	0.0	0.0	0.0	0.0	0.3	0.4	3.7	2.9	3.4	1.2	0.0	0.0
9	0.0	0.0	0.0	0.0	0.4	0.4	2.7	3.4	3.6	1.1	0.0	0.0
10	0.0	0.0	0.0	0.0	0.4	0.4	2.9	3.6	3.7	1.1	0.0	0.0
11	0.0	0.0	0.0	0.0	0.4	0.4	3.0	4.4	4.4	1.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.5	0.4	3.0	3.7	5.1	0.9	0.0	0.0
13	0.0	0.0	0.0	0.0	0.4	0.4	3.1	3.6	6.4	0.9	0.0	0.0
14	0.0	0.0	0.0	0.0	0.4	0.4	3.1	3.5	5.7	0.9	0.0	0.0
15	0.0	0.0	0.0	0.0	0.4	0.3	3.1	3.4	5.6	0.9	0.0	0.0
16	0.0	0.0	0.0	0.0	0.5	0.4	3.0	3.1	5.5	0.8	0.0	0.0
17	0.0	0.0	0.0	0.0	0.5	0.7	3.0	3.3	5.7	0.8	0.0	0.0
18	0.0	0.0	0.0	0.0	0.5	0.8	3.0	3.3	5.6	0.7	0.0	0.0
19	0.0	0.0	0.0	0.0	0.6	0.8	3.0	3.3	5.5	0.7	0.0	0.0
20	0.0	0.0	0.0	0.0	0.7	0.9	3.0	3.3	5.4	0.7	0.0	0.0
21	0.0	0.0	0.0	0.0	0.5	0.8	2.9	3.2	5.4	0.7	0.0	0.0
22	0.0	0.0	0.0	0.0	0.4	1.0	2.8	3.1	5.4	0.7	0.0	0.0
23	0.0	0.0	0.0	0.0	0.4	1.0	2.5	3.0	5.3	0.6	0.0	0.0
24	0.0	0.0	0.0	0.0	0.4	0.9	2.4	3.0	4.7	0.6	0.0	0.0
25	0.0	0.0	0.0	0.0	0.4	1.0	2.2	3.0	3.0	0.5	0.0	0.0
26	0.0	0.0	0.0	0.0	0.4	1.0	1.9	3.0	3.3	0.5	0.0	0.0
27	0.0	0.0	0.0	0.0	0.4	1.0	1.7	3.0	2.8	0.4	0.0	0.0
28	0.0	0.0	0.0	0.0	0.4	0.9	1.7	3.1	2.5	0.4	0.0	0.0
29	0.0		0.0	0.0	0.4	1.0	1.8	3.0	2.0	0.4	0.0	0.0
30	0.0		0.0	0.0	0.3	1.0	1.8	3.0	1.6	0.4	0.0	0.0
31	0.0		0.0		0.3		1.8	3.2		0.3		0.0

Station : Khamouan River Daily stream water level in m Year : 1999

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.9	1.5	4.1	8.3	3.7	2.5	2.0	0.7
2	0.0	0.0	0.0	0.0	0.4	1.7	4.1	8.3	3.8	2.4	1.7	0.7
3	0.0	0.0	0.0	0.0	0.3	2.0	4.0	8.5	3.3	2.3	1.5	0.5
4	0.0	0.0	0.0	0.0	0.2	2.6	3.9	6.6	2.9	2.3	1.2	0.7
5	0.0	0.0	0.0	0.0	0.1	2.3	3.6	6.3	2.7	2.0	1.5	0.7
6	0.0	0.0	0.0	0.0	0.2	2.7	3.5	5.8	2.3	2.0	2.0	0.6
7	0.0	0.0	0.0	0.0	0.2	2.3	3.4	4.8	2.5	1.9	1.8	0.6
8	0.0	0.0	0.0	0.0	0.2	1.9	3.3	4.9	2.8	1.9	1.8	0.6
9	0.0	0.0	0.0	0.0	0.2	1.5	3.2	3.7	3.1	1.6	1.3	0.6
10	0.0	0.0	0.0	0.6	0.2	1.7	3.1	3.9	3.3	1.6	1.4	0.6
11	0.0	0.0	0.0	0.0	0.2	1.5	3.1	4.6	3.5	1.5	1.3	0.6
12	0.0	0.0	0.0	0.0	0.2	1.3	3.0	4.7	3.8	1.5	1.3	0.6
13	0.0	0.0	0.0	0.0	0.2	1.2	3.0	3.5	3.8	1.3	1.4	0.6
14	0.0	0.0	0.0	0.0	0.2	1.1	2.9	3.2	4.1	1.3	1.7	0.6
15	0.0	0.0	0.0	0.8	0.2	1.3	2.8	3.1	4.1	1.3	1.6	0.6
16	0.0	0.0	0.0	0.6	0.2	1.5	2.7	3.0	4.2	1.2	1.3	0.6
17	0.0	0.0	0.0	0.2	0.1	1.6	2.7	3.0	4.1	1.2	1.3	0.6
18	0.0	0.0	0.0	0.2	0.2	1.7	2.5	2.8	4.1	1.1	1.1	0.6
19	0.0	0.0	0.0	0.2	1.4	1.8	2.6	2.8	4.0	1.1	1.1	0.6
20	0.0	0.0	0.0	0.2	2.5	2.2	2.6	2.7	3.8	1.1	1.0	0.5
21	0.0	0.0	0.0	0.2	1.7	2.5	2.6	2.5	3.5	1.1	1.0	0.5
22	0.0	0.0	0.0	0.4	1.3	2.3	3.5	3.2	3.5	1.0	1.0	0.5
23	0.0	0.0	0.0	0.8	1.0	2.7	3.8	3.5	3.1	1.1	1.0	0.5
24	0.0	0.0	0.0	0.4	0.9	2.8	4.8	4.1	3.1	1.0	0.9	0.5
25	0.0	0.0	0.0	0.3	0.8	2.8	6.2	4.1	3.2	1.0	0.9	0.5
26	0.0	0.0	0.0	0.2	0.8	3.1	7.4	4.5	3.0	1.0	0.9	0.5
27	0.0	0.0	0.0	0.2	0.7	3.4	7.0	4.2	2.9	0.9	0.9	0.5
28	0.0	0.0	0.0	0.1	0.9	3.5	6.7	3.0	2.8	0.9	0.9	0.5
29	0.0		0.0	0.1	1.1	3.7	7.0	3.5	2.7	0.8	0.8	0.4
30	0.0		0.0	0.1	1.5	3.8	7.2	3.7	2.5	0.9	0.8	0.4
31	0.0		0.0		1.1		7.6	3.7		1.2		0.4

Station : Khamouan River Daily stream water level in m Year : 2000

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.6	4.3	3.9	5.8	6.3	4.1	1.0	0.0
2	0.0	0.0	0.0	0.0	0.7	6.7	3.8	5.7	6.6	4.0	0.9	0.0
3	0.0	0.0	0.0	0.0	0.9	4.6	3.8	5.6	6.8	3.8	0.9	0.0
4	0.0	0.0	0.0	0.0	1.0	2.7	3.6	5.5	6.7	3.7	0.8	0.0
5	0.0	0.0	0.0	0.0	1.1	1.3	4.1	5.5	6.9	3.6	0.8	0.0
6	0.0	0.0	0.0	0.0	1.1	1.5	3.9	5.5	7.2	3.6	0.8	0.0
7	0.0	0.0	0.0	0.0	1.3	1.4	7.0	5.5	7.6	4.6	0.7	0.0
8	0.0	0.0	0.0	0.0	1.3	1.2	7.5	5.3	7.8	3.8	0.7	0.0
9	0.0	0.0	0.0	0.0	1.8	1.0	7.0	5.2	8.0	2.9	0.6	0.0
10	0.0	0.0	0.0	0.0	1.8	0.8	6.8	5.0	8.1	2.6	0.6	0.0
11	0.0	0.0	0.0	0.1	2.2	0.7	7.2	5.0	8.4	2.6	0.5	0.0
12	0.0	0.0	0.0	0.1	2.2	0.7	8.8	4.9	8.6	2.6	0.5	0.0
13	0.0	0.0	0.0	0.1	2.7	1.3	8.9	4.9	8.7	2.4	0.4	0.0
14	0.0	0.0	0.0	0.1	3.6	3.6	7.4	4.9	7.6	2.3	0.3	0.0
15	0.0	0.0	0.0	0.1	2.6	4.8	7.3	4.9	7.5	2.2	0.3	0.0
16	0.0	0.0	0.0	0.2	2.4	5.7	7.8	4.8	7.3	2.0	0.3	0.0
17	0.0	0.0	0.0	0.2	2.6	4.5	7.5	4.9	7.5	1.9	0.2	0.0
18	0.0	0.0	0.0	0.3	2.4	4.1	7.4	5.3	7.4	1.8	0.2	0.0
19	0.0	0.0	0.0	0.3	1.2	4.4	7.2	5.4	7.2	1.7	0.1	0.0
20	0.0	0.0	0.0	0.3	0.9	5.6	7.0	5.4	7.0	1.6	0.1	0.0
21	0.0	0.0	0.0	0.2	2.4	4.5	6.8	5.5	6.9	1.8	0.1	0.0
22	0.0	0.0	0.0	0.2	3.1	3.9	6.7	5.6	6.8	1.6	0.1	0.0
23	0.0	0.0	0.0	0.2	3.2	3.9	6.5	6.2	6.5	2.8	0.0	0.0
24	0.0	0.0	0.0	0.2	2.8	4.3	6.5	6.6	5.5	2.5	0.0	0.0
25	0.0	0.0	0.0	0.3	2.6	5.7	6.4	7.6	5.4	2.4	0.0	0.0
26	0.0	0.0	0.0	0.4	2.6	5.5	6.4	8.4	5.2	2.0	0.0	0.0
27	0.0	0.0	0.0	0.4	2.5	7.1	6.3	9.7	5.0	1.6	0.0	0.0
28	0.0	0.0	0.0	0.5	2.2	7.0	6.2	7.9	4.8	1.4	0.0	0.0
29	0.0	0.0	0.0	0.6	1.7	6.7	6.2	6.5	4.5	1.2	0.0	0.0
30	0.0		0.0	0.6	1.7	5.2	6.2	5.3	4.1	1.1	0.0	0.0
31	0.0		0.0		1.7		6.3	5.9		1.0		0.0

Station : Khamouan River Daily stream water level in m Year : 2001

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.3	1.8	4.6	4.5	6.6	4.5	2.5	0.0
2	0.0	0.0	0.0	0.0	0.2	1.8	4.7	4.1	6.8	4.6	2.2	0.0
3	0.0	0.0	0.0	0.0	0.3	2.0	5.3	5.2	6.7	5.0	2.0	0.0
4	0.0	0.0	0.0	0.0	0.3	2.2	5.6	5.3	6.6	5.2	1.7	0.0
5	0.0	0.0	0.0	0.0	0.5	2.4	5.5	5.3	6.7	5.4	1.5	0.0
6	0.0	0.0	0.0	0.0	0.5	2.5	5.5	5.4	6.4	5.2	1.3	0.0
7	0.0	0.0	0.0	0.0	0.5	2.9	5.3	5.3	6.2	5.0	1.2	0.0
8	0.0	0.0	0.0	0.0	0.5	3.1	5.1	5.1	6.1	5.1	1.1	0.0
9	0.0	0.0	0.0	0.0	0.5	3.2	5.1	5.1	6.6	4.8	1.1	0.0
10	0.0	0.0	0.0	0.0	0.5	3.3	5.2	5.5	7.0	4.8	1.0	0.0
11	0.0	0.0	0.0	0.0	0.5	3.6	5.7	5.9	7.4	4.9	1.0	0.0
12	0.0	0.0	0.0	0.0	0.5	3.8	5.8	6.6	7.6	5.2	0.9	0.0
13	0.0	0.0	0.0	0.0	0.5	3.6	5.7	7.1	7.7	5.1	0.9	0.0
14	0.0	0.0	0.0	0.0	0.5	3.6	5.5	7.2	7.5	5.1	0.8	0.0
15	0.0	0.0	0.0	0.0	0.5	3.5	5.4	7.2	7.5	5.0	0.7	0.0
16	0.0	0.0	0.0	0.0	0.4	3.5	5.7	7.2	7.3	4.9	0.6	0.0
17	0.0	0.0	0.0	0.0	0.5	3.8	5.4	8.2	7.2	4.9	0.6	0.0
18	0.0	0.0	0.0	0.0	0.5	3.8	5.5	8.9	7.1	4.9	0.5	0.0
19	0.0	0.0	0.0	0.0	0.5	3.9	5.9	8.9	7.0	4.9	0.5	0.0
20	0.0	0.0	0.0	0.0	0.5	4.1	6.2	8.9	6.5	4.8	0.4	0.0
21	0.0	0.0	0.0	0.0	0.5	4.2	6.4	9.0	6.1	4.9	0.4	0.0
22	0.0	0.0	0.0	0.0	0.5	4.2	6.4	8.9	6.0	4.9	0.3	0.0
23	0.0	0.0	0.0	0.0	0.6	4.3	6.3	8.7	5.9	4.9	0.2	0.0
24	0.0	0.0	0.0	0.0	0.8	4.3	5.9	7.8	5.8	4.9	0.2	0.0
25	0.0	0.0	0.0	0.0	0.9	4.3	5.8	7.7	5.5	4.8	0.2	0.0
26	0.0	0.0	0.0	0.0	0.9	4.5	5.8	7.9	5.4	4.7	0.1	0.0
27	0.0	0.0	0.0	0.0	1.0	4.5	5.6	8.3	5.2	4.6	0.1	0.0
28	0.0	0.0	0.0	0.0	1.0	4.5	5.5	8.7	5.0	4.3	0.0	0.0
29	0.0		0.0	0.0	1.2	4.6	5.3	8.7	4.8	3.9	0.0	0.0
30	0.0		0.0	0.0	1.3	5.1	5.1	8.2	4.6	3.3	0.0	0.0
31	0.0		0.0		1.3		4.7	7.7		2.8		0.0

Station : Khamouan River Daily stream water level in m Year : 2002

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.4	4.2	5.6	6.0	4.6	1.2	0.0
2	0.0	0.0	0.0	0.0	0.0	0.5	4.8	5.6	6.0	4.5	1.2	0.0
3	0.0	0.0	0.0	0.0	0.0	0.6	4.9	5.6	6.0	4.4	1.1	0.0
4	0.0	0.0	0.0	0.0	0.0	0.8	4.9	5.6	6.0	4.4	1.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.9	4.9	5.5	6.9	4.3	1.0	0.0
6	0.0	0.0	0.0	0.0	0.0	1.0	5.2	5.5	7.0	4.2	0.9	0.0
7	0.0	0.0	0.0	0.0	0.0	1.0	5.6	5.6	6.7	4.2	0.9	0.0
8	0.0	0.0	0.0	0.0	0.0	1.1	5.7	5.5	6.4	4.2	0.9	0.0
9	0.0	0.0	0.0	0.0	0.0	1.2	6.8	5.9	6.3	4.0	0.8	0.0
10	0.0	0.0	0.0	0.0	0.0	1.2	6.7	6.0	7.8	3.6	0.8	0.0
11	0.0	0.0	0.0	0.0	0.0	1.3	6.5	6.0	8.4	3.3	0.8	0.0
12	0.0	0.0	0.0	0.0	0.0	1.3	6.2	6.1	8.4	3.3	0.8	0.0
13	0.0	0.0	0.0	0.0	0.0	1.3	6.0	6.3	7.9	3.3	0.8	0.0
14	0.0	0.0	0.0	0.0	0.0	2.4	5.7	7.6	6.7	3.2	0.8	0.0
15	0.0	0.0	0.0	0.0	0.0	2.4	6.6	8.0	5.5	3.2	0.8	0.0
16	0.0	0.0	0.0	0.0	0.0	2.4	6.0	8.1	5.5	3.0	0.8	0.0
17	0.0	0.0	0.0	0.0	0.0	2.5	6.0	7.7	6.6	2.8	0.8	0.0
18	0.0	0.0	0.0	0.0	0.0	2.4	5.0	6.8	6.2	2.3	0.8	0.0
19	0.0	0.0	0.0	0.0	0.0	1.9	4.7	7.3	6.1	2.3	0.7	0.0
20	0.0	0.0	0.0	0.0	0.0	3.0	4.5	7.9	6.0	2.1	0.7	0.0
21	0.0	0.0	0.0	0.0	0.0	3.8	4.7	8.2	6.9	2.1	0.7	0.0
22	0.0	0.0	0.0	0.0	0.0	4.7	4.7	8.0	7.0	2.0	0.7	0.0
23	0.0	0.0	0.0	0.0	0.0	5.3	4.6	7.3	6.5	1.9	0.7	0.0
24	0.0	0.0	0.0	0.0	0.0	5.0	4.6	7.0	6.1	1.6	0.7	0.0
25	0.0	0.0	0.0	0.0	0.0	5.0	4.6	6.5	6.0	1.6	0.7	0.0
26	0.0	0.0	0.0	0.0	0.0	3.5	4.7	6.6	6.3	1.6	0.7	0.0
27	0.0	0.0	0.0	0.0	0.0	2.3	5.0	6.5	6.2	1.3	0.6	0.0
28	0.0	0.0	0.0	0.0	0.0	2.4	5.3	6.4	6.2	1.3	0.6	0.0
29	0.0		0.0	0.0	0.0	2.7	6.6	6.5	5.9	1.3	0.6	0.0
30	0.0		0.0	0.0	0.0	2.6	6.4	6.2	5.3	1.2	0.6	0.0
31	0.0		0.0		0.0		6.4	6.1		1.2		0.0

Station : Khamouan River Daily stream water level in m Year : 2003

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	3.9	0.7	1.2	3.0	3.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	3.6	0.7	1.3	3.9	3.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	3.0	0.7	1.7	4.8	3.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	3.0	0.6	2.3	5.6	3.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	2.1	0.7	2.1	5.5	2.7	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	1.8	0.7	2.5	5.7	2.7	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	1.6	0.6	2.8	6.0	2.3	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	1.5	0.6	3.1	6.0	2.2	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	1.5	0.7	3.4	5.7	2.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	1.2	0.8	3.5	5.7	2.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	1.1	0.8	3.9	5.7	1.9	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	1.1	0.8	5.1	6.5	1.8	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	1.2	0.8	5.4	7.0	1.7	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	1.2	0.9	3.9	7.1	1.4	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	1.2	0.9	4.1	6.8	1.1	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	1.2	1.3	3.9	6.5	0.9	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	1.2	0.9	3.5	6.2	0.8	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	1.8	0.8	3.7	6.3	0.7	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	2.7	0.6	3.7	5.9	0.7	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	1.5	0.6	3.8	5.4	0.6	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	1.3	0.6	4.3	5.3	0.6	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	2.3	0.7	4.7	5.1	0.6	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	2.6	0.7	5.2	4.6	0.5	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	2.0	1.1	5.8	4.5	0.5	0.0	0.0
25	0.0	0.0	0.0	0.0	0.7	1.0	3.8	6.6	4.5	0.5	0.0	0.0
26	0.0	0.0	0.0	0.0	1.3	2.5	4.0	6.1	4.5	0.5	0.0	0.0
27	0.0	0.0	0.0	0.0	0.7	1.5	4.1	5.7	4.4	0.5	0.0	0.0
28	0.0	0.0	0.0	0.0	5.1	1.3	5.1	4.9	4.2	0.5	0.0	0.0
29	0.0		0.0	0.0	2.1	1.2	4.8	5.2	3.9	0.4	0.0	0.0
30	0.0		0.0	0.0	2.0	1.0	2.7	4.7	3.7	0.4	0.0	0.0
31	0.0		0.0		2.3		2.4	3.6		0.4		0.0

Station : Khamouan River Daily stream water level in m Year : 2004

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.2	1.1	6.1	6.1	4.3	0.2	0.0
2	0.0	0.0	0.0	0.0	0.0	0.2	1.0	6.0	6.2	3.8	0.1	0.0
3	0.0	0.0	0.0	0.0	0.0	0.3	1.0	5.7	6.1	3.8	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.3	1.0	5.7	6.1	3.4	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.3	0.9	5.8	6.1	3.2	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.3	0.9	6.2	6.2	3.1	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.4	0.9	6.1	6.1	2.9	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.3	0.8	6.3	6.1	2.8	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.3	0.8	6.5	6.1	2.6	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.3	1.1	6.5	6.5	2.2	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.4	1.5	6.4	6.9	2.2	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.4	1.8	6.1	6.9	2.1	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.9	2.2	6.0	7.0	1.8	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	1.3	2.5	6.1	7.0	1.8	0.0	0.0
15	0.0	0.0	0.0	0.0	0.7	3.7	3.2	6.1	6.8	1.7	0.0	0.0
16	0.0	0.0	0.0	0.0	0.8	3.8	3.8	6.0	6.6	1.7	0.0	0.0
17	0.0	0.0	0.0	0.0	0.5	4.1	3.8	6.1	6.2	1.7	0.0	0.0
18	0.0	0.0	0.0	0.0	0.3	2.7	3.9	6.1	6.2	1.6	0.0	0.0
19	0.0	0.0	0.0	0.0	0.3	2.3	3.9	6.1	6.1	1.1	0.0	0.0
20	0.0	0.0	0.0	0.0	0.2	2.2	4.2	7.7	5.8	0.9	0.0	0.0
21	0.0	0.0	0.0	0.0	0.3	2.1	4.3	7.9	6.2	0.9	0.0	0.0
22	0.0	0.0	0.0	0.0	0.3	1.8	4.6	8.1	5.9	0.7	0.0	0.0
23	0.0	0.0	0.0	0.0	0.3	1.8	5.0	6.6	5.8	0.7	0.0	0.0
24	0.0	0.0	0.0	0.0	0.4	1.6	5.3	6.8	5.8	0.7	0.0	0.0
25	0.0	0.0	0.0	0.0	0.4	1.6	5.5	7.2	5.6	0.5	0.0	0.0
26	0.0	0.0	0.0	0.0	0.3	1.5	5.6	7.2	5.6	0.5	0.0	0.0
27	0.0	0.0	0.0	0.0	0.4	1.5	5.8	7.3	5.6	0.5	0.0	0.0
28	0.0	0.0	0.0	0.0	0.3	1.4	5.9	7.3	5.6	0.5	0.0	0.0
29	0.0	0.0	0.0	0.0	0.3	1.3	6.5	7.3	5.4	0.5	0.0	0.0
30	0.0		0.0	0.0	0.3	1.3	6.9	7.4	5.1	0.5	0.0	0.0
31	0.0		0.0		0.2		7.2	7.1		0.5		0.0

Station : Khamouan River Daily stream water level in m Year : 2005

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.4	3.1	6.7	5.7	1.3	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.4	3.7	6.6	5.4	1.2	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.4	4.2	6.5	4.7	1.1	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.4	3.9	6.6	4.3	1.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.3	3.6	6.7	4.3	0.8	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.3	3.8	6.9	4.3	0.8	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.4	3.9	7.0	4.2	0.7	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.4	4.0	7.1	4.0	0.7	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.4	4.2	7.2	4.0	0.6	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.4	4.4	7.6	3.8	0.3	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.4	4.8	7.0	3.3	0.2	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.5	4.6	6.4	3.3	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.7	4.8	6.4	3.2	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.8	5.0	6.4	3.1	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.5	5.0	6.2	3.1	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.4	5.1	6.2	3.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.4	5.2	6.6	2.9	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.5	5.6	7.0	2.8	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.4	5.7	7.1	2.4	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.4	6.0	7.1	2.3	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.4	6.2	7.0	2.3	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.3	0.4	6.3	6.8	2.2	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.3	0.4	6.4	6.8	2.1	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.3	0.4	6.6	6.3	2.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.3	0.4	6.7	6.1	1.9	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.4	4.0	6.7	6.2	1.7	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.4	2.3	6.4	6.3	1.6	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.5	1.5	6.8	6.2	1.5	0.0	0.0	0.0
29	0.0		0.0	0.0	0.5	2.2	6.8	6.2	1.4	0.0	0.0	0.0
30	0.0		0.0	0.0	0.5	2.9	6.8	6.4	1.3	0.0	0.0	0.0
31	0.0		0.0		0.5		6.7	6.1		0.0		0.0

Station : Khamouan River Daily stream water level in m Year : 2006

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.0	0.9	3.1	5.9	7.4	5.7	1.4	0.0
2	0.0	0.0	0.0	0.0	0.0	1.0	3.3	5.4	7.1	7.2	1.2	0.0
3	0.0	0.0	0.0	0.0	0.0	1.3	3.4	4.8	6.8	7.5	1.0	0.0
4	0.0	0.0	0.0	0.0	0.0	1.4	3.8	3.9	6.2	6.9	0.8	0.0
5	0.0	0.0	0.0	0.0	0.0	1.4	4.2	3.2	6.0	6.4	0.7	0.0
6	0.0	0.0	0.0	0.0	0.0	1.5	4.3	3.6	5.8	6.2	0.6	0.0
7	0.0	0.0	0.0	0.0	0.0	1.6	4.4	3.9	5.8	6.1	0.5	0.0
8	0.0	0.0	0.0	0.0	0.0	1.6	4.5	4.1	5.3	6.2	0.4	0.0
9	0.0	0.0	0.0	0.0	0.0	1.8	4.5	4.1	5.2	6.0	0.3	0.0
10	0.0	0.0	0.0	0.0	0.0	1.8	4.5	4.1	4.3	6.5	0.3	0.0
11	0.0	0.0	0.0	0.0	0.0	2.0	5.0	4.3	4.1	6.3	0.2	0.0
12	0.0	0.0	0.0	0.0	0.0	2.0	5.0	4.6	4.1	6.3	0.2	0.0
13	0.0	0.0	0.0	0.0	0.3	2.1	4.6	4.6	3.7	5.5	0.0	0.0
14	0.0	0.0	0.0	0.0	0.3	2.2	5.7	5.0	3.6	5.2	0.0	0.0
15	0.0	0.0	0.0	0.0	0.4	2.3	5.8	5.1	3.2	5.3	0.0	0.0
16	0.0	0.0	0.0	0.0	0.3	2.1	6.2	5.4	3.7	6.2	0.0	0.0
17	0.0	0.0	0.0	0.0	0.3	2.0	6.2	5.5	3.6	6.3	0.0	0.0
18	0.0	0.0	0.0	0.0	0.3	2.2	6.4	5.6	3.8	5.9	0.0	0.0
19	0.0	0.0	0.0	0.0	0.4	2.2	6.5	5.6	4.0	5.2	0.0	0.0
20	0.0	0.0	0.0	0.0	0.6	2.1	6.7	5.7	3.1	4.2	0.0	0.0
21	0.0	0.0	0.0	0.0	0.7	2.3	6.8	6.1	4.3	3.8	0.0	0.0
22	0.0	0.0	0.0	0.0	0.9	2.5	7.2	6.2	4.6	3.5	0.0	0.0
23	0.0	0.0	0.0	0.0	1.0	3.2	7.6	6.3	4.7	3.3	0.0	0.0
24	0.0	0.0	0.0	0.0	1.1	3.3	7.9	6.5	5.3	3.2	0.0	0.0
25	0.0	0.0	0.0	0.0	1.2	3.3	8.1	6.9	6.0	2.6	0.0	0.0
26	0.0	0.0	0.0	0.0	1.0	3.2	8.3	7.0	4.2	2.5	0.0	0.0
27	0.0	0.0	0.0	0.0	0.8	3.2	7.3	7.1	4.7	2.4	0.0	0.0
28	0.0	0.0	0.0	0.0	0.8	3.2	7.1	7.2	5.8	2.0	0.0	0.0
29	0.0		0.0	0.0	0.9	3.2	6.8	7.4	6.3	1.7	0.0	0.0
30	0.0		0.0	0.0	0.9	3.0	6.8	7.8	6.6	1.5	0.0	0.0
31	0.0		0.0		0.9		6.4	7.8		1.4		0.0

No data from 2007 to May 2015

Station : Khamouan River Daily stream water level in m Year : 2015

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1						0.4	0.6	4.3	4.3	2.9	0.3	0.0
2						1.1	0.5	4.5	4.7	2.1	0.3	0.0
3						1.3	0.4	4.8	5.1	4.8	0.3	0.0
4						1.0	0.4	4.9	5.0	5.2	0.3	0.0
5						0.7	0.3	5.1	4.8	6.3	0.3	0.0
6						0.6	0.3	5.2	4.7	2.6	0.3	0.0
7						0.5	0.3	5.5	4.7	2.5	0.3	0.0
8						0.4	1.4	5.6	4.6	2.3	0.4	0.0
9						0.4	3.0	6.2	4.6	4.6	0.6	0.0
10						0.4	3.9	5.2	4.9	3.8	0.9	0.0
11						0.4	5.6	5.8	4.3	2.6	0.5	0.0
12						0.4	6.3	6.5	4.2	2.4	0.5	0.0
13						0.4	5.6	6.0	4.0	2.5	0.4	0.0
14						0.4	4.4	4.5	4.0	2.5	0.3	0.0
15						0.4	3.8	4.5	6.2	2.5	0.3	0.0
16						0.4	2.8	3.0	6.7	2.4	0.3	0.0
17						0.4	1.6	2.5	3.9	2.3	0.3	0.0
18						0.4	1.0	2.3	3.9	2.1	0.3	0.0
19						0.4	0.7	2.6	3.5	1.7	0.3	0.0
20						0.4	1.0	2.3	3.3	1.4	0.3	0.0
21						0.4	1.5	2.2	2.8	1.4	0.3	0.0
22						0.8	2.6	2.2	2.8	1.4	0.3	0.0
23						0.9	2.7	2.3	2.7	1.3	0.3	0.0
24						0.8	2.6	2.2	2.7	1.3	0.3	0.0
25						0.7	2.7	2.1	2.5	0.8	0.3	0.0
26						0.7	2.7	2.2	2.2	0.6	0.3	0.0
27					0.5	0.8	2.6	2.4	2.0	0.5	0.3	0.0
28					0.5	1.3	2.8	3.5	2.1	0.5	0.2	0.0
29					0.5	1.0	3.2	2.5	3.4	0.4	0.2	0.0
30					0.4	0.8	3.6	2.9	4.8	0.4	0.2	0.0
31					0.4		3.9	2.0		0.4		0.0

Station : Soukhouma Daily stream water level in m Year : 2016

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0	0.0	0.0	0.0	0.4							
2	0.0	0.0	0.0	0.0	0.5							
3	0.0	0.0	0.0	0.0	0.3							
4	0.0	0.0	0.0	0.0	0.2							
5	0.0	0.0	0.0	0.0	0.5							
6	0.0	0.0	0.0	0.0	0.4							
7	0.0	0.0	0.0	0.0	0.2							
8	0.0	0.0	0.0	0.0	0.4							
9	0.0	0.0	0.0	0.0	0.4							
10	0.0	0.0	0.0	0.0	0.4							
11	0.0	0.0	0.0	0.0	0.4							
12	0.0	0.0	0.0	0.0	0.6							
13	0.0	0.0	0.0	0.0	0.6							
14	0.0	0.0	0.0	0.0	0.7							
15	0.0	0.0	0.0	0.0	1.0							
16	0.0	0.0	0.0	0.0	1.1							
17	0.0	0.0	0.0	0.0	1.4							
18	0.0	0.0	0.0	0.0	1.4							
19	0.0	0.0	0.0	0.0	1.6							
20	0.0	0.0	0.0	0.0	2.0							
21	0.0	0.0	0.0	0.0	1.8							
22	0.0	0.0	0.0	0.0	1.8							
23	0.0	0.0	0.0	0.0	1.4							
24	0.0	0.0	0.0	0.0	0.9							
25	0.0	0.0	0.0	0.0	0.5							
26	0.0	0.0	0.0	0.0	0.5							
27	0.0	0.0	0.0	0.0	0.7							
28	0.0	0.0	0.0	0.0	0.8							
29	0.0	0.0	0.0	0.0	1.3							
30	0.0		0.0	0.0	0.8							
31	0.0		0.0		0.7							

Appendix 10: Streamflow analysis

Only two streamflow discharge measurements at the Khamouan River gauge station were conducted between June 2015 and May 2016. The first measurement was implemented on 11 August 2015, when the peak flow likely occurred. The second measurement was conducted on 18 September 2015, when the middle flow likely occurred. The discharge at the Khamouan River gauge were measured by the hydrologists from the Division of Meteorology and Hydrology under the Provincial Office of Natural Resources and Environment of the Champasak Province (PoNRE). The current meter method is the most common method used by the United State Geological Survey (USGS) for measuring discharge (Turnipseed and Sauer, 2010) and this method was used to gauge the discharge in the Khamouan River.

The discharge at the Khamouan River gauge is read from a rating curve specifically developed for the Khamouan River catchment as shown in Figure 1. The daily stage-height measurements (m) for 1993, 197-2006, and 2015 to 2016 are therefore converted to daily flow (discharge) in cubic metre per second (m^3/s) using the stage-discharge relationship equation, as expressed below:

$$Q = 4.556\,h^2 + 1.12\,h \qquad \text{..........................} (1)$$

Where Q is the daily discharge (m^3/s) and h is the stream stage-height (m).

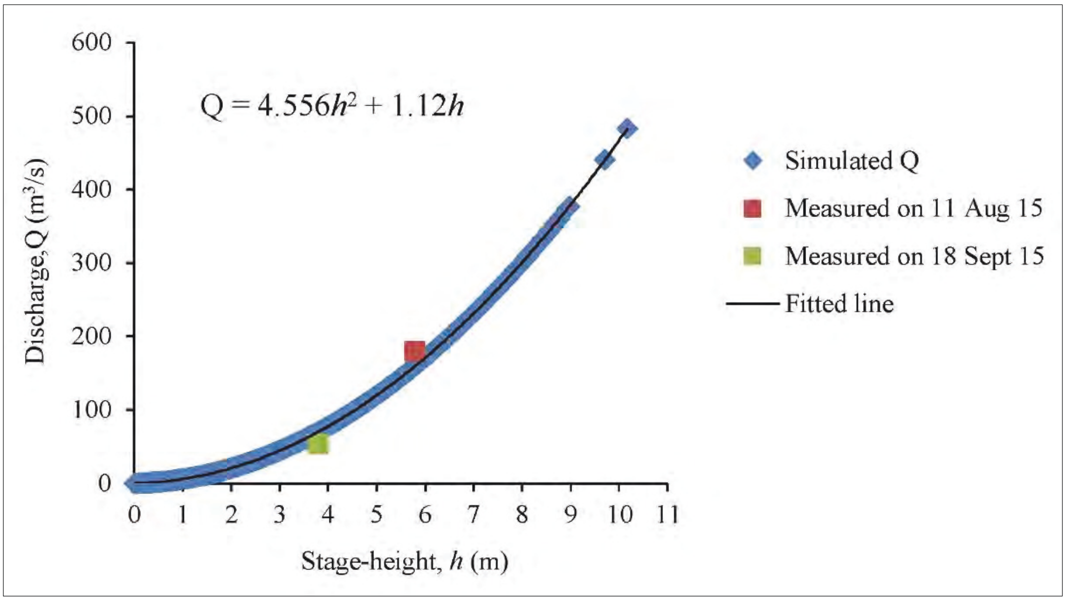


Figure 1: The stage and discharge relationship equation for the Khamouan River catchment using two discharge measurements and observed daily stage data for 1993, 1997-2006, and 1 June 2015 to 31 May 2016

Furthermore, the historical data of the Mekong River flow measured at the Pakse hydro-met station were also taken for this research from May 2000 to April 2016. The Pakse hydro-met station is located in the Pakse District of Champasak Province in Southern Laos. The daily Mekong River stage-height data at the Pakse station are collected by a hydrologist from the PoNRE of Champasak Province. The data at this station are also provided to the Mekong River Commission (MRC). The daily stage-height data at the Pakse station can also be accessed through the MRC's website (http://ffw.mrcmekong.org/ overview.htm). However for this research, the daily stage and flow data at this station were obtained from the DMH Office in Vientiane Capital because only daily stage data from 2008 to present are available on the MRCs website (Appendix 5).

Figure 2 illustrates monthly flow data in the Mekong River and the monthly rainfall data measured at the Pakse hydro-met and climate station from May 2000 to April 2016. The minimum monthly flow in the Mekong River at the Pakse hydro-met station for the period May 2000 to April 2016 was approximately 1,200 m^3/s during the dry season 2010 (March 2010). The maximum monthly flow during the same period was about 36,400 m^3/s during the wet season 2000 (September 2000). In August 2011, a monthly peak flow was also measured at around 36,100 m^3/s when an extreme flood was occurred in the Pakse District (MRC, 2011). The mean value of monthly flow data from May 2000 to April 2016 at Pakse station was 10,000 m^3/s with a standard deviation of 9,700 m^3/s. The monthly flow in the Mekong River shows similar seasonal fluctuations with the monthly rainfall measured at the Pakse rain gauge. It should be noted that rainfall data at the Pakse climate station are point data, while the flow in the Mekong River is accumulative flow from a long way from upstream and its tributaries in the upper parts.

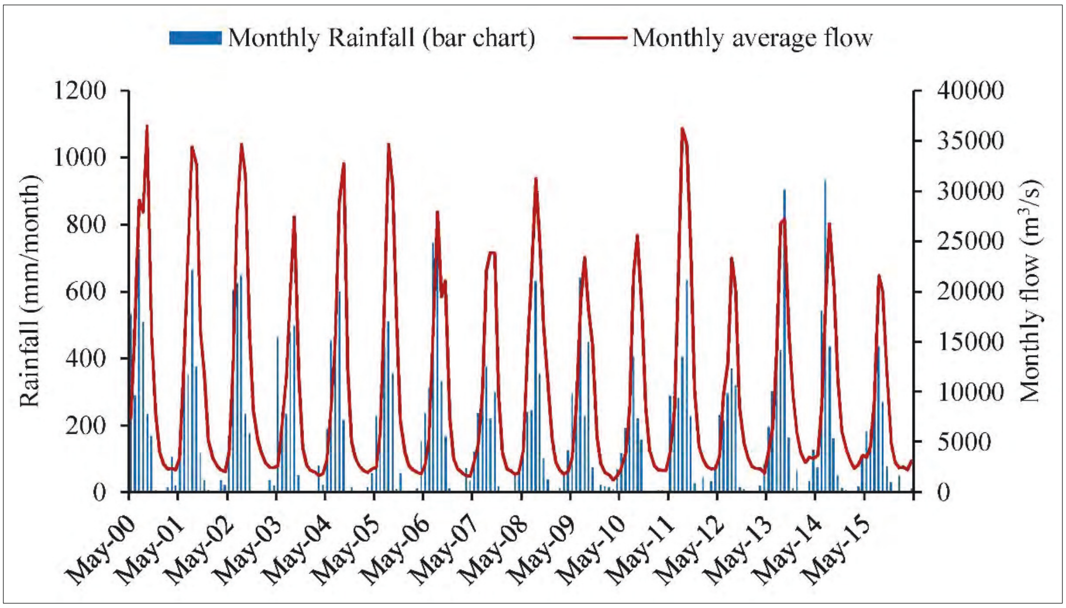


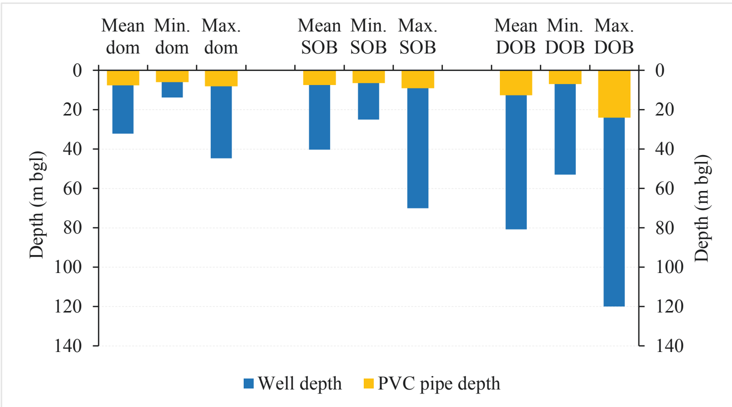
Figure 2: Monthly rainfall and monthly average flow in the Mekong River at the Pakse hydro-met station in Pakse District of Champasak Province, Southern Laos from May 2000 to April 2016

Appendix 11: Summary of wells information and groundwater data

1. Well locations

No.	Well name	DISTRICT	STATUS	X	Y	E	N	ELEVTOP (m amsl)	ELEVBED (m amsl)	DEPTH (m bgl)	Casing_PVC (m bgl)	Recalculated Transmissivity (m^2/day)
1	Sukhuma	Sukhuma	Domestic	14.655782	105.7955290	585663.00	1620405.00	98.00	63.00	35.00	8.00	
2	Parkor	Sukhuma	Domestic	14.677613	105.7478360	580519.15	1622802.21	107.00	77.82	29.18	8.00	
3	Nonyang	Sukhuma	Domestic	14.682960	105.7293740	578529.35	1623387.15	105.00	67.00	38.00	8.00	
4	Khoknongboua	Sukhuma	Domestic	14.614673	105.7913480	585228.64	1615856.35	100.00	55.37	44.63	8.00	
5	Thubcharn	Sukhuma	Domestic	14.630098	105.7954180	585661.59	1617564.21	97.00	67.40	29.60	8.00	
6	BoungKeo	Sukhuma	Domestic	14.632130	105.8494833	591483.00	1617810.00	98.00	76.64	21.36	8.00	
7	Phonphueng	Sukhuma	Domestic	14.646162	105.7827530	584290.88	1619336.13	103.00	68.35	34.65	8.00	
8	Sarmkhar	Sukhuma	Domestic	14.687352	105.7943780	585526.79	1623896.54	110.00	75.40	34.60	7.00	
9	Donghouabarn	Sukhuma	Domestic	14.614975	105.848489	591383.00	1615913.00	102.00	64.45	37.55	8.00	
10	Thadarn	Sukhuma	Domestic	14.597326	105.7923755	585346.00	1613938.00	102.00	66.70	35.30	6.00	
11	Hieng	Sukhuma	Domestic	14.693539	105.5846050	562939.38	1624512.69	125.00	111.20	13.80	6.00	
12	SOB-01-Boungkeo	Sukhuma	Shallow Observation	14.630912	105.8459590	591103.94	1617673.77	101.00	75.00	26.00	7.00	66.00
13	SOB-02-Sukhuma	Sukhuma	Shallow Observation	14.655690	105.7955300	585663.00	1620395.00	98.00	73.00	25.00	8.00	146.00
14	SOB-03-Parkor	Sukhuma	Shallow Observation	14.677613	105.7478360	580519.15	1622802.21	107.00	37.00	70.00	9.00	108.00
15	SOB-04-Pakxang	Sukhuma	Shallow Observation	14.693083	105.6761750	572798.00	1624489.00	111.00	58.00	53.00	6.50	75.00
16	SOB-05-Hieng	Sukhuma	Shallow Observation	14.698965	105.562197	560525.00	1625106.00	140.00	113.00	27.00	7.00	0.18
17	DOB-01-Boungkeo	Sukhuma	Deep Observation	14.630912	105.8459590	591103.94	1617673.77	101.00	20.00	81.00	16.00	66.00
18	DOB-02-Sukhuma	Sukhuma	Deep Observation	14.655690	105.7955300	585663.00	1620395.00	98.00	18.00	80.00	8.00	146.00
19	DOB-03-Parkor	Sukhuma	Deep Observation	14.677613	105.7478360	580519.15	1622802.21	107.00	37.00	70.00	24.00	108.00
20	DOB-04-Pakxang	Sukhuma	Deep Observation	14.693083	105.6761750	572798.00	1624489.00	111.00	58.00	53.00	8.00	75.00
21	DOB-05-Hieng	Sukhuma	Deep Observation	14.698965	105.562197	560525.00	1625106.00	140.00	20.00	120.00	7.00	0.18

	Well depth	PVC pipe depth
Mean dom	32.15	7.55
Min. dom	13.80	6.00
Max. dom	44.63	8.00
Mean SOB	40.20	7.50
Min. SOB	25.00	6.50
Max. SOB	70.00	9.00
Mean DOB	80.80	12.60
Min. DOB	53.00	7.00
Max. DOB	120.00	24.00



Aver dom	32.2	7.5
Min dom	13.8	6.0
Max dom	44.6	8.0
Aver SOB	40.2	7.5
Min SOB	25.0	6.5
Max SOB	70.0	9.0
Aver DOB	80.8	12.6
Min DOB	53.0	7.0
Max DOB	120.0	24.0

2. Depth to groundwater table

Date	Sukhuma_dom	Parkor_dom	None Yang_dom	Khoknong boua_dom	Thubcharn_dom	Boungkeo_dom	PhonePhueng_dom	SarmKha_dom	Donghuabarn_dom	Thadarn_dom	Hieng_dom	Boungkeo_SOB	Sukhuma_SOB	Parkor_SOB	Parkxang_SOB	Hieng_SOB	Boungkeo_DOB	Sukhuma_DOB	Parkor_DOB	Parkxang_DOB	Hieng_DOB
01-Oct-11	1.57	3.75	2.57	3.58	1.23	1.49	2.57	2.72	4.07	2.73	0.54										
08-Oct-11	1.68	3.89	2.68	3.98	1.48	1.67	2.68	2.79	4.23	2.93	0.63										
15-Oct-11	1.76	3.97	2.76	4.53	1.51	1.87	2.76	2.86	4.49	3.12	0.72										
22-Oct-11	1.82	4.25	2.82	4.72	1.68	2.55	2.82	2.92	4.73	3.57	0.85										
29-Oct-11	1.87	4.47	2.87	4.86	1.76	2.78	3.24	2.97	4.93	3.78	0.94										
05-Nov-11	1.95	4.56	3.95	4.89	1.89	2.89	3.28	3.50	5.53	3.86	1.12										
12-Nov-11	1.98	4.78	3.98	4.97	2.15	2.98	3.52	3.67	5.73	4.23	1.56										
19-Nov-11	2.26	5.83	4.26	5.26	2.51	3.05	3.64	3.77	5.89	4.43	1.94										
26-Nov-11	3.18	5.97	4.53	5.38	3.18	4.18	3.76	3.98	5.94	4.63	2.18										
03-Dec-11	3.59	6.25	4.86	5.57	3.38	4.68	3.95	4.26	6.15	4.84	2.75										
10-Dec-11	4.25	6.87	4.98	5.83	3.58	5.43	4.18	4.58	6.28	4.97	3.15										
17-Dec-11	4.48	7.14	5.14	5.97	3.85	5.89	4.26	4.77	6.37	5.12	3.48										
25-Dec-11	4.56	7.28	5.27	6.12	3.97	6.12	4.53	4.79	6.48	5.27	3.40										
31-Dec-11	4.67	7.35	5.36	6.24	4.14	6.28	4.72	4.84	6.53	5.34	3.45										
07-Jan-12	4.69	7.38	5.39	6.35	4.34	6.37	4.86	4.87	6.67	5.42	3.47										
14-Jan-12	4.75	7.47	5.47	6.48	4.52	6.44	4.98	4.91	6.75	5.52	3.48										
21-Jan-12	4.79	7.54	5.53	6.57	4.68	6.52	5.14	4.95	6.82	5.63	3.54										
28-Jan-12	4.82	7.57	5.72	6.68	4.71	6.67	5.28	4.98	6.94	5.75	3.58										
04-Feb-12	4.87	7.66	5.78	6.72	4.78	6.79	5.37	5.12	7.24	5.81	3.64										
11-Feb-12	4.93	7.78	5.84	6.83	4.82	6.86	5.57	5.23	7.35	5.97	3.68										
18-Feb-12	4.94	7.79	5.86	6.85	4.84	6.89	5.58	5.25	7.37	6.01	3.69										
25-Feb-12	4.96	7.81	5.88	6.86	4.86	6.92	5.59	5.26	7.39	6.04	3.72										
03-Mar-12	4.98	7.84	5.89	6.89	4.89	6.94	5.64	5.28	7.43	6.15	3.76										
10-Mar-12	5.02	7.87	5.92	6.92	4.93	6.97	5.68	5.31	7.45	6.17	3.79										
17-Mar-12	5.04	7.92	5.95	6.95	4.95	6.99	5.72	5.36	7.48	6.19	3.81										
24-Mar-12	5.07	7.96	5.97	6.98	4.97	7.08	5.74	5.38	7.49	6.21	3.85										
31-Mar-12	5.09	7.98	5.98	7.04	4.99	7.12	5.85	5.42	7.53	6.25	3.87										
07-Apr-12	5.12	8.07	6.08	7.16	5.08	7.14	6.61	5.46	7.57	6.27	3.93										
14-Apr-12	5.14	8.11	6.13	7.27	5.11	7.18	6.65	5.49	7.59	6.29	3.97										
21-Apr-12	5.15	8.15	6.17	7.29	5.17	7.22	6.68	5.64	7.61	6.35	3.98										
28-Apr-12	5.16	8.21	6.19	7.32	5.19	7.26	7.13	5.68	7.63	6.37	4.07										
05-May-12	5.14	8.24	6.21	7.35	5.22	7.28	7.23	5.72	7.65	6.38	4.11										
12-May-12	5.01	8.25	6.24	7.37	4.36	6.21	7.26	5.81	7.81	6.64	4.15										
19-May-12	4.36	8.28	6.27	7.28	4.12	5.46	7.27	5.85	8.14	6.83	4.21										
26-May-12	4.12	8.32	6.37	7.16	3.18	4.38	7.29	5.92	8.37	7.37	4.34										
02-Jun-12	3.34	8.34	6.25	6.37	3.07	3.27	7.34	5.97	8.72	8.26	4.37										
09-Jun-12	3.25	8.37	6.22	6.56	2.11	3.12	7.14	6.05	9.13	8.93	4.31										
16-Jun-12	3.23	8.41	6.18	6.70	2.34	2.64	7.13	6.18	9.43	8.93	4.18										
23-Jun-12	3.19	8.46	6.17	6.85	2.19	2.64	7.11	6.21	9.82	8.93	4.14										
05-Jul-12	3.15	6.73	6.30	6.80	2.21	3.21	7.14	6.80	7.14	8.95	4.64										
12-Jul-12	3.10	6.33	6.30	6.62	2.34	3.70	7.19	6.20	7.19	5.16	4.68										
19-Jul-12	3.80	6.00	6.65	6.00	2.14	4.00	7.28	6.00	7.28	5.60	4.70										
26-Jul-12	3.11	5.92	6.86	5.72	2.42	4.23	7.35	5.87	7.35	5.68	5.39										
06-Aug-12	2.91	5.74	7.98	4.64	1.10	5.21	5.56	5.76	5.56	4.56	5.65										
14-Aug-12	2.78	5.36	7.72	4.60	1.15	5.52	5.49	5.63	5.49	4.59	6.25										
22-Aug-12	2.64	4.10	7.65	4.68	1.80	5.98	5.58	5.52	5.58	4.62	6.70										
29-Aug-12	2.33	3.96	7.20	4.90	1.12	6.76	5.60	5.32	5.60	4.64	7.30										

05-Sep-12	1.70	4.62	6.90	3.28	1.50	4.36	8.32	4.92	8.32	4.13	7.58	3.79		4.3	3		2.1		4.9		
14-Sep-12	1.82	4.55	6.40	4.12	1.84	4.22	8.35	4.68	8.35	4.16	7.75	4.92		5.47	3.3		3.55		6.52		
22-Sep-12	1.86	4.65	6.60	4.46	2.20	3.82	8.62	4.63	8.62	4.28	8.00	4.98		6.54	3.65		4.47		6.64		
29-Sep-12	1.89	3.90	6.95	4.65	2.47	3.45	8.82	4.00	8.82	4.32	8.16	5		6.56	3.74		4.6		6.8		
05-Oct-12	1.16	4.73	7.40	5.00	3.15	2.24	9.41	3.64	9.41	4.54	8.25	5.13		6.3	4.11		4.62		6.3		
14-Oct-12	2.30	4.78	7.40	5.20	3.35	2.65	9.47	3.09	9.47	4.76	8.53	5.3		6.35	4.32		4.68		6.35		
22-Oct-12	3.20	5.10	7.50	5.36	3.39	2.94	9.52	3.47	9.52	5.90	8.67	5.5		6.4	4.55		4.73		6.39		
29-Oct-12	3.32	5.40	7.62	5.64	3.76	3.10	9.65	3.72	9.65	5.18	8.70	5.55		6.8	4.72		5.32		6.52		
04-Nov-12	3.64	5.68	7.68	5.80	4.30	3.34	9.73	4.30	9.73	5.30	8.90	5.76		7.1	5.15		5.5		6.86		
13-Nov-12	4.13	5.79	7.88	6.10	4.94	3.69	9.93	4.86	9.93	5.64	9.10	6.24		7.3	5.5		5.81		6.95		
21-Nov-12	4.68	6.20	7.94	6.60	5.20	4.29	10.10	5.13	10.10	5.94	9.30	6.64		7.59	5.9		6.2		7.2		
28-Nov-12	5.30	6.69	8.12	6.80	5.40	4.36	10.25	5.64	10.25	6.49	9.68	6.88		7.59	6.3		6.35		7.56		
03-Dec-12	3.17	6.99	8.25	6.21	7.52	6.45	10.27	5.37	10.37	5.68	9.74	6.86		8.11	6.38		6.36		7.1		
10-Dec-12	3.11	7.11	8.30	6.38	7.58	6.75	10.48	5.84	10.48	5.76	9.87	6.98		8.26	6.45		6.55		8.05		
17-Dec-12	3.16	7.20	8.38	6.50	7.63	6.88	10.69	5.90	10.69	5.84	9.93	7.14		8.42	6.63		6.69		8.15		
26-Dec-12	3.13	7.30	8.50	6.63	7.90	7.21	10.83	6.06	10.83	6.11	9.98	7.2	3.48	8.68	6.83		7		8.3		
05-Jan-13	3.48	7.56	8.52	6.19	7.17	2.2	7.17	6.15			5.14	4.48	3.55	6.12	5.85		5.32	4.19	8.14		
12-Jan-13	3.55	7.69	8.56	6.39	7.24	2.45	7.24	6.27			5.43	4.98	3.88	6.36	5.92		5.2	4.22	8.14	5.85	
21-Jan-13	3.88	7.83	8.65	6.81	7.38	2.85	7.38	6.41			5.81	5.39	3.85	6.84	6.3		4.3	4.3	8.16	5.92	
28-Jan-13	3.88	7.98	8.69	7.03	7.65	3.19	7.65	6.49			6.24	5.88	3.97	7.3	6.74		4.3	4.3	8.18	6.3	
03-Feb-13	3.97	8.00	8.72	7.29	7.87	3.78	6.87	6.53			6.35	6.4	4.03	7.79	6.95		4.3	4.33	8.19	6.34	
10-Feb-13	4.3	8.02	8.78	7.38	7.93	3.8	6.93	6.55			6.49	5.78	4.06	8.1	6.96		4.32	4.32	8.22	6.95	
16-Feb-13	4.6	8.08	8.83	7.65	7.98	3.8	7.12	6.61			6.67	5.82	4.1	8.11	6.56		4.34	4.34	8.24	6.96	
23-Feb-13	4.25	8.12	8.89	7.86	8.02	3.81	7.23	6.8			6.8	6.25	4.14	8.13	6.61		4.36	4.36	8.3	6.98	
02-Mar-13	4.3	8.12	9.05	7.87	8.1	3.81	7.42	6.9			7.02	6.16	4.21	8.14	6.08	5	4.52	4.52	8.33	7.07	7
09-Mar-13	4.43	8.13	9.12	7.92	8.19	3.82	7.56	7.05			7.28	6.16	4.3	8.16	6.74	5.11	4.64	4.64	8.36	7.1	7.15
16-Mar-13	4.45	8.16	9.17	7.97	8.31	3.84	7.66	7.2			7.39	6.17	4.33	8.16	6.75	5.18	4.68	4.68	8.36	7.13	7.25
23-Mar-13	4.48	8.15	9.2	7.82	8.35	3.84	7.61	7.15			7.1	6.18	4.39	8.18	6.75	5.18	5.09	4.59	8.35	7.2	7.32
01-Apr-13	4.63	8.15	9.3	6.81	8.34	4.24	7.58	4.63			6.02	5.6	4.63	8.25	6.83	5.2	5.15	4.34	8.05	7.19	7.38
08-Apr-13	4.42	8.08	9.32	6.89	8.34	4.34	7.53	4.42			5.72	5.64	4.42	8.16	7.22	5.25	5.2	4.36	8.27	7.22	7.4
15-Apr-13	4.46	8.16	9.32	7.62	8.36	4.39	7.42	4.46			5.68	5.83	4.46	8.25	7.56	5.45	5.49	4.4	8.38	7.49	7.45
24-Apr-13	4.49	8.12	9.5	7.78	8.39	4.43	7.47	4.49			6.1	6.05	4.49	8.28	7.92	5.71	6.52	4.42	8.39	7.61	7.5
01-May-13	4.52	8.13	9.58	7.74	8.38	4.45	7.49	4.52			6.12	6.1	4.52	8.32	8.23	6.14	6.57	4.48	8.42	7.78	7.57
08-May-13	4.58	8.10	9.61	7.63	8.3	4.49	7.49	4.58			6.15	6.14	4.58	8.33	8.26	6.18	6.6	4.41	8.46	7.96	7.58
15-May-13	4.63	8.08	9.65	7.68	8.31	4.56	7.58	4.62			6.18	6.2	4.62	8.36	8.35	6.29	6.73	4.52	8.49	7.99	7.63
22-May-13	4.69	8.16	9.64	7.64	8.39	4.65	7.64	4.78			6.29	6.3	4.78	8.46	8.42	6.31	6.76	4.64	8.52	7.94	7.69
31-May-13	4.19	7.20	8.04	6.81	7.63	4.36	7.12	4			6.11	6.12	4	7.82	7.62	6.11	6	4.11	7.84	7.16	7.42
07-Jun-13	4	7.00	7.72	6.61	7.38	4.31	7.00	3.92			5.72	5.92	3.92	7.64	7.56	6	5.93	4	7.73	7	7.21
14-Jun-13	3.81	6.91	7.41	6.42	7.11	4.28	6.94	3.72			5.63	5.86	3.72	7.39	7.4	5.52	5.69	3.81	7.62	6.92	6.34
21-Jun-13	1.66	6.73	7.27	6.33	6.72	4.32	6.79	1.78			5.34	5.88	1.78	7.2	7.22	5.11	5.49	1.97	6.42	6.73	6.23
30-May-15	3.80	11.12	9.83	7.43	3.01	4.22	5.80	6.23	10.20	7.65	5.30	6.63	3.02	11.17	8.38	5.33	6.35	3.3	8.9	8.15	7.25
6-Jun-15	2.60	12.45	9.55	7.83	3.14	4.32	5.42	6.73	11.50	7.80	5.12	6.38	2.65	12.76	7.99	5.28	6.7	2.78	8.3	7.97	7.23
13-Jun-15	3.10	13.56	10.09	7.50	3.56	4.99	5.51	6.87	11.20	7.95	5.29	7.02	2.86	13.41	8.3	5.05	6.9	2.9	8.28	7.91	7.18
20-Jun-15	3.26	12.57	9.86	7.53	3.44	4.92	5.43	6.70	10.37	7.70	5.12	6.39	2.66	12.7	8.42	5.13	7	2.69	7.83	8.31	7.9
28-Jun-15	2.19	12.08	8.77	7.34	2.61	5.56	4.09	5.48	9.91	7.85	4.71	6.75	3.06	12.62	7.84	4.85	6.45	2.47	7.05	7.93	7.37
4-Jul-15	1.91	13.05	9.53	7.63	2.85	5.09	4.25	5.12	10.12	7.97	4.47	6.12	2.65	13	7.08	4.18	6.87	1.82	7.66	7.12	7.12
11-Jul-15	1.62	10.58	9.09	7.25	2.18	4.31	4.12	4.43	9.84	7.22	4.14	5.73	1.89	12.11	6.63	4.65	6.03	1.67	6.21	7.35	7.04
18-Jul-15	1.74	7.02	8.71	6.97	1.41	3.27	3.97	4.03	9.75	7.03	3.36	5.32	1.47	11.81	5.11	4.04	5.75	1.42	6.06	6.76	6.93
26-Jul-15	1.58	6.58	8.26	6.68	1.13	2.92	3.81	3.14	7.13	6.77	3.07	4.83	1.25	8.14	4.55	4.17	5.12	1.38	6.25	6.13	6.85
2-Aug-15	1.31	6.33	7.25	5.25	0.98	2.63	3.75	2.55	5.10	6.41	2.58	4.66	1.11	6.31	3.41	4.77	4.81	1.33	6.13	5.53	6.71
9-Aug-15	1.44	6.56	8.16	5.34	1.12	2.73	4.03	3.12	6.04	6.12	2.76	4.91	1.24	6.73	4.03	4.91	4.62	1.44	6.47	5.19	6.8

16-Aug-15	1.99	6.12	7.82	5.51	1.03	2.51	3.71	3.77	6.32	6.25	2.25	4.58	1.17	6.35	4.21	4.53	4.18	1.52	6.14	5.44	6.63
23-Aug-15	1.73	5.86	7.43	5.09	0.93	2.17	3.53	2.65	6.13	6.04	2.13	4.35	1.48	6.17	3.54	4.19	4.31	1.21	6.02	4.73	6.19
30-Aug-15	1.51	5.77	7.15	4.91	0.84	2.03	3.45	3.15	6.65	5.69	1.08	4.18	1.41	6.11	3.12	4.06	4.53	1.37	5.84	4.52	6.94
6-Sep-15	2.03	5.87	7.04	5.11	0.68	2.17	3.81	3.18	6.82	5.83	1.18	4.27	1.68	5.83	3.06	4.13	4.77	1.52	5.24	4.37	6.71
13-Sep-15	1.63	5.62	6.84	4.24	1.01	2.05	3.49	3.10	6.34	5.37	1.37	4.09	1.42	5.41	2.96	4.58	4.39	1.77	5.53	4.17	6.53
20-Sep-15	1.38	5.18	6.51	4.73	0.92	2.54	3.73	3.07	6.79	5.69	1.73	4.36	1.33	5.73	2.61	4.74	4.21	1.93	5.91	4.05	6.82
27-Sep-15	1.29	5.66	6.18	4.91	0.74	2.13	3.81	3.03	7.07	5.78	1.56	4.22	1.42	5.57	2.38	4.63	4.68	1.56	5.11	4.11	6.68
4-Oct-15	1.20	5.74	6.03	4.63	0.89	1.95	3.63	2.14	7.50	5.55	1.55	4.11	1.2	5.43	2.18	4.55	4.23	1.23	5.77	3.68	6.44
11-Oct-15	1.17	5.81	6.28	4.71	0.74	2.09	3.15	1.83	7.43	5.13	1.68	4.07	1.18	5.83	2.74	4.64	4.26	1.08	5.81	3.84	6.47
18-Oct-15	1.21	5.85	6.61	4.67	1.12	2.43	4.68	2.15	7.20	5.19	1.93	4.07	1.31	6.04	3.37	4.81	4.44	1.29	5.64	4.09	6.55
25-Oct-15	1.19	6.32	7.36	4.72	1.64	2.58	4.94	2.32	7.46	5.24	2.15	4.48	1.5	6.16	4.11	5.08	4.57	2.12	5.77	4.37	6.5
1-Nov-15	1.28	6.84	7.83	5.36	1.75	2.71	5.07	2.57	7.55	5.77	2.24	4.67	1.64	6.31	4.25	5.74	4.73	2.18	5.92	4.52	6.84
8-Nov-15	1.78	6.65	7.87	5.42	1.79	2.92	5.13	2.86	8.61	5.79	2.18	5.07	2.03	6.23	4.28	5.69	5.18	2.27	6.16	4.53	6.79
15-Nov-15	2.15	6.93	7.91	5.44	1.77	3.42	5.19	3.41	10.25	5.83	2.20	5.25	2.15	6.61	4.25	5.63	5.42	2.31	6.23	4.56	6.86
22-Nov-15	2.24	6.88	7.99	5.54	2.10	3.62	4.42	4.05	10.60	5.90	2.27	5.4	2.22	6.72	4.26	5.44	5.47	2.19	6.44	4.58	6.9
29-Nov-15	2.50	6.93	7.91	5.95	2.22	3.84	4.69	4.21	10.57	6.05	2.35	5.44	2.37	7.11	4.64	5.51	5.78	2.35	6.64	4.65	6.54
6-Dec-15	2.44	7.02	7.92	5.99	2.44	3.99	4.74	4.22	10.60	5.99	2.66	5.69	2.47	6.6	4.91	5.4	5.75	3.44	6.57	5.01	6.55
13-Dec-15	2.55	7.37	7.97	6.07	2.67	4.06	4.97	4.37	10.68	6.04	2.77	5.87	2.58	6.71	5.14	5.33	5.79	3.48	6.64	5.31	6.58
20-Dec-15	2.71	7.64	8.04	6.11	2.83	4.08	5.37	4.54	10.71	6.13	2.83	5.99	2.77	6.79	5.44	5.39	5.88	3.55	6.69	5.66	6.64
27-Dec-15	2.78	7.73	8.24	6.17	3.12	4.13	5.65	4.84	10.77	6.36	2.88	6.12	2.87	6.86	5.88	5.27	6.13	3.62	6.83	5.86	6.68
3-Jan-16	2.88	8.12	8.56	6.33	3.22	4.15	5.83	5.27	10.84	6.55	2.96	6.21	3.05	7.11	6.27	5.44	6.22	3.77	7.12	6.14	6.71
10-Jan-16	3.09	8.38	8.77	6.43	3.30	4.18	6.03	5.69	10.98	6.65	3.09	6.29	3.12	7.23	6.66	5.59	6.37	3.81	7.29	6.58	6.75
17-Jan-16	3.17	8.54	8.93	6.64	3.44	4.47	6.01	6.03	11.12	6.72	3.73	6.33	3.21	7.28	6.68	5.61	6.38	3.87	7.33	6.61	6.78
24-Jan-16	3.29	8.63	9.05	6.83	3.61	4.62	6.04	6.08	11.23	6.83	4.16	6.38	3.32	7.34	6.71	5.64	6.4	3.99	7.49	6.65	6.82
31-Jan-16	3.38	8.76	9.11	7.08	3.84	4.30	6.05	6.16	11.27	7.10	4.50	6.05	3.45	7.42	6.81	5.58	5.77	4.02	7.47	6.75	6.83
7-Feb-16	3.44	8.83	9.23	7.15	4.02	4.41	6.11	6.33	11.31	7.18	4.67	6.01	3.55	7.45	6.94	5.56	5.82	4.07	7.55	6.84	6.87
14-Feb-16	3.57	8.96	9.33	7.21	4.12	4.53	6.28	6.57	11.39	7.27	4.82	6.02	3.68	7.47	7.11	5.57	5.85	4.11	7.64	6.97	6.95
21-Feb-16	3.63	9.08	9.47	7.27	4.28	4.66	6.41	6.77	11.47	7.33	5.07	5.94	3.74	7.49	7.24	5.58	5.88	4.13	7.76	7.18	6.97
28-Feb-16	3.77	9.14	9.55	7.30	4.37	4.83	6.55	6.91	11.55	7.38	5.26	5.92	3.83	7.52	7.33	5.59	5.91	4.15	7.84	7.31	7.03
6-Mar-16	3.84	9.27	9.68	7.33	4.46	4.99	6.64	7.04	11.62	7.42	5.43	5.93	3.9	7.54	7.48	6.01	5.93	4.18	7.9	7.4	7.08
13-Mar-16	4.04	9.41	9.77	7.41	4.61	4.63	6.68	7.08	11.74	7.66	5.66	5.81	4.13	7.72	7.85	6.03	5.84	4.21	7.94	7.78	7.13
20-Mar-16	4.12	9.67	9.86	7.44	4.69	4.28	6.70	7.11	11.86	8.02	5.82	5.73	4.18	7.84	7.97	6.04	5.77	4.23	7.96	7.93	7.24
27-Mar-16	4.18	9.83	9.95	7.50	4.73	3.81	6.75	7.15	11.98	8.09	6.13	5.66	4.24	7.94	8.03	6.07	5.71	4.25	7.99	8.42	7.38
2-Apr-16	4.21	9.87	10.06	7.58	4.88	4.22	7.08	7.21	12.01	8.11	6.18	5.69	4.28	7.97	8.14	5.59	5.73	4.27	8.04	8.14	7.28
10-Apr-16	4.25	9.88	10.12	7.65	5.06	4.54	7.43	7.24	11.99	8.12	6.29	5.72	4.34	8.03	8.28	5.51	5.75	4.29	8.06	8.25	7.17
17-Apr-16	4.28	10.12	10.19	7.73	5.08	4.66	7.55	7.33	12.00	8.13	6.34	6.07	4.36	8.17	8.37	5.57	6.03	4.31	8.13	8.33	7.25
24-Apr-16	4.33	10.15	10.24	7.81	4.91	4.76	7.67	7.46	11.33	8.14	6.38	6.22	4.38	8.21	8.43	5.6	6.11	4.35	8.28	8.45	7.34
1-May-16	4.45	10.16	10.30	7.91	5.04	3.95	8.29	7.59	11.34	8.16	6.67	6.05	4.47	8.23	8.6	5.61	6.07	4.43	8.26	8.56	7.32
8-May-16	4.43	9.74	10.26	7.93	5.06	4.78	8.04	7.46	11.24	8.14	6.33	6.17	4.34	8.11	8.63	5.33	6.22	4.33	8.15	8.53	7.34
15-May-16	4.42	9.22	10.22	7.95	5.09	4.83	7.66	7.41	11.06	8.03	6.12	6.25	4.22	8.03	8.62	5.16	6.39	4.26	8.09	8.5	7.32
22-May-16	4.41	8.18	10.18	7.97	5.11	4.66	7.20	7.39	10.95	7.95	5.93	6.36	4.12	7.87	8.61	5.04	6.5	4.12	8.04	8.48	7.3
29-May-16	4.37	7.74	9.88	7.80	4.72	4.26	6.83	7.34	10.43	7.93	5.27	6.33	3.75	7.71	8.31	5.02	6.48	3.67	7.79	8.34	7.22

3. Groundwater level elevations

Date	DAFO_dom (m)	Pkor_dom(m)	Nongyang_dom(m)	Knbua_dom(m)	Thubcharn_dom(m)	Bkeo_dom(m)	PhPhueng_dom(m)	SamKa_dom(m)	Dhban_dom (m)	Thadarn_dom(m)	Hieng_dom(m)	BKeo_SOB (m amsl)	SKM_SOB (m amsl)	Pkor_SOB (m amsl)	Pkxang_SOB (m amsl)	Hieng_SOB (m amsl)	BKeo_DOB (m amsl)	SKM_DOB (m amsl)	Pkor_DOB (m amsl)	Pkxang_DOB (m amsl)	Hieng_DOB (m amsl)
01-Oct-11	96.43	103.25	102.43	96.42	95.77	96.51	100.43	107.28	97.93	99.27	124.46										
08-Oct-11	96.32	103.11	102.32	96.02	95.52	96.33	100.32	107.21	97.77	99.07	124.37										
15-Oct-11	96.24	103.03	102.24	95.47	95.49	96.13	100.24	107.14	97.51	98.88	124.28										
22-Oct-11	96.18	102.75	102.18	95.28	95.32	95.45	100.18	107.08	97.27	98.43	124.15										
29-Oct-11	96.13	102.53	102.13	95.14	95.24	95.22	99.76	107.03	97.07	98.22	124.06										
05-Nov-11	96.05	102.44	101.05	95.11	95.11	95.11	99.72	106.5	96.47	98.14	123.88										
12-Nov-11	96.02	102.22	101.02	95.03	94.85	95.02	99.48	106.33	96.27	97.77	123.44										
19-Nov-11	95.74	101.17	100.74	94.74	94.49	94.95	99.36	106.23	96.11	97.57	123.06										
26-Nov-11	94.82	101.03	100.47	94.62	93.82	93.82	99.24	106.02	96.06	97.37	122.82										
03-Dec-11	94.41	100.75	100.14	94.43	93.62	93.32	99.05	105.74	95.85	97.16	122.25										
10-Dec-11	93.75	100.13	100.02	94.17	93.42	92.57	98.82	105.42	95.72	97.03	121.85										
17-Dec-11	93.52	99.86	99.86	94.03	93.15	92.11	98.74	105.23	95.63	96.88	121.52										
25-Dec-11	93.44	99.72	99.73	93.88	93.03	91.88	98.47	105.21	95.52	96.73	121.6										
31-Dec-11	93.33	99.65	99.64	93.76	92.86	91.72	98.28	105.16	95.47	96.66	121.55										
07-Jan-12	93.31	99.62	99.61	93.65	92.66	91.63	98.14	105.13	95.33	96.58	121.53										
14-Jan-12	93.25	99.53	99.53	93.52	92.48	91.56	98.02	105.09	95.25	96.48	121.52										
21-Jan-12	93.21	99.46	99.47	93.43	92.32	91.48	97.86	105.05	95.18	96.37	121.46										
28-Jan-12	93.18	99.43	99.28	93.32	92.29	91.33	97.72	105.02	95.06	96.25	121.42										
04-Feb-12	93.13	99.34	99.22	93.28	92.22	91.21	97.63	104.88	94.76	96.19	121.36										
11-Feb-12	93.07	99.22	99.16	93.17	92.18	91.14	97.43	104.77	94.65	96.03	121.32										
18-Feb-12	93.06	99.21	99.14	93.15	92.16	91.11	97.42	104.75	94.63	95.99	121.31										
25-Feb-12	93.04	99.19	99.12	93.14	92.14	91.08	97.41	104.74	94.61	95.96	121.28										
03-Mar-12	93.02	99.16	99.11	93.11	92.11	91.06	97.36	104.72	94.57	95.85	121.24										
10-Mar-12	92.98	99.13	99.08	93.08	92.07	91.03	97.32	104.69	94.55	95.83	121.21										
17-Mar-12	92.96	99.08	99.05	93.05	92.05	91.01	97.28	104.64	94.52	95.81	121.19										
24-Mar-12	92.93	99.04	99.03	93.02	92.03	90.92	97.26	104.62	94.51	95.79	121.15										
31-Mar-12	92.91	99.02	99.02	92.96	92.01	90.88	97.15	104.58	94.47	95.75	121.13										
07-Apr-12	92.88	98.93	98.92	92.84	91.92	90.86	96.39	104.54	94.43	95.73	121.07										
14-Apr-12	92.86	98.89	98.87	92.73	91.89	90.82	96.35	104.51	94.41	95.71	121.03										
21-Apr-12	92.85	98.85	98.83	92.71	91.83	90.78	96.32	104.36	94.39	95.65	121.02										
28-Apr-12	92.84	98.79	98.81	92.68	91.81	90.74	95.87	104.32	94.37	95.63	120.93										
05-May-12	92.86	98.76	98.79	92.65	91.78	90.72	95.77	104.28	94.35	95.62	120.89										
12-May-12	92.99	98.75	98.76	92.63	92.64	91.79	95.74	104.19	94.19	95.36	120.85										
19-May-12	93.64	98.72	98.73	92.72	92.88	92.54	95.73	104.15	93.86	95.17	120.79										
26-May-12	93.88	98.68	98.63	92.84	93.82	93.62	95.71	104.08	93.63	94.63	120.66										
02-Jun-12	94.66	98.66	98.75	93.63	93.93	94.73	95.66	104.03	93.28	93.74	120.63										
09-Jun-12	94.75	98.63	98.78	93.44	94.89	94.88	95.86	103.95	92.87	93.29	120.69										
16-Jun-12	94.77	98.59	98.82	93.3	94.66	95.36	95.87	103.82	92.57	93.07	120.82										
23-Jun-12	94.81	98.54	98.83	93.15	94.81	95.36	95.89	103.79	92.18	93.07	120.86										
05-Jul-12	94.85	100.27	98.7	93.2	94.79	94.79	95.86	103.2	94.86	93.05	120.36										
12-Jul-12	94.9	100.67	98.7	93.38	94.66	94.3	95.81	103.8	94.81	96.84	120.32										
19-Jul-12	94.2	101	98.35	94	94.86	94	95.72	104	94.72	96.4	120.3										
26-Jul-12	94.89	101.08	98.14	94.28	94.58	93.77	95.65	104.13	94.65	96.32	119.61										
06-Aug-12	95.09	101.26	97.02	95.36	95.9	92.79	97.44	104.24	96.44	97.44	119.35										
14-Aug-12	95.22	101.64	97.28	95.4	95.85	92.48	97.51	104.37	96.51	97.41	118.75										

22-Aug-12	95.36	102.9	97.35	95.32	95.2	92.02	97.42	104.48	96.42	97.38	118.3										
29-Aug-12	95.67	103.04	97.8	95.1	95.88	91.24	97.4	104.68	96.4	97.36	117.7										
05-Sep-12	96.3	102.38	98.1	96.72	95.5	93.64	94.68	105.08	93.68	97.87	117.42	97.21		102.7	108		98.9		102.1		
14-Sep-12	96.18	102.45	98.6	95.88	95.16	93.78	94.65	105.32	93.65	97.84	117.25	96.08		101.53	107.7		97.45		100.48		
22-Sep-12	96.14	102.35	98.4	95.54	94.8	94.18	94.38	105.37	93.38	97.72	117	96.02		100.46	107.35		96.53		100.36		
29-Sep-12	96.11	103.1	98.05	95.35	94.53	94.55	94.18	106	93.18	97.68	116.84	96		100.44	107.26		96.4		100.2		
05-Oct-12	96.84	102.27	97.6	95	93.85	95.76	93.59	106.36	92.59	97.46	116.75	95.87		100.7	106.89		96.38		100.7		
14-Oct-12	95.7	102.22	97.6	94.8	93.65	95.35	93.53	106.91	92.53	97.24	116.47	95.7		100.65	106.68		96.32		100.65		
22-Oct-12	94.8	101.9	97.5	94.64	93.61	95.06	93.48	106.53	92.48	96.1	116.33	95.5		100.6	106.45		96.27		100.61		
29-Oct-12	94.68	101.6	97.38	94.36	93.24	94.9	93.35	106.28	92.35	96.82	116.3	95.45		100.2	106.28		95.68		100.48		
04-Nov-12	94.36	101.32	97.32	94.2	92.7	94.66	93.27	105.7	92.27	96.7	116.1	95.24		99.9	105.85		95.5		100.14		
13-Nov-12	93.87	101.21	97.12	93.9	92.06	94.31	93.07	105.14	92.07	96.36	115.9	94.76		99.7	105.5		95.19		100.05		
21-Nov-12	93.32	100.8	97.06	93.4	91.8	93.71	92.9	104.87	91.9	96.06	115.7	94.36		99.41	105.1		94.8		99.8		
28-Nov-12	92.7	100.31	96.88	93.2	91.6	93.64	92.75	104.36	91.75	95.51	115.32	94.12		99.41	104.7		94.65		99.44		
03-Dec-12	94.83	100.01	96.75	93.79	89.48	91.55	92.73	104.63	91.63	96.32	115.26	94.14		98.89	104.62		94.64		99.9		
10-Dec-12	94.89	99.89	96.7	93.62	89.42	91.25	92.52	104.16	91.52	96.24	115.13	94.02		98.74	104.55		94.45		98.95		
17-Dec-12	94.84	99.8	96.62	93.5	89.37	91.12	92.31	104.1	91.31	96.16	115.07	93.86		98.58	104.37		94.31		98.85		
26-Dec-12	94.87	99.7	96.5	93.37	89.1	90.79	92.17	103.94	91.17	95.89	115.02	93.8		98.32	104.17		94		98.7		
05-Jan-13	94.52	99.44	96.48	93.81	89.83	95.8	95.83	103.85			119.86	96.52	94.52	100.88	105.15		95.68	93.81	98.86	105.15	
12-Jan-13	94.45	99.31	96.44	93.61	89.76	95.55	95.76	103.73		94.35	119.57	96.02	94.45	100.64	105.08		95.8	93.78	98.86	105.08	
21-Jan-13	94.12	99.17	96.35	93.19	89.62	95.15	95.62	103.59		94.2	119.19	95.61	94.12	100.16	104.7		96.7	93.7	98.84	104.7	
28-Jan-13	94.12	99.02	96.31	92.97	89.35	94.81	95.35	103.51		94.05	118.76	95.12	94.15	99.7	104.26		96.7	93.7	98.82	104.66	
03-Feb-13	94.03	99	96.28	92.71	89.13	94.22	96.13	103.47		94.3	118.65	94.6	94.03	99.21	104.05		96.7	93.67	98.81	104.05	
10-Feb-13	93.7	98.98	96.22	92.62	89.07	94.2	96.07	103.45		94.15	118.51	95.22	93.97	98.9	104.04		96.68	93.68	98.78	104.04	
16-Feb-13	93.4	98.92	96.17	92.35	89.02	94.2	95.88	103.39		94.03	118.33	95.18	93.94	98.89	104.44		96.66	93.66	98.76	104.3	
23-Feb-13	93.75	98.88	96.11	92.14	88.98	94.19	95.77	103.2		94.78	118.2	94.75	93.9	98.87	104.39		96.64	93.64	98.7	104.02	
02-Mar-13	93.7	98.88	95.95	92.13	88.9	94.19	95.58	103.1		94.97	117.98	94.84	93.79	98.86	104.92	135	96.48	93.48	98.67	103.93	133
09-Mar-13	93.57	98.87	95.88	92.08	88.81	94.18	95.44	102.95		95.23	117.72	94.84	93.7	98.84	104.26	134.89	96.36	93.36	98.64	103.9	132.85
16-Mar-13	93.55	98.84	95.83	92.03	88.69	94.16	95.34	102.8		95.59	117.61	94.83	93.67	98.84	104.25	134.82	96.32	93.32	98.64	103.87	132.75
23-Mar-13	93.52	98.85	95.8	92.18	88.65	94.16	95.39	102.85		95.88	117.9	94.82	93.61	98.82	104.25	134.82	95.91	93.41	98.65	103.8	132.68
01-Apr-13	93.37	98.85	95.7	93.19	88.66	93.76	95.42	105.37		95.75	118.98	95.4	93.37	98.75	104.17	134.8	95.85	93.66	98.95	103.81	132.62
08-Apr-13	93.58	98.92	95.68	93.11	88.66	93.66	95.47	105.58		95.96	119.28	95.36	93.58	98.84	103.78	134.75	95.8	93.64	98.73	103.78	132.6
15-Apr-13	93.54	98.84	95.68	92.38	88.64	93.61	95.58	105.54		96.31	119.32	95.17	93.54	98.75	103.44	134.55	95.51	93.6	98.62	103.51	132.55
24-Apr-13	93.51	98.88	95.5	92.22	88.61	93.57	95.53	105.51		96.17	118.9	94.95	93.51	98.72	103.08	134.29	94.48	93.58	98.61	103.39	132.5
01-May-13	93.48	98.87	95.42	92.26	88.62	93.55	95.51	105.48		96.63	118.88	94.9	93.48	98.68	102.77	133.86	94.43	93.52	98.58	103.22	132.43
08-May-13	93.42	98.9	95.39	92.37	88.7	93.51	95.51	105.42		96.31	118.85	94.86	93.42	98.67	102.74	133.82	94.4	93.59	98.54	103.04	132.42
15-May-13	93.37	98.92	95.35	92.32	88.69	93.44	95.42	105.38		96.22	118.82	94.8	93.38	98.64	102.65	133.71	94.27	93.48	98.51	103.01	132.37
22-May-13	93.31	98.84	95.36	92.36	88.61	93.35	95.36	105.22		96.45	118.71	94.7	93.22	98.54	102.58	133.69	94.24	93.36	98.48	103.06	132.31
31-May-13	93.81	99.8	96.96	93.19	89.37	93.64	95.88	106		96.87	118.89	94.88	94	99.18	103.38	133.89	95	93.89	99.16	103.84	132.58
07-Jun-13	94	100	97.28	93.39	89.62	93.69	96	106.08		96.81	119.28	95.08	94.08	99.36	103.44	134	95.07	94	99.27	104	132.79
14-Jun-13	94.19	100.09	97.59	93.58	89.89	93.72	96.06	106.28		96.76	119.37	95.14	94.28	99.61	103.6	134.48	95.31	94.19	99.38	104.08	133.66
21-Jun-13	96.34	100.27	97.73	93.67	90.28	93.68	96.21	108.22		96.23	119.66	95.12	96.22	99.8	103.78	134.89	95.51	96.03	100.58	104.27	133.77
										96.21											
30-May-15	94.2	95.88	95.17	92.57	93.99	93.78	97.2	103.77	91.8	96.17	119.7	94.37	94.98	95.83	102.62	134.67	94.65	94.7	98.1	102.85	132.75
6-Jun-15	95.4	94.55	95.45	92.17	93.86	93.68	97.58	103.27	90.5	96.1	119.88	94.62	95.35	94.24	103.01	134.72	94.3	95.22	98.7	103.03	132.77
13-Jun-15	94.9	93.44	94.91	92.5	93.44	93.01	97.49	103.13	90.8	95.95	119.71	93.98	95.14	93.59	102.7	134.95	94.1	95.1	98.72	103.09	132.82
20-Jun-15	94.74	94.43	95.14	92.47	93.56	93.08	97.57	103.3	91.63	96.01	119.88	94.61	95.34	94.3	102.58	134.87	94	95.31	99.17	102.69	132.1
28-Jun-15	95.81	94.92	96.23	92.66	94.39	92.44	98.91	104.52	92.09	95.96	120.29	94.25	94.94	94.38	103.16	135.15	94.55	95.53	99.95	103.07	132.63
4-Jul-15	96.09	93.95	95.47	92.37	94.15	92.91	98.75	104.88	91.88	95.87	120.53	94.88	95.35	94	103.92	135.82	94.13	96.18	99.34	103.88	132.88
11-Jul-15	96.38	96.42	95.91	92.75	94.82	93.69	98.88	105.57	92.16	95.64	120.86	95.27	96.11	94.89	104.37	135.35	94.97	96.33	100.79	103.65	132.96

18-Jul-15	96.26	99.98	96.29	93.03	95.59	94.73	99.03	105.97	92.25	95.45	121.64	95.68	96.53	95.19	105.89	135.96	95.25	96.58	100.94	104.24	133.07
26-Jul-15	96.42	100.42	96.74	93.32	95.87	95.08	99.19	106.86	94.87	95.35	121.93	96.17	96.75	98.86	106.45	135.83	95.88	96.62	100.75	104.87	133.15
2-Aug-15	96.69	100.67	97.75	94.75	96.02	95.37	99.25	107.45	96.9	95.28	122.42	96.34	96.89	100.69	107.59	135.23	96.19	96.67	100.87	105.47	133.29
9-Aug-15	96.56	100.44	96.84	94.66	95.88	95.27	98.97	106.88	95.96	95.17	122.24	96.09	96.76	100.27	106.97	135.09	96.38	96.56	100.53	105.81	133.2
16-Aug-15	96.01	100.88	97.18	94.49	95.97	95.49	99.29	106.23	95.68	94.9	122.75	96.42	96.83	100.65	106.79	135.47	96.82	96.48	100.86	105.56	133.37
23-Aug-15	96.27	101.14	97.57	94.91	96.07	95.83	99.47	107.35	95.87	94.82	122.87	96.65	96.52	100.83	107.46	135.81	96.69	96.79	100.98	106.27	133.81
30-Aug-15	96.49	101.23	97.85	95.09	96.16	95.97	99.55	106.85	95.35	94.73	123.92	96.82	96.59	100.89	107.88	135.94	96.47	96.63	101.16	106.48	133.06
6-Sep-15	95.97	101.13	97.96	94.89	96.32	95.83	99.19	106.82	95.18	94.67	123.82	96.73	96.32	101.17	107.94	135.87	96.23	96.48	101.76	106.63	133.29
13-Sep-15	96.37	101.38	98.16	95.76	95.99	95.95	99.51	106.9	95.66	94.62	123.63	96.91	96.58	101.59	108.04	135.42	96.61	96.23	101.47	106.83	133.47
20-Sep-15	96.62	101.82	98.49	95.27	96.08	95.46	99.27	106.93	95.21	94.58	123.27	96.64	96.67	101.27	108.39	135.26	96.79	96.07	101.09	106.95	133.18
27-Sep-15	96.71	101.34	98.82	95.09	96.26	95.87	99.19	106.97	94.93	94.34	123.44	96.78	96.58	101.43	108.62	135.37	96.32	96.44	101.89	106.89	133.32
4-Oct-15	96.8	101.26	98.97	95.37	96.11	96.05	99.37	107.86	94.5	93.98	123.45	96.89	96.8	101.57	108.82	135.45	96.77	96.77	101.23	107.32	133.56
11-Oct-15	96.83	101.19	98.72	95.29	96.26	95.91	99.85	108.17	94.57	93.91	123.32	96.93	96.82	101.17	108.26	135.36	96.74	96.92	101.19	107.16	133.53
18-Oct-15	96.79	101.15	98.39	95.33	95.88	95.57	98.32	107.85	94.8	93.89	123.07	96.93	96.69	100.96	107.63	135.19	96.56	96.71	101.36	106.91	133.45
25-Oct-15	96.81	100.68	97.64	95.28	95.36	95.42	98.06	107.68	94.54	93.88	122.85	96.52	96.5	100.84	106.89	134.92	96.43	95.88	101.23	106.63	133.5
1-Nov-15	96.72	100.16	97.17	94.64	95.25	95.29	97.93	107.43	94.45	93.87	122.76	96.33	96.36	100.69	106.75	134.26	96.27	95.82	101.08	106.48	133.16
8-Nov-15	96.22	100.35	97.13	94.58	95.21	95.08	97.87	107.14	93.39	93.86	122.82	95.93	95.97	100.77	106.72	134.31	95.82	95.73	100.84	106.47	133.21
15-Nov-15	95.85	100.07	97.09	94.56	95.23	94.58	97.81	106.59	91.75	93.84	122.8	95.75	95.85	100.39	106.75	134.37	95.58	95.69	100.77	106.44	133.14
22-Nov-15	95.76	100.12	97.01	94.46	94.9	94.38	98.58	105.95	91.4	93.86	122.73	95.6	95.78	100.28	106.74	134.56	95.53	95.81	100.56	106.42	133.1
29-Nov-15	95.5	100.07	97.09	94.05	94.78	94.16	98.31	105.79	91.43	93.97	122.65	95.56	95.63	99.89	106.36	134.49	95.22	95.65	100.36	106.35	133.46
6-Dec-15	95.56	99.98	97.08	94.01	94.56	94.01	98.26	105.78	91.4	94.05	122.34	95.31	95.53	100.4	106.09	134.6	95.25	94.56	100.43	105.99	133.45
13-Dec-15	95.45	99.63	97.03	93.93	94.33	93.94	98.03	105.63	91.32	94.07	122.23	95.13	95.42	100.29	105.86	134.67	95.21	94.52	100.36	105.69	133.42
20-Dec-15	95.29	99.36	96.96	93.89	94.17	93.92	97.63	105.46	91.29	91.87	122.17	95.01	95.23	100.21	105.56	134.61	95.12	94.45	100.31	105.34	133.36
27-Dec-15	95.22	99.27	96.76	93.83	93.88	93.87	97.35	105.16	91.23	91.64	122.12	94.88	95.13	100.14	105.12	134.73	94.87	94.38	100.17	105.14	133.32
3-Jan-16	95.12	98.88	96.44	93.67	93.78	93.85	97.17	104.73	91.16	91.45	122.04	94.79	94.95	99.89	104.73	134.56	94.78	94.23	99.88	104.86	133.29
10-Jan-16	94.91	98.62	96.23	93.57	93.7	93.82	96.97	104.31	91.02	91.35	121.91	94.71	94.88	99.77	104.34	134.41	94.63	94.19	99.71	104.42	133.25
17-Jan-16	94.83	98.46	96.07	93.36	93.56	93.53	96.99	103.97	90.88	91.28	121.27	94.67	94.79	99.72	104.32	134.39	94.62	94.13	99.67	104.39	133.22
24-Jan-16	94.71	98.37	95.95	93.17	93.39	93.38	96.96	103.92	90.77	91.17	120.84	94.62	94.68	99.66	104.29	134.36	94.6	94.01	99.51	104.35	133.18
31-Jan-16	94.62	98.24	95.89	92.92	93.16	93.70	96.95	103.84	90.73	90.90	120.5	94.95	94.55	99.58	104.19	134.42	95.23	93.98	99.53	104.25	**133.17**
7-Feb-16	94.56	98.17	95.77	92.85	92.98	93.59	96.89	103.67	90.69	90.82	120.33	94.99	94.45	99.55	104.06	134.44	95.18	93.93	99.45	104.16	133.13
14-Feb-16	94.43	98.04	95.67	92.79	92.88	93.47	96.72	103.43	90.61	90.73	120.18	94.98	94.32	99.53	103.89	134.43	95.15	93.89	99.36	104.03	133.05
21-Feb-16	94.37	97.92	95.53	92.73	92.72	93.34	96.59	103.23	90.53	90.67	119.93	95.06	94.26	99.51	103.76	134.42	95.12	93.87	99.24	103.82	133.03
28-Feb-16	94.23	97.86	95.45	92.7	92.63	93.17	96.45	103.09	90.45	90.62	119.74	95.08	94.17	99.48	103.67	134.41	95.09	93.85	99.16	103.69	132.97
6-Mar-16	94.16	97.73	95.32	92.67	92.54	93.01	96.36	102.96	90.38	90.58	119.57	95.07	94.1	99.46	103.52	133.99	95.07	93.82	99.1	103.6	132.92
13-Mar-16	93.96	97.59	95.23	92.59	92.39	93.37	96.32	102.92	90.26	90.34	119.34	95.19	93.87	99.28	103.15	133.97	95.16	93.79	99.06	103.22	132.87
20-Mar-16	93.88	97.33	95.14	92.56	92.31	93.72	96.3	102.89	90.14	89.98	119.18	95.27	93.82	99.16	103.03	133.96	95.23	93.77	99.04	103.07	132.76
27-Mar-16	93.82	97.17	95.05	92.5	92.27	94.19	96.25	102.85	90.02	89.51	118.87	95.34	93.76	99.06	102.97	133.93	95.29	93.75	99.01	102.58	132.62
2-Apr-16	93.79	97.13	94.94	92.42	92.12	93.78	95.92	102.79	89.99	89.89	118.82	95.31	93.72	99.03	102.86	134.41	95.27	93.73	98.96	102.86	132.72
10-Apr-16	93.75	97.12	94.88	92.35	91.94	93.46	95.57	102.76	90.01	89.88	118.71	95.28	93.66	98.97	102.72	134.49	95.25	93.71	98.94	102.75	132.83
17-Apr-16	93.72	96.88	94.81	92.27	91.92	93.34	95.45	102.67	90	89.87	118.66	94.93	93.64	98.83	102.63	134.43	94.97	93.69	98.87	102.67	132.75
24-Apr-16	93.67	96.85	94.76	92.19	92.09	93.24	95.33	102.54	90.67	89.86	118.62	94.78	93.62	98.79	102.57	134.4	94.89	93.65	98.72	102.55	132.66
1-May-16	93.55	96.84	94.7	92.09	91.96	94.05	94.71	102.41	90.66	89.84	118.33	94.95	93.53	98.77	102.4	134.39	94.93	93.57	98.74	102.44	132.68
8-May-16	93.57	97.26	94.74	92.07	91.94	93.22	94.96	102.54	90.76	89.86	118.67	94.83	93.66	98.89	102.37	134.67	94.78	93.67	98.85	102.47	132.66
15-May-16	93.58	97.78	94.78	92.05	91.91	93.17	95.34	102.59	90.94	89.97	118.88	94.75	93.78	98.97	102.38	134.84	94.61	93.74	98.91	102.5	132.68
22-May-16	93.59	98.82	94.82	92.03	91.89	93.34	95.8	102.61	91.05	90.05	119.07	94.64	93.88	99.13	102.39	134.96	94.5	93.88	98.96	102.52	132.7
29-May-16	93.63	99.26	95.12	92.2	92.28	93.74	96.17	102.66	91.57	90.07	119.73	94.67	94.25	99.29	102.69	134.98	94.52	94.33	99.21	102.66	132.78

4. Groundwater electrical conductivity (EC)

Date	DAFO_dom (m)	Pkor_dom(m)	Nongyang_dom(m)	Knbua_dom(m)	Thubchan_dom(m)	Bkeo_dom(m)	PhPhueng_dom(m)	SamKa_dom(m)	Dhban_dom (m)	Thadarn_dom(m)	Hieng_dom(m)	BKeo_SOB (m amsl)	SKM_SOB (m amsl)	Pkor_SOB (m amsl)	Pkxang_SOB (m amsl)	Hieng_SOB (m amsl)	BKeo_DOB (m amsl)	SKM_DOB (m amsl)	Pkor_DOB (m amsl)	Pkxang_DOB (m amsl)	Hieng_DOB (m amsl)
01-Oct-11	385	213	385	798	369	602	385	341	697	663	943										
08-Oct-11	379	212	486	795	367	612	479	346	790	671	943										
15-Oct-11	386	214	486	796	365	603	486	348	873	661	943										
22-Oct-11	376	157	476	786	368	608	476	347	690	668	943										
29-Oct-11	382	157	382	783	369	607	382	343	679	662	943										
05-Nov-11	379	153	479	788	371	601	479	303	674	661	943										
12-Nov-11	376	154	476	786	370	602	476	328	768	670	943										
19-Nov-11	370	152	370	783	369	582	370	307	779	664	943										
26-Nov-11	381	142	386	774	379	687	386	316	878	670	974										
03-Dec-11	370	124	473	787	388	604	473	308	796	668	997										
10-Dec-11	380	48	486	789	368	614	486	312	887	674	1006										
17-Dec-11	374	58	495	794	366	602	495	307	983	664	1004										
25-Dec-11	454	125	476	798	365	602	476	312	674	662	1042										
31-Dec-11	483	126	382	795	368	612	382	321	768	661	1043										
07-Jan-12	475	127	479	794	369	603	479	308	979	670	1008										
14-Jan-12	481	124	476	786	388	608	476	312	878	664	1048										
21-Jan-12	419	128	486	783	368	607	370	327	796	670	1044										
28-Jan-12	423	126	486	784	370	601	386	321	996	668	1009										
04-Feb-12	473	124	476	783	369	602	473	308	887	663	1049										
11-Feb-12	473	127	382	783	379	687	382	318	983	671	1008										
18-Feb-12	428	128	476	783	369	612	382	316	768	670	943										
25-Feb-12	474	127	370	788	379	603	479	326	979	664	974										
03-Mar-12	468	124	386	786	388	608	476	318	878	670	997										
10-Mar-12	428	126	473	783	368	607	370	321	796	668	1048										
17-Mar-12	473	127	486	774	369	608	386	316	996	674	1044										
24-Mar-12	468	128	495	787	388	607	473	318	878	664	1009										
31-Mar-12	464	127	476	794	368	601	486	312	796	670	1049										
07-Apr-12	472	124	382	786	370	601	495	327	996	668	1009										
14-Apr-12	474	128	479	783	365	602	479	321	887	663	1049										
21-Apr-12	476	127	385	784	368	687	486	318	679	668	997										
28-Apr-12	473	124	486	788	369	612	476	316	674	674	1048										
05-May-12	468	127	486	786	386	607	375	318	768	664	1044										
12-May-12	370	154	475	671	267	404	386	346	668	651	1006										
19-May-12	350	152	381	678	265	514	473	348	672	658	1004										
26-May-12	351	142	485	665	268	502	382	347	473	652	1042										
02-Jun-12	371	124	478	667	169	402	382	343	412	651	1044										
09-Jun-12	372	48	374	670	171	427	372	303	163	650	1009										
16-Jun-12	354	58	388	671	124	428		328	N/A	N/A	1049										
23-Jun-12	373	125	484	654	174	368	386	312	219	658	1008										
05-Jul-12	346	428	372	643	184	436	481	302	481	672	263										
12-Jul-12	334	421	434	676	193	462	419	313	419	467	324										
19-Jul-12	321	329	485	584	182	367	473	348	473	394	426										

26-Jul-12	529	394	489	729	176	379	339	467	339	375	473										
06-Aug-12	25926	434	559	721	234	471	7265	432	7265	384	484										
14-Aug-12	586	413	432	678	182	486	3065	484	3065	372	386										
22-Aug-12	592	6228	382	667	146	30001	7364	426	7364	208	469										
29-Aug-12	476	5975	359	873	174	3081	7484	984	7484	729	492										
05-Sep-12	4545	737	5736	884	194	391	1399	956	1399	8244	510										
14-Sep-12	3534	638	5639	1941	243	1472	1421	908	1421	46831	532										
22-Sep-12	5423	1085	5437	1953	274	1275	1442	756	1442	41602	1541										
29-Sep-12	4403	468	6424	3904	279	30847	1542	739	1542	40502	1552										
05-Oct-12	26110	371	6443	4283	321	21261	16572	702	16572	40420	1564										
14-Oct-12	6124	482	10213	4872	521	20417	15672	742	15672	40083	1612										
22-Oct-12	6215	1203	10343	4983	586	3468	5741	982	5741	45381	1647										
29-Oct-12	6220	1308	11002	345	596	3822	5749	1083	5749	46340	1664										
04-Nov-12	904	431	1043	462	598	3955	5632	536	5632	6305	1643										
13-Nov-12	409	546	526	459	426	639	455	438	455	3035	644										
21-Nov-12	337	1045	564	542	448	658	542	534	542	3842	596										
28-Nov-12	386	482	583	804	302	625	592	627	592	3800	494										
03-Dec-12	432	140	541	742	455	540	536	743	536	703	370										
10-Dec-12	478	120	502	708	408	584	482	731	482	709	402										
17-Dec-12	458	218	603	811	434	408	586	493	586	760	450										
26-Dec-12	464	303	611	1946	501	854	591	527	591	644	530										
05-Jan-13	242	140	854	2011	398	1646	398	498			1572										
12-Jan-13	00,281	248	1646	2579	368	1947	368	529			1829										
21-Jan-13	16032	8740	1947	2986	437	3708	437	583			1987										
28-Jan-13	4259	7622	3708	16072	674	6772	674	588			10142										
03-Feb-13	4905	10073	6772	16183	5953	6872	5953	572			20582										
10-Feb-13	4261	7462	6872	15544	5861	13293	5861	579			21475										
16-Feb-13	4502	7213	6695	13998	5943	13567	7361	6233			1634										
23-Feb-13	1143	6705	6273	13952	6112	13590	7014	6430			1784										
02-Mar-13	9620	9787	7240	13887	6124	13266	6306	6046			10149										
09-Mar-13	10781	5076	7503	13896	6427	13462	7756	7011			12630										
16-Mar-13	10458	6841	7861	13562	6581	13462	7806	7103			14630										
23-Mar-13	11301	5932	7642	10741	6497	13209	6801	7213			13460										
01-Apr-13	9137	1090	7826	10764	4086	13128	6703	9137			14821										
08-Apr-13	9347	7055	7721	10893	4120	13211	6514	9347			15793										
15-Apr-13	9436	7752	7863	12933	4201	13240	6492	9436			16549										
24-Apr-13	9497	7642	8693	12611	4221	14205	6849	9497			17083										
01-May-13	9503	7663	8294	12604	4212	14213	4991	9503			17094										
08-May-13	9611	6634	2814	10386	3492	14351	4861	9611			18042										
15-May-13	9621	6845	1721	1149	3584	20113	4653	8461			17121										
22-May-13	9751	6594	1745	7241	3795	4314	4536	7801			17052										
31-May-13	4416	5421	2413	7240	5214	4901	4491	9401			2640										
07-Jun-13	4318	6402	2520	7300	5413	4011	5931	8201			2153										
14-Jun-13	4302	5601	2413	7101	4310	4622	5908	8462			1240										
21-Jun-13	2346	6031	2397		4371		5805	8696			2013										
30-May-15	8385	974	8349	14200	11816	13044	6610	6446	18085	12531	21621	1149	2178	1021	10544	23656	11685	10134	1161	9431	21156

6-Jun-15	9161	1947	8100	15395	12024	14924	6344	6262	16496	9719	21104	11525	2088	1043	9021	23447	10471	9582	1211	8269	11094
13-Jun-15	8712	1874	7964	16303	13198	15445	6126	6180	17511	10483	20501	11944	2018	1067	8905	24288	10618	10622	1063	9783	11705
20-Jun-15	8720	1094	8436	16278	13128	15813	6284	9415	19087	14471	21475	12841	1971	951	8696	24620	10640	10255	1160	9607	11745
28-Jun-15	9312	1019	8233	17487	12616	24258	6445	6587	18623	13294	23244	11207	1925	992	11457	24430	10232	10308	1235	9300	11800
4-Jul-15	8744	997	8004	15240	11350	15046	7037	8530	18553	11787	21447	9671	1906	975	1849	23407	10144	10107	1054	3697	11635
11-Jul-15	9170	934	6564	15348	11421	17084	7346	8495	18151	10963	21153	9302	1966	948	1825	24501	10234	10837	1161	3720	11682
18-Jul-15	9549	1065	7817	14216	11342	11851	7085	8394	18336	10769	21708	8607	2016	905	1747	23441	10308	10118	1185	3744	11777
26-Jul-15	9834	1113	7841	15244	11306	15070	7393	8311	17510	10721	21277	9559	1948	735	1872	24487	9277	10711	1235	3664	11563
2-Aug-15	9904	1089	8035	14347	11338	17179	7464	8214	16974	10437	22117	9979	1911	673	1858	24927	9982	10433	1210	3847	11516
9-Aug-15	9416	951	7708	23495	12528	19467	7211	7809	17695	9028	21959	9574	1871	904	1611	23933	9696	11113	1185	3380	11389
16-Aug-15	9886	995	8167	22069	12338	20830	6911	7875	16787	8789	22849	9542	1855	873	1623	23833	9711	10900	1214	3312	11276
23-Aug-15	7978	876	8557	22846	12106	21303	7234	8100	16872	8980	23413	9620	1873	752	1668	24773	9665	10902	1173	3480	11387
30-Aug-15	8650	776	8604	23563	12315	21730	7224	7782	17602	8664	23910	9949	1789	644	1653	24668	9879	11877	1156	4100	11294
6-Sep-15	10483	937	7318	24312	11598	23540	6566	7491	19446	8673	22797	10549	1556	907	1392	21729	9824	10546	1218	3365	12066
13-Sep-15	10506	972	7383	23516	11779	23516	6547	7514	17496	8650	23364	10482	1673	716	1369	21616	9778	10668	1121	3316	11952
20-Sep-15	10599	948	8365	23956	11979	23377	6416	7746	17950	8975	23411	10458	1778	683	1278	21448	9665	10718	1203	3293	11423
27-Sep-15	10622	925	7274	23436	11140	23400	6580	7548	17695	9080	23246	10436	1809	774	1366	21353	9711	10873	1208	3339	11906
4-Oct-15	10413	974	7251	24145	11571	23426	6341	9623	18414	8998	23553	10504	1832	866	1292	21124	9824	10900	1232	3237	11682
11-Oct-15	10805	806	7375	23640	12802	19352	6749	8128	18136	7843	22727	9787	1948	763	1878	20849	10686	11495	1185	3312	12202
18-Oct-15	6921	830	7488	24805	11890	22233	1926	8167	16460	9006	23198	10845	1971	811	1873	20898	8807	10822	1161	3261	11729
25-Oct-15	11247	972	8033	20507	12570	23277	5355	7853	17367	8281	23151	10527	1974	874	4129	20849	8385	10143	1183	3530	12274
1-Nov-15	11348	874	8122	21371	12662	25387	6447	7762	18564	8557	24244	10436	1897	853	5242	20954	8277	10134	1175	3764	12284
8-Nov-15	9871	1021	8394	23642	12636	15695	6566	7077	17148	9560	23029	8326	2226	778	4708	20711	8585	10958	1232	3448	11951
15-Nov-15	10005	1044	8557	24072	12848	15928	6670	7191	17855	9960	22573	7804	2203	837	4731	20781	8763	11178	1185	3479	11707
22-Nov-15	9359	1067	8697	25273	12296	16471	6721	12032	15617	9235	21744	9007	2273	768	4742	20758	8474	10980	1208	3432	11774
29-Nov-15	10604	1086	8163	23006	12825	16211	7055	11924	15932	9982	22664	9369	2488	1067	5009	20293	9052	11350	1256	3426	10027
6-Dec-15	565	68	449	1248	682	664	367	669	1728	498	1284	578	143	72	270	1103	603	613	66	271	637
13-Dec-15	588	72	479	1087	639	857	329	684	933	747	1258	641	131	78	332	1099	585	610	70	257	614
20-Dec-15	596	64	480	1090	702	839	336	669	956	647	1262	627	126	64	304	1103	506	509	62	251	602
27-Dec-15	587	76	468	1085	710	756	339	698	671	743	1273	681	135	65	326	1053	341	612	59	248	599
3-Jan-16	592	58	477	1025	693	840	346	705	1002	607	1249	660	132	67	330	1113	594	545	67	265	633
10-Jan-16	586	76	470	1094	701	836	337	657	1067	703	1292	687	127	72	329	1110	564	536	63	293	434
17-Jan-16	548	71	478	1076	643	917	239	699	1077	386	1295	698	135	65	406	1079	604	596	72	404	587
24-Jan-16	229	68	492	1065	742	920	330	661	998	365	1099	686	118	71	395	982	461	605	63	317	591
31-Jan-16	572	72	424	994	644	873	271	635	1005	664	1062	703	136	81	446	1017	603	541	68	314	477
7-Feb-16	554	58	412	851	648	336	394	573	927	624	818	640	129	66	444	936	571	564	56	318	573
14-Feb-16	564	71	422	847	693	346	399	596	829	638	827	631	131	63	450	944	574	569	61	425	584
21-Feb-16	541	67	416	748	593	379	408	602	925	621	999	611	132	57	432	965	573	576	63	432	456
28-Feb-16	548	73	403	848	695	349	401	597	923	625	1010	643	152	62	424	981	563	501	54	412	648
6-Mar-16	518	64	405	791	583	489	369	534	827	597	799	620	188	65	443	906	580	567	55	434	543
13-Mar-16	553	66	426	810	689	840	534	540	971	573	863	621	197	82	463	989	537	583	58	449	547
20-Mar-16	560	58	435	828	685	837	533	553	882	672	858	624	192	75	471	889	525	476	62	439	567
27-Mar-16	545	72	419	806	690	838	510	550	946	612	855	605	193	57	473	988	536	573	66	447	566
2-Apr-16	493	68	421	654	623	660	441	537	902	693	860	579	193	62	499	990	529	528	61	419	542
10-Apr-16	502	58	405	635	615	653	439	519	881	677	815	566	191	52	495	989	487	392	53	424	523
17-Apr-16	384	72	415	711	634	739	474	580	903	828	855	588	157	53	563	953	529	557	65	462	598
24-Apr-16	367	58	412	703	630	700	462	531	883	813	742	584	155	44	533	930	511	553	68	460	606
1-May-16	643	68	438	638	621	680	264	604	906	705	941	555	218	54	600	899	512	643	68	497	587
8-May-16	619	72	463	689	632	519	151	465	788	764	903	557	123	63	472	998	507	244	71	482	584
15-May-16	611	66	453	704	614	433	251	575	791	759	906	561	122	53	451	988	512	270	77	476	521

22-May-16	602	74	455	683	630	347	134	342	836	714	901	558	168	57	461	998	501	238	81	485	588
29-May-16	307	68	195	662	590	220	354	267	782	512	794	550	124	61	433	1052	542	185	66	450	553

5. Groundwater temperature

Date	DAFO_dom (m)	Pkor_dom(m)	Nongyang_dom(m)	Knbua_dom(m)	Thubcharn_dom(m)	Bkeo_dom(m)	PhPhueng_dom(m)	SamKa_dom(m)	Dhban_dom (m)	Thadarn_dom(m)	Hieng_dom(m)	BKeo_SOB (m amsl)	SKM_SOB (m amsl)	Pkor_SOB (m amsl)	Pkxang_SOB (m amsl)	Hieng_SOB (m amsl)	BKeo_DOB (m amsl)	SKM_DOB (m amsl)	Pkor_DOB (m amsl)	Pkxang_DOB (m amsl)	Hieng_DOB (m amsl)
01-Oct-11	29.52	28.26	29.52	28.5	29.45	29.81	29.75	28.56	29.75	29.73	27.5										
08-Oct-11	28.71	27.41	28.71	30	29.53	29.37	29.63	28.68	29.63	28.15	28.12										
15-Oct-11	29.23	28.35	29.23	29.5	29.13	28.84	28.23	29.21	28.23	29.75	27.35										
22-Oct-11	29.18	27.45	29.18	28.57	29.13	29.78	29.75	29.16	29.75	29.78	28.76										
29-Oct-11	28.76	27.37	28.76	29.72	29.16	29.82	29.73	29.18	29.73	28.59	27.68										
05-Nov-11	29.23	28.21	29.23	28.75	29.45	29.78	29.23	29.31	29.23	29.75	28.54										
12-Nov-11	29.21	28.35	29.21	29.83	28.53	28.84	29.74	29.27	29.74	29.73	27.58										
19-Nov-11	29.18	27.43	29.18	30	29.12	29.37	29.72	29.35	29.72	29.75	28.12										
26-Nov-11	29.23	28.35	29.24	29.43	28.14	29.38	28.63	28.44	28.63	29.74	28.17										
03-Dec-11	29.43	26.43	29.12	28.16	29.53	29.82	29.67	29.25	29.67	29.59	29.12										
10-Dec-11	29.18	23.92	28.32	29.73	28.47	29.53	29.75	27.37	29.75	29.43	27.37										
17-Dec-11	28.25	27.48	29.37	30	28.17	29.74	28.87	29.43	28.87	29.75	27.47										
25-Dec-11	23.50	23.45	28.71	28.5	29.13	29.81	29.75	28.46	29.23	28.59	27.31										
31-Dec-11	24.43	27.46	29.23	30	29.13	29.37	29.73	29.43	29.74	29.75	27.34										
07-Jan-12	23.45	23.35	29.18	29.5	29.16	28.84	29.23	28.52	29.72	29.73	28.14										
14-Jan-12	23.41	27.44	29.23	28.57	29.53	29.78	29.74	28.44	28.63	29.75	27.47										
21-Jan-12	28.24	23.53	29.18	29.72	28.47	29.82	29.72	29.43	29.67	29.74	27.18										
28-Jan-12	28.31	27.23	28.76	28.75	28.53	29.78	28.63	28.53	29.67	29.59	28.24										
04-Feb-12	24.53	27.42	29.23	29.83	29.12	28.84	29.67	29.23	29.75	29.73	27.31										
11-Feb-12	24.53	23.47	29.21	30	28.14	29.38	29.73	29.44	28.87	28.15	28.16										
18-Feb-12	24.62	23.48	29.23	29.73	28.53	29.37	29.67	29.46	27.44	28.59	27.34										
25-Feb-12	24.53	23.42	29.18	30	28.14	28.84	29.75	29.44	27.14	28.73	28.14										
03-Mar-12	24.26	23.53	28.76	28.5	28.47	29.78	28.87	29.44	27.24	29.75	27.47										
10-Mar-12	24.56	27.42	29.23	30	28.17	28.84	29.75	29.46	27.16	28.53	27.58										
17-Mar-12	24.16	28.43	29.21	28.75	27.44	29.37	29.73	29.42	27.53	28.75	28.12										
24-Mar-12	26.18	28.47	29.18	29.83	27.53	29.38	28.16	28.53	27.47	27.44	28.17										
31-Mar-12	24.43	23.44	29.16	30	27.47	29.82	27.53	29.44	28.16	27.14	29.12										
07-Apr-12	24.64	23.47	29.23	29.73	27.56	29.53	28.18	29.24	28.63	27.24	27.47										
14-Apr-12	24.53	23.26	29.18	29.42	28.44	28.53	30.23	29.26	29.67	27.16	27.18										
21-Apr-12	24.26	27.44	28.76	28.75	27.16	28.47	29.44	29.53	29.67	27.53	28.16										
28-Apr-12	24.28	27.53	29.23	29.83	28.14	27.18	29.63	29.46	27.75	27.47	27.37										
05-May-12	24.26	28.44	28.53	29.31	27.53	27.16	29.31	28.16	27.23	28.16	27.39										
12-May-12	27.51	28.34	27.18	28.75	28.53	29.86	28.64	28.68	29.74	29.47	27.31										
19-May-12	27.48	27.47	28.76	28.93	29.46	29.63	29.67	29.21	29.72	29.58	27.48										
26-May-12	28.50	28.35	27.23	29.06	28.54	29.54	29.76	29.16	28.63	28.63	27.36										
02-Jun-12	27.50	26.42	28.21	29	29.16	29.81	29.93	29.18	29.67	29.45	27.26										
09-Jun-12	27.46	23.97	27.16	29.75	29.47	29.45	29.45	29.31	29.75	29.72	28.35										
16-Jun-12	28.18	27.42	28.24	28.96	29.45	29	29.5	29.27	29.5	29.6	27.37										
23-Jun-12	28.26	23.41	29.26	29.76	29.49	29.1	29.73	28.46	28.93	29.58	28.24										
05-Jul-12	28.24	27.65	29.32	28.66	29.72	28.3	28.47	28.42	28.47	29.73	28.42										
12-Jul-12	29.22	29.82	29.32	29.24	28.45	29.7	29.67	27.45	29.67	28.76	28.63										
19-Jul-12	28.44	28.73	29.73	28.09	29.74	29.92	29.69	28.54	29.69	29.82	29.32										

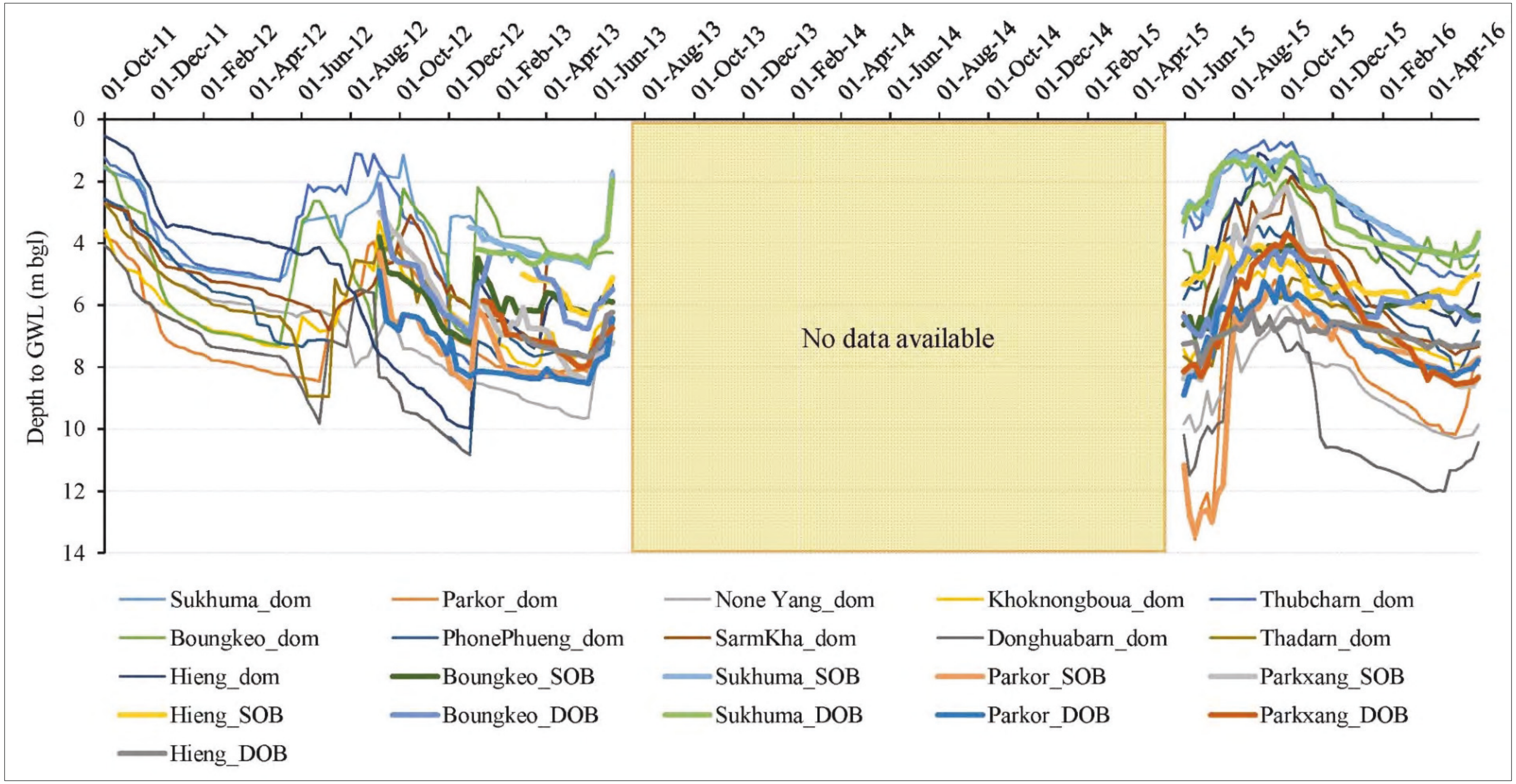
26-Jul-12	29.44	29.43	28.88	27.43	28.49	29.87	28.36	27.81	28.36	29.85	29.82
06-Aug-12	29.43	27.59	28.18	28.73	29.54	28.6	28.09	28.74	28.09	28.84	29.94
14-Aug-12	29.48	28.21	28.35	28.82	29.04	29.49	28.3	29.24	28.3	29.81	28.24
22-Aug-12	28.76	27.81	29.19	29.76	28.92	28.5	28.1	29.43	28.1	28.21	29.34
29-Aug-12	29.32	28.18	28.28	29.84	28.87	29.64	28.06	27.87	28.06	27.43	29.72
05-Sep-12	29.43	29.31	31.25	29.93	28.93	28.69	29.5	28.35	29.5	29.87	29.94
14-Sep-12	29.62	28.60	30.3	30.13	29.08	29.81	29.81	29.64	29.81	30.18	29.98
22-Sep-12	28.46	29.34	30.81	30.28	29.16	29.91	29.29	27.69	29.29	29.56	30.23
29-Sep-12	29.38	28.62	29.84	31.34	29.73	30.06	30.31	28.46	30.31	30.1	30.5
05-Oct-12	27.26	29.31	30.6	31.89	29.89	31.46	29.93	30.66	29.93	30.3	30.82
14-Oct-12	28.36	28.40	30.7	30.87	30.12	29.82	30.01	30.31	30.01	29.16	30.9
22-Oct-12	29.72	29.81	31.2	31.99	30.44	30.38	30.2	31.43	30.2	30.3	31.2
29-Oct-12	29.80	30.05	30.62	28.39	30.52	30.29	31.42	29.82	31.42	31.43	31.6
04-Nov-12	30.18	28.48	30.84	29.4	30.66	31.16	30.19	28.93	30.19	30.3	30.68
13-Nov-12	30.31	29.42	31.64	30.15	29.49	29.35	31.11	30.2	31.11	30.63	30.84
21-Nov-12	30.67	29.64	31.83	30.31	29.46	30.34	31.2	30.6	31.2	31.1	29.64
28-Nov-12	30.89	30.61	30.62	28.25	29.81	29.62	30.82	31.34	30.82	30.12	29.84
03-Dec-12	29.81	27.68	28.18	27.3	24.5	28.84	28.45	29.2	28.45	29.81	28.14
10-Dec-12	26.50	28.16	29.2	28.27	27.36	29.21	27.82	29.3	27.82	28.99	28.11
17-Dec-12	26.81	28.30	28.11	29	27.83	27.88	27.83	30.13	27.83	30.32	27.83
26-Dec-12	27.12	29.10	27.84	28.3	28.08	27.18	29.06	31.1	29.06	30.54	28.12
05-Jan-13	28.12	27.68	28.18	28.4	27.94	28.73	27.94	29.15			27.1
12-Jan-13	26.68	30.38	28.73	29.04	28.56	29.32	28.56	30.12			29.09
21-Jan-13	26.75	31.33	29.32	29.3	28.85	29.52	28.85	29.18			28.38
28-Jan-13	27.68	29.18	29.52	29.18	27.94	29.65	27.94	28.97			30.18
03-Feb-13	28.18	30.25	29.65	29.32	27.62	29.58	27.62	29.13			28.12
10-Feb-13	28.32	30.62	29.58	28	27.87	28.68	27.87	29.28			28.08
16-Feb-13	29.45	31.08	30.1	29.93	29.42	30.62	26.75	28.56			29.14
23-Feb-13	29.20	29.13	30.16	29.87	30.12	30.56	29.5	29.36			30.25
02-Mar-13	30.57	29.57	29.11	31.06	28.34	31.06	28.64	30.06			29.3
09-Mar-13	28.56	29.52	28.3	31.23	30.04	30.2	30.87	29.1			29.48
16-Mar-13	30.18	30.15	30.02	31.35	31	30.2	31	28.3			30.09
23-Mar-13	30.23	30.18	30.18	30.1	30.1	30.25	30	30.25			30.3
01-Apr-13	29.43	29.68	31.31	30.07	30.2	32.68	30.22	29.43			31.12
08-Apr-13	30.62	31.06	30.81	29.86	31.13	31.41	29.26	30.62			32.24
15-Apr-13	30.83	34.12	32.09	30.81	29.82	32.08	28.75	30.83			31.37
24-Apr-13	31.19	30.42	32.19	29.83	30.14	29.89	30.54	31.19			32.02
01-May-13	31.39	29.34	30.87	30.2	31.18	30.46	32.04	31.39			30.81
08-May-13	32.04	30.07	31.33	29.83	29.2	31.24	31.76	32.04			30.94
15-May-13	30.26	29.46	32.08	32.28	30.42	30.28	32.15	32.24			30.82
22-May-13	29.86	30.18	32.28	30.63	32.16	28.11	30.83	32.28			31.88
31-May-13	30.86	29.83	30.32	31.44	31.04	30.53	31.41	29.46			28.52
07-Jun-13	30.81	28.91	28.41	29.09	28.09	31.19	32.08	30.63			30.26
14-Jun-13	29.93	30.20	30.43	30.01	27.41	30.13	30.86	29.43			31.15
21-Jun-13	28.31	30.14	29.51		30.48		30.94	26			30.52

30-May-15	31.2	29.12	29.34	34.41	32.81	32.75	31.37	28.35	28.35	32.25	30.06	31.18	30.25	29.43	28.75	29.25	32.93	29.87	28.75	28.81	29.81

6-Jun-15	29.5	32.43	30.18	31.06	30.68	33.25	30.75	30	32.75	33.87	29.18	30.75	30.31	28.12	29.81	28.93	32.43	30.68	26.87	33.75	30.12
13-Jun-15	30.31	30.31	29.93	28.31	28.5	29.31	29.81	30.31	28.37	29.06	28.93	29.75	29.5	29.68	28.12	28.68	30.18	29.62	31.87	26.75	28.31
20-Jun-15	29.68	29.26	28.06	28.75	29.12	30.37	29.75	30.62	29.62	29.31	28.93	30.18	29.68	29.06	28.56	28.75	30.31	30.5	29.43	28.06	28.37
28-Jun-15	28.62	28.37	28.67	28.87	29.5	29.68	28.56	29.31	29.37	29.81	26.68	30.06	29.31	28.06	30.06	28.43	30.5	28.62	27.75	29.62	28.27
4-Jul-15	28.5	29.87	27.54	27.08	30.12	28.17	29.35	28.73	28.68	27.93	28.63	29.62	30.75	30.37	28.45	28.62	30.16	28.12	33.62	28.16	28.50
11-Jul-15	28.75	26.31	28.12	29.62	28.65	27.54	28.45	30.12	27.76	29.18	26.57	30.12	30.37	28.43	29.18	27.57	28.76	31.68	27.62	29.18	28.62
18-Jul-15	28.15	28	28.62	27.54	29.73	28.56	29.87	29.81	27.37	27.81	28.87	29.93	29.12	29.06	28.12	29.68	27.50	28.81	28.31	28.54	27.87
26-Jul-15	28.12	27.26	27.35	28.16	28.56	29.12	28.62	28.62	28.12	28.72	28.35	29.16	29.62	28.45	29.63	28.50	28.63	28.63	26.62	29.71	28.12
2-Aug-15	27.81	27.31	25.68	27.62	28.31	28.18	28.31	31.56	28.25	27.62	28.18	29.75	29.12	29.18	28.75	28.12	29.25	28.06	27.25	28.50	28.53
9-Aug-15	29.18	28.62	28.62	28.16	28.63	28.62	27.62	29.36	28.76	27.16	29.08	28.84	29.36	28.81	29.16	28.93	28.83	29.86	28.63	28.76	29.36
16-Aug-15	28.86	29.26	29.18	28.12	29.06	28.06	28.75	28.64	29.08	27.67	29.18	29.24	29.81	29.06	28.82	29.76	28.76	29.67	29.06	29.18	28.62
23-Aug-15	28.63	28.16	28.36	27.81	28.31	29.72	28.63	29.16	29.16	28.05	28.92	28.63	30.14	28.18	29.63	29.86	29.62	29.81	27.82	28.12	29.18
30-Aug-15	29.5	28.31	29.25	28.87	29.18	29.62	27.68	29.18	29.18	27.87	29.62	29.87	29.31	28.63	29.81	28.81	29.28	29.37	28.12	29.06	28.93
6-Sep-15	28.16	28.63	28.81	29.16	29.16	28.84	29.68	28.16	29.14	29.16	29.57	29.56	29.04	27.63	29.63	29.82	29.67	29.18	27.18	28.57	29.18
13-Sep-15	29.24	29.24	29.63	29.26	29.81	29.18	29.74	29.14	28.86	28.81	29.68	29.18	29.16	29.62	29.97	29.57	30.18	28.68	29.06	29.63	30.16
20-Sep-15	29.74	28.16	28.97	28.74	29.27	29.78	30.06	28.63	29.16	28.63	29.85	29.87	29.62	28.53	30.14	30.57	29.81	29.76	29.16	29.84	29.57
27-Sep-15	27.56	27.18	28.14	28.18	29.67	29.53	30.14	29.72	29.50	27.84	30.67	29.64	30.12	28.47	29.74	29.64	29.62	29.62	28.64	29.37	29.87
4-Oct-15	29.43	28.68	28.81	28.50	29.87	29.43	30.18	29.18	29.37	28.57	28.87	30.56	29.37	28.62	29.25	28.18	30.81	29.31	28.43	29.31	28.25
11-Oct-15	28.57	28.31	28.25	30.12	27.56	30.31	29.06	28.65	29.18	28.25	30.37	29.37	29.12	28.25	29.81	29.50	28.81	28.18	28.06	30.87	29.56
18-Oct-15	30	28.25	28.75	27.56	31.00	30.75	31.56	30.68	31.25	31.18	30.68	30.62	29.57	28.75	29.75	30.18	31.75	30.12	28.50	30.68	29.68
25-Oct-15	29.5	28.18	28.75	32.75	29.68	30.97	30.50	31.5	29.62	31.39	28.50	30.56	30.43	28.18	29.12	29.00	31.68	31.13	29.06	28.87	28.68
1-Nov-15	29.81	29.06	29.62	30.25	29.87	31.06	29.62	28.62	30.81	30.25	30.68	30.97	29.81	29.5	30.06	30.81	30.81	29.72	29.18	29.81	31.06
8-Nov-15	31.06	30.06	29.06	29.37	30.68	31.18	31.75	30.68	30.81	30.68	29.12	30.56	29.56	28.18	29.37	29.75	30.68	30.56	28.87	29.62	29.37
15-Nov-15	30.43	29.37	29.25	30.12	30.37	32.00	30.25	31.75	32.06	31.93	29.87	30.56	29.68	29.39	29.18	29.81	31.50	29.93	28.18	29.87	29.93
22-Nov-15	31.68	28.18	30.25	30.37	30.43	30.50	31.68	30.93	30.93	31.68	31.31	30.31	29.50	28.81	29.31	29.93	31.62	30.25	28.87	30.56	30.62
29-Nov-15	29.06	29.62	30.93	29.31	29.25	29.06	29.12	31.81	29.25	29.50	30.00	30.00	28.87	29.06	29.56	29.37	30.12	28.68	28.81	30.50	30.68
6-Dec-15	30.81	29.18	28.25	30.18	30.92	30.00	30.56	29.68	30.06	30.93	29.93	30.37	29.62	29.18	29.25	29.75	30.68	29.93	29.12	29.75	30.25
13-Dec-15	27.93	27.12	27.50	28.31	28.87	28.93	29.00	27.12	29.81	28.43	28.43	29.93	29.43	27.75	28.31	28.35	30.06	29.12	26.37	28.37	28.12
20-Dec-15	29.06	28.06	28.75	29.06	29.06	29.06	28.87	28.06	28.87	29.06	28.37	30.06	29.31	28.93	28.56	29.43	29.81	29.31	27.16	28.50	28.25
27-Dec-15	27.18	28.18	27.87	28.43	29.12	29.12	28.68	29.12	29.68	28.31	28.31	30.12	29.25	28.50	28.68	29.27	30.25	29.50	28.45	28.75	29.37
3-Jan-16	28.43	27.25	28.93	28.25	28.62	29.25	28.62	28.18	29.56	29.06	28.25	29.93	29.31	28.87	28.81	28.18	30.18	29.45	27.62	28.81	28.43
10-Jan-16	29	27.18	28.00	29.06	29.00	29.18	29.18	29.45	29.43	28.18	28.18	30.25	29.18	29.00	28.75	28.50	30.43	29.50	26.25	28.62	28.50
17-Jan-16	28.25	25.12	26.25	27.68	27.25	27.68	27.93	27.81	27.93	28.06	27.12	28.62	28.75	27.50	27.75	28.25	27.81	28.56	25.50	26.43	30.31
24-Jan-16	29.56	26.62	27.25	27.87	27.87	27.93	27.75	27.87	28.18	27.81	27.31	28.81	29.43	28.12	28.18	29.26	28.25	29.81	26.62	27.31	29.12
31-Jan-16	31.75	29.25	30.75	30.18	29.87	30.56	31.37	30.93	30.87	30.81	30.62	30.81	30.75	29.12	29.75	29.37	31.43	32.06	29.43	30.68	31.25
7-Feb-16	29.93	28.43	29.06	31.50	30.75	30.06	30.62	28.43	30.62	30.93	31.25	30.62	29.87	29.37	30.06	30.06	30.68	30.43	29.87	30.68	31.37
14-Feb-16	29.56	29.18	29.93	30.25	30.50	29.93	30.06	28.81	30.43	30.50	30.68	31.25	29.81	28.93	29.50	30.18	30.62	29.75	29.37	29.18	30.56
21-Feb-16	30.56	29.06	29.75	30.93	30.18	30.25	29.75	29.5	31.25	31.56	30.18	31.18	29.62	28.43	29.75	29.87	31.06	30.06	30.06	30.06	30.18
28-Feb-16	29.18	28.62	29.43	30.75	30.93	31.45	29.43	28.12	31.18	30.93	30.50	31.12	29.50	28.06	29.62	29.37	30.62	30.25	29.12	29.75	30.43
6-Mar-16	30.43	29.5	31.50	30.31	31.18	30.50	30.75	28.62	31.37	31.31	32.37	31.00	29.37	29.18	30.37	30.43	30.81	30.62	31.93	31.62	32.75
13-Mar-16	29.56	28.31	28.81	30.93	29.56	29.78	30.43	28.5	30.62	31.00	29.56	30.87	29.75	28.62	29.06	28.81	31.62	29.93	28.31	29.06	29.50
20-Mar-16	30.06	28.54	28.68	29.81	29.54	29.62	30.00	28.62	30.31	30.18	29.31	30.75	29.93	29.06	29.00	29.75	30.93	30.06	28.50	29.00	29.31
27-Mar-16	29.75	28.16	28.87	29.56	29.62	29.87	31.56	28.18	31.43	30.31	30.37	31.12	30.06	28.81	28.87	29.12	31.62	30.00	28.25	28.62	30.06
2-Apr-16	31.5	29.43	30.93	30.87	31.06	32.68	31.93	31.62	31.68	31.31	31.31	31.06	30.68	29.43	29.5	30.68	32.12	31.87	30.43	30.62	31.43
10-Apr-16	32.18	29.93	32.06	32.81	32.31	32.93	32.81	31.37	30.56	32.25	32.87	31.87	31.31	29.56	29.56	31.00	32.93	31.56	31.68	31.43	32.93
17-Apr-16	30.5	28.68	29.12	29.87	31.06	31.62	30.31	30.81	30.31	30.06	29.62	30.56	29.81	29.06	29.25	28.87	31.68	29.75	28.81	29.43	29.50
24-Apr-16	31.06	28.81	29.62	30.50	31.43	32.50	31.18	31.87	30.12	30.87	30.43	30.50	30.00	28.93	29.18	29.12	32.06	29.81	28.62	29.56	30.31
1-May-16	30.62	29.06	30.93	32.37	31.43	32.43	32.37	31.93	31.25	31.50	30.37	31.81	30.43	29.12	29.62	29.43	32.87	30.62	29.18	30.43	31.18
8-May-16	30.43	29.62	30.06	29.18	29.75	29.75	31.87	30.81	30.12	30.31	30.06	30.62	29.75	29.56	29.81	29.81	31.25	31.12	29.50	30.06	29.81
15-May-16	30.18	29.75	29.75	29.87	29.75	30.18	30.50	30.31	30.00	29.68	30.43	30.62	29.18	29.50	29.75	30.12	30.93	30.68	30.81	30.31	30.18

22-May-16	30.75	29.81	30.68	29.37	29.81	29.62	29.93	29.43	30.62	29.25	31.56	30.75	29.12	29.81	30.12	30.18	31.37	29.62	31.68	30.75	30.81
29-May-16	30.18	29.93	30.00	29.18	30.43	30.12	30.37	29.93	28.93	29.81	31.50	29.87	30.12	29.06	30.62	30.75	29.18	30.37	29.43	30.43	31.93
Average T	29.05	28.60	28.59	29.03	29.42	29.62	29.47	29.52	29.13	29.10	29.06	29.84	29.69	28.75	29.28	29.11	29.98	29.51	28.63	29.24	28.98

Appendix 12: Weekly depth to groundwater level (GWL) hydrographs at eleven domestic wells and five paired (shallow and deep) observation wells in Sukhuma District from October 2011 to May 2016



Note: dom = domestic bore, SOB = Shallow observation bore, DOB = Deep observation bore, bgl = below ground level

Appendix 13: Water chemistry and stable isotope testing

1. Water samples collections for water chemistry and isotopes analysis

The major ions (Bicarbonate, Chloride, Sulfate, Calcium, Magnesium, Sodium, and Potassium), stable isotopes ($\delta^{18}O$ and $\delta^{2}H$), and tritium were undertaken with the aim of getting a basic understanding of the connection between rainwater and groundwater and between surface water and groundwater in the Sukhuma District. The water samples from rainwater, surface water and groundwater were collected during the second field visit to Sukhuma District from 20 June to 8 July 2016 by the researcher and an assistant from the International Water Management Institute (IWMI) in Vientiane Capital.

The rainwater samples were obtained from the three different levels of rainfall intensity. The three levels of rainfall intensity were classified herein based on the visual observation in the field and rainfall data recorded at the Sukhuma District Official rain gauge. The samples of light rain (10 mm/day), normal rain (40 mm/day) and heavy rain (125 mm/day) were collected on 20 June 2016, on 23 June 2016 and on 26 June 2016, respectively. All rainwater samples were collected from the runoff from the metal roof. Three rain water samples from three different intensity of rainfall were collected for the stable isotopes analysis and one sample from the normal rain was collected for the major ions analysis as given in *Table 1*.

Table 1: The total of water samples for each water source and for each chemical testing

Sample source	**Water chemical testing**			
	Major ions	**Isotopes**	**Tritium**	**Arsenic**
Rain water (samples)	1	3	0	0
Surface water (samples)	1	3	0	0
Groundwater (samples)	7	7	2	2
Total (samples)	**9**	**13**	**2**	**2**

The surface water samples were taken from the Khamoun River at the staff gauge station. Samples were undertaken at three different levels of stream stage-height, namely low, middle and high stages. The samples of the low stage (0.2 m), the middle stage (0.8 m) and the high stage (2.6 m) were collected on 18 June 2016, on 21 June 2016 and on 23 June 2016, respectively. Three surface water samples from these three different levels of river stages were taken for the stable isotopes analysis and only one sample was collected from the middle river stage-height for the major ions analysis *(Table 1)*.

The groundwater samples were collected after the bore volumes of groundwater were purged for at least three times and values of EC, pH and temperature of groundwater were approximately stable. The groundwater samples (including seven samples for the major ions analysis and seven samples for the isotopes analysis as shown in *Table 1*) were collected at the five domestic wells (including None Yang, Sarmkha, Thubcharn, Thadarn, Boungkeo), the Sukhuma shallow observation well and the Sukhuma deep observation well. Furthermore, two groundwater samples were also collected for tritium analysis. The first sample of tritium was collected at the Sukhuma shallow observation well and another sample was taken at the Sukhuma deep observation well. The pumps were set at the depth of between 7 and 14 m bgl (average 12 m bgl) for the domestic wells. Also, the pump was set at the depth of around 17 m bgl for the Sukhuma shallow observation well and at the depth of 49 m bgl for the Sukhuma deep observation well. The time for purging the well volume took around 1 hour for the domestic wells and about 2 hours for the shallow and deep observation wells before collecting each sample of groundwater.

The physico-chemical parameters (EC, pH and temperature) of rainwater, surface water and groundwater were measured in the field with a Water Quality Meter (WA-2017SD model). The field meter was calibrated in every morning before the sampling and measurements commenced.

The major ions samples were collected in 1 L and 500 mL plastic bottles. The 20 mL plastic bottles were used for collecting the stable isotope samples. Also, the 1 L bottles were used for collecting the tritium samples. The bottles were washed for at least three times before collecting the water samples. Subsequently, sample bottles were sealed with the sticky black plastic tapes and were labelled. The label on each sample includes the project name, location name, sample code, sampling date, sample source, and sample name. All samples were then put in the cooler box for the duration of the field work and were stored in the refrigerator upon returning to the laboratory.

The major ions samples (9 samples) were delivered to and analysed by the Environmental Engineering Laboratory, Faculty of Engineering, Khon Kaen University, Thailand. The analytical data are compiled in attachments at the end of this Appendix. These data were interpreted by using AqQA water quality and chemistry software (Demo version 1.5.0.0).

The water samples for stable isotopes (13 samples) and tritium (2 samples) analysis were transported to the Thailand Institute of Nuclear Technology (Public Organization) in Bangkok, Thailand. The stable isotopes samples were analysed by using the Water Laser Isotope Analyzer Method. The units of the results were reported as “%VSMOW” for both $\delta^{18}O$ and $\delta^{2}H$. The tritium samples were analysed by using the Electrolytic Enrichment Method and the unit of results was reported as TU. The official testing results sheets for the stable isotopes and tritium from the laboratory are given in the attachments on the results of isotopes and tritium testing as shown at the end of this Appendix.

In addition, arsenic contamination in the groundwater has been found in some areas of Champasak Province and other provinces of Southern Laos (Chanpiwat et al., 2011; Cho et al., 2011). Therefore, in order to test for the Arsenic contamination in groundwater in Sukhuma District, two groundwater samples (one at the Parkxang deep observation bore on 2 December 2015 and another one at the Boungkeo shallow observation bore on 4 December 2015) were collected *(Table 1)*. The water samples were collected by using 2 litres plastic bottles after the well volume of groundwater was purged. The sample bottles were sealed by black plastic tapes and delivered to the Nam Saath's laboratory in Champasak Province. Arsenic concentration in the samples is below the detection limit. The results of the arsenic test are not further discussed in this thesis. The official test results sheet issued by the Nam Saath's laboratory in Champasak Province is given in the attachments at the end of this Appendix.

2. Outputs of water chemistry and isotopes analysis

2.1. Water chemistry

The interaction between surface water and groundwater was investigated primarily by testing the major ions samples, the isotope and the tritium samples for the water samples that collected from groundwater, river water and rain water. The methods used for analysis and the test results are described in the following paragraphs in this section.

The water samples were analysed for concentration of major ions (Bicarbonate, Chloride, Sulfate, Calcium, Magnesium, Sodium, and Potassium) at the Environmental Engineering Laboratory, Faculty of Engineering, Khon Kaen University, Thailand by using the methods as summarised in *Table 2*.

Table 2: Methods used for major ions samples tests

Parameter	**Method**
Calcium (Ca)	EDTA Titrimetric method
Magnesium (Mg)	EDTA Titrimetric method
Sodium (Na)	In-house method/Flame AAS based on Standard method
Potassium (K)	In-house method/Flame AAS based on Standard method
Bicarbonate Alkalinity (HCO_3)	EDTA Titrimetric method
Sulfate (SO_4)	Turbidimetric method
Chloride (Cl)	Argentometric: Standard method part 4500-Cl-B
Electric Conductivity (EC)	Conductivity meter
pH	pH meter

The Piper diagram is commonly used to classify water types (Piper, 1944) and the Stiff diagram is often used to identify the sources of groundwater (Stiff, 1951). These two graphical methods are useful for studying the similarities (or differences) between water samples and investigating the interaction between surface water and groundwater.

Dragon and Gorski (2015) used the Piper diagram to identify the water types of the groundwater samples from 185 wells in Poland. Bondu et al. (2018) used the Piper diagram to identify water types for 19 groundwater samples collected from the fractured bedrock aquifer in western Quebec, Canada.

The results of major ions tests for the water samples collected in Sukhuma District were plotted on the Piper diagram (Piper, 1944) by using the AqQA Software (Demo version 1.5) as shown in *Figure 1*. Summary of water types for individual water sample is given in *Table 3*.

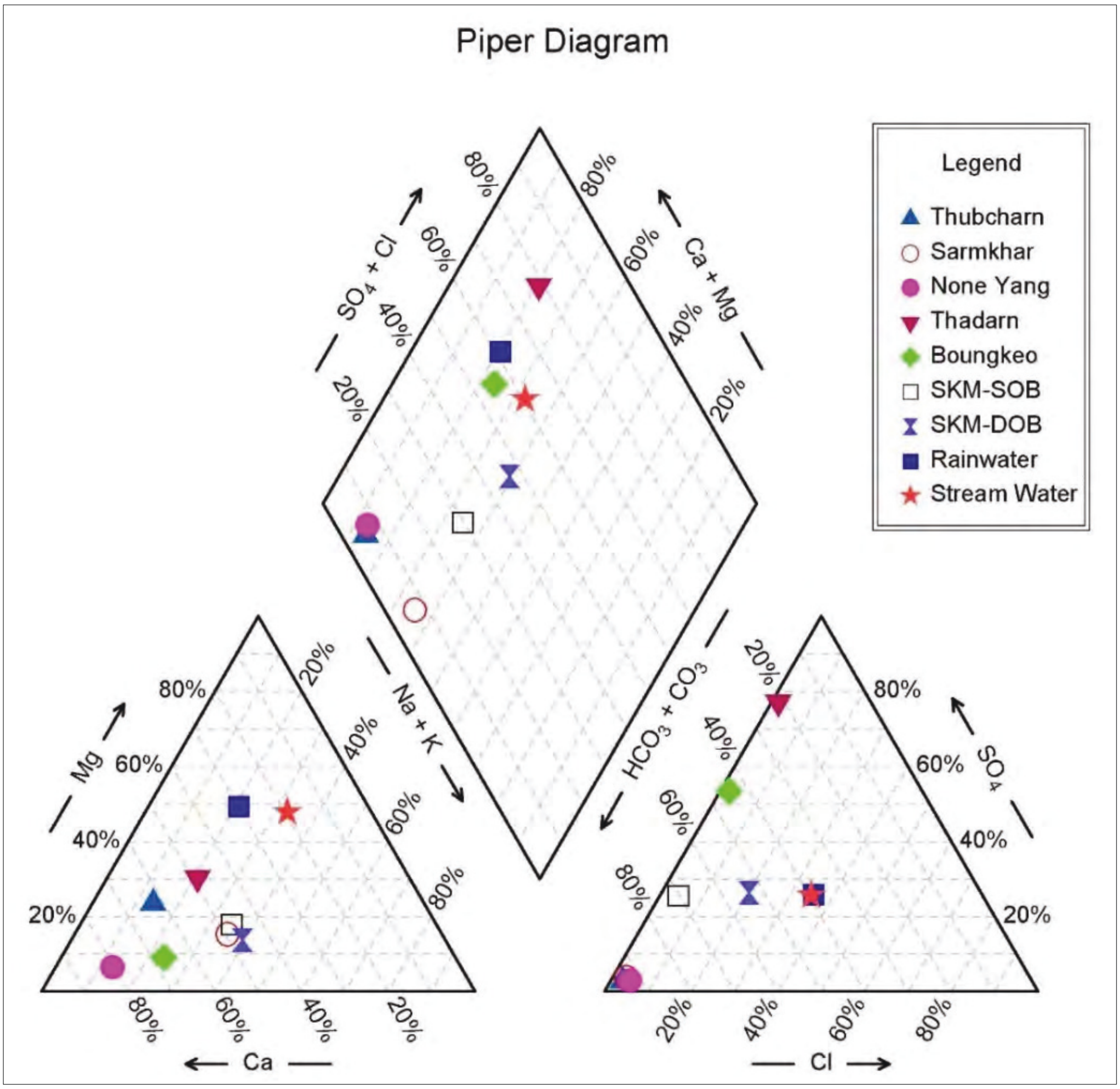


Figure 1: Piper diagram showing the groups of water samples based on the major ion chemistry analysis

Table 2: Summary of water types for individual water sample collected in Sukhuma District

Sample name/location	**Water type**	**Estimated TDS (mg/L)**	**Water source**
Thubcharn	Ca-HCO_3	465.38	Groundwater
Sarmkhar	Ca-HCO_3	414.20	Groundwater
None Yang	Ca-HCO_3	394.03	Groundwater
Thadarn	Ca-SO_4	1448.12	Groundwater
Boungkeo	Ca-SO_4	973.01	Groundwater
SKM-SOB	Ca-HCO_3	459.46	Groundwater
SKM-DOB	Ca-HCO_3	555.46	Groundwater
Rain water at SKM DAFO	Mg-HCO_3	22.83	Rain water
Stream water at the gauge	Mg-HCO_3	35.38	Stream water

Based on the results presented in *Figure 1* and *Table 3* the vast majority of water types for the groundwater samples in Sukhuma District is classified as a Ca-HCO_3 type, except for the groundwater samples at the Thadarn and Boungkeo wells that were identified as a Ca-SO_4 type. The Ca-HCO_3 water types can imply the direct recharge from rainfall with short residence times. The Ca-HCO_3 waters have values of TDS (Total Dissolved Solids) which range from 394 to 555 mg/L. The low values of TDS also indicate that groundwater in these locations is good quality.

At the Thadarn and Boungkeo wells, water chemical results show high values of TDS that are 1448 mg/L and 973 mg/L, respectively. These results also indicate that groundwater quality at these areas should be carefully tested again because the proportion of SO_4 concentration in the groundwater are considered high *(Figure 1)*. The high SO_4 and TDS concentrations in these wells may reflect the occurrence of deeper saline groundwater which has been reported anecdotally in deep wells in this area.

Furthermore, *Figure 1 and Table 3* also depict that rain water and stream water are identified as the Mg-HCO_3 types. The Mg-HCO_3 waters have a low concentration of TDS. The TDS of rain water and stream water show similarity. This can also mean a good correlation between rainfall and stream water level fluctuation.

The Stiff diagrams (Stiff, 1951) method in the AqQA Software (Demo version 1.5) was used to present the different water ions in the water samples collected in Sukhuma District as shown in *Figure 2*. This figure indicates that rainfall can be a critical source for groundwater recharge in Sukhuma District.

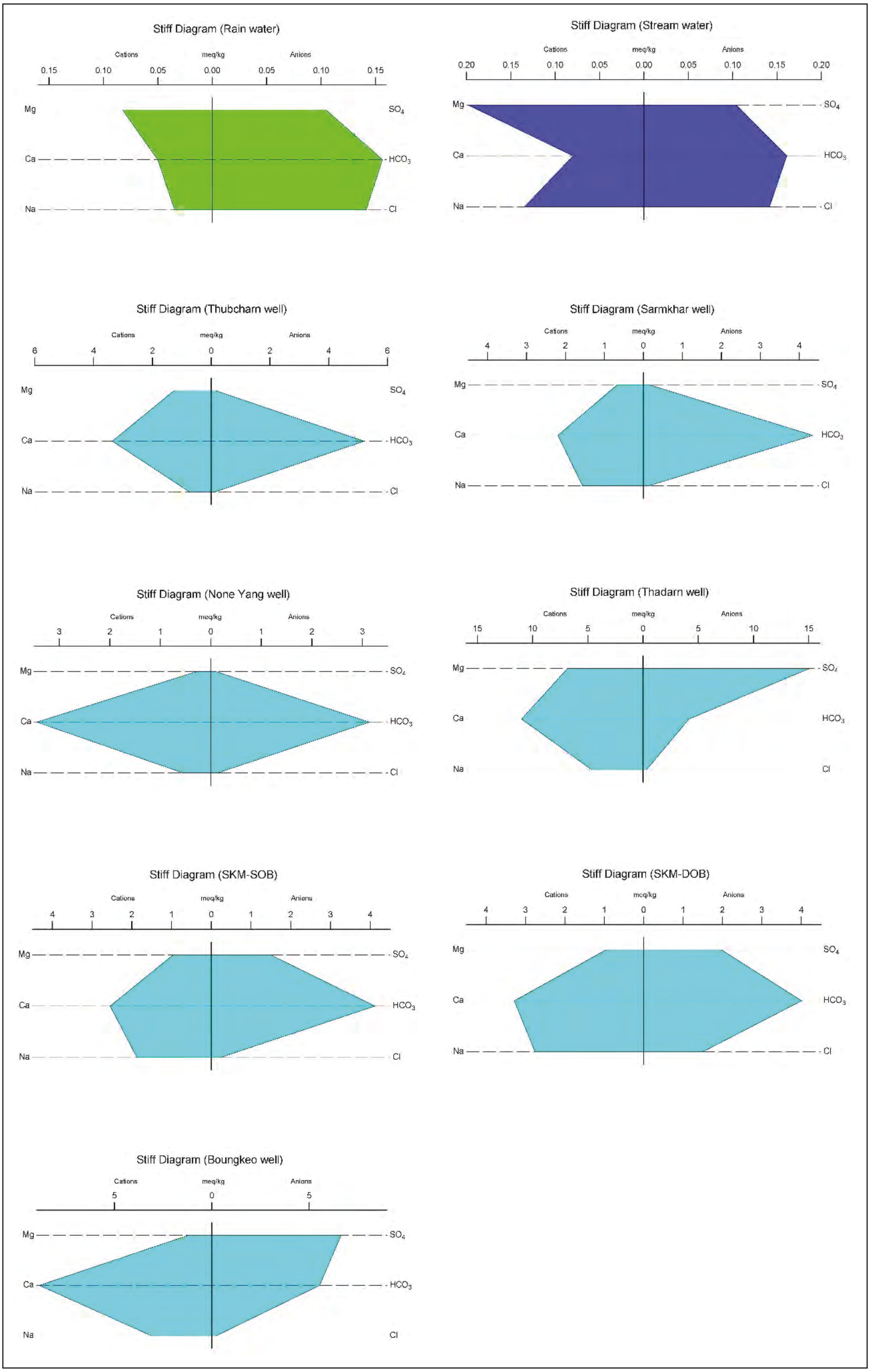


Figure 2: Stiff diagrams of the water samples collected in Sukhuma District during July 2016

2.2. Stable isotopes and tritium

The stable isotopes analysis can provide useful data on identifying the source of groundwater and investigate the interaction between groundwater and surface water. The isotopic ratio of oxygen-18 ($\delta^{18}O$) and hydrogen ($\delta^{2}H$) in different water sources (e.g. seawater, water vapour, precipitation, run-off, etc.) are all different depending on: vapour pressure, humidity, altitude, temperature and evaporation (Noipow, 2015; Tang et al., 2015). Therefore, the ratio of $\delta^{18}O$ and $\delta^{2}H$ is often used to investigate the source of groundwater recharge (Wisittammasri and Chotpantarat, 2016). For example, Wisittammasri and Chotpantarat (2016) identified the groundwater recharge area surrounding the Chulalongkorn University by analysing the stable isotopes ($\delta^{18}O$ and $\delta^{2}H$) from 10 rain water samples, 14 surface water samples and 44 groundwater samples collected in the Kaeng Khoi District, Saraburi Province of Thailand. Dun et al. (2014) used the stable isotopes analysis in identifying the interaction between river water and groundwater in the North China Plain by analysing the 19 surface water samples and 16 groundwater samples.

For the current study, the results of isotopic data from rain water, stream water and groundwater samples collected in Sukhuma District are compared to the Global Meteoric Water Line (GMWL) and the Local Meteoric Water Line (LMWL) as presented in *Figure 3*. The GMWL was created based on a linear regression equation developed by Craig (1961). The LMWL was generated from the stable isotope data of annual precipitation observed at the Bangkok station in Thailand from 1969 to 2001, at the Kunming station in China from 1986 to 2001, at the Luang Prabang station in Laos from 1961 to 1963, at the Lanzhou station in China from 1985 to 1999, at the Yangon station in Myanmar from 1961 to 1963, and in the Savannakhet Province of Laos in August 2004 (Last and Milne-Home, 2004).

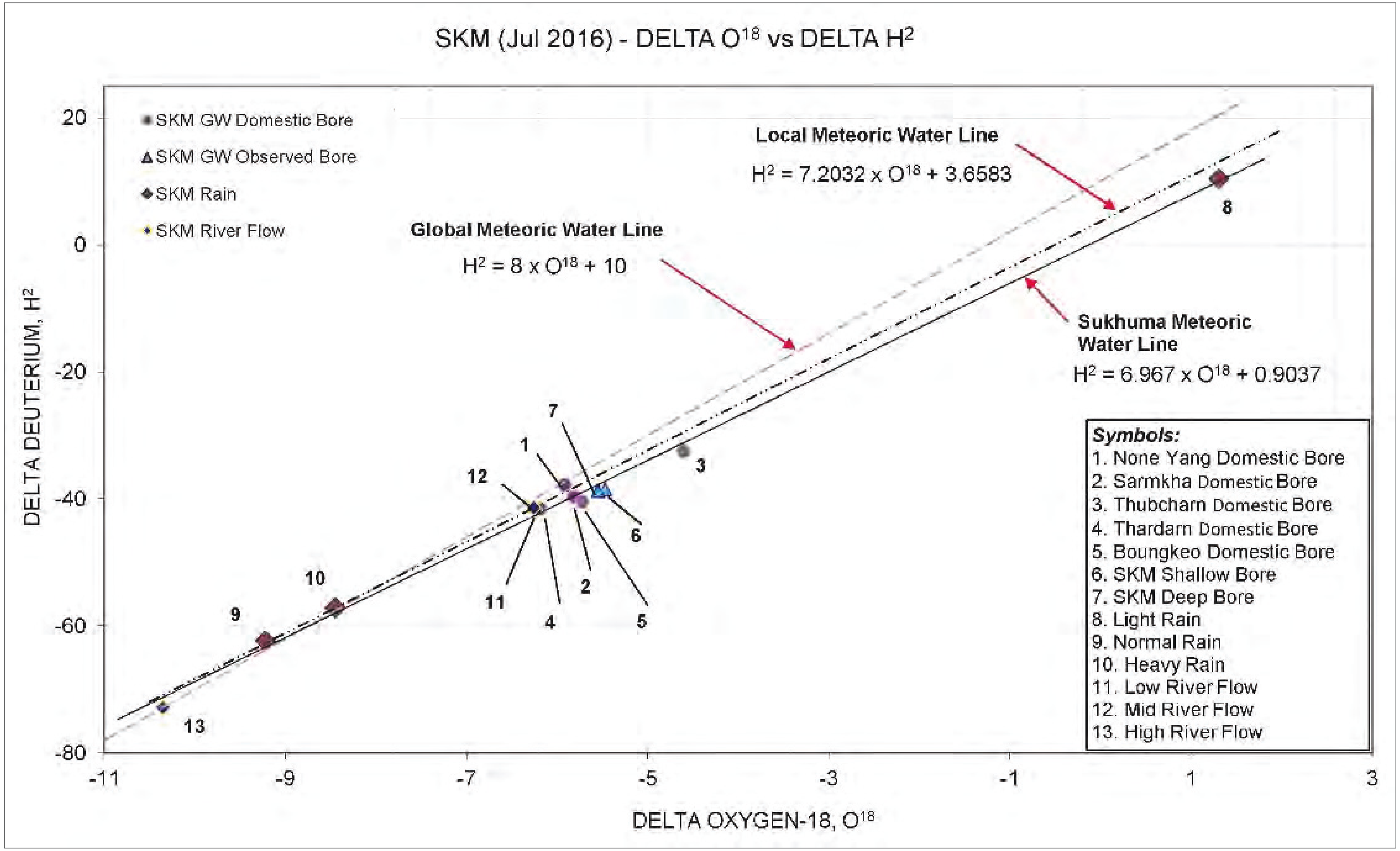


Figure 3: Stable isotope samples analysis results for water samples collected in July 2016 in Sukhuma District

The $\delta^{18}O$ and δ^2H of groundwater samples range from -6.18‰ to -4.60‰ and -41.72‰ to -32.64‰, respectively. The $\delta^{18}O$ and δ^2H of rain water samples range from -8.45‰ to 1.30‰ and -57.13‰ to 10.31‰, respectively. The $\delta^{18}O$ and δ^2H of stream water range from -10.35‰ to -6.24‰ and -72.79‰ to -41.41‰, respectively. As illustrated in Figure 3, the slope of the Sukhuma Meteoric Water Line is shifted slightly to the right of the LMWL. The isotopic ratio of oxygen-18 ($\delta^{18}O$) and hydrogen (δ^2H) from groundwater water samples are distributed along the LMWL *(Figure 3).* This indicates that the groundwater originates from direct rainfall recharge (Wisittammasri and Chotpantarat, 2016).

The results of water chemistry and the stable isotope analyses of water samples demonstrate that rainfall may be the main source of groundwater recharge in Sukhuma District. However, the number of water samples collected for this study are very sparse in both spatial and temporal.distribution. Future studies should increase the frequency of water sampling (maybe to monthly or seasonally) and design a good water sampling network to cover the entire Sukhuma District.

The two samples for tritium analysis were collected to check whether the deep groundwater had greater residence time than the shallow groundwater. However, the results may show only effects of mixing due to the placement of the well casing. An estimate of the residence time, t, of the groundwater is found from:

$$^3H = {}^3H_0 \ln \exp(0.056\ \lambda t) \qquad \text{.....................................} (1)$$

Where ^3H is the measured concentration of tritium in tritium units (TU), λ is the decay constant of tritium (equal to -0.056) and $^3H_0$ is the initial (pre-bomb) concentration of tritium in the groundwater (Kazemi et al., 2006).

If $^3H_0$ is assumed to be 4 and the measured value of ^3H in the well SKM-SL (Sukhuma Shallow well) of 0.1 TU is used in Equation (1), t is found as approximately 65 years. Values less than 0.8 TU are considered Pre 1952. This result may imply that the deep groundwater in the fractured bed rock aquifer is in the regional groundwater flow system, but still gets rainfall recharge as shown by the stable isotopes and water chemistry.

The results of the water samples analysis will not be further discussed in this thesis.

Attachments: Results from laboratory experiment

1. Arsenic concentration testing

ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ

ສັນຕິພາບ ເອກະລາດ ປະຊາທິປະໄຕ ເອກະພາບ ວັດທະນະຖາວອນ

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ແຂວງ ຈຳປາສັກ

ພະແນກສາທາລະນະສຸກແຂວງ ເລກທີ: 24....../ ອ ສ ນ

ຂະແໜງ ອ ສ ນ ແຂວງ ປາກເຊ , ວັນທີ :...8.12.2015

ໃບວິໄຈຄຸນນະພາບນ້ຳ

ຊື່..Pak xong..................ບ້ານ...........................ເມືອງ....[illegible]...........ແຂວງ.[illegible]

ຕົວຢ່າງສິ່ງກວດ: ..[illegible].... ວັນທີເກັບຕົວຢ່າງ.4.12.2015...ວັນທີວິໄຈນ້ຳ ...7.12.2015.

ລ/ດ	ລາຍການວິໄຈ	ຜົນວິໄຈ	ຫົວໜ່ວຍ	ຄ່າມາດຕະຖານ	ໝາຍເຫດ
1	ຄວາມເປັນກົດເປັນດ່າງ P H			6,5 – 8,5	
2	ຄວາມກະດ້າງຂອງນ້ຳ Hardness (caco3)		mg / l	< 300	
3	ຄວາມຂຸ້ນ Turbidlty		NTU	< 10	
4	ຟູໂອລາຍ Fluoride		mg / l	< 1,5	
5	ໄນໄຕຣ Nitrite (No2)		mg / l	3	
6	ໄນເຕຣດ Nitrate (No3)		mg / l	50	
7	ເຫຼັກ Iron (Fe)		mg / l	< 1	
8	ມັງກາເນັດ Manqanese		mg / l	< 0,5	
9	ອາເຊນິກ Asenic	00	mg / l	< 0,05	
10	ກິ່ນ ແລະ ລົດຊາດ Test and oder			ຍອມຮັບໄດ້	
11	ການຊັກນຳໄຟຟ້າ Conductivity		US /cn	1.000	
12	ເຊື້ອພະຍາດ Coliform		No /100ml	0	
13	ກລໍຣີນຕົກຄ້າງໃນນ້ຳ Residual Chlorine in Chlorine Water Supply		mg / l	0,2	

ຂໍ້ແນະນຳ:......[illegible]...

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ຫົວໜ້າພະແນກສາທາລະນະສຸກແຂວງຈຳປາສັກ: ຫົວໜ້າຂະແໜງ ອ ສ ນ ແຂວງ: ພະນັກງານວິໄຈ:

ພະແນກ ສາທາລະນະສຸກ ແຂວງຈຳປາສັກ

ພະແນກສາທາລະນະສຸກ ແຂວງຈຳປາສັກ

ຂະແໜງອະນາໄມສິ່ງແວດລ້ອມ ແລະ ຈັດການນ້ຳສະອາດ

ດຣ. ສົມກຽດ ວໍຣະຣາດ

ພຊ ສູວັນທອງ ແມນວິໄລ

ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ

ສັນຕິພາບ ເອກະລາດ ປະຊາທິປະໄຕ ເອກະພາບ ວັດທະນະຖາວອນ

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ແຂວງ ຈໍາປາສັກ

ພະແນກສາທາລະນະສຸກແຂວງ ເລກທີ: 28....../ ອ ສ ນ

ຂະແໜງ ອ ສ ນ ແຂວງ ປາກເຊ , ວັນທີ : 8.12.2015

ໃບວິໃຈຄຸນນະພາບນໍ້າ

ຊື່.....B.K. - S.2.................ບ້ານ............................ເມືອງ....ຊ.ວ.ດ...........ແຂວງ..ຈໍາປາສັກ

ຕົວຢ່າງສິ່ງກອດ: ..ນໍ້າບາດານ.. ວັນທີເກັບຕົວຢ່າງ...2..12..2015...ວັນທີວິໃຈນໍ້າ ....7..12..2015

ລ/ດ	ລາຍການວິໃຈ	ຜົນວິໃຈ	ຫົວໜ່ວຍ	ຄ່າ ມາດຕະຖານ	ໝາຍເຫດ
1	ຄວາມເປັນກົດເປັນດັ່ງ P H			6,5 – 8,5	
2	ຄວາມກະດ້າງຂອງນໍ້າ Hardness (caco3)		mg / l	< 300	
3	ຄວາມຂຸ້ນ Turbidlty		NTU	< 10	
4	ຟູໂອລາຍ Fluoride		mg / l	< 1,5	
5	ໄນໄຕຣ Nitrite (No2)		mg / l	3	
6	ໄນເຕຣດ Nitrate (No3)		mg / l	50	
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10	ກິ່ນ ແລະ ລົດຊາດ Test and oder			ຍອມຮັບໄດ້	
11	ການຊັກນໍາໄຟຟ້າ Conductivity		US /cn	1.000	
12	ເຊື້ອພະຍາດ Coliform		No /100ml	0	
13	ກລໍຣິນຕົກຄ້າງໃນນໍ້າ Residual Chlorine in Chlorine Water Supply		mg / l	0,2	

\# ຂໍ້ແນະນໍາ:......ບໍ່ພົບ ທາດອາເຊນິກ...

....

ຫົວໜ້າພະແນກສາທາລະນະສຸກແຂວງຈໍາປາສັກ:

ພະແນກ ສາທາລະນະສຸກ ແຂວງຈໍາປາສັກ

ດຣ. ສົມກຸດ ວໍຣະຣາດ

ຫົວໜ້າຂະແໜງ ອ ສ ນ ແຂວງ:

ພະແນກສາທາລະນະສຸກ ແຂວງຈໍາປາສັກ
ຂະແໜງອະນາໄມສິ່ງແວດລ້ອມ ແລະ ຈັດຫານໍ້າສະອາດ

ພຊ ສູວັນທອງ ແມນວິໄລ

ພະນັກງານວິໃຈ:

2. Ionic balance testing

Environmental Engineering Laboratory
Faculty of Engineering, Khon Kaen University
Mittraphab Road Tambol Naimuang Amphur Muang, Khon Kaen Province Tel/ Fax 0-43202571

NSC-TISI-TIS 17025
TESTING 0265

Water Analysis Report

Report Number : RP 300659/2
Client : Sinxay Vongphachanh's PhD Project
42 city Road, Chippendale, Sydney, NSW, Australia 2008
Date of Sample Receiving : June 30, 2016
Date of Analysis : June 30 - July 25, 2016
Analyzed by : Ms. Nattaya Sirisan, Ms. Jeeranant Juthong

Parameter	Unit	Sample/Code and Sample Description		
		None Yang	Sarmkhar	Thupcharn
		Ngrd 300659-1	Ngrd 300659-2	Ngrd 300659-3
		Clear and colourless	Clear and colourless	Clear and colourless with slightly sediment
pH*		6.6	7.1	7.3
Electrical Conductivity*	µS/cm	381	408	469
Bicarbonate Alkalinity*	mg/l as $CaCO_3$	244	255	288
Chloride	mg/l	< 5.0	< 5.0	5.1
Sulfate*	mg/l	< 5.0	8.7	7.6
Calcium*	mg/l	68.9	43.9	67.3
Magnesium*	mg/l	3.4	8.3	15.4
Sodium*	mg/l	12.4	35.5	16.9
Potassium*	mg/l	0.6	0.6	0.5

This report valid for analyzed sample only.
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* This parameter/result is not included in accreditation scope by Thai Industrial Standards Institute.

P. Wanny

Ms. Paisri Wannasangthong
Senior Scientist

Pinthita Mungkarndee

Assoc. Prof. Pinthita Mungkarndee
Approved Authorize

Environmental Engineering Laboratory
Faculty of Engineering, Khon Kaen University
Mittraphab Road Tambol Naimuang Amphur Muang, Khon Kaen Province Tel/ Fax 0-43202571

NSC-TISI-TIS 17025
TESTING 0265

Water Analysis Report

Report Number : RP 300659/2
Client : Sinxay Vongphachanh's PhD Project
42 city Road, Chippendale, Sydney, NSW, Australia 2008
Date of Sample Receiving : June 30, 2016
Date of Analysis : June 30 - July 25, 2016
Analyzed by : Ms. Nattaya Sirisan, Ms. Jeeranant Juthong

Parameter	**Unit**	**Sample/Code and Sample Description**		
		Thadarn	Boungkeo	Sukhuma Observation Shallow well
		Ngrd 300659-4	Ngrd 300659-5	Ngrd 300659-6
		Clear and colourless with slightly sediment	Clear and colourless with slightly sediment	Clear and colourless with slightly sediment
pH*		7.0	7.2	7.4
Electrical Conductivity*	µS/cm	1,685	1,083	504
Bicarbonate Alkalinity*	mg/l as $CaCO_3$	249	312	223
Chloride	mg/l	10.4	8.5	8.5
Sulfate*	mg/l	721	318	71.8
Calcium*	mg/l	220	177	50.9
Magnesium*	mg/l	83.0	14.6	11.7
Sodium*	mg/l	106	70.3	42.3
Potassium*	mg/l	1.3	1.8	1.0

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* This parameter/result is not included in accreditation scope by Thai Industrial Standards Institute.

P. Wannasangthong
Ms. Paisri Wannasangthong
Senior Scientist

Pinthita Mungkarndee
Assoc.Prof. Pinthita Mungkarndee
Approved Authorize
July 26, 2016

Environmental Engineering Laboratory
Faculty of Engineering, Khon Kaen University
Mittraphab Road Tambol Naimuang Amphur Muang, Khon Kaen Province Tel/ Fax 0-43202571

NSC-TISI-TIS 17025
TESTING 0265

Water Analysis Report

Report Number : RP 300659/2
Client : Sinxay Vongphachanh's PhD Project
42 city Road, Chippendale, Sydney, NSW, Australia 2008
Date of Sample Receiving : June 30, 2016
Date of Analysis : June 30 - July 25, 2016
Analyzed by : Ms. Nattaya Sirisan, Ms. Jeeranant Juthong

Parameter	Unit	Sample/Code and Sample Description		
		Sukhuma Observation Deep well	Rain Water	Stream Water
		Ngrd 300659-7	Util 300659-1	Nsur 300659-1
		Clear and colourless	Clear and colourless with slightly sediment	Brown colloidal and sedimentable
pH*		7.4	7.9	6.5
Electrical Conductivity*	µS/cm	712	2.6	22.8
Bicarbonate Alkalinity*	mg/l as $CaCO_3$	217	8	14
Chloride	mg/l	53.2	< 5.0	< 5.0
Sulfate*	mg/l	94.9	< 5.0	< 5.0
Calcium*	mg/l	65.7	< 1.0	1.6
Magnesium*	mg/l	11.7	< 1.0	2.4
Sodium*	mg/l	62.6	< 0.5	1.5
Potassium*	mg/l	1.2	< 0.5	2.7

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* This parameter/result is not included in accreditation scope by Thai Industrial Standards Institute.

P. Wannasangthong
Ms. Paisri Wannasangthong
Senior Scientist

Pinthita Mungkarndee
Assoc.Prof. Pinthita Mungkarndee
Approved Authorize
.....26 / 2016.....

3. Isotopes and Tritium testing

สถาบันเทคโนโลยีนิวเคลียร์แห่งชาติ (องค์การมหาชน)
Thailand Institute of Nuclear Technology (Public Organization)
9/9 Moo 7, Sai Mun, Ongkarak, Nakorn Nayok, 26120 Tel.+66 (0)37 392901-6Fax +66 (0)37 392913

Reporting Date: 22 September 2016
Page No.: of 1 Page (s)

Analysis Report

Customer Name: International Water Management Institute
Ref. No.:
Received Sample (s) Date: 8 July 2016
Analyzed Date: 20 September 2016
Method : Water Laser Isotope Analyzer

Results

Sr. No.	Sample Code	Lab code	$\delta^{18}O$ (‰ VSMOW))	$\delta^{2}H$ (‰ VSMOW)
1	NY	IHLS16572	-5.91	-37.88
2	SKH	IHLS16573	-5.81	-39.80
3	THC	IHLS16574	-4.60	-32.64
4	THD	IHLS16575	-6.18	-41.72
5	BK	IHLS16576	-5.72	-40.49
6	SKM-SL	IHLS16577	-5.47	-38.50
7	SKM-D	IHLS16578	-5.55	-38.77
8	L-R	IHLS16579	1.30	10.31
9	N-R	IHLS16580	-9.22	-62.31
10	H-R	IHLS16581	-8.45	-57.13
11	L-FL	IHLS16582	-6.24	-41.75
12	M-FL	IHLS16583	-6.26	-41.41
13	H-FL	IHLS16584	-10.35	-72.79

Remark

Analyzed by

Kiattipong

(Mr. Kiattipong Kamdee)
Nuclear Specialist

Verified by

Phiriyatorn Suwanmala

(Ms.Phiriyatorn Suwanmala)
Supervisor

Approved by

Phiriyatorn Suwanmala

(Ms.Phiriyatorn Suwanmala)
Director of Nuclear Research and Development Division

The resultsare available only the analyzed sample(s)

FM-RDD-48 Rev. No:00 Eff. Date:11/05/2016

Thailand Institute of Nuclear Technology (Public Organization)
9/9 Moo 7, Sai Mun, Ongkarak, Nakorn Nayok, 26120 Tel. +66 (0)37 392901-6 Fax +66 (0)37 392913

Reporting Date : 22 September 2016
Page No. : 1 Page

Analysis Report

Customer Name : International Water Management Institute
Ref. No. :
Received Sample Date : 8 July 2016
Analyzed Date : 21 September 2016
Method : Electrolytic Enrichment

Results

No.	Lab Code	Sample Code/Description	TU
1	SKM-SL	SKM-SL	0.1±0.2
2	SKM-SD	SKM-D	0.0±0.2

Remark

Analyzed by
Chakrit Saeng
(Mr. Chakrit Saengkorakot)
Nuclear Scientist

Verified by
Phiriyatorn Suwanmala
(...Ms. Phiriyatorn...Suwanmala...)
Supervisor

Approved by
Phiriyatorn Suwanmala
(Ms. Phiriyatorn Suwanmala)
Director of Nuclear Research and Development Division

The results are available only the analyzed sample (s) in destructive CO_2 preparation method.

FM-RDD-08_01 Rev. No: 00 Eff. Date: 28/04/2015

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Appendix 14: Single-well Pumping test data from the ACIAR Project

Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-I

Village: Boung Keo	Borehole N0. BH-01	Date: 25 Jul 2012	**Remark**
Casing Set up depth : 16.00 m	Static water level : 05.00 m	Start : 05:00 AM	
Drilling depth : 81.00 m	Stabilization :	End : 08:00 AM	
Pump set up depth : 50.0 m	Pump up rate : 0.90 l/sec		

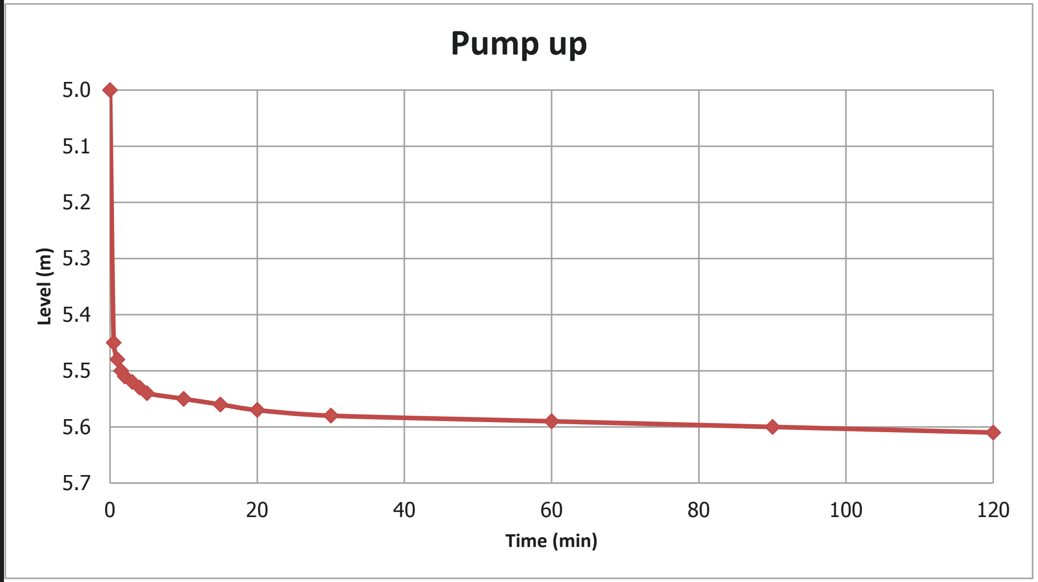
Test for Pump up			Test for Recovery		
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up
(min)	(m)	(m)	(min)	(m)	(m)
0	5.00	0.00			
0.5	5.45	0.45			
1	5.48	0.48			
1.5	5.50	0.50			
2	5.51	0.51			
3	5.52	0.52			
4	5.53	0.53			
5	5.54	0.54			
10	5.55	0.55			
15	5.56	0.56			
20	5.57	0.57			
30	5.58	0.58			
60	5.59	0.59			
90	5.60	0.60			
120	5.61	0.61			

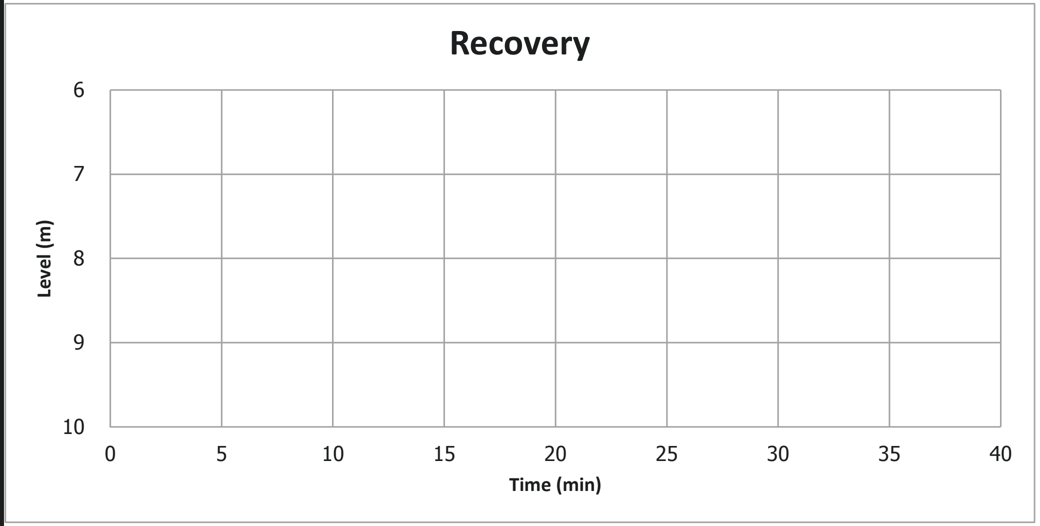
Name of practice:
Mr. Somphit Homsombath

Result of Pumping Test Data

Pump up and Recovery Volume-I
The Test bore hole Drilling in Sukhuma

Borehole N0. BH-01	Pump up Volume-I : 0.90 l/sec	Recorded by: Mr. Somphit Homsombath
Date : 25 Jul 2012		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-II

Village: Boung Keo	Borehole N0. BH-01	Date: 25 Jul 2012
Casing Set up depth : 16.00 m	Static water level : 05.00 m	Start : 05:00 AM
Drilling depth : 81.00 m	Stabilization :	End :
Pump set up depth : 50.0 m	Pump up rate : 1.51 l/sec	

Test for Pump up			Test for Recovery			Remark
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
0	5.00	0.00				
0.5	5.70	0.70				
1	5.73	0.73				
1.5	5.74	0.74				
2	5.75	0.75				
3	5.76	0.76				
4	5.77	0.77				
5	5.78	0.78				
10	5.79	0.79				
15	5.80	0.80				
20	5.81	0.81				
30	5.83	0.83				
60	5.84	0.84				
90	5.85	0.85				
120	5.86	0.86				

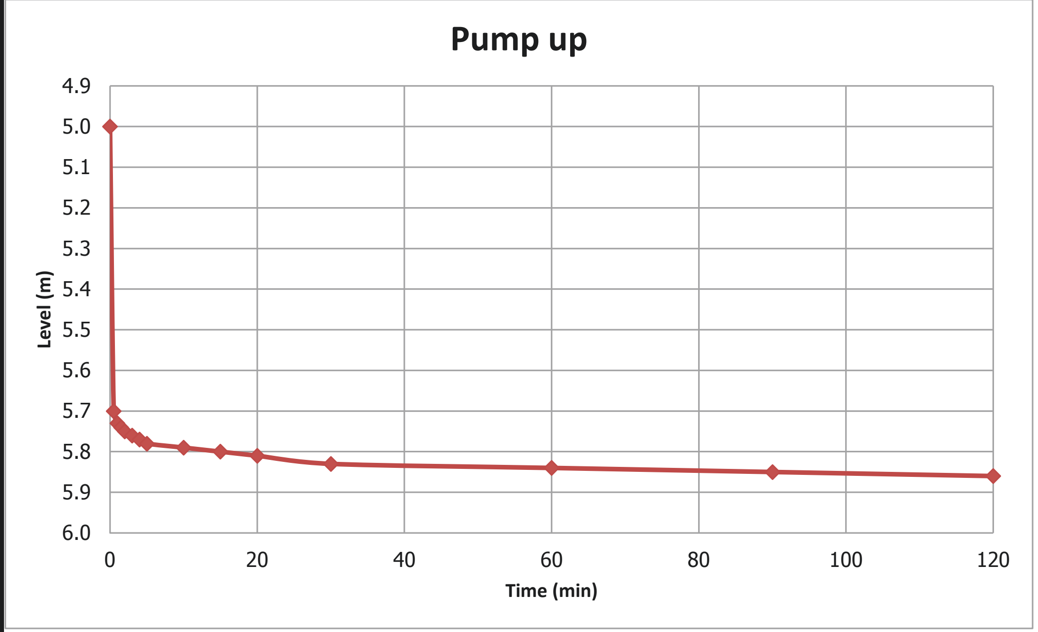
Name of practice:
Mr. Somphit Homsombath

Result of Pumping Test Data

Pump up and Recovery Volume-II

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-01	Pump up Volume-I : 1.51 l/sec	Recorded by: Mr. Somphit Homsombath
Date : 25 Jul 2012		



Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-III

Village: Boung Keo	Borehole N0. BH-01	Date: 25 Jul 2012	**Remark**
Casing Set up depth : 16.00 m	Static water level : 05.00 m	Start : 05:00 AM	
Drilling depth : 81.00 m	Stabilization :	End :	
Pump set up depth : 50.0 m	Pump up rate : 2.50 l/sec		

Test for Pump up			Test for Recovery		
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up
(min)	(m)	(m)	(min)	(m)	(m)
0	5.00	0.00			
0.5	6.02	1.02			
1	6.04	1.04			
1.5	6.05	1.05			
2	6.06	1.06			
3	6.07	1.07			
4	6.08	1.08			
5	6.09	1.09			
10	6.10	1.10			
15	6.11	1.11			
20	6.12	1.12			
30	6.13	1.13			
60	6.14	1.14			
90	6.15	1.15			
120	6.16	1.16			

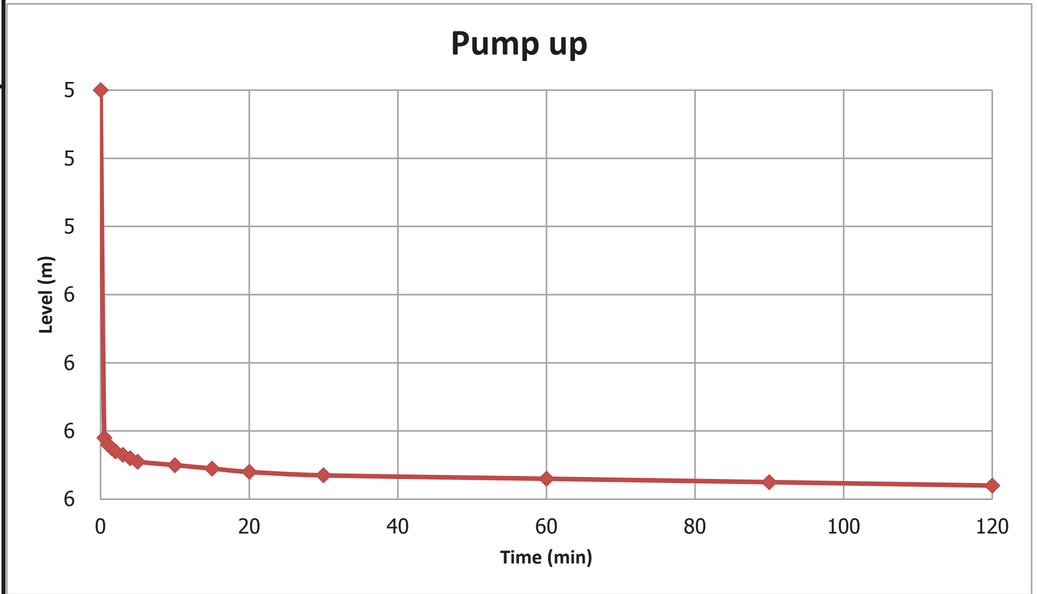
Name of practice:
Mr. Somphit Homsombath

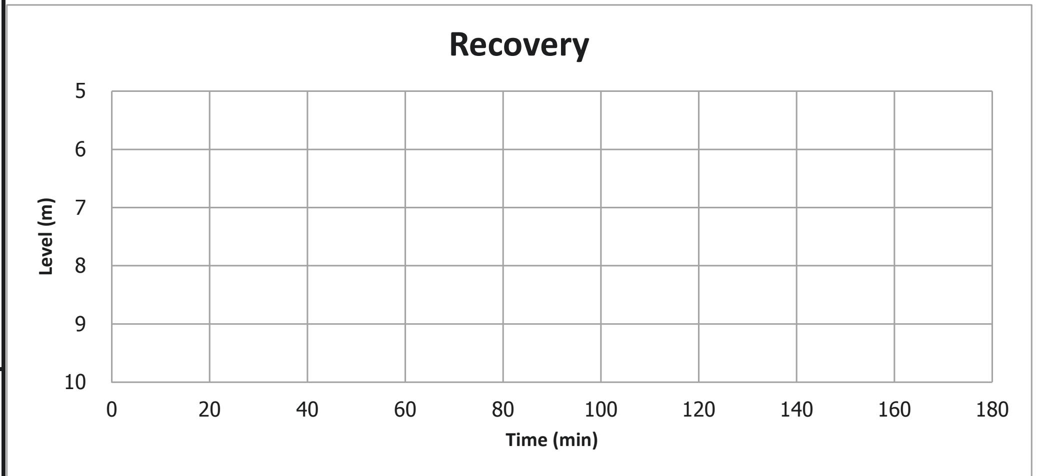
Result of Pumping Test Data

Pump up and Recovery Volum-III

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-01	Pump up Volume-I : 2.50 l/sec	Recorded by: Mr. Somphit Homsombath
Date : 25 Jul 2012		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Continuous Pump up Test & Recovery

Village: Boung Keo		Borehole N0. BH-01		Date: 25 Jul 2012		Remark
Casing Set up depth : 16.00 m		Static water level : 05.00 m		Start : 05:00 AM		
Drilling depth : 81.00 m		Stabilization :		End :		
Pump set up depth : 50.0 m		Pump up rate : 2.50 l/sec				
Test for Pump up			Test for Recovery			
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
0	5.50	0.00				
1	6.30	0.80				
2	6.41	0.80				
4	6.48	0.91				
6	6.51	0.98				
8	6.55	1.01				
10	6.58	1.05				
20	6.61	1.08				
40	6.65	1.11				
60	6.69	1.15				
120	6.75	1.19				
180	6.82	1.25				
240	6.86	1.32				
300	6.90	1.36	120	5.50	0.00	
360	6.92	1.40	60	5.55	0.05	
420	6.94	1.42	40	5.65	0.15	
480	6.95	1.44	20	6.05	0.55	
540	6.96	1.45	10	6.15	0.65	
600	6.97	1.46	8	6.23	0.73	
660	6.98	1.47	6	6.34	0.84	
720	6.99	1.48	4	6.45	0.95	
840	7.00	1.49	2	6.51	1.01	
960	7.01	1.50	1	6.56	1.06	
1200	7.01	1.51	0	7.01	1.51	

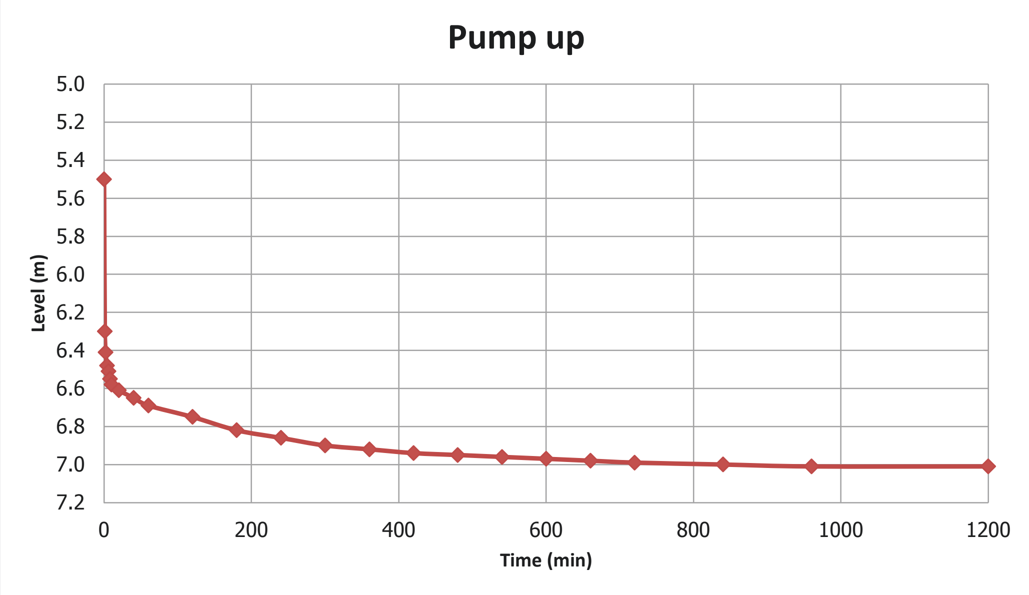
Name of practice:
Mr. Somphit Homsombath

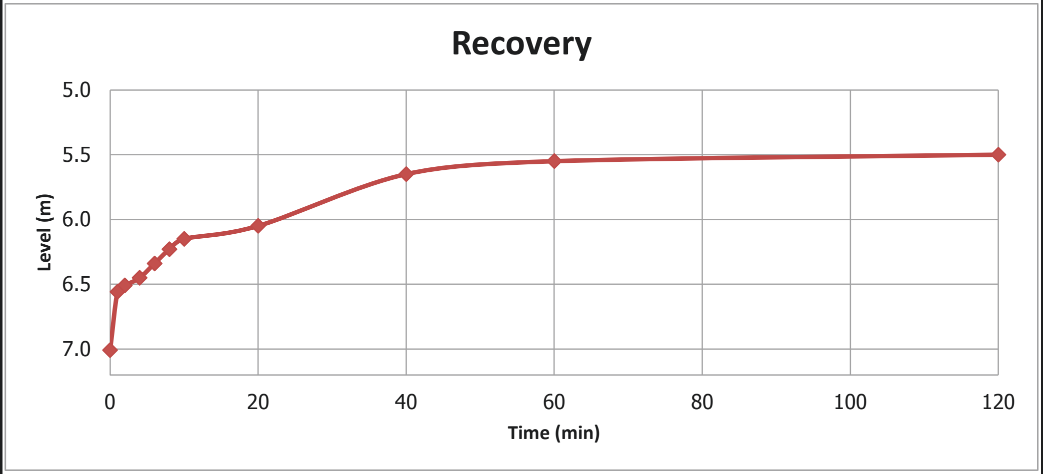
Result of Pumping Test Data

Continuous Pump up Test & Recovery

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-01	Pump up Volume-I : 2.50 l/sec	Recorded by: Mr. Somphit Homsombath
Date : 25 Jul 2012		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-I

Village: Pakor	Borehole N0. BH-02	Date: 26 - 27 July 2012
Casing Set up depth : 24.00 m	Static water level : 06.12 m	Start : 06:00 AM
Drilling depth : 70.00 m	Stabilization :	End :
Pump set up depth : 50.0 m	Pump up rate : 1.52 l/sec	

Test for Pump up			Test for Recovery			Remark
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
0	5.00	0.00				
0.5	5.45	0.45				
1	5.48	0.48				
1.5	5.50	0.50				
2	5.51	0.51				
3	5.52	0.52				
4	5.53	0.53				
5	5.54	0.54				
10	5.55	0.55				
15	5.56	0.56				
20	5.57	0.57				
30	5.58	0.58				
60	5.59	0.59				
90	5.60	0.60				
120	5.61	0.61				

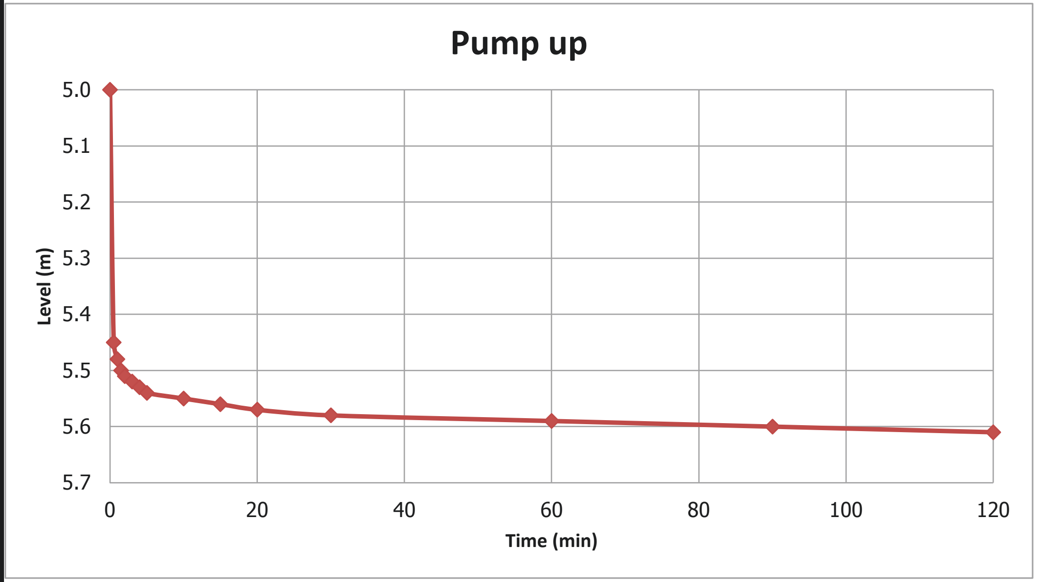
Name of practice:
Mr. Somphit Homsombath

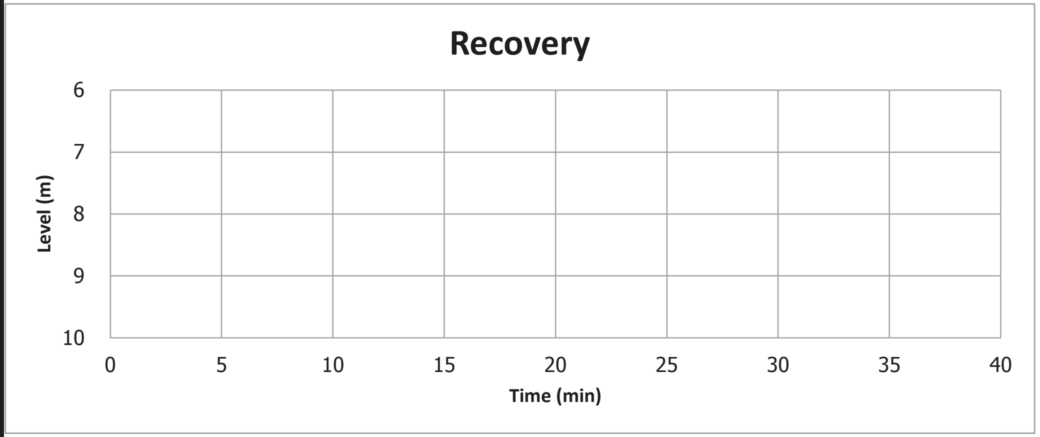
Result of Pumping Test Data

Pump up and Recovery Volume-I

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-02	Pump up Volume-I : 1.52 l/sec	Recorded by: Mr. Somphit Homsombath
Date : 27 Jul 2012		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-II

Village: Pakor	Borehole N0. BH-02	Date: 26 - 27 July 2012
Casing Set up depth : 24.00 m	Static water level : 06.12 m	Start : 06:00 AM
Drilling depth : 70.00 m	Stabilization :	End :
Pump set up depth : 50.0 m	Pump up rate : 2.1 l/sec	

Test for Pump up			Test for Recovery			**Remark**
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
0	5.00	0.00				
0.5	5.70	0.70				
1	5.73	0.73				
1.5	5.74	0.74				
2	5.75	0.75				
3	5.76	0.76				
4	5.77	0.77				
5	5.78	0.78				
10	5.79	0.79				
15	5.80	0.80				
20	5.81	0.81				
30	5.83	0.83				
60	5.84	0.84				
90	5.85	0.85				
120	5.86	0.86				

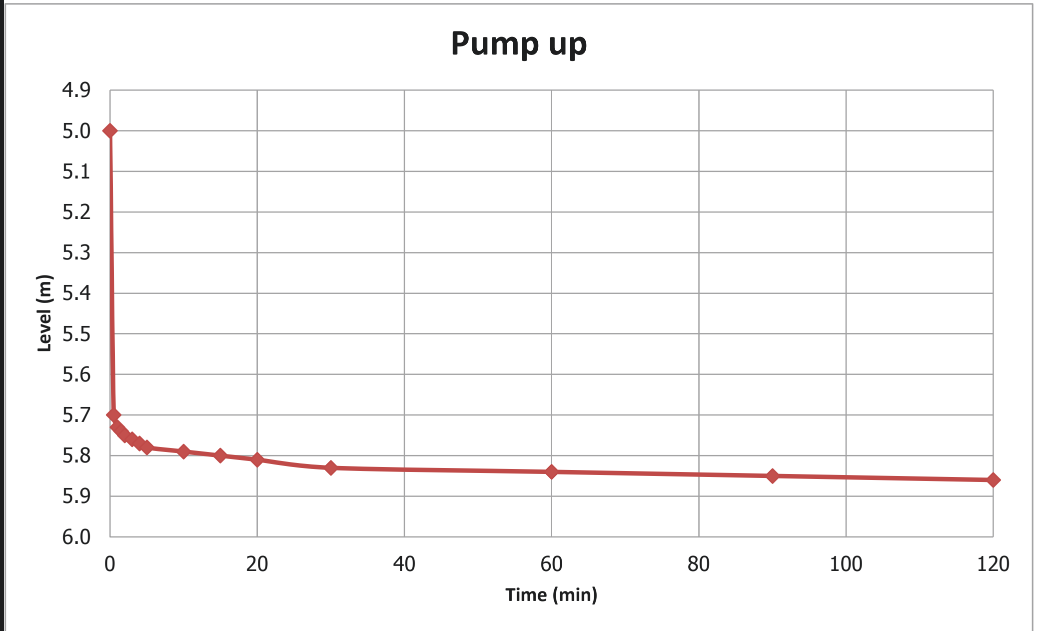
Name of practice:
Mr. Somphit Homsombath

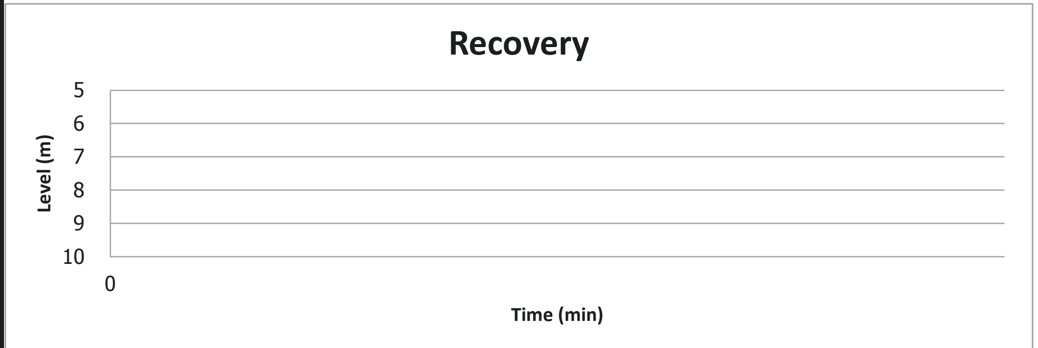
Result of Pumping Test Data

Pump up and Recovery Volume-II

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-02	Pump up Volume-I : 2.1 l/sec	Recorded by: Mr. Somphit Homsombath
Date : 26 - 27 Jul 2012		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-III

Village: Pakor	Borehole N0. BH-02	Date: 26 - 27 July 2012
Casing Set up depth : 24.00 m	Static water level : 06.12 m	Start : 06:00 AM
Drilling depth : 70.00 m	Stabilization :	End :
Pump set up depth : 50.0 m	Pump up rate : 2.6 l/sec	

Test for Pump up			Test for Recovery			Remark
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
0	5.00	0.00				
0.5	6.02	1.02				
1	6.04	1.04				
1.5	6.05	1.05				
2	6.06	1.06				
3	6.07	1.07				
4	6.08	1.08				
5	6.09	1.09				
10	6.10	1.10				
15	6.11	1.11				
20	6.12	1.12				
30	6.13	1.13				
60	6.14	1.14				
90	6.15	1.15				
120	6.16	1.16				

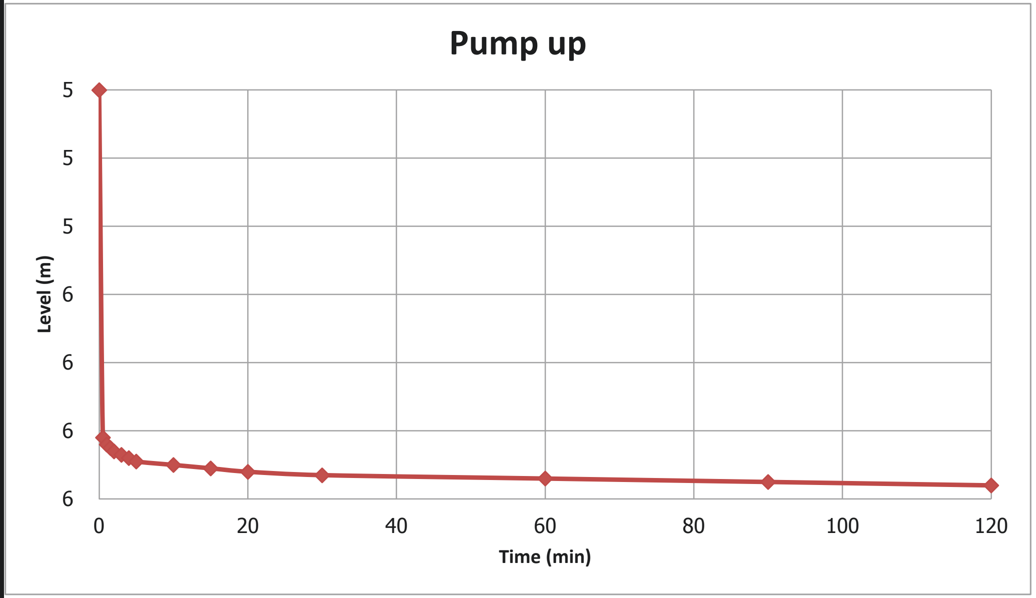
Name of practice:
Mr. Somphit Homsombath

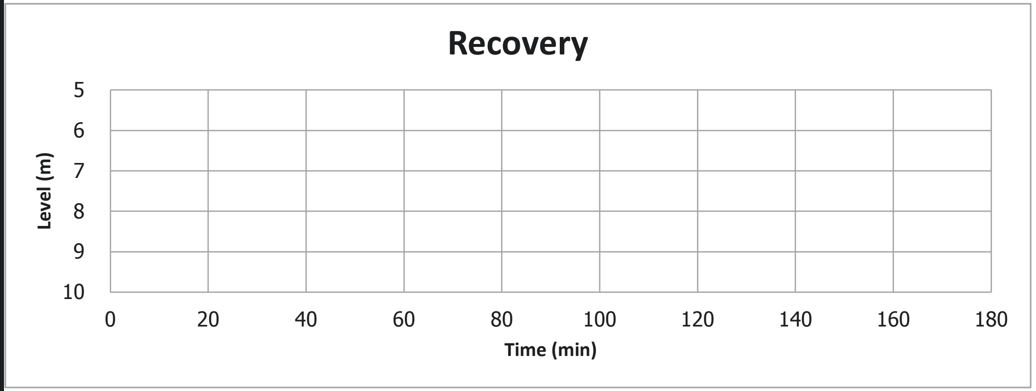
Result of Pumping Test Data

Pump up and Recovery Volume-III

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-02	Pump up Volume-I : 2.60 l/sec	Recorded by: Mr. Somphit Homsombath
Date : 26 - 27 Jul 2012		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak
PUMPING TEST RAW DATA
Continuous Pump up Test & Recovery

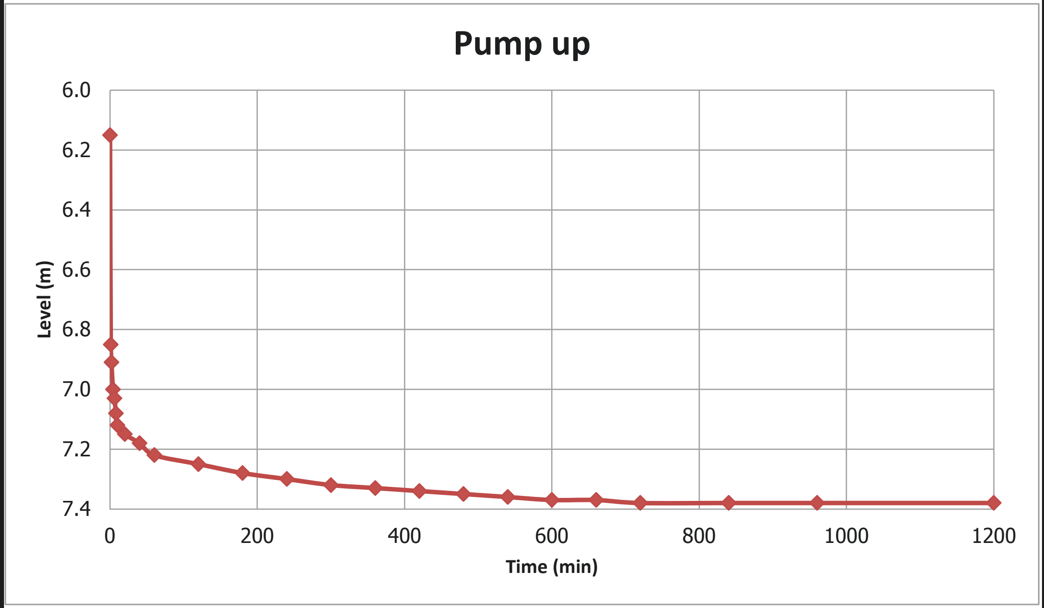
Village: Pakor	Borehole N0. BH-02	Date: 28 July 2012	Remark
Casing Set up depth : 24.00 m	Static water level : 06.15 m	Start : 06:00 AM	
Drilling depth : 70.00 m	Stabilization :	End :	
Pump set up depth : 50.0 m	Pump up rate : 2.8 l/sec		

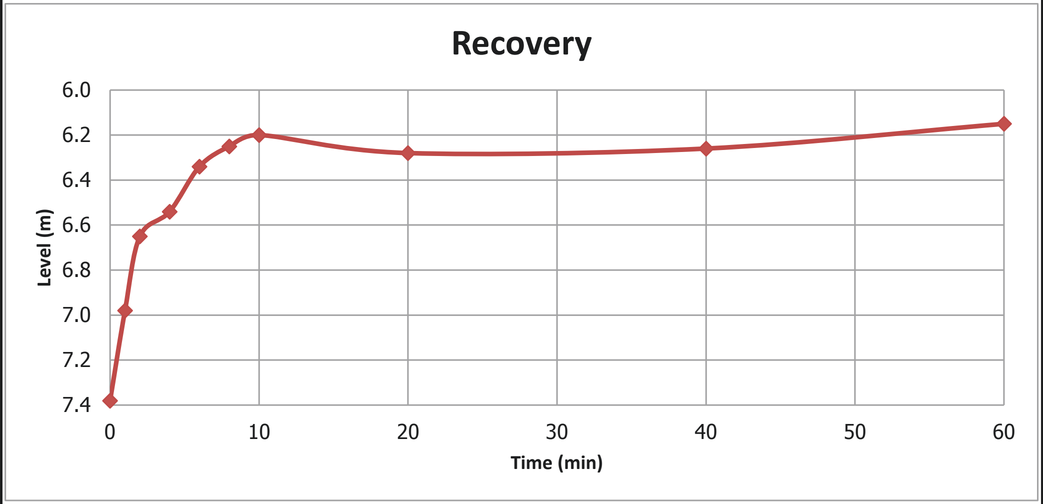
Test for Pump up			Test for Recovery		
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up
(min)	(m)	(m)	(min)	(m)	(m)
0	6.15	0.00			
1	6.85	0.70			
2	6.91	0.70			
4	7.00	0.76			
6	7.03	0.85			
8	7.08	0.88			
10	7.12	0.93			
20	7.15	0.97			
40	7.18	1.00			
60	7.22	1.03			
120	7.25	1.07			
180	7.28	1.10			
240	7.30	1.13			
300	7.32	1.15			
360	7.33	1.17	60	6.15	0.00
420	7.34	1.18	40	6.26	0.11
480	7.35	1.19	20	6.28	0.13
540	7.36	1.20	10	6.20	0.05
600	7.37	1.21	8	6.25	0.10
660	7.37	1.22	6	6.34	0.19
720	7.38	1.22	4	6.54	0.39
840	7.38	1.23	2	6.65	0.50
960	7.38	1.23	1	6.98	0.83
1200	7.38	1.23	0	7.38	1.23

Name of practice:
Mr. Somphit Homsombath

Result of Pumping Test Data
Continuous Pump up Test & Recovery
The Test bore hole Drilling in Sukhuma

Borehole N0. BH-02	Pump up Volume-I : 2.80 l/sec	Recorded by: Mr. Somphit Homsombath
Date : 28 Jul 2012		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-I

Village: Hieng	Borehole N0. BH-03		Date: 18 - 20 Jan 2013			Remark
Casing Set up depth : 16.00 m	Static water level : 07.30 m		Start :			
Drilling depth : 120.00 m	Stabilization :		End :			
Pump set up depth : 80.0 m	Pump up rate :					
Test for Pump up			Test for Recovery			
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				

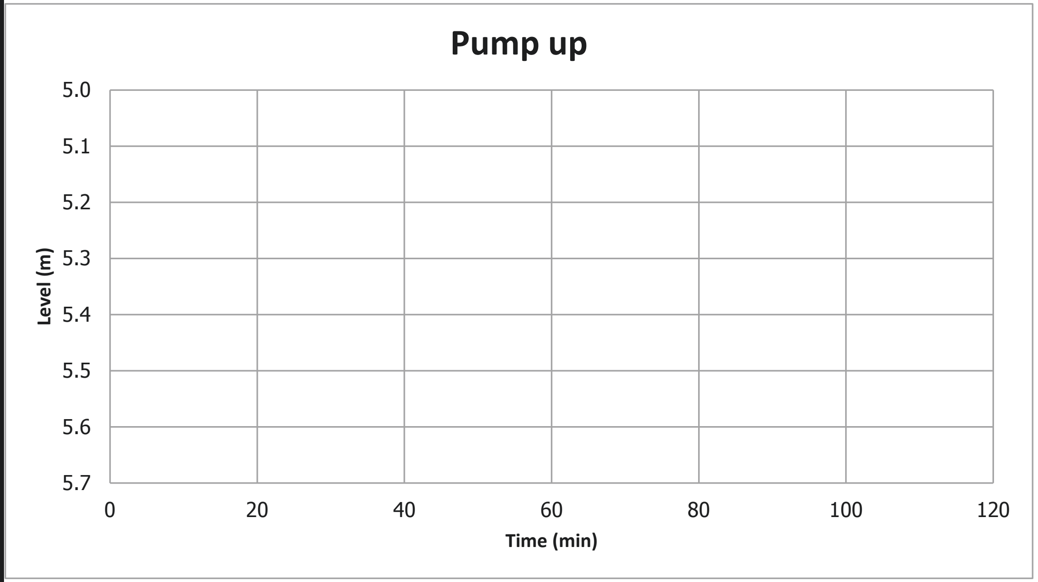
Name of practice:
Mr. Somphit Homsombath

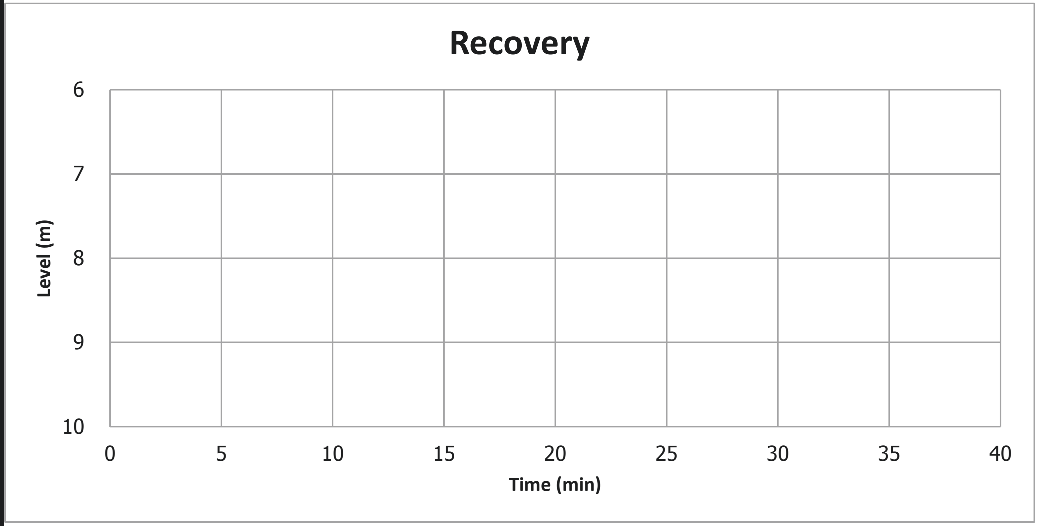
Result of Pumping Test Data

Pump up and Recovery Volume-I

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-03	Pump up Volume-I :	Recorded by: Mr. Somphit Homsombath
Date :		





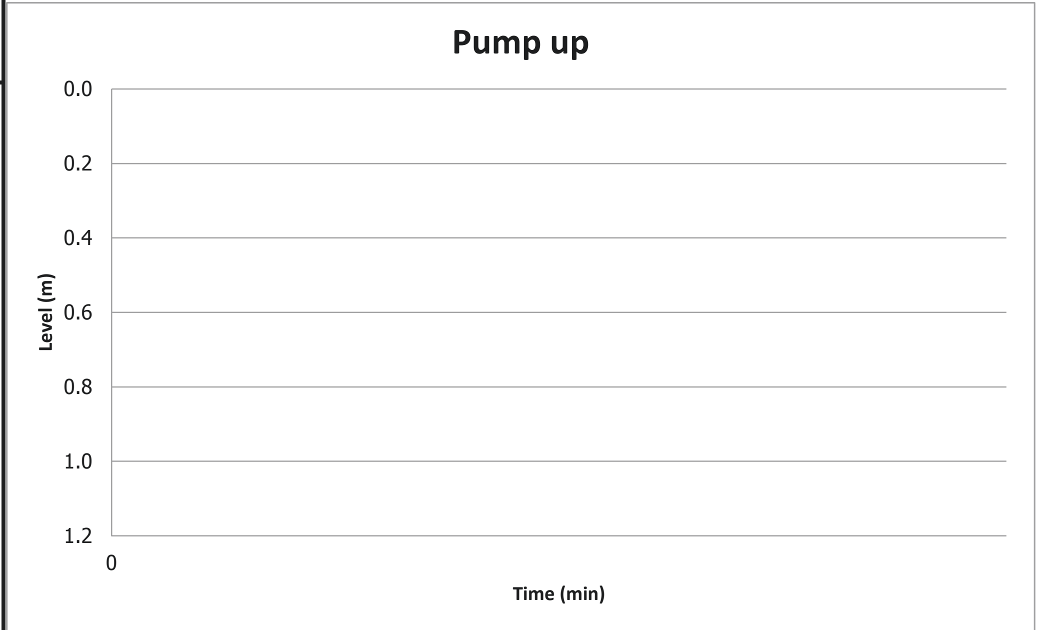
Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak
PUMPING TEST RAW DATA
Step Test & Recovery Volume-II

Village: Hieng	Borehole N0. BH-03		Date: 18 - 20 Jan 2013			**Remark**
Casing Set up depth : 16.00 m	Static water level : 07.30 m		Start :			
Drilling depth : 120.00 m	Stabilization :		End :			
Pump set up depth : 80.0 m	Pump up rate :					
Test for Pump up			Test for Recovery			
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				

Name of practice:
Mr. Somphit Homsombath

Result of Pumping Test Data
Pump up and Recovery Volume-II
The Test bore hole Drilling in Sukhuma

Borehole N0. BH-03	Pump up Volume-II :	Recorded by: Mr. Somphit Homsombath
Date :		



Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-III

Village: Hieng	Borehole N0. BH-03		Date: 18 - 20 Jan 2013			**Remark**
Casing Set up depth : 16.00 m	Static water level : 07.30 m		Start :			
Drilling depth : 120.00 m	Stabilization :		End :			
Pump set up depth : 80.0 m	Pump up rate :					
Test for Pump up			Test for Recovery			
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				
		0.00				

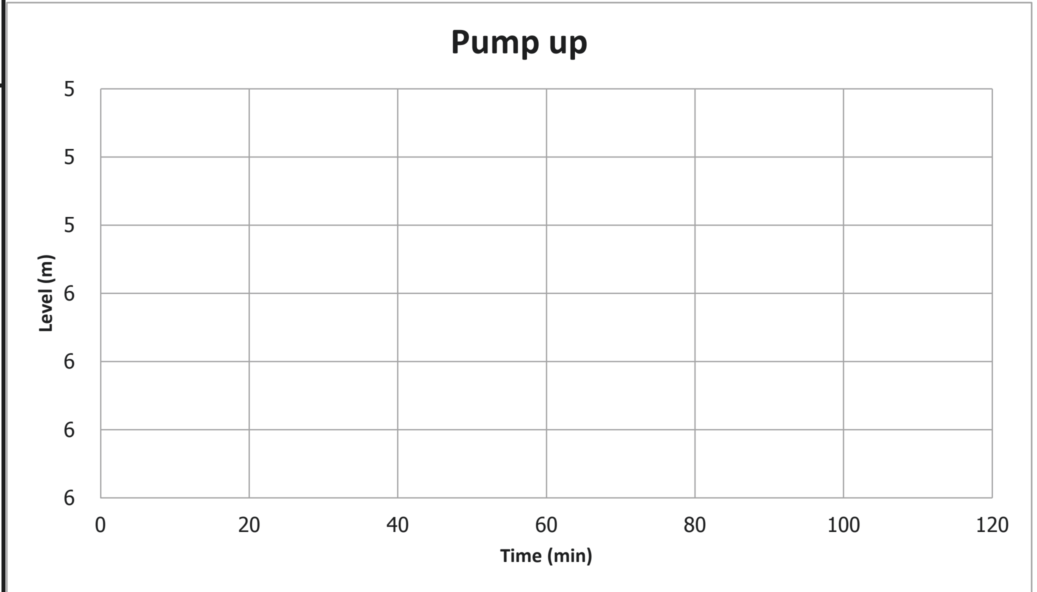
Name of practice:
Mr. Somphit Homsombath

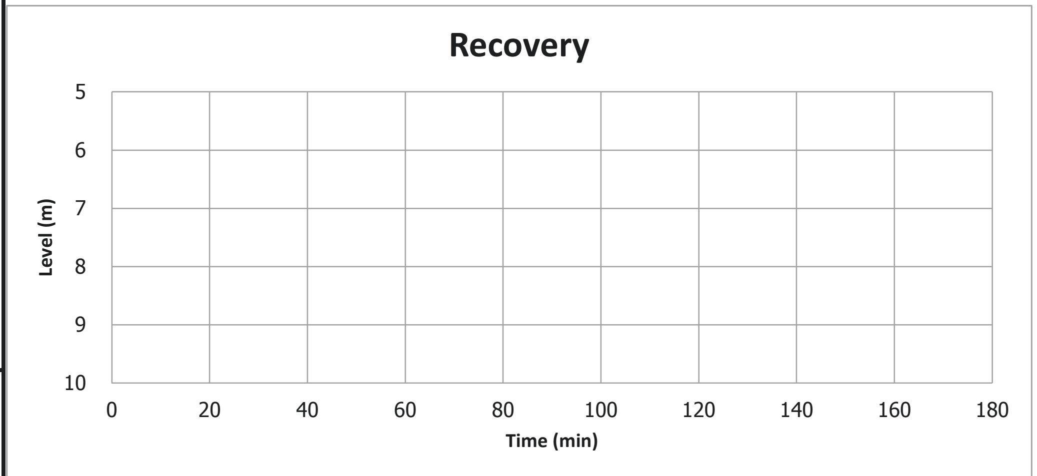
Result of Pumping Test Data

Pump up and Recovery Volume-III

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-03	Pump up Volume-I :	Recorded by: Mr. Somphit Homsombath
Date :		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak
PUMPING TEST RAW DATA
Continuous Pump up Test & Recovery

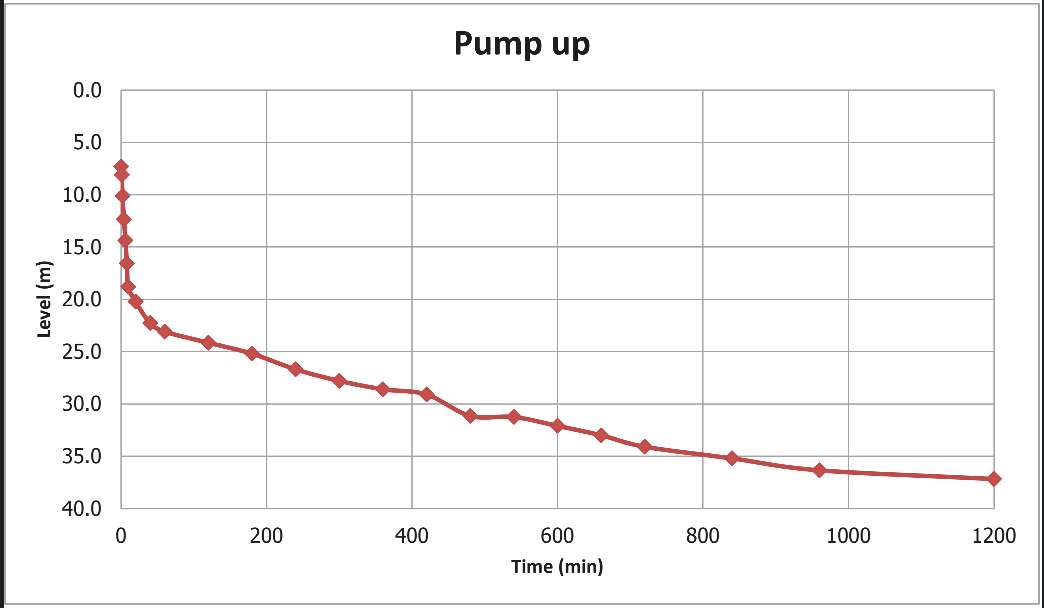
Village: Hieng	Borehole N0. BH-03	Date: 7 Feb 2013
Casing Set up depth : 16.00 m	Static water level : 07.30 m	Start : 08:40 AM
Drilling depth : 120.00 m	Stabilization :	End :
Pump set up depth : 80.0 m	Pump up rate : 0.10 l/sec	

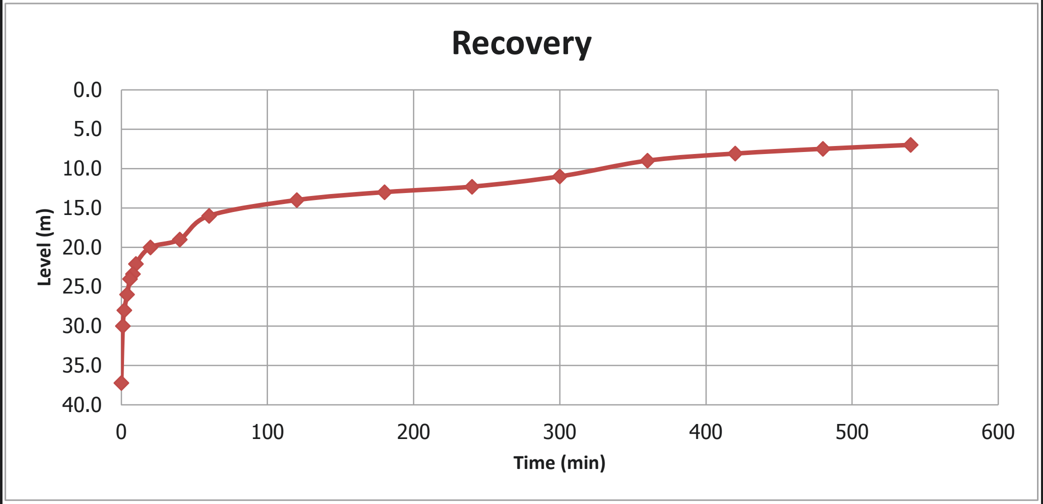
Test for Pump up			Test for Recovery			Remark
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
0	7.30	0.00				
1	8.10	0.80				
2	10.12	0.80				
4	12.34	2.82				
6	14.37	5.04				
8	16.56	7.07				
10	18.80	9.26	540	7.00	-0.30	
20	20.23	11.50	480	7.50	0.20	
40	22.28	12.93	420	8.10	0.80	
60	23.10	14.98	360	9.00	1.70	
120	24.15	15.80	300	11.00	3.70	
180	25.20	16.85	240	12.30	5.00	
240	26.70	17.90	180	13.00	5.70	
300	27.80	19.40	120	14.00	6.70	
360	28.60	20.50	60	16.00	8.70	
420	29.10	21.30	40	19.00	11.70	
480	31.15	21.80	20	20.00	12.70	
540	31.25	21.80	10	22.10	14.80	
600	32.10	23.85	8	23.40	16.10	
660	33.00	23.95	6	24.00	16.70	
720	34.10	24.80	4	26.00	18.70	
840	35.21	25.70	2	28.00	20.70	
960	36.35	26.80	1	30.00	22.70	
1200	37.18	27.91	0	37.23	29.93	

Name of practice:
Mr. Somphit Homsombath

Result of Pumping Test Data
Continuous Pump up Test & Recovery
The Test bore hole Drilling in Sukhuma

Borehole N0. BH-03	Pump up Volume-I : 0.1 l/sec	Recorded by: Mr. Somphit Homsombath
Date : 28 Jul 2012		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-I

Village: Park Xang	Borehole N0. BH-04	Date: 5 Feb 2013	**Remark**
Casing Set up depth : 16.00 m	Static water level : 07.10 m	Start : 10:20 AM	
Drilling depth : 51.00 m	Stabilization :	End :	
Pump set up depth : 50.0 m	Pump up rate : 0.90 L/s		

Test for Pump up			Test for Recovery		
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up
(min)	(m)	(m)	(min)	(m)	(m)
0	7.10	0.00			
0.5	8.45	1.35			
1	8.45	1.35			
1.5	8.45	1.35			
2	8.45	1.35			
3	8.45	1.35			
4	8.45	1.35			
5	8.45	1.35			
10	8.45	1.35			
15	8.45	1.35			
20	8.45	1.35			
30	8.45	1.35			
60	8.45	1.35			
90	8.45	1.35			
120	8.45	1.35			

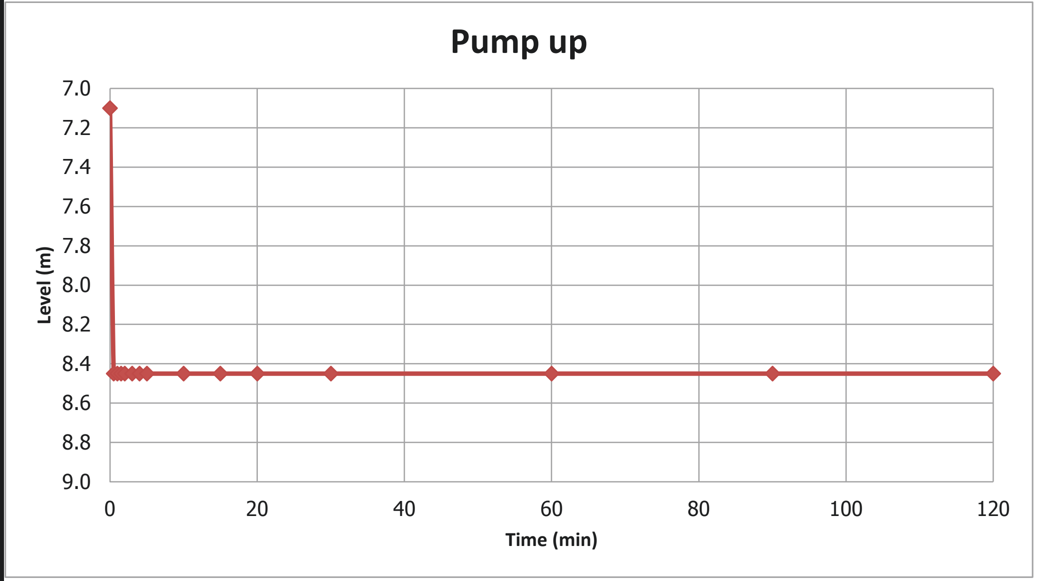
Name of practice:
Mr. Somphit Homsombath

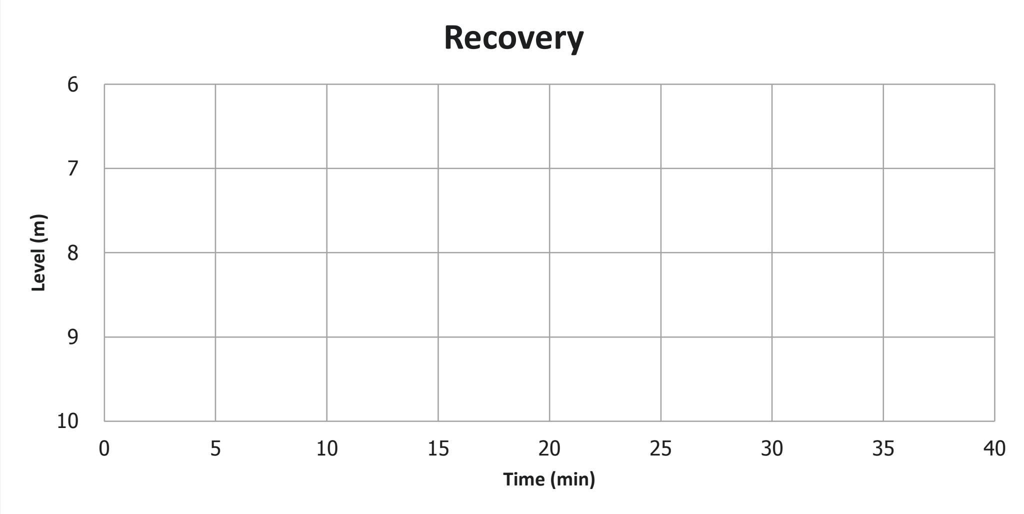
Result of Pumping Test Data

Pump up and Recovery Volume-I

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-04	Pump up Volume-I : 0.90 L/s	Recorded by: Mr. Somphit Homsombath
Date : 5 Feb 2013		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-II

Village: Park Xang	Borehole N0. BH-04	Date: 5 Feb 2013	**Remark**
Casing Set up depth : 16.00 m	Static water level : 07.10 m	Start : 10:20 AM	
Drilling depth : 51.00 m	Stabilization :	End :	
Pump set up depth : 50.0 m	Pump up rate : 1.51 L/s		

Test for Pump up			Test for Recovery		
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up
(min)	(m)	(m)	(min)	(m)	(m)
0	7.10	0.00			
0.5	8.70	1.60			
1	8.70	1.60			
1.5	8.70	1.60			
2	8.70	1.60			
3	8.70	1.60			
4	8.70	1.60			
5	8.70	1.60			
10	8.70	1.60			
15	8.70	1.60			
20	8.70	1.60			
30	8.70	1.60			
60	8.70	1.60			
90	8.70	1.60			
120	8.70	1.60			

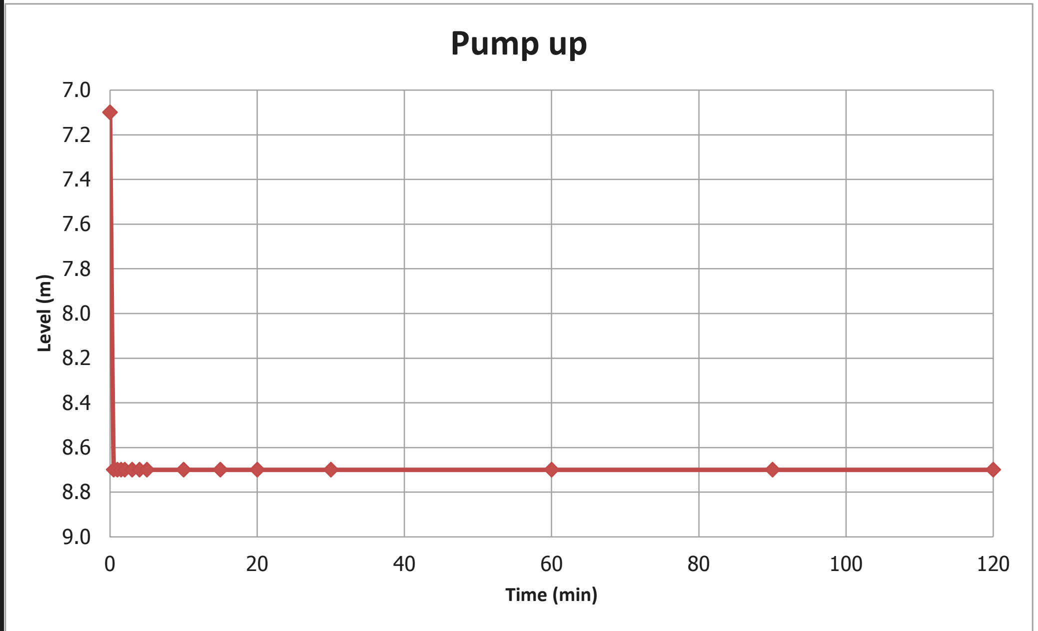
Name of practice:
Mr. Somphit Homsombath

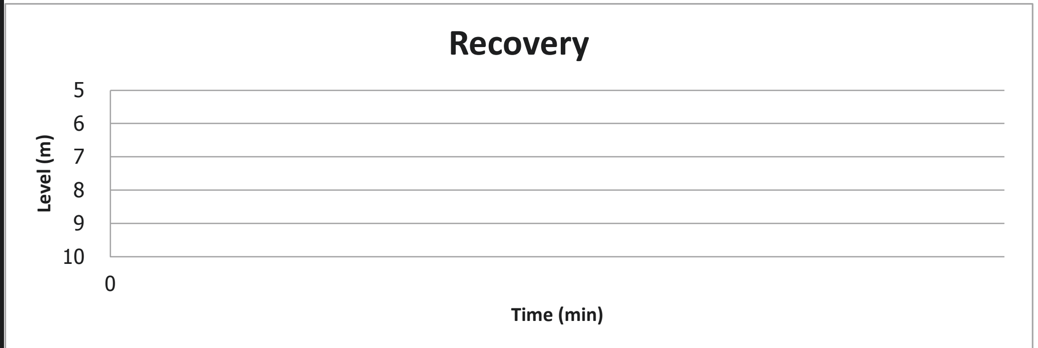
Result of Pumping Test Data

Pump up and Recovery Volume-II

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-04	Pump up Volume-II : 1.51 L/s	Recorded by: Mr. Somphit Homsombath
Date : 5 Feb 2013		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-III

Village: Park Xang	Borehole N0. BH-04	Date: 5 Feb 2013	**Remark**
Casing Set up depth : 16.00 m	Static water level : 07.30 m	Start :	
Drilling depth : 51.00 m	Stabilization :	End :	
Pump set up depth : 50.0 m	Pump up rate : 4.2 L/s		

Test for Pump up			Test for Recovery		
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up
(min)	(m)	(m)	(min)	(m)	(m)
0	7.10	0.00			
0.5	8.71	1.61			
1	8.72	1.62			
1.5	8.73	1.63			
2	8.74	1.64			
3	8.75	1.65			
4	8.76	1.66			
5	8.77	1.67			
10	8.78	1.68			
15	8.78	1.68			
20	8.78	1.68			
30	8.78	1.68			
60	8.78	1.68			
90	8.78	1.68			
120	8.78	1.68			

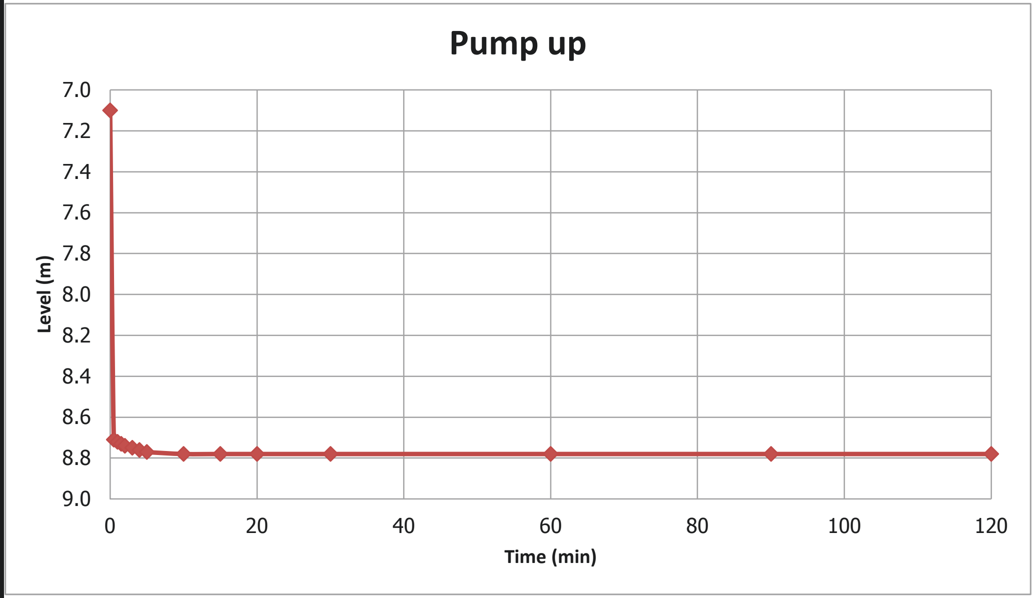
Name of practice:
Mr. Somphit Homsombath

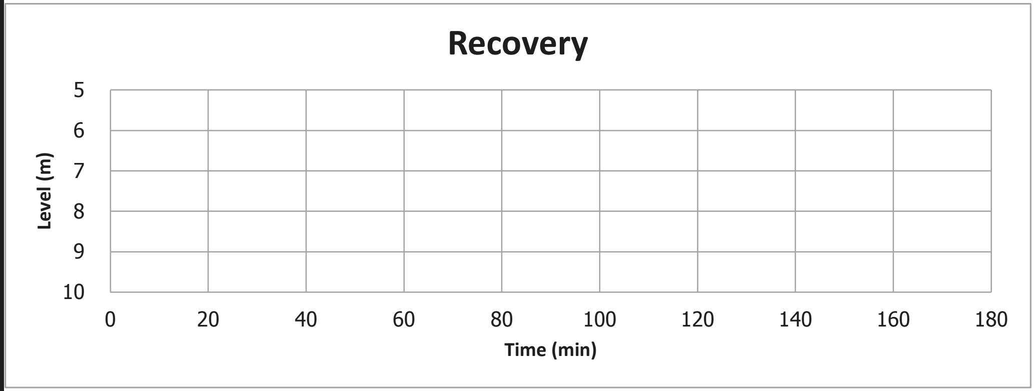
Result of Pumping Test Data

Pump up and Recovery Volume-III

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-04	Pump up Volume-III : 4.2 L/s	Recorded by: Mr. Somphit Homsombath
Date :		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Continuous Pump up Test & Recovery

Village: Park Xang	Borehole N0. BH-04	Date: 5 - 6 Feb 2013	**Remark**
Casing Set up depth : 16.00 m	Static water level : 07.10 m	Start :	
Drilling depth : 53.00 m	Stabilization :	Ending :	
Pump set up depth : 50.0 m	Pump up rate : 3.9 L/s		

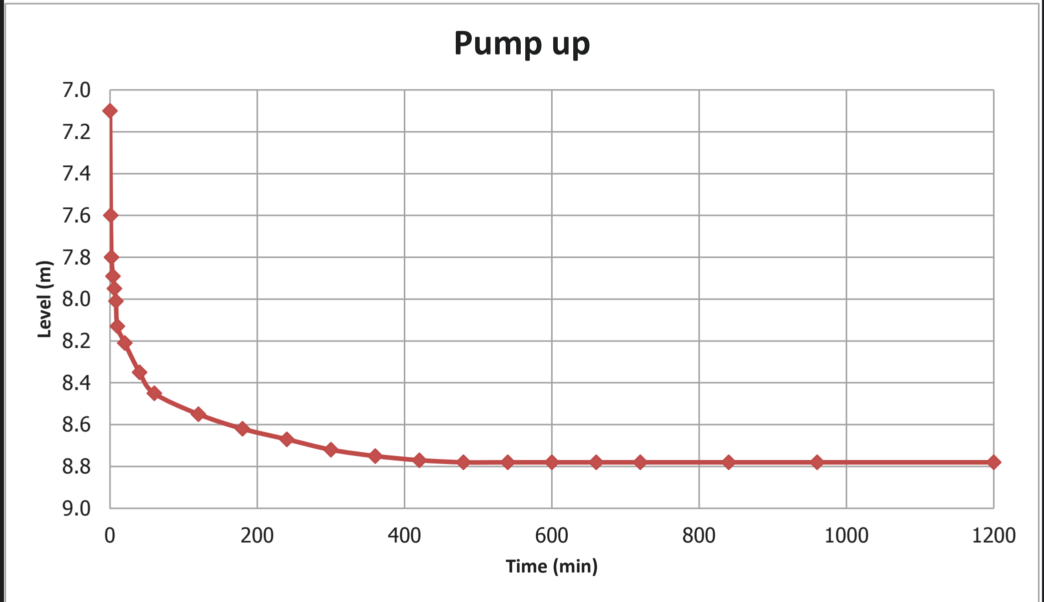
Test for Pump up			Test for Recovery		
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up
(min)	(m)	(m)	(min)	(m)	(m)
0	7.10	0.00			
1	7.60	0.50			
2	7.80	0.70			
4	7.89	0.79			
6	7.95	0.85			
8	8.01	0.91			
10	8.13	1.03			
20	8.21	1.11			
40	8.35	1.25			
60	8.45	1.35			
120	8.55	1.45			
180	8.62	1.52			
240	8.67	1.57			
300	8.72	1.62			
360	8.75	1.65			
420	8.77	1.67			
480	8.78	1.68			
540	8.78	1.68	10	7.10	0.00
600	8.78	1.68	8	7.25	0.15
660	8.78	1.68	6	7.34	0.24
720	8.78	1.68	4	7.54	0.44
840	8.78	1.68	2	7.65	0.55
960	8.78	1.68	1	7.98	0.88
1200	8.78	1.68	0	8.78	1.68

Name of practice:
Mr. Somphit Homsombath

Result of Pumping Test Data

Continuous Pump up Test & Recovery
The Test bore hole Drilling in Sukhuma

Borehole N0. BH-04	Pump up Volume-I : 3.9 L/sec	Recorded by: Mr. Somphit Homsombath
Date : 5 - 6 Feb 2012		



Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-I

Village: Sukhuma	Borehole N0. BH-05	Date: 3 Feb 2013	**Remark**
Casing Set up depth : 16.00 m	Static water level : 5.0 m	Start : 17:00 PM	
Drilling depth : 80.00 m	Stabilization :	End :	
Pump set up depth : 50.0 m	Pump up rate : 0.90 L/s		

Test for Pump up			Test for Recovery		
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up
(min)	(m)	(m)	(min)	(m)	(m)
0	5.00	0.00			
0.5	5.45	0.45			
1	5.48	0.48			
1.5	5.50	0.50			
2	5.51	0.51			
3	5.52	0.52			
4	5.53	0.53			
5	5.54	0.54			
10	5.55	0.55			
15	5.56	0.56			
20	5.57	0.57			
30	5.58	0.58			
60	5.59	0.59			
90	5.60	0.60			
120	5.61	0.61			

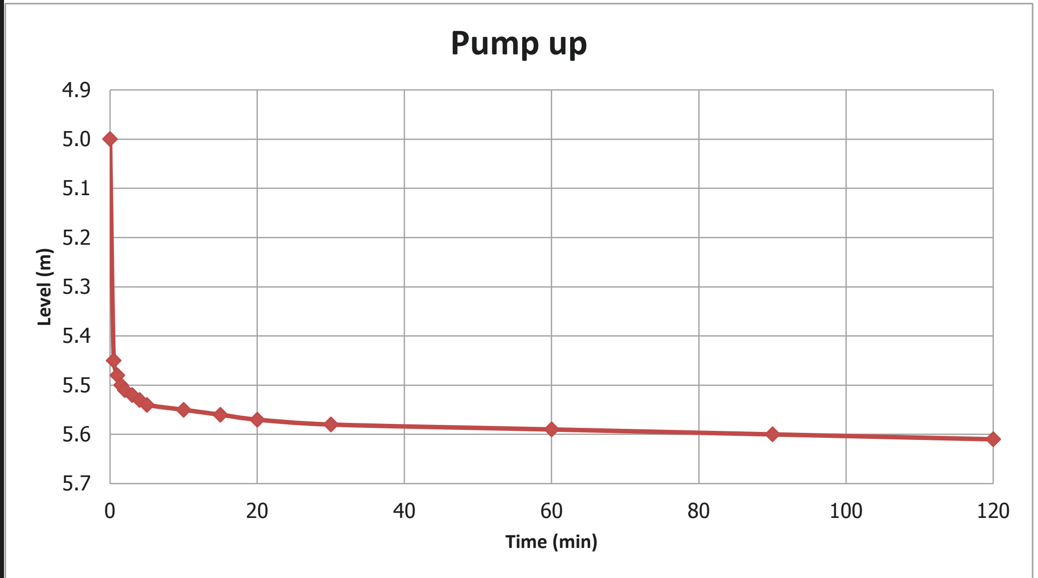
Name of practice:
Mr. Somphit Homsombath

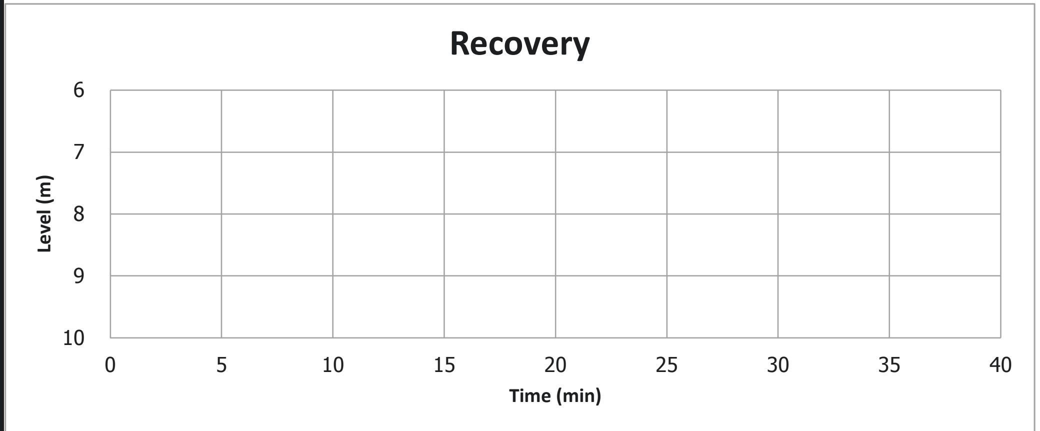
Result of Pumping Test Data

Pump up and Recovery Volume-I

The Test bore hole Drilling in Sukhuma

Borehole N0. BH-05	Pump up Volume-I : 0.90 L/s	Recorded by: Mr. Somphit Homsombath
Date : 3 Feb 2013		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-II

Village: Sukhuma	Borehole N0. BH-05	Date: 3 Feb 2013	**Remark**
Casing Set up depth : 16.00 m	Static water level : 5.0 m	Start : 17:00 PM	
Drilling depth : 80.00 m	Stabilization :	End :	
Pump set up depth : 50.0 m	Pump up rate : 1,51 L/s		

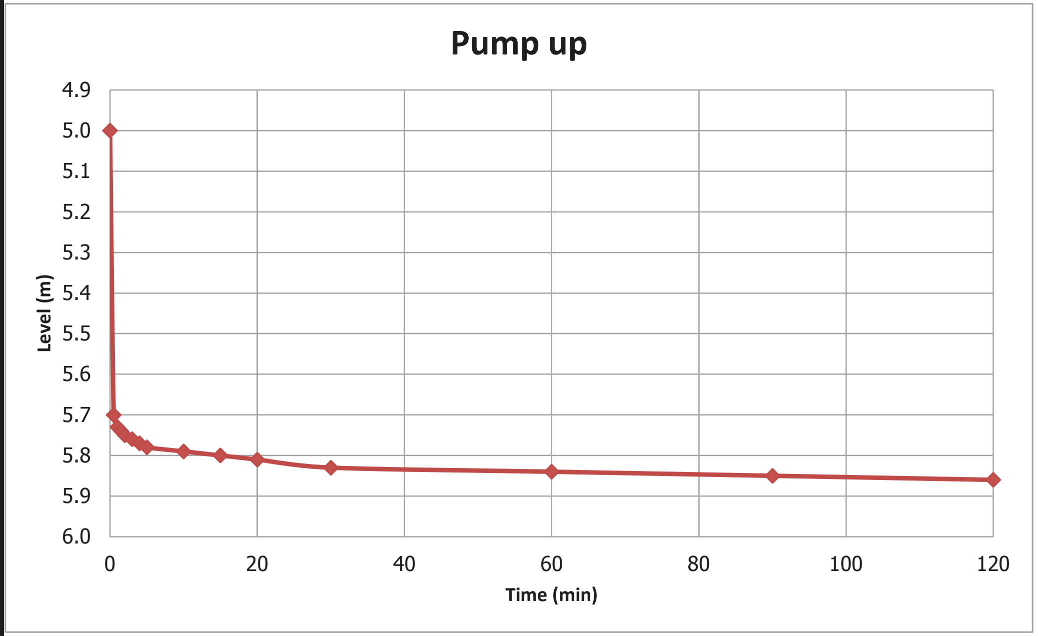
Test for Pump up			Test for Recovery		
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up
(min)	(m)	(m)	(min)	(m)	(m)
0	5.00	0.00			
0.5	5.70	0.70			
1	5.73	0.73			
1.5	5.74	0.74			
2	5.75	0.75			
3	5.76	0.76			
4	5.77	0.77			
5	5.78	0.78			
10	5.79	0.79			
15	5.80	0.80			
20	5.81	0.81			
30	5.83	0.83			
60	5.84	0.84			
90	5.85	0.85			
120	5.86	0.86			

Name of practice:
Mr. Somphit Homsombath

Result of Pumping Test Data

Pump up and Recovery Volume-II
The Test bore hole Drilling in Sukhuma

Borehole N0. BH-05	Pump up Volume-II : 1.51 L/s	Recorded by: Mr. Somphit Homsombath
Date : 5 Feb 2013		



Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Step Test & Recovery Volume-III

Village: Sukhuma	Borehole N0. BH-05	Date: 3 Feb 2013
Casing Set up depth : 16.00 m	Static water level : 5.0 m	Start : 17:00 PM
Drilling depth : 80.00 m	Stabilization :	End :
Pump set up depth : 50.0 m	Pump up rate : 4.4L/s	

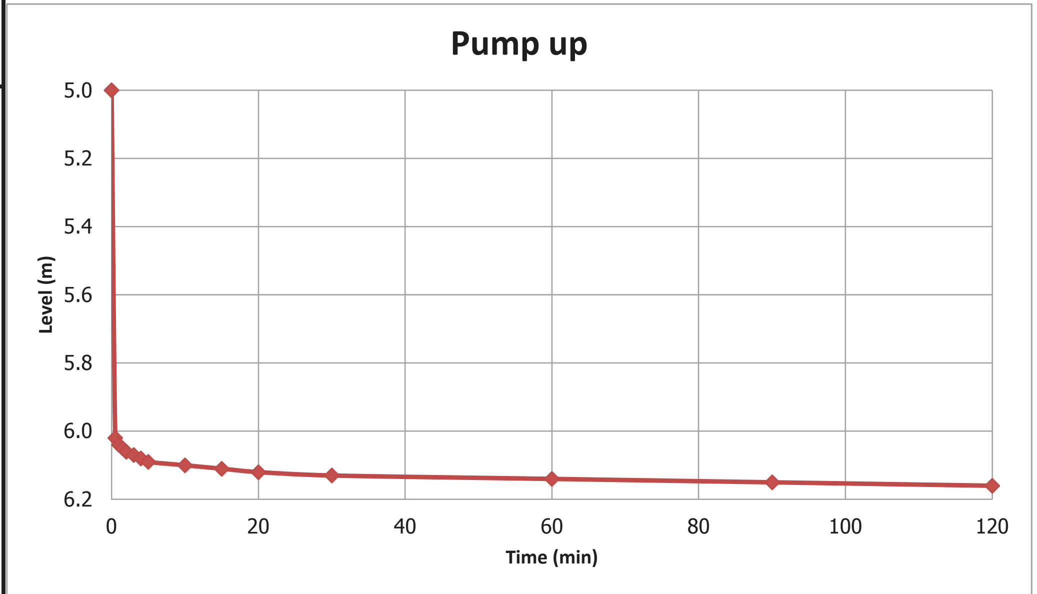
Test for Pump up			Test for Recovery			Remark
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
0	5.00	0.00				
0.5	6.02	1.02				
1	6.04	1.04				
1.5	6.05	1.05				
2	6.06	1.06				
3	6.07	1.07				
4	6.08	1.08				
5	6.09	1.09				
10	6.10	1.10				
15	6.11	1.11				
20	6.12	1.12				
30	6.13	1.13				
60	6.14	1.14				
90	6.15	1.15				
120	6.16	1.16				

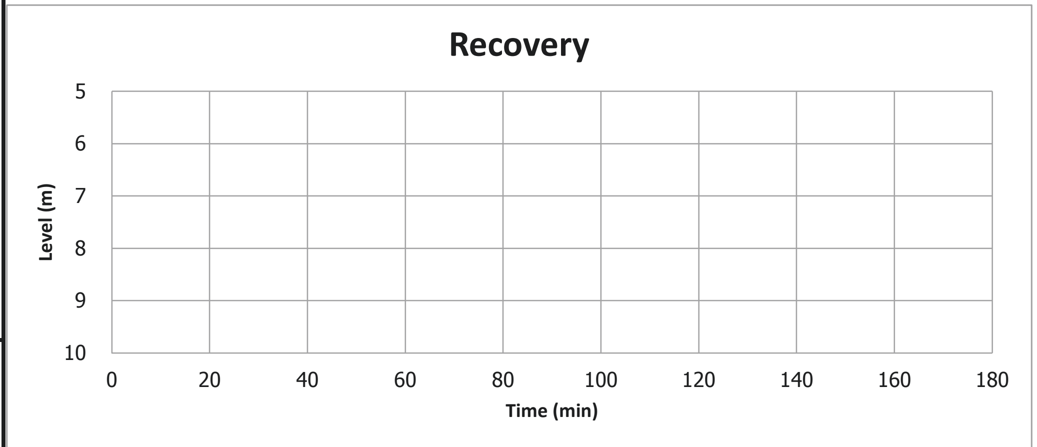
Name of practice:
Mr. Somphit Homsombath

Result of Pumping Test Data

Pump up and Recovery Volume-III
The Test bore hole Drilling in Sukhuma

Borehole N0. BH-05	Pump up Volume-III : 4.4 L/s	Recorded by: Mr. Somphit Homsombath
Date : 5 Feb 2013		





Project : The TEST BOREHOLE DRILLING in the SOUTHERN Provinces (Champasak Provincial Health Dept - Water Supply Environmental and Sanitation Section)

PUMPING TEST RAW DATA

Continuous Pump up Test & Recovery

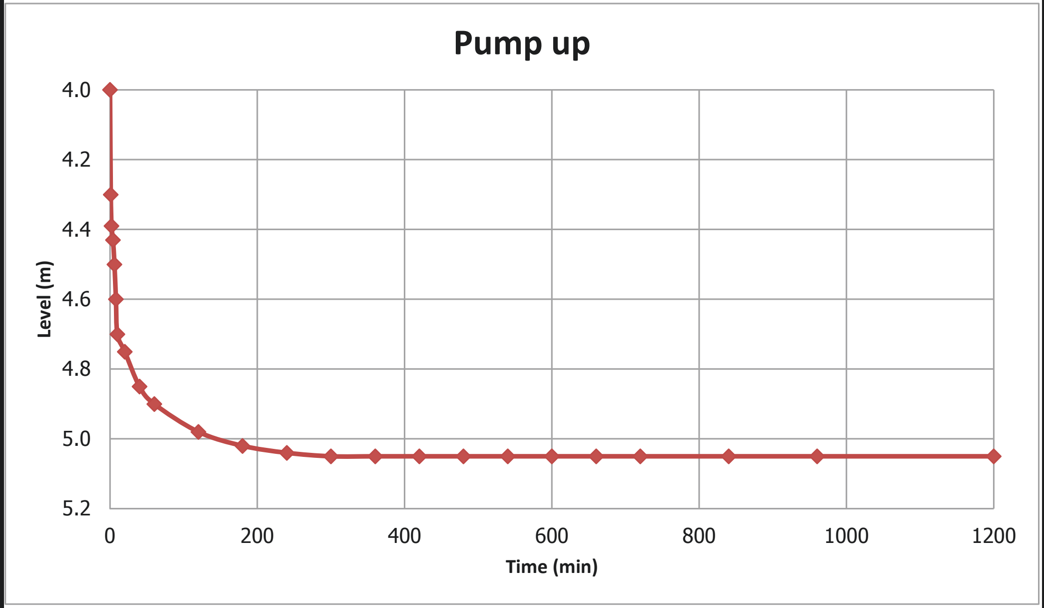
Village: Sukhuma		Borehole N0. BH-05		Date: 4 - 5 Feb 2013		**Remark**
Casing Set up depth : 16.00 m		Static water level : 4.0 m		Start : 08:40 AM		
Drilling depth : 80.00 m		Stabilization :		End :		
Pump set up depth : 50.0 m		Pump up rate : 4.2L/s				
Test for Pump up			Test for Recovery			
Pump Up Time	Water level from G.L	Draw down	Water level Up Time	Water level from G.L	Draw up	
(min)	(m)	(m)	(min)	(m)	(m)	
0	4.00	0.00				
1	4.30	0.30				
2	4.39	0.39				
4	4.43	0.43				
6	4.50	0.50				
8	4.60	0.60				
10	4.70	0.70				
20	4.75	0.75				
40	4.85	0.85				
60	4.90	0.90				
120	4.98	0.98				
180	5.02	1.02				
240	5.04	1.04				
300	5.05	1.05	120	4.00	0.00	
360	5.05	1.05	60	4.02	0.02	
420	5.05	1.05	40	4.08	0.08	
480	5.05	1.05	20	4.18	0.18	
540	5.05	1.05	10	4.20	0.20	
600	5.05	1.05	8	4.25	0.25	
660	5.05	1.05	6	4.34	0.34	
720	5.05	1.05	4	4.54	0.54	
840	5.05	1.05	2	4.65	0.65	
960	5.05	1.05	1	4.98	0.98	
1200	5.05	1.05	0	5.05	1.05	

Name of practice:
Mr. Somphit Homsombath

Result of Pumping Test Data

Continuous Pump up Test & Recovery
The Test bore hole Drilling in Sukhuma

Borehole N0. BH-05	Pump up Volume-I : 4.2 L/sec	Recorded by: Mr. Somphit Homsombath
Date : 4 -5 Feb 2012		



Appendix 15: Parkxang pumping test data on 2 December 2015

Ban Parkxang Pump Test
Deep Observation Bore

Casing Height above GL (m)	0.3
SWL at start (mbgl)	5.16
logger (mbgl)	16.973
Pump (mbgl)	17.7

WLbtc=Water Level below top of Casing, m.
WLbgl=Water Level below ground level, m.
SWL=Surface Water Level
Pump time: minutes
Drawdown: metres

Date	*Time*	Pressure head from logger to SWL	*WLbtc*	*Pump time*	*WLbgl*	*Drawdown*
2/12/2015	15:45:00	11.513	5.46	0	5.16	0
	15:46:00	11.42	5.553	1	5.253	0.093
	15:47:00	11.396	5.577	2	5.277	0.117
	15:48:00	11.383	5.59	3	5.29	0.13
	15:49:00	11.383	5.59	4	5.29	0.13
	15:50:00	11.378	5.595	5	5.295	0.135
	15:51:00	11.378	5.595	6	5.295	0.135
	15:52:00	11.376	5.597	7	5.297	0.137
	15:53:00	11.361	5.612	8	5.312	0.152
	15:54:00	11.365	5.608	9	5.308	0.148
	15:55:00	11.367	5.606	10	5.306	0.146
	15:56:00	11.361	5.612	11	5.312	0.152
	15:57:00	11.348	5.625	12	5.325	0.165
	15:58:00	11.341	5.632	13	5.332	0.172
	15:59:00	11.335	5.638	14	5.338	0.178
	16:00:00	11.328	5.645	15	5.345	0.185
	16:01:00	11.322	5.651	16	5.351	0.191
	16:02:00	11.317	5.656	17	5.356	0.196
	16:03:00	11.322	5.651	18	5.351	0.191
	16:04:00	11.328	5.645	19	5.345	0.185
	16:05:00	11.328	5.645	20	5.345	0.185
	16:06:00	11.331	5.642	21	5.342	0.182
	16:07:00	11.331	5.642	22	5.342	0.182
	16:08:00	11.331	5.642	23	5.342	0.182
	16:09:00	11.331	5.642	24	5.342	0.182
	16:10:00	11.328	5.645	25	5.345	0.185
	16:11:00	11.328	5.645	26	5.345	0.185
	16:12:00	11.326	5.647	27	5.347	0.187
	16:13:00	11.315	5.658	28	5.358	0.198
	16:14:00	11.309	5.664	29	5.364	0.204
	16:15:00	11.302	5.671	30	5.371	0.211
	16:16:00	11.298	5.675	31	5.375	0.215
	16:17:00	11.291	5.682	32	5.382	0.222
	16:18:00	11.298	5.675	33	5.375	0.215
	16:19:00	11.3	5.673	34	5.373	0.213
	16:20:00	11.302	5.671	35	5.371	0.211
	16:21:00	11.302	5.671	36	5.371	0.211
	16:22:00	11.304	5.669	37	5.369	0.209
	16:23:00	11.304	5.669	38	5.369	0.209
	16:24:00	11.304	5.669	39	5.369	0.209
	16:25:00	11.302	5.671	40	5.371	0.211
	16:26:00	11.302	5.671	41	5.371	0.211
	16:27:00	11.3	5.673	42	5.373	0.213
	16:28:00	11.298	5.675	43	5.375	0.215
	16:29:00	11.298	5.675	44	5.375	0.215
	16:30:00	11.296	5.677	45	5.377	0.217
	16:31:00	11.294	5.679	46	5.379	0.219
	16:32:00	11.283	5.69	47	5.39	0.23
	16:33:00	11.272	5.701	48	5.401	0.241
	16:34:00	11.261	5.712	49	5.412	0.252
	16:35:00	11.252	5.721	50	5.421	0.261

16:36:00	11.25	5.723	51	5.423	0.263
16:37:00	11.246	5.727	52	5.427	0.267
16:38:00	11.239	5.734	53	5.434	0.274
16:39:00	11.25	5.723	54	5.423	0.263
16:40:00	11.252	5.721	55	5.421	0.261
16:41:00	11.254	5.719	56	5.419	0.259
16:42:00	11.254	5.719	57	5.419	0.259
16:43:00	11.257	5.716	58	5.416	0.256
16:44:00	11.257	5.716	59	5.416	0.256
16:45:00	11.257	5.716	60	5.416	0.256
16:46:00	11.259	5.714	61	5.414	0.254
16:47:00	11.259	5.714	62	5.414	0.254
16:48:00	11.257	5.716	63	5.416	0.256
16:49:00	11.257	5.716	64	5.416	0.256
16:50:00	11.254	5.719	65	5.419	0.259
16:51:00	11.254	5.719	66	5.419	0.259
16:52:00	11.254	5.719	67	5.419	0.259
16:53:00	11.254	5.719	68	5.419	0.259
16:54:00	11.252	5.721	69	5.421	0.261
16:55:00	11.25	5.723	70	5.423	0.263
16:56:00	11.244	5.729	71	5.429	0.269
16:57:00	11.239	5.734	72	5.434	0.274
16:58:00	11.237	5.736	73	5.436	0.276
16:59:00	11.235	5.738	74	5.438	0.278
17:00:00	11.233	5.74	75	5.44	0.28
17:01:00	11.235	5.738	76	5.438	0.278
17:02:00	11.233	5.74	77	5.44	0.28
17:03:00	11.231	5.742	78	5.442	0.282
17:04:00	11.228	5.745	79	5.445	0.285
17:05:00	11.226	5.747	80	5.447	0.287
17:06:00	11.222	5.751	81	5.451	0.291
17:07:00	11.22	5.753	82	5.453	0.293
17:08:00	11.215	5.758	83	5.458	0.298
17:09:00	11.213	5.76	84	5.46	0.3
17:10:00	11.207	5.766	85	5.466	0.306
17:11:00	11.196	5.777	86	5.477	0.317
17:12:00	11.189	5.784	87	5.484	0.324
17:13:00	11.183	5.79	88	5.49	0.33
17:14:00	11.176	5.797	89	5.497	0.337
17:15:00	11.17	5.803	90	5.503	0.343
17:16:00	11.165	5.808	91	5.508	0.348
17:17:00	11.161	5.812	92	5.512	0.352
17:18:00	11.159	5.814	93	5.514	0.354
17:19:00	11.146	5.827	94	5.527	0.367
17:20:00	11.139	5.834	95	5.534	0.374
17:21:00	11.133	5.84	96	5.54	0.38
17:22:00	11.128	5.845	97	5.545	0.385
17:23:00	11.128	5.845	98	5.545	0.385
17:24:00	11.128	5.845	99	5.545	0.385
17:25:00	11.128	5.845	100	5.545	0.385
17:26:00	11.126	5.847	101	5.547	0.387
17:27:00	11.124	5.849	102	5.549	0.389
17:28:00	11.12	5.853	103	5.553	0.393
17:29:00	11.12	5.853	104	5.553	0.393
17:30:00	11.115	5.858	105	5.558	0.398
17:31:00	11.115	5.858	106	5.558	0.398
17:32:00	11.115	5.858	107	5.558	0.398
17:33:00	11.122	5.851	108	5.551	0.391
17:34:00	11.126	5.847	109	5.547	0.387
17:35:00	11.126	5.847	110	5.547	0.387
17:36:00	11.133	5.84	111	5.54	0.38
17:37:00	11.133	5.84	112	5.54	0.38
17:38:00	11.126	5.847	113	5.547	0.387

	17:39:00	11.124	5.849	114	5.549	0.389
	17:40:00	11.124	5.849	115	5.549	0.389
	17:41:00	11.122	5.851	116	5.551	0.391
	17:42:00	11.12	5.853	117	5.553	0.393
	17:43:00	11.117	5.856	118	5.556	0.396
	17:44:00	11.111	5.862	119	5.562	0.402
	17:45:00	11.113	5.86	120	5.56	0.4
	17:46:00	11.111	5.862	121	5.562	0.402
	17:47:00	11.109	5.864	122	5.564	0.404
	17:48:00	11.107	5.866	123	5.566	0.406
	17:49:00	11.107	5.866	124	5.566	0.406
	17:50:00	11.113	5.86	125	5.56	0.4
	17:51:00	11.117	5.856	126	5.556	0.396
	17:52:00	11.12	5.853	127	5.553	0.393
	17:53:00	11.124	5.849	128	5.549	0.389
	17:54:00	11.124	5.849	129	5.549	0.389
	17:55:00	11.124	5.849	130	5.549	0.389
	17:56:00	11.124	5.849	131	5.549	0.389
	17:57:00	11.12	5.853	132	5.553	0.393
	17:58:00	11.102	5.871	133	5.571	0.411
	17:59:00	11.096	5.877	134	5.577	0.417
	18:00:00	11.094	5.879	135	5.579	0.419
	18:01:00	11.094	5.879	136	5.579	0.419
	18:02:00	11.096	5.877	137	5.577	0.417
	18:03:00	11.094	5.879	138	5.579	0.419
	18:04:00	11.096	5.877	139	5.577	0.417
	18:05:00	11.098	5.875	140	5.575	0.415
	18:06:00	11.1	5.873	141	5.573	0.413
	18:07:00	11.102	5.871	142	5.571	0.411
	18:08:00	11.102	5.871	143	5.571	0.411
	18:09:00	11.1	5.873	144	5.573	0.413
	18:10:00	11.102	5.871	145	5.571	0.411
	18:11:00	11.104	5.869	146	5.569	0.409
	18:12:00	11.104	5.869	147	5.569	0.409
	18:13:00	11.107	5.866	148	5.566	0.406
	18:14:00	11.107	5.866	149	5.566	0.406
Stopped Pump	18:15:00	11.109	5.864	150	5.564	0.404
	18:16:00	11.183	5.79	151	5.49	0.33
	18:17:00	11.196	5.777	152	5.477	0.317
	18:18:00	11.202	5.771	153	5.471	0.311
	18:19:00	11.204	5.769	154	5.469	0.309
	18:20:00	11.211	5.762	155	5.462	0.302
	18:21:00	11.215	5.758	156	5.458	0.298
	18:22:00	11.22	5.753	157	5.453	0.293
	18:23:00	11.224	5.749	158	5.449	0.289
	18:24:00	11.226	5.747	159	5.447	0.287
	18:25:00	11.231	5.742	160	5.442	0.282
	18:26:00	11.233	5.74	161	5.44	0.28
	18:27:00	11.237	5.736	162	5.436	0.276
	18:28:00	11.222	5.751	163	5.451	0.291
	18:29:00	11.217	5.756	164	5.456	0.296
	18:30:00	11.222	5.751	165	5.451	0.291
	18:31:00	11.233	5.74	166	5.44	0.28
	18:32:00	11.237	5.736	167	5.436	0.276
	18:33:00	11.224	5.749	168	5.449	0.289
	18:34:00	11.222	5.751	169	5.451	0.291
	18:35:00	11.22	5.753	170	5.453	0.293
	18:36:00	11.231	5.742	171	5.442	0.282
	18:37:00	11.237	5.736	172	5.436	0.276
	18:38:00	11.241	5.732	173	5.432	0.272
	18:39:00	11.244	5.729	174	5.429	0.269
	18:40:00	11.248	5.725	175	5.425	0.265
	18:41:00	11.25	5.723	176	5.423	0.263

	18:42:00	11.252	5.721	177	5.421	0.261	
	18:43:00	11.254	5.719	178	5.419	0.259	
	18:44:00	11.257	5.716	179	5.416	0.256	
	18:45:00	11.259	5.714	180	5.414	0.254	Observed recovering
3/12/2015	10:08:00	11.415	5.558	1103	5.258	0.098	Take out the logger

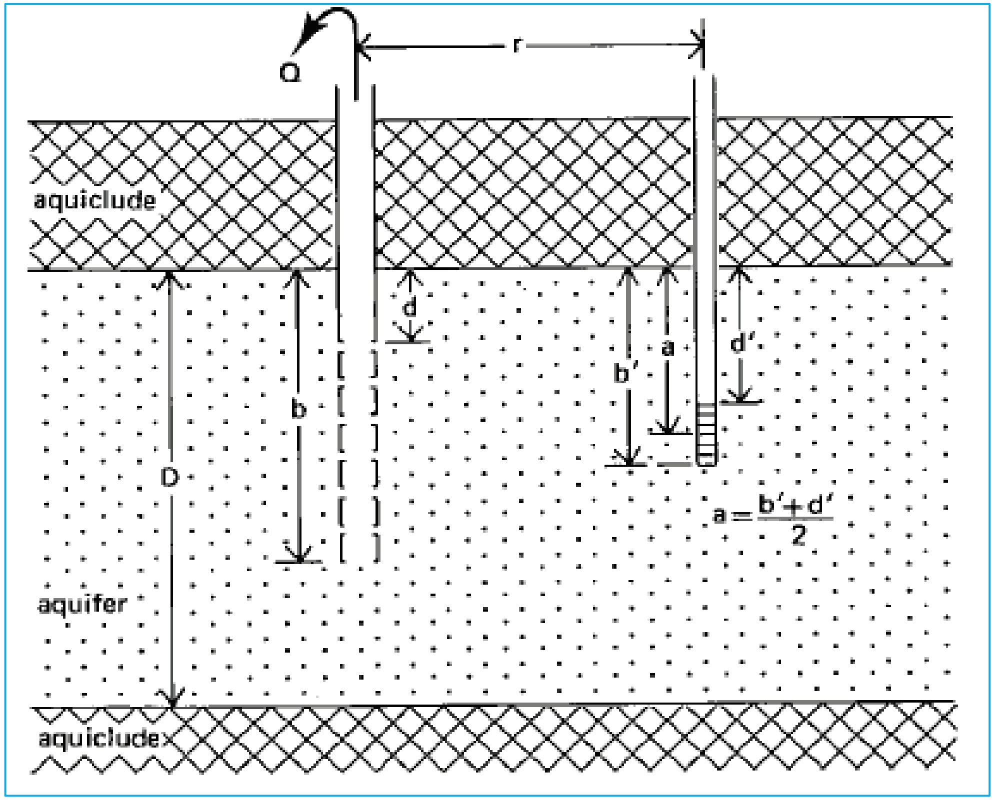
Ban Parkxang Pump Test
Irrigation Bore
Casing Height above GL 0.014m
SWL at start 4.787 mbgl

WLbtc=Water Level below top of Casing, m.
WLbgl=Water Level below ground level, m.

Pump time: minutes
Drawdown: metres

Date	*Time*	*WLbtc*	*Pump time*	*WLbgl*	*Drawdown*
2/12/2015	15:45	4.801	0	4.787	0
	15:46	4.851	1	4.837	0.05
	15:47	4.854	2	4.84	0.053
	15:48	4.854	3	4.84	0.053
	15:49	4.856	4	4.842	0.055
	15:50	4.864	5	4.85	0.063
	15:51	4.867	6	4.853	0.066
	15:53	4.869	8	4.855	0.068
	15:55	4.872	10	4.858	0.071
	16:05	4.91	20	4.896	0.109
	16:15	4.94	30	4.926	0.139
	16:25	4.94	40	4.926	0.139
	16:35	4.991	50	4.977	0.19
	16:45	4.996	60	4.982	0.195
	16:55	5.004	70	4.99	0.203
	17:05	5.009	80	4.995	0.208
	17:15	5.08	90	5.066	0.279
	17:25	5.131	100	5.117	0.33
	17:35	5.126	110	5.112	0.325
	17:45	5.138	120	5.124	0.337
	17:55	5.131	130	5.117	0.33
	18:05	5.156	140	5.142	0.355
	18:15	5.154	150	5.14	0.353
	18:16	5.123	151	5.109	0.322
	18:17	5.121	152	5.107	0.32
	18:18	5.11	153	5.096	0.309
	18:19	5.108	154	5.094	0.307
	18:20	5.105	155	5.091	0.304
	18:21	5.1	156	5.086	0.299
	18:23	5.093	158	5.079	0.292
	18:25	5.08	160	5.066	0.279
	18:27	5.085	162	5.071	0.284
	18:29	5.08	164	5.066	0.279
	18:31	5.077	166	5.063	0.276
	18:33	5.075	168	5.061	0.274
	18:35	5.08	170	5.066	0.279
	18:40	5.067	175	5.053	0.266
	18:45	5.055	180	5.041	0.254
3/12/2015	10:02	4.87	917	4.856	0.069

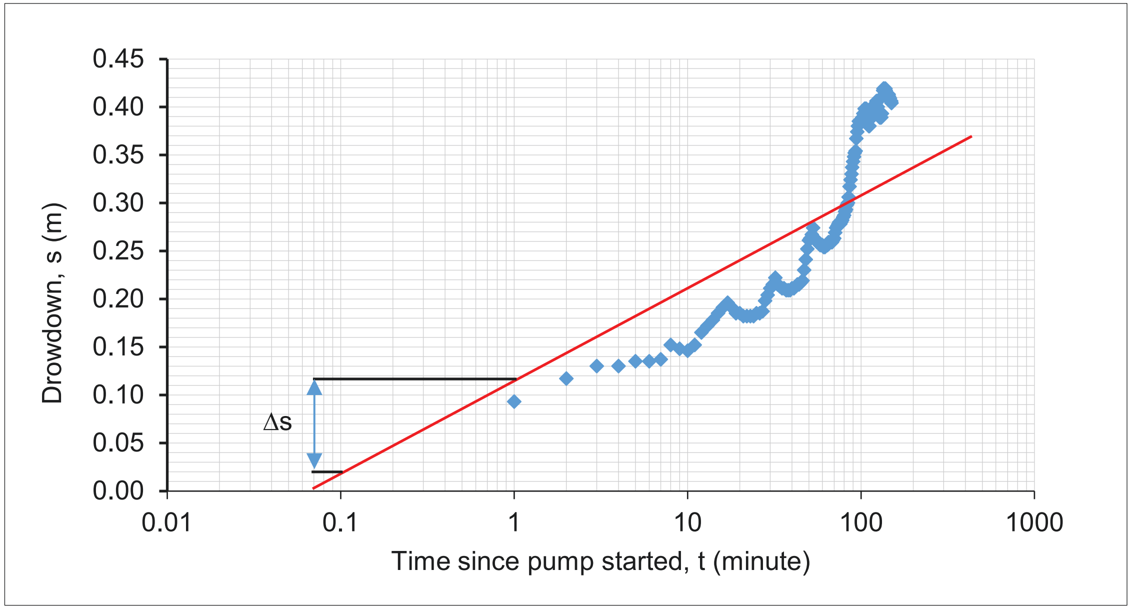
Analysis of pumping test data



Total depth of Deep observation bore (DOB) = 53 m

Total depth of Irrigation bore (IB) $\approx$ 25 m

D=b=	41	m
d=d'=	4	m
b'=	13	m
a'=	8.5	m
r =	33.52	m



Result:	T = 94.404	m^2/day
	K = 2.303	m/day
	S = 1.322E-02	dimensionless

Calculation procedures:

1	t0 =	0.07	min	0.07 min
2	ΔS =	0.095	m	

3 estimate KD from

$$\boxed{\Delta s = \frac{2.30Q}{4\pi KD}} \quad \Rightarrow \quad \boxed{KD = \frac{2.30\,Q}{4\pi\Delta s}}$$

Q =	49	m^3/day
KD =	94.404	m^2/day

As we knew that Transmissivity (T) is

T= Kb

so T= 94.404011 m^2/day

4 K= 2.3025 m/day

5 Estimate fs from

$$f_s = \frac{4D^2}{\pi^2 (b-d)(b'-d')} \sum_{n=1}^{\infty} \left(\frac{1}{n^2}\right) K_0\left(\frac{n\pi r}{D}\right) \left\{\sin\left(\frac{n\pi b}{D}\right) - \sin\left(\frac{n\pi d}{D}\right)\right\} \left\{\sin\left(\frac{n\pi b'}{D}\right) - \sin\left(\frac{n\pi d'}{D}\right)\right\}$$

If we give

$$A = \left\{\sin\left(\frac{n\pi b}{D}\right) - \sin\left(\frac{n\pi d}{D}\right)\right\} \left\{\sin\left(\frac{n\pi b'}{D}\right) - \sin\left(\frac{n\pi d'}{D}\right)\right\}$$

$$f_s = \frac{4D^2}{\pi^2 (b-d)(b'-d')} \sum_{n=1}^{\infty} \left(\frac{1}{n^2}\right) K_0(X) * (A)$$

If we give

$$\boxed{B_n = \sum_{n=1}^{\infty}\left(\frac{1}{n^2}\right)K_0(X) * (A)}$$

$$\boxed{f_s = \frac{4D^2}{\pi^2(b-d)(b'-d')} * B_n}$$

According to K0 from Appendix 4.1 in Kruseman and de Ridder (1990) is

K0(x)

Which $\boxed{X = \frac{n\pi r}{D}}$

in this case, I assume that n = 1

n= 1

X = 2.5684436

Therefore, K0= 0.057499

Finally, fs = -0.000930873

6 Estimate Storativity (S) from

$$t_0 = \frac{S * r^2}{2.25 * KD * \exp(f_s)}$$

$$S = \frac{2.25 * t_0 * KD * \exp(f_s)}{r^2}$$

where			
	t0=	0.07	mim
	KD=	94.404	m^2/day
	r =	33.52	m

	n	X	K0(X)	A	Bn	fs	S
Validated value	1.946704256	5	0.0037	-0.27			
	1	2.5684436	0.0575	-0.162	-0.009	-0.019	0.012983008
	2	5.1368871	0.0032	-0.194	-8E-04	-0.002	0.013212297
	3	7.7053307	0.0002	0.5111	0.0001	0.0003	0.013236913
	4	10.273774	1E-05	1.5884	3E-05	6E-05	0.013233958
	5	12.842218	9E-07	1.9621	3E-06	5E-06	0.013233212
	20	51.368871	9E-24	0.1574	2E-24	4E-24	0.013233141

S = 1.322E-02

Appendix 16: Groundwater abstraction estimation

The average water use per household per day, average water use per person per day, and total water use or groundwater abstraction in Sukhuma District for wet season and dry season were estimated by using the following equations:

$$Q_{HH} = \frac{\sum_{i=1}^{n} Q_{HH(i)}}{N_{HH}} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where Q_{HH} is the average water use per household per day (l/hh/day), $Q_{HH(i)}$ is the water use per day in the household ith, i = 1, 2, 3, …, n (l/day), and NHH is the total number of sampled households (hh).

$$Q_{PP} = \frac{Q_{HH}}{Average\ HH\ size} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where Q_{PP} is the average water use per person per day (l/p/day) and Average HH size is the average household size (persons per household = p/hh).

$$Q_W = \frac{(Q_{PP})\times(Total\ population)\times(Days)}{A_{SKM}} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where Q_W is the total water use or total groundwater use (abstraction) within the Sukhuma District during the wet season or dry season (mm), $Total\ population$ is the total population for the season or for the year that data on household water use were collected (persons), $Days$ is the number of days for duration of the wet season (May to October) or dry season (November to April), and A_{SKM} is the total area of Sukhuma District (m^2).

The long-term statistical record of surface water and groundwater use in Sukhuma District is not available. However, Vote et al. (2015) conducted a survey on the daily households water use at None Yang Village of Sukhuma District by interviewing 20 households (hhs). They interviewed these households by using questionnaires. In order to investigate the current situation of the households water use in the Sukhuma District, the current data and more information on surface water and groundwater consumption were collected for this study.

A survey of the daily households groundwater use was conducted by the PhD candidate during the third field visit to Sukhuma District in March 2017. The target group for the survey of households groundwater use was divided into two types of user. The types of groundwater user are classified herein based on the distance of their house from the river, whether their houses are located in less than or further than approximately 500 m away from the river.

The 80 households in the Sukhuma District were selected randomly and interviewed by using questionnaires. Furthermore, the groundwater abstraction information from the six bottled water factories (including Hieng, None Yang, two factories in Sukhuma and two factories in Boungkeo) in Sukhuma District were also collected for this study. The contents of questionnaires for the household groundwater use survey consist of five main parts. Part one is about the details of the households. Part two asks for information about the wells. The sources of water used are asked for in Part three. The information on groundwater abstraction and use are asked for in Part four. General information on the issues and problems relevant to the groundwater abstraction and use are asked for in Part five. The questionnaires for surveying the daily households' groundwater usage and groundwater abstraction by the bottled water factories in Sukhuma District are given in the attached file at the end of this appendix.

The groundwater use information were used for estimating the amount of daily groundwater use per person per day and the groundwater abstraction component in the water balance for Sukhuma District.

Groundwater is a significant source of water supplies for domestic and horticulture uses for both wet and dry seasons in Sukhuma District. The groundwater herein refers to the water withdrawn from aquifers, which includes well water, spring water and bottled water.

Based on a survey of 80 households in the study area in March 2017, water sources and household use are illustrated in Figure 1. This figure depicts that 100% of households (hh) have access to well water during the wet and dry seasons. All households use an electric pump to abstract water from the aquifer. The capacity of the pump ranges between 13 litres per minute to 25 litres per minute (average 17 litres per minute). The total time for operation of the pump ranges between 15 minutes per day to 50 minutes per day (average 28 minutes per day). The pump were operated about 3 to 6 times per day based on their requirement.

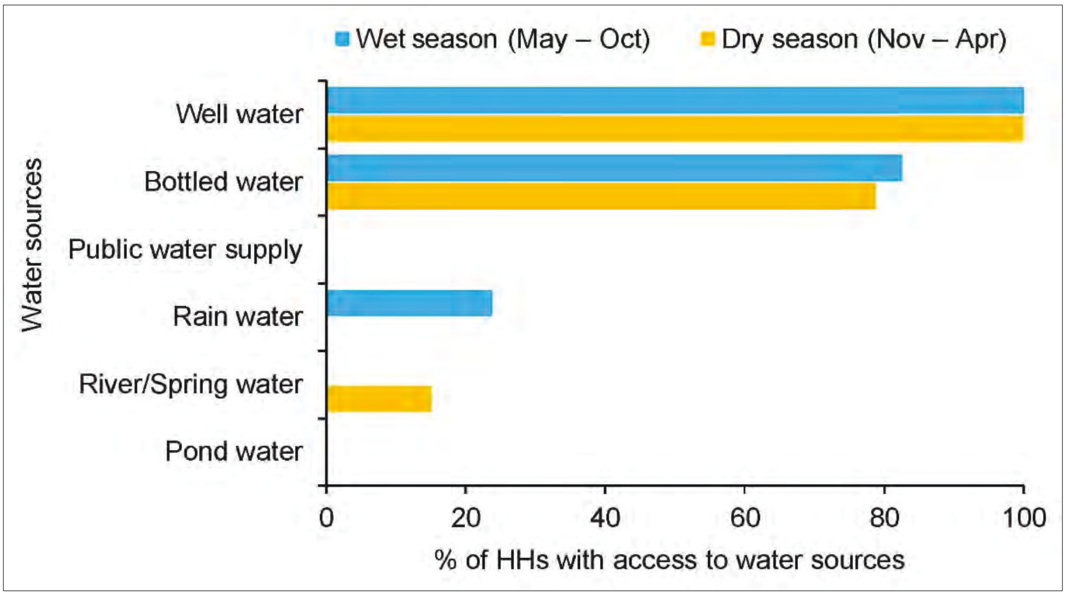


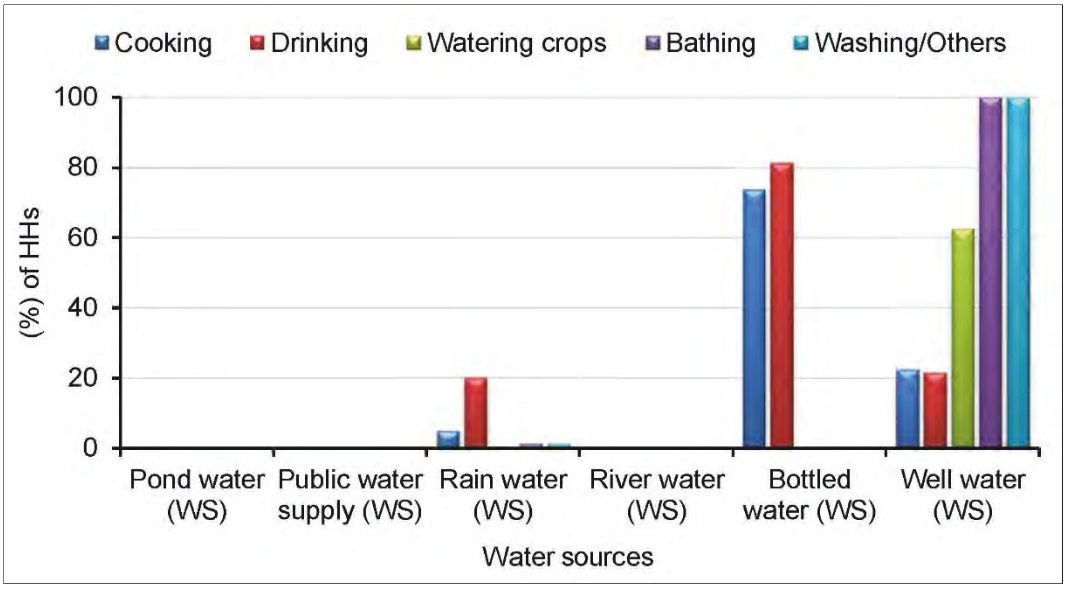
Figure 1: Water sources and percentage of households (HHs)

The bottled water, which is produced by the bottled water factories from groundwater, is used by 79% of sampled households in the dry season and 83% of sampled households in the wet season *(Figure 1)*. The percentage of bottled water use in the dry season is slightly smaller than in the wet season because some households (15% of households) took water from the spring discharge to the rivers. During the dry season, the stream water surface at the Khamouan River gage is very low and the water level cannot be measured by using the staff gauge. However, villagers can access the spring that occurs in the Khamouan Riverbed close to the river gauge. The spring water maybe drained from the shallow groundwater. This spring will be always flooded during the high flows in the wet season.

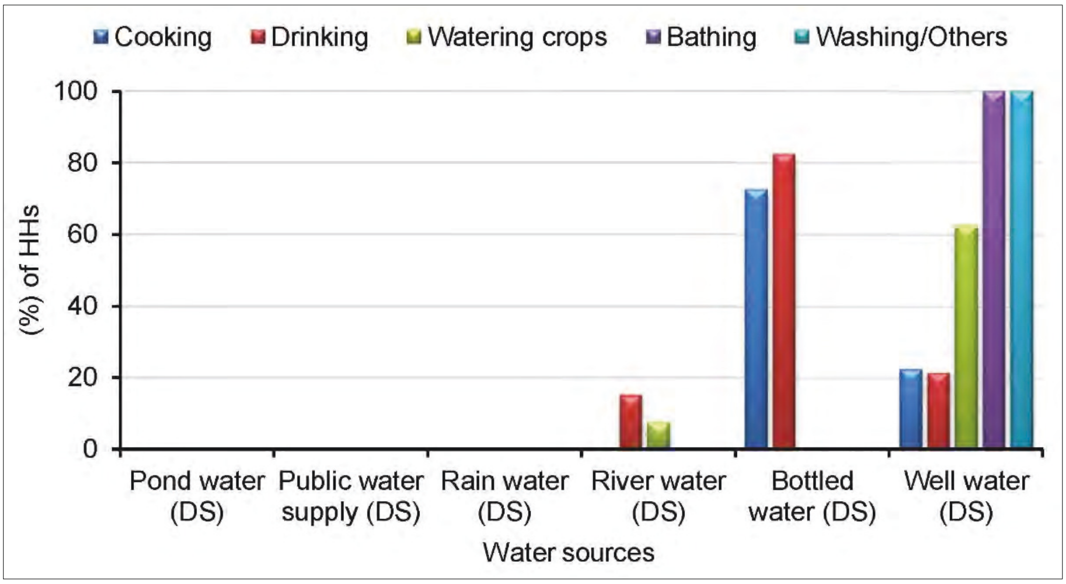
Regarding the observation during the field visit in March 2017, some poor households would occasionally use water from the spring water source in the dry season and use the rainwater during the rainy season *(Figure 1)*. The main reason for this is that they cannot buy the bottled water and pay the electricity bills for the groundwater pumping. During the rainy season, 24% of households collect rainwater from their house’s roof into a storage tank. About 15% of households collect water from the spring. Rainwater and spring water were used mainly for drinking. The result from this survey also shows that the low-income households are relying on the spring and rainwater sources more than the well water.

In the future, the better socio-economic development in the study area may lead to higher groundwater abstraction (Makino et al., 2016). In Sukhuma District, public water supply is not yet available. Rainwater and river water during the dry season are usually scarce. There are many ponds in Sukhuma District; however, the result of the survey reveals that the pond water was not used by all households. They reported that the pond water is not clean and is contaminated with lots of sediment. Hence the groundwater is a primary source of water supply for the residential households in Sukhuma District.

The results of the survey also indicated that the proportions of households using water from the well and the bottles during the wet and dry seasons for each purpose are almost the same (Figure 2a and Figure 2*b*). These figures illustrate that 100% of surveyed households used the well water for bathing and washing. Around 60% of households used well water for watering crops. Only about 20% of households used well water for cooking and drinking. Approximately 80% of surveyed households responded that they preferred to use bottled water for cooking and drinking because it is cleaner and safer. A few households used rainwater for cooking and drinking during the wet season *(Figure 2a)* and took water from springs or rivers for drinking and watering crops *(Figure 2b)*. These households reported that they drink rainwater and spring water because they do not have enough money to buy the bottled water regularly and they can drink water from rain and springs directly.



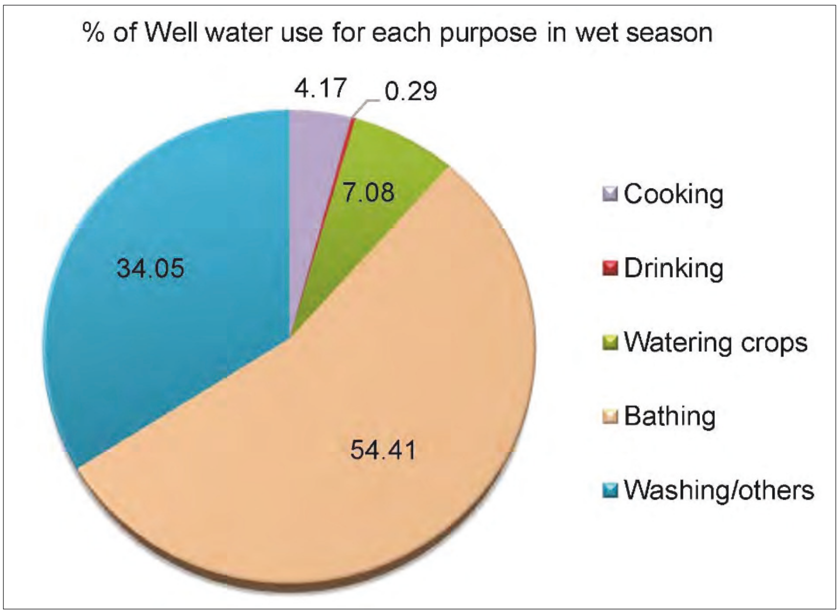
(a)



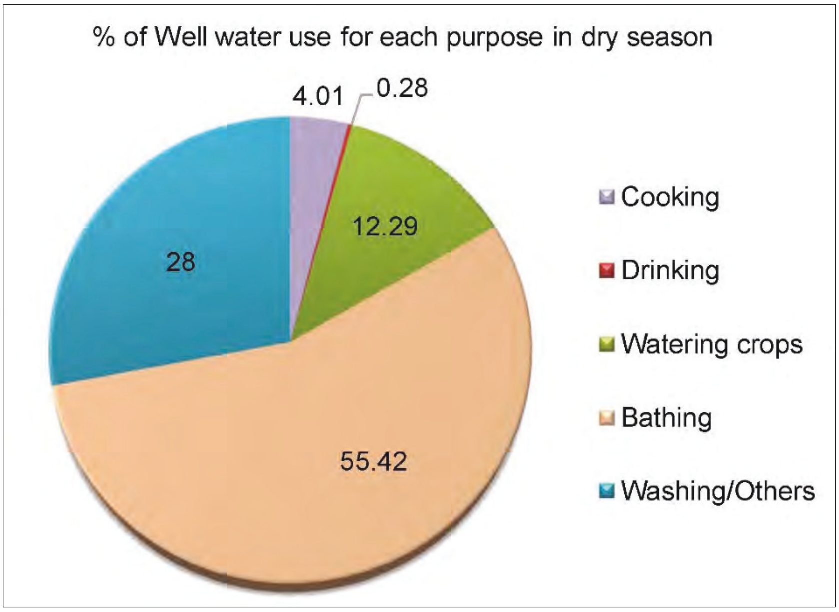
(b)

Figure 2: Percentage of households (HHs) and use of water from the sources during: (a) the wet season (WS) and (b) the dry season (DS)

The groundwater (well water) abstraction in the Sukhuma District during wet and dry seasons is primarily supplied for domestic use (e.g. cooking, bathing, washing, drinking) as well as watering crops, as shown in *Figure 3a* and *Figure 3b*. The proportions of well water use during the wet and dry seasons show similarity. The highest percentage of well water use was for bathing, which is 54% and 55% in wet season and dry season, respectively. The next highest by using well water for washing and others was 34% in the wet season and 28% in the dry season. Small home gardens for growing crops and vegetables is the usual practice during the dry season. Therefore, using well water for watering crops during the wet season was only about half (7%) of the dry season (12%) (*Figure 3a* and Figure 3*b*). Well water used for cooking during wet and dry seasons was at the same rate of 4%. The smallest proportion of well water use was for drinking purpose, which was only 0.3% for both wet and dry seasons.



(a)



(b)

Figure 3: Percentage of well water use during: (a) the wet season and (b) the dry season

The average daily water use per capita in the Sukhuma District varies from around 105 litres during the wet season to 130 litres during the dry season. The average daily water use per household was also estimated at 525 litres during the wet season and 645 litres during the dry season based on the average household size of 5 people (minimum of 2 people and maximum of 10 people). Total district water consumption per season for the hydrological years 2015-16 is 0.82 mm per wet season (June – October) and 1.35 mm per dry season (November – May). The annual groundwater use in Sukhuma District for 2015-16 was approximately 2.20 mm.

The average daily water consumption per capita estimated from the current study for the wet and dry seasons shows similarity with other studies conducted in the Sukhuma District and other areas of Laos *(Table 1)*. The only previous study conducted by Vote et al. (2015) in Sukhuma, estimated the daily water use per person in the None Yang Village of Sukhuma District by interviewing 20 households samples. Their study reported that daily water use per person in the None Yang Village was approximately 106 litres *(Table 1)*. This volume of daily water use was average for both wet and dry seasons. In addition, Vote et al. (2015) also conducted the same method of survey for estimating the daily water consumption in the Nonsavange and Don Sat Villages in the Champasak District, Champasak Province of Southern Laos. *Table 1* shows a summary of estimated daily water consumption per capita by other studies in many parts of Laos and by the current study in the Sukhuma District. High daily water use per capita was estimated in the Vientiane Capital, which was 150 l/p/d (UN-Laos, 2001) and 174 l/p/d (Thammavongsa, 2004). The lowest daily water use per capita (34 l/p/d) was estimated in the Khiat Ngong Village in Pathoumphone District, Champasak Province of Southern Laos (Phommavong, 2015). Daily water consumption per capita in the Khiat Ngong Village is low because access to water sources is difficult (Phommavong, 2015). The results estimated from the current study fall within the minimum and maximum daily water use per capita computed by Phommavong (2015) and Thammavongsa (2004). Furthermore, the results from the current study also show similarity with daily water use per capita that was estimated in the Champasak District (Vote et al., 2015) and in the Vientiane Plain of Vientiane Province (Heang and Keovongdy, 2016; Serre, 2013) as given in *Table 4.6*. The methodology used for data collection in the current study is similar to those applied in most previous studies *(Table 1)*.

Table 1: Average water consumption per person per day estimated in other areas of Laos and estimated in the Sukhuma District. Note: DS and WS stand for dry season and wet season, respectively

Source	**Average daily water use per person per day (l/p/d)**	**Location of study**	**Methodology**
Current research	DS = 129 WS = 105	Sukhuma District, Southern Laos	• Questionnaires survey and measurement by meter • 80 HHs samples in 14 villages are randomly selected
Vote et al. (2015)	Average = 106	None Yang Village, Sukhuma District, Champasak Province, Southern Laos	• Questionnaires survey and measurement by meter • 20 HHs samples
	Average = 141	Nonsavang Village, Champasak District, Southern Laos	• Questionnaires survey and measurement by meter • 20 HHs samples
	Average = 131	Don Sat Village, Champasak District, Southern Laos	• Questionnaires survey and measurement by meter • 20 HHs samples
Heang and Keovongdy (2016)	DS = 137 WS = 104	Vientiane plain, Vientiane Province	• Questionnaires survey and measurement by meter • 40 HHs samples in 4 villages (10 HHs/village)
UN-Laos (2001)	Average = 150	Vientiane Capital	• Not specified
Thammavongsa (2004)	Average = 174	Vientiane Capital	• Not specified
Serre (2013)	Average = 100	Ekxang Village, Vientiane Province	• Questionnaires survey
Phommavong (2015)	Average = 34	Khiat Ngong Village, Pathoumphone District, Champasak Province, Southern Laos	• Questionnaires survey and measurement by meter • 63 HHs samples

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Attachment: Questionnaires for household GW usage in wet and dry seasons in Sukhuma District

Name of Village: …………………………………………………….,
Topography: …………………………………………..

Name of interviewer: ……………………………………………………………………

Contact number of interviewer: …………………………………………..

Date of interview: ………………………………………………………………

GPS Coordinate of the household: E (lat): ……………………….……. N (lon): ……………..……… /
GPS Point No.: ……………..

Depth to GW level: ……………..… m bgs (below ground surface), EC: …………………… µs,
T: ………………. °C

I. Household details

1. What is your name (name of interviewee)? ..…………………………..………………………………….
2. What is your role in your household? …..…………………………………………………………………
3. How old are you? ………………………………………………………………………..…………………… ………….
4. How many people are there in your household (HH) during dry and wet seasons? ……………..

II. Boreholes information

5. How many wells do you have?

   ( ) 1 well ( ) 2 wells ( ) ……… wells

6. What types of well do you have?

   ( ) Drilled well ( ) Dug well ( ) other: ………………………

7. When were they constructed?

Well 1: year……………………, Well 2: year…………………………, Well …. : year…………………………

8. How deep are they?

Well 1: ………………………… m, Well 2: …………………………… m,
Well …. : ………………………… m

9. How deep is the casing of each well?

Well 1: ………………………… m, Well 2: …………………………… m,
Well …. : ………………………… m

10. When are these wells used?

No.	Wet season	Dry season
Well 1		
Well 2		
Well ……		

III. Source of water use

11. What is the main source of water use for your HH? And how much water do your HH usually use from each water source? (more than one source of water use is possible)

Source of HH water use	Dry season (Nov – Apr)	Wet season (May – Oct)	Remark
	Y/N	Y/N	
Pond water			

River water			
Rain water			
Public water supply (Nam papa)			From GW or SW?
Bottled water			
Groundwater well			

12. How many buckets / tanks of water do your HH usually use from the pond in wet and dry seasons?

Source of HH water use	**Dry season (Nov – Apr)**	**Wet season (May – Oct)**
Number of buckets or tanks	…………………… units per day or ……..	…………………… units per day or ……..
Volume of bucket or tank	……………………………... m^3 or litres …..	……………………………... m^3 or litres ….

13. How many buckets / tanks of water do your HH usually use from the river in wet and dry seasons?

Source of HH water use	**Dry season (Nov – Apr)**	**Wet season (May – Oct)**
Number of buckets or tanks	…………………… units per day or ……..	…………………… units per day or ……..

Volume of bucket or tank	…………………………….. m^3 or litres …..	…………………………….. m^3 or litres ….

14. How many buckets / tanks of water do your HH usually use from rain water in wet and dry seasons?

Source of HH water use	**Dry season (Nov – Apr)**	**Wet season (May – Oct)**
Number of buckets or tanks	…………………… units per day or ……..	…………………… units per day or ……..
Volume of bucket or tank	…………………………….. m^3 or litres …..	…………………………….. m^3 or litres ….

15. How many buckets / tanks of water do your HH usually use from the public water supply (Nam papa) in wet and dry seasons?

Source of HH water use	**Dry season (Nov – Apr)**	**Wet season (May – Oct)**
Public water supply (Nam papa)	…………………………….. m^3/month	…………………………….. m^3/month
Number of buckets or tanks	…………………… units per day or ……..	…………………… units per day or ……..
Volume of bucket or tank	…………………………….. m^3 or litres …..	…………………………….. m^3 or litres ….

16. How many bottles do your HH usually use from the bottled water in wet and dry seasons?

Bottled size	**Dry season (Nov – Apr)**	**Wet season (May – Oct)**
18 litres	………… units per day or ……….	………… units per day or ……….
2 litres	………… units per day or ……….	………… units per day or ……….
…… litres	………… units per day or ……….	………… units per day or ……….

17. What are the purposes of your household usually use water from these water sources as identified in the following table? And how much?

Water sources	**Cooking**		**Drinking**		**Watering crops**		**Bathing**		**Washing/ Cleaning/Others**	
	Y/N	%	Y/N	%	Y/N	%	Y/N	%	Y/N	%
Pond water										
River water										
Rain water										
Public water supply (Nam papa)										
Bottled water										
Groundwater well										

IV. Groundwater abstraction and usage

18. What methods do you apply to abstract the groundwater from the well?

    ( ) Bucket ( ) Pump ( ) other: ………………….

    - If use bucket, please go to question (19)
    - If use pump, please go to question (21)

19. What is the volume of the bucket that you use to abstract the groundwater?

    ( ) 3 litres ( ) 5 litres ( ) 10 litres ( ) ……………………………..

20. How many buckets of water per day do you usually take from your well?

Average in Dry season	Average in Wet season
………………………. buckets per day	…………………….. buckets per day

21. What type of pump do you have?

    ( ) hand pump ( ) electric pump ( ) other: …………………..

22. How many times per day or per week do you usually operate the pump and for how long per time?

Average in Dry season	Average in Wet season
……………………….times per day or per …….	……………………….times per day or per ……….
………………… minutes or hours per time	………………… minutes or hours per time

23. How long does the pump usually take to fill a bucket / a tank of ……………….. litres or m^3?

Average in Dry season	**Average in Wet season**
………………… seconds or minutes or hours	………………… seconds or minutes or hours

24. If you used groundwater for watering home garden, what is the area of your home garden?

Garden farm in dry season	**Garden farm in wet season**
• Width: …………………. metre • Length: …………………... metre • Area : …………………………… m^2 or …….	• Width: …………………. Metre • Length: …………………... metre • Area : …………………………… m^2 or …….

Note: The interviewer should measure the area of garden.

25. What crops do you usually grow and when are they planted and harvested?

- Wet season crops:

Crop name	May	Jun	Jul	Aug	Sept	Oct
……………………………………………………………						
……………………………………………………………						

…………………………………………………………						

- Dry season crops:

Crop name	Nov	Dec	Jan	Feb	Mar	Apr
…………………………………………………………						
…………………………………………………………						
…………………………………………………………						

26. Have you ever have experience with well dry or encounter with groundwater depletion in the dry season?

( ) Never ( ) Yes, please specify when and how long in the table below:

Month	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**
In typical year, how many days it takes to recover?								
In drought year (e.g. 2016), how many days it takes to recover?								
In wet year (e.g. 2014), how many days it takes to recover?								

V. General information that interviewee would like to share

- Note: In order to check the pump capacity and compare with question 23, the interviewer should operate the pump and measure the times it takes to fill a bucket of a known capacity (10 L, 20 L, or etc.)

  Time = …………………………. to fill a bucket of ………………..… (litres)

- Other problems relates to groundwater abstraction and usage:

  ………

  ………

- Future plan of groundwater abstraction and usage:

  ………

  ………

………..

Thank you very much for your kind cooperation

Appendix 17: Contour line maps of monthly water table (WT) elevation from June 2015 to May 2016

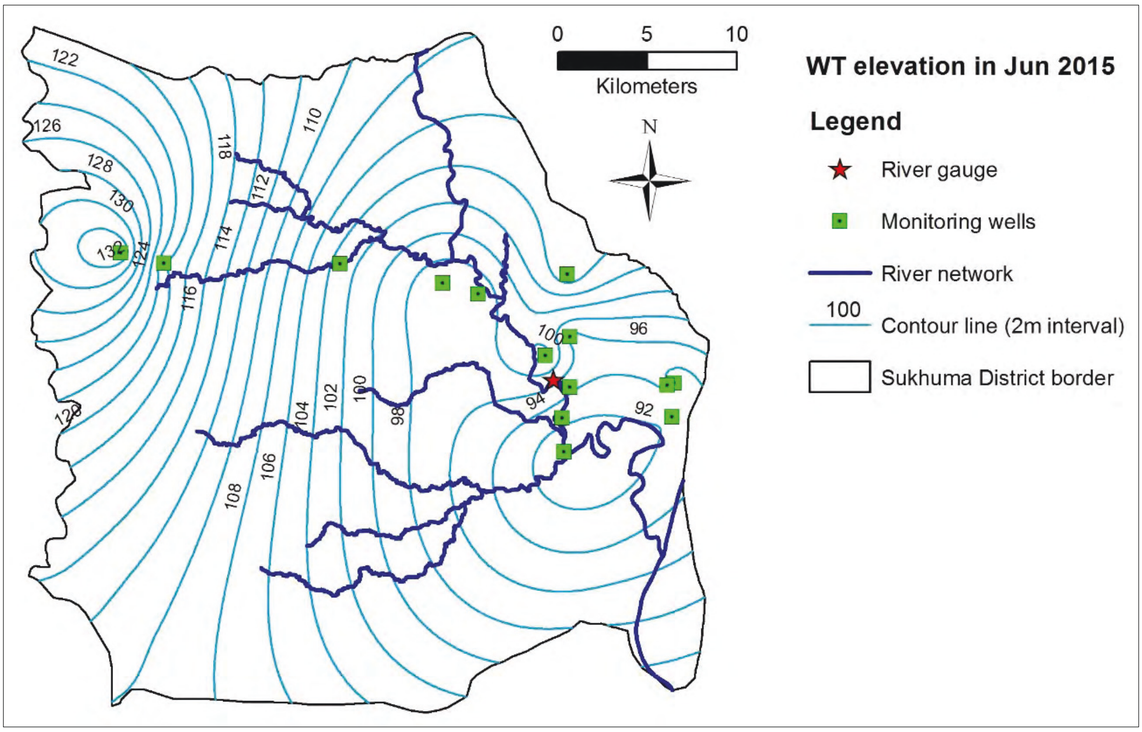

Figure 1:

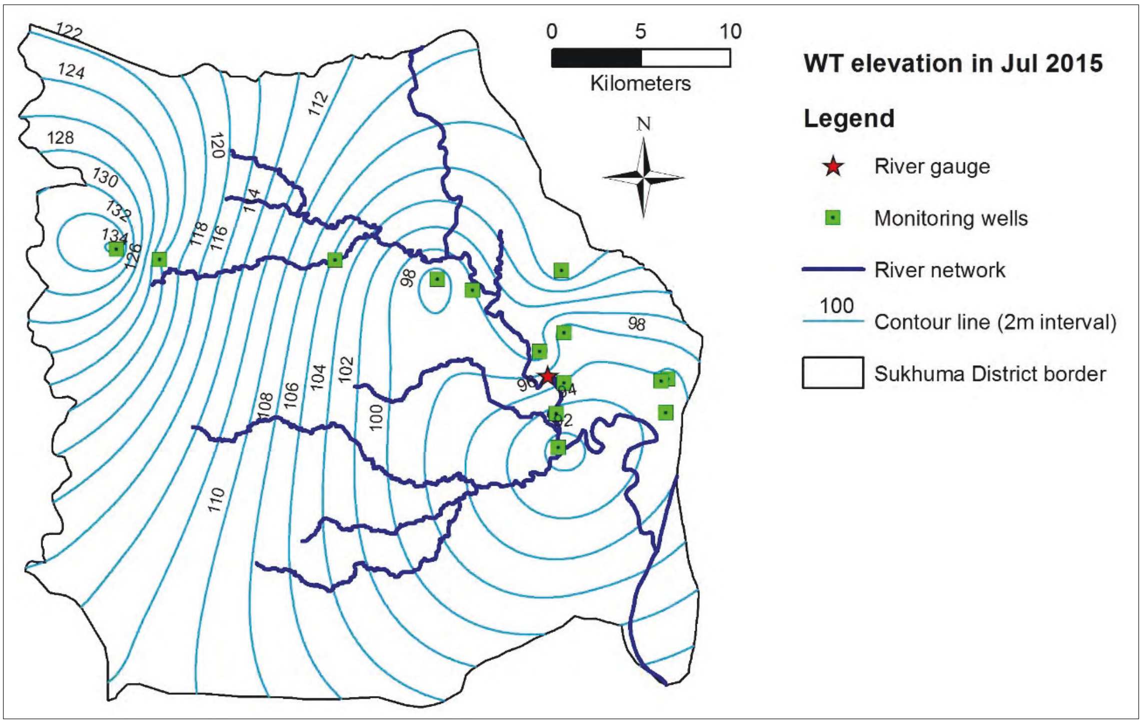

Figure 2:

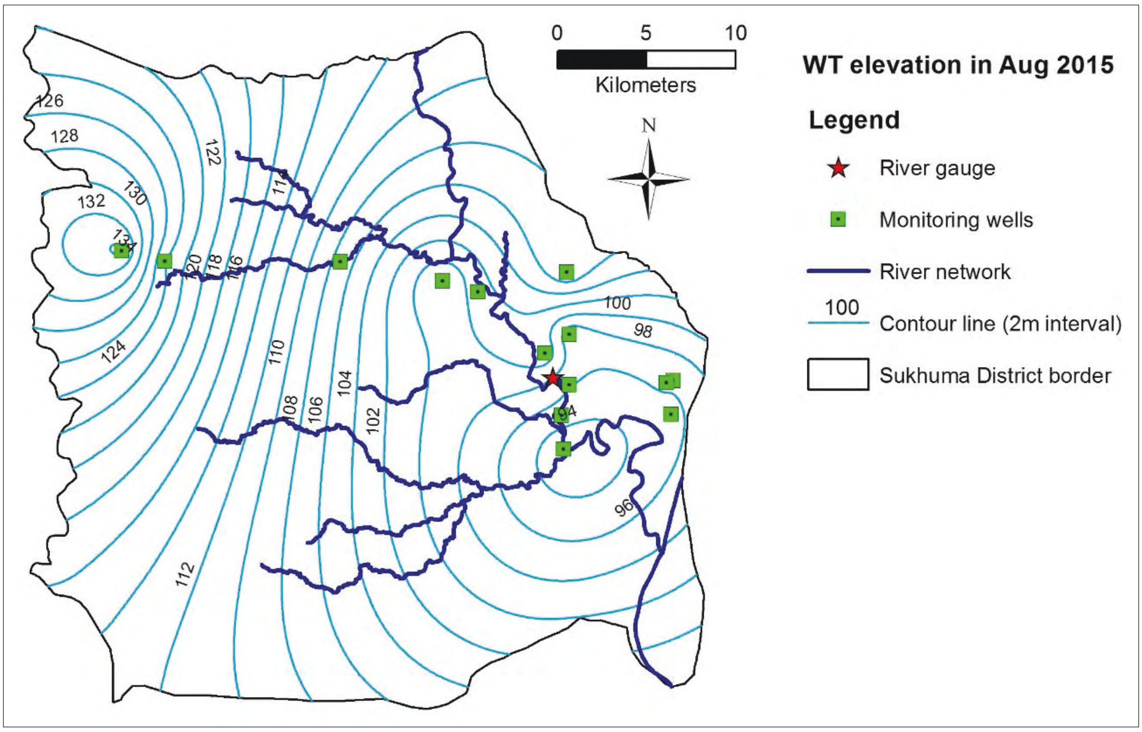

Figure 3:

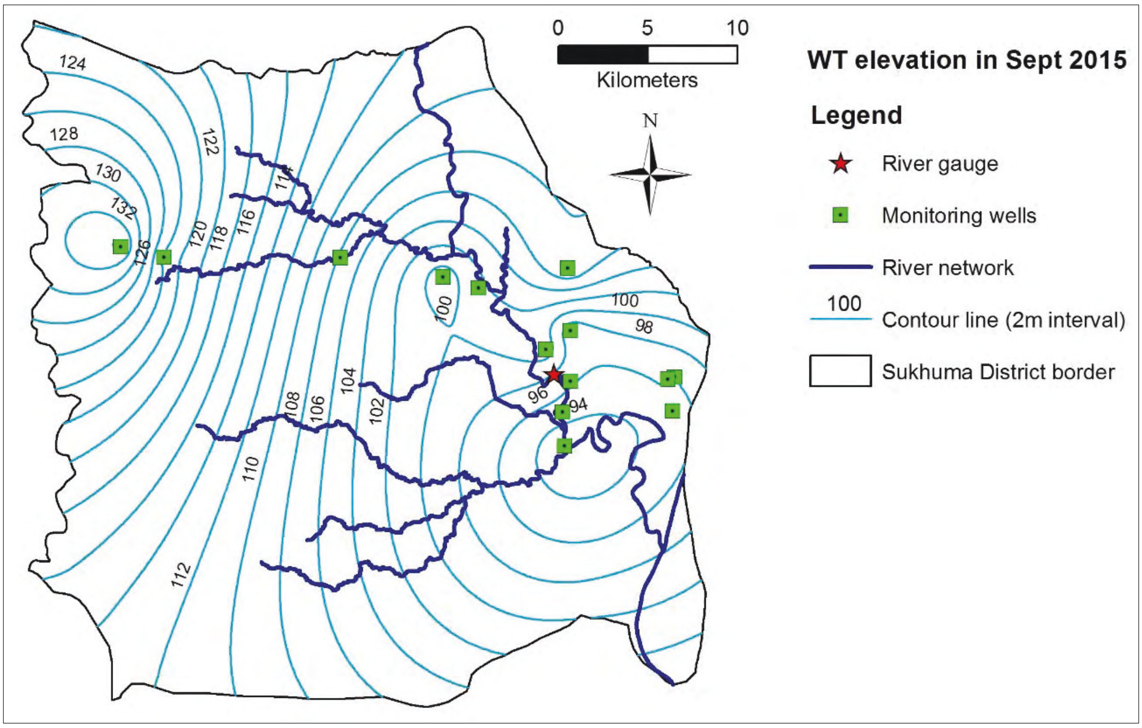

Figure 4:

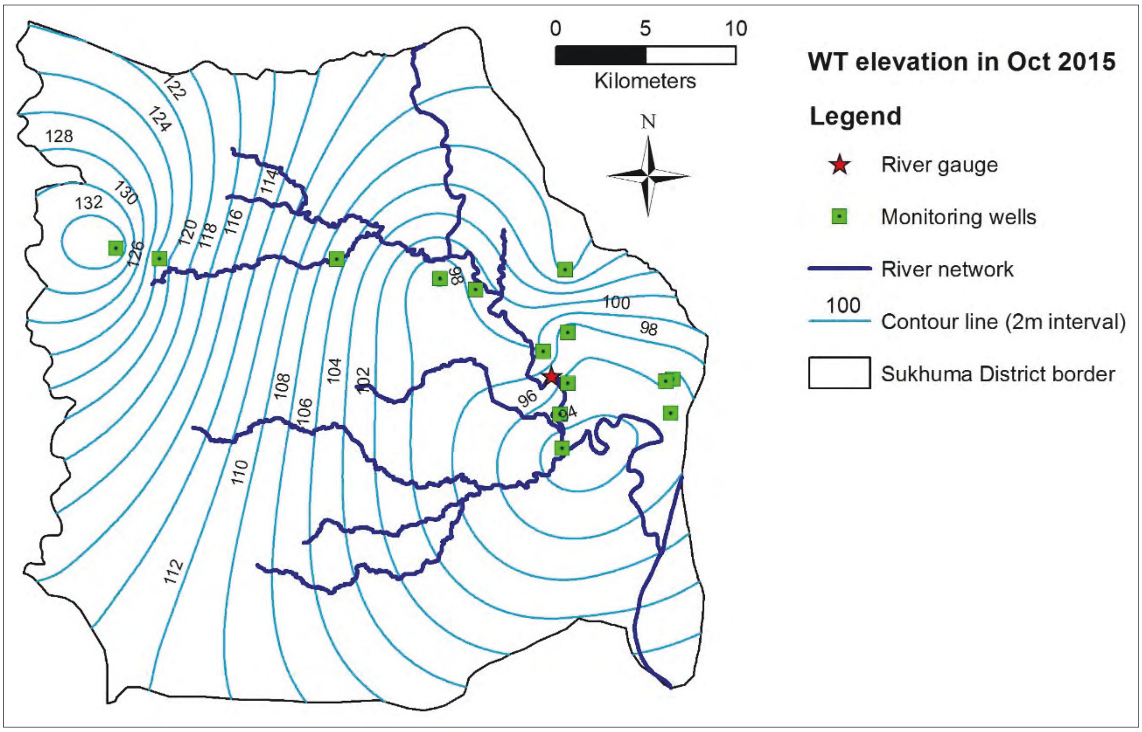

Figure 5:

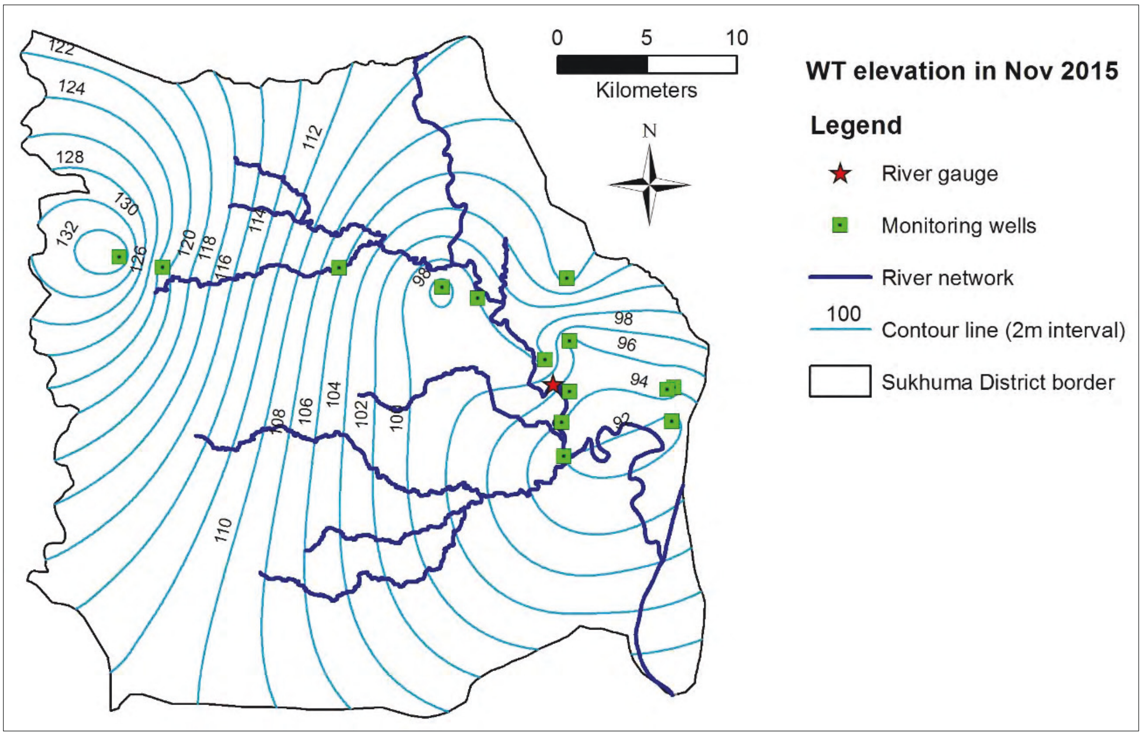

Figure 6:

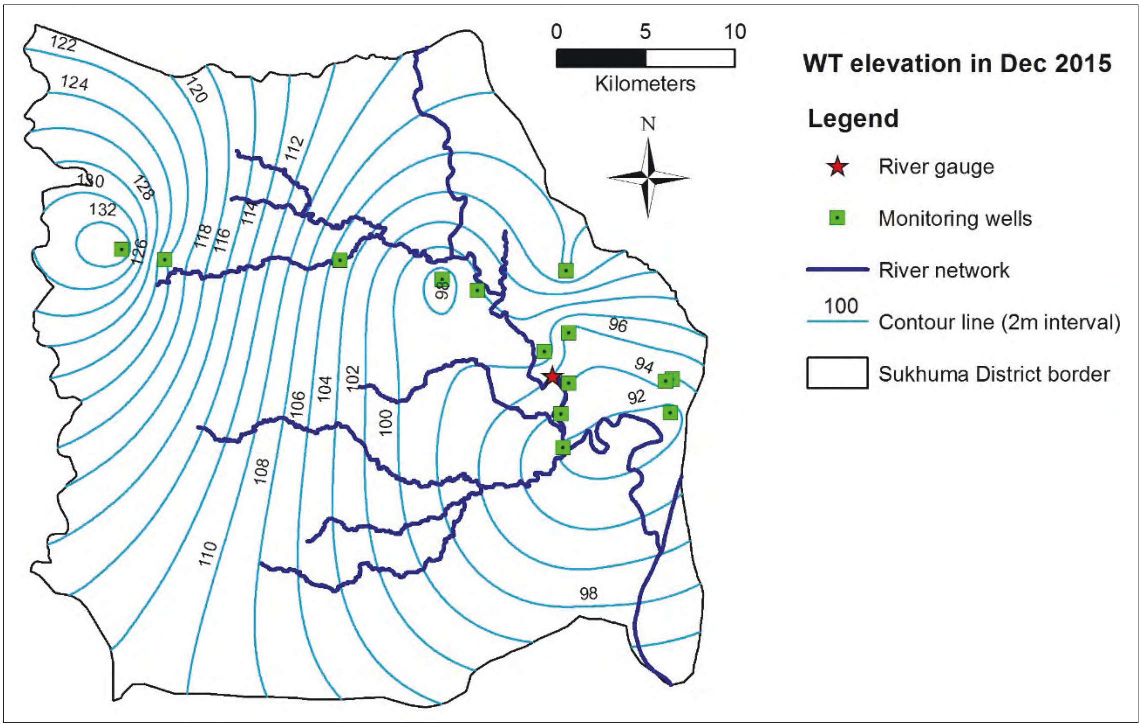

Figure 7:

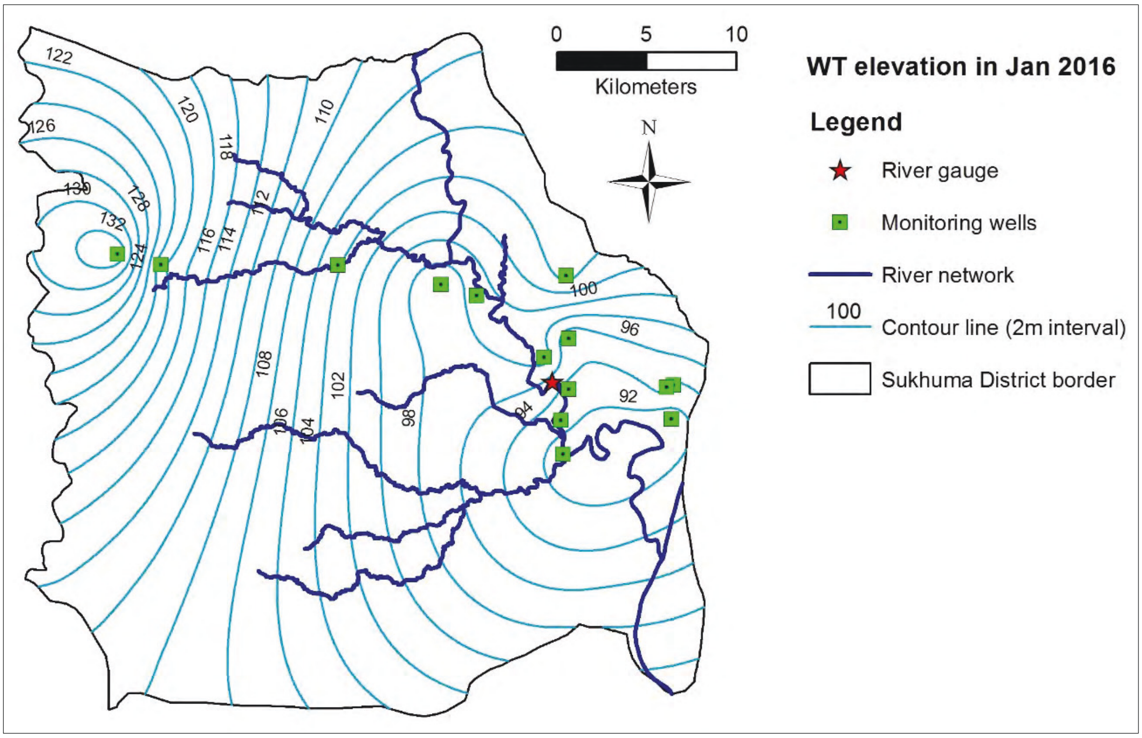

Figure 8:

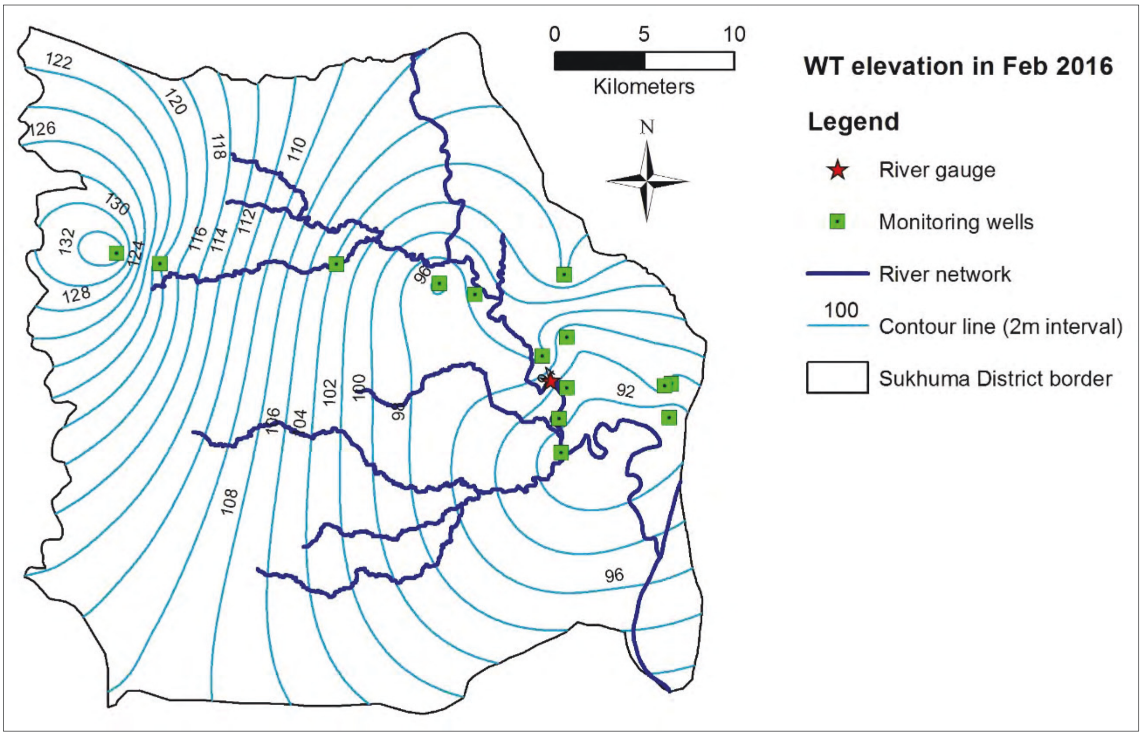

Figure 9:

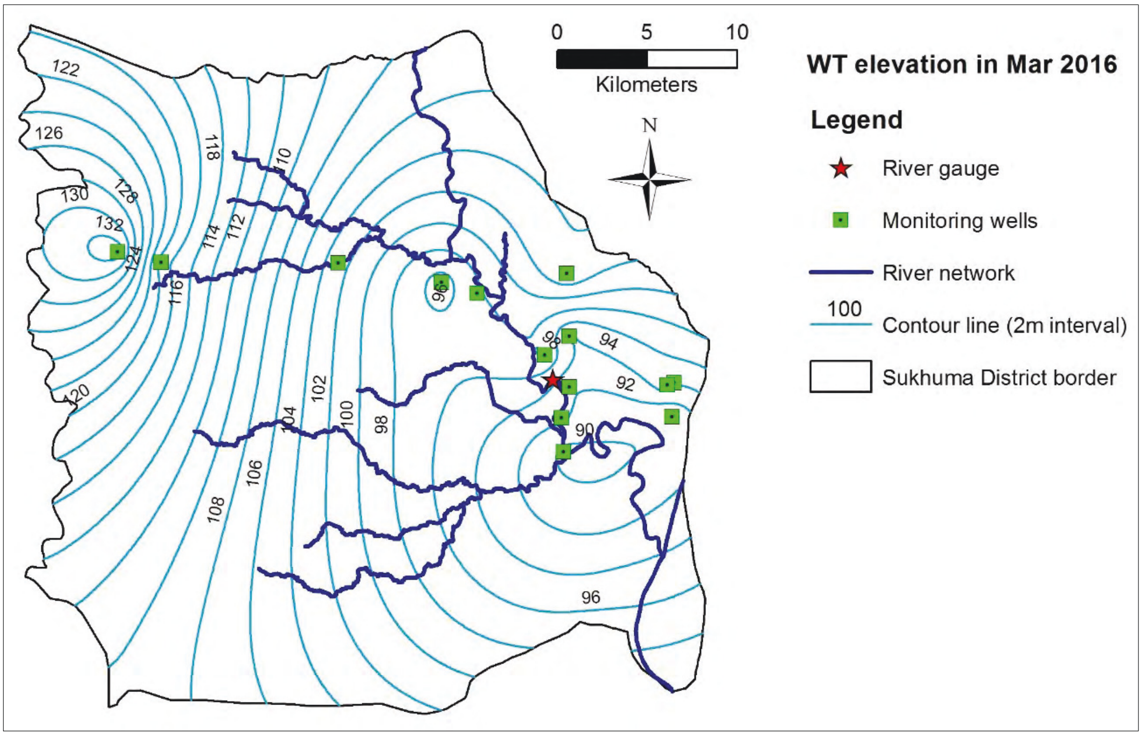

Figure 10:

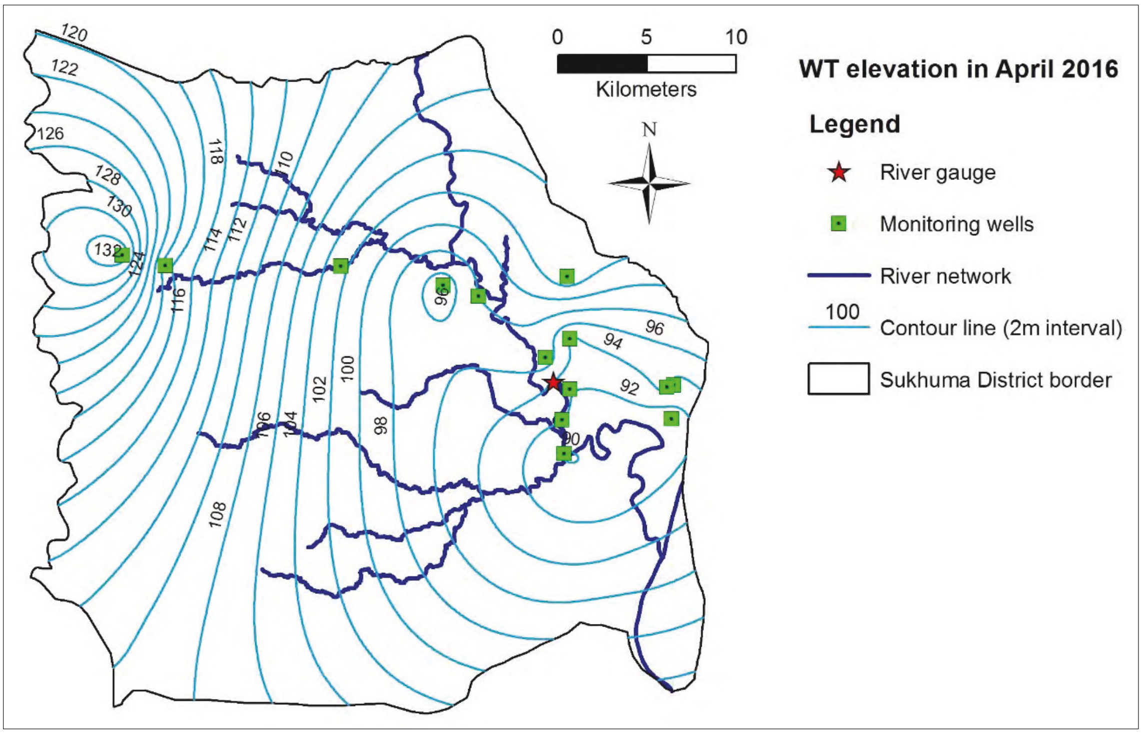

Figure 11:

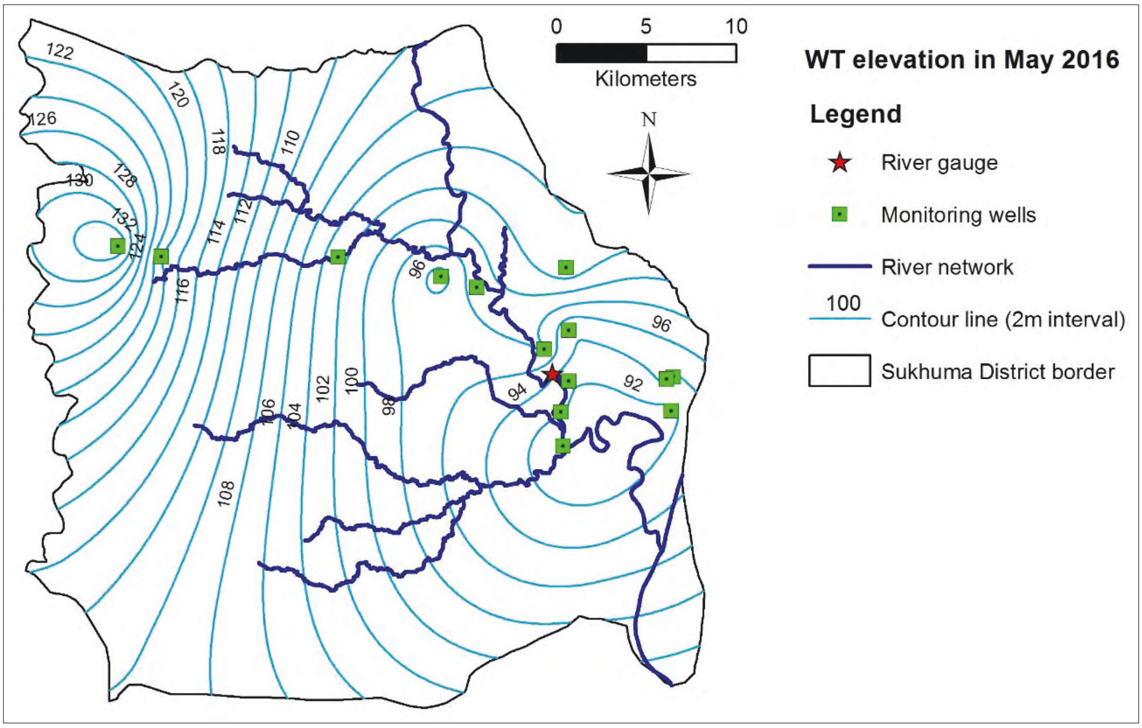

Figure 12:

Appendix 18: Groundwater levels response to rainfall (time lags)

The cross-correlation approach is often used to evaluate the similarity between two series (Ross, 2009). This approach has been used by many previous studies to quantify the correlation and time lags between rainfall and groundwater level rise (Cai and Ofterdinger, 2016; Hu et al., 2017; Moon et al., 2004).

For the current research, the sample cross-correlation function in the MATLAB Program was employed to evaluate the time lags and the correlation coefficient between cumulative weekly rainfall and weekly groundwater level that were measured at each data monitoring point in Sukhuma District. The mathematical expression of the sample cross-correlation function in the MATLAB Program can be written as follows:

$$r_{y_1y_2}(k) = \frac{C_{y_1y_2}(k)}{S_{y_1}S_{y_2}} \quad ; \; k = 0, \pm 1, \pm 2, \ldots .. \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where $r_{y_1y_2}(k)$ is the cross-correlation coefficient at the time lags k, $C_{y_1y_2}(k)$ is the covariance between cumulative weekly rainfall (y_{1t}) and weekly groundwater level (y_{2t}) at the time lags k, and S_{y_1} and S_{y_2} are the standard deviations of the series.

The cross-covariance of two series is estimated as:

$$C_{y_1y_2}(k) = \begin{cases} \frac{1}{T}\sum_{t=1}^{T-k}(y_{1t} - \bar{y}_1)(y_{2,t+k} - \bar{y}_2) \; ; k = 0, 1, 2, \ldots. \\ \frac{1}{T}\sum_{t=1}^{T+k}(y_{2t} - \bar{y}_2)(y_{1,t-k} - \bar{y}_2) \; ; k = 0, -1, -2, \ldots \end{cases} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where $\bar{y}_1$ and $\bar{y}_2$ are the means of the series.

The standard deviations of series are computed as:

$$S_{y_1} = \sqrt{C_{y_1y_1}(0)}, \qquad \text{where } C_{y_1y_1}(0) = Var(y_1) \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$S_{y_2} = \sqrt{C_{y_2y_2}(0)}, \qquad \text{where } C_{y_2y_2}(0) = Var(y_2) \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where S_{y_1} and S_{y_2} are the standard deviations of the cumulative weekly rainfall and weekly groundwater levels.

Ross (2009) explained that the correlation coefficient (r) is always between -1 and +1. The r will equal "+1" when the large y_2 values are attached to large y_1 values and created a straight line relation between y_1 and y_2. The r will equal "-1" when large y_2 values are attached to small y_1 values and make a linear relation. Therefore, it could be said that if a value of r closes to +1, it indicated that large y_1 values were strongly associated with large y_2 values and small y_1 values are strongly associated with small y_2 values. In contrast, a value of r near -1 illustrates that large y_1 values are strongly associated with small y_2 values and small y_1 values with large y_2 values.

Table 11: Time lags between GWL and Cumulative rainfall for 1 June to 29 November 2015 by using MATLAB. Note: Dom., SOB and DOB stands for domestic bore, shallow observation bore and deep observation bore, respectively.

Number	**Bore name**	**Lags (weeks)**	**Correlation coefficient**
1	Sukhuma Dom.	3	0.42
2	SKM DOB	2	0.35
3	SKM SOB	3	0.39
4	Parkor Dom.	3	0.32
5	None Yang	3	0.27
6	Khok Nongboua	5	0.36
7	Thubcharn	2	0.47
8	Boungkeo Dom.	4	0.45
9	Phone Pheung	2	0.50
10	Sarmkha	3	0.32
11	Dong Houabarn	3	0.53
12	Thardarn	4	0.56
13	Parkxang DOB	6	0.27
14	Parkxang SOB	3	0.27
15	Hieng DOB	3	0.36
16	Hieng dom	5	0.32
17	Hieng SOB	2	0.49
18	Boungkeo DOB	3	0.45
19	Boungkeo SOB	2	0.42
20	Parkor DOB	3	0.28
21	Parkor SOB	5	0.32
Average (weeks)		**3**	**0.38**
Minimum (weeks)		**2**	
Maximum (weeks)		**6**	

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Appendix 19: Overview introduction of data derived from GLDAS

1. Global Land Data Assimilation System data

The Global Land Data Assimilation System (GLDAS) data is the new product of reanalysis developed jointly by the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) and the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Prediction (NCEP) (Rodell et al., 2004). Currently, GLDAS drives four land surface models (LSMs), namely Mosaic, the Community Land Model (CLM), the Variable Infiltration Capacity (VIC) and Noah (Rui and Beaudoing, 2018). At present, GLDAS drives only the Noah Land Surface Model (LSM) with the spatial and temporal resolutions of 0.25° to 1° and 3-hourly to monthly, respectively.

The forcing data requirements to run the Noah LSM (Ek et al., 2003) simulation include surface downward shortwave radiation, surface downward longwave radiation, precipitation, near-surface air temperature, near-surface specific humidity, wind speed at the near-surface, and surface pressure (Meng et al., 2012; Rodell et al., 2004). These forcing data are obtained from ground observations, satellite data, radar precipitation measurements, and output from numerical prediction models (Ji et al., 2015). The products of GLDAS comprise land surface state (e.g. soil moisture content and surface temperature) and flux (e.g. evaporation and sensible heat flux) parameters generated by using land surface modelling and data assimilation techniques (Rodell et al., 2004).

Currently, two versions of GLDAS data are available on the Giovani website [https://giovanni.gsfc.nasa.gov/giovanni/], namely the GLDAS version 2 (GLDAS-2) and the GLDAS version 2.1 (GLDAS-2.1). The GLDAS-2 data are available from 1 January 1948 to 31 December 2010, while the GLDAS-2.1 data run from 1 January 2000 to present. Therefore, GLDAS-2.1 data were used for the current study because the duration of GLDAS-2.1 data shows overlapped with the field measurements (e.g. groundwater levels, streamflow, rainfall) in the Sukhuma District.

The GLDAS-2.1 dataset is simulated with the Noah Model 3.3 in Land Information System (LIS) Version 7 (Rui and Beaudoing, 2018). Forcing data of the GLDAS-2.1 simulation are based on data from the multiple datasets for the period of 2001 to present, which includes a combination of the National Oceanic and Atmospheric Administration (NOAA) and the Global Data Assimilation System (GDAS) atmospheric analysis fields, spatially and temporally disaggregated Global Precipitation Climatology Project (GPCP) precipitation fields, and ground-based downward shortwave and longwave radiation fields obtained using the method of the Air Force Weather Agency's AGRicultural METeorological modeling System (AGRMET) (Rui and GES DISC, 2016). Furthermore, the common GLDAS datasets are used for the simulation, such as land water mask, digital elevation model (GTOPO30), as well as the Noah model default land cover and soils datasets (Rui and Beaudoing, 2018). The GLDAS-2.1 products for both temporal resolutions (3-hourly and monthly) and both spatial resolutions (0.25° and 1°) contain 36 parameters from 2000 to present.

For the current study, only eight parameters of GLDAS-2.1 data (0.25° x 0.25° or ~800 km^2 spatial resolution and monthly temporal scale) from May 2000 to April 2016 were downloaded from the Giovanni website. The eight parameters of GLDAS-2.1 used for this study include: plant canopy surface water, evapotranspiration, surface runoff, subsurface runoff, and four soil moisture parameters (one parameter for each soil depth layer and range from 0 to 10, 10 to 40, 40 to 100, and 100 to 200 cm). These parameters were derived for the area within the GRACE footprint, which is about 12,000 km^2 comprising 16 grids of GLDAS. The unit of monthly evapotranspiration derived from GLDAS (GLDAS-derived ET) is kg/m^2/s and units of other variables are kg/m^2. It is important to note that the monthly GLDAS-derived ET data are past 3 hours average variables, the monthly surface and subsurface runoff are past 3 hours accumulated variables, and plant canopy surface water and soil moisture content are instantaneous variables (Rui and Beaudoing, 2018). Therefore, the total monthly values of GLDAS-derived ET, surface runoff and subsurface runoff variables were, respectively, calculated by using Equation (4.1) and Equation (4.2) (Rui and Beaudoing, 2018). Consequently, the units of all GLDAS variables were converted from (kg/m^2/month) to millimetres per month (mm/month) based on the assumption that the density of the water is 1000 kg/m^3.

$$ET[kg/m^2] = ET'[kg/m^2/sec] \times 10800\ [sec/3hr]\ \times 8[3hr/day]\ \times N \quad \text{………..... (1)}$$

Where ET[kg/m^2] is estimated monthly GLDAS-derived ET, ET'[kg/m^2/sec] is downloaded monthly GLDAS-derived ET, the 10800 [sec/3hr] is the seconds in 3 hours, the 8 [3hr/day] is the eight times of each 3-hourly interval per day, and N is the number of days in each month of interest.

$$Q_x\ [kg/m^2]\ = Q'_x[kg/m^2/3hr] \times 8[3hr/day]\ \times N \quad \text{……….... (2)}$$

Where Q_x [kg/m^2] is estimated monthly GLDAS-derived surface runoff or subsurface runoff, Q'_x[kg/m^2/3hr] is downloaded monthly GLDAS-derived surface runoff or subsurface runoff, and the meaning of the 8 [3hr/day] and N are the same as stated in Equation (1).

The basic statistical characteristics of the long-term annual GLDAS-2.1 data within the GRACE footprint from May 2000 to April 2016 (2000-01 to 2015-16) used for this study are summarised in Table 1.

Table 1: Basic statistical characteristics of annual GLDAS-2.1 data used in this study for the period May 2000 to April 2016 (2000-01 to 2015-16 hydrological years) at the GRACE footprint. Note: the trend column shows plus (+) and minus (-) symbols, these are referred to increasing (+) or decreasing (-) trends of the data for the period 2000-01 to 2015-16

Parameter	Abbreviation	Minimum (mm/year)	Max (mm/year)	Mean (mm/year)	Standard deviation (mm/year)	Trends (mm/year)
Canopy water storage (CWS)	GLDAS(CWS)	1.67	2.57	2.11	0.29	-0.05
Evapotranspiration (ET)	GLDAS(ET)	1086	1324	1206	68	+10
Surface runoff (Q_{SR})	GLDAS(Q_{SR})	120	260	180	45	-0.25
Subsurface runoff (Q_{SubR})	GLDAS(Q_{SubR})	312	1015	681	206	-30
Total soil moisture (0 – 200 cm depth) (SM)	GLDAS(SM)	6373	7560	7062	356	-33

For this study, the data derived from GLDAS were used mainly for estimating the components of the water balance and downscaling GRACE-derived TWS to the Sukhuma District scale in order to quantify the long-term groundwater storage. The results were compared with the output from the field measurements whenever field measurements are available.

2. GLDAS-derived soil moisture content

In the hydrology model, the Noah LSM (Chen and Dudhia, 2001) the volumetric soil moisture content (Θ) is simulated by using the following equation:

$$\frac{\partial \Theta}{\partial t} = \frac{\partial}{\partial z}\left(\acute{D}\frac{\partial \Theta}{\partial z}\right) + \frac{\partial K}{\partial z} + F_{\Theta} \qquad \text{……………} (3)$$

Where $\acute{D}$ is the soil water diffusivity and K is the soil hydraulic conductivity of the soil. These two components are functions of Θ. Also, F_{Θ} is the representative component of sources and sinks (such as rainfall, evaporation, and runoff) for soil water.

The soil water diffusivity ($\acute{D}$) in Equation (4) is estimated from Darcy's Law based on the assumption of a rigid, isotropic, homogenous, one dimensional vertical flow domain (Chen and Dudhia, 2001) as following equation:

$$\acute{D} = K(\Theta)\left(\frac{\partial \psi}{\partial \Theta}\right) \qquad \text{…………… (4)}$$

Where ψ is the soil water tension function.

The values of K and ψ are estimated by using a method proposed by Cosby et al. (1984) as follows (Chen and Dudhia, 2001):

$$K(\Theta) = K_s\left(\frac{\Theta}{\Theta_s}\right)^{(2b+3)} \qquad \text{…………… (5)}$$

$$\psi(\Theta) = \frac{\psi_s}{\left(\frac{\Theta}{\Theta_s}\right)^b} \qquad \text{…………… (6)}$$

Where b is a curve-fitting parameter, K_s is the saturated hydraulic conductivity, ψ_s is the saturated soil water tension function. The values of b, K_s, and ψ_s will depend on soil type.

The GLDAS database has provided the soil moisture content data for four soil layers (Chen and Dudhia, 2001). The soil moisture content in individual soil layer is simulated by using the following equations:

$$d_{z1}\frac{\partial \Theta_1}{\partial t} = -\acute{D}\left(\frac{\partial \Theta}{\partial z}\right)_{z1} - K_{z1} + P_d - Q_{SR} - E_{dir} - E_{t1} \qquad \text{…………… (7)}$$

$$d_{z2}\frac{\partial \Theta_2}{\partial t} = \acute{D}\left(\frac{\partial \Theta}{\partial z}\right)_{z1} - \acute{D}\left(\frac{\partial \Theta}{\partial z}\right)_{z2} - K_{z1} - K_{z2} - E_{t2} \qquad \text{…………… (8)}$$

$$d_{z3}\frac{\partial \Theta_3}{\partial t} = \acute{D}\left(\frac{\partial \Theta}{\partial z}\right)_{z2} - \acute{D}\left(\frac{\partial \Theta}{\partial z}\right)_{z3} - K_{z2} - K_{z3} - E_{t3} \qquad \text{…………… (9)}$$

and

$$d_{z4}\frac{\partial \Theta_4}{\partial t} = \acute{D}\left(\frac{\partial \Theta}{\partial z}\right)_{z3} + K_{z3} - K_{z4} \qquad \text{…………… (10)}$$

Where d_{zi} is the thickness of the i^{th} soil layer, P_d is the rainfall not intercepted by the canopy, E_{ti} is the canopy transpiration that is taken by the canopy root in the i^{th} soil layer within the root zone layers (including three soil layers from the ground surface), and Q_{SR} is the surface runoff. The unit of these components are expressed as millimetres per time interval considered.

3. GLDAS-derived surface runoff and subsurface runoff

The surface runoff (Q_{SR}) and subsurface runoff (Q_{SubR}) from GLDAS are simulated by using the following equations (Chen et al., 1996; Schaake et al., 1996):

$$Q_{SR} = \frac{P_x^2}{(P_x + I_c)} \qquad \text{............... (11)}$$

$$Q_{SubR} = \begin{cases} Q_{max}\left(1 - \frac{\acute{D}_b}{S_{max}}\right), & \acute{D}_b < S_{max} \\ 0, & otherwise \end{cases} \qquad \text{............... (12)}$$

Where P_x is the excess rainfall passed into the bottom layer, I_C is the capacity of the spatially averaged infiltration, S_{max} is a critical value of soil moisture deficit, $\acute{D}_b$ is the soil moisture deficit of the bottom layer, and Q_{max} is the maximum rate of subsurface runoff.

4. Canopy water storage

The canopy water storage (CWS) from the GLDAS is estimated from a water balance equation as follows (Chen and Dudhia, 2001; Chen et al., 1997; Chen et al., 1996):

$$\frac{\partial W_C}{\partial t} = \sigma_f P - \acute{D} - E_C \qquad \text{............... (13)}$$

Where W_C is the intercepted canopy water storage or CWS, σ_f is the green vegetation fraction (Chen et al., 1996), P is the total rainfall, $\acute{D}$ is the soil water diffusivity, and E_C is the wet canopy evaporation.

5. Evapotranspiration

The total evapotranspiration (ET) derived from GLDAS, $GLDAS(ET)$, is defined as the sum of the direct evaporation from the top shallow soil layer (E_{dir}), evaporation of rainfall intercepted by the canopy (E_C), and transpiration through canopy and roots (E_t) (Chen and Dudhia, 2001; Chen et al., 1997; Chen et al., 1996). The equation is expressed as follows:

$$GLDAS(ET) = E_{dir} + E_C + E_t \qquad \text{............... (14)}$$

The direct evaporation from the ground surface is computed by (Chen and Dudhia, 2001):

$$E_{dir} = (1 - \sigma_f)\beta E_p \quad \text{and} \quad \beta = \frac{\Theta_1 - \Theta_w}{\Theta_{ref} - \Theta_w} \qquad \text{............... (15)}$$

Where E_p is the potential evaporation estimated by a Penman-based energy balance method, Θ_1, Θ_{ref} and Θ_w are the soil moisture content in the top soil layer, the soil moisture at the field capacity and the soil moisture at the wilting point, respectively.

The wet canopy evaporation is computed by (Chen and Dudhia, 2001; Chen et al., 1997; Chen et al., 1996):

$$E_C = \sigma_f E_p \left(\frac{W_C}{\grave{S}}\right)^n \quad \text{............... (16)}$$

Where W_C is the canopy water storage, $\grave{S}$ is the maximum allowed canopy water storage capacity ($\grave{S} = 0.5\ mm$), and $n = 0.5$.

The evapotranspiration of canopy is computed by (Chen and Dudhia, 2001; Chen et al., 1997; Chen et al., 1996):

$$E_t = \sigma_f E_p B_C \left[1 - \left(\frac{W_C}{\grave{S}}\right)^n\right] \quad \text{............... (17)}$$

Where B_C is a function of canopy resistance and is computed by:

$$B_C = \frac{1+\frac{\Delta}{R_r}}{1+R_C C_h+\frac{\Delta}{R_r}} \quad \text{............... (18)}$$

Where C_h is the surface exchange coefficient for heat and moisture; Δ is a parameter that depends on the slope of the saturation specific humidity curve; R_r is a function of surface air temperature, surface pressure, and C_h; and R_C is the canopy resistance. Details on the estimation of C_h, R_r, and Δ are provided by Ek and Mahrt (1991). The canopy resistance (R_C) is computed by using the method of Jacquemin and Noilhan (1990).

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