



Mandurah greyhound track upgrade
Report 8 – Design 3 catching pen analysis

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30 March 2021

Executive summary

This is the eight report in a series of reports prepared by UTS for Racing and Wagering Western Australia.

The purpose of this Report was to analyse the catching pen for Design 3 (and Design 4) for the Mandurah greyhound track (70.9 m bends, 59.8 m transitions, 7.0 m wide)¹. The details of Design 3 can be found on Report 4.

This report analysed the location, layout and alignment of Design 3 catching pen for greyhound dynamics.

It was concluded that the alignment² of catching pen in Design 3 poses some safety concerns for greyhounds for different slowing down distances. These concerns can be mitigated to some extent when the catching pen is widened as shown in Figure 3.

When the catching pen is located near the existing track catching pen location the modelling showed that it was less safe for different slowing down distances when compared to Design 3 proposed catching pen alignment.

It is recommended that a dual-gate system such as the one depicted in Figure 6 be investigated as a possible safer catching pen design.

This report should be read in conjunction with Reports 4 to 6.

¹Design 3 is the safest proposed Mandurah greyhound track upgrade that UTS has evaluated.

²The orientation of the catching pen with respect to the track.

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1 Introduction

Figure 1 is the David Allan Consulting Engineer Pty Ltd plan for the Design 3 Mandurah greyhound track dated 23 February 2021.

The Design 3 (and Design 4³) proposal is an oval shaped track with two 70.9 m semicircular bends joined to two 15.7 m straights by four 59.8 m. This design has approximately 2.1 m and 4.2 m longer circumference compared to Design 1 and Design 2 respectively.

Design 3 track has four starts, namely: 303.0 m, 403.0 m, 498.0 m and 697.5 m.

In Design 3 the catching pen is located inside the bend between the 403 m and 498 m distances starts. As the catching pen is an extension to the track and within the bend, the proper alignment of the catching pen is necessary for providing a gradual slowing down of the greyhounds. It is also important that the pathway to the catching pen does not have any corners or sharp turning points from the natural trajectory of the greyhounds.

This report analyses the location, layout and alignment of Design 3 catching pen for greyhound dynamics.

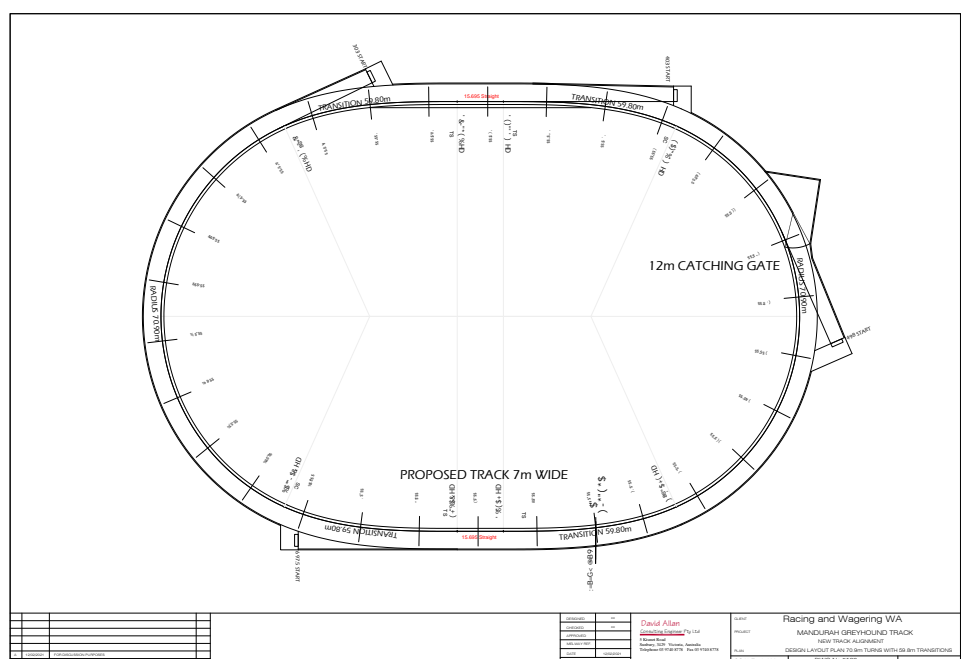


Figure 1: Design 3 Mandurah greyhound track plan (70.9 m bends, 59.8 m transitions)
David Allan Consulting Engineer Pty Ltd (23 February 2021).

³Design 4 is an additional 340 m start on the back straight of Design 3 using a set of drop-on boxes.

2 Catching pen location and layout

The catching pen in Design 3 is located approximately 135 m after the finish post. This location provides an adequate distance for the greyhounds to reduce their speed safely. When the catching pen gate is open the narrowest entrance width is more than 7 m. This is indicated by the red-dashed line in Figure 2. This width is sufficient to allow safe entry of eight greyhounds into the catching pen. Figure 2 shows that there is a depth distance of approximately 17 m inside the catching pen for greyhounds that have failed to adequately decelerate prior to entering the catching pen.

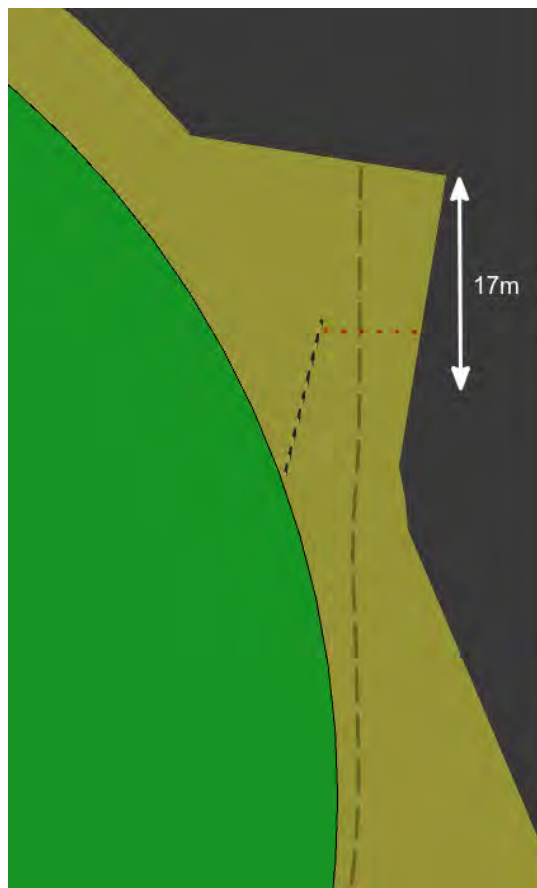


Figure 2: Design 3 Mandurah greyhound track catching pen. The grey dashed line represents greyhound heading direction after the finish post and into the catching pen. The red line represents the narrowest width inside the catching pen.

3 Greyhound trajectory into the catching pen

Greyhound trajectory dynamics plays an important role in the proper alignment of the catching pen with respect to the track. Observations from the Greyhound Racing Victoria (GRV) tracks catching pen footage showed the following incidents for greyhound trajectory into the catching pen post the finish line:

- One or more greyhounds continue to run following the rail and the track circuit i.e. head towards the closed gate despite the dummy lure within the catching pen. This behaviour is shown in:

Video 1 – Cranbourne: <https://bit.ly/39pSmcH>

Video 2 – Cranbourne: <https://bit.ly/3cy9E9N>

- A few greyhounds which are at the back of the pack and also for greyhounds which follow a wider path the chances of greyhound bumping into the outside of the track increases when the catching is not aligned with the wider running greyhounds. This behaviour is shown in:

Video 3 – Ballarat: <https://bit.ly/2PgBMoT>

Video 4 – Ballarat: <https://bit.ly/39pTAoj>

Video 5 – Cranbourne: <https://bit.ly/2PhNG1N>

- When adequate space is available inside the catching pen for the greyhound heading the catching can accommodate all the approaching greyhounds while avoiding greyhound impacting the back of the catching pen. This behaviour is shown in:

Video 6 – Ballarat: <https://bit.ly/3u8oREr>

- Slowing down distance is the distance between the greyhound and the catching pen when the greyhound withdraw from hard chasing and redirect its thoughts towards the decoy lure that has been manually deployed within the catching pen. This behaviour is shown in:

Video 7 – Ballarat: <https://bit.ly/3cwNBjs>

Video 8 – Ballarat: <https://bit.ly/3rxQAMT>

- A short slowing down distance and sharp turning point reduces greyhound safety. This behaviour is shown in:

Video 9 – Bendigo: <https://bit.ly/3szSn1V>

Video 10 – Meadows: <https://bit.ly/3cL4PtD>

- Alternatively, a longer slowing down distance with no sharp turning point increases greyhound safety. This behaviour is shown in:

Video 11 – Bendigo: <https://bit.ly/31tbjH9>

By using information available from the GRV catching pen racing video footage and modelling greyhound stride performance dynamics greyhound trajectory, the Design 3 catching pen dynamics were simulated.

In the simulation of the catching pen dynamics, three different scenarios were created where the *slow down distances*⁴ were 15 m, 20 m and 30 m from the middle of the catching pen as these slowing down distances appears to be occurring at the track as seen from various catching pen footage. The following videos show simulations of greyhound catching pen dynamics for each of the slowing down distances:

Simulation 1 – 15 m slow down distance: <https://bit.ly/3m8pN96>

Simulation 2 – 20 m slow down distance: <https://bit.ly/3fxqhUC>

Simulation 3 – 30 m slow down distance: <https://bit.ly/3sAr0IA>

Simulation analyses of the above simulations provided the following details about slowing down distances for the Design 3 catching pen alignment.

With the 15 m slowing down distance a sharp turning would occur near the catching pen and the chances of greyhound bumping into the catching pen gate were highest with this configuration.

The 20 m slowing down distance provided greyhounds with a more gradual path towards the catching pen as can be seen from the simulations.

With the 30 m slowing down distance greyhound path towards the catching pen is more gradual than 20 m slowing down distance except greyhounds are more likely to bump with the track outside edge. Based on the simulation results, to improve the Design 3 catching pen alignment the catching pen can be widened along the track outside like shown in Figure 3 where the catching pen is widened approximately 1 m from the current shape.

⁴The distance between the leading greyhound and the middle of the catching pen when the greyhound aligns itself with the decoy lure located at the catching pen.

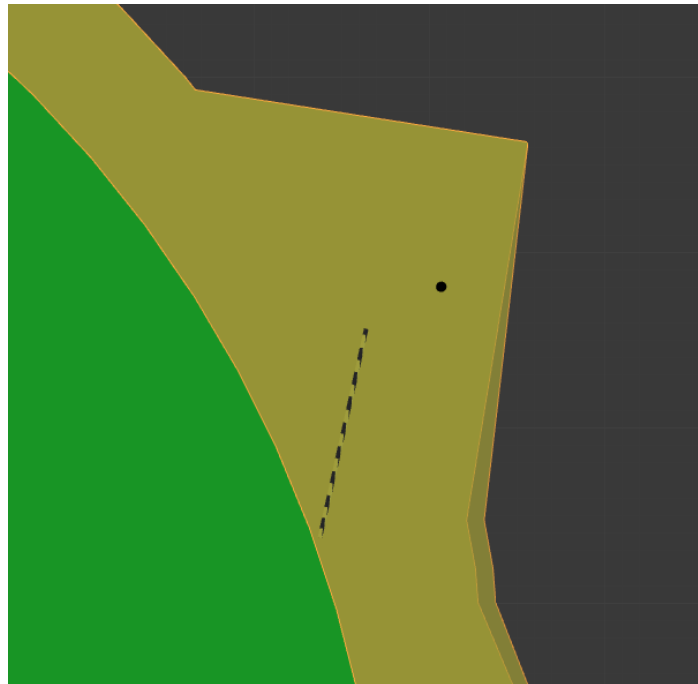


Figure 3: Design 3 Mandurah greyhound track catching pen widening along the track outside for providing more clearance for greyhounds approaching with longer slowing down distance.

Figure 4 shows an approximation of greyhound trajectory (blue line) from modelling for Design 3 catching pen alignment. From the modelling, it can be seen that with Design 3 catching pen alignment the greyhounds need to alter their heading where the direction of centrifugal force would change as can be seen from the curvature combs of the greyhound trajectory. The change of direction of centrifugal force is not preferable as it increases the hazardous conditions for the greyhounds.

Figure 5 shows the modelling of greyhound trajectory (blue line) where the direction of greyhound centrifugal force would not change and the centrifugal force would gradually drop (length of curvature combs) as the greyhound approaches the catching pen. This greyhound trajectory in Figure 5 is preferable as it would likely reduce hazardous conditions for the greyhounds.



Figure 4: Modelling of greyhound trajectory and associated curvature combs for Design 3 Mandurah greyhound track catching pen run.

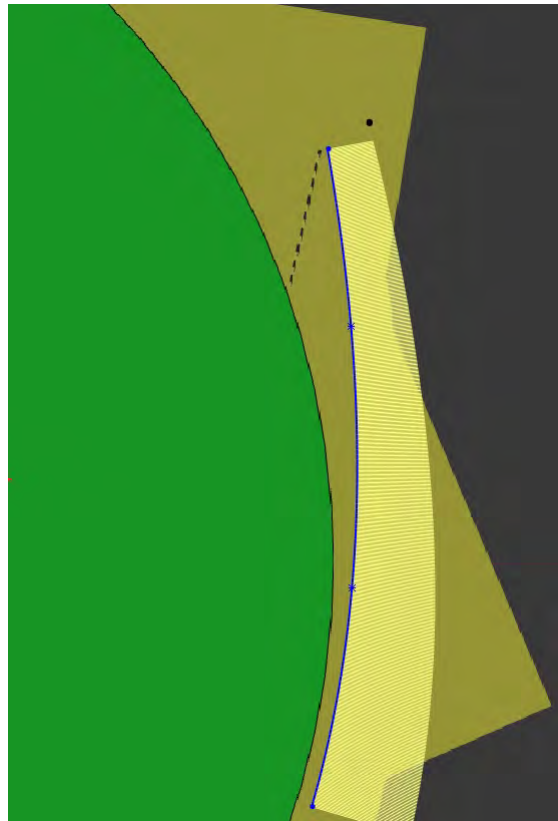


Figure 5: Modelling of greyhound trajectory and associated curvature combs where the greyhound trajectory follows a decreasing force turning for Design 3 Mandurah greyhound track catching pen run.

The links below show simulations of catching pen run for Design 3 where the catching pen resembles the existing Mandurah greyhound track plan. In the simulation of the catching pen run it is unlikely a slowing down distance of 15 m could occur, only two different scenarios were created. The slowing down distances were 20 m and 30 m.

With the 20 m slowing down distance the chances of greyhound bumping into the catching pen gate were higher than original Design 3 catching pen alignment (Figure 1). With the 30 m slowing down distance it is more likely that greyhounds would bump into the track outside edge and corner of the catching pen compared to the original Design 3 catching pen alignment (Figure 1):

Simulation 4 – 20 m slow down distance (for existing the catching pen):

<https://bit.ly/3rEGji5>

Simulation 5 – 30 m slow down distance (for existing the catching pen):

<https://bit.ly/3dp3SGq>

4 Recommendations

It is recommended that a dual-gate system such as the one depicted in the following simulation videos and Figures 6 and ?? be investigated as a possible safer catching pen design.

Simulation 6 – 15 m slow down distance: <https://bit.ly/3dwMsrI>

Simulation 7 – 20 m slow down distance: <https://bit.ly/3upjNvc>

Simulation 8 – 30 m slow down distance: <https://bit.ly/3miWHDO>

Figure 6 illustrates an improved catching pen alignment based on the greyhound trajectory shown in Figure 5. The red dashed line in Figure 6 depicts the catching pen boundary for the improved catching pen alignment where the black dashed lines represents the catching pen gates. There are two catching pen gates in the improved catching pen alignment as shown by dark black dashed lines where the light black dashed lines represent when the gates are not closed.

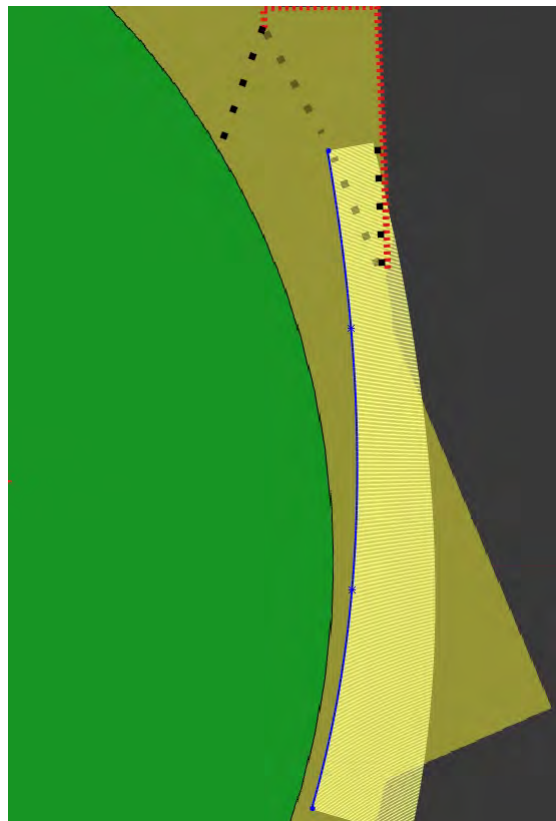


Figure 6: An improved catching pen alignment for Design 3 Mandurah greyhound track where it accommodates a greyhound trajectory that follows a decreasing force turning for the catching pen run. The red dashed line represents the new catching pen boundary where the light and dark black dashed lines are two catching pen gates when opened and closed for the catching pen run.

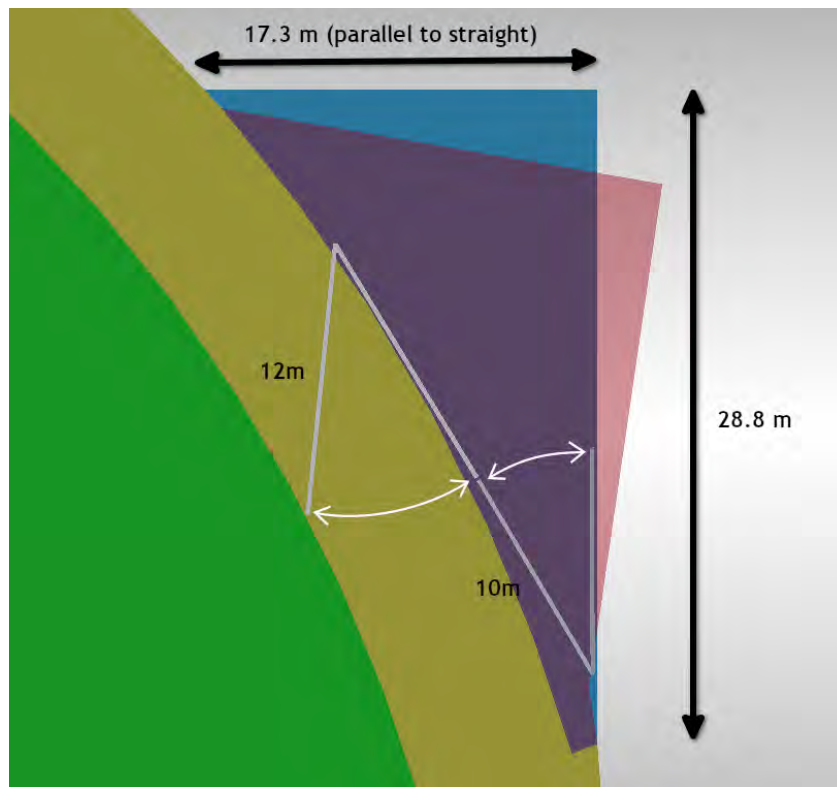


Figure 7: Approximate dimensions for the improved catching pen alignment (blue-shaded area) and dual-gate (white lines) for Design 3 Mandurah greyhound track. The Design 3 proposed catching pen alignment is depicted in pink beneath the blue shaded area.

Figure 8 illustrates the suggested drainage directions for the improved catching pen alignment shown in Figure 7 (blue-shaded area).

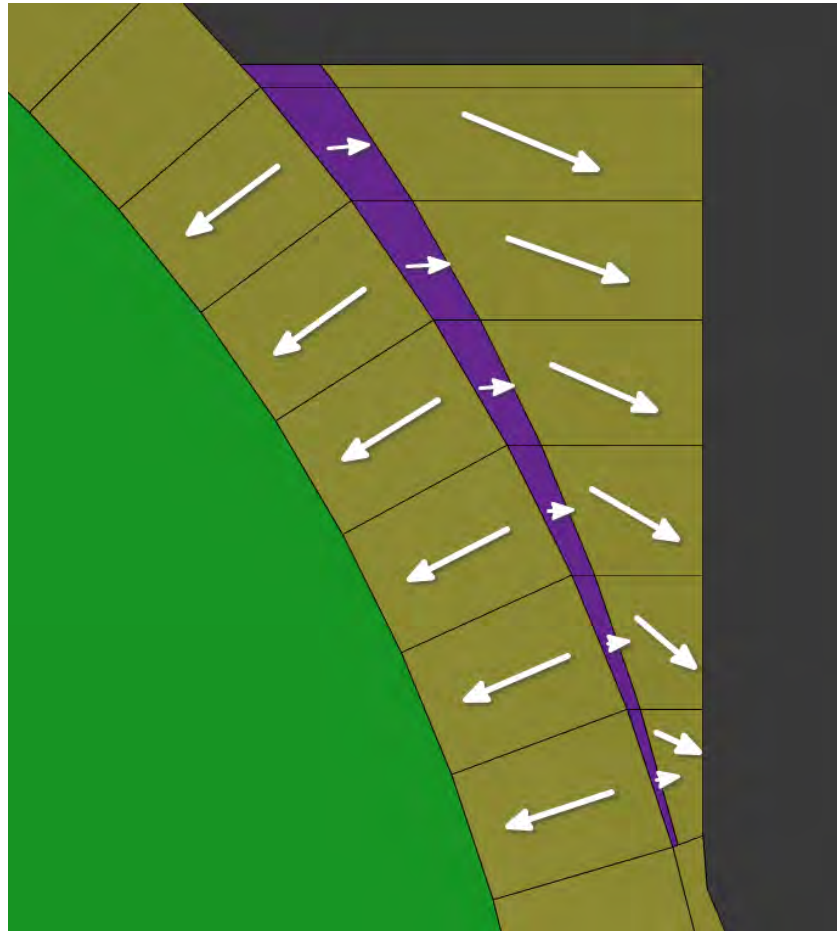


Figure 8: Suggested drainage directions for the improved catching pen alignment (blue-shade area) with dual-gate for Design 3 Mandurah greyhound track. The cross-fall reduce the likelihood of cross-contamination of the track surface while maintaining a gradual uphill grade with the intent of encouraging any greyhounds that are still galloping to stop on the softer catching pen sand.