Hunter Water Corporation

ROADS AROUND TILLEGRA DAM
NEW SALISBURY ROAD

Concept Design Report

for
Hunter Water Corporation

Roads Around Tillegra Dam
New Salisbury Road

Concept Design Report

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Contents

1 Introduction

1.1 General

This Concept Design Report (CDR) relates to the concept design phase for the Roads around Tillegra Dam – New Salisbury Road Project. This report details the standards and assumptions that will be used for, and will give direction to, the completion of the project through the detailed design.

The CDR is not exhaustive but identifies the elements or assumptions that are critical to the success of the design and discusses the associated benefits and risks inherent in the recommended philosophy.

1.2 Project Background

Hunter Water Corporation (HWC) is planning to augment its current water supply system with the construction of on-creek storage (Tillegra Dam) on the upper Williams River. The proposed Tillegra Dam Site is located approximately 3½ km upstream from the confluence with the Chichester River. Dungog is the closest township, approximately 9½ km east of the site via Chichester Dam Road.

The reservoir of Tillegra Dam will inundate approximately 15km of Salisbury Road, a local road with a traffic volume of around 300 movements per day. The proposed new road will need to travel around the reservoir and reconnect to Salisbury Road. The new road will extend from south of the proposed dam site to a location beyond the reach of influence of the reservoir.

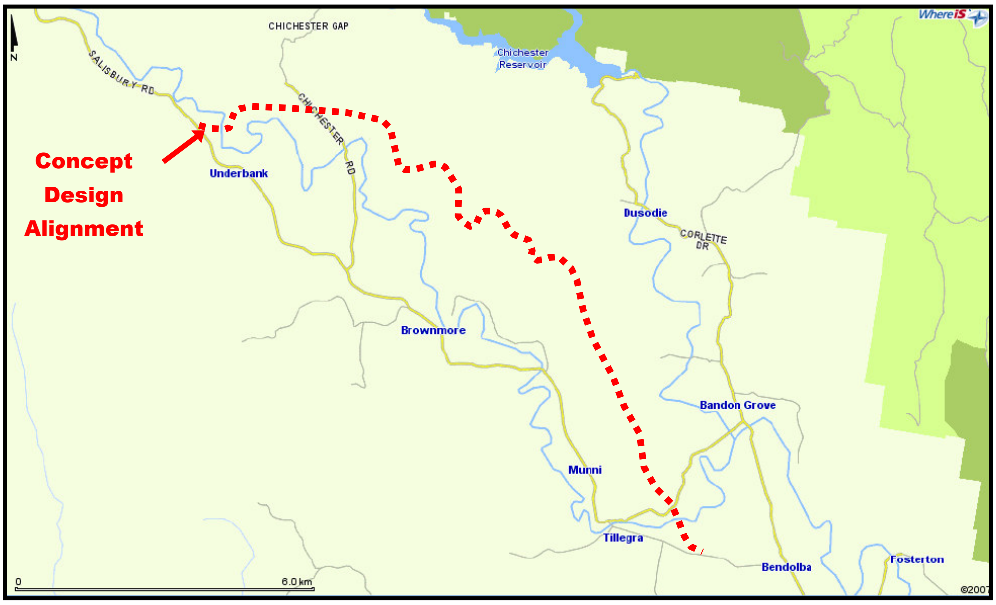


Figure 1.1: Locality Plan

1.3 Reports

Several documents have been produced during the development of the project, which include:

- Feasibility Stage Road Safety Audit Report, by Samsa Consulting, March 2008;
- Value Management Workshop No. 1 January 2008, Report prepared by Constructive Solutions
- Roads Around Tillegra Dam – Route Selection – Options Report, by Opus International Consultants, April 2008;
- Value Management Workshop No. 2, May 2008, Report prepared by ValueFirst Pty Ltd in association with Australasian Value Management – still in Draft
- Erosion and Sediment Control Concepts Report prepared by Opus, June 2008
- Road Pollution Risk Assessment and Control Measures prepared by Opus, June 2008
- Bridge Options Report prepared by Opus – still in Draft
- Moolee Creek Crossing Options Report prepared by Opus, June 2008

1.4 Design Approach for Concept Design

Generally the concept design was developed in accordance with the brief, Austroads and Dungog Shire Council's design guidelines and incorporating, as appropriate, design parameters and the philosophy agreed to at the Value Management Workshop (VMW) No.1 and clear findings from the VMW No.2.

1.4.1 Design Risk

The new road will provide access for the relatively low volumes of traffic around the existing valley that is due to be inundated by the new Tillegra Dam storage. The new road is being designed to a standard of amenity, comfort and speed environment similar to the existing road and allowing for the difficult topography that it has to traverse.

Because of the low volume of traffic that will use it and therefore likely to be affected, in a risk based approach to the application of the appropriate levels of safety to vehicle and other users of the new road, the probability of occurrence (likelihood) has been ranked as low (Rare or Unlikely to AS/NZS4360: 2004). Because consequences range from Insignificant to Major (not considered many events on such a road could be catastrophic), most events have a Moderate or Lower Risk rating attached to them.

These risk ratings have influenced the choice of design parameters in many areas of the design – establishing a reason for the minimum or 'low end' requirements in many of the design standards that are always discretionary in design of such infrastructure. Where the risk rating is higher the design standards are kept appropriately 'high'.

1.4.2 Road Geometrics

The design speed environment through the length of the new road has been chosen as part of the road selection and concept design process. Optimisation of the design speed, the topography of the terrain to be traversed, and the risks involved and to be catered for is a key part of the geometric design process.

Typically, because of the Moderate or Lower Risk rating, the lowest geometric design parameters have been used in the design process. This has enabled the geometry of the road to better fit the topography thereby not creating excessive amounts of earthworks.

1.4.3 Safety Measures

Within the above geometric design optimisation, appropriate attention has been given to the safety of road users and catered for by the use of positive measures of protection rather than simply warning against any design safety limitations. For example, appropriate sight distances for the speed environment are ensured by additional earthworks on bends etc, changes in horizontal and vertical alignments are coordinated and areas of high risk as a result of vehicles running off the road are protected by guard railing or barriers.

1.4.4 Pavement Drainage

While the approach is to shed stormwater from the pavement and to discharge it in a controlled manner away from the road, this is achieved in a number of different ways that are related to the road geometrics, the type of earthwork environment it is in and the natural topography.

In cuttings, the run-off from the pavement and from the cutting surfaces is directed into the roadside table drain which carries it down the grade of the road until it reaches the end of the cutting. At this point it is either directed down to the gully on the upstream side of the road embankment or is piped under the road to the downstream side of the embankment and directed to the gully.

On fill embankments or at grade the run-off is shed directly off the pavement and down the faces of the embankment in an uncontrolled manner. The run-off is not collected or concentrated before it runs off the edge of the embankment and does not pose an erosion risk to the embankment.

Depending on whether the road has a crown or superelevation, the size of the catchment per metre run of road for pavement run-off is either half or the whole width of the paved road surface (4m and 8m) respectively. The sizes of the cutting face catchments per metre run of road depends on the height and gradiant of the batter slopes above the road.

1.4.5 Cross Drainage

Cross drainage under the new road is required whenever the road passes over/under existing gullies to allow the normal stormwater flows occurring in these gullies during rain events to flow past the road and to continue downstream to its existing downstream collector drainage system (creek, river etc).

Where the road passes over a gully, the run-off is passed through the embankment below the road level. Where the road passes under a gully, run-off from the "hanging valley" is collected at the top of the cutting and transferred down to the roadside table drain and becomes part of the pavement drainage run-off.

1.4.6 Retaining Walls

In some locations along the route there is a need for support of the road alignment where the proposed fill slope (2H:1V) is very close to the slope of the natural surface beneath it and the depth of fill over that surface is relatively small potentially creating a relatively thin layer of fill. Rather than have the proposed thin fill spilling a long way down the natural slope, it is proposed to intercept the fill batter line with an appropriately designed retaining wall. The situations where this concept design has been applied are limited by the feasibility and cost of a suitable type of retaining wall in this environment. In general, such structures are likely to be rock filled gabion basket type structures which will be relatively easy and cheap to build.

1.4.7 Bridges

There will be three substantial bridges on the new road: at the Lower Crossing of the Williams River; at Moolee Creek; and at the Upper Crossing. The total length of bridges will comprise less than 1% of the length of the new road, but the principles underlying their concept design are based on achieving the best in economy, serviceability, safety and amenity.

The three bridges are located in quite differing locations, so their designs could not be completely uniform. However, where appropriate, details will be repeated from bridge to bridge to simplify construction.

The concept designs have been steered by some basic aims:

- To use standardised, readily available, pre-fabricated components where practicable.
- To employ foundations that are constructible, given the geotechnical information available.
- To use fewer, larger spans rather than more, smaller spans.
- To provide uniform span lengths on each bridge to maximise economy.
- To position the bridges with due regard to their impact on the watercourse and the local environment.
- To have the underside of the bridge deck free from irregularities that might entrap debris during high flow events.
- To provide a waterway area beneath the bridge sufficient to pass the 100 year flood event without overtopping the structure.
- To provide a carriageway width compatible with the approach lane widths and the required edge distances to the traffic barriers.
- To provide traffic barriers along the sides of the bridge that meet the requirements of the Bridge Design Code as well as providing a degree of safety for cyclists using the bridge.
- To provide pier shapes that will assist the flow of water beneath the bridge and minimise the risk of logs and debris being caught.

- To provide approach slabs at the ends of the bridges to mitigate road surface undulations caused by settlement at the abutments.
- To cater for an SM1600 live loading, which conforms to the requirements of the Bridge Design Code.
- To incorporate the necessary erosion protection measures into the riverbank areas beneath the bridges.
- To minimise construction joints in the deck to improve riding comfort.
- To provide holding-down devices to prevent the superstructure dislodging during extreme flow events.

2 Project Description

2.1 Project Objectives

The objectives of the project are:

- To provide a replacement for the portion of the existing Salisbury Road that will be inundated by the storage of the proposed Tillegra Dam in order to provide access to/from Salisbury and beyond (Barrington).
- The design and construction of an alternative route to the existing road that will be acceptable to stakeholders and local residents and that accommodates the changed environment following completion of the dam and filling of the reservoir

2.2 Design Description

The road follows the following alignment:

- Connecting from the existing Salisbury Road about 1.7 km from the Corlette Drive turnoff.
- Northwards across farming land between Salisbury Road and the Williams River
- Crossing of the Williams River
- Northwards across farming land between the Williams River and the eastern flank of the Chichester Range
- Climbing up the eastern side of the southern section of the Chichester Range
- Travelling along the ridge on the Chichester Range
- Dropping down to the western side of the northern section of a prominent ridge on the Chichester Range to the “lower route” that traverses around the eastern side of the reservoir
- Crossing Moolee Creek in an area of some inundation
- Through the area east of the Underbank
- Crossing of the Williams River a second time
- Through the Fisher’s property
- Reconnecting to the existing Salisbury Road

The general geometry consists of:

- A maximum vertical gradient of 8% is located on the eastern ascent to the ridge from about CH2300 to Ch3100 with gradients varying between 6.5% and 8% from CH3100 to CH3600 where the road then flattens out onto the ridge.
- There are about 46 cuttings and about 47 fill embankments along the alignment.
- The alignment generates significant cuts with a maximum cut height of about 15m along the centreline. Because these cuts are usually through cross sloping topography, they are frequently significantly higher on one side of the centreline (and lower on the other side).
- The alignment generates significant fills with a maximum fill height of about 18m along the centreline. Because these fills are usually through cross sloping topography, they are frequently significantly higher on one side of the centreline (and lower on the other side).
- Earthwork volumes along the realignment are in the order of 900,000 m3 of cut and fill.

3 Relevant Design Standards and References

The concept design has been undertaken using the following design standards, guidelines and references

- Austroads: Rural Road Design Guide
- Austroads Part 5: Intersections at Grade
- Roads and Traffic Authority NSW (RTA) - Road Design Guide
- Dungog Shire Council – Road Design Policy
- AS5100-Bridge Design Code
- AS3600-Concrete Code
- Australian Rainfall and Runoff (AR & R) 2001
- Concrete Pipe Association of Australia (CPAA) “Hydraulics of Precast Concrete Conduits”
- Austroads “Waterways Design”
- Opus’ Culvert manual (CEP 706)
- Culvert Design Guide (CIRIA)

Any departures to these standards are outlined in Section 15.

4 Survey

4.1 General

The concept design has been based on LIDAR survey of the area supplied by Hunter Water. The LIDAR reference is 12548A02NOB 17-28 March 2007

Hunter Water has undertaken a QA check on the LIDAR survey compared to ground survey. About 200 sample points were compared. In general the points compared within specification. On open ground the contours can be relied upon to be within half the contour interval i.e. 0.25 metres. On hard surfaces, e.g. Salisbury Road near the Cemetery, agreement closer than 100mm was observed. In heavily wooded areas, often near creeks and in gullies, the thick tree canopy does affect the LIDAR survey by artificially raising the recorded ground level, possibly by up to 0.7m, although not many of points in these areas have been compared.

As most of the proposed alignment is through clear ground the survey was assessed by HWC as being be quite suitable for the concept design. It may be required to undertake some ground survey in heavily wooded areas during the detailed design phase in order to refine the design.

In order to aid the refinement of the bridge designs additional ground survey was undertaken at the Lower Bridge (CH1100), Moolee Bridge (CH 13800) and Upper Bridge (CH 16200) sites in May 2008.

4.2 Project Co-ordinate System

All project deliverables are to the following datums:

- Horizontal: MGA Zone 56
- Vertical: Australian Height Datum (AHD)

5 Geotechnical

5.1 General

The concept design geotechnical investigation commenced in December 2007 and a draft factual report issued in May 2008. The Interpretive Report in Draft was issued by Douglas Partners on 16th May 2008.

The geotechnical design used at the time of writing this Concept Design Report is based on the Draft Interpretive Report (May 2008). However, the design may be modified during detailed design based on the outcomes of the additional site investigations.

5.2 Cut Slopes and Fill Embankments

The general design criteria for the cut and fill profiles is summarised in Table 5.1. The slope angles vary in certain locations where adverse rock or poor rock quality occurs. In these areas, slope batters have been flattened.

Earthworks	Element	Specification
CUT	Cut Batter (hard rock – drill & blast)	0.5H:1V
	Cut Batter (heavy to light rippable)	1H:1V
	Cut Batter (soft gravels, topsoil)	2H:1V
	Cut Batter (soft gravels, topsoil –relaxed)	1.5H:1V
FILL	Engineered Fill Batters (general – with guardrail)	2H:1V
	Engineered Fill Batters (general – without guardrail)	4H:1V

Table 5.1: Proposed Cut and Fill Profiles

The values in Table 5.1 may vary once the outcomes of the additional investigations are known.

5.3 Embankment Footings

Douglas Partners is currently in the process of inspecting a number of gullies along the route for the purpose of mapping the visible geology.

Douglas Partners and Opus are also currently assessing the need for detailed investigations in those gullies that are due to support high embankments

6 Road Design

6.1 Design Standards

The horizontal and vertical alignment is based on a various design speeds from 60km/hr to 80km/hr along the length of the road to suit the topography and other constraints.

The following Tables 6.1 and 6.2 set out the design criteria and standards that have been adopted for the current design:

Criterion	Value
AADT	500-1500
Lane width (sealed)	2x3.5m
Shoulder (sealed)	0.5m
Normal Cross fall	-3%
Superelevation (max)	7%
Max Grade	8%

Table 6.1 Design Criteria Values

Criterion	Design Speed		
	80kph	70kph	60kph
SSD (stopping sight dist - Includes grade correction for max -8% grade)	127m	99	77
Horizontal Radius (for max. 3% downgrades)	220m	150	90
Horizontal Radius (for max. 8% downgrades – Absolute minimums)	230m	150	105
Superelevation warp rate	2.5%/sec	2.5 - 3.5%/sec	
Spiral Length	65m	45m	40m
Vertical K crest	31	20	12
Vertical K sag	11	8	6
Lane widths on curves	3.8m on curves between 100m & 200m rad		3.8m on curves between 100 & 200m rad and 4.1m for curves under 100m
Approx. lateral offset for SSD from lane C.L. on curves	9m	8m	7m

Note: Above values have been derived from Austroads Rural Road Design using the desirable minimum values based on a 2.5 sec reaction time unless noted otherwise

Table 6.2 Design Standard Values

6.2 The Environment

The terrain in the area varies from rolling to hilly with an elevation change of around 150m. To accommodate the changing terrain, the alignment has been fitted to the terrain using curves of changing speed categories.

Vertical geometry has been used with suitable grades and k values for different speed sections to help minimise cuts and fills and so reduce the environmental impact.

The scheme proposes to implement various water quality proposals to help reduce the environmental impact of the finished project.

6.3 Design Speeds

The first 3km at the southern end and the last 3.5km at the northern end are designed with an 80kph design speed in mind. This gives way to a section in between with curves in the 70kph design range culminating in the minimum radius corner of 60 kph design at chainage 9500.

The design is such that the driver is progressively drawn down in speed as he approaches the 60Kph mid section corner and then lead back up to the 80kph section as he comes to the end of the section.

In a number of places in the 70kph section curves of the same radius are grouped together to help stabilize speeds and give a smooth flow.

6.4 Safety

A number of safety initiatives have been put in place. Where practical, fill side slopes will be reduced to 1 in 4 or better so as to avoid the use of W-section guardrail. This will be evaluated as construction progresses as some areas may be in-filled with waste material and have adjoining batter slopes reduced or removed.

Those locations that remain with slopes of 3H:1V or steeper will have W-section guardrail fitted with the appropriate “Length of Need” to protect vehicles from the clear zone hazard.

Widening is applied to the pavement on corners of less than 200m radius to accommodate heavy vehicle tracking.

The appropriate sight distance for the different speed categories is achieved with corners cut back as necessary.

A number of property or service access points have been identified which satisfy the required sight distance for the particular speed environment in the vicinity.

6.5 Road User Comfort

The principal of coordination between horizontal and vertical alignment has been applied in designing the alignment. By aligning the geometry a road that is pleasing to the eye and harmonises with the local terrain has been achieved.

Horizontal curves have been kept to the largest practical radius compatible with the terrain and the vertical geometry has been designed to complement this. For the most part, pavement warp has been set at 2.5% with an increase to 3.5% in the 60 to 70Kph design curves.

6.6 Earthworks

The alignment has been positioned in order to minimise the amount of cut and fill quantities whilst avoiding as much as possible significant areas of ecological interest as identified in the Environmental Assessment report prepared by Connell Wagner, 2008.

The Concept Design geotechnical site investigation has been completed and a Draft Interpretive Report issued by Douglas Partners on 16th May 2008. The concept design cut batters have been based on this draft interpretive geotechnical report.

The detailed design geotechnical investigation is currently underway in order to provide more refined and detailed information about the below ground geological conditions.

6.7 Road Cross Sections

6.7.1 Typical Section

The proposed typical cross section for both the cut and fill profile is represented below in Figure 6.1:

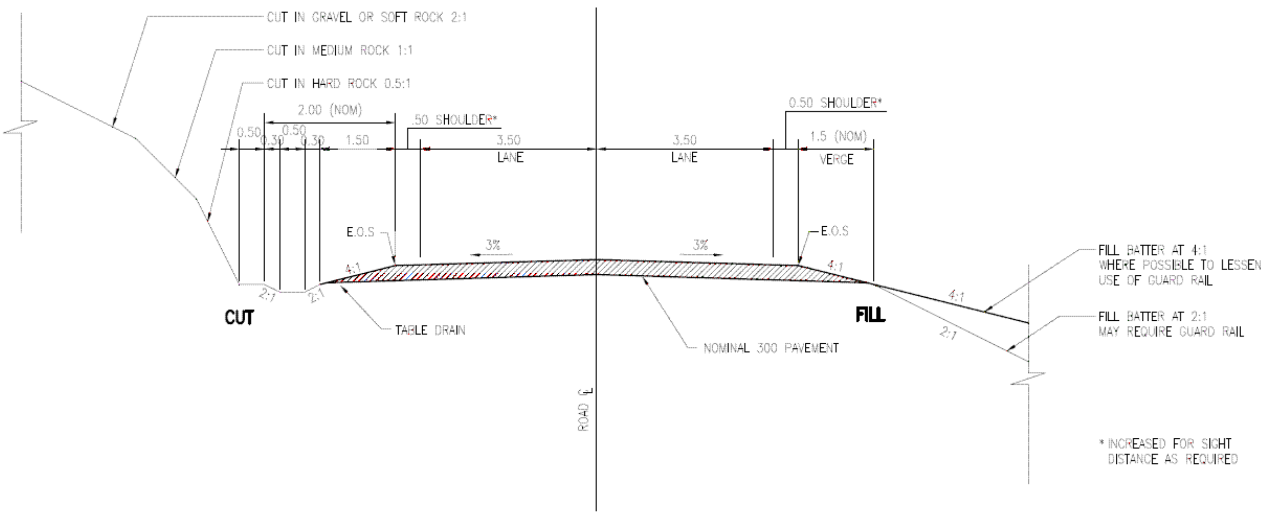


Figure 6.1: Typical Cross Section (cut & fill case shown)

NOTE: Refer to the other typical sections in the Concept Design drawings for other situations such as guardrail and curve widening.

It is noted that the design standards for the carriageway have been relaxed from those specified in the brief (1.5m shoulders) to 0.5m shoulders in consultation with and approval of Dungog Shire Council in order to reduce the width of formation. The narrower formation reduces earthworks, environmental impact and maintenance.

6.8 Slow Vehicle Passing Opportunities

6.8.1 General

It should be noted that the following discussion assumes:

- the normal traffic flows are similar to existing.
- If this section of the road is being used for construction traffic there would be a much higher vehicle count and much higher percentage of heavy vehicles which would need more extensive work to provide a reasonable level of service.
- The 19m semi used in Austroads is conservative with regard to power.
- More modern trucks have far greater power and their deceleration/acceleration rates will be a lot better.

Various options for the location of slow vehicle passing opportunities have been considered as follows:

6.8.2 Option A: Slow Vehicle Turnout Bay at Bottom of Chichester Range North Bound – CH2500

It is doubtful that a slow vehicle bay is actually needed here as there have been plenty of opportunities for overtaking prior to this point so frustration level should not have built up for a following driver. The Concept Design does not include such a feature at this location for this reason.

6.8.3 Option B: Slow Vehicle Passing Opportunity at Top of Chichester Range, North Bound

- A 19m semi at the top of the 8% grade would have a speed of around 35kph and be accelerating as the grade reduces.
- The logical place for a widened shoulder here is starting at CH3950 as the alignment exits the last deep cut to allow faster accelerating vehicles a passing opportunity before the heavy vehicles have a chance to get back up to speed.
- Because the trucks will be accelerating, and a queue may have developed behind them, a longer bay would be required (say 500m).
- However, a bay in the latter half would fall on a sweeping left hand curve which is not really desirable for visibility to the end of the bay - an overtaking vehicle may not correctly assess when the slow vehicle will pull back into the traffic lane.
- The preference is to have a widened shoulder extending the full length of the ridge top (CH3950 to CH4900). This will allow slow vehicles the ability to move over or even stop clear of the traffic lane to assist passing. It also would help to improve any access to off-road rest/view areas by allowing vehicles to clear the traffic lane as they slow down to turn in

6.8.4 Option C: Slow Vehicle Passing Opportunity at Top of Chichester Range, South Bound

The best opportunity identified is at CH6050. This would need shoulder widening of 2.5m about 400m long (including the 125m tapers). However, this is in a section of large cuts so would be very expensive.

6.8.5 Option D: Slow Vehicle Passing Opportunity at Top of Chichester Range, South Bound

Similar arguments in favour of a slow vehicle passing opportunity apply in the southbound direction as applied to the northbound direction in Option B above.
Therefore, the preference here is similar to the north bound situation above in having the shoulder widening along the full length of the ridge top (CH 5000 to CH4000)

6.8.6 Recommended Locations

A slow vehicle passing opportunity (widened shoulder) has been provided on the ridge for both directions of traffic (Options B and D).

While the arguments above for the full length (about 1km length) of passing opportunity are valid, the Concept Design has adopted the minimum length of 500m in each direction.

However, this could be extended for the full length of the ridge for minimal additional cost, and additional widening may also assist with improving access to possible lookouts, rest areas and the like.

The 500m long slow vehicle passing opportunity (widened shoulder) in each direction is shown on the concept design drawings.

6.9 Clear Zones and Clearances

Table 6.2 compares the clear zone requirements set out in Austroads to the proposed design. Figures are based on 1000 vpd (Ref.Austroads Rural Road Design Manual).

Profile	Desirable Clearzone Width	Design
Cut	3.50m-4.50m	3.10-6.10
Fill	4.50m-5.00m	W Section Barrier*[1]

Table 6.2: Clear zone Requirements

*[1] In accordance with Figure 17.4 in AUSTROADS, a barrier is warranted.

The clear zone requirements as set out in Austroads have not been met due to the difficult and restricting topography. The 3.10m of standard clear zone provided in the cut case will increase up to 6.10m in areas of carriageway widening to meet sight distance requirements. Sight distance widening varies from 0.00 to 3.00m generally with a maximum of 6.50m at CH9500.

6.10 Side Protection Barriers

A W-beam section barrier will be adopted and will be used on the outside edge of the carriageway when in fill (as shown on the concept design drawings in Appendix A). The requirement to use guardrail of the nearside edge of the carriageway in a fill situation will be investigated further during detailed design.

While guard rail protection is not specifically required in cuttings, there are some sufficiently short cuttings where terminating the guardrail and providing end treatments is not economical compared to continuing the guardrail through the length of the cutting.

All guardrail barriers shall be installed in accordance with RTA standards

6.11 Traffic Signs and Road Markings

All local road and highway signs shall be designed in accordance with the AS1742.2 Traffic control devices for general use

Material and construction specifications shall be in accordance with the AS1742.2 and the reference standards contained within. All posts shall be of a frangible design and construction.

Positioning of signs shall be such as to maintain clearances in accordance with the relevant standards and guidelines

Road markings shall be designed in accordance with the AS1742.2

6.12 Lighting

There are no street lighting proposals for this development.

6.13 Property Access Locations

There are several existing property access locations along the new road alignment that have been assessed for Safe Intersection Sight Distance and incorporated into the concept design.

A number of potential property access locations have been identified during the concept design phase. These locations may be for access to private property, future lookouts, recreation areas or access roads to the storage reservoir.

The potential locations have been assessed in accordance with the Safe Intersection Sight Distances, for the particular speed environment, as specified in the Dungog Shire Council Road Policy. The potential property access locations have been indicated on the concept design drawings.

6.14 Provision for Pedestrians & Cyclists

Given the remote location and mountainous nature of the surrounding terrain, there is no known demand for pedestrians along the length of the realignment. However, there may be the potential for cyclists to use the road to get access to the future recreation areas.

While it is desirable to provide adequate lane width for cyclists, because of the anticipated low number of cyclists and vehicles using the road and the associated cost of widening the carriageway, no specific provision has been made for cyclists on this road.

The pavement width will be 8m with the outer 0.5m of shoulder on each side separated from the lane by line marking. This will provide a place for cyclists to travel in when they are passed by the occasional vehicle.

6.15 Specific Site constraints

Apart from aiming to minimise the earthworks volumes, cut and fill depths and similar issues, the concept design also aimed to minimise the impact on existing vegetation and properties where possible. Some of these locations included:

- Tea-trees at CH2200; to be avoided
- Grove of trees on ridge near CH4400, used for shade by cattle, to be avoided
- Keeping west of existing private property along ridge (CH4200 to CH5100)
- Cedar tree on eastern bank at Upper Williams River Bridge crossing to be avoided if possible (Approximate CH16200). Alignment moved about 15m north to be clear of this tree.

7 Pavement and Surfacing

7.1 General

The pavement for the concept design has been nominally assessed as approximately 300mm deep.

The pavement design for detailed design will be carried out based on 'Pavement Design – A Guide to the Structural Design of Road Pavements', Austroads, 2004 based on the following design parameters:

The Annual Average Daily Traffic (AADT), - 300 (2007)

Design Life – 30 years

7.2 Subgrade Evaluation

From the concept design Geotechnical Investigations, it is anticipated that cuttings will be in rock and engineered fills will utilise crushed compacted rock from cuts.

On this basis, it is assumed at this stage that a relatively high CBR value will be used for pavement design.

7.3 Sub-base and Base Course Material

The use of suitable and competent materials in the construction of the pavement will be critical to ensuring it will have the required life and serviceability. The testing of materials from the potential sources of these elements of the pavement will need to be undertaken during detailed design stage to establish the suitability of them for their use. Testing will need to confirm the quantity of materials available, the crushing process that will need to be employed to achieve the required product (grading), as well as the durability of the material.

A number of quarries are either existing or are due to be opened up in the vicinity of the dam and road. Douglas Partners has undertaken some testing of some existing quarries.

The materials tested did not appear to be suitable for use as sub-base or base course material.

Until other quarries are opened up and some testing is undertaken, there will be some uncertainty attached to the availability of around 100,000m3 of suitable base course materials.

7.4 Pavement Surfacing

At this concept design stage it is assumed that a 2 coat sprayed seal wearing surface will be utilised for the pavement.

8 Retaining Walls

8.1 General

Locations along the route where the proposed fill slope (2H:1V) is very close to the slope of the natural surface beneath it and the depth of fill over that surface is relatively small creating a need for appropriately designed retaining walls are tabulated in Table 8.1 below.

Gravity retaining walls made up with gabion baskets filled with rock won from excavations is proposed at this concept design stage. The Table 8.1 contains the estimated maximum height of each of the walls as well as volume of rock needed.

8.2 Locations and Sizes

Location			Size of Structure		
From (Chainages)	To (Chainages)	Length m	Maximum height m	Area of retained surface sq metres	Volume of retaining structure cu metres
2910	2940	30	2	60	75
3320	3370	50	1	50	50
3520	3640	150	2	300	375
3750	3770	20	1	20	20
3890	3990	100	2.5	250	350
6210	6260	50	4	200	500
6380	6430	40	3	120	280
13690	13740	50	4	200	500
14860	14990	130	3	390	910
TOTALS		**620**		**1590**	**3060**

Table 8.1: Recommended Conceptual Retaining Wall Designs

9 Stormwater

9.1 General

This stormwater design philosophy describes the stormwater management concepts and design methodology to give effect to the concept design of the stormwater system.

9.2 Stormwater Design Criteria

The overall design philosophy and objective of the stormwater management system is to provide effective drainage of the road area and to maintain the existing stormwater regime in the existing landform as best is practicable while either avoiding, remedying or mitigating adverse environmental effects of the construction and operation of the road.

The design criteria have been established by either

- from standards and codes,
- from accepted best practice guidelines
- from Hunter Water Corporation,
- Dungog Shire Council and
- good engineering practice in relation to stormwater management

and are summarised below:

- Road longitudinal drainage, table drains and pipe systems, to convey the 5year ARI event flows without impeding the traffic lanes.
- Most of the gullies crossing the new road alignment do not have permanent flowing water. Cross drainage culverts have been designed to pass the 5year ARI storm flow, with no heading up of water at the inlet of the culvert.
- Larger flows will be passed by allowing limited heading up at the inlet.
- All the culverts were checked to determine the headwater depth required to pass the 100 year ARI storm flow.
- For those culverts where the water level required to pass the 100 year ARI flow was either above road level or within 500 mm of the formation level or the headwater depth exceeded 5m, larger diameter culverts have been sized.
- Culvert structures have been designed or verified in accordance with requirements in NZS/AS 3725 – 1989: Australian Standard Loads on Buried Pipes
- The slope of the gullies is generally steep and consequently flow velocities in some culverts are very high and the high velocities may cause erosion inside precast concrete culverts. For those culverts with velocities greater than 8.0 m/s the culverts will not be able to be laid on the floor of the gully and pipe drop structures will be incorporated to reduce the velocity to an acceptable value and to act as energy dissipaters.
- The CIRIA (Construction Industries Research Information Association) recommends that for long culverts the minimum diameter of a culvert should be greater than 1.0 m.

Following discussion with Dungog Shire Council, 750 mm diameter has been agreed as the minimum diameter for all culverts with a length of 40 m and greater.
- Erosion and sediment control during construction will be in accordance with the NSW Department of Housing 'Blue Book';
- Protect and enhance ecological values;
- To mitigate erosion (during life of road) at the interface between natural streams and culvert headwall/wingwalls, appropriate erosion control and energy dissipation measures shall be incorporated into the site-specific design;

The main challenge on this project is the steep topography and the difficult construction conditions. In the long term the proposed works will have minimal additional impact on the receiving environment as the use of the site will not be significantly altered.

10 Bridges on Williams River and Moolee Creek

10.1 Lower Bridge

The layout of the Lower Bridge was adopted later in the Concept Design Process than that for the Upper Bridge. The decision to adopt two 19m spans at the Lower Bridge was a modification of an earlier concept that incorporated two 18m spans and a cattle underpass through the northern abutment. The northern abutment cattle underpass was removed in favour of a cattle crossing a short distance to the north requested by the owner of the land that is separated into two portions by the new road alignment. Confirmation survey of the banks in the area of the Lower Bridge also confirmed the width of river to be crossed by it. Removing the cattle underpass necessitated increasing the total span of the bridge by about 2m.

The flow conditions in the Williams River have not been a major factor in the design of the bridge. Information from Hunter Water Corporation about existing flooding conditions in the creek was interpreted to show the underside of the deck of the proposed bridge would be above the 100year flood level. While this was only an estimate from flood levels recorded at a few locations in the river around this site, the fact that the dam when construction will attenuate the flood flows considerably means the long term bridge will have flood levels rather lower than the current estimated flows.

Concept Design has been completed to a moderate level of confidence in structure sizing and layout.

10.2 Upper Bridge

Layout of the Upper Bridge was primarily based on the topography at the road crossing and the hydraulic behaviour of the waterway. The Department of Commerce (DoC) provided HWC with predicted flows at the site up to the 100year flow. Opus undertook hydraulic modelling of the watercourse in the vicinity of the bridge and analysed the impact different bridge waterway opening options would have on those flows. The topography of the crossing suggested a four 15m spans option was the most suitable. The impact of the bridge on the flow depths through such an opening was analysed. The resulting upstream water levels for the flows were also used to determine the level of the bridge deck.

The DoC predicted flows had some uncertainty attached to them. While RORB modelling provided a predicted 100year flow, flood frequency analysis predicted considerably higher values. Taking this into account, Council accepted the bridge deck level could be based on the higher predicted flow without the need for additional clearance for debris. The design of the bridge accommodates loading from debris build-up against the structure.

Concept Design determining the structure sizing and layout has been completed.

10.3 Moolee Creek Crossing

Options for the crossing of Moolee Creek in a location where there will be inundation by the main storage have been considered and reported on in the Options Report that has recently been completed and is currently with HWC for consideration. Opus' recommendation was that a 3 x 18m span bridge be used at this location. While the alternative of an embankment with high level culvert and low flow pipe has a small apparent capital cost advantage over the bridge option, it is proposed that the whole of life maintenance costs and the uncertainty in the design and, hence, cost of the embankment option makes the bridge the preferred option on the grounds of cost. Additionally, the embankment option is also a much greater impediment to the movement of aquatic life than is the bridge option.

For cost estimating purposes, the bridge option is taken as the option for the Moolee Creek Crossing. Upon HWC giving their approval to this option, concept design of the crossing shall commence.

10.4 Design Parameters

The following Table 10.1 outlines the application of the design requirements and parameters to each of the three bridges that are currently subject to Concept Design.

Tillegra Bridges Design Parameters			
Parameter	**Upper Bridge**	**Lower Bridge**	**Moolee Creek**
Road cross section	Two 3.5 metre lanes plus shoulders	Two 3.5 metre lanes plus shoulders	**OPTIONS REPORT**
Waterway cross section	Natural between retaining wall abutments	Generally natural, with spill-through abutments	
Geotechnical information	See Douglas Partners Interpretive Report	See Douglas Partners Interpretive Report	**CURRENTLY BEING**
Footway requirements	Not required	Not required	
100 year ARI Flood Level	Below deck soffit	Below deck soffit	**CONSIDERED**
Design streamflow velocities	To be confirmed	To be confirmed	
Debris likelihood	High	High prior to dam, thereafter low	**BY CLIENT**
Settlement potential	Minimal with piled footings on rock	Minimal with piled or spread footings on rock	
Stock crossing requirements	Beneath end spans is sufficient	None required at bridge	
Traffic barrier category	Regular performance level	Regular performance level	
Traffic barrier height (bicycles)	Desirable	Desirable	
Adjoining road barrier type	W-beam	W-beam	
Environmental issues	To be advised	To be advised	
Precast vs insitu concrete	Insitu concrete available if required	Insitu concrete available if required	
Pile types	Cast insitu reinforced concrete	Cast insitu reinforced concrete	
Superstructure - concrete or steel?	Concrete	Concrete	
Superstructure type	Standard RTA PSC planks	Modified RailCorp PSC planks	
Abutments - spill-through or retaining?	Retaining	Spill-through	
Wingwall - angled, square or parallel?	Parallel to bridge centreline	Parallel to bridge centreline	
Minimum span requirements	None, but small spans prone to trap	None, but small spans prone to trap	

Tillegra Bridges Design Parameters			
Parameter	**Upper Bridge**	**Lower Bridge**	**Moolee Creek**
	debris	debris	
Buoyancy issues	Considered in design; hold-down bolts provided	Considered in design; hold-down bolts provided	
Skewed or square?	Skewed	Square	
Deck joints	Strip seal expansion joint	Recess filled with sealer	
Requirement to carry utility services	Ducts provided in kerbs	Ducts provided in kerbs	
Abutments - jointed or integral?	Jointed	Jointed	
Live loading	SM 1600	SM 1600	
Anti-grafitti measures	None	None	**OPTIONS REPORT**
Nameplates	To be advised	To be advised	
Superstructure soffit characteristics	Hydraulically smooth	Hydraulically smooth	**CURRENTLY BEING**
Kerb types	Modified New Jersey with 2-rail barrier to suit bicycles	Modified New Jersey with 2-rail barrier to suit bicycles	
Design speed	80 km/h	80 km/h	**CONSIDERED**
Piers - blade walls, columns, other?	Single column with cantilevered headstock	Blade wall with headstock	
Designation - eg specific site names	To be advised	To be advised	**BY CLIENT**
Inspection and maintenance access	No special provision	No special provision	
Construction staging	Not required	Not required	
Construction access - from one end or both?	Probably from both	Probably from both	
Construction safety during flood	Could be exacerbated if road embankment in place	Vulnerable to flooding until dam completed	
Riverbank erosion protection	Minimal	Extensive protection advisable	
Projected traffic volume	600 AADT	600 AADT	
Vertical alignment	Horizontal	Slight sag vertical curve	

Tillegra Bridges Design Parameters			
Parameter	**Upper Bridge**	**Lower Bridge**	**Moolee Creek**
Horizontal alignment	Curved, 230m radius	Straight	
Approach slabs	Yes	Yes	
Deck joint locations	At abutments only	At abutments only	**OPTIONS REPORT**
Designed for submergence	Yes	Yes	
Overall length of bridge deck	60 metres	38.0 metres	**CURRENTLY BEING**
Number of spans	Four	Two	
Span lengths	4 / 15 metres	2 / 19 metres	**CONSIDERED**
Max height deck level to streambed	7.6 metres approximately	7.6 metres approximately	
Carriageway wearing surface	Broomed concrete	Broomed concrete	**BY CLIENT**
Linemarking	As per adjoining road	As per adjoining road	

Table 10.1: Tillegra Bridges Design Parameters

11 Cattle and Machinery Crossings

11.1 General

At several locations along the route there are blocks of land that are due to be separated into two parcels by the proposed new road. Consideration has been given to linking the parcels by cattle crossings.

11.2 Crossing No.3

The affected property is on the northern side of the Williams River adjacent to the Lower Bridge and is currently owned by the Dowling family. They have asked HWC to provide an under road cattle crossing mid-way between the river and the boundary with the neighbour to the north. This crossing is proposed to be an approximately 22m long 2.1m high by 3m wide box culvert with approach earthworks and drainage. Drainage of the low area will probably need to be piped to the Williams River.

11.3 Crossing No.1 and 2

The affected property is on the north western (NW) side of the Williams River adjacent to the Upper Bridge and is currently owned by the Fisher family. They have asked HWC to provide an under road cattle crossing about mid-way between the river and the eastern side of the higher dairy land to the NW. This crossing is proposed to be an approximately 30m long 3.6m high by 3.6m wide box culvert passing through the proposed embankment carrying the new Salisbury Road over and is designed to pass farm machinery (tractor in particular). They have also a second crossing that is proposed to be at the lower flats drainage gully that crosses under the proposed new road. This second crossing is to be an approximately 22m long x 2.1m high by 3.6m wide box culvert. Drainage of the culvert area will continue to be along the natural channel that is on the same alignment as the culvert and discharges to the Williams River.

11.4 Under the Upper Bridge

The small portion of land currently owned by the Hobson family to the north of the Upper Bridge on the eastern bank of the Williams River will be accessible to the main portion of the land by the river bank area under the easternmost span of the proposed bridge. A separate under road crossing is not required at this location.

12 Services

12.1 General

There are both Telecommunications and Electricity supply infrastructure that will be affected by the inundation of the existing road the alignment of the proposed new road.

12.2 Telecommunications

Telstra – Network Integrity Services (NIS) are responsible for the management of Telstra assets where it is identified that potential conflict may occur with any development proposals nationally. NIS was requested to investigate the proposed impact on the Telstra network as a result of the Tillegra Dam project. NIS produced a Telstra Impact Identification Report that defines the requirements of the relocation and/or protection via various concepts. The requirements may yet be subject to further negotiation.

Detailed design will need to accommodate the final agreed works. More detailed information may be needed by both Telstra (NIS) and Opus to meet this requirement.

Impact on the network will be as a result of:

- Elements of the proposed new road route such as cuttings, embankments, drainage structures affecting the current optical fibre main route
- The water storage inundation covering the area where the current optical fibre main route passes
- Construction of the dam

12.3 Electrical Services

Country Energy is responsible for the electrical supply in the Tillegra area. The existing power line infrastructure generally follows the alignment of the existing Salisbury Road on power poles. Because of the construction of the dam and inundation of the area behind it, this existing infrastructure will have to be rerouted to suitable areas so that:

- It is clear of the inundation
- Provides power to a new layout of customers
- Is readily serviceable

Country Energy supplied a Design Information Package for Level 3 Designers to provide a concept and detail design of the alterations necessary.

The following Companies have been requested to supply a cost for the concept and detail design of the electrical services:

- Clarence Constructions
- Power Serve
- Power Connections

At this stage it has not been defined whether the design is to progress to concept only, with a separate package issued for a detail design and construction phase or for one level 3 designer to develop a full detail design and issue a separate contract for the construction phase.

Quotations have been received from all three Level 3 Contractors. There is a difference in fee and difference in the programs for undertaking the work between the offers. Opus is to review the offers and make a recommendation to HWC on the methodology of delivery of the design and which contractor to be appointed.

13 Concept Design Road Safety Audit

13.1 General

The concept design (Stage Two) audit conducted by Samsa Consulting followed a standard practice in identifying safety related issues of the preferred road network including the main route alignment. It involved a desktop assessment of relevant concept design documentation, design reports and other related project material. Standard issues such as intersection conditions, sight distance, speed zones, safety barriers, road alignment, linemarking and signage (amongst others) were assessed with respect to road safety. A feasibility stage audit was undertaken previously in March 2008.

The concept design audit is structured around a standard checklist provided in the Austroads “Road Safety Audit Manual: 2nd Edition” and RTA’s “Accident Reduction Guide – Part 2: Road Safety Audits”.

A site visit for this stage of the audit was deferred to the next audit stage because the proposed road alignment is currently largely inaccessible (on private lands) and connects to the existing road network at limited locations only. A formal entry meeting was held at Opus offices on Thursday 19th June 2008, with the project’s Road Design Manager, who provided background information on the concept design development for the project.

13.2 Audit Results

The safety audit process requires that the safety issues identified during an audit be acknowledged by the Audit Team and accordingly responded to by Opus International Consultants. The issues are characterised according to their risk.

One of three possible priority levels (e.g. high, medium or low) has been assigned to each safety issue. The priority levels are defined as follows:

- High Priority: A high road safety risk requiring urgent re-design or design amendment.
- Medium Priority: A medium road safety risk that may require re-design or design amendment and needs to be resolved at a later design stage.
- Low Priority: A lower road safety risk that should be considered in subsequent design development and/or incorporated into a later design stage.

The audit of the project concept design identified a number of potential road safety issues. A large percentage of those issues related to the documented posted speed limit along the route being marked as 90kph. All the Identified Safety Issues have a Risk Rating of Medium or Medium/Low or Low. None of the Risk Ratings is above medium.

As advised earlier in this Concept Design Report, the design speeds to be applied to the design are from 80kph down to 60kph. A review of the issues by the Road Design Team has identified that most of the Issues identified could be adequately dealt with by the adjustment of the posted speed on the Signage and Linemarking drawings to reflect the:

- design speed zones of 80kph in the southern section of the road,
- a reduction to a 70kph zone through the middle section of the route and
- an advisory speed of 55kph at one location (bend)
- a return to a 80kph speed zone in the northern section of the route

Opus has advised the Auditor of the responses to the Issues raised by him and he has indicated that the responses should substantially reduce or eliminate the risks identified.

These responses to the Identified Safety Issues have yet to be documented on the RSA Report for final review by the Auditor.

13.3 Detailed Design

Notwithstanding the satisfactory finalisation of the Concept Design Safety Issues by the Auditor, the matters raised will be taken into account in the Detailed Design.

14 Landscape & Visual

14.1 General

In order to achieve the desired alignment, extensive earthworks both cut and fill are required. The bare faces of both cut and fill batters will have a significant visual effect until new vegetation is established. The extent of visual effects will depend on the type of batter construction and the relative ease of these new batters to re-vegetate and support growth.

Cut batters will be more difficult to re-vegetate than fill batters due to the hard, rocky substrate, the general lack of moisture absorption of the substrate and the high level of exposure to sun and prevailing northerly winds. Fill areas should regenerate relatively quickly in comparison to the cut faces due to the nature of the substrate which would include fine, relatively un-compacted and fertile material.

15 Departures from Standards

15.1 General

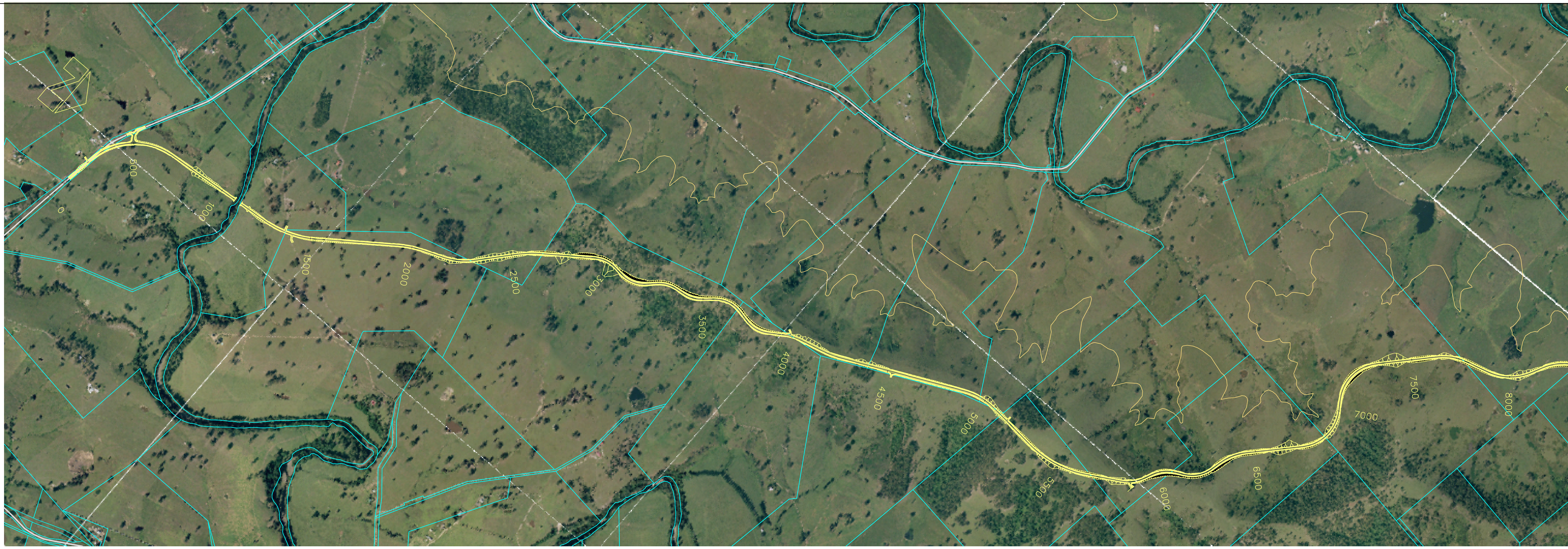
This section reflects on known current departures from the design standards that are yet to be dealt with in some way during the detailed design process

15.2 Sight Distance at Upper Bridge Crossing

With the current level bridge design and the horizontal radius curve that includes the bridge, there is a sight distance requirement that is not achieved at this location for Dungog bound traffic. For the 80kph design speed on this section of the road, the railings on the inside of the curve prevent sight of the standard size object on the road at the appropriate distance before the object..

Opportunities for this to become an acceptable design criterion that does depart from the standard or for it to be corrected by design have yet to be fully explored and addressed in the design process. This will be undertaken during the detailed design process

Appendix A – Concept Design Drawings



LAYOUT PLAN

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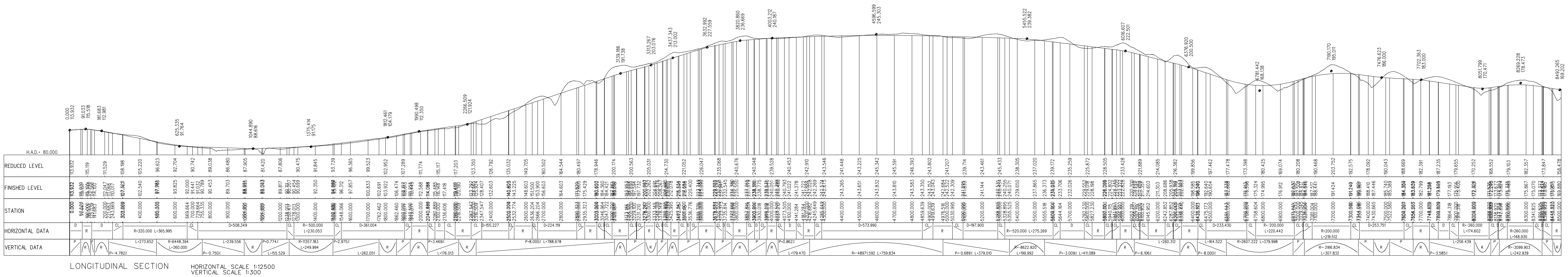

LONGSECTION

SCALE 1:12500

NOT FOR CONSTRUCTION

		BY	CHECKED	DATE
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	DRAWN	N.TURVEY		07/08
	APPROVED			

	AMENDMENT	APP'D	DATE
R3	ISSUED FOR FINAL DRAFT DETAILED DESIGN		13.03.09
R2	ISSUED FOR REVIEW		29.10.08
1.	ISSUED FOR FINAL DRAFT CONCEPT DESIGN		16.07.08

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TITLE ROADS AROUND TILLEGRA DAM
NEW SALISBURY ROAD

PLAN & LONGITUDINAL SECTION – SHEET 1 OF 2
CH 0 TO CH 8500

STATUS	DETAILED DESIGN	FILE	11563-17		
SCALE 1:10000, 1:12500	PLOT DATE	FEATURE IDENTIFIER 11563	CODE –	SHEET 06	REVISION R3

11/03/2009 20:48

GRAPHIC SCALES

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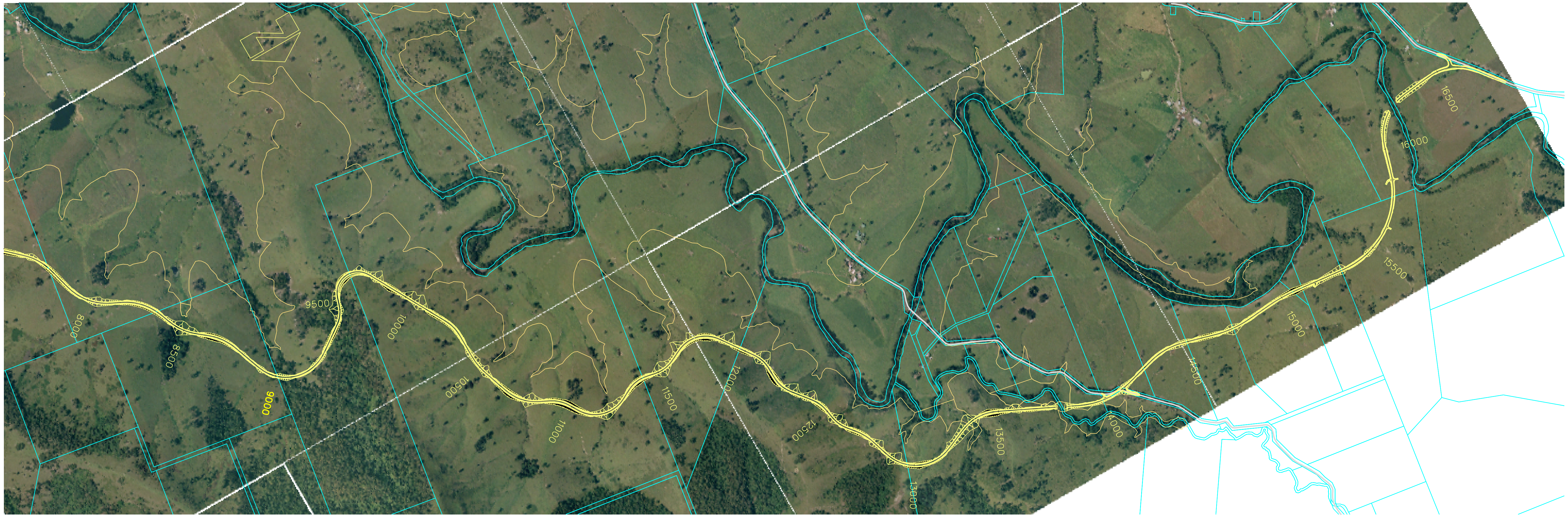

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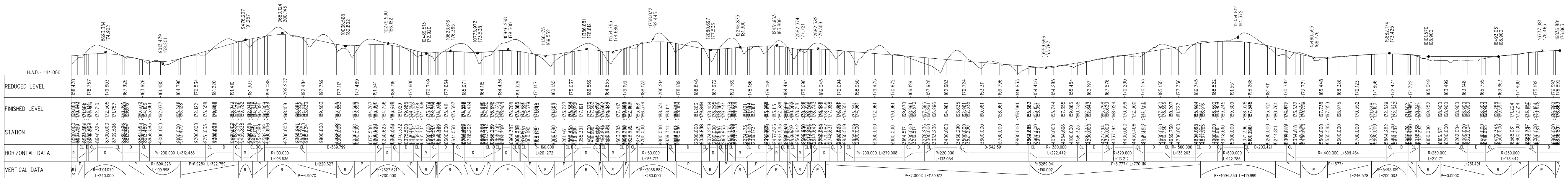

LONGITUDINAL SECTION HORIZONTAL SCALE 1:12500 VERTICAL SCALE 1:3000

LONGSECTION

SCALE 1:12500

300 mm

200

100

50

10 mm

0

GRAPHIC SCALES

NOT FOR CONSTRUCTION

11/03/2009 20:49

		APP'D	DATE
R3	ISSUED FOR FINAL DRAFT DETAILED DESIGN		13.03.09
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1.	ISSUED FOR FINAL DRAFT CONCEPT DESIGN		16.07.08
	AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
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DRAWN	N.TURVEY		07/08
APPROVED			

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TITLE ROADS AROUND TILLEGRA DAM
NEW SALISBURY ROAD

PLAN & LONGITUDINAL SECTION – SHEET 2 OF 2
CH 8500 TO CH 17500

STATUS	FILE
DETAILED DESIGN	11563-17

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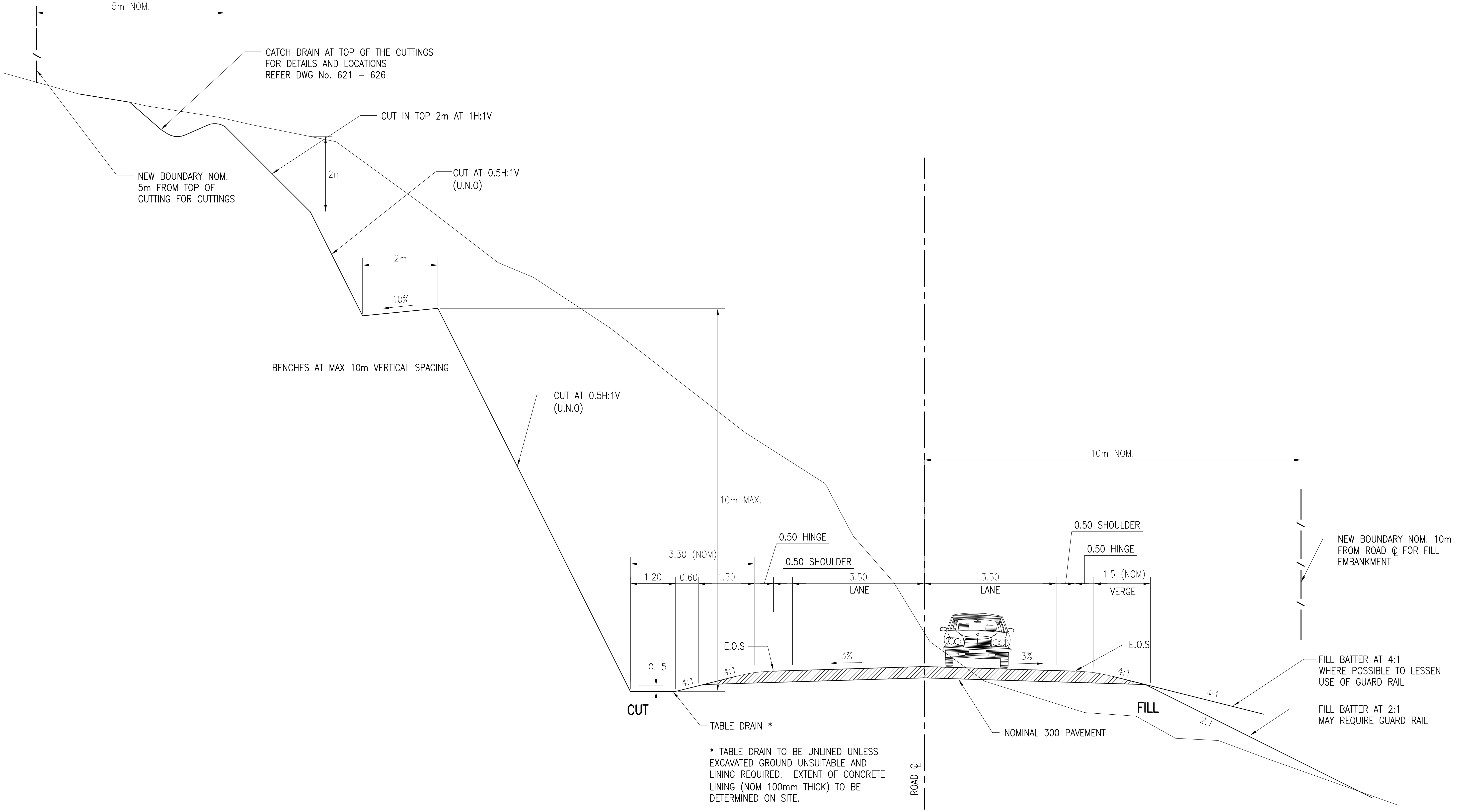

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GRAPHIC SCALES: 0, 10 mm, 50, 100, 200, 300 mm

NOT FOR CONSTRUCTION

11/03/2009 8:55

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6	ISSUED FOR REVIEW		7.10.08
5	ISSUED FOR R.S.A		29/10/08
4	ISSUED FOR REVIEW		17/10/08
3.	ISSUED FOR FINAL DRAFT CONCEPT DESIGN		16/07/08
2.	ISSUED FOR REVIEW		19/06/08
1.	ISSUED FOR INFORMATION		22.04.08

	BY	CHECKED	DATE
DESIGN	N.TURVEY		03/08
DRAWN	B.MALOUSIS		03/08
APPROVED			

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TITLE: ROADS AROUND TILLEGRA DAM
NEW SALISBURY ROAD

ROAD TYPICAL SECTIONS SHEET 1

STATUS	FILE			
DETAILED DESIGN	11563–17			

SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
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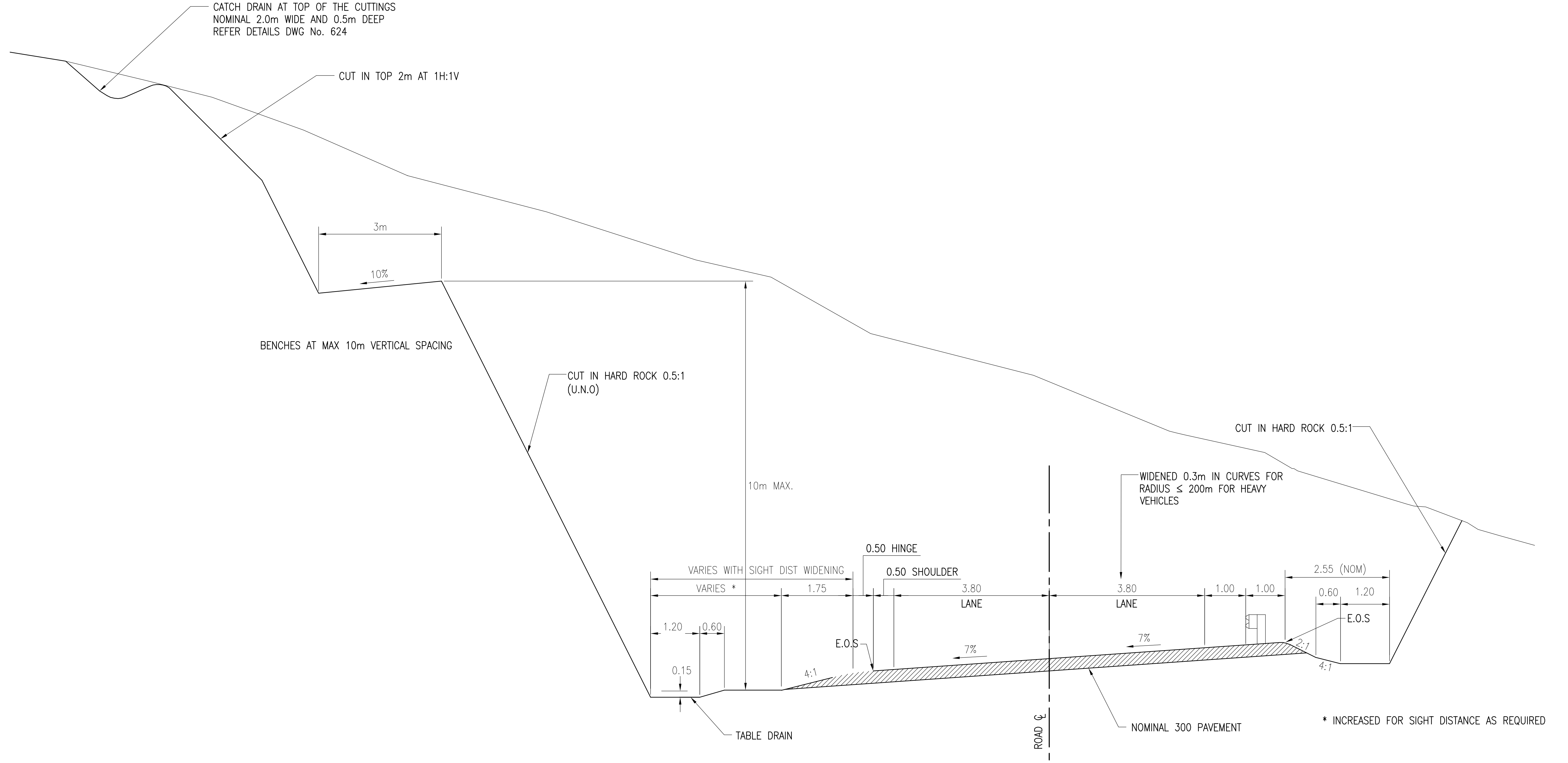

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NOT FOR CONSTRUCTION

	AMENDMENT	APP'D	DATE
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6	ISSUED FOR REVIEW		7.10.08
5	ISSUED FOR RSA		29/10/08
4	ISSUED FOR REVIEW		17/10/08
3.	ISSUED FOR FINAL DRAFT CONCEPT DESIGN		16/07/08
2.	ISSUED FOR REVIEW		19/06/08
1.	ISSUED FOR INFORMATION		22/04/08

	BY	CHECKED	DATE
DESIGN	N.TURVEY		03/08
DRAWN	B.MALOUSIS		03/08
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TITLE ROADS AROUND TILLEGRA DAM
NEW SALISBURY ROAD

ROAD TYPICAL SECTIONS SHEET 2

STATUS	FILE
DETAILED DESIGN	11563-17

SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
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GRAPHIC SCALES

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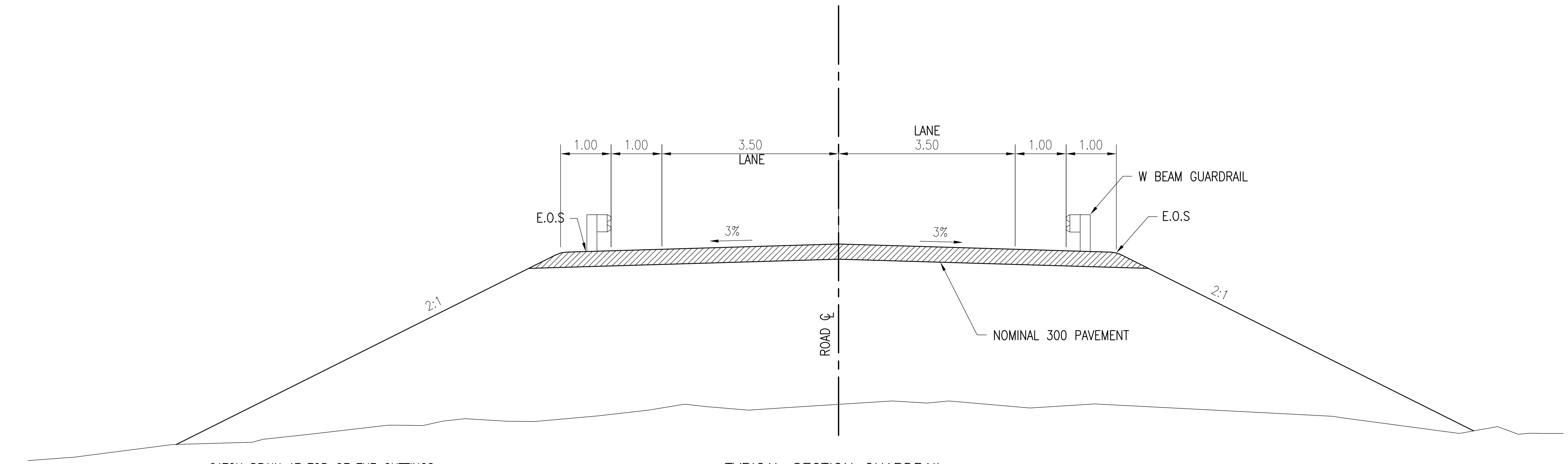

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BOTH SIDES
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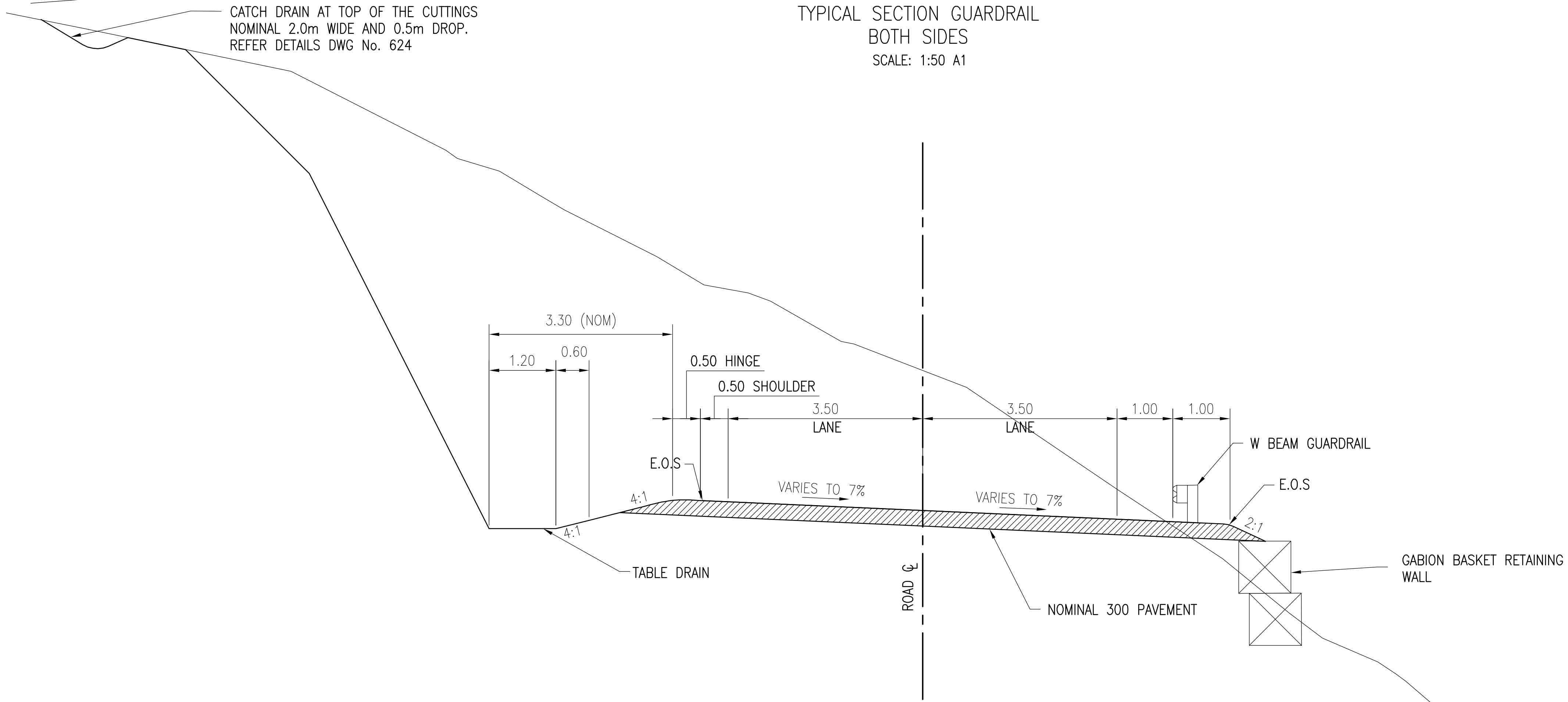

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NOT FOR CONSTRUCTION

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1. ISSUED FOR INFORMATION		22/04/08

	BY	CHECKED	DATE
DESIGN	N.TURVEY		03/08
DRAWN	B.MALOUSIS		03/08
APPROVED			

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TITLE ROADS AROUND TILLEGRA DAM
NEW SALISBURY ROAD

ROAD TYPICAL SECTIONS SHEET 3

STATUS	FILE
DETAILED DESIGN	11563-49

SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
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1 COVER SHEET
2 LOCALITY PLAN
3 DRAWING INDEX SHEET 1
4 DRAWING INDEX SHEET 2
5 (NOT USED)
6 PLAN AND LONGITUDINAL SECTION, SHEET 1 OF 2 CH 0 TO CH 8500
7 PLAN AND LONGITUDINAL SECTION, SHEET 2 OF 2 CH 8500 TO CH 16830
8 SHEET INDEX LAYOUT, SHEET 1 OF 2
9 SHEET INDEX LAYOUT, SHEET 2 OF 2
10 ROAD TYPICAL SECTIONS SHEET 1
11 ROAD TYPICAL SECTIONS SHEET 2
12 ROAD TYPICAL SECTIONS SHEET 3

30 ALIGNMENT CONTROL DATA 1
31 ALIGNMENT CONTROL DATA 2

40 PAVEMENT DETAIL
50 LIST OF STANDARD DRAWINGS

DRGS 101-150 – EARTHWORKS & DRAINAGE:

101 EARTHWORKS AND DRAINAGE 0-360
102 EARTHWORKS AND DRAINAGE 360-720
103 EARTHWORKS AND DRAINAGE 720-1080
104 EARTHWORKS AND DRAINAGE 1080-1440
105 EARTHWORKS AND DRAINAGE 1440-1800
106 EARTHWORKS AND DRAINAGE 1800-2160
107 EARTHWORKS AND DRAINAGE 2160-2520
108 EARTHWORKS AND DRAINAGE 2520-2880
109 EARTHWORKS AND DRAINAGE 2880-3240
110 EARTHWORKS AND DRAINAGE 3240-3600
111 EARTHWORKS AND DRAINAGE 3600-3960
112 EARTHWORKS AND DRAINAGE 3960-4320
113 EARTHWORKS AND DRAINAGE 4320-4680
114 EARTHWORKS AND DRAINAGE 4680-5040
115 EARTHWORKS AND DRAINAGE 5040-5400
116 EARTHWORKS AND DRAINAGE 5400-5760
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121 EARTHWORKS AND DRAINAGE 7200-7560
122 EARTHWORKS AND DRAINAGE 7560-7920
123 EARTHWORKS AND DRAINAGE 7920-8280
124 EARTHWORKS AND DRAINAGE 8280-8640
125 EARTHWORKS AND DRAINAGE 8640-9000
126 EARTHWORKS AND DRAINAGE 9000-9360
127 EARTHWORKS AND DRAINAGE 9360-9720
128 EARTHWORKS AND DRAINAGE 9720-10080
129 EARTHWORKS AND DRAINAGE 10080-10440
130 EARTHWORKS AND DRAINAGE 10440-10800
131 EARTHWORKS AND DRAINAGE 10800-11160
132 EARTHWORKS AND DRAINAGE 11160-11520
133 EARTHWORKS AND DRAINAGE 11520-11880
134 EARTHWORKS AND DRAINAGE 11880-12240
135 EARTHWORKS AND DRAINAGE 12240-12600
136 EARTHWORKS AND DRAINAGE 12600 -12960
137 EARTHWORKS AND DRAINAGE 12960-13320
138 EARTHWORKS AND DRAINAGE 13320-13680
139 EARTHWORKS AND DRAINAGE 13680-14040
140 EARTHWORKS AND DRAINAGE 14040-14400
141 EARTHWORKS AND DRAINAGE 14400-14760
142 EARTHWORKS AND DRAINAGE 14760-15120
143 EARTHWORKS AND DRAINAGE 15120-15480
144 EARTHWORKS AND DRAINAGE 15480-15840
145 EARTHWORKS AND DRAINAGE 15840-16200
146 EARTHWORKS AND DRAINAGE 16200-16560
147 EARTHWORKS AND DRAINAGE 16560-16889.25

DRGS 161-170 – PAVEMENT DRAINAGE:

161 PAVEMENT DRAINAGE LONG SECTION, 1 & 2
162 PAVEMENT DRAINAGE LONG SECTION, 3 & 4
163 PAVEMENT DRAINAGE LONG SECTION, 5 & 6
164 PAVEMENT DRAINAGE LONG SECTION, 7 & 8
165 PAVEMENT DRAINAGE LONG SECTION, 9 & 10
166 (NOT USED)
167 PAVEMENT DRAINAGE SCHEDULE

DRGS 201-289 – CULVERTS:

201 TABULATED SCHEDULE
202 CULVERT PLAN AND SECTION CULVERT 1
203 CULVERT PLAN AND SECTION CULVERT 2
204 CULVERTS 1 AND 2 CROSS SECTIONS
205 CULVERT PLAN AND SECTION CULVERT 3 AND 4
206 CULVERTS 3 AND 4 CROSS SECTIONS
207 CULVERT PLAN AND SECTION CULVERT 5 AND 6
208 CULVERTS 5 AND 6 CROSS SECTIONS
209 CULVERT PLAN AND SECTION CULVERT 7
210 CULVERT 7 CROSS SECTIONS
211 CULVERT PLAN AND SECTION CULVERT 8
212 CULVERT PLAN AND SECTION CULVERT 11
213 CULVERT PLAN AND SECTION CULVERT 14
214 CULVERTS 8, 11 AND 14 CROSS SECTIONS
215 CULVERT PLAN AND SECTION CULVERT 15
216 CULVERT PLAN AND SECTION CULVERT 16
217 CULVERTS 15 AND 16 CROSS SECTIONS
218 CULVERT PLAN AND SECTION CULVERT 17
219 CULVERT PLAN AND SECTION CULVERT 18
220 CULVERTS 17 AND 18 CROSS SECTIONS
221 CULVERT PLAN AND SECTION CULVERT 19
222 CULVERT PLAN AND SECTION CULVERT 20
223 CULVERTS 19 AND 20 CROSS SECTIONS
224 CULVERT PLAN AND SECTION CULVERT 21
225 CULVERT PLAN AND SECTION CULVERT 22 AND 51
226 CULVERTS 21, 22 AND 51 CROSS SECTIONS
227 CULVERT PLAN AND SECTION CULVERT 23
228 CULVERT PLAN AND SECTION CULVERT 24
229 CULVERTS 23 AND 24 CROSS SECTIONS
230 CULVERT SECTION CULVERT 25
231 CULVERT PLAN AND SECTION CULVERT 26
232 CULVERTS 25 AND 26 CROSS SECTIONS
233 CULVERT PLAN AND SECTION CULVERT 27
234 CULVERT SECTION CULVERT 28
235 CULVERTS 27 AND 28 CROSS SECTIONS
236 CULVERT PLAN AND SECTION CULVERT 29
237 CULVERT PLAN AND SECTION CULVERT 30
238 CULVERTS 29 AND 30 CROSS SECTIONS
239 CULVERT PLAN AND SECTION CULVERT 31
240 CULVERT SECTION CULVERT 32
241 CULVERTS 31 AND 32 CROSS SECTIONS
242 CULVERT PLAN AND SECTION CULVERT 33
243 CULVERT SECTIONS CULVERT 34 AND 35
244 CULVERTS 33 AND 34 CROSS SECTIONS
245 CULVERT 35 CROSS SECTIONS
246 CULVERT PLAN AND SECTION CULVERT 36
247 CULVER SECTION CULVERT 37
248 CULVERT 36 AND 37 CROSS SECTIONS
249 CULVERT PLAN AND SECTION CULVERT 38
250 CULVERT 38 CROSS SECTIONS
251 CULVERT PLAN AND SECTION CULVERTS 39A AND 40
252 CULVERT SECTION CULVERT 39B
253 CULVERTS 39A AND 40 CROSS SECTIONS
254 CULVERT 39B CROSS SECTIONS
255 CULVERT PLAN AND SECTION CULVERT 41 AND 42
256 CULVERTS 41 AND 42 CROSS SECTIONS
257 CULVERT PLAN AND SECTION CULVERTS 43 AND 44
258 CULVERTS 43 AND 44 CROSS SECTIONS
259 CULVERT PLAN AND SECTION CULVERT 45 AND 46
260 CULVERT PLAN AND SECTION CULVERT 47
261 CULVERTS 45, 46 AND 47 CROSS SECTIONS
262 CULVERT PLAN AND SECTION CULVERT 49
263 CULVERT PLAN AND SECTION CULVERT 50
264 CULVERTS 49 AND 50 CROSS SECTIONS
265 TYPICAL CULVERT HEADWALL DETAILS
266 TYPICAL BEDDING AND CLAY PLUG AND FACING DETAILS
267 TYPICAL SLOTTED DRAIN ON CUT FACES DETAILS
268 TYPICAL BOX CULVERT CONCRETE DETAILS
269 TYPICAL BOX CULVERT SLAB REINFORCEMENT DETAILS
270 TYPICAL ROCK RIPRAP BASIN
271 TYPICAL SAF BASIN CONCRETE DETAILS
272 SAF BASIN REINFORCEMENT DETAILS SHEET 1
273 SAF BASIN REINFORCEMENT DETAILS SHEET 2

DRGS 290-295 – CATTLE UNDERPASS:

290 NO.1 PLAN AND SECTION CH 1200.00 TO 1350.00
291 NO.1 CROSS SECTIONS CH 1283.00
292 NO.1 CONCRETE DETAILS
293 NO.2 PLAN AND SECTION CH 16300.00 TO 16450.00
294 NO.2 CROSS SECTIONS CH 16372.00
295 BOX CULVERT CONCRETE DETAILS

DRGS 301-312 – GROUND IMPROVEMENT:

301 CH 0.00 TO 850.00
302 CH 850.00 TO 2300.00
303 CH 2300.00 TO 3850.00
304 CH 3850.00 TO 5400.00
305 CH 5400.00 TO 6950.00
306 CH 6950.00 TO 8550.00
307 CH 8550.00 TO 9950.00
308 CH 9950.00 TO 1155.00
309 CH 11550.00 TO 13200.00
310 CH 13200.00 TO 14750.00
311 CH 14750.00 TO 16250.00
312 CH 16250.00 TO 16836.8

DRGS 331-339 – EARTHWORK QUANTITIES:

331 SECTION CH 0.00 – 2000.00
332 SECTION CH 2000.00 – 4000.00
333 SECTION CH 4000.00 – 6000.00
334 SECTION CH 6000.00 – 8000.00
335 SECTION CH 8000.00 – 10000.00
336 SECTION CH 10000.00 – 12000.00
337 SECTION CH 12000.00 – 14000.00
338 SECTION CH 14000.00 – 16000.00
339 SECTION CH 16000.00 – 16835.80

DRG 351 – RETAINING WALL:

351 RETAINING WALL DETAILS

DRGS 401-415 – LINEMARKING & ROAD FURNITURE:

401 LINEMARKING AND ROAD FURNITURE LAYOUT 0-850
402 LINEMARKING AND ROAD FURNITURE LAYOUT 850-2150
403 LINEMARKING AND ROAD FURNITURE LAYOUT 2150-3550
404 LINEMARKING AND ROAD FURNITURE LAYOUT 3550-5100
405 LINEMARKING AND ROAD FURNITURE LAYOUT 5100-6600
406 LINEMARKING AND ROAD FURNITURE LAYOUT 6600-8200
407 LINEMARKING AND ROAD FURNITURE LAYOUT 8200-9900
408 LINEMARKING AND ROAD FURNITURE LAYOUT 9900-11400
409 LINEMARKING AND ROAD FURNITURE LAYOUT 11400-12850
410 LINEMARKING AND ROAD FURNITURE LAYOUT 12850-14500
411 LINEMARKING AND ROAD FURNITURE LAYOUT 14500-16050
412 LINEMARKING AND ROAD FURNITURE LAYOUT 16050-16845.312
413 DETAIL SIGN LAYOUT
414 LINEMARKING & ROAD FURNITURE SCHEDULE OF GUIDE POSTS

DRGS 501-525 – ROAD INTERSECTIONS:

SOUTH INTERSECTION:
501 DETAIL LAYOUT CH 500.00
502 LONGITUDINAL SECTIONS OLD SALISBAURY RD & FARM ACCESS RD
503 OLD SALSBURY ROAD CROSS SECTIONS STA 0 –100
504 FARM ACCESS ROAD CROSS SECTIONS STA 0 – 30
505 SETTING OUT DATA

CHICHESTER ROAD:
511 INTERSECTION DETAIL PLAN CH 14070.00
512 LONGITUDINAL SECTION CH 14070.00
513 CROSS SECTIONS CH 14070.00
514 SETTING OUT DATA

NORTH INTERSECTION:
521 LAYOUT PLAN CH 16550.00
522 LONGITUDINAL SECTIONS OLD SALISBAURY RD
523 OLD SALSBURY ROAD CROSS SECTIONS STA 0 – 90
524 SETTING OUT DATA

DRGS 551-570 – BOUNDARY LINE:

551 LAYOUT PLAN CH 0.00 TO 850.00
552 LAYOUT PLAN CH 850.00 TO 2250.00
553 LAYOUT PLAN CH 2250.00 TO 3550.00
554 LAYOUT PLAN CH 3550.000 TO 5100.000
555 LAYOUT PLAN CH 5100.000 TO 6600.000
556 LAYOUT PLAN CH 6600.000 TO 8200.000
557 LAYOUT PLAN CH 8200.000 TO 9900.000
558 LAYOUT PLAN CH 9900.000 TO 11400.000
559 LAYOUT PLAN CH 11400.000 TO 12850.000
560 LAYOUT PLAN CH 12850.000 TO 14500.000
561 LAYOUT PLAN CH 14500.000 TO 16050.000
562 LAYOUT PLAN CH 16050.000 TO 16845.312
563 SET OUT DETAILS
564 SET OUT DETAILS
565 SET OUT DETAILS

DRGS 604-626 – EROSION & SEDEMENT CONTROL:

604 LAYOUT PLAN CH 0.000 TO 800.000
605 LAYOUT PLAN CH 800.000 TO 1600.000
606 LAYOUT PLAN CH 1600.000 TO 2500.000
607 LAYOUT PLAN CH 2500.000 TO 3400.000
608 LAYOUT PLAN CH 3400.000 TO 4250.000
609 LAYOUT PLAN CH 4250.000 TO 5100.000
610 LAYOUT PLAN CH 5100.000 TO 6000.000
611 LAYOUT PLAN CH 6000.000 TO 6800.000
612 LAYOUT PLAN CH 6800.000 TO 7750.000
613 LAYOUT PLAN CH 7750.000 TO 8600.000
614 LAYOUT PLAN CH 8600.000 TO 9750.000
615 LAYOUT PLAN CH 9750.000 TO 10600.000
616 LAYOUT PLAN CH 10600.000 TO 11550.000
617 LAYOUT PLAN CH 11550.000 TO 12450.000
618 LAYOUT PLAN CH 12450.000 TO 13250.000
619 LAYOUT PLAN CH 13250.000 TO 14050.000
620 LAYOUT PLAN CH 14050.000 TO14850.000
621 LAYOUT PLAN CH 14850.000 TO 15650.000
622 LAYOUT PLAN CH 15650.000 TO 16800.000
623 STANDARD DETAILS
624 CATCH DRAIN DETAILS
625 NOTES
626 PERSPECTIVE LAYOUT

					BY	CHECKED	DATE
			DESIGN		W.WALBURN	R.CHARLTON	02/09
			DRAWN		J.THOMAS	W.WALBURN	02/09
			APPROVED				
R2. ISSUED FOR FINAL DRAFT DETAILED DESIGN		13.03.09					
R1. ISSUED FOR FINAL DRAFT DETAILED DESIGN		16.07.08					
AMENDMENT	APP'D	DATE					

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OPUS

TITLE ROADS AROUND TILLEGRA DAM
NEW SALISBURY ROAD

DRAWING INDEX SHEET 1

STATUS	DETAILED DESIGN		FILE	11563-49		
SCALE N.T.S.	PLOT DATE		FEATURE IDENTIFIER 16_3000_1	CODE 52404	SHEET 03	REVISION R2

GRAPHIC SCALES 0 10 mm 50 100 200 300 mm

12/03/2009 8:17

g:\projects\11500-11599\11563_17_tillegra concept road design\drafting\16_3000_1_52404_03.dwg ORIGINAL SHEET SIZE A1 [840x594]

DRGS 701–857 – CROSS SECTIONS:

701 SECTION CH 130.00 TO 260.00
702 SECTION CH 280.00 TO 420.00
703 SECTION CH 440.00 TO 580.00
704 SECTION CH 600.00 TO 740.00
705 SECTION CH 760.00 TO 900.00
706 SECTION CH 920.00 TO 1060.00
707 SECTION CH 1080.00 TO 1220.00
708 SECTION CH 1240.00 TO 1380.00
709 SECTION CH 1400.00 TO 1540.00
710 SECTION CH 1560.00 TO 1700.00
711 SECTION CH 1720.00 TO 1860.00
712 SECTION CH 1880.00 TO 2020.00
713 SECTION CH 2040.00 TO 2180.00
714 SECTION CH 2200.00 TO 2340.00
715 SECTION CH 2360.00 TO 2460.00
716 SECTION CH 2480.00 TO 2600.00
717 SECTION CH 2620.00 TO 2680.00
718 SECTION CH 2700.00 TO 2760.00
719 SECTION CH 2780.00 TO 2860.00
720 SECTION CH 2880.00 TO 2920.00
721 SECTION CH 2940.00 TO 2960.00
722 SECTION CH 2980.00 TO 3000.00
723 SECTION CH 3020.00 TO 3040.00
724 SECTION CH 3060.00 TO 3120.00
725 SECTION CH 3140.00 TO 3200.00
726 SECTION CH 3220.00 TO 3240.00
727 SECTION CH 3260.00 TO 3280.00
728 SECTION CH 3300.00 TO 3320.00
729 SECTION CH 3340.00 TO 3360.00
730 SECTION CH 3380.00 TO 3440.00
731 SECTION CH 3460.00 TO 3520.00
732 SECTION CH 3540.00 TO 3600.00
733 SECTION CH 3620.00 TO 3680.00
734 SECTION CH 3700.00 TO 3760.00
735 SECTION CH 3780.00 TO 3840.00
736 SECTION CH 3860.00 TO 3920.00
737 SECTION CH 3940.00 TO 4040.00
738 SECTION CH 3060.00 TO 4160.00
739 SECTION CH 4180.00 TO 4280.00
740 SECTION CH 4300.00 TO 4420.00
741 SECTION CH 4400.00 TO 4560.00
742 SECTION CH 4580.00 TO 4720.00
743 SECTION CH 4740.00 TO 4860.00
744 SECTION CH 4880.00 TO 4980.00
745 SECTION CH 5000.00 TO 5100.00
746 SECTION CH 5120.00 TO 5260.00
747 SECTION CH 5280.00 TO 5360.00
748 SECTION CH 5380.00 TO 5440.00
749 SECTION CH 5460.00 TO 5520.00
750 SECTION CH 5540.00 TO 5620.00
751 SECTION CH 5640.00 TO 5760.00
752 SECTION CH 5780.00 TO 5860.00
753 SECTION CH 5880.00 TO 5920.00
754 SECTION CH 5940.00 TO 5960.00
755 SECTION CH 5980.00 TO 6040.00
756 SECTION CH 6060.00 TO 6100.00
757 SECTION CH 6120.00 TO 6140.00
758 SECTION CH 6160.00 TO 6180.00
759 SECTION CH 6200.00 TO 6220.00
760 SECTION CH 6240.00 TO 6260.00
761 SECTION CH 6280.00 TO 6340.00
762 SECTION CH 6360.00 TO 6420.00
763 SECTION CH 6440.00 TO 6520.00
764 SECTION CH 6540.00 TO 6640.00
765 SECTION CH 6660.00 TO 6740.00
766 SECTION CH 6760.00 TO 6880.00
767 SECTION CH 6900.00 TO 7000.00
768 SECTION CH 7020.00 TO 7120.00
769 SECTION CH 7140.00 TO 7200.00
770 SECTION CH 7220.00 TO 7280.00
771 SECTION CH 7300.00 TO 7380.00
772 SECTION CH 7400.00 TO 7480.00
773 SECTION CH 7500.00 TO 7600.00
774 SECTION CH 7620.00 TO 7720.00
775 SECTION CH 7740.00 TO 7840.00
776 SECTION CH 7860.00 TO 7980.00
777 SECTION CH 8000.00 TO 8100.00
778 SECTION CH 8120.00 TO 8220.00
779 SECTION CH 8240.00 TO 8340.00
780 SECTION CH 8360.00 TO 8420.00
781 SECTION CH 8440.00 TO 8500.00
782 SECTION CH 8520.00 TO 8600.00
783 SECTION CH 8620.00 TO 8700.00
784 SECTION CH 8720.00 TO 8840.00
785 SECTION CH 8860.00 TO 8960.00
786 SECTION CH 8980.00 TO 9080.00
787 SECTION CH 9100.00 TO 9200.00
788 SECTION CH 9220.00 TO 9320.00
789 SECTION CH 9340.00 TO 9420.00
790 SECTION CH 9440.00 TO 9500.00
791 SECTION CH 9520.00 TO 9580.00
792 SECTION CH 9600.00 TO 9680.00
793 SECTION CH 9700.00 TO 9760.00
794 SECTION CH 9780.00 TO 9840.00
795 SECTION CH 9860.00 TO 9920.00
796 SECTION CH 9940.00 TO 10020.00
797 SECTION CH 10040.00 TO 10100.00
798 SECTION CH 10120.00 TO 10220.00
799 SECTION CH 10240.00 TO 10360.00
800 SECTION CH 10380.00 TO 10480.00
801 SECTION CH 10500.00 TO 10620.00
802 SECTION CH 10640.00 TO 10740.00
803 SECTION CH 10760.00 TO 10860.00
804 SECTION CH 10880.00 TO 10960.00
805 SECTION CH 10980.00 TO 11040.00
806 SECTION CH 11060.00 TO 11160.00
807 SECTION CH 11180.00 TO 11240.00
808 SECTION CH 11260.00 TO 11320.00
809 SECTION CH 11340.00 TO 11400.00
810 SECTION CH 11420.00 TO 11520.00
811 SECTION CH 11540.00 TO 11600.00
812 SECTION CH 11620.00 TO 11680.00
813 SECTION CH 11700.00 TO 11760.00
814 SECTION CH 11780.00 TO 11860.00
815 SECTION CH 11880.00 TO 11940.00
816 SECTION CH 11960.00 TO 12040.00
817 SECTION CH 12060.00 TO 12120.00
818 SECTION CH 12140.00 TO 12200.00
819 SECTION CH 12220.00 TO 12300.00
820 SECTION CH 12320.00 TO 12380.00
821 SECTION CH 12400.00 TO 12480.00
822 SECTION CH 12500.00 TO 12580.00
823 SECTION CH 12600.00 TO 12680.00
824 SECTION CH 12700.00 TO 12800.00
825 SECTION CH 12820.00 TO 12900.00
826 SECTION CH 12920.00 TO 12980.00
827 SECTION CH 13000.00 TO 13100.00
828 SECTION CH 13120.00 TO 13220.00
829 SECTION CH 13240.00 TO 13320.00
830 SECTION CH 13340.00 TO 13420.00
831 SECTION CH 13440.00 TO 13500.00
832 SECTION CH 13520.00 TO 13580.00
833 SECTION CH 13600.00 TO 13680.00
834 SECTION CH 13700.00 TO 13780.00
835 SECTION CH 13800.00 TO 13920.00
836 SECTION CH 13940.00 TO 14040.00
837 SECTION CH 14060.00 TO 14200.00
838 SECTION CH 14220.00 TO 14340.00
839 SECTION CH 14360.00 TO 14460.00
840 SECTION CH 14480.00 TO 14600.00
841 SECTION CH 14620.00 TO 14720.00
842 SECTION CH 14740.00 TO 14840.00
843 SECTION CH 14860.00 TO 14960.00
844 SECTION CH 14980.00 TO 15080.00
845 SECTION CH 15100.00 TO 15200.00
846 SECTION CH 15220.00 TO 15320.00
847 SECTION CH 15340.00 TO 15460.00
848 SECTION CH 15480.00 TO 15620.00
849 SECTION CH 15640.00 TO 15780.00
850 SECTION CH 15800.00 TO 15940.00
851 SECTION CH 15960.00 TO 16060.00
852 SECTION CH 16080.00 TO 16180.00
853 SECTION CH 16200.00 TO 16300.00
854 SECTION CH 16320.00 TO 16440.00
855 SECTION CH 16460.00 TO 16600.00
856 SECTION CH 16620.00 TO 16740.00
857 SECTION CH 16760.00 TO 16830.00

DRGS 901–914 – LOWER CROSSING BRIDGE:

901 GENERAL ARRANGMENT
902 FOUNDATION LAYOUT & PILE DETAILS
903 ABUTMENT CONCRETE
904 ABUTMENT REINFORCEMENT
905 PIER CONCRETE
906 PIER REINFORCEMENT
907 19M SPAN PSC PLANK
908 DECK CONCRETE SHEET 1 OF 2
909 DECK CONCRETE SHEET 2 OF 2
910 DECK REINFORCEMENT
911 TRAFFIC BARRIER STEELWORK DETAILS SHEET 1 OF 2
912 TRAFFIC BARRIER STEELWORK DETAILS SHEET 2 OF 2
913 APPROACH SLABS
914 BAR SHAPES DIAGRAM

DRGS 931–944 – MOOLEE CREEK BRIDGE:

931 GENERAL ARRANGEMENT
932 FOUNDATION LAYOUT AND PILE DETAILS
933 ABUTMENT CONCRETE
934 ABUTMENT REINFORCEMENT
935 PIER CONCRETE
936 PIER REINFORCEMENT
937 18M SPAN PSC PLANK
938 DECK CONCRETE SHEET 1 OF 2
939 DECK CONCRETE SHEET 2 OF 2
940 DECK REINFORCEMENT
941 TRAFFIC BARRIER STEELWORK DETAILS SHEET 1 OF 2
942 TRAFFIC BARRIER STEELWORK DETAILS SHEET 2 OF 2
943 APPROACH SLABS
944 BAR SHAPES DIAGRAM

DRGS 961–977 – UPPER CROSSING BRIDGE:

961 GENERAL ARRANGEMENT
962 FOUNDATION LAYOUT & PILE DETAILS
963 ABUTMENT A – CONCRETE
964 ABUTMENT B – CONCRETE
965 ABUTMENT DETAILS
966 ABUTMENT REINFORCEMENT – SHEET 1 OF 2
967 ABUTMENT REINFORCEMENT – SHEET 2 OF 2
968 ABUTMENT APPROACH SLABS
969 ABUTMENT WINGWALL DETAILS
970 PIER CONCRETE
971 PIER REINFORCEMENT
972 15M SPAN PSC PLANK
973 DECK CONCRETE
974 DECK REINFORCEMENT
975 TRAFFIC BARRIER STEELWORK DETAILS 1 OF 2
976 TRAFFIC BARRIER STEELWORK DETAILS 2 OF 2
977 BAR SHAPES DIAGRAM

AMENDMENT	APP'D	DATE
R2. ISSUED FOR FINAL DRAFT DETAILED DESIGN		13.03.09
R1. ISSUED FOR FINAL DRAFT DETAILED DESIGN		16.07.08

	BY	CHECKED	DATE
DESIGN	W.WALBURN	R.CHARLTON	02/09
DRAWN	J.THOMAS	W.WALBURN	02/09
APPROVED			

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OPUS

TITLE ROADS AROUND TILLEGRA DAM
NEW SALISBURY ROAD

DRAWING INDEX SHEET 2

STATUS	DETAILED DESIGN	FILE	11563-49		
SCALE	N.T.S.	PLOT DATE	FEATURE IDENTIFIER 16_3000_1	CODE 52404	SHEET 04	REVISION R2

GRAPHIC SCALES 0 10 mm 50 100 200 300 mm

12/03/2009 8:18

g:\projects\11500-11599\11563_17_tillegra concept road design\drafting\16_3000_1_52404_04.dwg ORIGINAL SHEET SIZE A1 [840x594]

Drawing No.	Description
MD.R1	
MD.R1.A03.A	ORGANIC FIBRE REINFORCED JUTE MESH DRAINS
MD.R1.B02.A	TEMPORARY EROSION CONTROL TYPICAL SILT TRAPS & EMBANKMENT DRAINAGE TREATMENT
MD.R11	
MD.R11.A01.A.2	INSTALLATION, BEDDING AND FILLING/BACKFILLING AGAINST/OVER CONCRETE PIPE CULVERTS
MD.R11.A26.A.1	TAPERED CONCRETE MEDIAN HEADWALL
MD.R11.A32.A	PRECAST HEADWALLS 300MM TO 600MM DIAMETER
MD.R11.B18.A.1	SK4, TYPE SK1 GULLY PIT WITH LINED TYPE (A & B) CATCH DRAIN INLET
MD.R11.B19.A	STANDARD GULLY PIT TYPE SK GRATINGS AND FRAMES
MD.R11.B27.A.1	TABLE DRAIN GULLY PIT TD 1
MD.R11.B33.A.1	STANDARD GULLY PIT DEPRESSED MEDIAN PITS GRATINGS AND FRAMES
MD.R11.B47.A	STEP IRONS FOR DRAINAGE PITS
MD.R132.	
MD.R132.A01.A.1	W BEAM AND THRIE BEAM SAFETY BARRIERS POST AND BLOCKOUT COMPONENTS
MD.R132.A01.A.1	W BEAM AND THRIE BEAM SAFETY BARRIERS POST AND BLOCKOUT COMPONENTS
MD.R132.A03.A.1	MODIFIED ECCENTRIC LOADER TERMINAL (MELT) POST, TUBE AND YOKE DETAILS
MD.R132.A04.A.1	W BEAM AND THRIE BEAM SAFETY BARRIER POST ON BASE PLATE
MD.R132.A05.A.1	W BEAM AND THRIE BEAM SAFETY BARRIER POST ON SLIP BASE PLATE
MD.R132.B01.A.1	W BEAM RAIL AND STIFFENING PIECE CONNECTION
MD.R132.B02.A.2	THRIE BEAM RAIL (2.7BMT & 3.5BMT) AND STIFFENING PIECE CONNECTION
MD.R132.B03.A.1	W BEAM AND THRIE BEAM SAFETY BARRIERS TERMINAL CONNECTORS
MD.R132.B04.A.1	W BEAM AND THRIE BEAM SAFETY BARRIER W BEAM TO THRIE BEAM TRANSITION
MD.R132.B05.A.1	W BEAM NESTING RAIL AND HALF LENGTH RAIL
MD.R132.B06.A.1	THRIE BEAM NESTING RAIL AND HALF LENGTH RAIL
MD.R132.B07.A.2	THRIE BEAM 2.7BMT NEST. RAIL & 3.5BMT RAIL FOR TRANSITION TO RIGID BARRIER
MD.R132.B08.A.1	W-BEAM RAIL TERMINAL COMPONENT ANCHOR BRACKET
MD.R132.B09.A.2	MELT AND TT TERMINALS W BEAM RAIL DETAIL OF TERMINAL RAILS
MD.R132.B10.A.2	MODIFIED ECCENTRIC LOADER TERMINAL (MELT) DIAPHRAGM PLATE DETAILS
MD.R132.B11.A.2	MODIFIED ECCENTRIC LOADER TERMINAL (MELT) AN D TRAILING TERMINAL (TT) BUFFERED END SECTION DETAILS
MD.R132.C01.A.1	MODIFIED ECCENTRIC LOADER TERMINAL (MELT) AN D TRAILING TERMINAL (TT) CABLE ASSEMBLY AND FASTENERS
MD.R132.C02.A.1	MODIFIED ECCENTRIC LOADER TERMINAL (MELT) AN D TRAILING TERMINAL (TT) FASTENER COMPONENTS M16 BOLTS & NUTS – RAIL
MD.R132.C03.A	W BEAM AND THRIE BEAM RAIL FASTENER COMPONENTS HEXAGON HEAD BOLTS AND NUTS
MD.R132.C04.A	W BEAM AND THRIE BEAM – POSTS BASE PLATE AND SLIP BASE PLATE HEXAGON HEAD BOLTS AND NUTS
MD.R132.C05.A	W & THRIE BEAM SAFETY BARRIER CONNECTION TO TYPE F BARRIER CAST-IN ASSEMBLY
MD.R132.E01.A	W BEAM AND THRIE BEAM SAFETY BARRIER DELINEATION UNIT
MD.R132.F01.A.2	AASHTO G4 W BEAM ASSEMBLY
MD.R132.F02.A.1	THRIE BEAM ASSEMBLY USING STANDARD BLOCKOUTS
MD.R132.F06.A	W BEAM AND THRIE BEAM POST INSTALLATION HARD GROUND AND TERMINALS
MD.R132.G01.B	MODIFIED ECCENTRIC LOADER TERMINAL (MELT) GENERAL ARRANGEMENT
MD.R132.G03.A.2	TRAILING TERMINAL (TT) GENERAL ARRANGEMENT POST AND ANCHORAGE DETAIL
MD.R18	
MD.R18.A02.A	SETTING OUT DIAGRAM FOR RURAL ROADS
MD.R60	
MD.R60.A01.A.1	PAVEMENT LINEMARKING AND DIMENSIONS
MD.R60.A02.A	DETAILS OF TRANSVERSE LINES
MD.R60.C02.A	PAVEMENT ALPHABET AND NUMERALS
MD.R62.	
MD.R62.A01.A	RAISED PAVEMENT MARKERS
MD.R70	
MD.R70.F01.A	TEMPORARY FENCING TEMPORARY STAR PICKET AND WIRE FENCE
	DUNGOG SHIRE COUNCIL – PRIVATE ENTRY – BUS ROUTE
	DUNGOG SHIRE COUNCIL – PRIVATE ENTRY – NON-BUS ROUTE

GRAPHIC SCALES 0 10 mm 50 100 200 300 mm

12/03/2009 8:22

AMENDMENT	APP'D	DATE
R0. ISSUED FOR FINAL DRAFT DETAILED DESIGN		13.03.09

	BY	CHECKED	DATE
DESIGN			
DRAWN			
APPROVED			

HUNTER WATER

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OPUS

TITLE ROADS AROUND TILLEGRA DAM
NEW SALISBURY ROAD
PROPOSED ROAD ALIGNMENT

LIST OF STANDARD DWGS

STATUS		FILE 11563-49			
SCALE 1:1 @ A1	PLOT DATE	FEATURE IDENTIFIER 16_3000_1	CODE 52404	SHEET 50	REVISION R0

g:\projects\11500-11599\11563_49_tillegra concept road design\drafting\16_3000_1_52404_50.dwg ORIGINAL SHEET SIZE A1 [840x594]