Roads & Maritime

M1 Princes Motorway Improvements, Picton Road to Bulli Tops
Stage 1 – Picton Road to Bellambi Creek
Submissions report

June 2017

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Roads and Maritime Services

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Approval and authorisation

Title	M1 Princes Motorway Improvements, Picton Road to Bulli Tops (Stage 1) submissions report
Accepted on behalf of Roads and Maritime NSW by	Julian Watson Project Development Manager
Signed	
Dated	29 May 2017

Executive summary

Background

Roads and Maritime Services proposes to upgrade the M1 Princes Motorway (previously Mount Ousley Road) for 8.3 kilometres, between Picton Road at Mount Ousley and Bulli Pass at Bulli Tops. The upgrade involves road widening and realignment of the M1 Princes Motorway from a four lane divided road (two lanes in each direction), to a six lane divided road (three lanes in each direction). This project is jointly funded by the Australian ($42 million) and the New South Wales ($43 million) governments.

Purpose of this report

This report relates to submissions received by Roads and Maritime in response to the Review of Environmental Factors (REF) prepared for the M1 Princes Motorway Improvements, Picton Road to Bulli Tops (Stage 1 – Picton Road to Bellambi Creek).

The REF document is available on www.rms.nsw.gov.au/m1improvements and was placed on public display between December 2016 and February 2017. This report summarises the issues and questions raised by submissions and provides responses to each issue (see Chapter 2). It also identifies new or revised environmental management measures (see Chapter 3) as a result of these submissions.

Key issues raised

A total of 11 submissions were received in response to the REF display. This included submissions from five government agencies, Endeavour Energy, one bus company and four from members of the community. Of the submissions received, one was supportive of the proposal, one objected and all other submissions did not offer a position.

The main issues raised, and Roads and Maritime's responses are summarised below (see Chapter 2 for all issues raised).

Options development, assessment and justification

Concerns were raised that the options selection process was insufficiently presented and that the options assessment process, the methodology used and the justification for the project in general were insufficiently described.

An *Options Analysis Report* (Appendix A) has been prepared to better outline the options development and assessment process, and the assessment methodology used to develop the preferred option.

Biodiversity impacts and safeguards

Coastal Upland Swamps

Concerns were raised that the level of impact the proposal has on Coastal Upland Swamps was not correctly assessed.

A specialist biodiversity assessment has been carried out in accordance with relevant legislation, polices and guidelines. The proposal would impact 2.27 hectares of Coastal Uplands Swamp endangered ecological community (EEC); however there are 53.59 hectares of adjoining Coastal Upland Swamp EEC not impacted by the proposal. In addition, none of the impacted Coastal Upland Swamps were determined to be swamps of special significance. This has been assessed in accordance with Draft Upland Swamp Environmental Assessment Guidelines (OEH, 2013) which determined the proposal would not result in a significant impact on Upland Coastal Swamps.

Fish Passage

The design of stream crossings is of particular interest to the DPI (Fisheries) due to the issues associated with maintaining fish passage. As a result, the Department has requested further consultation when the detailed designs of these crossing extensions is being carried out.

Roads and Maritime would consult with DPI (Fisheries) regarding the design of crossing extensions.

Biodiversity Offsetting

The Office of Environment and Heritage (OEH) requested that a biodiversity offset strategy (BOS) be prepared in accordance with the NSW BioBanking Assessment Methodology (BBAM). WaterNSW also requested that all biodiversity offsets be located within Cataract catchment.

Roads and Maritime would prepare a Biodiversity Offset Strategy in accordance with the Roads and Maritime Guideline for Biodiversity Offsets (Nov 2016), noting the challenge of obtaining suitable land within the Cataract catchment. Roads and Maritime would continue to consult with WaterNSW on the matter.

Groundwater

Questions were raised by a respondent that statements within the groundwater assessment on Coastal Upland Swamps regarding the reliance on aquifers and lateral flow were incorrect. The requirement to carry out a groundwater monitoring program and commit to remedial actions was also advised.

A hydrological assessment was carried out in accordance with relevant legislation, polices and guidelines. The assessment determined that the proposal would not result in any impacts on the regional groundwater systems and would not result in draining of Coastal Upland Swamps. The proposal is not anticipated to have any effects on adjoining swamps to the east or downgradient of the proposal or to the west of the existing roads. This indicates groundwater flow to lower altitudes has been considered and as such there is unlikely to be indirect impacts on the swamps at lower altitudes.

Roads and Maritime would work with OEH on the post-construction groundwater monitoring requirement near the Coastal Upland Swamps. Appropriate remedial measures would be developed and implemented where impacts on groundwater is identified. Roads and Maritime would also consider, adopting swamp monitoring regimes suggested in the Addendum to NSW Biodiversity Offsets Policy for Major Projects (Upland swamps impacted by longwall mining subsidence)(Dec 2016).

Eastern Pygmy Possums

Concerns were raised that the assessment carried out on impacts to Eastern Pygmy Possums was incorrect and that the conclusions made regarding significant impact were not appropriate.

Targeted surveys for Eastern Pygmy-possums were carried out in accordance with the Draft Threatened Biodiversity Survey and Assessment Guidelines (DEC, 2004). Only one sub-adult individual was found within the study area, indicating the potential for a viable low-density population. Roads and Maritime's experienced specialist consultants concluded that, considering the wider population and habitat, combined with appropriate mitigation measures, the impacts would not be considered significant. An assessment of significance under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) determined that the impacts of the proposal would not be significant.

Soil and Water quality impacts and safeguards

Neutral or Beneficial effect on water quality

Concerns were raised that the proposal may not achieve the Neutral or Beneficial Effects (NorBE) for water quality.

Roads and Maritime would ensure a neutral or beneficial effect (NorBE) is achieved for any areas of the proposal that drain to WaterNSW catchment area. A concept operational water management system was developed for the REF (refer to Appendix E, Section 6.3.1) to identify potential treatment measures to achieve NorBE requirements. Typical water quality management measures which could be used to achieve NorBE requirements include water quality basins, swales, bio filtration swales and vegetated channels.

The NorBE assessment concluded that a neutral or beneficial effect on water quality could be achieved, with improvements to water quality ranging from two to 100 per cent, through the provision of various water quality management measures (which would be further investigated and finalised during detailed design).

There would be a neutral or beneficial improvement compared to the existing situation as the current road does not have any operational water quality control measures.

Erosion and sediment control

EPA and DPI (Fisheries) requested further consultation during the development of the Erosion and Sediment Control Plan and Water Management Plan. WaterNSW commented that appropriate erosion and sediment controls, and tannin leachate controls must be implemented and maintained to manage runoff from the stockpile.

Roads and Maritime would consult with EPA, WaterNSW and DPI (Fisheries) during detailed design and the preparation of the Soil and Water Management plan and Erosion and Sediment Control Plans. An additional safeguard has been included in this submissions report for the management of tannins.

Roadside memorial access and rest area

One respondent requested that access to a road-side memorial site be retained and suggested that a light vehicle rest stop should be located next to the memorial.

Further consultation would be carried out with the respondent to ensure that any access arrangement needed in the future is suitable and appropriate. Potential access to the memorial would be considered further during detailed design. There is currently no proposal to develop a light vehicle rest area along this section of the M1 Princes Motorway.

Design refinements and additional investigations

Following the examination of all submissions, no design refinements or additional investigations were considered necessary. An *Options Analysis Report* has been prepared to provide additional detail surrounding the options analysis and project development (Appendix A).

Revised safeguards and management measures

As a result of the submissions received, the following safeguards, Biodiversity 17 and Biodiversity 19 relating to Coastal Upland Swamps were reworded for clarity:

- assessing the effectiveness of **damming (**bunding**) the swamp edge and the reincorporation of appropriate material to** ensure no indirect impacts on surrounding Upland Swamps have occurred as a result of the works;

- **revegetating the batters with species associated with the particular swamp habitat and/or tubestock planting will be used where appropriate.**

As a result of the submissions received, one safeguard - Surface Water 6, was added in relation to the management of tannins from mulch stockpiles and additional measures have been added to safeguard - Surface Water 1:

- **tannins from mulch stockpiles would be managed in accordance with *RTA Environmental Direction - Management of Tannins from Vegetation Mulch* (Jan 2012);**
- operational water quality control measures will be developed **during detailed design** to ensure that a neutral or beneficial effect **(NorBE)** on water quality is achieved. Water treatment structures should be designed to be accessible for structural and vegetation maintenance and for removal of sediment. **A risk assessment will be carried out during detailed design to assess the likelihood and consequence of a major spill and determine practical control measures to be implemented as necessary.**

Next steps

Following the determination of the REF, Roads and Maritime will finalise the concept design and would start detailed design in second half of 2017. Roads and Maritime will continue to consult with relevant stakeholders and agencies throughout the design phase.

Subject to project approval, the construction of Stage 1 would start in 2018 and be delivered over two years.

Contents

Appendices

1 Introduction and background

1.1 The proposal

A more detailed description of the proposal is found in the M1 Princes Motorway Improvements, Picton Road to Bulli Tops (Stage 1 – Picton Road to Bellambi Creek) review of environmental factors (REF) prepared by Roads and Maritime in December 2016. This is available on the project website www.rms.nsw.gov.au/m1improvements

The location and overview of the proposal is provided in Figure 1-1.

1.2 REF display

Roads and Maritime prepared the REF to assess the environmental impacts of the proposal. The REF was placed on public display from the 21 December 2016 to 3 February 2017. During this time three staffed 'information kiosks' were set up at two locations as detailed in Table 1.1. The REF was also placed on the Roads and Maritime project website for download. In addition to the staffed displays, copies and information on the REF were available at Wollongong City Council and the University of Wollongong. A Facebook post advertising the display was also done during the display period.

Table 1.1: Information kiosk locations

Location (date)	Address
Wollongong Traders Market (13/01/17)	Crown Street Mall, Wollongong
Wollongong Central (14/01/17 and 19/01/17)	200 Crown Street, Wollongong

Roads and Maritime spoke to nearly 100 people during these sessions.

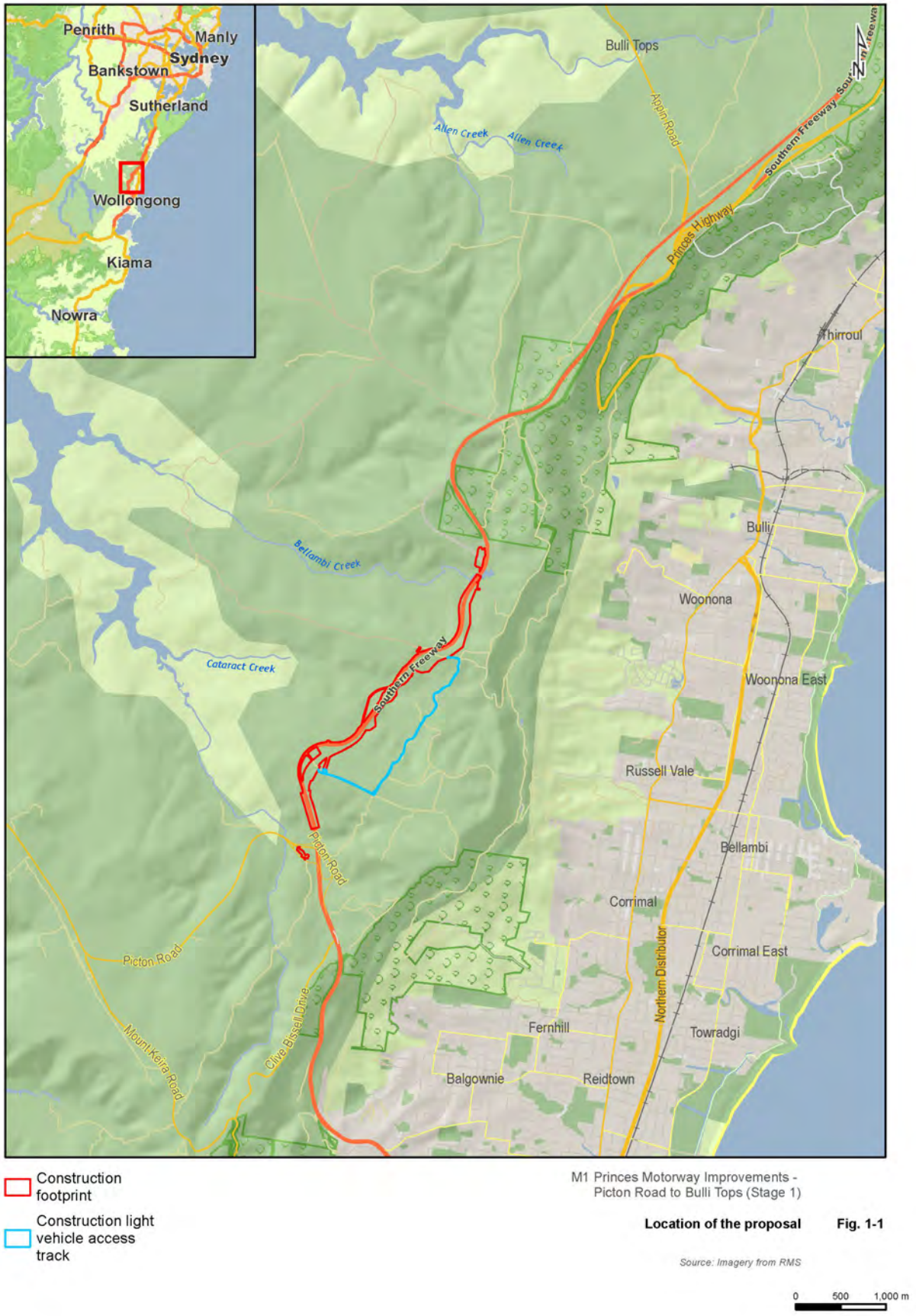
1.3 Purpose of the report

This report relates to submissions received by Roads and Maritime in response to the review of environmental factors (REF) prepared for the M1 Princes Motorway Improvements, Picton Road to Bulli Tops (Stage 1 – Picton Road to Bellambi Creek).

The REF document is available on www.rms.nsw.gov.au/m1improvements and was placed on public display between December 2016 and February 2017. This report summarises the issues and questions raised by submissions and provides responses to each issue (see Chapter 2). It also identifies new or revised environmental management measures (see Chapter 3) as a result of these submissions.

No project changes are proposed that would require the preparation of a preferred infrastructure report.

Figure 1-1: Proposal location



2 Response to issues

Roads and Maritime Services received 11 submissions, accepted up until the 3 February 2017. Table 2.1 lists the respondents and each respondent's allocated submission number. The table also indicates where the issues from each submission have been addressed in Chapter 3 of this report.

Table 2.1: Respondents

Respondent	Submission No.	Section number where issues are addressed
Busabout	1	2.5.1
Community member	2	2.5.2
Endeavour Energy	3	2.6.1 and 2.6.2
Community member	4	2.5.5
Department of Primary Industries (Fisheries)	5	2.3.7 and 2.4.2
NSW Rural Fire Service	6	2.5.3 and 2.5.4
Community member	7	2.2.1, 2.2.2, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.3.6, 2.3.9, 2.3.11, 2.4.1, 2.4.3, 2.5.7, 2.5.8 and 2.7.1
Office of Environment and Heritage (OEH)	8	2.3.4, 2.3.8, 2.3.10, 2.13.1, 2.13.2, 2.13.3 and 2.14.1
Community member	9	2.5.6
WaterNSW	10	2.3.8, 2.3.9, 2.4.1, 2.4.2, 2.5.4 and 2.6.1
Environment Protection Authority (EPA)	11	2.8.1, 2.8.2, 2.9.1, 2.10.1, 2.11.1 and 2.12.1

2.1 Overview of issues raised

A total of 11 submissions were received in response to the display of the REF. This included submissions from five government agencies, Endeavour Energy, one bus company and four from members of the community.

Each submission has been examined individually to understand the issues being raised. The issues raised in each submission have been collated and responded to. Where similar issues have been raised in different submissions, only one response has been provided. The issues raised and the Roads and Maritime response to these issues forms the basis of this chapter.

Of the submissions received one was supportive of the proposal, one objected and all other submissions did not offer a position.

The main issues raised by the government agencies included:

- Construction arrangements and the concept design of accesses (eg. Fire trails) to and from the proposal
- Construction and operational water quality management
- Property acquisition and fencing
- Biodiversity offsetting and rehabilitation of disturbed land
- General construction impacts and licensing
- Design of drainage

The main issues raised by the public included:

- Options development and assessment
- Justification of the proposal
- Biodiversity impacts and safeguards
- Water quality impacts and safeguards
- Groundwater impacts and safeguards
- Other road upgrades.

2.2 Alternative options

2.2.1 Assessment of alternative options

Submission number(s)

7 (community member)

Issue description

- Concerns raised about the level of adequacy of the options assessment, the methodology used and project justification
- Comment raised regarding the lack of consideration of the overall environmental impact or cost in the project objectives
- Concerns raised regarding the lack of traffic assessment for the major realignment option.
- Concerns raised that the 'base case/do nothing' option is dismissed without proper analysis
- Concerns raised about whether other potentially viable low-impact options have been considered such as dedicated lanes for heavy vehicle, the use of climbing lanes, smart motorway and average speed cameras.

Response

An Options Analysis Report (Appendix A) presents additional information on the options assessment process, the assessment methodology, the alternative sub-options, the base case and the criteria used to compare different options. Although not listed as specific project objectives, minimising environmental impacts and providing value for money are important considerations for all Roads and Maritime projects and were considered in the design development of options – impacts were avoided and/or minimised wherever possible.

The number of potential options that would achieve the project objectives is limited because of the local topography, surrounding land uses and the existing road alignment. In terms of the major realignment, Roads and Maritime determined that this option would have greater environmental impacts, require additional property acquisition and result in a higher overall cost compared to the

upgrade and minor realignment option (the preferred option), while delivering similar project benefits. Based on this assessment, detailed traffic modelling was not undertaken for this option.

An assessment of the base case was completed as part of the REF in Section 6.6. The traffic analysis determined that without upgrades the M1 Princes Motorway would operate at an unacceptable level of service (LoS), therefore not meeting the project objectives. Traffic modelling of the M1 LoS for 2038 AM peak indicated that without the proposed upgrade, the LoS on the M1 would be E/F for the majority of the alignment between Bellambi Creek and Picton Road. The proposed upgrade would substantially improve traffic flow on the M1 between Bellambi Creek and Picton Road to LoS A/B.

The implementation of smart motorway infrastructure, variable speed limit and point-to-point camera were considered as part of the Base Case option. However, these options were considered to be unsuitable for the project due to limits of technology currently available and not being able to address all the project objectives. Refer to Appendix A for further details.

The provision of extra climbing lanes in steep sections of existing road alignment was also considered, however this option did not meet all the project objectives and is detailed further in Appendix A.

A keep left requirement for all heavy vehicles would impact travel efficiency. All heavy vehicles would be travelling at the speed of the slowest vehicle in front of them. This may introduce an increased crash risk (particularly for rear-end crashes) for heavy vehicles.

2.2.2 Options assessment criteria

Submission number(s)

7 (community member)

Issue description

- Comment raised regarding the definition of ‘travel efficiency’ in the project objectives
- Concerns raised on the selection of the preferred option based on minor improvements in travel times
- Concerns that the separation of traffic objective is too narrow and eliminates the base case option immediately
- Comment raised on the provision of safe access for utilities and other reasons which are considered a minor objective
- Clarification requested on how the proposal increases reliability of access
- Clarification requested on the public interest benefits of the project.

Response

Additional information on the options assessment process, the assessment methodology alternative sub-options, the base case and the criteria used to compare different options is presented in Appendix A.

Travel efficiency when referring to road traffic is generally the ratio of the average travel speed to the posted travel speed (or free flow speed, if available). Travel efficiency can be impacted by the distance travelled, traffic volume, capacity of the road network, composition of the road fleet (eg proportion of heavy vehicles) and the geometry of the road eg. grades and curves can impact overall efficiency.

Travel time improvements are typically incremental across the range of network improvements that are undertaken. Travel time improvements would be one of the many benefits this proposal delivers. It should also be noted that the length of the upgrade is relatively short, so travel time improvements would appear low in terms of actual minutes and the travel time improvements do not take in consideration any reduction in traffic incidents. Traffic incidents can cause major delays and increases in travel times.

The proposal would provide greater efficiency and reliability for road traffic during operation and would reduce the potential of car vehicle crashes through the provision of additional lanes.

While the separation of slowing moving and fast moving traffic may appear to be a narrow objective, on roads with high grades and a high proportion of heavy vehicles such as the existing road alignment, this is a key objective and method to achieving a safer road environment and reducing traffic incidents. Consequently this was included as an assessment criteria between options.

There are numerous access locations along the proposal used for catchment management, fire fighting and utilities purposes. These are used frequently and many of them are substandard and pose additional safety risks to road users and vehicles using the accesses. Maintaining and improving the design of these access locations would have road safety benefits and also provide improved access for relevant agencies. It should also be recognised that the submissions from the relevant agencies identified the need to maintain and/or improve accesses along the proposal. Roads and Maritime has a legal obligation to consider the safety of all aspects of the projects life-cycle for both the road user and those involved in operation and maintenance activities as well as secondary users. Access for maintenance requires adequate line of sight and distances. Maintaining safe access for agencies onto the motorway is also a key consideration for this project.

The proposal would be in the public interest as it would improve the safe and efficient movement of people, goods and materials in a manner appropriate both for the present and the foreseeable future. Impacts on property, utilities and other items (such as water quality and threatened species) have been identified and are not considered to be significant.

2.3 Biodiversity

2.3.1 Coastal Upland Swamps

Submission number(s)

7 (community member)

Issue description

- Concerns raised on the level of impact of the proposal on Coastal Upland Swamps
- Concerns raised about the effectiveness of the Coastal Upland Swamps management plan being developed post approval of the REF
- Concerns raised about the lack of remedial actions that complement the Coastal Upland Swamp monitoring strategy
- Clarification requested of the proposed mitigation measures ‘bunding revegetation’ and planting the batter slopes with Coastal Upland Swamp species
- Concerns raised about the possibility of major spills impacting Coastal Upland Swamps.

Response

A specialist biodiversity assessment was undertaken in accordance with relevant legislation, polices and guidelines. The impact of the proposal on Coastal Upland Swamps has been assessed in accordance with Draft Upland Swamp Environmental Assessment Guidelines (OEH, 2013). The proposal would impact 2.27 hectares of Coastal Uplands Swamp endangered ecological community (EEC) however, 53.59 hectares of adjoining Coastal Upland Swamp EEC would not be impacted. Furthermore, none of the impacted Coastal Upland Swamps were determined to be swamps of special significance. The assessment determined that the proposal would not result in a significant impact on Upland Coastal Swamps.

The biodiversity assessment within the REF identifies the impacts on Coastal Upland Swamps. This information would be incorporated into the Coastal Upland Swamp management plan and would include targeted proven mitigation measures for Coastal Upland Swamps proposed in the biodiversity assessment.

Monitoring of Coastal Upland Swamps prior to, during and after construction would provide valuable information to design of other projects. The Coastal Upland Swamp Management Plan would have management action triggers which would be implemented if the monitoring indicates that there are impacts on the swamps from the proposal.

The proposed mitigation measure to implement “bunding revegetation” has been re-worded to

"Assessing the effectiveness of damming (bunding) the swamp edge and the reincorporation of appropriate material to ensure no indirect impacts on surrounding Upland Swamps have occurred as a result of the works"

The proposed mitigation measure to plant batters with Coastal Upland Swamps has been re-worded to

"In particular, revegetating the batters with species associated with the particular swamp habitat and/or tubestock planting will be used where appropriate."

A portion of the Coastal Upland Swamps is located above the road level, and as such road drainage would not drain into them. Additionally, a risk assessment would be carried out during detailed design to assess the likelihood of a major spill and its effect, and to determine practical control measures to be implemented as necessary.

2.3.2 Groundwater impacts on Coastal Upland Swamps

Submission number(s)

7 (community member), 8 (OEH)

Issue description

- Concerns raised about the validity of the statements contained within the groundwater assessment on Coastal Upland Swamps, and their reliance on aquifers and lateral flow.
- Concerns raised about the adequacy of investigations carried out for the groundwater assessment and whether the findings are sufficiently informed
- Concerns that construction in swamp areas would cause damage to swamps.
- Suggestion made to establish a groundwater monitoring program and commit to remedial actions

Response

A hydrological assessment was undertaken in accordance with relevant legislation, polices and guidelines (refer to Section 6.3.1 of the REF). The assessment determined that the proposal would not result in any impacts on the regional groundwater systems and would not result in draining of Coastal Upland Swamps. The proposal is not anticipated to have any effects on adjoining swamps to the east or downgradient of the proposal or to the west of the existing roads. This indicates that groundwater flow to lower altitudes has been considered and as such there is unlikely to be indirect impacts on the swamps at lower altitudes.

A specialist biodiversity assessment was also undertaken in accordance with relevant legislation, polices and guidelines (refer to Section 6.4.1 of the REF). The impact of the proposal on Coastal Upland Swamps has been assessed in accordance with Draft Upland Swamp Environmental Assessment Guidelines (OEH, 2013). The proposal would impact 2.27 hectares of Coastal Uplands Swamp EEC however, 53.59 hectares of adjoining Coastal Upland Swamp EEC would not be impacted. Furthermore, none of the impacted Coastal Upland Swamps were determined to be swamps of special significance. The assessment determined that the proposal would not result in a significant impact on Upland Coastal Swamps.

The monitoring investigations undertaken to inform the Groundwater Assessment are considered sufficient to determine the characteristics of the site and to assess rainfall response for the purposes of the REF.

Roads and Maritime would continue consultation with OEH on the post-construction groundwater monitoring requirement in the vicinity of the Coastal Upland Swamps. Practical remedial measures would be developed and implemented where impacts on groundwater is identified. Furthermore, Roads and Maritime would consider, where relevant, adopting swamp monitoring regimes suggested in the Addendum to NSW Biodiversity Offsets Policy for Major Projects (Upland swamps impacted by longwall mining subsidence)(Dec 2016).

2.3.3 Impacts on Eastern Pygmy Possums

Submission number(s)

7 (community member)

Issue description

- Concerns raised regarding the adequacy of the assessment undertaken on the impacts to Eastern Pygmy Possums and the conclusions regarding significance of impact.
- Concerns raised regarding the adequacy of the proposed mitigation measures for Eastern Pygmy Possums

Response

Targeted surveys for Eastern Pygmy-possums were undertaken in compliance with the Draft Threatened Biodiversity Survey and Assessment Guidelines (DEC, 2004) and only one sub-adult individual was found within the study area. Mapping prepared as part of the Wollongong Bioregional Assessment (NPWS, 2002) indicates that the proposal area is on the western edge of a much larger viable population and a 90 hectare area of prime possum habitat. This adjacent habitat is considered higher quality than habitat in the proposal area as it has been mapped to have similar vegetation communities and is substantially less disturbed by human activities and infrastructure.

An assessment of significance under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) determined that the impacts of the proposal would not be significant. This was

based on the likelihood of the proposal putting a viable local population at risk of extinction. As 90 hectares of high quality habitat would not be impacted by the proposal and that mitigation measures to provide connectivity in the area would be implemented, it was determined that the proposal would be unlikely to put any viable local population at risk of extinction.

2.3.4 Threatened species assessment

Submission number(s)

7 (community member), 8 (OEH)

Issue description

- Concerns raised about the adequacy of the threatened species assessment in terms of species abundance, habitat (and its fragmentation), foraging resources and populations
- Comment on the need to assess the impacts of the proposal in accordance with principles and legislation established by OEH

Response

Impacts have and would continue to be assessed in accordance with principles and legislation established by OEH. Roads and Maritime would consider, where relevant, adopting swamp monitoring regimes suggested in the Addendum to NSW Biodiversity Offsets Policy for Major Projects (Upland swamps impacted by longwall mining subsidence)(Dec 2016).

All threatened species and ecological communities with a likelihood of occurrence of medium and above were further assessed in accordance with statutory guidelines (refer to Biodiversity Assessment Report) - Appendix H).

The Wollongong Bioregional Assessment (NPWS, 2002) was used to guide the assessment of alternative adjacent habitat. National Parks and Wildlife Service (NPWS) mapping or other assessments are typically used in biodiversity assessments to identify other areas of habitat near projects. This adjacent habitat is considered higher quality than habitat in the proposal area as it has been mapped to have similar vegetation communities and is substantially less disturbed by human activities and infrastructure.

Habitat fragmentation on threatened fauna species has been considered in Section 4.2.1 and in each of the assessments of significance under Part 5A of the EP&A Act. This can be found in section d(ii) of each assessment.

2.3.5 Connectivity impacts and mitigation

Submission number(s)

7 (community member)

Issue description

- Opinion expressed that the existing motorway is not a barrier to connectivity
- Opinion expressed about the appropriate timing for the preparation of the Fauna Connectivity Strategy
- Concern raised about the effectiveness of the use of fauna exclusion fencing and fauna crossing structures.
- Comment made on the need to include remedial actions as part of the fauna crossings monitoring strategy

Response

High volumes of existing road traffic and the extent of the existing concrete barrier, which runs for the length of the proposal result provides a significant barrier to the movement of fauna species Furthermore, viable local populations exist in the presence of this significant barrier and in the place of proposed connectivity mitigation measures, the proposal is unlikely to exacerbate the current connectivity issues.

A fauna connectivity strategy would be prepared and it would identify the most effective fauna connectivity structures to be included in the detailed design. It is expected that the connectivity strategy would be an improvement to the current connectivity for target species as the current road is considered a barrier to most target species and the existing road has no existing specific fauna connectivity structures.

Fauna fencing would primarily be used to direct/funnel target species to any new fauna connectivity structures. Monitoring of crossing structures would provide valuable information for the design of other projects as well as assessing the effectiveness of the proposal's crossing structures.

2.3.6 Impacts on hollow bearing tress

Submission number(s)

7 (community member)

Issue description

- Clarification requested on how the proposed nest box management plan would 'ameliorate the reduction in habitat features'
- Clarification sought on how a 'no net loss' of habitat is to be achieved with the removal of hollow bearing trees
- Concerns raised with the removal of 191 hollow bearing trees not being consistent with the aim of 'retaining large glide trees'.

Response

The nest box management plan would identify the type, timing and location/height of proposed nest boxes which assists in restoring habitat features.

Nest boxes would be installed at a 1:1 ratio to those removed ensuring that there will be no net loss of Eastern Pygmy-possum habitat as a result of hollow-bearing tree removal. Foraging habitat in the form of Banksia's etc. would remain in higher quality adjacent habitat.

During the detailed design and construction planning phase, opportunities to retain glide and hollow-bearing trees would be further investigated.

The REF incorrectly stated that there were 191 hollow bearing trees and 87 large hollows to be removed. Roads and Maritime has subsequently reviewed the figures and confirmed the figure contained within the Biodiversity Technical Assessment as correct. A total of 173 hollow bearing trees and no large hollows within the approved Stage 1 footprint would be removed.

Clearing for the proposal would remove 173 hollow bearing trees which contain 57 small hollows, 173 medium, no large and 37 extra-large hollows. All hollows would be replaced at a 1:1 ratio in adjacent areas with suitable nest boxes.

2.3.7 Fish passage

Submission number(s)

5 (DPI Fisheries)

Issue description

- Requested further consultation during detailed design with respect to maintaining fish passage, including the design of culvert extensions.

Response

Roads and Maritime would consult with DPI Fisheries on the detailed design of any structures that may impact on fish passage. Design would be undertaken in consideration of relevant fish passage guidelines.

A new environmental safeguard and management measure has been proposed:

The maintenance of fish passage will be addressed during detailed design and construction in consultation with DPI Fisheries.

2.3.8 Biodiversity offsets

Submission number(s)

8 (OEH), 10 (WaterNSW)

Issue description

- OEH noted that the appropriate measures to avoid, minimise and offset impacts of the proposal should be fully considered, and that a biodiversity offset strategy (BOS) be prepared in accordance with the NSW BioBanking Assessment Methodology (BBAM).
- WaterNSW requested that land for biodiversity offsets be located in located in the Cataract Dam catchment.

Response

Roads and Maritime would prepare a Biodiversity Offset Strategy in accordance with the Roads and Maritime Guideline for Biodiversity Offsets (Nov 2016).

Roads and Maritime would continue to consult with WaterNSW on biodiversity offset opportunities and feasible locations.

2.3.9 Rehabilitation of redundant roads and construction areas

Submission number(s)

7 (community member), 10 (WaterNSW)

Issue description

- The project description does not include any firm commitment for the redundant road section other than the possibilities that it 'may' be retained for a heavy vehicle weighing or inspection station. This lack of commitment fails to justify Roads and Maritime not rehabilitating the redundant road surface for the benefit of pygmy possum. In addition, the edge effects of a truck stop such as this are significant (e.g. rubbish dumping, people using it as an open air toilet etc.) and would further impact on this species.
- The main site compound should be rehabilitated at the conclusion of Stage One activities to assist in maintaining the ecological integrity of the land on the western side of the new road alignment.

- WaterNSW requests the rehabilitation of the Stage One southern section of Mount Ousley Road that would be replaced with the realignment and transferred to WaterNSW, as well as other redundant sections of road on the western side of Mount Ousley Road.

Response

The final use or rehabilitation of redundant road areas has yet to be determined. Initial assessments indicated that full rehabilitation of all the redundant road areas would incur substantial cost and would not necessarily provide a high quality habitat for pygmy possums or other fauna species.

However, some areas of existing road pavement would be removed and rehabilitated and other areas disturbed by construction (eg. Site compounds) would be rehabilitated to an acceptable standard at the completion of construction. Roads and Maritime would continue to consult with WaterNSW on the final use and other environmental safeguards for the redundant road.

2.3.10 Revocation of the Illawarra Escarpment SCA

Submission number(s)

8 (OEH)

Issue description

- Stage 2 of M1 Motorway improvements, which are separate from the current project, would require some revocation of the Illawarra Escarpment SCA. OEH recommend engaging with NPWS officers early in the process of preparing the Stage 2 REF to progress any proposed revocation that may be required.

Response

Noted. Roads and Maritime would undertake early consultation with NPWS in relation to any revocation of the Illawarra Escarpment SCA would be undertaken during Stage 2.

2.3.11 Weeds and edge effects

Submission number(s)

7 (community member)

Issue description

- The new alignment would double the edge zone especially considering there is no commitment to remove any redundant road surfaces. This would result in an increased weed zone.

Response

As most of the construction would be within the existing edge zone of the existing road it is not considered that there would be a double edge effect. In addition, as the existing road area would no longer be active, the edge effects in this area would be greatly reduced. Weeds would be managed during construction in accordance with Roads and Maritime biodiversity guidelines.

2.4 Water quality

2.4.1 Design of operational water quality control basins

Submission number(s)

7 (community member), 10 (WaterNSW)

Issue description

- Concerns raised that the proposal may not achieve the Neutral or Beneficial Effects (NorBE) for water quality
- Reminder that the works occur in the Metropolitan Special Area. The Special Areas are subject to the provisions of the 'Special Areas Strategic Plan of Management' (SASPoM), and are jointly managed by WaterNSW and the Office of Environment and Heritage under the Water NSW Act 2014.
- Concern raised on the potential impact on water quality from major spills resulting from traffic incidents

Response

Roads and Maritime is committed to meeting the neutral or beneficial effect (NorBE) requirement for any areas of the proposal that drain to WaterNSW catchment area. A concept operational water management system was developed for the REF (refer to Appendix E, Section 6.3.1) to identify potential treatment measures to achieve NorBE requirements. Typical proposed water quality management measures which could be used to achieve NorBE requirements could include water quality basins, swales, bio filtration swales and vegetated channels.

The NorBE assessment concluded that a neutral or beneficial effect on water quality could be achieved, with improvements to water quality ranging from 2 to 100 per cent, through the provision of various water quality management measures (to be further investigated and finalised during detailed design).

There would be a neutral or beneficial improvement compared to the existing situation as the current road does not have any operational water quality control measures.

Roads and Maritime would continue to consult with WaterNSW to identify appropriate locations and operational water quality controls. Additionally, a risk assessment would be carried out during detailed design to assess the likelihood and consequence of a major spill, and to determine practical control measures to be implemented as necessary.

2.4.2 Construction water quality management measures

Submission number(s)

5 (DPI (Fisheries)), 10 (WaterNSW), 11 (EPA)

Issue description

- DPI (Fisheries) requested that further consultation be undertaken during detailed design with regard to adverse impacts upon water quality during the construction phase. Specific consultation required in relation to the following documents Soil and Water Management Plan, Erosion and Sediment Control Plan and the Construction Environmental Management Plan.
- WaterNSW noted that two construction compounds are in close proximity to creeks and appropriate controls would be required to minimise water quality impacts.
- WaterNSW and EPA identified potential water quality impacts from erosion and sedimentation, fuels, hazardous substances, tannins and plant maintenance, refuelling and cleaning.

Response

Roads and Maritime would consult with EPA, DPI Fisheries and WaterNSW during the detailed design process and the preparation of the Soil and Water Management Plan, Erosion and

Sediment Control Plans and the Construction Environmental Management Plan. Water quality controls identified in the appropriate management plans would be implemented during construction.

A new environmental safeguard and management measure has been proposed for the management of tannins:

Tannins from mulch stockpiles would be managed in accordance with RTA Environmental Direction - Management of Tannins from Vegetation Mulch (Jan 2012).

In addition, all stockpile sites would be managed in accordance with Roads and Maritime Stockpile Site Management Guideline (May 2015). It is considered that the safeguards in the REF adequately address this issue.

2.4.3 Impacts on creeks

Submission number(s)

7 (community member)

Issue description

- Concerns raised about the impacts assessed in the REF on Cataract, Bellambi and Allen's Creeks.
- Comments raised about the lack of assessment in the REF for the diversion of Cataract Creek during construction
- Concerns raised about whether stockpile sites can be practically located sufficiently away from any watercourses and/or EECs.

Response

Roads and Maritime would continue to work with WaterNSW, NSW DPI (Fisheries) and the NSW EPA through the detailed design and construction phases of the proposal to ensure that appropriate water quality goals and outcomes are met, including the Neutral or Beneficial Effect.

The scope and scale of the diversion of Cataract Creek required during construction would be further investigated during detailed design and in consultation with NSW EPA, WaterNSW and DPI (Fisheries). Additional environmental assessments on the creek diversion would be undertaken as necessary.

2.5 Traffic and transport

2.5.1 Motorway closures

Submission number(s)

1 (Busabout)

Issue description

- No objection to the proposal provided the Princes Motorway remains open during construction.

Response

During construction of the proposal, the Princes Motorway would remain open to traffic at all times and there would no change in access to the proposal. A traffic management plan would be prepared and implemented to management traffic and access during construction. Road users

including bus providers would be informed of any changes in traffic management which may impact upon travel times.

2.5.2 Access to memorial site

Submission number(s)

2 (community member)

Issue description

- Requested that access to a road-side memorial site be retained and suggested that a light vehicle rest stop be located adjacent to the memorial

Response

Access arrangements to the memorial site during construction would be considered during detailed design. Further consultation would be undertaken with the respondent to ensure that the access proposed is suitable and appropriate.

Currently there is no proposal to develop a light vehicle rest area along this section of the M1 Princes Motorway. Road and Maritime would continue to monitor the need for light vehicle rest area along this section of the M1 Princes Motorway.

2.5.3 Road shoulder access for emergency vehicles

Submission number(s)

6 (NSW RFS)

Issue description

- Comment made on the existing road shoulder width being restrictive for emergency vehicles accessing accidents or other incidents when there is traffic congestion on the motorway.

Response

The proposal would have a three metre road shoulder along the full length of the proposal alignment. In addition, the improved alignment and roadside drainage (gutter) arrangement would improve the access and safety for emergency vehicles responding to traffic or other incidents.

2.5.4 Access to fire trails

Submission number(s)

6 (NSW RFS), 10 (WaterNSW)

Issue description

The NSW RFS and other organisations requested further clarification on access arrangement to existing fire trails including:

- RFS requested confirmation that the southbound Brokers Nose access would be available as both an exit from the Motorway and entry to the Motorway.
- RFS preference is to retain the old road formation west of Brokers Nose Fire Trail for access and management purposes (hazard reduction burns).
- RFS requested that access to the western side of the Motorway (South of Bellambi Creek) remains, as access to a supply of emergency water needs to be available.

- RFS and WaterNSW all requested access to Sassafras Fire Trail

Response

Access to the Brokers Nose fire trail would be a 'left-in, left-out' access at a new location. The access at the new location would have improved sight distances with suitable road design. It is envisaged that the new access would substantially improve safety for vehicles particularly service vehicles such as fire tankers.

The existing road formation west of Brokers Nose Fire Trail would be retained. Access to this area would be determined during detailed design and RFS and WaterNSW would be consulted to ensure that appropriate access arrangements are provided.

The area west of the Motorway and south of Bellambi would generally be not affected by the works. Access to this area for emergency water supplies would be a balance between safe and controlled access and would be considered during the detailed design.

Southbound access (left-in, left-out) to the Sassafras Fire Trail has been included in the current design. Northbound access to the Sassafras Fire Trail would also be provided. However the access arrangements have yet to be determined and would be considered during the detailed design in consultation with RFS.

2.5.5 Other road upgrades

Submission number(s)

4 (community member)

Issue description

- Comment made that an upgrade of the M1 Princes Highway from Clive Bissell Drive to Picton Road should be considered.
- Concerned that slow moving heavy vehicles in this section would increase following the opening of the truck rest stop (currently under construction). Suggested the provision of a third lane would provide improved traffic flow especially since a lot of heavy vehicles turn left into Picton Road.

Response

Roads and Maritime would continue to monitor this length of the M1 Princes Highway for network optimisation and efficiency. However, this area is outside the scope of the current proposal.

2.5.6 Design criteria

Submission number(s)

9 (community member)

Issue description

- Comments made in relation to the design criteria should be of a higher geometric standard so as to facilitate 110 km/h posted speed limit along the entirety of the proposed upgrade.

Response

Posted speed limits for this part of the network are constrained by the topography, which minimises the opportunities for a higher speed design. A range of design alignments which investigated the potential for improved grades and curves potentially suitable for a higher posted speed limit were

undertaken, and are further discussed in Appendix A. It was not considered feasible to adopt designs of a generally higher limit.

2.5.7 Traffic modelling and economic appraisal

Submission number(s)

7 (community member)

Issue description

- Concerns raised about how the travel time costs savings and the Cost Benefit Ratios are calculated using inconsistent distance figures and not taking into account of the effect of speed reduction down to 40km/h during construction.
- Concern raised about the applicability of the traffic modelling and economic appraisal given it is two years old.

Response

The economic analysis completed for the project provides an indicative benefit to cost ratio (BCR) that reflects the current status of the project, i.e. concept development phase.

The analysis has considered the traffic benefits for the entire study area as well as that of a Stage 1 proposal and is therefore considered appropriate for the current stage of development. Although a guide for possible funding considerations, the economic analysis would be updated as the project progresses through its concept development into detailed design and would be subject to independent review processes.

Roads and Maritime notes the inconsistency in Section 2.3.3 Crash Data and Tables 2-3 and Table 2-4 of the Traffic Modelling and Economic Appraisal report. Roads and Maritime has reviewed these sections of the report and confirms that the crash analysis was completed for the 3.5 kilometre Stage 1 length (Picton Road to Bellambi Creek) as detailed in Appendix A of the report.

Roads and Maritime is yet to determine specific traffic control measures, such as possible speed reductions, for the construction phase of the project. These potential measures are not typically considered in the development of BCR's.

Although completed in 2014 the traffic modelling used to assess the proposal is still considered relevant, given the minor increase in traffic since the report was completed.

2.5.8 Road safety

Submission number(s)

7 (community member)

Issue description

- Concerns raised about the lack of information in the traffic modelling and economic appraisal, in the areas of existing safety performance and the effect of traffic safety with improved average speed in poor weather conditions.
- Concerns raised about the lack of reasoning to substantiate the reduction in crashes delivered by the proposal as suggested in the traffic modelling and economic appraisal.

Response

The proposed alignment is anticipated to be a marked improvement over the existing conditions, with improved sight distances, vertical grade and horizontal curves for a 100km/hr posted speed limit. In conditions which are not optimal, such as wet weather, drivers should drive to the conditions and reduce speed and increase the distance between vehicles.

The proposed upgrade would improve travel speed conditions on the M1 which would reduce the travel speed differential between slow vehicles (typically trucks) and faster vehicles (typically cars). The proposed upgrade would therefore reduce the likelihood of rear-end crashes.

Crash reduction analysis was determined based on the typical treatments suggested by Roads and Maritime guidelines. Most of the treatments were based on *"treatment type 94-Alignment – change horizontal & vertical"*.

2.6 Property and landuse

2.6.1 Acquisition of property

Submission number(s)

3 (Endeavour Energy), 10 (WaterNSW)

Issue description

- Requested further information on the property acquisition boundaries, timeframe and process
- Endeavour Energy had no objection to acquisition but requested fencing be relocated, no works on Endeavour Energy land without consent and protection of overhead powerlines
- WaterNSW noted land acquisition and requested that Road and Maritime acquire all WaterNSW land to the east of the proposal to provide a logical boundary for ownership and management.

Response

Roads and Maritime would continue to consult with Endeavour Energy and WaterNSW regarding acquisition and access requirements. Property acquisition would be undertaken prior to construction – generally when sufficient detailed design information is available to confidently identify the area and the new boundary locations for acquisition. Other issues such as ongoing land management and residual land areas would also be considered in the acquisition process.

Impacted boundary fences would be replaced on a like-for-like basis at the new boundary locations. If works are required on Endeavour Energy or Water NSW land, consultation and consent would be obtained before undertaking those works. Construction risk assessment and planning would consider the risks around the overhead powerlines and appropriate measures would be implemented to eliminate any risks.

2.6.2 Access to substation

Submission number(s)

3 (Endeavour Energy)

Issue description

- Access to the substation from the M1 must be maintained at all times
- Temporary vehicle access should be designed to suit a heavy rigid vehicle.

Response

Roads and Maritime would continue to consult with Endeavour Energy on access requirements and recognises the need for continuous access to the electricity substation. This would be included in the Traffic Management Plan and considered during the construction works design.

2.7 Project staging

2.7.1 Cumulative impacts

Submission number(s)

7 (community member)

Issue description

- Respondent commented that Stage 1 and 2 should be treated as a single project to assess cumulative impacts and an EIS should be prepared.

Response

During the planning of the proposal, consideration was given to the environmental impacts of the stages 1 and 2 combined; it was determined by Roads and Maritime that a significant impact was unlikely for the combined stages and therefore an EIS was not required.

Stage 2 of the project is not currently funded and the scope of this stage has not yet been fully defined. Therefore stage 1 has been assessed separately.

The REF has assessed the impacts of stage 1 and determined that there are no significant impacts. The environmental assessment for stage 1 has been prepared to comply with the requirements of the EP&A Act.

Stage 1 would be constructed as a stand-alone project and is not reliant upon stage 2 proceeding. If stage 2 is funded and proposed to proceed, a separate environmental assessment would be prepared that would include consideration of the cumulative impacts of other relevant projects including stage 1.

2.8 Statutory Approvals

2.8.1 Environment Protection Licence

Submission number(s)

11 (EPA)

Issue description

- EPA noted the construction of the proposal would require an EPL and the scheduled activities would be road construction and extractive activities.

Response

Roads and Maritime recognise that an EPL would be required and would continue to consult with the EPA regarding the scheduled activities and as well as the timing for the EPL.

2.8.2 Complaints and incidents

Submission number(s)

11 (EPA)

Issue description

- Adequate procedures should be established including notification requirements to the appropriate regulatory authority and other relevant authorities for incidents that cause, or have the potential to cause, material harm to the environment
- Respondent requested a complaints handling system to be implemented during construction.

Response

Complaints management procedures would be established in the construction environmental management plan (CEMP) prior to construction. The procedures would include processes for documenting and resolving issues and complaints. The procedures would also address and conform to all complaints management requirements as detailed in the project Environmental Protection Licence.

Environmental incidents would be assessed in accordance with Roads and Maritime's *Environmental Incident Classification and Report Procedure* and reported to the relevant authorities as required.

2.9 Air quality

2.9.1 Construction air quality

Submission number(s)

11 (EPA)

Issue description

- EPA noted that while there are no sensitive receivers near the proposal, air quality objectives and impacts must comply with relevant guidelines and legislation
- Dust and plant emissions need to managed and all reasonable and feasible measures should be implemented.

Response

Section 7 of the REF contains safeguards relating to air quality that would be implemented during construction. This includes complying with relevant standards and guidelines, implementing all reasonable and feasible measures to minimise dust and ensuring that all plant meets the relevant emission standards. These safeguards would be included in the CEMP or a specific construction air quality management plan.

2.10 Noise and vibration

2.10.1 Construction noise and vibration

Submission number(s)

11 (EPA)

Issue description

- EPA provided information on construction noise and vibration guidelines and requested that these be considered in the CEMP.

Response

A Construction Noise and Vibration Management Plan would be prepared and implemented. The relevant guidelines provided by the EPA would be used in the preparation of the management plan. It should be noted that because the nearest sensitive receiver is over 1200 metres from the proposal, construction noise and vibration impacts would not be expected.

2.11 Contamination

2.11.1 Contamination guidelines

Submission number(s)

11 (EPA)

Issue description

- EPA provided information on contamination guidelines, legislation and policy

Response

The Erosion and Sedimentation Management Report prepared for the REF (Appendix E) found that there is a low risk of the proposal encountering contaminated land during construction along the existing corridor and proposed ancillary sites. However if previously unknown contamination is encountered, the contaminated areas and material would be managed in accordance with Roads and Maritime's Guideline for the Management of Contamination (Sept 2013) and would comply with relevant guidelines, legislation and policy.

2.12 Waste

2.12.1 Waste management

Submission number(s)

11 (EPA)

Issue description

- EPA provided information on waste guidelines, legislation and policy and requested that a Construction Waste Management Plan be prepared

Response

A Construction Waste Management Plan (CWMP) would be prepared and implemented, to address the requirements identified by the EPA in the EPL and would also comply with relevant guidelines, policies and legislation.

2.13 Aboriginal heritage

2.13.1 Assessment procedures

Submission number(s)

8 (OEH)

Issue description

- OEH will not approve or certify a person's compliance with their due diligence requirements carried out under their own process. This is the responsibility of the company or individual doing the activity.

Response

Roads and Maritime understands this provision and are confident that the individuals and the PACHCI process meets due diligence requirements.

2.13.2 Discovery of unknown heritage items

Submission number(s)

8 (OEH)

Issue description

- If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the project, all works in the vicinity of the find must cease. In this event, contact the relevant OEH office for advice and follow the Roads and Maritime (2015) *Standard Management Procedure: Unexpected Heritage Items*. An Aboriginal Heritage Impact Permit may be required if Aboriginal objects cannot subsequently be avoided as part of construction works.

Response

Roads and Maritime would follow the Roads and Maritime (2015) *Standard Management Procedure: Unexpected Heritage Items*. It is recognised that an Aboriginal Heritage Impact Permit may be required if Aboriginal objects cannot subsequently be avoided as part of construction works.

2.13.3 Location of Aboriginal heritage sites

Submission number(s)

7 (community member)

Issue description

- Aboriginal sensitive sites are included in figures available on the project website.

Response

The locations of Aboriginal sensitive sites have been removed from publically available material on the web site and other media.

2.14 Hydrology

2.14.1 Design of drainage and flooding

Submission number(s)

8 (OEH)

Issue description

- The respondent requests all existing cross drainage structures as well as concept designs for the proposed transverse drainage infrastructure be provided as part of this report.

- The respondent requests that the design consider floodplain risk management; safety and access for emergency vehicles, implications of climate change, adverse impacts and transverse drainage concept designs

Response

Roads and Maritime have provided concept design drawings of the proposed transverse drainage infrastructure in Appendix B of this report.

Roads and Maritime would consider the minimum freeboard requirements, blockage assumptions, climate change considerations, suitable IFD data and emergency vehicle access during development of the detailed design. Issues relating to flood plain risk management would be communicated to other relevant agencies including the OEH, NSW EPA, WaterNSW and DPI (Fisheries).

3 Environmental management

The REF for the M1 Princes Motorway Improvements, Picton Road to Bulli Tops (Stage 1 – Picton Road to Bellambi Creek) identified the framework for environmental management, including safeguards and management measures that would be adopted to avoid or reduce environmental impacts (Section 7 of the review of environmental factors).

After consideration of the issues raised in the public submissions and changes to the proposal, the safeguard and management measures have been revised and are detailed in Section 3.2.

Should the proposal proceed, environmental management would be guided by the framework and measures outlined below.

3.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Project Environmental Management Plan (PEMP) and a Construction Environmental Management Plan (CEMP) would be prepared to describe safeguards and management measures identified. The PEMP and CEMP would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The PEMP and CEMP would be prepared prior to construction of the proposal and must be reviewed and certified by environment staff, southern region, prior to the commencement of any on-site works. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The PEMP and CEMP would be developed in accordance with the specifications set out in the [adjust as necessary: QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan), QA Specification G40 – Clearing and Grubbing and QA Specification G10 - Traffic Management].

3.2 Summary of safeguards and management measures

The review of environmental factors for the M1 Princes Motorway Improvements, Picton Road to Bulli Tops (Stage 1 – Picton Road to Bellambi Creek) identified a range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts.

After consideration of the issues raised in the public submissions, the environmental management measures for the project (refer to Chapter 7 of the REF) have been revised. Should the project proceed, the environmental management measures in Table 3.1 would guide the subsequent phases of the M1 Princes Motorway Improvements, Picton Road to Bulli Tops (Stage 1 – Picton Road to Bellambi Creek) development. Additional and/or modified environmental safeguards and management measures to those presented in the REF have been underlined and deleted measures, or parts of measures, have been struck out.

Table 3.1: Summary of environmental safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following: • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. The endorsed CEMP will be	Contractor / Roads and Maritime project manager	Pre-construction / detailed design	Core standard safeguard GEN1

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		implemented during the undertaking of the activity.			
GEN2	General - notification	All businesses, residential properties and other key stakeholders (eg schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor / Roads and Maritime project manager	Pre-construction	Core standard safeguard GEN2
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include*:* • threatened species habitat (Coastal Upland Swamp areas) • adjoining private properties and accesses (Endeavour Energy, Wollongong Coal Limited)	Contractor / Roads and Maritime project manager	Pre-construction / detailed design	Core standard safeguard GEN3
Soils 1	Erosion and sedimentation	Work areas are to be stabilised progressively during the works.	Contractor	Pre-construction/construction	
Soils 2	Erosion and sedimentation	The maintenance of established stockpile sites during construction is to be in accordance with the *Roads and*	Contractor	Pre-construction/construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		Maritime Services Stockpile Site Management Guideline (EMS-TG-10).			
Soils 3	Erosion and sedimentation	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction. The SWMP will be reviewed by a soil conservationist on the Roads and Maritime list of Registered Contractors for Erosion, Sedimentation and Soil Conservation Consultancy Services. The SWMP should contain at a minimum the following elements: • Consideration of appropriate erosion and sediment control. • Consideration of appropriate erosion and sediment controls at ancillary sites with particular consideration of sediment basins at sites where material processing or stockpiling would occur. • Procedure to be developed for early warnings of imminent and severe weather approaching site and	Contractor	Pre-construction/construction	Core standard safeguard SW1 Section 2.1 of QA G38 *Soil and Water Management*

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		response required by site for preparation of the forecasted event • Identification of site conditions or construction activities that could potentially result in erosion and associated sediment runoff. • Methods to minimise potential adverse impacts of construction activities on the water quality within surrounding waterways. • Details of specific measures to protect sensitive areas including drinking water catchments and sensitive vegetation such as (EECs). • Details of measures to minimise any adverse impacts of sedimentation on the surrounding environment. • Details of measures to minimise soil erosion caused by all construction works including clearing, grubbing and earthworks. • Details of measures to provide spill management and basin discharge procedures • Details of measures to make site personnel aware of the requirements of the SWMP by providing information within induction, toolbox and training sessions. • Details of the roles and responsibilities of personnel			

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		responsible for implementing the SWMP. • Details of measures for the inspection and maintenance of construction phase water treatment devices and structures.			
Soils 4	Erosion and sedimentation	A site specific Erosion and Sediment Control Plan/s (ESCP) will be prepared and implemented as part of the SWMP The plan will include site specific erosion and sediment controls, size and locations of sedimentation basins (as well as detailed erosion and sedimentation control design), arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.	Contractor	Pre-construction/construction	Core standard safeguard SW2 Section 2.2 of QA G38 *Soil and Water Management*
Soils 5	Erosion and sedimentation	Roads and Maritime will develop an ESCP in parallel during the concept/detailed design phase in consultation with WaterNSW.	Roads and Maritime/Design contractor	Detailed design	
Surface water 1	Operational water quality	Detailed design will seek to minimise water quality impacts by incorporating the following design principles:	Roads and Maritime	**Detailed design**/Pre-construction	**Safeguard reworded in Submissions**

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		• Vegetated drainage lines should be used in preference to engineered structures wherever practicable • Operational water quality control measures will be developed **during detailed design** to ensure that a neutral or beneficial effect **(NorBE)** on water quality is achieved. Water treatment structures should be designed to be accessible for structural and vegetation maintenance and for removal of sediment. **A risk assessment will be carried out during detailed design to assess the likelihood and consequence of a major spill and determine practical control measures to be implemented as necessary.** • Appropriate energy dissipation and scour prevention measures will be incorporated downstream of culverts and other drainage structures to minimise soil erosion.			**Report**
Surface water 2	Construction water quality impacts	A Surface Water Quality Monitoring Program will be designed and implemented to detect and respond to any changes in water quality in Bellambi Creek and Cataract Creek waterways downstream of the proposal during	Contractor	Pre-construction/ construction	-

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		construction. The Program will include monthly and post rainfall visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) to identify any potential spills or deficient erosion and sediment controls.			
Surface water 3	Local water quality impacts	If an incident (eg spill) occurs, the Roads and Maritime Services *Environmental Incident Classification and Reporting Procedure* is to be followed and the Roads and Maritime Services Contract Manager notified as soon as practicable. Roads and Maritime would immediately advise WaterNSW on the WaterNSW incident number 1800 061 069.	Contractor	Construction	
Surface water 4	Local water quality impacts	Spill kits, including hydrocarbon absorbent booms would be kept at the ancillary site compounds in clearly marked and accessible locations	Contractor	Construction	
Surface water 5	Local water quality impacts	The refuelling of plant and equipment would occur in designated impervious bunded areas. Bunded areas will be located as far as possible from drainage lines or waterways.	Contractor	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Surface water 6	**Local water quality impacts**	**Tannins from mulch stockpiles would be managed in accordance with *RTA Environmental Direction - Management of Tannins from Vegetation Mulch* (Jan 2012).**	**Contractor**	**Pre-construction/construction**	**Additional safeguard identified in Submissions Report**
Ground water 1	Pollution or reduction in stream base flows	Drainage systems and water management measures will be designed to reduce sediment-related pollution of stream/aquifers and any reduction in base flows.	Roads and Maritime/Contractor	Detailed design	Additional safeguard
Biodiversity 1	General biodiversity impacts	A Flora and Fauna Management Plan (FFMP) will be prepared in accordance with Roads and Maritime's *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to: • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas (a map showing the Coastal Upland Swamp EEC and other native vegetation to be retained) • management strategies for pre-construction, construction activities including control measures for the pre-clearing process	Contractor	Pre-construction	Core standard safeguard B1 Section 4.8 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		• requirements set out in the *Landscape Guideline* (RTA, 2008) • pre-clearing survey requirements including specific requirements for protected fauna (Ecological pre-clearing surveys to be undertaken prior to the commencement of the clearing, comprising searches for nest sites, maternal roosting sites for microchiropteran bats, and breeding sites for large forest birds such as Owls and the Glossy Black-Cockatoo) by a suitably qualified ecologist in accordance with the *Roads and Maritime Biodiversity Guidelines* (Pre-clearing process) (RTA, 2011) • procedures for unexpected threatened species finds and fauna handling • protocols to manage weeds and pathogens • proposed strategies for re-use of coarse woody debris and bushrock • fauna rescue and release procedure.			
Biodiversity 2	General biodiversity impacts	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and	Roads and Maritime Maritime/Contractor	Detailed design/pre-construction	Core standard safeguard B2

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		feasible.			
Biodiversity 3	Native vegetation	Detailed design will seek to minimise the construction footprint to the extent possible. A Clearing Limits Report (or similar) will be prepared which identifies reduced clearing limits achieved by detailed design, compared to the original planned clearing limits. The report will clearly explain / justify the proposed clearing limits at any locations that a reduction cannot be achieved, or only minor reductions can be achieved. The report will be approved by the Roads and Maritime Environment Manager.	Roads and Maritime/Contractor	Detailed design/pre-construction	
Biodiversity 4	Native vegetation	Ensure exclusion zones areas are established prior to vegetation clearing through fencing and signage and these Management of exclusion zones should address the following matters: • Ensure that any trees to be felled to establish exclusion zones are felled away from the exclusion zone and not into retained bushland habitats • Signs should be clearly visible from a distance of at least 20 metres and be general in nature, such as 'Exclusion Zone' or 'Environmental	Contractor	Pre-construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		Protection Zone' • No clearing, stockpiling of plant and material shall take place in the established exclusion zones • Regular inspections of exclusion zone boundaries, and repairs to fencing should be undertaken. Additional checks should be undertaken following storms where there is a higher risk of material falling on fencing. Where possible, inspections of exclusion zones should form part of regular site environmental checks • Communication of the locations and purpose of the exclusion zones should be provided to all site staff (eg in toolbox talks and formal inductions).			
Biodiversity 5	ROTAP species - *Darwinia grandiflora*	Investigate options for salvage of the *Darwinia grandiflora* plant. Consultation with the local botanic gardens and council would be undertaken to investigate opportunities to collect seed from the plant or accepting individual plants that can be salvaged.	Roads and Maritime/Contractor	Pre-construction/construction	
Biodiversity 6	Native vegetation	Landscape and Urban Design Plan to be prepared following project approval. This is to include:	Road and Maritime	Detailed design/construction/post-construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		• Areas that are to be revegetated • Areas that are to be stabilised • Topsoil requirements for revegetation Ensure plant species used for revegetation are suitable for the habitat and where practicable indigenous species may be used.			
Biodiversity 7	Native vegetation	Management of access into the project area through gating/fencing of existing tracks to reduce the impacts of human disturbance and dumping on the retained vegetation adjacent to the site.	Contractor	Construction	
Biodiversity 8	Invasive species and pathogens	The Site Erosion and Sediment Control Plan will be implemented in accordance with the Blue Book (Landcom 2004) during construction to minimise the movement of the soil borne organism, *Phytophthora cinnamomi* and weed seeds.	Contractor	Construction	
Biodiversity 9	Invasive species and pathogens	A Weed Management Plan (WMP) will be developed for the site as part of the CEMP and in accordance with the *Biodiversity Guidelines - Guide 6* (RTA 2001). It will include, but not be limited to: • A procedure for stockpile management	Contractor	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		• Requirements for the use of pesticides • Wash down procedure for vehicles to prevent the spread of weeds Undertake weed management and control in accordance with the *Roads and Maritime Biodiversity Guidelines* (RTA, 2011) during and post-construction. Stockpiling of topsoil from cleared areas for re-use in site revegetation is only to be sourced from areas classified as 'weed free' by a site ecologist.			
Biodiversity 10	Invasive species and pathogens	Establish a protocol to prevent introduction or spread of *Phytophthora cinnamomi* and Myrtle Rust consistent with *Roads and Maritime Biodiversity Guidelines - Guide 7 (Pathogen Management)* (RTA, 2011) during construction. The protocols used should be either the *Sydney Region Pest Management Strategy* or Best Practice Guidelines for Phytophthora cinnamomi (DECC 2008) and the DPI handout prepared for Myrtle rust response 2010–11: *Preventing spread of Myrtle Rust in bushland* or the OEH Interim management plan for Myrtle rust in	Contractor	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		bushland (2011).			
Biodiversity 11	Habitat corridor and wildlife connectivity fragmentation	Produce a fauna connectivity strategy in consultation with Roads and Maritime environmental staff and an experienced fauna consultant to investigate and determine what types of wildlife connectivity structures will be included in the detailed design and facilitate the movement of threatened species. Target species include forest owls, Glossy Black Cockatoo, Little Lorikeet, Gang-gang Cockatoo, microchiropteran bats, Greater Glider, Yellow-bellied Glider and Eastern Pygmy-possum. The fauna connectivity strategy will consider: • Enhancing the likelihood of culvert use with fauna exclusion fencing to funnel wildlife towards culvert openings and promote tree growth near entrances to encourage use of culverts as wildlife underpasses and reduce barrier effect of the motorway. • Retention of large glide trees adjacent to the road to facilitate Glider movement. • The location of the fauna exclusion	Roads and Maritime/Contractor	Detailed design	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		fencing to be determined and shown on the detailed design.			
Biodiversity 12	Habitat corridor and wildlife connectivity fragmentation	A monitoring program will be designed and implemented to assess the effectiveness of fauna connectivity measures installed (once determined).	Roads and Maritime	Detailed design/post-construction	
Biodiversity 13	Loss of fauna habitat areas	Undertake staged habitat removal of hollow-bearing trees in accordance with the *Roads and Maritime Biodiversity Guidelines* (RTA, 2011). All habitat trees proposed for removal shall be tagged in the field with surveyors flagging tape and spray paint and clearly mapped for clearing Contractors. Felled habitat trees should be relocated into suitable retained habitats, where practicable, under the supervision of the project ecologist. Lost hollows shall be replaced by the installation of nest boxes in suitable habitats at a 1:1 ratio prior to their felling in accordance with the Nest Box Management Plan.	Contractor	Pre-construction/construction	
Biodiversity 14	Loss of fauna habitat areas	A Nest Box Management Plan would be prepared in accordance with the *Roads and Maritime Biodiversity Guidelines- Guide 8 (Nestboxes)* (RTA 2011) and in consultation with a suitably experienced	Contractor	Pre-construction/during construction/post construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		Fauna ecologist, to ameliorate the reduction in habitat features and loss of tree hollows. Target species for nest boxes would include forest owls, Glossy Black Cockatoo, The Little Lorikeet and the Gang-gang Cockatoo, microchiropteran bats and Greater Glider, Yellow Bellied Glider and Eastern Pygmy-possum. The Nest Box Management Plan is to ensure no net loss of suitable Eastern Pygmy-possum habitat occurs as a result of hollow-bearing tree removal. Eastern Pygmy-possum nest boxes would be installed in suitable habitats at a frequency of one every 30-50 metres. Undertake post-construction nest box installation maintenance and monitoring checks in accordance with the prepared Nest Box Management Plan and Roads and Maritime Biodiversity Guidelines (RTA, 2011).			
Biodiversity 15	Protected fauna	In the unlikely event any nest sites of the larger sized birds such as the Square-tailed Kite and other raptors, Powerful Owl, and Masked Owl are located within the clearing area, the clearing contractor will move the nest from the construction site to the nearest	Contractor	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		suitable area outside of the construction site under direction of an ecologist.			
Biodiversity 16	Coastal Upland Swamps	An Upland Swamp Management Plan will be developed that will incorporate measures to minimise the impacts on Upland Swamps. This will include: • Identification of impacts to upland swamps • Methods to minimise impacts on upland swamps • Undertake a monitoring program at upland swamp locations prior to, during and for 12 months following, construction.	Contractor/Roads and Maritime	Pre-construction/construction/post construction	**Safeguard reworded in Submissions Report**
Biodiversity 17	Coastal Upland Swamps	As part of an Upland Swamp Management Plan, post construction checks in line with the *Roads and Maritime Biodiversity Guidelines* (RTA 2011), will be implemented as part of the plan and will consider but not be limited to: • Assessing the effectiveness of **damming (**bunding**) the swamp edge and the reincorporation of appropriate material to** ~~revegetation and~~ ensure no indirect impacts on surrounding Upland Swamps have occurred as a result	Contractor/Roads and Maritime	Pre-construction/construction/post construction	**Safeguard reworded in Submissions Report**

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		of the works. • Should indirect impacts be encountered, remedial actions will be investigated and if practicable implemented.			
Biodiversity 18	Coastal Upland Swamps	Spill management policy / guidelines to be followed to protect the retained Coastal Upland Swamp vegetation from any spills during construction of batters.	Contractor/Roads and Maritime	Construction	
Biodiversity 19	Coastal Upland Swamps	~~Batters between the new road cuttings and remaining swamps will be established to minimise impacts to the remaining Coastal Upland Swamps by preventing draining of the dissected Coastal Upland Swamps~~ **Revegetating the batters with species associated with the particular swamp habitat and/or tubestock planting will be used where appropriate.**	Contractor/Roads and Maritime	Construction	**Safeguard reworded in Submissions Report**
Biodiversity 20	Coastal Upland Swamps	The Landscape and Urban Design Plan is to incorporate progressive construction revegetation and restoration of cleared areas of Coastal Upland Swamp EEC in accordance with *Roads and Maritime Biodiversity Guidelines* (RTA, 2011). In particular, revegetating the batters installed with species associated with	Roads and Maritime	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		that particular swamp to prevent drainage of the Coastal Upland Swamps Stockpiled topsoil and/or tubestock planting will be used where appropriate.			
Biodiversity 21	Eastern Pygmy-possum	The Fauna Connectivity Strategy plan within the Construction FFMP will incorporate all of the mitigation measures, monitoring and control measures specific to Eastern Pygmy-possum in line with the *Roads and Maritime Biodiversity Guidelines* (RTA, 2011). These are to include: • Measures to mitigate habitat fragmentation: including removal of concrete barriers on the old road alignment at the southern end of the project to provide additional connectivity for the existing Eastern Pygmy-possum population to the wider locality. • Enhance likelihood of culvert use with fauna fencing to funnel wildlife towards culvert openings and promote tree growth near entrances to encourage use of culverts as wildlife underpasses and reduce barrier effect of the motorway. The Nest Box Strategy will incorporate specific measures to ensure no net loss	Contractor	Pre-construction/construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		of suitable Eastern Pygmy-possum habitat as a result of hollow-bearing tree removal within their habitat in accordance with the *Roads and Maritime Biodiversity Guidelines - Guide 8* (nestboxes) (RTA, 2011). And in consultation with a suitably experienced Fauna ecologist Twenty five EPP nestboxes are currently installed within the study area within suitable habitat and those not within the construction footprint can be retained. Undertake post-construction nest box installation maintenance and monitoring checks in accordance with the prepared nest box strategy and Roads and Maritime Biodiversity Guidelines (RTA, 2011).			
Biodiversity 22	**Fish passage**	**The maintenance of fish passage will be addressed during detailed design and construction in consultation with DPI Fisheries.**	**Roads and Maritime** **Construction contractor**	**Detailed design** **Construction**	**Additional safeguard identified in Submissions Report**
Air quality 1	General air quality impacts	An Air Quality Management Plan (AQMP) will be prepared for construction of the Proposal and implemented as part of the CEMP. The plan would detail air quality control measures and procedures to be	Contractor	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		undertaken during construction.			
Air quality 2	Impacts on local air quality during construction.	• Areas of exposed surfaces are to be minimised through construction site planning and programming, to reduce the area of potential construction dust emission sources. • Control measures would be implemented in order to minimise dust from stockpile sites. • Dust suppression measures, such as the use of water carts or soil binders, would be used on any unsealed surfaces and other exposed areas. • All trucks would be covered when transporting materials to and from the site. • Construction activities that would generate dust would be avoided or modified during high wind periods. • Work activities would be reviewed if the dust suppression measures are not adequately restricting dust generation. • Rehabilitation of completed sections would be progressively undertaken.	Contractor	Construction	
Traffic 1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and	Contractor	Pre-construction/construction	Core standard safeguard TT1 Section 4.8 of

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		Maritime *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Roads and Maritime, 2008). The TMP will include: • confirmation of haulage routes • measures to maintain access to local roads • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain cyclist access and provision of alternative cyclist routes during construction • requirements and methods to consult and inform Busways and the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • processes to monitor and review the			QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		effectiveness of traffic control measures and to amend the TMP should this be necessary.			
Traffic 2	Property access	An access strategy for construction and operational phases will be developed and agreed with relevant agencies to maintain access to fire trails and other service roads	Design and construction contractors/ Roads and Maritime	Pre-construction, construction and operation	Additional safeguard
Aboriginal 1	Aboriginal heritage	The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Roads and Maritime does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Pre-construction/construction	Core standard safeguard AH2 Section 4.9 of QA *G36 Environment Protection*
Landscape and visual 1	Landscape character and visual impact	A Landscape and Urban Design Plan (LUDP) will be prepared during the detailed design phase of the project and implemented as part of the CEMP. The LUDP will present an integrated	Roads and Maritime/ Design contractor	Detailed design	Landscape character and visual impact

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		landscape and urban design for the project, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for: • location and identification of existing vegetation and proposed landscaped areas, including species to be used, density and size • Areas of the redundant road pavement that will be removed and revegetated • Hydromulch seed mix designs and locations • built elements including any retaining walls and bridge walls • pedestrian and cyclist elements if necessary • fixtures such as lighting, fencing and signs • details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage • procedures for monitoring and maintaining landscaped or rehabilitated areas. The Landscape and Urban Design Plan			

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		will be prepared in accordance with relevant guidelines, including: • *Beyond the Pavement urban design policy, process and principles* (Roads and Maritime, 2014) • *Landscape Guideline* (RTA, 2008) • *Bridge Aesthetics* (Roads and Maritime 2012) • *Shotcrete Design Guideline (RTA, 2005).*			
Landscape and visual 2	Visual impacts of construction activities	To reduce the potential visual impact of construction activities: • Work sites will be left tidy at the end of each work day • Where appropriate, fencing with material attached (eg shade cloth) will be provided around the construction compound to screen views from adjoining properties Lighting for night-time work will comply with relevant Australian Standards, including *AS4282-1997 (Control of the obtrusive effects of outdoor lighting).*	Construction contractor	Construction	Visual impacts of construction activities
Access 1	Property acquisition	All property acquisition will be carried out in accordance with the *Land Acquisition Information Guide* (Roads and Maritime, 2012) and the *Land Acquisition (Just Terms Compensation) Act 1991*.	Roads and Maritime project manager	Pre-construction/construction	Core standard safeguard PL1

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Access 2	Wollongong Coal Limited overhead power line	Roads and Maritime will work with Wollongong Coal to minimise impacts during potential power line relocation. Undergrounding the cable in this area or an amended overhead power supply would be further investigated in detailed design	Roads and Maritime	Detailed design/pre-construction,	Additional standard safeguard
Waste 1	Construction waste impacts to the local environment as a result of the proposal	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to: • measures to avoid and minimise waste associated with the project • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • monitoring, record keeping and reporting. • The WMP will be prepared taking into account the Environmental Procedure - Management of Wastes on Roads and Maritime Services Land (Roads and Maritime, 2014) and relevant Roads and Maritime	Contractor	Pre-construction/construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		Waste Fact Sheets.			
Hazards and risks 1	Bushfire	A Bushfire Management Plan would be prepared and include provisions to minimise the potential for ignition or spread of fire. Consultation with the local Rural Fire Service would be undertaken during the preparation of the Bushfire Management Plan.	Contractor	Pre-construction/construction	
Hazards and risks 2	Traffic access	The TMP, would include measures to facilitate emergency vehicle access through the site (including appropriately spaced divides in the central median), as well as access into or from adjacent lands in the event of an incident (eg. vehicle crash).	Contractor	Pre-construction/construction	
Climate 1	Impacts to the proposal as a result of climate change	Opportunities to increase the resilience of the road to the impacts of climate change would be investigated during detailed design where possible, as new information about the impact of climate change on performance of materials (for road foundation, fill, asphalt, bitumen etc.) and drainage structures becomes available. The review would aim to identify materials that are less susceptible to degradation impacts of climate change.	Roads and Maritime Services	Detailed design	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Climate 2	Impacts of the proposal on climate change	Detailed design is to include consideration of the following as a minimum to minimise the potential for GHG emissions: • Preferential use of local materials (where feasible and practicable) to reduce quantities of fuel consumption associated with material transportation. • Delivery of materials with full loads where feasible. • Ensure that all plant and vehicles are maintained regularly to maintain fuel efficiency. • Seek opportunities to reduce the quantity of construction materials used through innovative design and construction methodologies. • Where reasonable and feasible, procure recycled content road construction and maintenance materials such as recycled aggregates in road pavement and surfacing (including crushed concrete, granulated blast furnace slag, glass, slate waste and fly ash). This measure forms part of ROADS AND MARITIME' implementation of the NSW	Contractor	Pre-construction/construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		Government's 'Waste Reduction and Purchasing Policy' (WRAPP).			
Cumulative 1	Traffic	If any other road works projects in the regional network have overlapping construction periods with the proposal, consultation between the construction contractors would be undertaken to identify any measures to minimise traffic impacts on road users	Roads and Maritime/ Construction contractor	Pre-construction/construction	Additional safeguard

3.3 Licensing and approvals

In addition to project approval under Part 5 of the EP&A Act, the separate licenses, permits, notifications and/or approvals listed in Table 5-2 may be required to construct/operate the proposal.

Table 3.2: Summary of licensing and approval required

Instrument	Requirement	Timing
Water NSW Act 2014 Water NSW Regulation 2013	The proposed work would be undertaken within a WaterNSW 'special area', as identified in Schedule 1 of the Water NSW Regulation 2013. Roads and Maritime would continue to liaise with WaterNSW in regard to access and work for the proposal within the 'special area'.	Prior to start of the activity.
Protection of the Environment Operations Act 1997 (Schedule 1, Parts 1(35)(2a) and 1(19)(1)	The proposal is classified as a scheduled activity on two accounts; i) extraction of more than 30,000 tonnes of material and ii) a road greater than four lanes in width and for a distance of more than one kilometre in the metropolitan area. An EPL would be required for the proposal and would be applied for through EPA.	Prior to start of the activity.
Threatened Species Conservation Act 1995 (s91)	Licence to harm or pick threatened species, populations or ecological communities or damage habitat from the Chief Executive of OEH.	Prior to start of the activity
Water Act 1912 (s10 / s18F)	Licence and/or permit for construction or use of a 'work' (eg water conservation, irrigation, water supply, drainage or changing the course of a river) for certain purposes from the DPI (Water).	Prior to start of the activity

4 References

SMEC (2016). M1 Princes Motorway Improvements, Picton Road to Bulli Tops (Stage 1 – Picton Road to Bellambi Creek). December 2016.

Appendix A

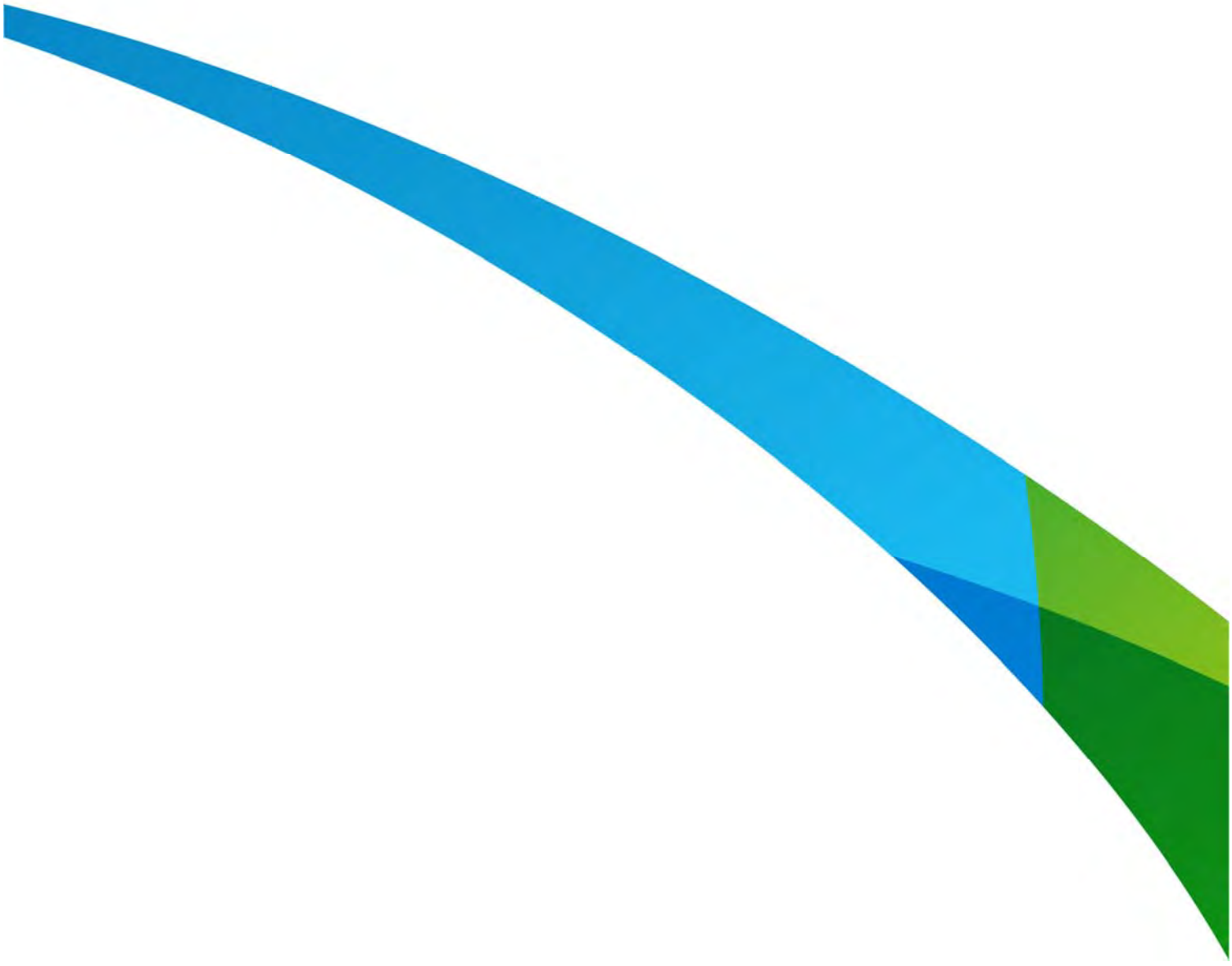
Options Analysis Report

Roads & Maritime

Options development report

M1 improvements, Picton Road to Bulli Tops

June 2017



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Contents

1. Introduction

The M1 Princes Motorway between Picton Road and Bulli tops is a four lane road separated by a central median with a speed limit of 100km/h.

The M1 in this location has challenging topography with sections of the road having steep hills that range between grades of seven to 10 per cent. There are also a number of tight curves along the road that combined with the steep grades make it difficult for heavy vehicles to maintain a constant speed.

In addition to its role as a commuter route between the Illawarra and Sydney, the M1 has an important access and transport function for freight between Port Kembla and Sydney (including South West Sydney). The M1 provides the only A-double and B-double access route into the Illawarra from the north.

In 2014 the M1 between Picton Road and Bulli tops recorded traffic volumes of around 37,000 vehicles per day. These traffic volumes include a large proportion of heavy vehicles, which make up around 13 per cent of the daily traffic volume or around 4800 heavy vehicles per day. The increase in heavy vehicles on the M1 due to the expansion of Port Kembla and increased colliery operations places additional pressure on the route.

Figure 1. Location of the proposal

1.1 Background

In 2009 Roads and Maritime Services (then RTA) began investigating the performance of the M1 between Picton Road and Bulli Tops. The purpose of the investigations were to gain an understanding of the issues along this route and how these may be contributing to road safety and traffic efficiency concerns reported in this location.

The *Mt Ousley Road/Southern Freeway Traffic Modelling – Final Report* identified a number of concerns with the performance of the M1. It provided guidance on the potential traffic benefits of providing additional lanes and recommended up to six climbing lanes (three in each direction) to be provided through this section. The recommended lanes were proposed on the steeper sections as this would provide the greatest overall network benefits.

In 2009 Roads and Maritime completed one of the northbound climbing lanes as an 1800m on-load to the M1 at Bulli Tops.

In 2013 Roads and Maritime received funding for another northbound climbing lane / acceleration lane located from the intersection of the M1 and Picton Road. This lane was finalised and open to traffic in 2014.

In 2015 Roads and Maritime received additional funding to investigate the remainder of the climbing lanes. This was linked to an $84 million joint New South Wales Government and Australian government funding commitment for improvements on the M1.

1.2 Purpose of the report

The purpose of the report is to outline the steps taken to arrive at a preferred option for the M1 improvements project. Specifically this report:

- identifies the project objectives;
- summaries the project issues and constraints;
- summarises the options assessment criteria;
- discusses the preferred option development.

1.3 Project objectives

Before starting any design work, Roads and Maritime identified a number of project objectives. These objectives, ensure projects are developed to address site specific challenges.

The purpose of this project project is to improve travel efficiency and road safety on the M1 Princes Motorway between Picton Road and Bulli Tops. The project objectives developed for the project are to:

- improve travel time and efficiency through additional lane capacity;
- improve road safety through enabling enhanced separation of slower moving and faster moving vehicles;
- provide for safe road and utility maintenance and access;
- increase reliability of access into and out of the Illawarra region and Port Kembla including for general freight, larger restricted access vehicles and high performance freight vehicles.

Roads and Maritime also places a high priority on achieving quality project outcomes from a customer, time, budget, environmental and work health and safety perspective. These factors are fundamental to design development, options evaluation and selection.

2. Preliminary option selection

As part of the early investigation into the proposed improvements, Roads and Maritime considered a number of alternative treatments that might help meet the project objectives. Roads and Maritime also revisited the base or 'do minimum' option to better understand the issues associated with this section of the M1.

2.1 Do minimum

The existing route includes a range of steep hills, including sections that range between grades of 7.5 per cent and 10.2 per cent. A number of the existing curves, particularly toward the south of the project do not meet the design goals for the posted travel speed. This creates travel efficiency and road safety concerns particularly given the combination of grades and crests. Tight curves ranging from a 300 metre radius to 399 metre radius are present on sections of the route, which is well below the goal of a 460 metre radius curve.

Other issues experienced on this section of the M1 include the lack of drainage across the median which can result in aquaplaning risk or the creation of excessive spray, and the lack of appropriate facilities for carrying out maintenance in a high speed, high traffic environment.

Given the road safety and traffic performance of the road is unchanged under a do minimum option Roads and Maritime did not consider this to be a viable alternative as it would not meet the project objectives.

2.2 Technology

'Point-to-point' speed cameras

The road safety and traffic efficiency issues experienced on this section of the M1 are generally associated with the steep and winding topography of the road rather than heavy vehicles exceeding the speed limit. Although point-to-point cameras could be used to help regulate the speed of heavy vehicles, the introduction of this system would not improve the grade or poor alignment of the road. As this system would not help meet the project objectives it was not considered a viable standalone option for further investigation. A point-to-point speed camera system is already on place over the project extent.

Environmental response technology

Fog and rainfall have been identified as factors influencing safety along the M1. Although environmental response technology such as fog detectors may provide some benefit in these conditions they would not address the ongoing road safety and traffic performance issues on the route created by the road's alignment. As this system would not help meet the project objectives it was not considered a viable standalone option for further investigation.

'Smart Motorways', Variable Speed Limiting and Intelligent Transport Systems

Roads and Maritime completed an early review to understand the likely requirements to achieve Smart Motorways technology such as a combination of the systems described above

and variable speed limiting on the M1. These systems require significant infrastructure and management items including:

- vehicle detection systems, which are in-pavement detection 'loops' installed in each lane of the road at (typically) 500 metre intervals;
- Lane Use Management Systems (LUMS) which are overhead gantries, typically spanning the full width of a motorway with lane use signs above each lane. Associated with each gantry is a combined maintenance bay and breakdown bay, emergency telephones, telecommunications and power access points, and space for the gantry footings and supports;
- variable speed limit signs, typically installed on the LUMS gantries;
- Closed Circuit Television (CCTV), ideally installed to provide an 'end-to-end' vision for staff managing the Motorway length. To ensure this, CCTV cameras are placed on LUMS gantries, as well as on additional CCTV pole mounts, to provide full roadway length coverage;
- Variable Message Signs (VMS), ideally these would be installed to supplement any existing VMS. Locations may be stand alone or installed on LUMS gantries;
- communications and power. All of the Intelligent Transport Systems infrastructure requires cabling to provide power and communications. Power and communications are typically required in separated underground conduits, with access pits for service and maintenance located at appropriate and safe locations.

Although incorporating Smart Motorways technology into the M1 improvements is likely to provide road safety and traffic benefits in the longer term, retro fitting the system into the existing route under traffic would come at a significant cost and create substantial delays to traffic during its construction and implementation. The system would also be constructed along the existing route (on-alignment) so would not address the alignment constraints, enhance the separation between light and slower moving heavy vehicles or address the ongoing maintenance concerns with the route. As this system would not help meet the project objectives it was not considered a viable standalone option for further investigation.

2.3 Climbing lanes

In line with the 2015 funding announcement of $84 million for improvements on the M1, Roads and Maritime continued investigations into the four remaining climbing lanes recommended as part of the 2009 study. The lanes, located between Picton Road and Bulli Pass included:

- a northbound lane from Cataract Creek, around 1300m in length;
- a northbound lane from Bellambi Creek, around 2200m in length;
- a southbound lane near Bulli Pass, around 2300m in length;
- a southbound lane from Cataract Creek, around 1500m in length.

As part of these investigations, Roads and Maritime considered lessons learned from the completion of the first two climbing lanes including a range of traffic management, worker safety and constructability issues.

In particular, issues raised during the construction of the Picton Road/M1 acceleration lane led Roads and Maritime to further consider the risks of carrying out similar works over other sections of the M1 Princes Motorway, and potentially on both sides of the road at the same time as may be required by the proposal.

As a result of the lessons learned, Roads and Maritime identified the need to not only ensure the climbing lanes would meet the adopted project objectives, but also to progress the design and environmental investigations considering a number of specific issues including:

- road safety implications of adding additional lanes on the outside of an existing substandard curve;
- road surface drainage issues from additional road pavement (including the need for new drainage in the median);
- environmental issues;
- Aboriginal and non-Aboriginal heritage matters;
- soils and water management issues;
- utility constraints;
- constructability and construction staging;
- traffic management and impact;
- cost;
- safety of workers and motorists during construction.

A review of the proposed climbing lanes against these criteria identified a number of concerns. These included:

- the need for extensive construction activities on the existing road surface from a major overlay across current traffic lanes. The overlay would be required to ensure road safety and drainage performance (particularly related to aquaplaning). Additional width for two additional lanes, a wider median and suitable width for construction staging would also be required;
- issues with relocating traffic, removing and relocating the centre median barrier, and providing a safe working space behind shoulder barriers;
- safety concerns around additional weaving movements for traffic around the worksite. A proposal to join the two northbound climbing lanes across Bellambi Creek bridge was proposed to reduce the amount of weaving in high speed environments improving safety;
- Limited options for the location of the two northern lanes between Bellambi Creek and Bulli Pass - to avoid expensive utility relocations, property acquisition and environmental impact, the climbing lanes would need to fit between power transmission infrastructure and also maintain access to nearby landholdings including; WaterNSW, NSW National Parks and Wildlife estate (Illawarra Escarpment State Conservation Area) and Wollongong Coal, by these land owners and other

emergency services, agencies and utilities, particularly the NSW Rural Fire Service, Endeavour Energy and TransGrid.

In addition to the above, the development of the design demonstrated a difficulty in providing a safe location for transitioning from three lanes back to two. This was worsened by steep grades and substandard curves on the route.

3. Further options development

Roads and Maritime considered that the above issues were likely to affect the ability to meet the safety, maintenance and constructability objectives for the project and as such, the climbing lanes should not be progressed any further. This led to the need to investigate alternative design solutions for this section of the route. These were mostly desktop investigations and were mostly design led with cost and other impacts considered at a broad strategic level.

3.1 Criteria

In determining alternative options for future investigation, Roads and Maritime considered a number of broad criteria. These included:

Traffic

Options that had the greatest potential to reduce the steep grades of the route and improve the alignment (i.e. improve the curves) were identified. These options would likely achieve the broader travel time improvements on the route, reduce the weaving interactions between light and heavy vehicles by reducing the speed differences between vehicle types, and were seen to have the greatest benefit.

Road safety

The difference in the travel speeds between light and heavy vehicles as well as the existing road alignment are factors that influence road safety. Options that improved the alignment and allowed for safe merge locations at the end of overtaking or climbing lanes were considered for further investigation.

Environment

Roads and Maritime considered the information from the environmental investigations for the project to help guide the options selection process. Options that could reduce the potential project footprint, particularly in environmentally sensitive areas while achieving the project objectives were prioritised.

Constructability

Building upgrades on roads with high traffic volumes such as the M1 can lead to safety concerns for both workers and road users. Construction under traffic also requires mitigation such as speed reductions that can impact travel times and create delays for large periods

during construction. Options that had the potential to minimise these interactions and reduce the need for speed reductions were considered in the design development.

Property impacts
Options that had the potential to minimise property impacts including acquisition were considered in the design development.

Cost
Options that would minimise the need for expensive utility relocation and reduce earthworks including limiting spoil etc. were considered for future investigation.

Designs that best addressed the above criteria and were expected to meet the project objectives were prioritised for consideration in the options selection process.

3.2 Design Criteria

In considering alternative options, the following minimum criteria were identified:

- typically 3.5 metre lanes unless otherwise required for heavy vehicle tracking;
- 3.0 metre wide outside shoulders;
- median width of up to 2.5 metres for drainage and gutters;
- median barrier full length (other than emergency crossovers);
- longitudinal drainage (including median drainage) as required;
- providing for future Smart Motorways/Managed Motorways infrastructure;
- typical road furniture such as barriers, fences and maintenance accesses as required;
- Overall design to facilitate a general 100 kilometres per hour posted speed environment.

3.3 Options considered

Roads and Maritime considered a number of potential options. These included:

Tunnel Options
Tunnel options over a length of 400 metres were not considered to be economically feasible for this project. Three potential tunnel options with maximum grades of three per cent, six per cent and eight per cent were considered. No tunnel lengths below 580 metres could be found and a maximum length of 1,252 metres was identified. While likely traffic efficiency benefits would be high, funding would be outside the available scope. These options were not further progressed.

Large scale realignment of the M1
A large scale realignment to provide an 1800 metre radius curve between Picton Road interchange and Bellambi Creek was considered. This option could be built mostly outside the existing route (off-alignment), which would address the majority of the constructability and worker safety issues identified during development. The option would remove the tight curves on the existing section of road improving road safety and traffic efficiency. However, early investigations found that this option would have over 2,000,000m^3 of earthwork and

cuttings over 40 metres deep. The option would also have a larger project area with potentially greater environmental impacts. Given this and the expected high costs associated with the earthworks, this option was not progressed further.

Minor to major realignments on the M1

A number of smaller scale realignments were considered through this section. Although addressing some of the project objectives each of these options included a number of challenges and were therefore not progressed. These included:

- an option realigning the existing road to produce a minimum curve radius of 460 metres and to provide for a 100km/h design speed. While a mostly built beside or on the existing route (on-alignment) this still involved considerable work off-alignment. It also had significantly unbalanced earthworks, requiring major importation of fill, and extensive construction under traffic, leading to high costs and risks;
- an option largely on-alignment with a minimum 600 metre radius curves. This option also involved major earthworks, large areas of construction under traffic and some lengths of grades worse than the current alignment (up to 13.2 per cent versus the existing alignment at 10.2 per cent worst case);
- an option providing for a minimum curve radius of 600 metres with minor realignments. South of Bellambi Creek this required major cuts (34 metres deep) and fills (29 metres), with sections of steep grades up to 12.3 per cent. North of Bellambi Creek cuts of 18 metres and 26 metres and fills of 51 metres deep were required. While minimising works under traffic, the earthwork balances created by this option result in major costs. North of Bellambi Creek major impacts to utilities would also be unavoidable adding to the complexity and cost of construction;
- an option providing for a 600 metre minimum curve radius but allowing for a major realignment. This option required a set of major cuts along the project length (depths of 36 metres, 51 metres, 31 metres) and major fills (20 metres, 33 metres, 34 metres, 37 metres). While the improved alignment would likely result in excellent efficiency and road safety performance, the costs and likely environmental impacts associated with this option were considered prohibitive. It would also be difficult to stage the construction given the location of the realigned areas.

4. Staging options

While the investigations outlined above did not identify a viable option for further development, the improved understanding of the site area, potential alignments and estimated construction costs led to the consideration of a staged approach for the project and its delivery (building the project in two stages).

The staging option considered a mixed ‘on-alignment and off-alignment’ design at the southern end of the project (Stage 1), and a mostly ‘on-alignment’ design at the northern end of the project (Stage 2).

Bellambi Creek formed a natural boundary for the staging due to likely stage lengths, potential construction costs and other known delivery risks (e.g. the likely need for acquisition of section of the Illawarra Escarpment State Conservation Area for the stage north of Bellambi Creek). A range of specialist studies that had previously been considered for the full project scope were used where appropriate to progress the single stage investigations.

4.1 Stage 1

Once a staged approach had been proposed, Roads and Maritime identified the southern stage would be best considered as Stage 1 (i.e. constructed first) as it:

- could be achieved for the available funding of $84 million;
- does not require potential revocation from the NSW National Parks Estate (time delays and other risks and associated with revocation);
- currently has a poorer standard of geometric design than the 'northern stage';
- has a poorer crash performance than the 'northern stage'.

On-alignment / Off-alignment investigations

Investigations into Stage 1 identified an early on-alignment / off-alignment arrangement. This included:

- a new section to the east of the existing route at the top of Picton Hill;
- additional lanes on the existing alignment each side of the Cataract Creek straight (also known as 'the Big Dipper');
- a new alignment between the Big Dipper and Bellambi Creek
- five lanes over the existing Bellambi Creek bridge (three northbound and two southbound).

Based on broad earthwork cut/fill ratios and general strategic cost estimating, an on-alignment / off-alignment option for Stage 1 would be achievable for the funding profile.

A number of designs with minor variations were developed for the above option and included designs where:

- the on-alignment portion was centred over the existing median lane, and included works east and west of the existing route on the Cataract straight or 'Big Dipper';
- the carriageway would be split to separate old and new alignments;
- different curves were examined to achieve safer tie-ins to the existing alignment and where undercutting could be minimised etc.

Roads and Maritime considered the best performing design option, based on the project's objectives, risks, environmental impacts and funding profile was a design that included:

- work to the east of the existing alignment only;
- minimum 460 metre radius curves;
- a northern boundary immediately south of Bellambi Creek.

This is the design that was assessed as the preferred option in the REF (figure 7.1).

Figure 7.1 - Preferred option

5. Next Steps

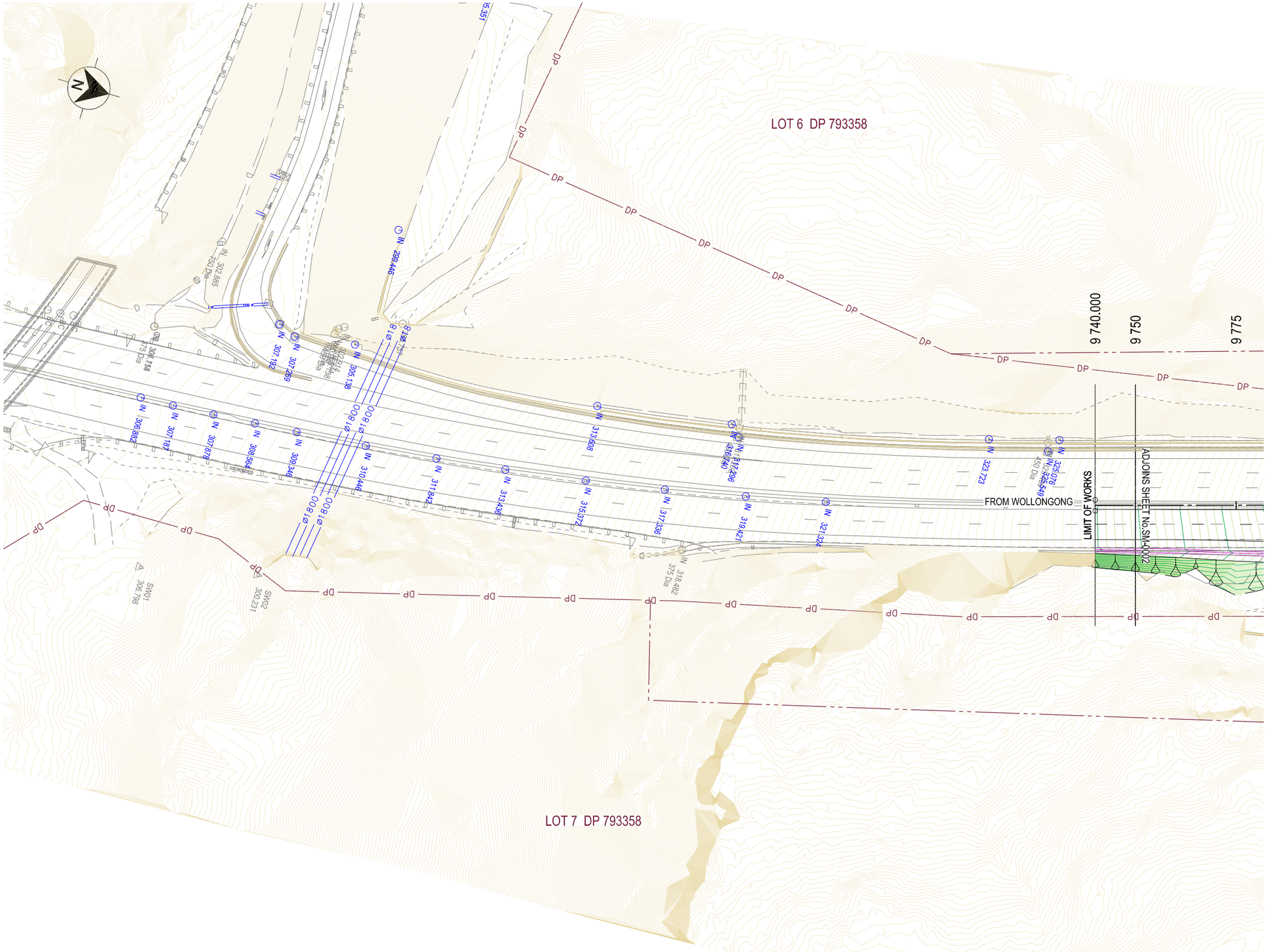
Subject to environmental and planning approvals, Roads and Maritime will finalise the concept design and expects to start detailed design in second half of 2017. Roads and Maritime will continue to consult with relevant stakeholders and agencies throughout the design phase.

Subject to project approval, the construction of Stage 1 would start in 2018 and be delivered over two years.

The design for Stage 2 (Bellambi Creek to Bulli Tops) is continuing. A number of options have been considered for a mostly on-alignment approach. A variety of curve designs are being investigated for the poorest-performing curve at the northern end, as are investigations into the crossing of Bellambi Creek.

Appendix B

Transverse Drainage Concept Design Drawings



LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

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- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- Ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
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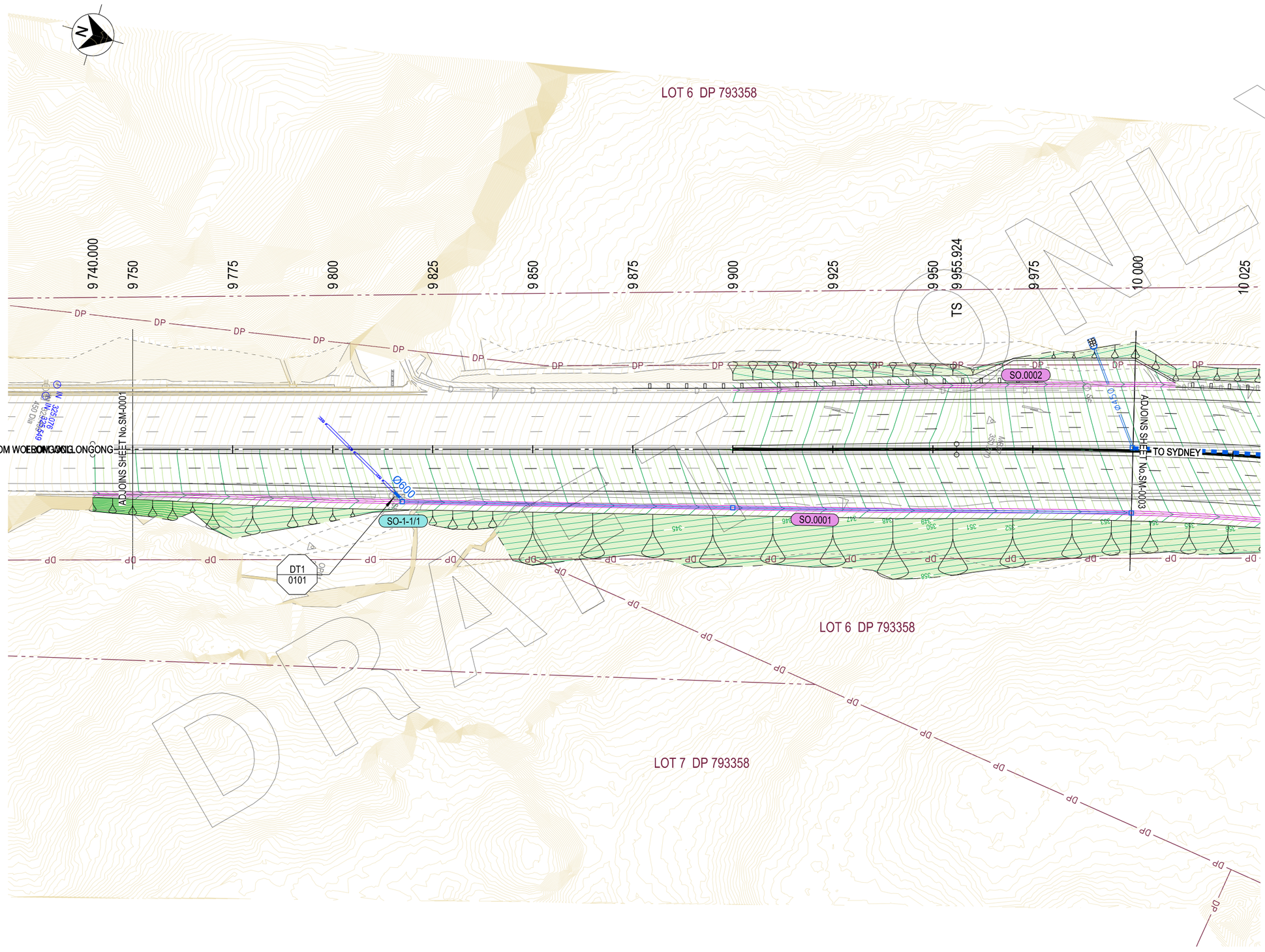

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- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
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DRAINAGE LABELS

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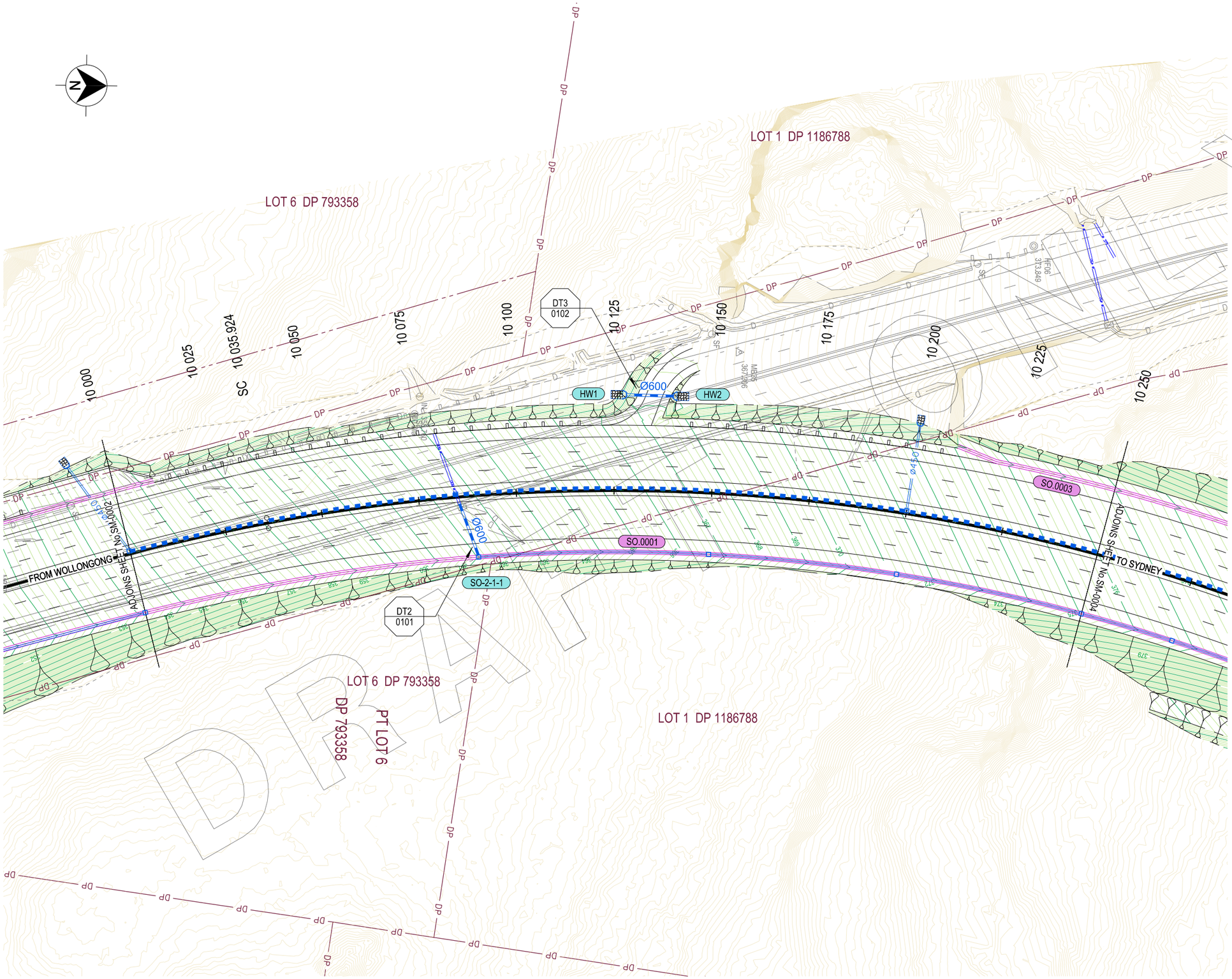

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- LINED CONCRETE CATCH DRAIN
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- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

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PROJECT MNGR	J. WATSON	09.11.15

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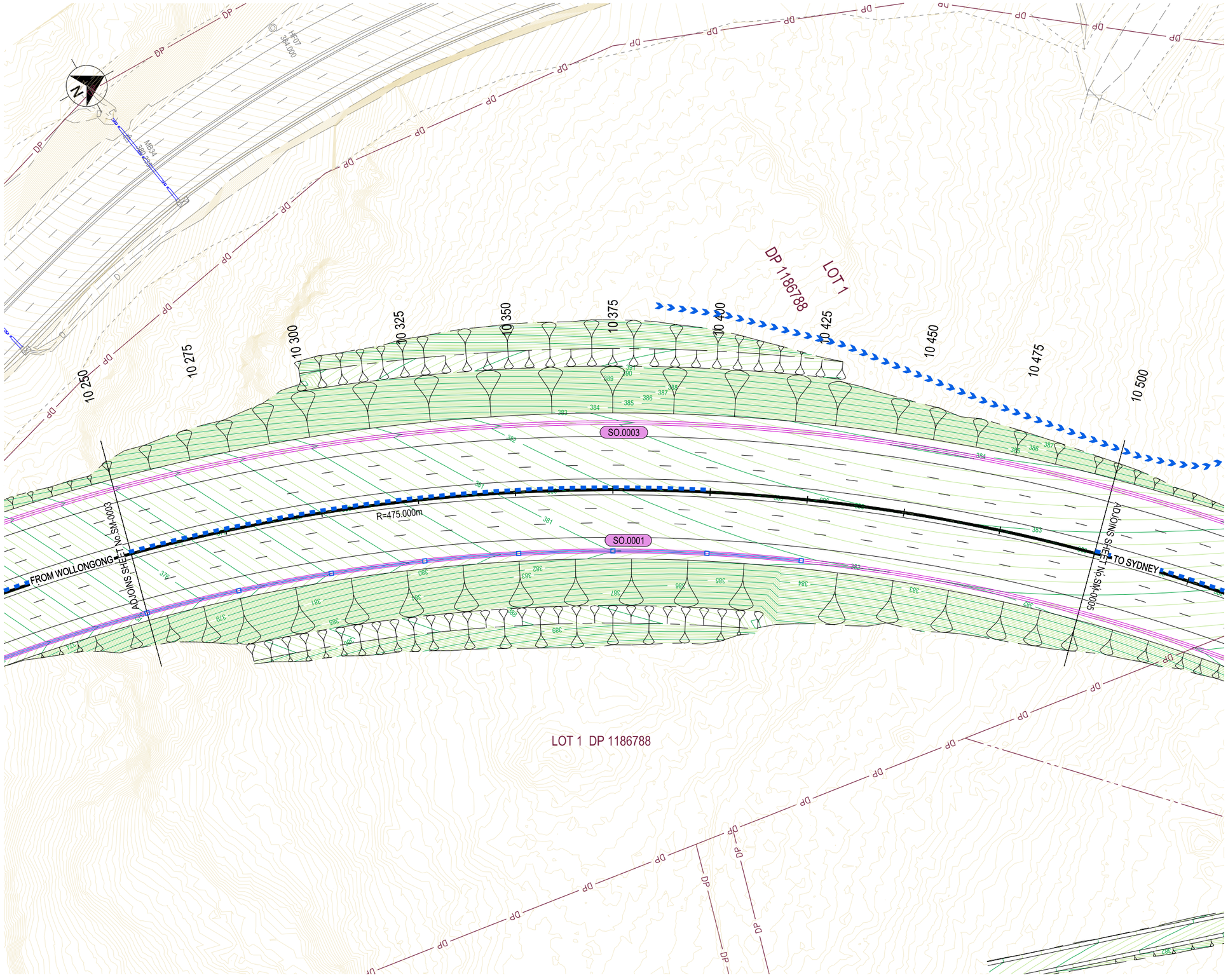

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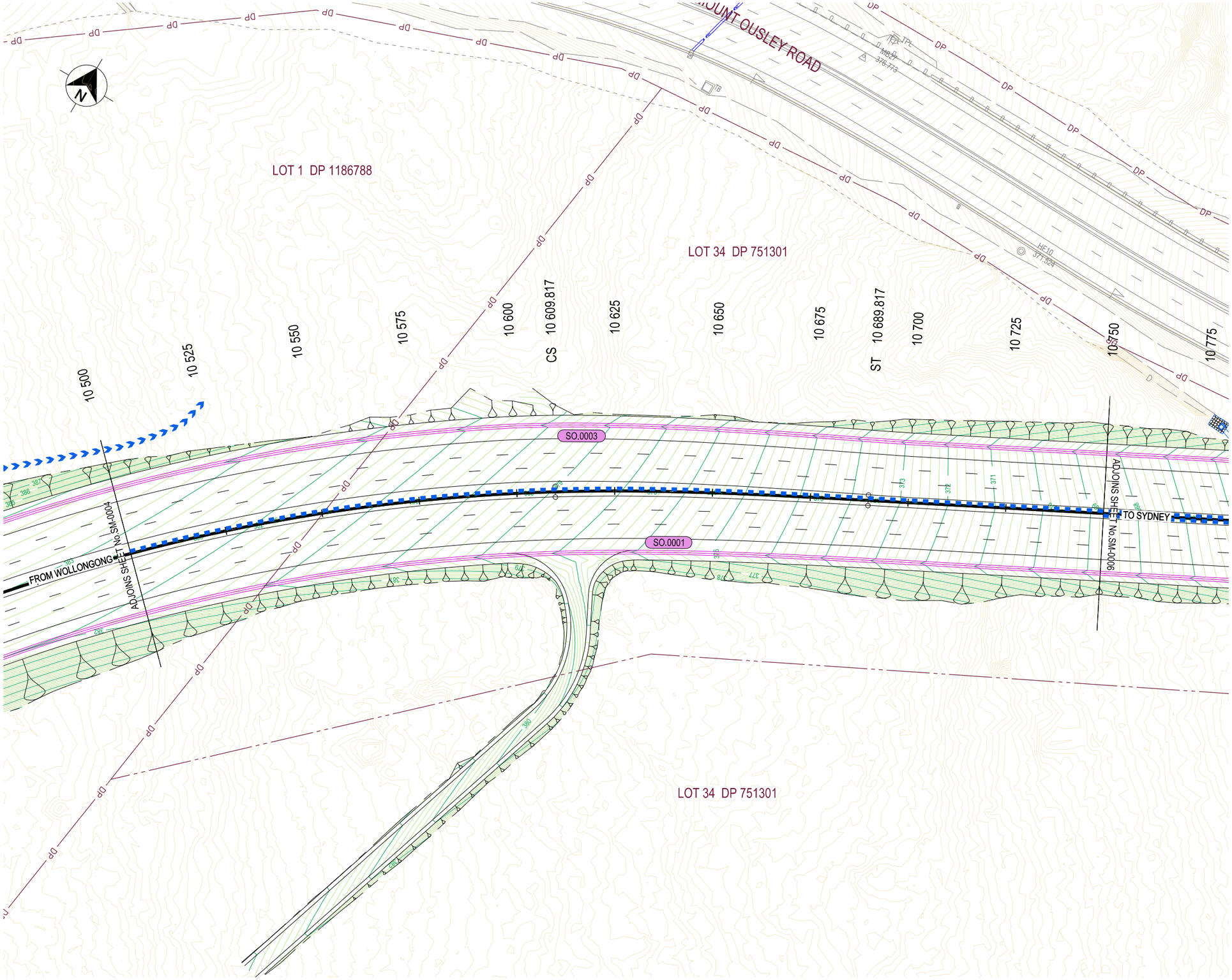

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PLOT DATE / TIME: 27/08/2017 12:02:23 PM
PLOT BY: eganc

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REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

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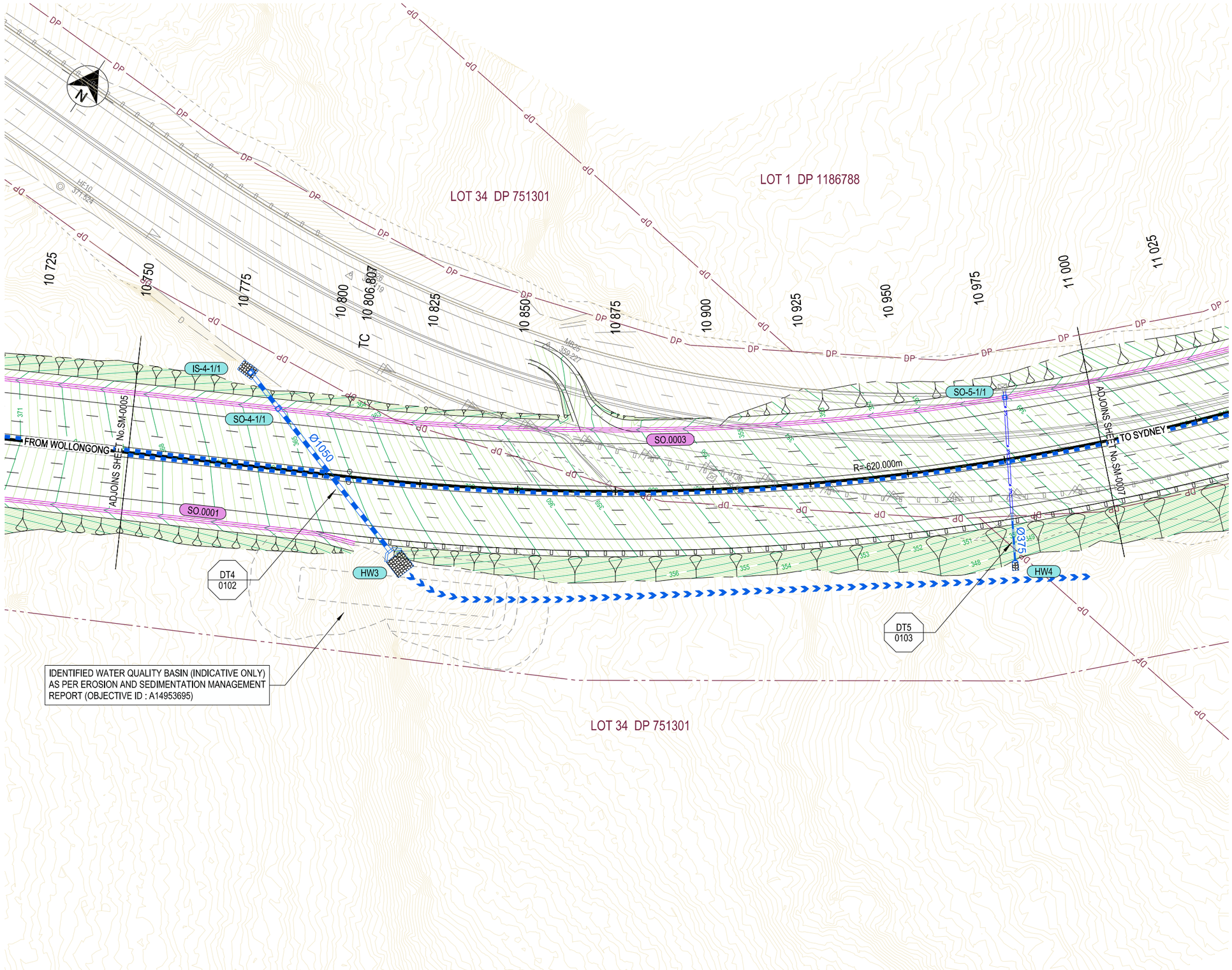

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- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- Ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
- EA — EASEMENT

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
K:\Design\MR513 - Mt Ousley Rd\SF2015_109015 - Stage 1 Realignment Picton Rd to Bellambi Ck Concept\Microstation\DS2015_001395_GD_SM.dgn

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: 27/05/2011 2:02:23 PM — PLOT BY: eganc

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
	01	XX-XX-XX	ISSUED FOR 80% REVIEW	XX

SCALES ON A3 SIZE DRAWING: 0 10 20 30 40 — SCALE 1:1000m

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: Transport NSW GOVERNMENT Roads & Maritime Services

	NAME	DATE
TITLE		
DRAWN	C. EGAN	09.11.15
DRG CHECK	X. XXXXXX	09.11.15
DESIGN	C. EGAN	09.11.15
DESIGN CHECK	X. XXXXXX	09.11.15
DESIGN MNGR	N. COOKE	09.11.15
PROJECT MNGR	J. WATSON	09.11.15

CLIENT: Transport NSW GOVERNMENT Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT, FREIGHT & REGIONAL PROGRAM OFFICE, PROJECT DEVELOPMENT

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD

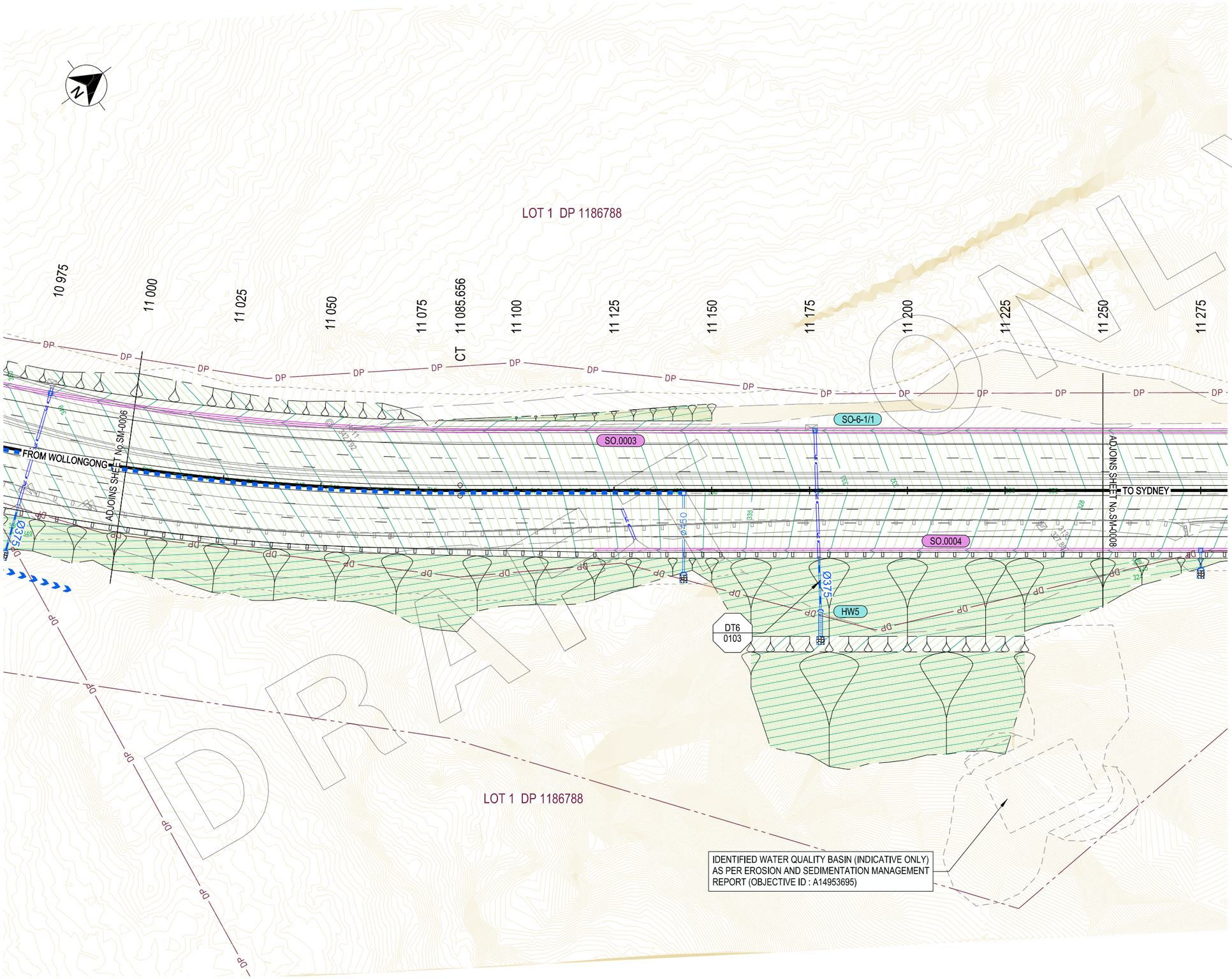
REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

MR513 - MOUNT OUSLEY ROAD - MC00 - 10750 TO 11000

A3

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS: CONCEPT DESIGN - 80% REVIEW — SHEET No. SM-0006 — ISSUE 1



LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

- DT1 / XXXX — TRANSVERSE STRUCTURE LABEL / TRANSVERSE STRUCTURE SHEET NUMBER
- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
- EA — EASEMENT

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
K:\Design\MR513 - Mt Ousley Rd\SF2015_109015 - Stage 1 Realignment Picton Rd to Bellambi Ck Concept\Microstation\DS2015-001395-GD-SM.dgn

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: 27/02/2017 12:02:23 PM
PLOT BY: eganc

CLIENT: Transport NSW GOVERNMENT Roads & Maritime Services

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
	01	XX-XX-XX	ISSUED FOR 80% REVIEW	XX

SCALES ON A3 SIZE DRAWING
0 10 20 30 40
SCALE 1:1000m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: Transport NSW GOVERNMENT Roads & Maritime Services

	NAME	DATE
TITLE		
DRAWN	C. EGAN	09.11.15
DRG CHECK	X. XXXXXX	09.11.15
DESIGN	C. EGAN	09.11.15
DESIGN CHECK	X. XXXXXX	09.11.15
DESIGN MNGR	N. COOKE	09.11.15
PROJECT MNGR	J. WATSON	09.11.15

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
FREIGHT & REGIONAL PROGRAM OFFICE
PROJECT DEVELOPMENT

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD

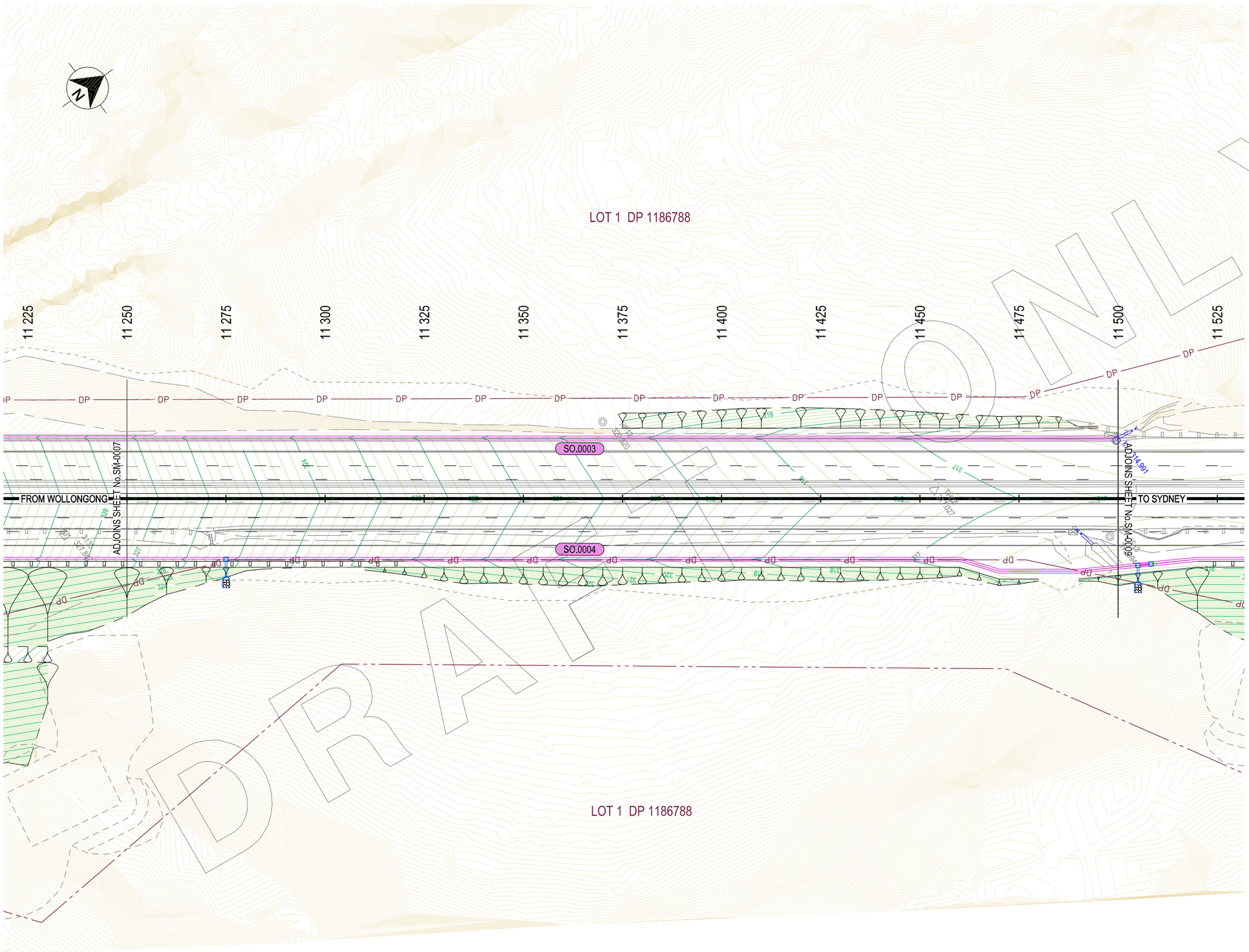
REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

MR513 - MOUNT OUSLEY ROAD - MC00 - 11000 TO 11250

A3

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS: CONCEPT DESIGN - 80% REVIEW
SHEET No.: SM-0007
ISSUE: 1



LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

- DT1 / XXXX — TRANSVERSE STRUCTURE LABEL / TRANSVERSE STRUCTURE SHEET NUMBER
- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
- EA — EASEMENT

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50

DRAWING FILE LOCATION / NAME
K:\Design\MR513 - Mt Ousley Rd\SF2015_109015 - Stage 1 Realignment Picton Rd to Bellambi Ck Concept\Microstation\DS2015_001395_GD_SM_0008.dgn

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: 27/02/2017 12:22:23 PM
PLOT BY: eganc

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
	01	XX-XX-XX	ISSUED FOR 80% REVIEW	XX

SCALES ON A3 SIZE DRAWING: 0 10 20 30 40 — SCALE 1:1000m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: Transport for NSW — Roads & Maritime Services

TITLE	NAME	DATE
DRAWN	C. EGAN	09.11.15
DRG CHECK	X. XXXXXX	09.11.15
DESIGN	C. EGAN	09.11.15
DESIGN CHECK	X. XXXXXX	09.11.15
DESIGN MNGR	N. COOKE	09.11.15
PROJECT MNGR	J. WATSON	09.11.15

CLIENT: NSW GOVERNMENT — Transport Roads & Maritime Services

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
FREIGHT & REGIONAL PROGRAM OFFICE
PROJECT DEVELOPMENT

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD

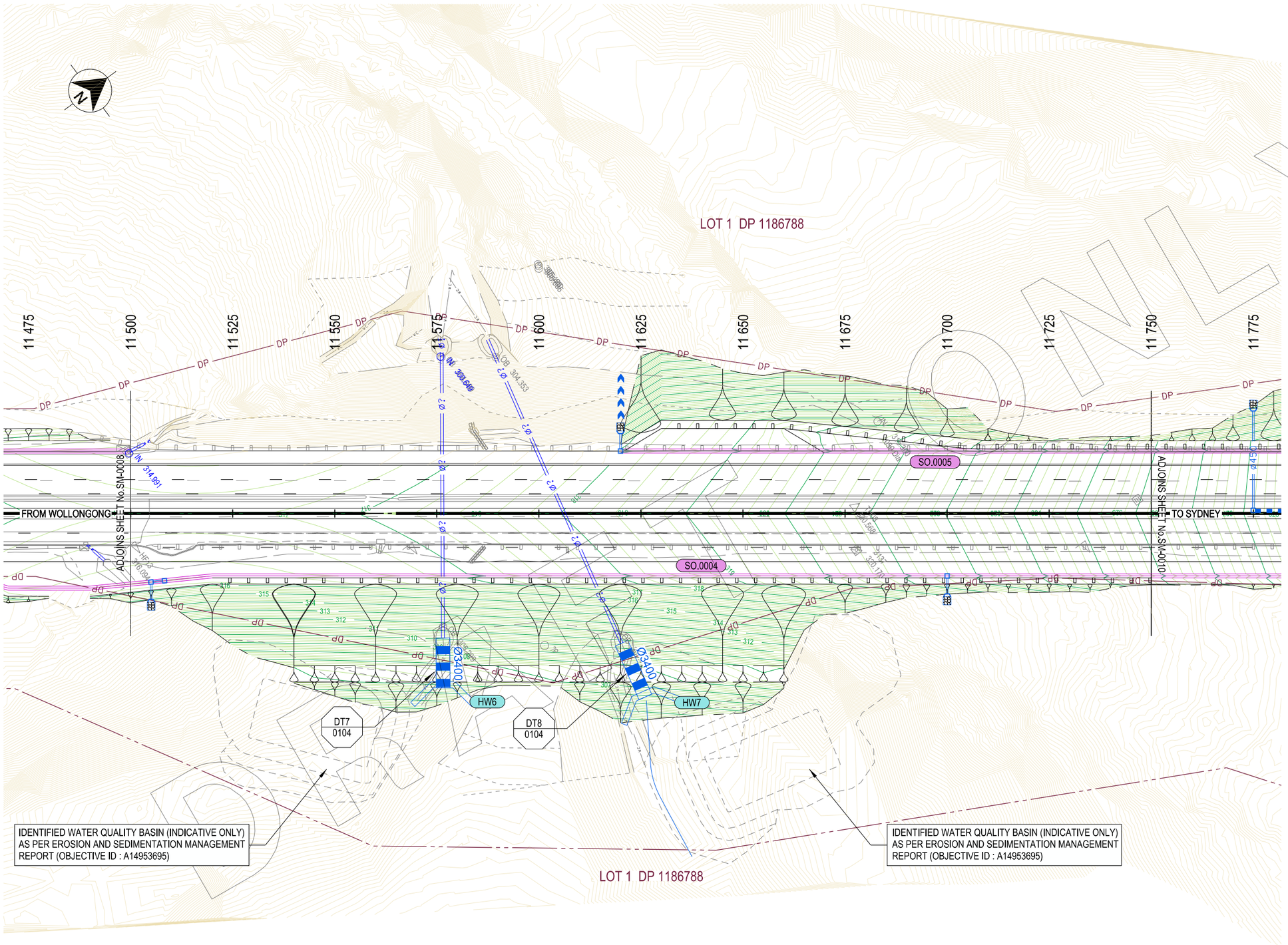
REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

MR513 - MOUNT OUSLEY ROAD - MC00 - 11250 TO 11500

A3

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS: CONCEPT DESIGN - 80% REVIEW
SHEET No.: SM-0008
ISSUE: 1



LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

- DT1 / XXXX — TRANSVERSE STRUCTURE LABEL / TRANSVERSE STRUCTURE SHEET NUMBER
- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- Ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
- EA — EASEMENT

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
K:\Design\MR513 - Mt Ousley Rd\SF2015_109015 - Stage 1 Realignment Picton Rd to Bellambi Ck Concept\Microstation\DS2015-001395-GD-SM.dgn

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
01	XX-XX-XX	ISSUED FOR 80% REVIEW	XX

SCALES ON A3 SIZE DRAWING
0 10 20 30 40
SCALE 1:1000m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
Transport for NSW GOVERNMENT — Roads & Maritime Services

PLOT DATE / TIME: 27/02/2017 12:02:23 PM
PLOT BY: eganc

	TITLE	NAME	DATE
DRAWN		C. EGAN	09.11.15
DRG CHECK		X. XXXXXX	09.11.15
DESIGN		C. EGAN	09.11.15
DESIGN CHECK		X. XXXXXX	09.11.15
DESIGN MNGR		N. COOKE	09.11.15
PROJECT MNGR		J. WATSON	09.11.15

CLIENT
NSW GOVERNMENT — Transport Roads & Maritime Services

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
FREIGHT & REGIONAL PROGRAM OFFICE
PROJECT DEVELOPMENT

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD

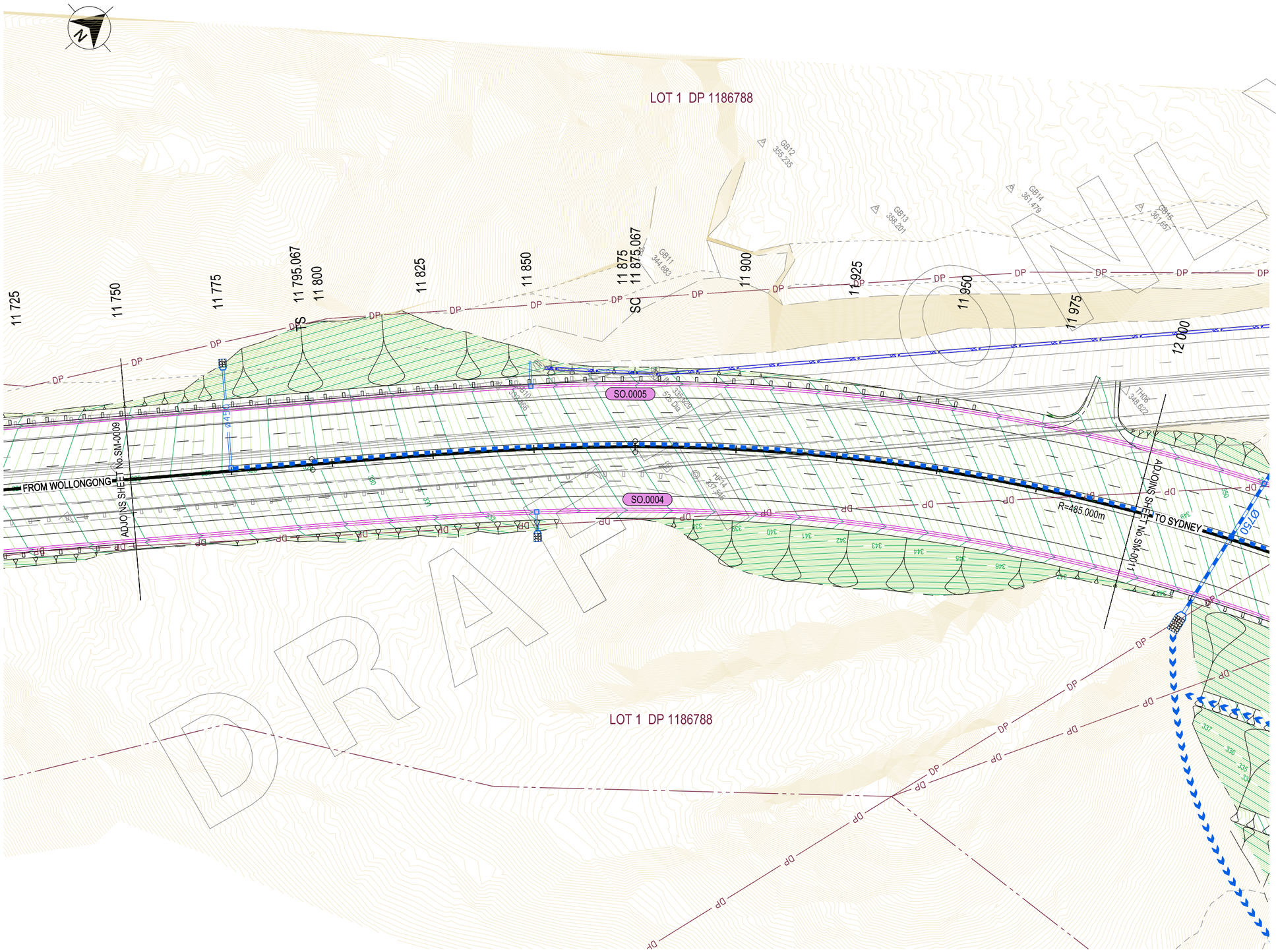
REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

MR513 - MOUNT OUSLEY ROAD - MC00 - 11500 TO 11750

A3

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS: CONCEPT DESIGN - 80% REVIEW
SHEET No.: SM-0009
ISSUE: 1



LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

- DT1 / XXXX — TRANSVERSE STRUCTURE LABEL / TRANSVERSE STRUCTURE SHEET NUMBER
- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- Ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
- EA — EASEMENT

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: 27/02/2017 12:29:23 PM — PLOT BY: eganc

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
	01	XX-XX-XX	ISSUED FOR 80% REVIEW	XX

SCALES ON A3 SIZE DRAWING: 0 10 20 30 40 — SCALE 1:1000m

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: Transport for NSW GOVERNMENT — Roads & Maritime Services

TITLE	NAME	DATE
DRAWN	C. EGAN	09.11.15
DRG CHECK	X. XXXXXX	09.11.15
DESIGN	C. EGAN	09.11.15
DESIGN CHECK	X. XXXXXX	09.11.15
DESIGN MNGR	N. COOKE	09.11.15
PROJECT MNGR	J. WATSON	09.11.15

CLIENT: Transport for NSW GOVERNMENT — Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT, FREIGHT & REGIONAL PROGRAM OFFICE, PROJECT DEVELOPMENT

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD

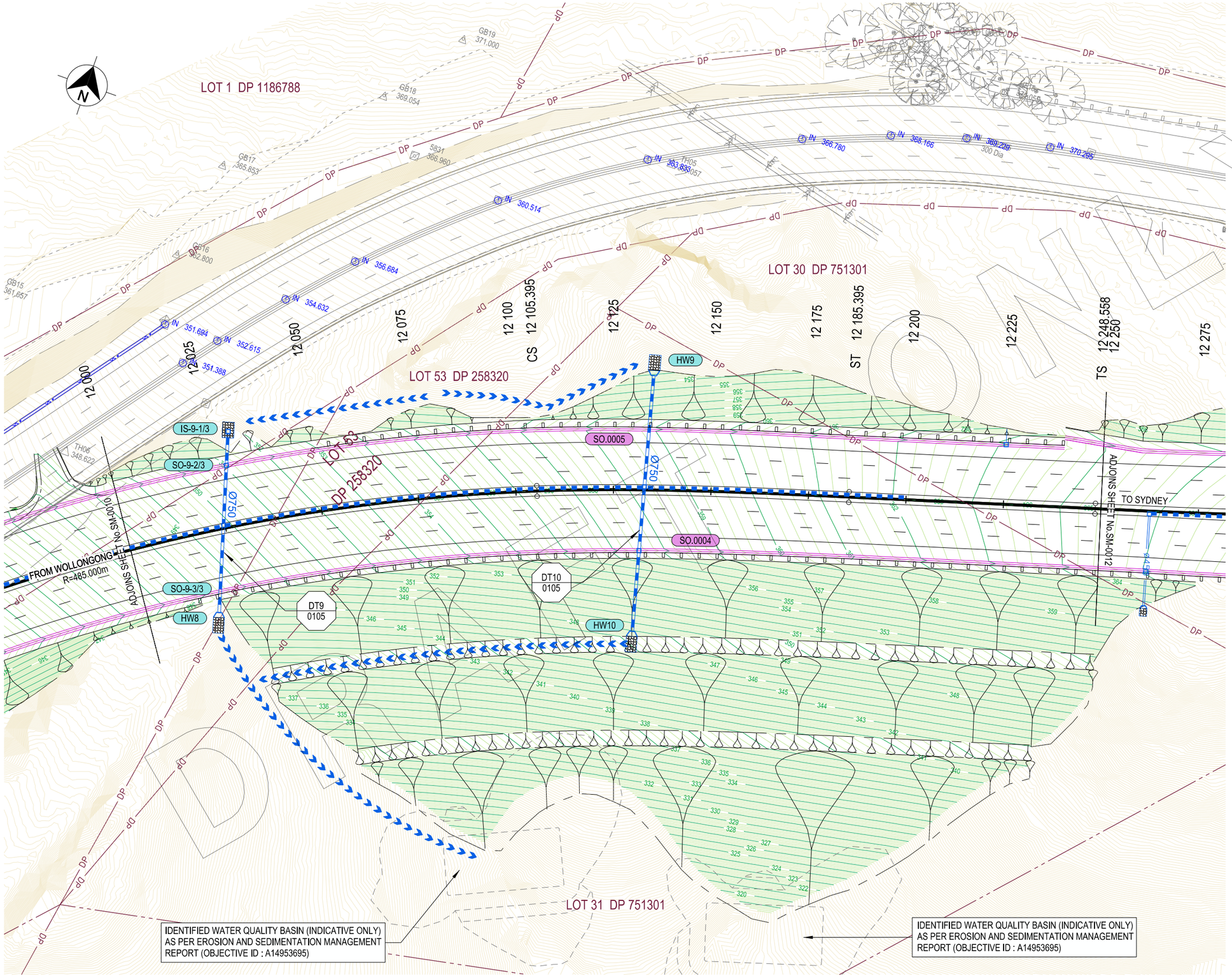
REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

MR513 - MOUNT OUSLEY ROAD - MC00 - 11750 TO 12000

A3

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS: CONCEPT DESIGN - 80% REVIEW — SHEET No. SM-0010 — ISSUE 1



LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

- DT1 / XXXX — TRANSVERSE STRUCTURE LABEL / TRANSVERSE STRUCTURE SHEET NUMBER
- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
- EA — EASEMENT

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
K:\Design\MR513 - Mt Ousley Rd\SF2015_109015 - Stage 1 Realignment Picton Rd to Bellambi Ck Concept\Microstation\DS2015_001395_SD-SM_Main.dgn

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME 27/02/2017 12:02:23 PM — PLOT BY eganc

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
	01	XX-XX-XX	ISSUED FOR 80% REVIEW	XX

SCALES ON A3 SIZE DRAWING: 0 10 20 30 40 — SCALE 1:1000m

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: Transport for NSW — Roads & Maritime Services

TITLE	NAME	DATE
DRAWN	C. EGAN	09.11.15
DRG CHECK	X. XXXXXX	09.11.15
DESIGN	C. EGAN	09.11.15
DESIGN CHECK	X. XXXXXX	09.11.15
DESIGN MNGR	N. COOKE	09.11.15
PROJECT MNGR	J. WATSON	09.11.15

CLIENT: Transport for NSW — Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT, FREIGHT & REGIONAL PROGRAM OFFICE, PROJECT DEVELOPMENT

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD

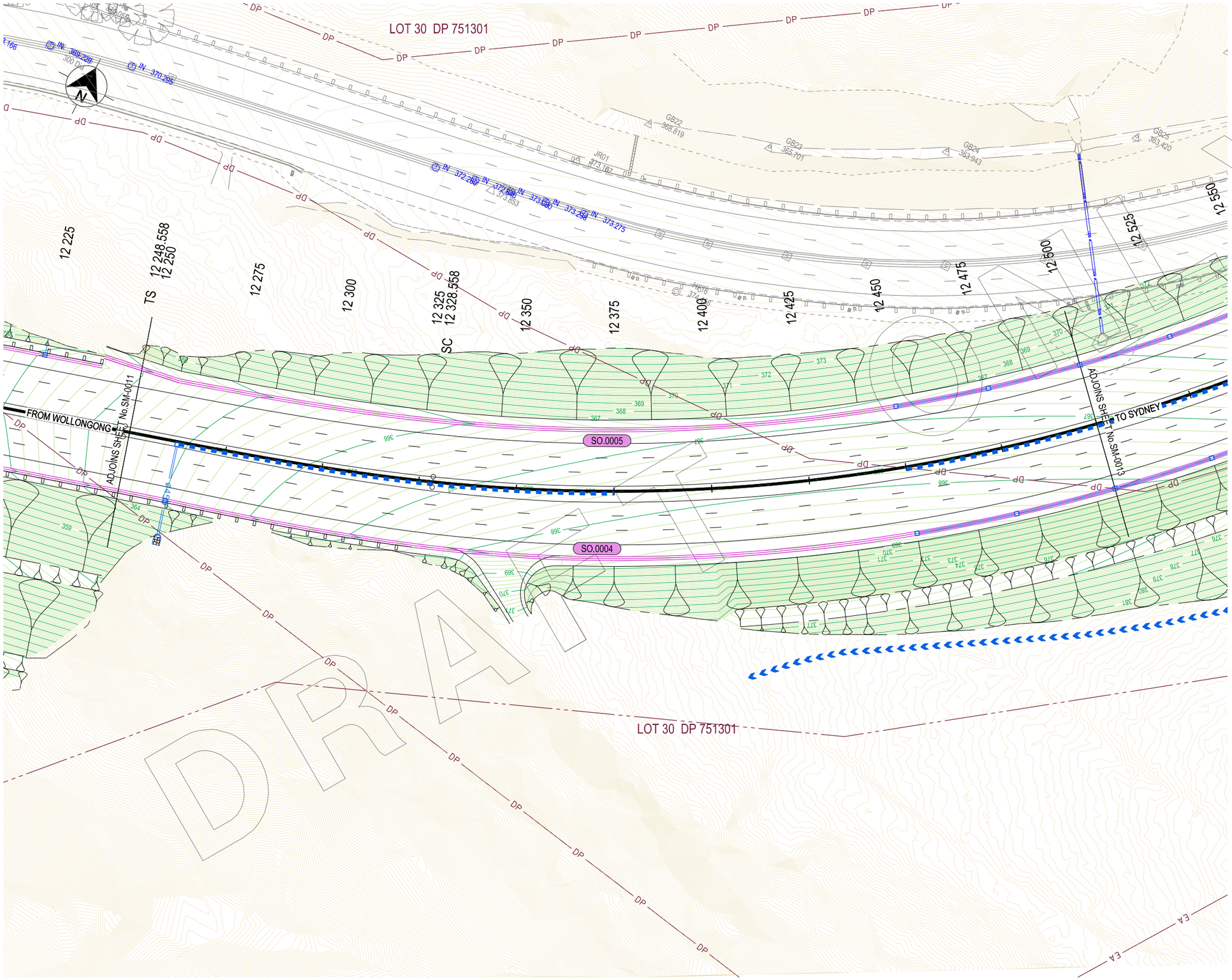
REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

MR513 - MOUNT OUSLEY ROAD - MC00 - 12000 TO 12250

A3

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS: CONCEPT DESIGN - 80% REVIEW — SHEET No. SM-0011 — ISSUE 1



LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

- DT1 / XXXX — TRANSVERSE STRUCTURE LABEL / TRANSVERSE STRUCTURE SHEET NUMBER
- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- Ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
- EA — EASEMENT

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
K:\Design\MR513 - Mt Ousley Rd\SF2015_109015 - Stage 1 Realignment Picton Rd to Bellambi Ck Concept\Microstation\[illegible].dgn

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME [illegible] PLOT BY eganc

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD

REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

MR513 - MOUNT OUSLEY ROAD - MC00 - 12250 TO 12500

A3

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
	01	XX-XX-XX	ISSUED FOR 80% REVIEW	XX

SCALES ON A3 SIZE DRAWING: 0 10 20 30 40 — SCALE 1:1000m

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

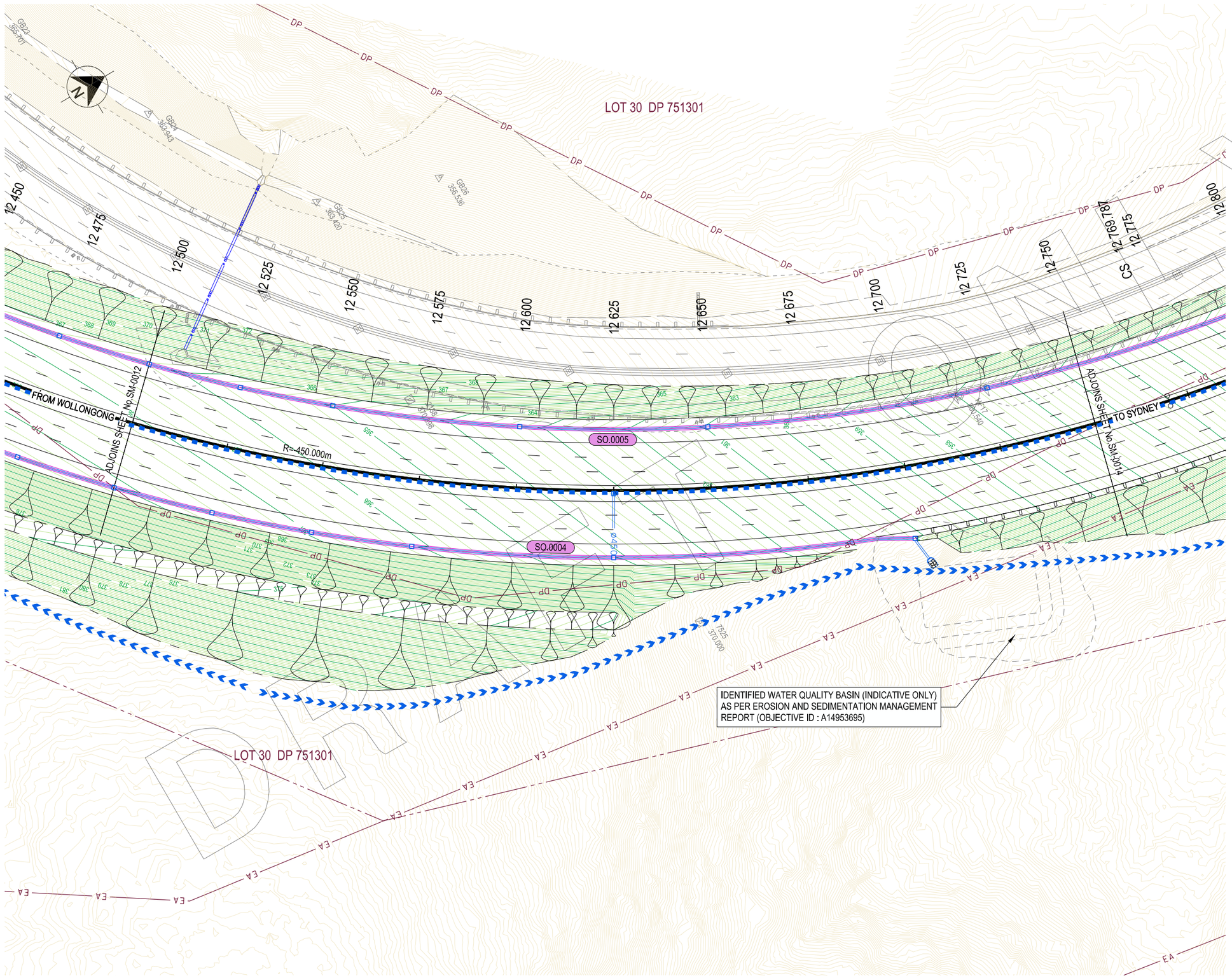
DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport Roads & Maritime Services

	TITLE	NAME	DATE
DRAWN		C. EGAN	09.11.15
DRG CHECK		X. XXXXXX	09.11.15
DESIGN		C. EGAN	09.11.15
DESIGN CHECK		X. XXXXXX	09.11.15
DESIGN MNGR		N. COOKE	09.11.15
PROJECT MNGR		J. WATSON	09.11.15

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
FREIGHT & REGIONAL PROGRAM OFFICE
PROJECT DEVELOPMENT

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS: CONCEPT DESIGN - 80% REVIEW | SHEET No. SM-0012 | ISSUE 1



LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

- DT1 / XXXX — TRANSVERSE STRUCTURE LABEL / TRANSVERSE STRUCTURE SHEET NUMBER
- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- Ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
- EA — EASEMENT

NOT FOR CONSTRUCTION

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0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME 27/05/2017 1:20:23 PM — PLOT BY eganc

CLIENT: Transport Roads & Maritime Services (NSW GOVERNMENT)

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD
REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN
MR513 - MOUNT OUSLEY ROAD - MC00 - 12500 TO 12750

A3

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
	01	XX-XX-XX	ISSUED FOR 80% REVIEW	XX

SCALES ON A3 SIZE DRAWING: 0 10 20 30 40 — SCALE 1:1000m

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

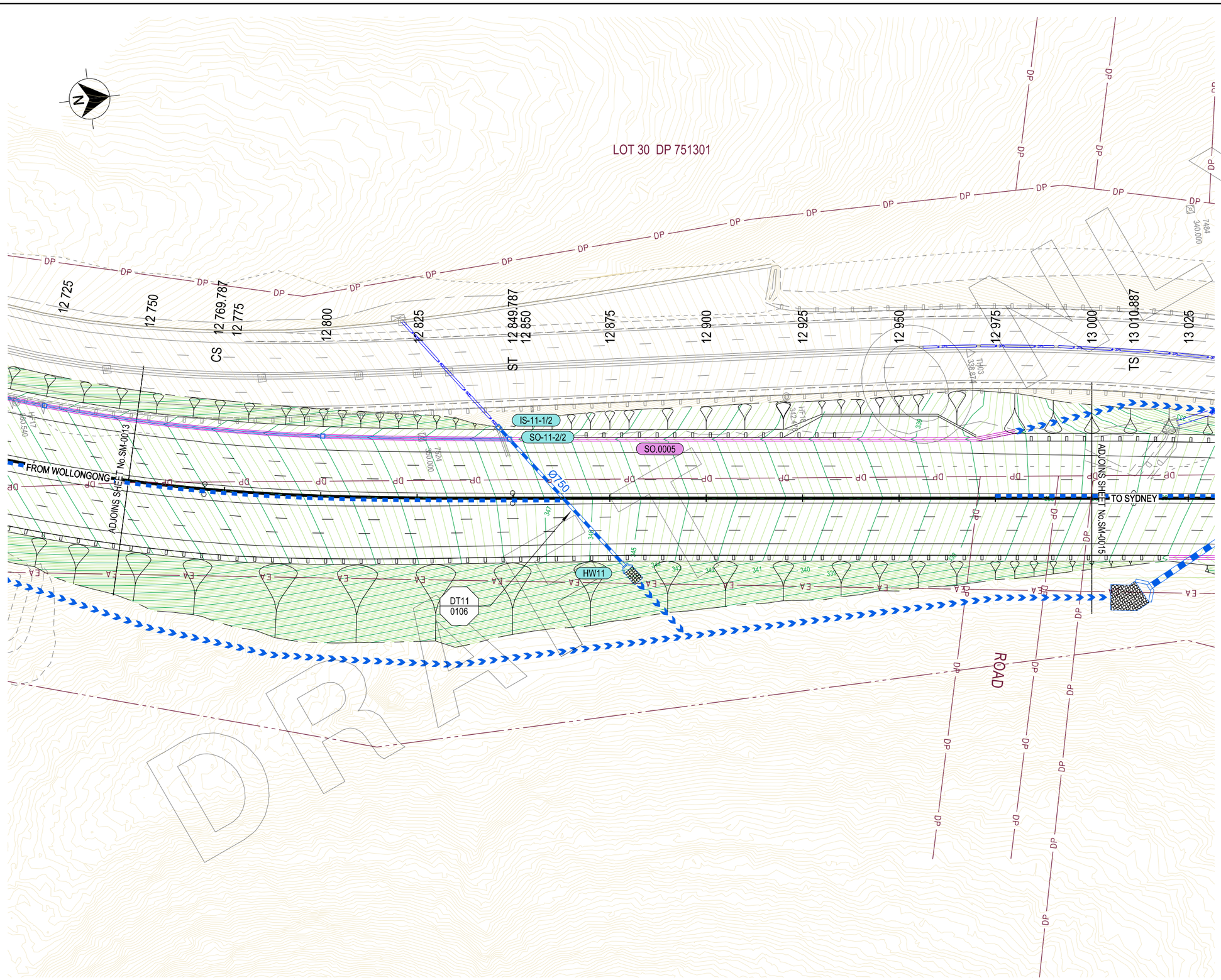
DRAWINGS / DESIGN PREPARED BY: Transport Roads & Maritime Services (NSW GOVERNMENT)

	NAME	DATE
TITLE		
DRAWN	C. EGAN	09.11.15
DRG CHECK	X. XXXXXX	09.11.15
DESIGN	C. EGAN	09.11.15
DESIGN CHECK	X. XXXXXX	09.11.15
DESIGN MNGR	N. COOKE	09.11.15
PROJECT MNGR	J. WATSON	09.11.15

PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
FREIGHT & REGIONAL PROGRAM OFFICE
PROJECT DEVELOPMENT

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS: CONCEPT DESIGN - 80% REVIEW — SHEET No. SM-0013 — ISSUE 1



LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

- DT1 / XXXX — TRANSVERSE STRUCTURE LABEL / TRANSVERSE STRUCTURE SHEET NUMBER
- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- Ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
- EA — EASEMENT

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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
	01	XX-XX-XX	ISSUED FOR 80% REVIEW	XX

SCALES ON A3 SIZE DRAWING
0 10 20 30 40
SCALE 1:1000m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
Transport Roads & Maritime Services (NSW GOVERNMENT)

PLOT DATE / TIME: 27/02/2017 1:20:23 PM
PLOT BY: eganc

TITLE	NAME	DATE
DRAWN	C. EGAN	09.11.15
DRG CHECK	X. XXXXXX	09.11.15
DESIGN	C. EGAN	09.11.15
DESIGN CHECK	X. XXXXXX	09.11.15
DESIGN MNGR	N. COOKE	09.11.15
PROJECT MNGR	J. WATSON	09.11.15

CLIENT
Transport Roads & Maritime Services (NSW GOVERNMENT)
PREPARED FOR
INFRASTRUCTURE DEVELOPMENT
FREIGHT & REGIONAL PROGRAM OFFICE
PROJECT DEVELOPMENT

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD

REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

MR513 - MOUNT OUSLEY ROAD - MC00 - 12750 TO 13000

A3

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS: CONCEPT DESIGN - 80% REVIEW
SHEET No.: SM-0014
ISSUE: 1

LOT 70 DP 751301

HW12 HW13 HW14

DT12 0106 DT13 0107

SO.0006 SO.0007 SO-13-1/1

TS SC CS

13 000 13 010.887 13 025 13 050 13 075 13 090.887 13 100 13 125 13 150 13 175 13 200 13 225 13 234.923 13 250

Ø1350 Ø1500 Ø600

R=460.000m

FROM WOLLONGONG

TO SYDNEY

ADJOINS SHEET No SM-0014

ADJOINS SHEET No SM-0016

ROAD

DRAFT

LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

- DT1 / XXXX — TRANSVERSE STRUCTURE LABEL / TRANSVERSE STRUCTURE SHEET NUMBER
- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- Ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
- CONTOUR MINOR INTERVAL 0.2M
- DP — DP OVERLAY (ACCURACY 0.1M)
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50mm ON A3 SIZE ORIGINAL

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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	
SCALES ON A3 SIZE DRAWING	0 10 20 30 40 SCALE 1:1000m
CO-ORDINATE SYSTEM	MGA ZONE 56
HEIGHT DATUM	AHD
DRAWINGS / DESIGN PREPARED BY	Transport for NSW GOVERNMENT Roads & Maritime Services
PLOT DATE / TIME	27/02/2017 12:22:23 PM
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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
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TITLE	NAME	DATE
DRAWN	C. EGAN	09.11.15
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DESIGN	C. EGAN	09.11.15
DESIGN CHECK	X. XXXXXX	09.11.15
DESIGN MNGR	N. COOKE	09.11.15
PROJECT MNGR	J. WATSON	09.11.15

CLIENT: Transport for NSW GOVERNMENT Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT FREIGHT & REGIONAL PROGRAM OFFICE PROJECT DEVELOPMENT

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD

REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

MR513 - MOUNT OUSLEY ROAD - MC00 - 13000 TO 13250

A3

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS	SHEET No.	ISSUE
CONCEPT DESIGN - 80% REVIEW	SM-0015	1

LOT 70 DP 751301

LOT 69 DP 751301

13 225 | 13 234.923 CS | 13 250 | 13 275 | 13 300 | 13 314.923 ST | 13 325 | 13 340.000

FROM WOLLONGONG

TO SYDNEY

ADJOINS SHEET No SM-0015

LIMIT OF WORKS

Ø600

Ø300

LEGEND

DRAINAGE ELEMENTS TO BE CONTRUCTED

- Ø600 — DRAINAGE CULVERT
- DRAINAGE HEADWALL
- ROCK PROTECTION OF OUTLET
- KERB SYSTEM
- LINED CONCRETE CATCH DRAIN
- CORRUGATED STEEL PIPE BATTER DRAIN
- ACO TRAFFICDRAIN - TD300

DRAINAGE LABELS

- DT1 / XXXX — TRANSVERSE STRUCTURE LABEL / TRANSVERSE STRUCTURE SHEET NUMBER
- HW1 — DRAINAGE HEADWALL LABEL
- SO-1-1/1 — DRAINAGE PIT LABEL
- S?.0001 — DRAINAGE KERB SYSTEM LABEL

DESIGN FEATURES

- CONTOUR MAJOR INTERVAL 0.5M
- CONTOUR MINOR INTERVAL 0.1M
- PROPOSED ROAD BOUNDARY

EXISTING FEATURES

- Ø300 — DRAINAGE PIPE
- CONTOUR MAJOR INTERVAL 1.0M
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DRAWING FILE LOCATION / NAME	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	PLOT DATE / TIME	PLOT BY
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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
	01	XX-XX-XX	ISSUED FOR 80% REVIEW	XX

SCALES ON A3 SIZE DRAWING: 0 10 20 30 40 — SCALE 1:1000m

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: Transport Roads & Maritime Services

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DRAWN	C. EGAN	09.11.15
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PROJECT MNGR	J. WATSON	09.11.15

CLIENT: Transport Roads & Maritime Services

PREPARED FOR: INFRASTRUCTURE DEVELOPMENT, FREIGHT & REGIONAL PROGRAM OFFICE, PROJECT DEVELOPMENT

WOLLONGONG CITY COUNCIL
MR513 MOUNT OUSLEY ROAD

A3

REALIGNMENT BETWEEN PICTON ROAD AND BELLAMBI CREEK DRAINAGE PLAN

MR513 - MOUNT OUSLEY ROAD - MC00 - 13250 TO 13340.000

RMS REGISTRATION No. DS2015 / 001395

ISSUE STATUS: CONCEPT DESIGN - 80% REVIEW

SHEET No. SM-0016

ISSUE 1

Appendix C

Hollow Bearing Tree Survey Information

Hollow bearing Trees with the proposed construction footprint

Number	Scientific name	Common name	Small hollows (0<5cm)	Medium hollows (5<10cm)	Large hollows (10<20cm)	Extra large hollows (>20cm)	Height (m)	Easting	Northing	Notes
1		Stag dead	0	0	0	1	10	304501	6197434	Stag, hollow top
2		Stag dead	0	1	0	0	9	304511	6197426	Stag
3		Stag dead	0	0	0	1	8	304516	6197443	Stag, hollow top trunk
4	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	0	6	304522	6197443	Stag, limb, trunk
5	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	0	12	304517	6197466	Limb
6	*Eucalyptus piperita*	Sydney Peppermint	1	1	0	0	12	304517	6197450	Trunk and limb
7	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	1	8	304540	6197437	Trunk and limb
8	*Eucalyptus piperita*	Sydney Peppermint	3	0	0	0	6	304544	6197454	Trunk and limbs
9	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	2	0	304552	6197467	Trunks x 2
10	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	1	6	304589	6197440	Trunk and limb
11	*Eucalyptus piperita*	Sydney Peppermint	2	0	0	1	0	304576	6197436	Trunk and limb
12	*?*	?	0	0	0	1	8	304580	6197427	Stag, trunk
13	*Syncarpia glomulifera*	Turpentine	0	0	0	1	6	304564	6197422	Trunk
14	*?*	?	0	0	0	0	6	304573	6197417	Stag, trunk
15	*?*	?	0	0	0	1	6	304585	6197420	Stag, trunk
16	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	0	8	304580	6197414	Limb
17	*Eucalyptus piperita*	Sydney Peppermint	0	2	0	1	10	304612	6197417	Trunk/old circumference and 370 cm
18	*Eucalyptus piperita*	Sydney Peppermint	2	0	0	0	8	304630	6197510	Limbs
19	*Eucalyptus sp.*	Eucalyptus sp.	0	3	0	0	8	304656	6197512	Limbs (almost dead)
20	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	1	14	304656	6197484	Limbs
21	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	1	12	304638	6197483	Trunk and limbs/540 cm circumference
22	*?*	?	0	2	0	1	10	304675	6197462	Stag limbs and trunk

23	*Eucalyptus piperita*	Sydney Peppermint	1	0	0	0	5	304609	6197469	Trunk
24	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	0	6	304682	6197497	Limb
25	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	1	18	304706	6197523	Limb and trunk
26	*Eucalyptus piperita*	Sydney Peppermint	1	0	0	0	5	304715	6197533	Trunk
27	*Eucalyptus pilularis*	Blackbutt	0	0	0	1	18	304737	6197566	Limb
28	*Eucalyptus pilularis*	Blackbutt	0	1	0	0	15	304721	6197592	Limb x2
29	*Eucalyptus pilularis*	Blackbutt	1	0	0	0	0	304756	6197752	Trunk
30	*Syncarpia glomulifera*	Turpentine	0	0	0	0	5	304750	6197604	Trunk - open hollow
31	*?*	?	0	0	0	1	11	304644	6197448	Trunk
32	*Eucalyptus piperita*	Sydney Peppermint	0	2	0	1	12	304634	6197443	Limb
33	*Stag dead*	Stag dead	0	2	0	1	8	304591	6197435	Trunk and limb stag
34	*Stag dead*	Stag dead	0	0	0	1	0	304590	6197436	Trunk stag
35	*Eucalyptus pilularis*	Blackbutt	0	0	0	1	0	304497	6197384	Limbs circ ~ 470 cm
36	*Stag dead*	Stag dead	0	0	0	1	5	304448	6197381	Stag, trunk
37	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	0	14	304413	6197376	Limb
38	*Syncarpia glomulifera*	Turpentine	0	1	0	0	20	304373	6197352	Trunk, limb 555 cm circumference ~ 35 m tall
39		Coachwood	0	1	0	0	4	304331	6197343	Trunk, used (birds nest)
40		Coachwood	0	2	0	0	3	304313	6197334	Trunk
41		Coachwood	0	1	0	0	2	304329	6197306	Trunk, goes up
42		Coachwood	0	1	0	0	2	304323	6197286	Trunk
43	*Eucalyptus pilularis*	Blackbutt	0	2	0	1	15	304213	6197328	Trunkand limb
44	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	0	8	304329	6197331	Trunk
45	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	1	2	304270	6197371	Trunk
46	*Eucalyptus pilularis*	Blackbutt	0	2	0	0	11	304287	6197374	Trunk
47	*Eucalyptus pilularis*	Blackbutt	0	2	0	0	14	304291	6197360	Limb

48	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	0	12	304295	6197377	Trunk and limb
49	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	0	12	304296	6197383	Trunk
50	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	0	12	304299	6197402	Trunk and limb
51	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	0	4	304319	6197408	Trunk
52		Sydney Peppermint	0	2	0	0	13	304353	6197387	Limbs
53		Sydney Peppermint	0	0	0	1	0	304351	6197407	Limbs
54		Sydney Peppermint	0	1	0	0	8	304366	6197397	Trunk and limb
55		Sydney Peppermint	0	0	0	0	12	304381	6197403	Trunk
56		Stag dead	0	0	0	0	8	304378	6197413	Limbs
57		Stag dead	0	2	0	0	10	304381	6197413	Limbs
58		Silver ash	1	1	0	0	6	303088	6196224	Trunk
59		Silver ash	1	2	0	0	7	303089	6196224	Limb
60		Silver ash	0	0	0	0	6	303088	6196214	Trunk
61		Scribbly gum	2	2	0	0	2	303095	6196206	Limb
62		Silver ash	1	2	0	0	8	303103	6196184	Limb
63		Silver ash	0	1	0	0	7	303113	6196163	Limb
64		Silver ash	0	0	0	0	4	303112	6196158	Trunk
65		Stag dead	2	3	0	0	2	303124	6196146	Stag
66		Silver ash	0	0	0	0	3	303101	6196169	Half dead attached to tree
67		Scribbly gum	1	0	0	0	5	303102	6196174	Limb
68		Silver ash	0	2	0	0	6	303104	6196183	Limb
69		Scribbly gum	1	2	0	0	3	303049	6196181	Limb
70	*Eucalyptus sieberi*	Silver ash	3	0	0	0	4	303066	6196152	Trunk
71	*Eucalyptus sieberi*	Silver ash	0	1	0	0	4	303080	6196149	Limb
72	*Eucalyptus sieberi*	Silver ash	0	1	0	0	5	303082	6196147	Limb
73	*Eucalyptus sieberi*	Silver ash	1	4	0	0	7	303082	6196149	Limb

74	*Eucalyptus sieberi*	Silver ash	0	1	0	0	4	303080	6196137	Limb
75	*Eucalyptus sieberi*	Silver ash	0	2	0	0	6	303086	6196103	Limb
76		Stag dead	0	1	0	0	6	303069	6196107	Stag
77	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	5	303040	6196114	Trunk - half dead
78	*Eucalyptus sieberi*	Silver ash	3	1	0	0	4	303024	6196176	Limb - bird nest at bottom
79		Stag dead	0	1	0	0	3	303002	6196129	Stag - possible animal sap bite.
80	*Corymbia gummifera*	Red bloodwood	0	1	0	0	2	303013	6196105	Trunk
81		Stag dead	3	2	0	0	2	303037	6196083	Stag - dead Bloodwood
82	*Eucalyptus sieberi*	Silver ash	1	1	0	0	6	303030	6196069	Trunk, limb
83		Stag dead	0	1	0	0	4	303065	6196072	Stag
84	*Eucalyptus sieberi*	Silver ash	0	0	0	0	4	303010	6195990	Broken trunk
85	*Eucalyptus sieberi*	Silver ash	2	1	0	0	8	302997	6195991	Limb
86	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	6	303014	6195981	Limb
87	*Eucalyptus racemosa*	Scribbly gum	0	0	0	0	6	303011	6195950	Limb
88	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	4	303029	6195941	Limb
89	*Eucalyptus racemosa*	Scribbly gum	1	2	0	0	6	303025	6195926	Limb
90	*Eucalyptus racemosa*	Scribbly gum	1	1	0	0	7	303014	6195922	Limb - Fallen onto tree
91	*Eucalyptus racemosa*	Scribbly gum	1	1	0	0	5	303008	6195919	Limb
92	*Eucalyptus sieberi*	Silver ash	0	1	0	0	8	303032	6195891	Trunk
93	*Eucalyptus racemosa*	Scribbly gum	0	2	0	0	6	303035	6195821	Trunk
94	*Eucalyptus pilularis*	Blackbutt	0	3	0	0	10	303058	6195747	Trunk, limb
95	*Eucalyptus pilularis*	Blackbutt	0	0	0	0	12	303082	6195731	Limb
96	*Eucalyptus sieberi*	Silver ash	0	1	0	0	10	303076	6195717	Limb
97	*Eucalyptus sieberi*	Silver ash	0	0	0	0	8	303069	6195702	Limb
98	*Eucalyptus*	Scribbly gum	0	1	0	1	10	303092	6195700	Limb

	racemosa									
99	*Eucalyptus sieberi*	Silver ash	0	0	0	0	4	303090	6195673	Trunk
100	*Eucalyptus sieberi*	Silver ash	1	3	0	0	6	303078	6195666	Trunk, limb
101	*Eucalyptus sieberi*	Silver ash	0	0	0	0	8	303099	6195658	Trunk
102	*Eucalyptus sieberi*	Silver ash	0	1	0	0	7	303115	6195622	Limb
103	*Eucalyptus sieberi*	Silver ash	0	1	0	0	8	303131	6195577	Trunk
104	*Eucalyptus sieberi*	Silver ash	1	1	0	0	9	303124	6195552	Limb
105		Stag dead	1	1	0	0	6	303117	6195548	Trunk, stag
106	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	1	2	303145	6195534	Trunk
107	*Stag dead*	Stag dead	0	4	0	0	6	303144	6195526	Stag, trunk
108	*Eucalyptus racemosa*	Scribbly gum	1	3	0	0	4	303095	6196251	Trunk, nesting material and limbs
109	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	6	303109	6196247	Limb
110		Stag dead	0	1	0	0	8	303137	6196211	Stag
111		Stag dead	0	1	0	0	6	303137	6196243	Stag
112	*Eucalyptus racemosa*	Scribbly gum	2	2	0	0	10	303126	6196250	Limb
113	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	4	303196	6196278	Trunk, limb
114	*Eucalyptus racemosa*	Scribbly gum	0	3	0	0	3	303199	6196287	Trunk, limb
115	*Corymbia gummifera*	Red bloodwood	1	1	0	0	6	303183	6196290	Limb
116	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	6	303168	6196323	Limb
117	*Corymbia gummifera*	Red bloodwood	0	1	0	0	9	303225	6196280	Limb
118	*Eucalyptus racemosa*	Scribbly gum	1	1	0	0	7	303206	6196316	Limb, trunk
119	*Corymbia gummifera*	Red bloodwood	2	1	0	0	15	303215	6196356	Limb
120	*Eucalyptus racemosa*	Scribbly gum	0	2	0	0	2	303246	6196343	Limb
121		Stag dead	0	0	0	0	6	303250	6196349	Stag
122	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	6	303261	6196328	Limb

123	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	4	303267	6196317	Trunk, limb
124	*Eucalyptus racemosa*	Scribbly gum	1	1	0	0	5	303260	6196318	Limb
125	*Eucalyptus racemosa*	Scribbly gum	2	1	0	0	6	303257	6196313	Limb
126	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	8	303282	6196315	Limb
127	*Eucalyptus racemosa*	Scribbly gum	0	2	0	0	10	303279	6196348	Limb
128	*Eucalyptus racemosa*	Scribbly gum	0	0	0	0	8	303287	6196342	Limb
129	*Eucalyptus racemosa*	Scribbly gum	0	3	0	0	6	303294	6196349	Limb
130	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	6	303341	6196377	Limb
131	*Eucalyptus racemosa*	Scribbly gum	1	2	0	0	12	303327	6196328	Limb
132	*Eucalyptus sieberi*	Silver ash	0	0	0	0	8	303351	6196338	Limb
133		Stag dead	1	1	0	0	12	303343	6196354	Limb
134	*Eucalyptus racemosa*	Scribbly gum	1	1	0	0	3	303434	6196429	Limb
135	*Eucalyptus racemosa*	Scribbly gum	0	1	0	0	3	303438	6196433	Limb
136		Stag dead	0	2	0	0	6	303469	6196440	Limb
137	*Eucalyptus racemosa*	Scribbly gum	0	2	0	0	8	303589	6196553	Limb
138		Stag dead	0	2	0	0	8	303621	6196573	Limb
139	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	0	10	303619	6196571	Limb
140	*Eucalyptus piperita*	Sydney Peppermint	0	2	0	0	9	303661	6196612	Limb
141	*Eucalyptus piperita*	Sydney Peppermint	1	1	0	0	10	303653	6196604	Limb
142		Stag dead	0	1	0	0	10	303653	6196605	Limb
143		Stag dead	0	1	0	0	8	303667	6196607	Limb
144	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	0	10	303668	6196602	Limb
145	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	0	8	303673	6196615	Limb
146	*Eucalyptus pilularis*	Blackbutt	2	3	0	1	20	303665	6196638	Limb, trunk
147	*Eucalyptus pilularis*	Blackbutt	0	1	0	1	15	304324	6197429	Limb, trunk

148	*Eucalyptus pilularis*	Blackbutt	0	1	0	1	10	304311	6197430	Trunk, limb
149	*Syncarpia glomulifera*	Turpentine	0	1	0	1	16	304320	6197417	Trunk, limb
150	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	0	14	304266	6197398	Limb
151	*Eucalyptus piperita*	Sydney Peppermint	0	2	0	0	12	304269	6197392	Limb
152	*Eucalyptus pilularis*	Blackbutt	0	1	0	0	15	304241	6197373	Limb
153		Stag dead	0	0	0	0	15	304232	6197363	Limb
154		Stag dead	0	0	0	0	10	304233	6197362	Trunk
155		Stag dead	0	1	0	0	6	304229	6197365	Trunk
156	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	0	10	304232	6197358	Limb
157	*Eucalyptus piperita*	Sydney Peppermint	0	1	0	0	8	304241	6197337	Limb
158	*Eucalyptus pilularis*	Blackbutt	0	1	0	0	6	304238	6197327	Trunk
159	*Syncarpia glomulifera*	Turpentine	0	0	0	1	20	304240	6197324	Trunk
160	*Eucalyptus piperita*	Sydney Peppermint	0	2	0	0	12	304219	6197331	Limb
161	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	1	10	304170	6197283	Trunk
162	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	1	12	304166	6197267	Trunk
163	*Eucalyptus piperita*	Sydney Peppermint	1	2	0	0	15	304137	6197220	Limb
164		Stag dead	0	0	0	0	25	304060	6197131	Limb (original coords: 604060, 6197131)
165	*Eucalyptus pilularis*	Blackbutt	0	0	0	1	25	303858	6196898	Limb
166	*Eucalyptus pilularis*	Blackbutt	0	1	0	1	30	303860	6196875	Trunk, limb
167	*Eucalyptus sp.*	Eucalyptus sp.	1	2	0	0	15	303841	6196848	Limb
168	*Eucalyptus pilularis*	Blackbutt	0	1	0	0	20	303817	6196833	Limb
169	*Eucalyptus piperita*	Sydney Peppermint	0	0	0	1	17	303952	6197088	Trunk - half dead
170	*Eucalyptus pilularis*	Blackbutt	0	2	0	0	12	303970	6197100	Limbs
171	*Eucalyptus pilularis*	Blackbutt	0	0	0	0	18	303854	6196939	Limb
172	*Eucalyptus*	Scribbly gum	0	1	0	0	7	303570	6196574	Limb

	racemosa									

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