REVIEW OF ENVIRONMENTAL FACTORS (REF)

SHOALWATER INFRASTRUCTURE – MOSS VALE RD URAs

PART 1 : MOSS VALE RD WATER LEAD-IN

Contents

1. PROPOSAL AND LOCATION

1.1 Proposed activity

The proposed activity is the construction of a water main from Cambewarra, running approximately 1.575km eastward along Main Rd and the south-east along Moss Vale Rd, as a water lead-in, to service the Moss Vale Rd Urban Release Areas (URAs).

Works would involve the following:

- Trenching to depths ranging from 1.0m to 1.47m below the existing ground surface;
- Installation of water pipe (OD400 PE 100 PN16 and OD355 PE100 PN16), air valves, scour valves and hydrants;
- Minimal clearing of native and exotic vegetation;
- Temporary removal and subsequent replacing of rock scour protection at Good Dog Creek.

Refer to Appendix A (D20/402471 and D20/406054) for layout plans with longitudinal sections.

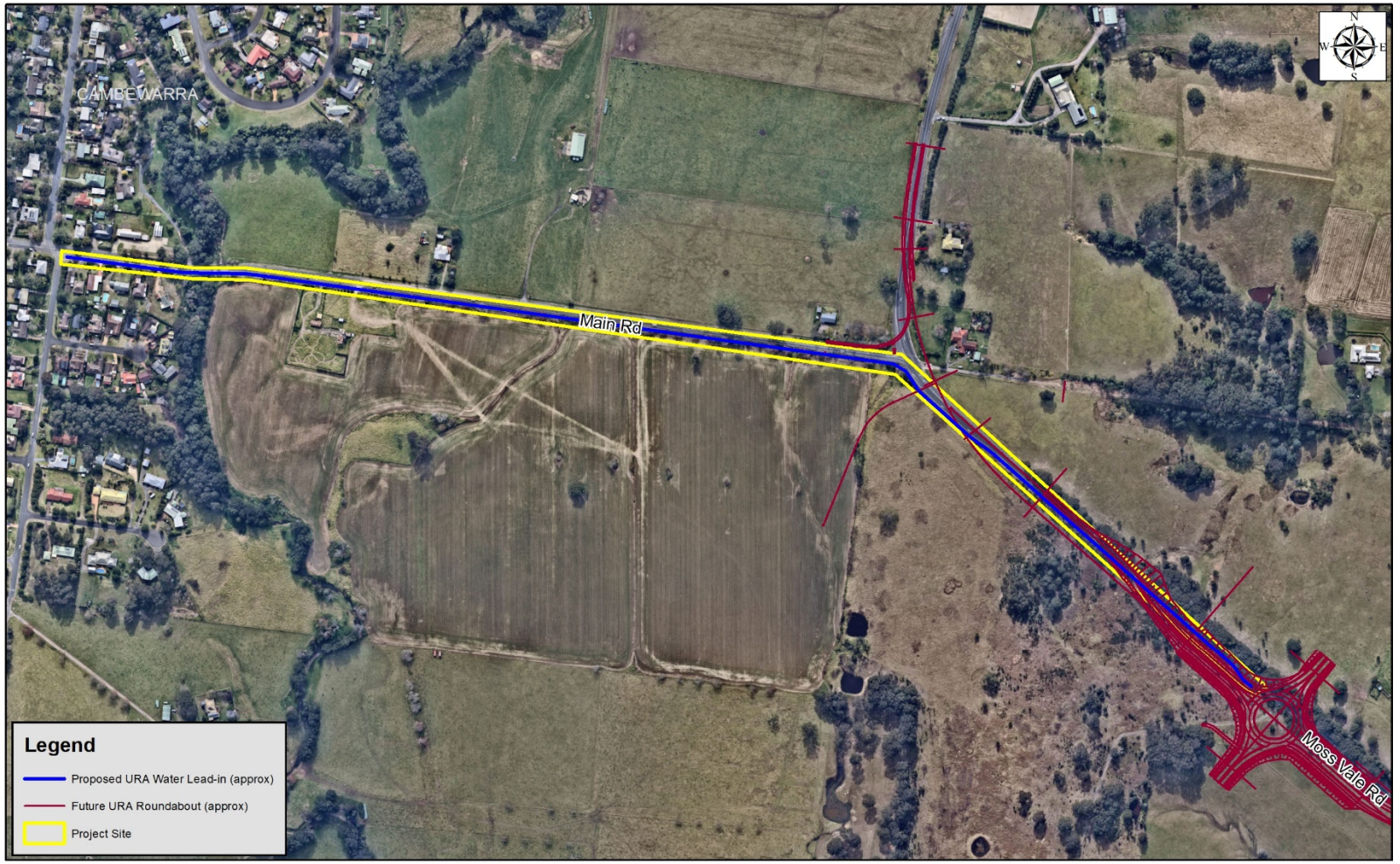
Shoalhaven City Council (SCC) is the proponent and the determining authority under Part 5 of the EP&A Act. The environmental assessment of the proposed activity and associated environmental impacts has been undertaken in the context of Clause 228 of the *Environmental Planning and Assessment Regulation 2000*. In doing so, this Review of Environmental Factors (REF) helps to fulfil the requirements of Section 5.5 of the Act that SCC examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

1.2 Location

The proposed activity would be undertaken within the road reserves of Main Rd and Moss Vale Rd in Cambewarra. The proposed water main would be constructed along the southern verge of Main Rd, running approximately east from Hockeys Lane and then approximately south-east along the southern verge of Moss Vale Rd, to the future site of the Moss Vale Rd roundabout (refer to Figures 1 and 2).

Figure 1. Site location

Figure 2. Proposed water lead-in along Main Rd and Moss Vale Rd to future Moss Vale Rd URA roundabout



2. EXISTING ENVIRONMENT

2.1 Habitat and vegetation assessment

A general site survey was undertaken by a Council Environmental Officer on 3rd August 2020 from approximately 11.15am until 12.15pm. The survey involved vegetation and habitat assessment, recording of all flora species within and immediately adjacent to the subject site, determination of vegetation communities, investigation of fauna signs, and targeted survey for potentially occurring threatened flora species (including *Soalnum celatum, Rhodamnia rubescens* and *Hibbertia stricta* subsp. *furcatula*).

The site is mostly cleared and modified, with gardens from residential properties encroaching into the road reserve between Hockeys Lane and Good Dog Creek (with planted Callistemon, Oleander and succulents), and cleared farming land adjoining the road reserve between Good Dog Creek and the eastern end of the site, with planted Coral Tree (*Erythrina x sykessi*) lining Main Rd east of Good Dog Creek within turf/paddock grass dominated by Kikuyu, and patchy, regenerating native vegetation occurring along the southern side of Moss Vale Rd.

Vegetation communities

Vegetation communities mapped as occurring within and immediately around the site are shown in Figure 3 and include:

PCT1105 (Biometric SR606) River Oak open forest of major streams, Sydney Basin and South East Corner;

PCT1212 (Biometric SR642) Spotted Gum - Grey Ironbark - Woollybutt grassy open forest on coastal flats, southern Sydney Basin and South East Corner.

PCT694 (Biometric SR516) Blackbutt – Turpentine – Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin

PCT1079 (Biometric SR592) Red Bloodwood – Blackbutt – Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin

None of these vegetation communities are associated with any endangered ecological communities.

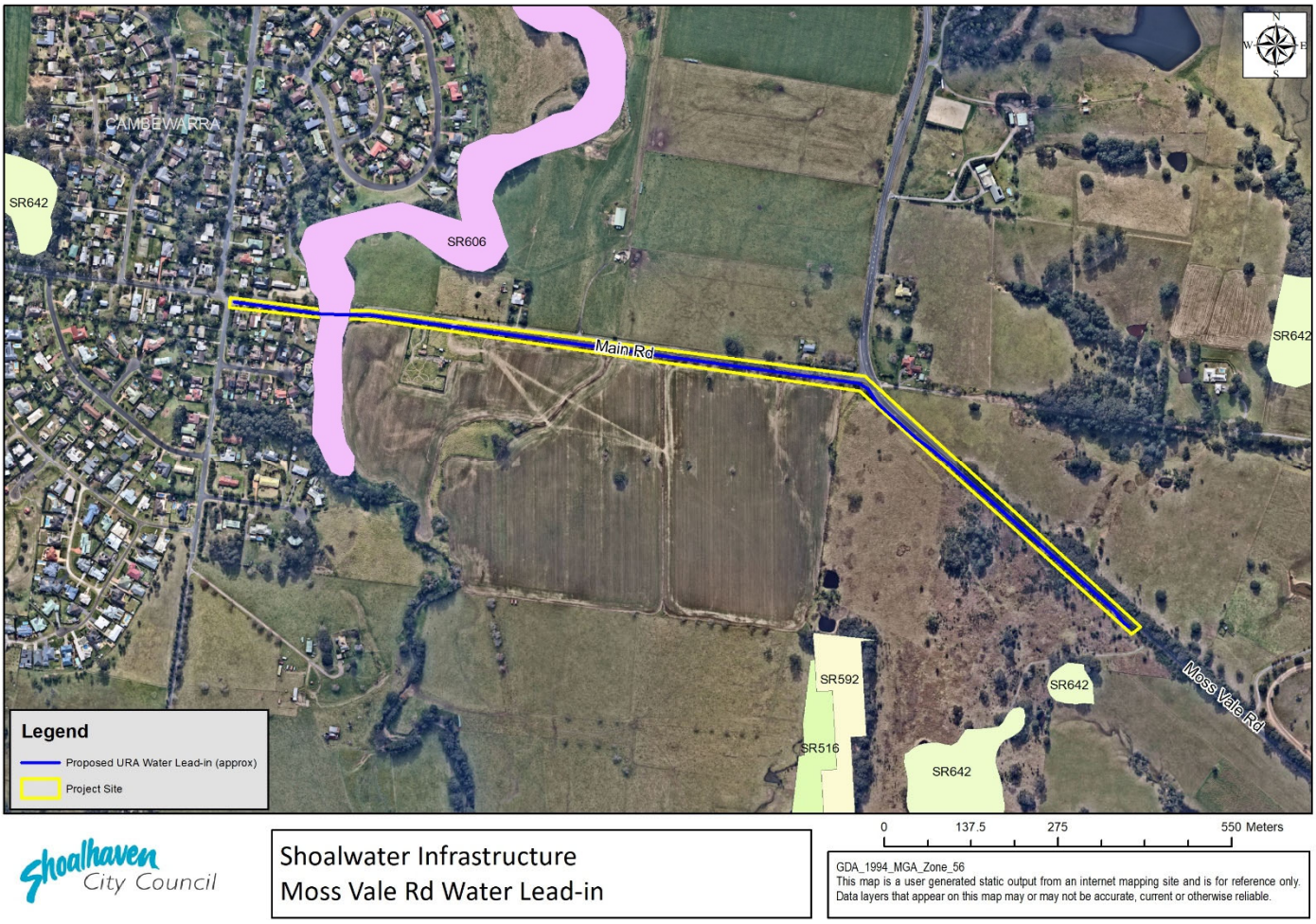
The only mapped vegetation occurring within the site is PCT1105 (SR606), associated with the riparian corridor of Good Dog Creek. Within the site, Cheese Tree *Glochidion ferdinandi,* Sweet Pittosporum *Pittosporum undulatum* and exotic Large-leaf Privet *Ligustrum lucidum* occur within the riparian corridor, with River She-Oak *Casuarina cunninghamiana* extending beyond the proposal footprint.

Patchy, regenerating, native vegetation occurring particularly in proximity to the future Moss Vale Rd URA roundabout, is primarily influenced by PCT 1212 (Biometric SR642) and containing Spotted Gum *Corymbia maculata,* Black Wattle *Acacia mearnsii,* Maidens Wattle *A. maidenii,* Fern-leaved Wattle *A. filicifolia,* Two-veined Hickory *A. binervata,* Sweet Pittosporum *Pittosporum undulatum,* Cherry Ballart *Exocarpus cupressiformis,* and with groundcover

species including Spiny Mat-rush *Lomandra longifolia*, Kangaroo Grass *Themeda triandra*, *Daviesia ulicifolia, Kennedia* sp. and *Marsdenia rostrata.*

A small cluster of native trees occurs on the southern side of Main Rd, including a mature Rough-barked Apple *Angophora floribunda*, with Two-veined Hickory *Acacia binervata* and Red Forest Gum *Eucalyptus tereticornis* saplings.

Figure 3. Vegetation communities (Biometric type) mapped as occurring within and in proximity to the site



Habitat and targeted survey results

No threatened flora or fauna species were observed during surveys and site inspections.

A targeted survey which involved investigation of potential threatened microbat habitat (specifically for Southern Myotis and Large Bentwing-bat) in proximity to Good Dog Creek bridge was undertaken on the 25th of August 2020, from approximately 9.45am to 10.30am. This survey involved inspection of holes and crevices within the rock scour protection, on the southern side of the bridge abutments, undertaken with an endoscope (inspection camera) for deeper, winding crevices and headlamp for shallower crevices. Visual assessment, including through use of the endoscope, was undertaken systematically through the extents of all holes and crevices large enough to accommodate microbats within approximately 4m of the bridge. Scats belonging to a rat

species were noted in the lowest and furthest opening from the bridge on the eastern side of the creek. No microbats were detected and no evidence was noted which would indicate use of this potential habitat by microbats.

Beyond the riparian corridor, the site contains little else in terms of potentially important habitat, and is generally characterised as disturbed, open land with patchy vegetation and little to no connectivity.

No potential habitat for deciduous and cryptic flora species including locally occurring threatened orchids *Genoplesium baueri, Pterostylis ventricosa, P.pulchella* or *Cryptostylis hunteriana* was considered to occur within the site.

No hollow-bearing trees occurred within areas which are likely to be impacted by the proposed works. Poorly developed hollows were noted in a mature Rough-barked Apple tree (shown in Photo 4) and several of the Coral Trees occurring along Main Rd. Each of these trees originate on the road reserve boundary, and are located away from the road shoulder by approximately 3 to 4m and are therefore assumed outside the area of impact.

No Glossy Black Cockatoo or Glider feed tree species (e.g. *Allocasuarina littoralis, Corymbia gummifera* and *Eucalyptus punctata*) were noted within the site.

No signs of potential threatened fauna use of the site (e.g. owl whitewash, bandicoot diggings) were noted.

Photos 1 through 9 below show the site and any relevant features.

Photo 1. Site facing east along Main Rd from Hockeys Lane toward Good Dog Creek

Photo 2. Southern side of Good Dog Creek bridge facing east, showing rock scour protection

Photo 3. Site looking east along Main Rd showing planted Coral Trees

Photo 4. Site looking east along Main Rd toward Moss Vale Rd showing cluster of native trees

Photo 5. Site looking south-east along Moss Vale Rd from Main Rd

Photo 6. Site looking south-east along Moss Vale Rd showing regenerating Spotted Gum trees

Photo 7. Site facing south-west toward future Moss Vale Rd URA roundabout showing regenerating Wattles

Photo 8. Rock scour protection on the southern side of Good Dog Creek bridge

Photo 9. Disturbed and modified road verge looking east along Moss Vale Rd

3. ASSESSMENT OF LIKELY ENVIRONMENTAL IMPACTS

3.1 Impacts associated with the proposal

The proposal would involve the following disturbance and impacts:

- Clearing of native and exotic vegetation comprising:
    - Possible removal of planted and exotic species between Hockeys Lane and Good Dog Creek (planted Callistemon trees and ornamental garden shrubs and groundcovers);
    - Minor pruning of River She-Oak, Cheese Tree and Pittosporum for access at Good Dog Creek may be required;
    - Pruning and possible removal of Coral Trees, in addition to Acacia species and Eucalypt saplings may be required along Main Rd between Good Dog Creek and Moss Vale Rd;
    - Removal of regenerating Spotted Gum (young trees and saplings) in addition to Acacia species required along Moss Vale Rd to site of future Moss Val Rd URA roundabout – clearing along the water main alignment would be to a width of approx. 5m for access;
    - No hollow-bearing trees or significant feed trees would be removed or otherwise impacted. Poorly developed hollows were noted in a mature Rough-barked Apple tree (shown in Photo 4) and several of the Coral Trees occurring along Main Rd. Each of these trees originate on the road reserve boundary, and are located away from the road shoulder by approximately 3 to 4m and are therefore assumed outside the area of impact. In the event that any of these trees required removal (e.g. if impact to structural roots could not be avoided and would destabilise the tree), inspection of the hollow would be undertaken and further assessment undertaken as appropriate to ensure no harm to resident fauna and no impact to threatened species. Given the poorly developed nature of the hollows and the lack of connectivity in the landscape, the likelihood of these hollows being utilised by any locally occurring hollow-dependent threatened species is considered very low.
- Excavation comprising trenching to depths ranging from 1.0m to 1.47m below the existing ground surface, for a distance of approx. 1.575km, along the southern verge of Main Rd and Moss Vale Rd;
- Temporary removal and subsequent replacing of rock scour protection at Good Dog Creek to a depth of approx. 1.4m below road surface to enable pipe to be attached to the side of the bridge.

3.2 Threatened species impact assessment (NSW)

Section 1.7 of the EP&A Act 1979 applies the provisions of Part 7 of the NSW *Biodiversity Conservation Act 2016* and Part 7A of the *NSW Fisheries Management Act 1994* that relate to the operation of the Act in connection with the terrestrial and aquatic environment. Each are addressed below.

- ***Part 7A Fisheries Management Act 1994***

Part 7A relates to threatened species conservation. As the proposed activity would not affect aquatic environments, this section of the Act is not relevant and further consideration is unnecessary.

- ***Part 7 Biodiversity Conservation Act 2016***

An assessment of the potential for NSW threatened flora and fauna species occurring on-site or otherwise being impacted by the proposal was undertaken (refer to Appendix B). The following species and endangered ecological communities are known to occur on-site or are considered to have some potential to occur on-site or be otherwise impacted by the proposal, and therefore required further assessment under Part 7 of the NSW Biodiversity Conservation Act 2016:

- Large/Eastern Bentwing-bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*)

Section 7.3 of the Act provides a 'five-part' test to determine whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. Each Part is addressed below:

Part A - In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be place at risk of extinction.

Hollow-dependent microchiropteran bats: Eastern Bentwing-bat (*Miniopterus orianae oceanensis*); and Southern Myotis (Large-footed Myotis) *Myotis macropus*

Eastern Bentwing-bat (*Miniopterus orianae oceanensis*) primarily roosts in caves, but it also uses derelict mines, storm-water tunnels, buildings and other man-made structures. The species forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. The species hunts in forested areas, catching moths and other flying insects above the tree tops (OEH 2017a).

Southern Myotis (*Myotis Macropus*) generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. The species is dependent on waterways with pools of 3m wide or greater for foraging, with

habitat surrounding the waterways (usually within 200m) being used for breeding and roosting. The species will forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December (OEH 2017b).

The site was regarded as containing potential roosting habitat for Eastern Bentwing-bat and Southern Myotis within the rock-scour protection adjacent to Good Dog Creek bridge (refer to Photo 8).

Comprehensive and systematic inspection of the holes and crevices within the rock scour protection (refer to S1.1) detected no microbats or evidence (e.g. scats) which would indicate use of this potential habitat by microbats.

It is considered therefore that the potential habitat within the rock scour protection is not relied upon by microbat species.

The proposal involves minimal disturbance to the riparian corridor, involving pruning of trees (River She-Oak, Cheese Tree and Sweet Pittosporum) for access and temporary removal of the rock scour protection adjacent to the southern side of the bridge to a depth of 1.4m. The rock scour protection would subsequently be restored and vegetation left to regenerate.

Foraging and potential roosting habitat will therefore not be removed or impacted long-term.

Works would occur during normal construction hours, so would not affect the nocturnal foraging activities of these species.

It is considered unlikely therefore that the Eastern Bentwing-bat and Southern Myotis would be impacted by the proposed works and the proposed activity is unlikely to have an adverse effect on the lifecycle of the species such that a viable local population of any of these species is likely to be placed at risk of extinction.

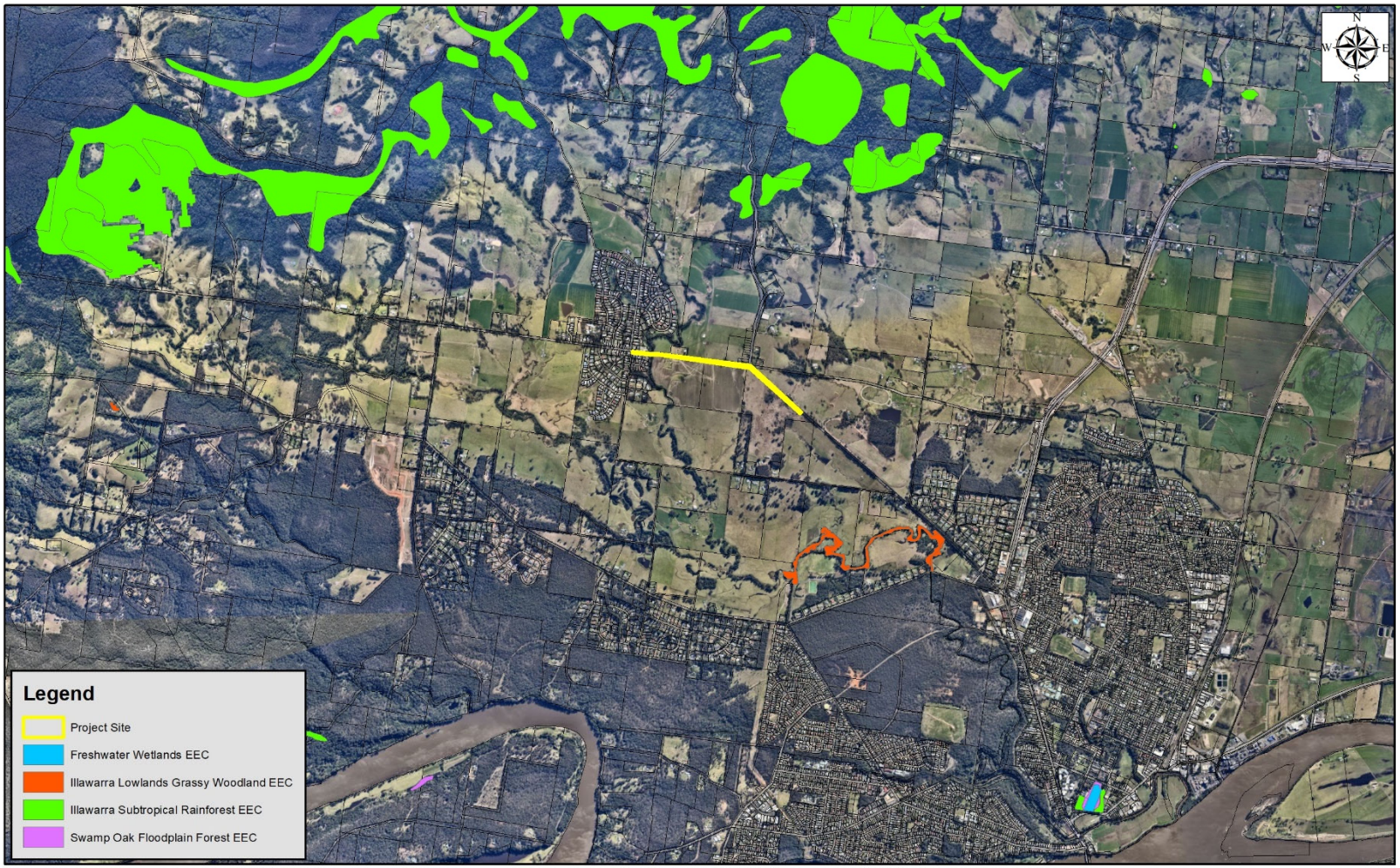
Part B - In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

- ***(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***
- ***(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction***

No endangered ecological community (EEC) is mapped as occurring in close proximity to the site of the proposed works (refer to Figure 4). Site surveys confirmed that no EEC occurrs in close proximity to the site such that there was any risk of impact as a result of the proposed works.

The proposal is therefore unlikely to adversely affect the extent or composition of any EEC such that a local occurrence of the EEC will be placed at risk of extinction.

Figure 4. Endangered Ecological Communities (EECs) mapped as occurring in the surrounding locality



Shoalwater Infrastructure
Moss Vale Rd Water Lead-in

0 750 1,500 3,000 Meters

GDA_1994_MGA_Zone_56
This map is a user generated static output from an internet mapping site and is for reference only.
Data layers that appear on this map may or may not be accurate, current or otherwise reliable.

Part C - In relation to the habitat of a threatened species or ecological community:

(iii) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity

(iv) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(v) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

No important habitat for threatened species would be removed or otherwise significantly impacted (see Part A).

No EEC would not be fragmented or isolated, nor removed or modified to an extent that would affect the long term survival of the EEC occurring in the locality (refer to Part B).

The proposal will therefore not affect the long-term survival of any threatened species or endangered ecological community in the locality.

Part D – Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

No "*areas of outstanding biodiversity values"* have been declared in the City of Shoalhaven.

Part E – Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Clearing of native vegetation is listed as a key threatening process, defined by the Scientific Committee's determination as

> *the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long-term modification, of the structure, composition and ecological function of a stand or stands.*

Clearing of native vegetation has been shown to:

- cause widespread fragmentation of ecological communities;
- reduce the viability of ecological communities by disrupting ecological functions;
- result in the destruction of habitat and loss of biological diversity;
- lead to soil and bank erosion, increased salinity and loss of productive land.

The proposal would involve minimal removal of native vegetation to facilitate installation of the water main and associated infrastructure. Native vegetation to be removed comprises regenerating Spotted Gum (young trees and saplings) in addition to Acacia species required along Moss Vale Rd to site of future Moss Val Rd URA roundabout. Clearing along the water main alignment would be to a width of approx. 5m for access. The vegetation to be cleared does not

form part of any habitat corridor or provide any significant habitat for locally occurring native fauna species.

There would be no destruction of important habitat nor impact to any locally occurring threatened species (see Part 1).

The proposed vegetation clearing would therefore not result in fragmentation of ecological communities or disrupt ecological function.

The impacts of the key threatening process of clearing of native vegetation would therefore be minimised and managed as part of the proposal.

3.3 Threatened species impact assessment (Commonwealth EPBC Act 1999)

A Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Report was generated on 03 September 2020. Of those threatened species and endangered ecological communities reported as likely occurring or having habitat within the area of the report, none were considered to have potential habitat within the site and require further assessment. Additional, highly mobile species including migratory birds may occur occasionally and transiently within the vicinity of the proposed activity but would not be affected by the proposal.

3.4 Indigenous heritage

Under Section 86 of the NSW *National Parks and Wildlife Act 1974* (NPW Act) it is an offence to disturb, damage, or destroy any Aboriginal object without an Aboriginal Heritage Impact Permit (AHIP). The Act, however, provides that if a person who exercises 'due diligence' in determining that their actions will not harm Aboriginal objects has a defence against prosecution if they later unknowingly harm an object without an AHIP (Section 87(2) of the Act). To effect this, the NSW Department of Environment, Climate Change and Water have prepared the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wale*s (hereafter referred to as the 'Due Diligence Guidelines) to assist individuals and organisations to exercise due diligence when carrying out activities that may harm Aboriginal objects and to determine whether they should apply for an AHIP.

The site does contain landscape features that are regarded as indicating a higher potential for Aboriginal objects, namely:

- Located within 200m of waters,

In accordance with the Due Diligence Guidelines (DECCW 2010), a search on the Aboriginal Heritage Information Management System (AHIMS) on 08 September 2020 indicated that there are two recorded Aboriginal sites or places, 52-5-0915 and 52-5-0916, in the vicinity of the proposal (refer to AHIMS report below in Figure 5 and location of records in Figure 6).

The site card for site 52-5-0915 describes the record location as a “saddle landform containing one fine grained siliceous flake, one quartz flake and one silcrete distal flake”, with artefacts having been recovered from test pits through sieving.

The site card for site 52-5-0916 describes the record as being a single quartzite flake found at a depth of 10-15cm.

The proposal would not occur in close proximity to any recorded Aboriginal sites or places.

Due Diligence Guidelines define disturbed land as follows:

> *“Land is disturbed if it has been the subject of a human activity that has changed the land’s surface, being changes that remain clear and observable. Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks.”*

The site of the proposed works is immediately adjacent to Main Rd and Moss Vale Rd and is considered disturbed land, as a result of road construction and associated land-forming (refer to Photo 9) and maintenance.

As the proposal would occur on disturbed land and would not impact any recorded Aboriginal sites or places, the Due Diligence Guidelines requires no further assessment, an AHIP is not required and the activity can proceed with caution.

Figure 5. Results of AHIMS Aboriginal heritage search

Office of Environment & Heritage
NSW GOVERNMENT

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : Moss Vale Rd - Shoalwater

Client Service ID : 533701

Shoalhaven City Council

Date: 08 September 2020

PO Box 42 Bridge Rd
Nowra New South Wales 2541

Attention: Jeff Bryant

Email: jeff.bryant@shoalhaven.nsw.gov.au

Dear Sir or Madam:

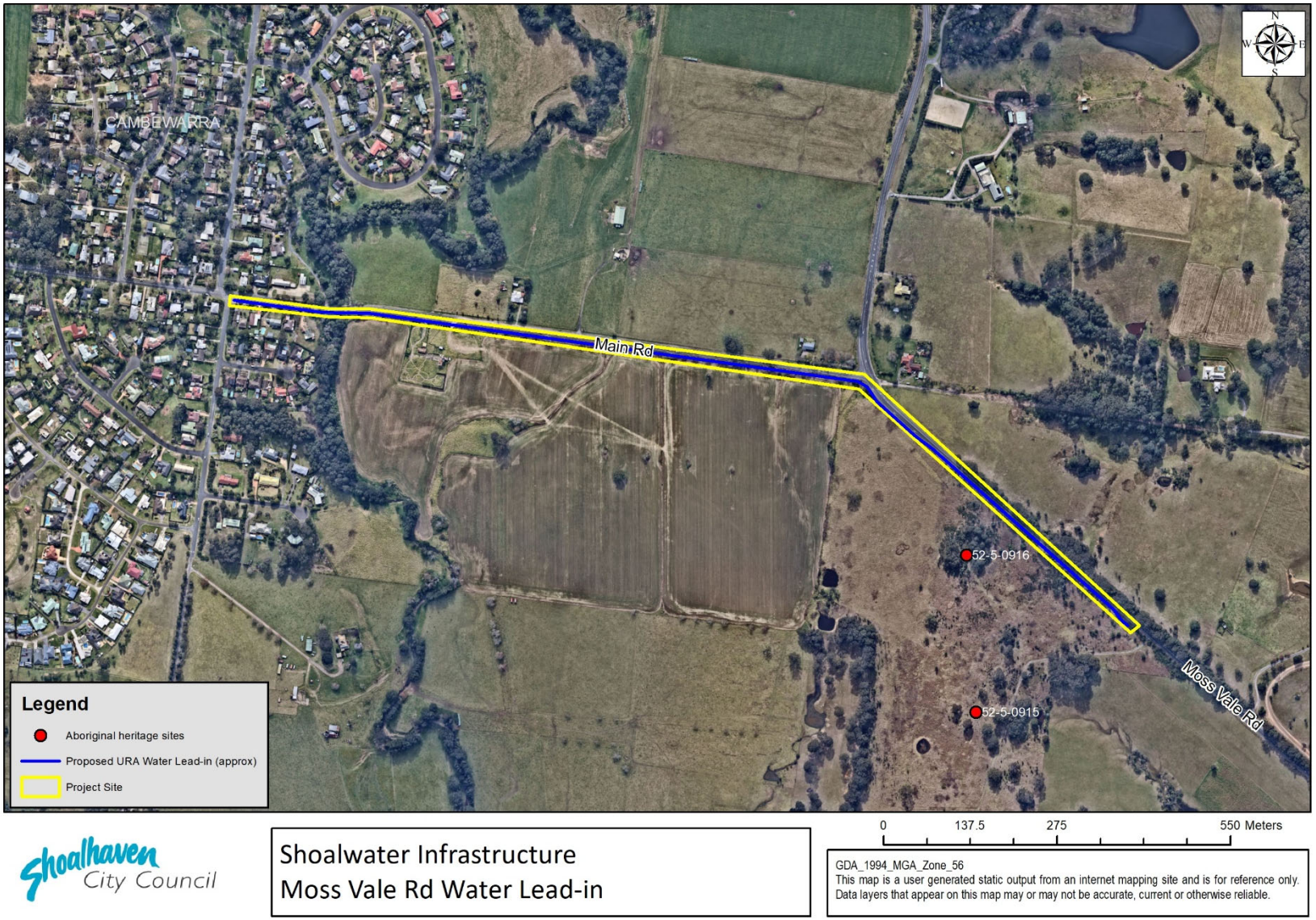
AHIMS Web Service search for the following area at Datum :GDA, Zone : 56, Eastings : 276835 - 278468, Northings : 6143187 - 6143875 with a Buffer of 50 meters, conducted by Jeff Bryant on 08 September 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

2	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Figure 6. Locations of recorded Aboriginal heritage sites in proximity to proposed works



3.5 Non-indigenous heritage

NSW Heritage listed items 2390179 and 2390180 comprise a “Former Schoolmasters Brick Residence & Garden” and Former Weatherboard School” respectively, occurring on the north side of Main Rd in proximity to the site of the current proposal. The proposed works would occur on the south side of Main Rd and would present no risk of impact to these heritage listed items.

No items of local heritage significance or any items on the State Heritage Register or listed in the Shoalhaven Local Environmental Plan occur in close proximity to the site such that the proposed works might impact them.

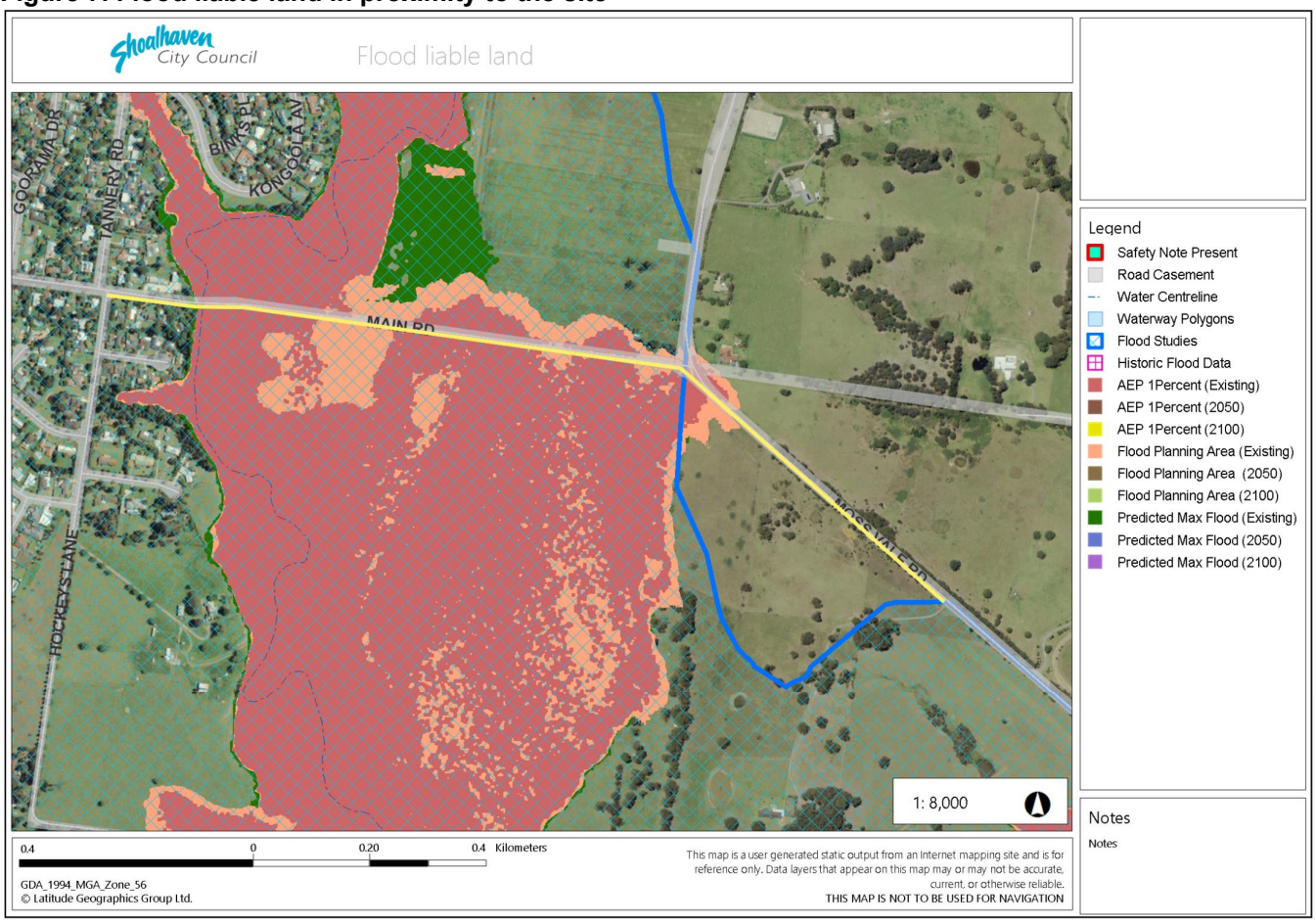
3.6 Flood liable land

Land within the site along Main Rd is mapped as being flood liable (refer to Figure 7).

The proposal is for the construction of subsurface water infrastructure. It is considered therefore, that the proposal will not change flood patterns or local flood behaviour, or lead to an increased risk associated with flooding.

Consultation under Part 2, Division 1 of the Infrastructure SEPP is therefore not required or warranted.

Figure 7. Flood liable land in proximity to the site



3.7 Riparian corridors

The site contains a Category 1 riparian corridor, associated with Good Dog Creek an intersecting the site towards the western end (refer to Figure 8).

The proposal involves minimal disturbance to the riparian corridor, involving pruning of trees (River She-Oak, Cheese Tree and Sweet Pittosporum) for access and temporary removal of the rock scour protection adjacent to the southern side of the bridge to a depth of 1.4m. The rock scour protection would subsequently be restored and vegetation left to regenerate.

The proposal would not involve removal of trees or significant vegetation from the banks of the creek or elsewhere within the corridor.

Works would therefore not compromise the integrity of the creek banks, nor the function of the riparian corridor in providing habitat connectivity.

Erosion and sediment controls would be installed to manage potential erosion in the vicinity of the creek.

Figure 8. Riparian corridors within and in proximity to the site

3.8 Other considerations

In the context of this environmental assessment, the area to be affected by the proposed activity:

- is not an Aboriginal Place in the context of the NSW National Parks and Wildlife Act 1974, nor is it known to contain Aboriginal artefacts
- is not mapped as "potentially contaminated land"
- is not mapped as having potential for Acid Sulfate Soils (the site is mapped as Class 5 A.S.S)

3.9 EP&A Regulation – Clause 228 matters of consideration

Clause 228(2) of the *Environmental Planning and Assessment Regulation 2000* lists the factors to be taken into account when consideration is being given to the likely impact of an activity on the environment under Part 5 of the EP&A Act. The following assessment in Table 5 deals with each of the factors in relation to the proposed activity.

Table 5. Clause 228 Matters of consideration

Does the proposal:	Assessment	Reason
a) Have any environmental impact on a community?	Positive	The proposal is to construct a water main and associated infrastructure as a water lead-in to the Moss Vale Rd URAs. The proposal is therefore for required infrastructure to facilitate provision of water to these urban release areas. The proposal would require minimal pruning and removal of native vegetation, with impact to native vegetation occurring primarily in previously cleared and modified areas which are now in stages of relatively early regeneration. The proposed activity would not have any impact on other community services and infrastructure such as water, waste management, educational, medical or social services.
b) Cause any transformation of a locality?	Negligible	The locality's current use would remain unchanged. The water main would be subsurface except where attached to the side of the bridge. Valves would be unobtrusive. Vegetation removal would be minimal and primarily in previously cleared and modified areas which are now in stages of relatively early regeneration.
c) Have any environmental impact on the	Low adverse	The five-part test of significance (Section 3.2) concludes that the proposed activity would not have a significant impact upon endangered ecological communities.

ecosystem of the locality?		No hollow-bearing trees, threatened flora species, rocky outcrops, caves or water bodies would be removed or otherwise impacted. Potential habitat within the rock scour protection of Good Dog Creek bridge would be removed temporarily and was shown to not be relied upon by microbat species (Section 3.2). No food resources critical to the survival of a particular species would be removed. Aquatic ecosystems are not likely to be affected by the proposed activity and there is not likely to be any long-term or long-lasting impact through the input of sediment and nutrient into the ecosystem. Environmental safeguards and mitigation measures (Section 7) would be employed to minimise risk of impacts.
d) Cause a diminution of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	Low adverse	Impact to the aesthetic, recreational, scientific and environmental values of the site would be temporary and not significant.
e) Have any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific, or social significance or other special value for present or future generations?	Low adverse	The site of the proposed activity has no significant aesthetic, architectural, cultural, historical or scientific values. As such, the proposed activity would have no significant impact on these items. No items in the vicinity of the work site which are listed on the State Heritage Register and the Shoalhaven Local environmental Plan would be impacted by the proposal. The site is not within an Aboriginal Place declared under the *National Parks and Wildlife Act 1974.* In accordance with the NSW Department of Environment, Climate Change and Water's Due Diligence Code of Practice, the proposed activity does not require an Aboriginal Heritage Impact Permit as harm to an Aboriginal object is unlikely.
f) Have any impact on the habitat of protected fauna (within the meaning of the	Low adverse	No important habitat would be removed or otherwise impacted as part of the proposal. Habitat corridors would not be severed. Barriers to fauna movement and new

Biodiversity Conservation Act 2016)?		threats to fauna would not be introduced. Mitigation measures (Section 7) will reduce risks further.
g) Cause any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?	Low adverse	The five-part test of significance, provided in Section 3.2 above, concludes that the proposed activity would not have a significant impact upon threatened fauna. No potentially important habitat or food resources for locally occurring threatened species would be removed or otherwise impacted by the proposal. No hollow-bearing trees, threatened flora species, rocky outcrops, caves, crevices or water bodies would be removed or otherwise impacted. Potential habitat within the rock scour protection of Good Dog Creek bridge would be removed temporarily and was shown to not be relied upon by microbat species (Section 3.2). No food resources critical to the survival of a particular species would be removed.
h) Have any long-term effects on the environment?	Negligible	The proposed activity would not use hazardous substances or use or generate chemicals which may build up residues in the environment. Minimal maintenance corridors (approx. 5m wide) would be retained long-term, but these are primarily in areas where vegetation growth is prevented (e.g. roadsides) and would not affect the potential for future significant habitat.
i) Cause any degradation of the quality of the environment?	Low-adverse	The environmental safeguards (Section 7) to be undertaken would minimise impacts and risks to the quality of the environment. No significant habitat would be removed or otherwise impacted. Works would be undertaken through previously cleared and modified land. The proposal would not intentionally introduce noxious weeds, vermin, or feral animals into the area or contaminate the soil.
j) Cause any risk to the safety of the environment?	Negligible	The proposal would involve trenching across relatively flat land.

		The proposal involves minimal disturbance to the riparian corridor, involving pruning of trees (River She-Oak, Cheese Tree and Sweet Pittosporum) for access and temporary removal of the rock scour protection adjacent to the southern side of the bridge to a depth of 1.4m. The rock scour protection would subsequently be restored and vegetation left to regenerate.
k) Cause any reduction in the range of beneficial uses of the environment?	Negligible	The site and local environment will remain unchanged.
l) Cause any pollution of the environment?	Negligible	The proposal would involve a temporary and local generation of noise. However, this is not anticipated to negatively affect any sensitive receivers such as schools, childcare centres and hospitals. It is unlikely that the activity (including the environmental impact mitigation measures) would result in water pollution, spillages, dust, odours, vibration or radiation. The proposal does not involve the use, storage or transportation of hazardous substances or the use or generation of chemicals which may build up residues in the environment.
m) Have any environmental problems associated with the disposal of waste?	Negligible	There would be no trackable waste, hazardous waste, liquid waste, or restricted solid waste as described in the NSW *Protection of the Environment Operations Act 1997*.
n) Cause any increased demands on resources (natural or otherwise) which are, or are likely to become, in short supply?	Low adverse	The amount of resources that would be used are not considered significant and would not increase demands on current resources such that they would become in short supply.
o) Have any cumulative environmental	Low adverse	The assessed low adverse or negligible impacts of the proposal are not likely to interact.

effect with other existing or likely future activities?		Mitigation measures (Section 7) shall be implemented to minimise the risk of cumulative environmental effects. Future development associated with the URAs will involve further vegetation clearing with associated environmental assessment. The current proposal would not affect any habitat corridor or reduce any significant vegetation.
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions	Low adverse	The proposed activity would have no effect on coastal processes including those projected under climate change conditions. The site of the proposal is not located in an identified coastal hazard area.

4. PERMISSIBILITY

Section 4.1 (Development that does not need consent) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) states that:

> *"If an environmental planning instrument provides that specified development may be carried out without the need for development consent, a person may carry the development out, in accordance with the instrument, on land to which the provision applies."*

In this regard, clause 125(1) of the NSW *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) provides that:

> *Development for the purpose of water reticulation systems may be carried out by or on behalf of a public authority without consent on any land.*

As the proposal does not require development consent, and as it constitutes an 'activity' for the purposes of Part 5 of the EP&A Act, being carried out by (or on behalf of) a public authority, environmental assessment under Part 5 of the EP&A Act is required. This REF provides this assessment.

A summary of other relevant legislation and permissibility is provided in Table 7 below.

Table 7. Summary of other relevant legislation and permissibility

NSW STATE LEGISLATION
***Environmental Planning and Assessment Act 1979* (EP&A Act)**
Permissible √ Not permissible ☐
Justification: The Infrastructure SEPP provides for the proposed works to be undertaken without development consent (refer above). In circumstances where development consent is not required, the environmental assessment provisions outlined in Part 5 of the Act are required to be complied with. This REF fulfils this requirement.
Shoalhaven Local Environmental Plan 2014 (SLEP)
Permissible √ Not permissible ☐
Justification: Under the SLEP the proposed activity may have required development consent. The provisions of SEPP Infrastructure, however, prevail over the SLEP where there is an inconsistency by virtue of Section 3.28 of the EP&A Act. Consequently, development consent is not required.

State Environmental Planning Policy (Coastal Management) 2018
Permissible √ Not permissible ☐
Justification: The proposed activity would be undertaken within an area which is not mapped for the purpose of the SEPP as *Coastal Use Area* and *Coastal Management Area*.
State Environmental Planning Policy (Koala Habitat Protection) 2019
Permissible √ Not permissible ☐
Justification: Development control provisions of the SEPP apply only in relation to a development application (Part 2 of the SEPP). The proposal would not remove or otherwise impact habitat that Koalas are likely to rely on.
Wilderness Act 1987
Permissible √ Not permissible ☐
Justification: The proposed activity is not located within a wilderness area declared under this Act.
Protection of the Environment Operations Act 1997
Permissible √ Not permissible ☐
Justification: The proposed activity does not constitute scheduled development work or scheduled activities as listed in Schedule 1 of the Act. The proposed activity therefore does not require an environmental protection licence.
***National Parks and Wildlife Act 1974* (NP&W Act)**
Permissible √ Not permissible ☐
Justification: • The proposed activity would not encroach into National Park estate. • The Act provides the basis for the legal protection and management of Aboriginal sites in NSW. Under Sections 86 and 90 of the Act it is an offence to disturb an Aboriginal object or knowlingly destroy or damage, or cause the destruction or damage to, an Aboriginal object or place, except in accordance with a permit of consent under section 87 and 90 of the Act.

- As there are no recorded sites or visible objects and as the site is on 'disturbed land', the Due Diligence Guidelines requires no further assessment as it is reasonable to conclude that there is a low probability of objects occurring in the area of the proposed activity and an AHIP is not required. Refer to Section 3.4 for more information.

Fisheries Management Act 1994

Permissible √ Not permissible ☐

Justification:

The proposed activity:

- would not affect declared aquatic reserves (Part 7, Division 2 of the Act);
- would not involve dredging or reclamation (Part 7, Division 3). Note that disturbance to Good Dog Creek would only involve temporary removal and subsequent reinstatement of rock scour protection. Sediment erosion controls shall be implemented to prevent sediment movement into the waterway. No dredging or machinery access into the creek would be involved;
- would not involve blocking the passage of fish (s.219);
- would not impact mangroves and marine vegetation (Part 7, Division 4);
- would not involve disturbance to gravel beds where salmon or trout spawn (s.208 of the Act);
- does not involve the release of live fish (Part 7, Division 7);
- does not involve the construction of dams and weirs (s.218);
- would not result in the blocking of the passage of fish;
- would not impact declared threatened species of endangered ecological communities (Part 7A);
- does not constitute a declared key threatening process (Part 7A); and
- would not use explosives in a watercourse (Clauses 70 and 71 of the *Fisheries Management (General) Regulation 2019).*

A Fisheries Permit is therefore not required

Heritage Act 1977

Permissible √ Not permissible ☐

Justification:

- The proposed activity would not disturb an item of state heritage significance.
- The Act also provides statutory protection to relics, archaeological deposits, artefacts or deposits. Section 139 to 146 of the Act require that excavation that is likely to contain, or is believed may contain, archaeological relics is undertaken in accordance with an excavation permit issued by the Heritage Council. The Act

defines an archaeological relic as "*any deposit, artefact, object or material evidence that:*

a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement; or
b) *is of state and local heritage significance"*

As the site has little to no archaeological potential, a permit is not required.

Biodiversity Conservation Act 2016

Permissible √ Not permissible ☐

Justification:

- The proposed activity is unlikely to have a significant impact on species and communities listed in the schedules of the Act (refer to Section 3.2).
- The proposed development is not within an area declared to be of "outstanding biodiversity value" as defined in the Act.
- The design and mitigation measures (Section 7) would ensure that no *serious and irreversible impacts on biodiverstiy values* (as defined by the BC Act) occur at the site of the proposed activity.

The proposed activity therefore is not deemed to be *likely to significantly affect threatened species* and an environmental impact statement (EIS) or a Biodiversity Development Assessment Report (BDAR) is not required.

It is also a defence to a prosecution for an offence under Part 2 of the Act (harming animals, picking plants, damaging the habitat of threatened species or ecological communities *etc*) if the work was essential for the carrying out of an activity by a determining authority within the meaning of Part 5 of the Environmental Planning and Assessment Act 1979 after compliance with that Part. The activity will not remove vegetation that is listed under Schedule 1 Threatened Species, Schedule 2 Threatened ecological communities and Schedule 6 Protected Plants. Therefore the activity is considered permissible as this REF has been prepared and determined in accordance with the EP&A Act.

Water Management Act 2000

Permissible √ Not permissible ☐

Justification:

- Local councils are exempt from s.91E(1) of the Act in relation to all controlled activites that they carry out in, on or under waterfront land (by virtue of clause 41 of the *Water Management (General) Regulation 2018.*

- The proposal would not interfere with the aquifer and therefore an interference licence is not required (s.91F).

COMMONWEALTH LEGISLATION

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EP&BC Act)

Permissible √ Not permissible ☐

Justification:

The proposed activity would not be undertaken on Commonwealth land and no matters of National Environmental Significance are likely to be significantly impacted by the proposed activity (Section 3.3). The proposed activity is therefore not a controlled action and does not require commonwealth referral.

Commonwealth *Native Title Act 1993*

Permissible √ Not permissible ☐

Justification:

All affected land comprises road reserves for which Council is the authority (refer to Section 1.3). Native Title has therefore been extinguished as a Previous Exclusive Possession Act – Freehold Title (Section 23B). Consultation or approval from native title claimants is therefore not required.

5. CONSULTATION WITH GOVERNMENT AGENCIES

5.1 Infrastructure SEPP

In consideration of the consultation requirements specified in the Infrastructure SEPP, the proposed activity:

- would not be undertaken on adjacent to land reserved under the *National Parks and Wildlife Act 1974* or in Zone E1 or in equivalent zones
- would not be undertaken within or adjacent to a marine park or aquatic reserve declared under the *Marine Estate Management Act 2014*
- would not be undertaken in the foreshore area within the meaning of the *Sydney Harbour Foreshore Authority Act 1998*
- does not comprise a fixed or floating structure in or over navigable waters
- is not a development for the purposes of an educational establishment, health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land.
- would not increase the amount of artificial light in the night sky and located on land within the dark sky region as identified on the dark sky region map
- would not be undertaken within Defence communications facility buffer (only relevant to the defence communications facility near Morundah)
- would not be undertaken on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*
- would be undertaken partially on land which is identified as flood liable (Section 3.6) however, the proposal is not a "*relevant provision"* as listed in clause 15AA(2) as the proposal would not change flood patterns or local flood behaviour, or lead to an increased risk associated with flooding. Consultation under Part 2, Division 1 of the Infrastructure SEPP is therefore not required or warranted.

The consultation requirements specified under Part 2 of the Infrastructure SEPP therefore do not apply.

6. COMMUNITY ENGAGEMENT

In accordance with Council's Community Engagement Policy, the proposal constitutes a *Local Area – Low Impact* activity which does not require any formal community engagement.

Notification via mail to properties whose frontage shall be affected along Main Rd and Moss Vale Rd shall be undertaken prior to commencement of works.

7. ENVIRONMENTAL SAFEGUARDS AND MEASURES TO MINIMISE IMPACTS

- Notification via mail to properties whose frontage shall be affected along Main Rd and Moss Vale Rd shall be undertaken prior to commencement of works.
- Erosion and sediment controls in accordance with the 'Blue Book' (Landcom 2004) shall be installed and maintained to prevent the entry of sediment into waterways i.e. water diversion, minimising disturbance, erosion control and rapid re-establishment. Erosion and sediment controls shall be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion is minimal.
- Disturbance to Good Dog Creek shall only involve temporary removal and subsequent reinstatement of rock scour protection. Sediment erosion controls shall be implemented to prevent sediment movement into the waterway. No dredging or machinery access into the creek is permitted.
- Native vegetation removal and pruning shall be undertaken only to the extent required to construct and maintain the proposed water infrastructure.
- Pruning of trees where required is to be undertaken in accordance with AS 4373-1996 "Pruning of Amenity Trees".
- Impact to the structural root zones of trees to be retained shall be avoided to every practical extent.
- Poorly developed hollows were noted in a mature Rough-barked Apple tree (shown in Photo 4) and several of the Coral Trees occurring along Main Rd. These trees were assumed outside the area of impact. In the event that any of these trees require removal (e.g. if impact to structural roots could not be avoided and would destabilise the tree), inspection of the hollow shall and further assessment be undertaken by Council's Environmental Officer, to ensure no harm to resident fauna and no impact to threatened species.
- In the event that any wildlife be significantly disturbed or injured during works, Council's Environmental Officers are to be contacted on 4429 3405, or if unavailable, Wildlife Rescue – South Coast should be contacted on 0418 427 214, to rescue and relocate the animal(s).
- Staff working at the site will be instructed to stop work immediately on identification of any suspected Aboriginal heritage artefact. If any objects are found, NSW Department of Planning, Industry and Environment (ph:131 555) shall be contacted.
- An asset form must be trimmed to file 44574E on commissioning of each facility within the proposed activity in accordance with POL15/8 Asset Accounting Policy section 3.1.4 and POL16/79 Asset Management Policy section 3.3. Asset forms are available are webpage http://sccintranet/AssetsWorks/TechnicalServices/AssetStrategy/AssetForms.aspx

8. SIGNIFICANCE EVALUATION & CONCLUSION

This Review of Environmental Factors has assessed the likely environmental impacts, in the context of Part 5 of the Environmental Planning and Assessment Act 1979, of a proposal by Shoalhaven City Council for the construction of a water main and associated infrastructure along Main Rd and Moss Vale Rd, Cambewarra, to provide a water lead-in for Moss Vale Rd URAs.

Shoalhaven City Council has considered the potential environmental effects of the proposal and the effectiveness and feasibility of measures for reducing or preventing detrimental effects. It is determined that:

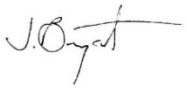
1. The proposed safeguards and mitigation measures identified in the report (Section 7) shall be adopted and implemented.
2. It is unlikely that there will be any significant environmental impact as a result of the proposed work and an Environmental Impact Statement is not required for the proposed works.
3. The proposed activity is not likely to significantly affect threatened species, populations or ecological communities, or their habitats and a Species Impact Statement / BDAR is not required.
4. No additional statutory approvals, licences, permits and external government consultations are required.

COUNCIL STRATEGY & ASSETS COMMITTEE 13 October 2020 - Item SA20.202
RESOLVED (Clr Proudfoot / Clr Gash) MIN20.756

That Council, after consideration of the Review of Environmental Factors (REF) for the Proposed Moss Vale Road URAs Part 1: Moss Vale Road Water Lead In project at Cambewarra, dated September 2020:
1. Determine that it is unlikely that there will be any significant environmental impact as a result of the proposed works and an Environmental Impact Statement is therefore not required for the proposed activity.
2. Adopt and implement the proposed mitigation measures and controls outlined in the REF.
3. That consideration be given to finishing the works with a gravel surface.

CARRIED

Document Review:

	Name	Signature	Date
Author:	Jeff Bryant		08/09/2020
Reviewed by:	Geoff Young		09/09/2020

9. REFERENCES

DECCW (Department of Environment, Climate Change and Water, NSW) 2010 Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales.

DoE (Department of Environment, Commonwealth of Australia). 2013. *Matters of National Environmental Significance Significant Impact Guidelines 1.1*. Available at: http://155.187.2.69/epbc/guidelines-policies.html

EES (Environment, Energy and Science – NSW Department of Planning, Industry and the Environment). 2020. *Surveying threatened plants and their habitats*.

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Klaphake, V. 2010. Eucalypts of the Sydney region (2nd edn.). Van Klaphake: Byabarra, NSW.

Morcombe, M. 2004. *Field Guide to Australian Birds*. Steve Parish Publishing, Australia.

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OEH (NSW Office of Environment and Heritage). 2017b. *Southern Myotis – profile*. Available at: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10549

APPENDIX A

“Moss Vale Potable Water Main”

Drawings SK01 – SK06 by Cardno Pty Ltd

(layout plan with longitudinal sections)

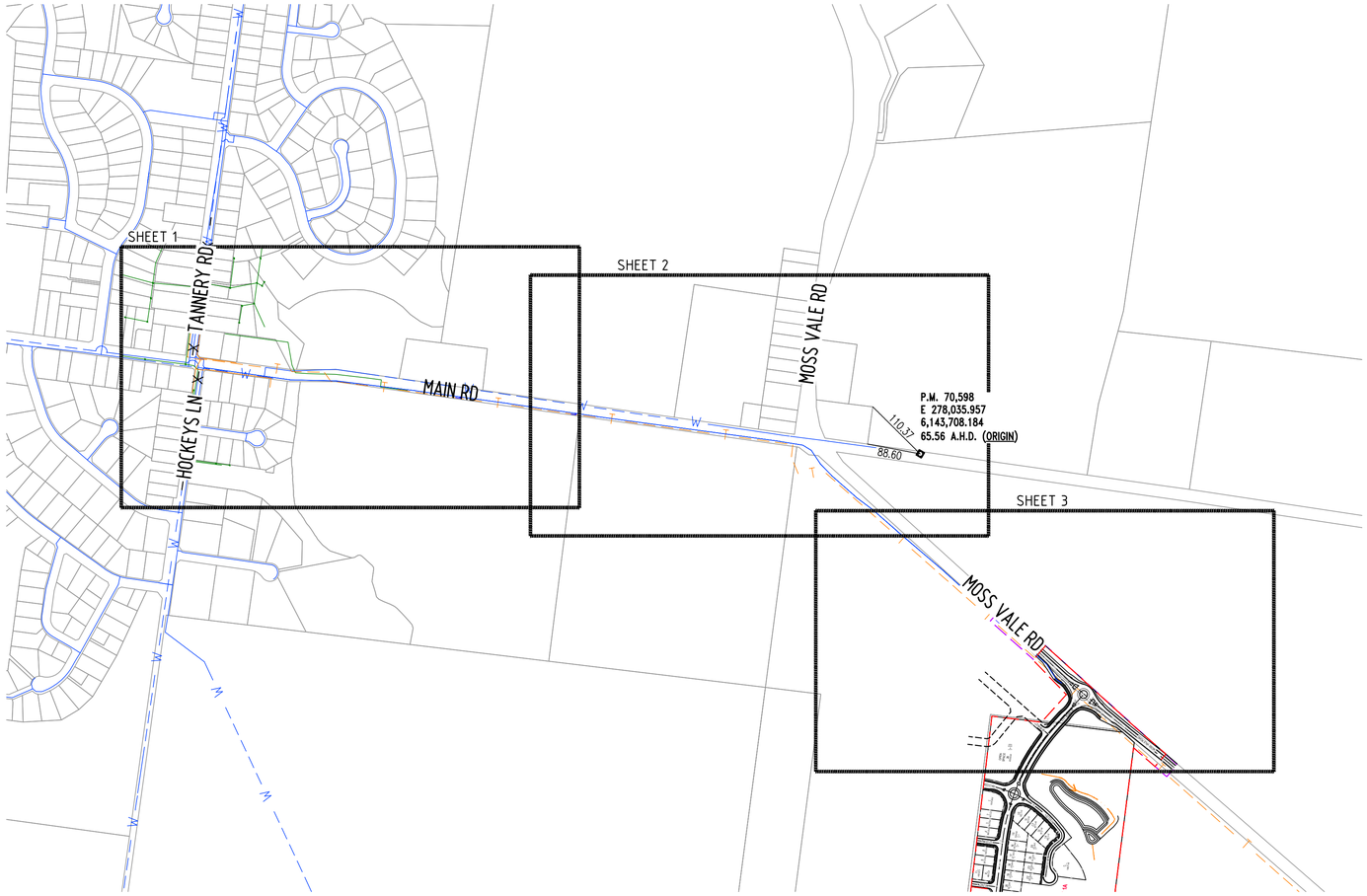
Council reference: D20/402471

See also:

“Moss Vale Potable Water Main”

Drawings SK05 (Rev A) and SK06 (Rev A) by Cardno Pty Ltd

Council reference: D20/406054



LOCALITY PLAN
NOT TO SCALE

DRAWING LIST	
DRAWING No.	DESCRIPTION
SK-01	LOCALITY PLAN AND DRAWING LIST
SK-02	WATER CONSTRUCION NOTES
SK-03	LAYOUT PLAN - SHEET 1 OF 3
SK-04	LAYOUT PLAN - SHEET 2 OF 3
SK-05	LAYOUT PLAN - SHEET 3 OF 3
SK-06	LONGITUDINAL SECTION - SHEET 1 OF 3
SK-07	LONGITUDINAL SECTION - SHEET 2 OF 3
SK-08	LONGITUDINAL SECTION - SHEET 3 OF 3

ADDRESS - STAGE #

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

No.	AMENDMENT DESCRIPTION	BY	DATE
1		##	

No.	REVISION DETAILS	DWN	DATE
A	PRELIMINARY ISSUE	AM	24/07/20

CONSULTANT DETAILS:
CARDNO

Shoalhaven Council's Water Utility
WATER
City Administrative Centre
PO Box 42, Nowra, NSW 2541
Ph 02 4429 3111
www.shoalwater.nsw.gov.au

SURVEYED:	DATE:	COMPANY:	
DESIGNED: MK	DATE: 24/07/20	COMPANY: CARDNO	
DRAWN: LM/AM	DATE: 24/07/20	COMPANY: CARDNO	
CHECKED:	DATE:	COMPANY:	
APPROVED:	DATE:	COMPANY:	

SIZE: A1 | SCALE FACTOR: N.T.S. | CO-ORDINATE SYSTEM: MGA Zone 56 | HEIGHT DATUM: AHD

TITLE:
MOSS VALE POTABLE WATER MAIN

POTABLE WATER - LOCALITY PLAN AND DRAWING LIST

CONSULTANT REFERENCE No.	INDEX No.	DRAWING No.	SHEET	REV No.
	xxxxx	SK-01	1	A

Plotted: 24/07/20 - 10:49 CAD File: \\cardno.corp\global\AU\NSW\DirectoryStructure\Projects\820\FY20\197_Moss Vale Rd Concept Design\Des-An_General\Watermain Alignment.dwg

0 10 20 30 40 50 60 70 80 90 100 mm on original

WATER CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE WORK HEALTH AND SAFETY ACT 2011, WHICH REQUIRES EMPLOYERS TO ENSURE THE HEALTH, SAFETY AND WELFARE OF EMPLOYEES.
2. THE CONTRACTOR SHALL AT ALL TIME EXERCISE ALL NECESSARY PRECAUTIONS APPROPRIATE TO ENSURE THE SAFETY OF ALL PERSONS ON THE WORK SITE OR IN THE VICINITY OF THE WORK SITE.
3. PRIOR TO COMMENCING WORK ON SITE THE CONTRACTOR SHALL GIVE ALL NECESSARY NOTIFICATIONS AS REQUIRED AND SHALL PROVIDE TO THE SUPERINTENDENT SATISFACTORY EVIDENCE TO SUCH EFFECT.
4. PRIOR TO COMMENCING WORK ON SITE THE CONTRACTOR SHALL PROVIDE TO THE SUPERINTENDENT EVIDENCE THAT THE CONTRACTOR HAS CURRENT PUBLIC RISK (LIABILITY) AND WORKERS COMPENSATION INSURANCE POLICIES.
5. THE CONTRACTOR SHALL GIVE NOT LESS THAN 4 DAYS NOTICE TO THE SUPERINTENDENT AND THE SHOALHAVEN WATER MANAGER PRIOR TO ORGANISING A PRE-COMMENCEMENT MEETING ON THE SITE.
6. NOTWITHSTANDING ANY OTHER PROVISIONS THE CONTRACTOR SHALL ARRANGE FOR THE WORK TO BE INSPECTED BY THE SUPERINTENDENT AND/OR THE SHOALHAVEN WATER INSPECTOR AT THE FOLLOWING STAGES:

a. AFTER LAYING OF PIPES ON 100MM SAND BEDDING AND PRIOR TO COMPLETION OF SAND BACKFILL.
b. AFTER SAND BACKFILL TO 150MM OVER PIPES AND PRIOR TO COMPLETION OF BACKFILL.
c. PRIOR TO POURING OF THRUST BLOCKS.
d. AFTER INSTALLATION OF UNDER-ROAD CONDUITS PRIOR TO BACKFILLING.
e. DURING THE DISINFECTION AND PRESSURE TESTING OF WATER MAINS.
f. AT PRACTICAL COMPLETION, AFTER SUPPLY OF WORK-AS-EXECUTED PLANS.
g. AT THE END OF THE SIX MONTH MAINTENANCE PERIOD.
h. AT ANY OTHER SPECIFIED STAGE OF THE WORKS AS REQUIRED BY COUNCIL'S INSPECTOR.

7. WATER MAINS TO BE CLASS 16, SERIES II, RRJ MPVC TO AS/NZS 4765 OR OPVC TO AS/NZS 4441, UNLESS OTHERWISE SPECIFIED ON PLAN. PIPES TO BE LIGHT BLUE IN COLOUR.
8. WATER MAINS LOCATED WITHIN EASEMENTS ACROSS PRIVATE ALLOTMENTS TO BE CLASS K9 DUCTILE IRON CEMENT LINED (DICL) RRJ PIPES.
9. WATER MAINS ARE TO BE LOCATED IN ROAD RESERVES 2.4 METRES FROM THE PROPERTY BOUNDARY, IN EASEMENTS 1.5M FROM THE PROPERTY BOUNDARY, OR AS SHOWN OTHERWISE ON THE PLAN.
10. WATER MAIN IS TO HAVE A MINIMUM COVER OF 600MM FROM THE DESIGN FINISHED SURFACE IN NON-TRAFFICABLE AREAS INCLUDING FOOTPATHS, 600MM IN SEALED TRAFFICABLE AREAS, AND 750MM IN ALL UNSEALED TRAFFICABLE AREAS.
11. WHERE THE WATER MAIN IS TO BE CONSTRUCTED IN AREAS OF FILL, THE CONTRACTOR IS TO ENSURE THAT THE FOOTPATH IS TRIMMED AND COMPACTED PRIOR TO CONSTRUCTION OF THE MAIN.
12. DETECTABLE TRACER TAPE TO BE PROVIDED ON TOP OF THE PIPE EMBEDMENT MATERIAL OR 1.0 METRE BELOW THE FINISHED SURFACE LEVEL, WHICHEVER IS THE HIGHER. DETECTABLE TAPE IS TO BE GREEN IN COLOUR WITH THE INSCRIPTION "CAUTION – WATER MAIN BURIED BELOW", 100MM WIDE POLYTHENE TAPE WITH 316 STAINLESS STEEL WIRE INSERT.
13. ALL VALVES, FITTINGS AND BENDS SHALL BE NYLON OR FUSION BONDED EPOXY (FBE) COATED TO AS/NZS 4158.
14. ALL VALVES ARE TO BE CLASS 16, NON-RISING SPINDLE, CLOCKWISE CLOSING RESILIENT SEATED AND MANUFACTURED TO AS 2638.
15. ALL SPRING HYDRANTS TO BE AT A DEPTH OF NO GREATER THAN 300MM BELOW FINISHED GROUND SURFACE.
16. ALL HYDRANT AND STOP VALVE COVERS ARE TO BE LEFT PROTRUDING 50MM (MINIMUM) ABOVE THE FINISHED GROUND SURFACE LEVEL. THIS IS TO ALLOW FOR GRASS GROWTH AROUND THE HYDRANT AND STOP VALVE COVERS.
17. ALL FLANGED FITTINGS ARE TO BE FASTENED WITH MARINE GRADE (316) STAINLESS STEEL NUTS, BOLTS AND WASHERS.
18. CONCRETE THRUST BLOCKS ARE TO BE PROVIDED AT ALL BENDS, TEES, TAPERS AND END CAPS IN ACCORDANCE WITH SHOALHAVEN WATER'S "WATER RETICULATION SPECIFICATIONS AND CONSTRUCTION STANDARDS".
19. ROAD CROSSING CONDUITS ARE TO BE LOCATED IN THE POSITION AS SHOWN ON THE PLAN TO COUNCIL'S STANDARD DRAWING (W20857-01C & 21755-29D) USING 40MM DIAMETER SWV OR CLASS 12 UPVC CONDUITS (RESIDENTIAL) OR 100MM UPVC CONDUIT FOR INDUSTRIAL/COMMERCIAL SUBDIVISION, UNLESS OTHERWISE SPECIFIED ON PLAN.
20. ALL CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH THE DRAWINGS, WITH WATER SERVICES ASSOCIATION OF AUSTRALIA "WATER SUPPLY CODE OF AUSTRALIA" WSA03-2011 V3.1 AND SHOALHAVEN WATER'S SUPPLEMENT TO THE WATER SERVICES ASSOCIATION OF AUSTRALIA "WATER SUPPLY CODE OF AUSTRALIA" WSA03-2011 V3.1. THESE NOTES AND ANY OTHER REQUIREMENTS OF SHOALHAVEN WATER AND THE SUPERINTENDENT.
21. SEDIMENT AND EROSION CONTROL MEASURES ARE TO BE IMPLEMENTED PRIOR TO CONSTRUCTION WORK COMMENCING AND MAINTAINED DURING THE CONSTRUCTION PHASE. SEDIMENT AND EROSION CONTROL MEASURES ARE TO INCORPORATE THOSE AS DETAILED ON THE SEDIMENT AND EROSION CONTROL PLAN INCLUDED IN THE ROAD AND DRAINAGE PLANS. MEASURES SHOULD ALSO INCORPORATE THOSE AS SET OUT IN COUNCIL'S STANDARD ANNEXURE "EROSION CONTROL MEASURES FOR WORK UNDERTAKEN BY CONTRACTORS DURING THE INSTALLATION OF UTILITY SERVICES".
22. INTERCONNECTIONS AND 'CUT-INS' INTO COUNCIL'S EXISTING WATER MAINS ARE TO BE UNDERTAKEN BY SHOALHAVEN WATER STAFF AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR IS TO SUPPLY ALL FITTINGS AND MATERIALS FOR THOSE WORKS (INCLUDING PLANT AND SUPPORTING LABOUR) AS DIRECTED BY SHOALHAVEN WATER.
23. INTERCONNECTION WORKS WILL NOT TAKE PLACE UNTIL SUCH TIME AS ALL PROPOSED CONSTRUCTION IS COMPLETED, BACKFILLED AND SATISFACTORILY TESTED.
24. SAND BACKFILL COMPACTED IN 300MM LAYERS (MAXIMUM TO THE TOP OF THE TRENCH (UNDERSIDE OF ROAD BASE) IS TO BE PROVIDED FOR THE PROPOSED ROAD CROSSINGS. THIS IS TO EXTEND A MINIMUM OF 1.0 METRE PAST THE BACK OF THE KERB AND GUTTER.
25. HYDRANT COVERS ARE TO BE INSTALLED IN AN ORIENTATION WHERE THE NEAREST ONCOMING TRAFFIC WILL STRIKE THE COVERS CLOSED, OR AS DIRECTED BY SHOALHAVEN WATER'S INSPECTOR.
26. BLUE 'CATS-EYE' REFLECTIVE MARKERS TO BE FIXED IN THE CENTRE OF ROADWAYS POINTING TO THE HYDRANT LOCATION OR AS DIRECTED BY SHOALHAVEN WATER.
27. THE CONTRACTOR IS TO GAIN APPROVAL UNDER SECTION 138 OF THE ROADS ACT 1993 PRIOR TO COMMENCING CONSTRUCTION WITHIN ALL ROAD RESERVES.
28. THE CONTRACTOR SHALL WORK ONLY WITHIN THE HOURS FROM 7:00AM-5:00PM MONDAY TO FRIDAY EXCLUDING PUBLIC HOLIDAYS. ANY WORK OUTSIDE THESE HOURS BY ARRANGEMENT WITH SHOALHAVEN WATER.
29. THE CONTRACTOR SHALL ENSURE THAT THE RESIDENTS ADJACENT TO THE CONSTRUCTION ZONE ARE NOT AFFECTED BY DUST OR UNDUE NOISE DURING CONSTRUCTION AND ARE NOT DEPRIVED OF ALL WEATHER ACCESS NOR ARE SUBJECTED TO ADDITIONAL STORMWATER RUNOFF.
30. THE CONTRACTOR SHALL NOT DISTURB ANY SURVEY CONTROL MARKS. SHOULD ANY SURVEY CONTROL MARK BE DISTURBED OR OBLITERATED, THE CONTRACTOR SHALL NOTIFY THE SUPERINTENDENT IMMEDIATELY. THE CONTRACTOR SHALL HAVE THE MARKS REPLACED AT HIS EXPENSE.
31. THE CONTRACTOR IS TO ENSURE THAT MPVC PIPES ARE NOT DEFLECTED BY MORE THAN THE MINIMUM BENDING RADIUS OF 300 TIMES THE NOMINAL PIPE DIAMETER. 100MM PIPE, FOR EXAMPLE SHALL NOT BE BENT TO A RADIUS LESS THAN 30 METRES.
32. THE CONTRACTOR IS TO LOCATE AND LEVEL ALL SERVICES PRIOR TO PROCEEDING. IF A CONFLICT ARISES THE CONTRACTOR IS TO IMMEDIATELY NOTIFY THE SUPERINTENDENT. RECORDS OF SERVICE LOCATION ARE TO BE SUBMITTED TO THE SUPERINTENDENT AT THE COMPLETION OF THE WORKS.
33. THE CONTRACTOR SHALL PROVIDE ALL LABOUR, MATERIALS AND EQUIPMENT NECESSARY FOR THE ACCURATE SETTING OUT OF THE ENTIRE WORKS. THE CONTRACTOR SHALL ENSURE THE PIPES ARE LAID TO CORRECT INVERT LEVELS.
34. ALL FILLING THAT TAKES PLACE OVER THE SITE IS TO BE IN ACCORDANCE WITH 'ENGINEER DESIGN SPECIFICATIONS, DCP 100 SECTION D6'. THE COMPACTION TEST RESULTS SHALL BE FORWARDED TO SHOALHAVEN WATER UPON COMPLETION.
35. ALL SERVICES SHALL BE LOCATED PRIOR TO THE COMMENCEMENT OF EXCAVATION.
36. AT ALL POINTS IN THE PIPELINE (EG, BENDS, TEES, TAPERS, VALVES, ETC) WHERE THERE WILL BE UNBALANCED FORCES RESULTING FROM INTERNAL WATER PRESSURE SHALL REQUIRE THRUST RESTRAINT TO ENSURE NO MOVEMENT OF THE PIPELINE WHEN IN SERVICE.

POLYETHYLENE WATERMAINS

37. ALL POLYETHYLENE (PE) WATERMAINS SHALL BE DESIGNED AND INSTALLED IN ACCORDANCE WITH THE WATER SERVICES ASSOCIATION OF AUSTRALIA POLYETHYLENE PIPELINE CODE (WSA01-2004).
38. PE PIPE SHALL COMPLY WITH AS/NZS 4130.
39. FITTINGS USED ON PE PIPE SHALL COMPLY WITH AS 2129.
40. THE PE COMPOUND SHALL BE PE100 AND SHALL COMPLY WITH AS/NZS 4131.
41. PIPE SIZES HAVE BEEN SELECTED IN ACCORDANCE WITH TABLE 2.1 OF WSA01-2004 TO BE EQUIVALENT TO SERIES 2 CLASS 16 PVC PRESSURE PIPE TO AS/NZS 1477.
42. PE MAY BE COLD BENT TO A MINIMUM RADIUS OF 30 X OD. STAKES OR OTHER SOURCES OF POINT LOADS SHALL NOT BE USED TO ASSIST IN BENDING THE PIPE.
43. ALLOWANCE SHALL BE MADE DURING CONSTRUCTION FOR EXPANSION AND CONTRACTION OF PE PIPE DUE TO TEMPERATURE CHANGES.
44. THE PRESSURE RATING OF PE PIPES AND FITTINGS HAVE BEEN DETERMINED IN ACCORDANCE WITH SECTION 2.5 OF WSA01-2004 AND AS/NZS 4130.
45. PE PIPE SHALL BE BLACK PIPE WITH BLUE STRIPES.
46. PE PIPE AND FITTINGS SHALL BE STORED ON SITE IN ACCORDANCE WITH SECTION 2.7 OF WSA01-2004.
47. INSTALLATION OF PE PIPE SHALL BE IN ACCORDANCE WITH AS/NZS 2566.2.
48. DETECTABLE TRACER TAPE SHALL BE PROVIDED ON TOP OF THE PIPE EMBEDMENT MATERIAL OR 1.0 METRE BELOW THE FINISHED SURFACE LEVEL, WHICHEVER IS HIGHER. DETECTABLE TAPE SHALL BE GREEN IN COLOUR WITH THE INSCRIPTION "CAUTION – WATER MAIN BELOW", 100MM WIDE PE TAPE WITH 316 STAINLESS STEEL WIRE INSERT.
49. JOINTING SHALL BE BY BUTT-FUSION WELDING METHOD UNLESS NOTED OTHERWISE.
50. BUTT-FUSION WELDERS SHALL BE CERTIFIED AND ACCREDITED IN ACCORDANCE WITH SECTION 5.2 OF WSA01-2004.
51. PRE-QUALIFICATION OF THE BUTT-FUSION WELDING TECHNIQUE SHALL BE OBTAINED FROM SHOALHAVEN WATER, PRIOR TO COMMENCEMENT OF WORKS. REFER TO SECTION 2.12 OF WSA01-2004.
52. TESTING OF WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH SECTION 2.13 OF WSA01.2001 AND SECTION 6 OF AS/NZS2566.2.2002 (APPENDIX M) AS PER FIELD HYDROSTATIC TESTING FOR PRESSURE PIPELINES.
53. ALL FLANGE BACKING PLATES, NUTS & BOLTS ARE TO BE 316 STAINLESS STEEL.
54. ALL PE CONNECTIONS TO HAVE 316 STAINLESS STEEL BACKING PLATE AND PE STUB FLANGE WELDED TO THE MAIN.

ADDRESS – STAGE #

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

No.	AMENDMENT DESCRIPTION	BY	DATE
1		##	

No.	REVISION DETAILS	DWN	DATE
A	PRELIMINARY ISSUE	AM	24/07/20

CONSULTANT DETAILS:
CARDNO

SIZE: A1 | SCALE FACTOR: N.T.S. | CO-ORDINATE SYSTEM: MGA Zone 56 | HEIGHT DATUM: AHD

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DESIGNED:	MK	DATE: 24/07/20	COMPANY: CARDNO
DRAWN:	LM/AM	DATE: 24/07/20	COMPANY: CARDNO
CHECKED:	DATE:	COMPANY:	
APPROVED:	DATE:	COMPANY:	

TITLE:
MOSS VALE POTABLE WATER MAIN

POTABLE WATER - WATER CONSTRUCTION NOTES

CONSULTANT REFERENCE No.	INDEX No.	DRAWING No.	SHEET	REV No.
	xxxxx	SK-02	1	A

100 mm on original

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LEGEND

PROPOSED
- WATER MAIN
- V — VALVE
- AV — AIR VALVE
- SCV — SCOUR VALVE
- HYD — HYDRANT

EXISTING
- W — WATER MAIN
- W — AIR VALVE
- W — HYDRANT
- SR — SEWER RISING MAIN
- S — GRAVITY SEWER
- S — SEWER MANHOLE
- T — TELSTRA

LAYOUT PLAN
SCALE 1:1000

No.	AMENDMENT DESCRIPTION	BY	DATE
1		##	

No.	REVISION DETAILS	DWN	DATE
A	PRELIMINARY ISSUE	AM	24/07/20

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

CONSULTANT DETAILS:
CARDNO

1:1000 0 50 100m

SIZE: A1 | SCALE FACTOR: N.T.S. | CO-ORDINATE SYSTEM: MGA Zone 56 | HEIGHT DATUM: AHD

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DESIGNED:	MK	24/07/20	CARDNO
DRAWN:	LM/AM	24/07/20	CARDNO
CHECKED:			
APPROVED:			

TITLE:
MOSS VALE POTABLE WATER MAIN

POTABLE WATER - LAYOUT PLAN

SHEET 1 OF 3

CONSULTANT REFERENCE No.	INDEX No.	DRAWING No.	SHEET	REV No.
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100 mm on original

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LAYOUT PLAN
SCALE 1:1000

LEGEND

PROPOSED
- WATER MAIN
- V — VALVE
- AV — AIR VALVE
- SCV — SCOUR VALVE
- HYD — HYDRANT

EXISTING
- W — WATER MAIN
- W — AIR VALVE
- W — HYDRANT
- SR — SEWER RISING MAIN
- S — GRAVITY SEWER
- S — SEWER MANHOLE
- T — TELSTRA

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

No.	AMENDMENT DESCRIPTION	BY	DATE
1		##	

No.	REVISION DETAILS	DWN	DATE
A	PRELIMINARY ISSUE	AM	24/07/20

CONSULTANT DETAILS:
CARDNO

1:1000 0 50 100m

SIZE: A1 | SCALE FACTOR: N.T.S. | CO-ORDINATE SYSTEM: MGA Zone 56 | HEIGHT DATUM: AHD

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CHECKED:			
APPROVED:			

TITLE:
MOSS VALE POTABLE WATER MAIN

POTABLE WATER - LAYOUT PLAN

SHEET 2 OF 3

CONSULTANT REFERENCE No.	INDEX No.	DRAWING No.	SHEET	REV No.
	xxxxx	SK-04	3	A

100 mm on original

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LAYOUT PLAN
SCALE 1:1000

LEGEND

PROPOSED
- WATER MAIN
- V — VALVE
- AV — AIR VALVE
- SCV — SCOUR VALVE
- HYD — HYDRANT

EXISTING
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- W — HYDRANT
- SR — SEWER RISING MAIN
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PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

No.	AMENDMENT DESCRIPTION	BY	DATE
1		##	
A	PRELIMINARY ISSUE	AM	24/07/20
No.	REVISION DETAILS	DWN	DATE

CONSULTANT DETAILS:
CARDNO

1:1000 0 50 100m

SIZE: A1 | SCALE FACTOR: N.T.S. | CO-ORDINATE SYSTEM: MGA Zone 56 | HEIGHT DATUM: AHD

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APPROVED:			

TITLE:
MOSS VALE POTABLE WATER MAIN

POTABLE WATER - LAYOUT PLAN

SHEET 3 OF 3

CONSULTANT REFERENCE No.	INDEX No.	DRAWING No.	SHEET	REV No.
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100 mm on original

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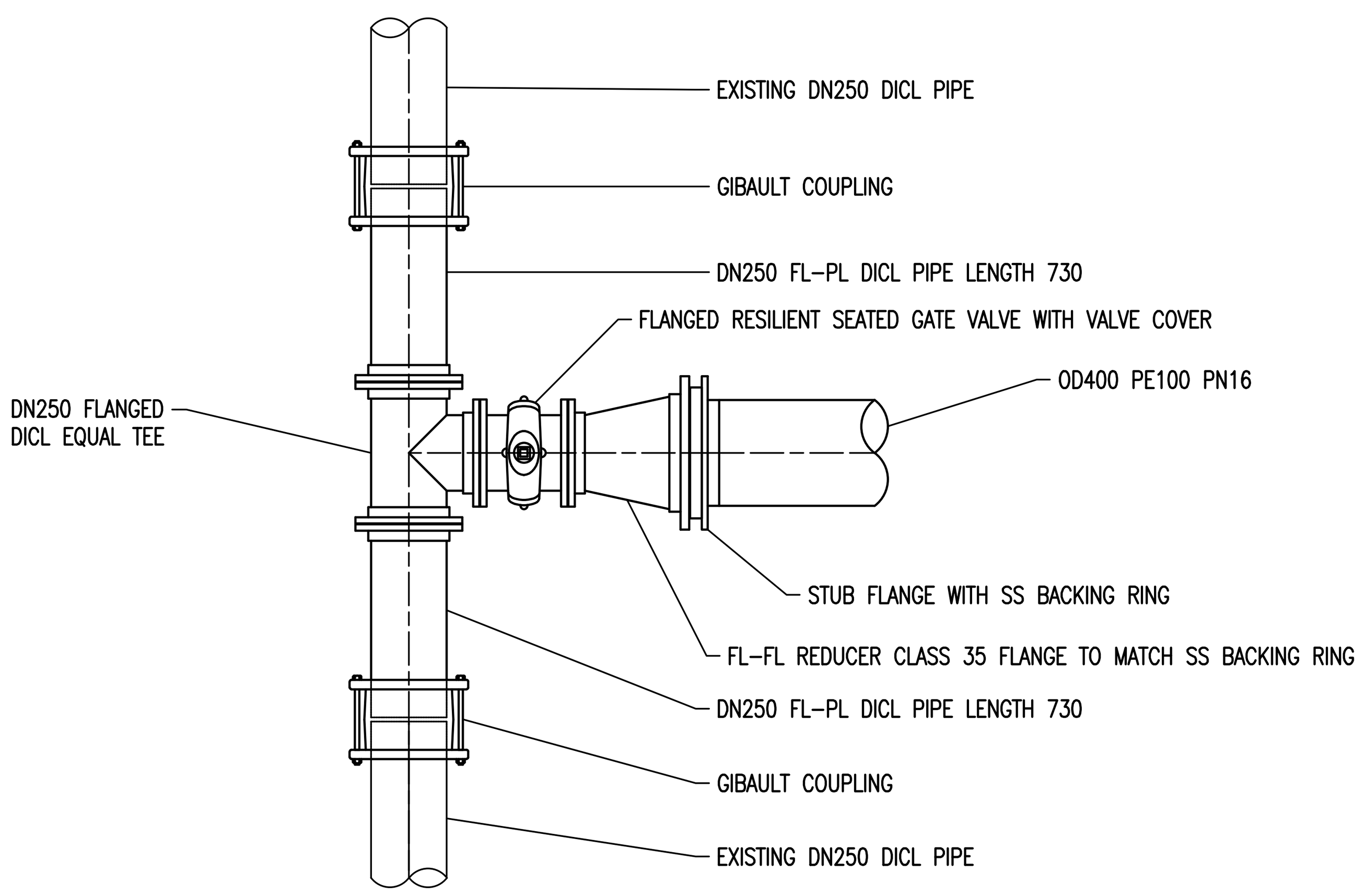
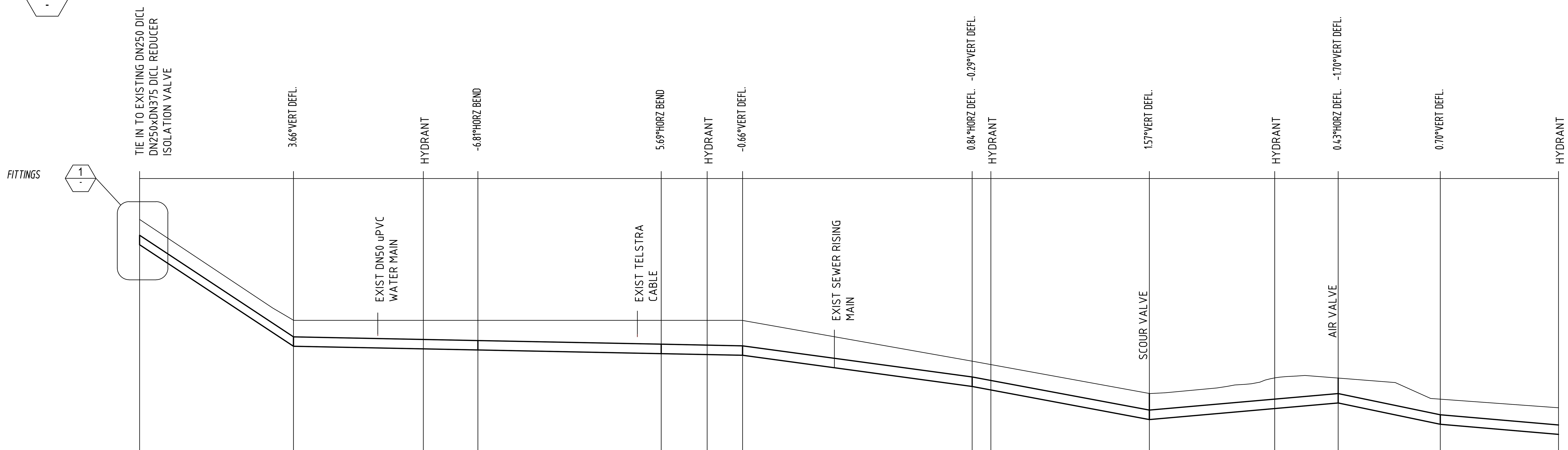


DETAIL 1 / -
SCALE 1:25



PIPE SIZE & MATERIAL: OD400 PE100 PN16

GRADE: -6.61% | -0.20% | -0.20% | -0.20% | -1.36% | -1.87% | 0.88% | -2.09% | -0.86%

DATUM 52

DEPTH TO INVERT (P.F.S.L.)	1.07	1.10		1.26	1.41		1.47	1.07		1.10		1.06	1.06	1.13
INVERT LEVEL	63.20	58.90		58.74	58.59		58.52	57.20		55.80		56.50	55.60	55.17
PROPOSED FINISHED SURFACE LEVELS (P.F.S.L.)	64.27	60.00		60.00	60.00		59.99	58.27		56.90		57.56	56.66	56.30
CHAINAGE	0.00	65.10	120.00	143.05	220.56	240.00	255.00	352.05	360.00	427.00	480.00	506.86	550.00	600.00

LONGITUDINAL SECTION

1:1000 HORIZONTAL
1:100 VERTICAL

ADDRESS - STAGE #

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

No.	AMENDMENT DESCRIPTION	BY	DATE
1		##	

No.	REVISION DETAILS	DWN	DATE
A	PRELIMINARY ISSUE	AM	24/07/20

CONSULTANT DETAILS: CARDNO

SIZE: A1 | SCALE FACTOR: N.T.S. | CO-ORDINATE SYSTEM: MGA Zone 56 | HEIGHT DATUM: AHD

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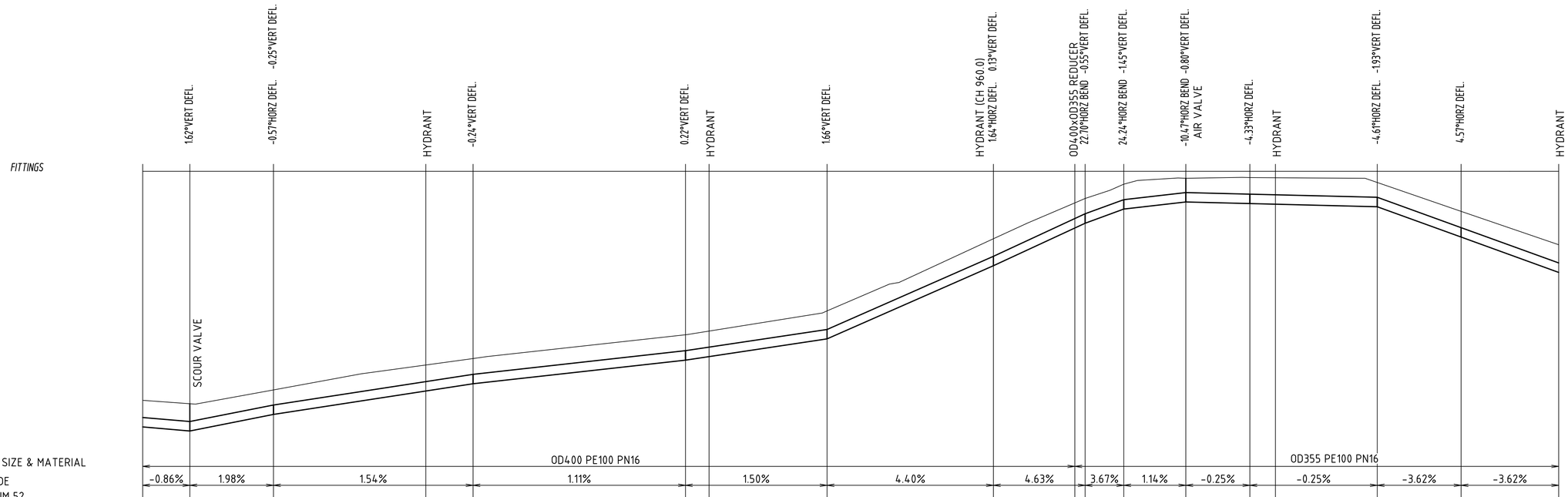
SURVEYED:			
DESIGNED:	AM	24/07/20	CARDNO
DRAWN:	AM	24/07/20	CARDNO
CHECKED:			
APPROVED:			

TITLE:
MOSS VALE POTABLE WATER MAIN
POTABLE WATER - LONGITUDINAL SECTION
SHEET 1 OF 3

CONSULTANT REFERENCE No.	INDEX No.	DRAWING No.	SHEET	REV No.
	XXXXX	SK-06	5	A



DEPTH TO INVERT (P.F.S.L.)	1.13	1.16	1.04		1.07		1.08		1.19	1.14		1.05	1.05	1.00	1.10		1.03	1.09	1.17
INVERT LEVEL	55.17	55.00	55.70		57.00		58.00		58.90	62.00		63.80	64.40	64.70	64.63		64.50	63.22	61.72
PROPOSED FINISHED SURFACE LEVELS (P.F.S.L.)	56.30	56.16	56.74		58.07		59.08		60.09	63.14		64.85	65.45	65.70	65.73		65.53	64.30	62.89
CHAINAGE	600.00	620.00	655.43	720.00	740.00	830.00		840.00	890.00	960.50	1050.00	999.37	1015.72	1042.01	1069.15	1080.00	1123.13	1158.65	1200.00

LONGITUDINAL SECTION

1:1000 HORIZONTAL
1:100 VERTICAL

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

No.	AMENDMENT DESCRIPTION	BY	DATE
1		##	
A	PRELIMINARY ISSUE	AM	24/07/20
No.	REVISION DETAILS	DWN	DATE

CONSULTANT DETAILS:
CARDNO

1:1000 0 50 100m

SIZE: A1 | SCALE FACTOR: N.T.S. | CO-ORDINATE SYSTEM: MGA Zone 56 | HEIGHT DATUM: AHD

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APPROVED:	DATE:	COMPANY:	

TITLE:
MOSS VALE POTABLE WATER MAIN

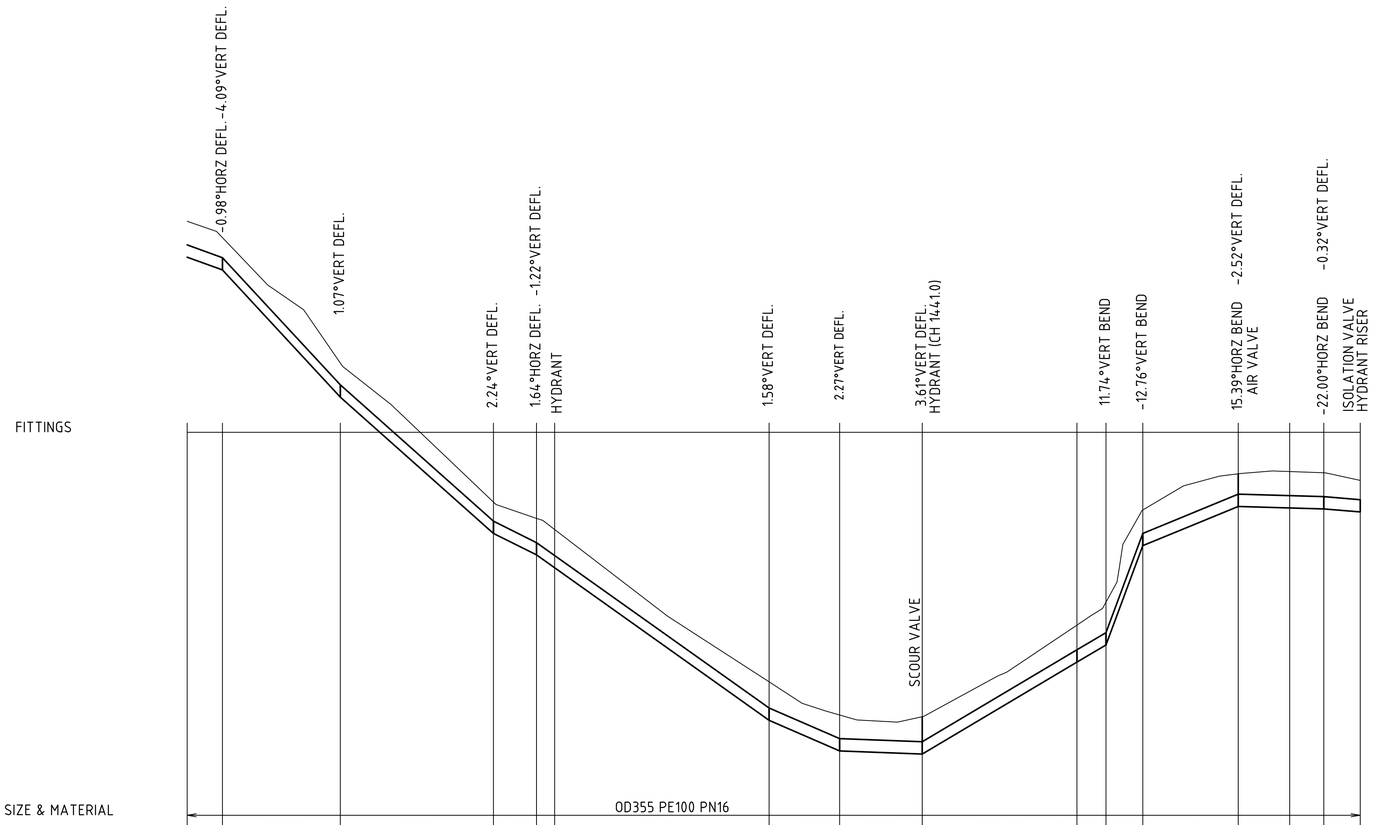
POTABLE WATER - LONGITUDINAL SECTION

SHEET 2 OF 3

CONSULTANT REFERENCE No.	INDEX No.	DRAWING No.	SHEET	REV No.
	xxxxx	SK-07	6	A

100 mm on original

Plotted: 24/07/20 - 10:38 CAD File: \\cardno.corp\global\AU\NSW\DirectoryStructure\Projects\820\FY20\197_Moss Vale Rd Concept Design\Des-An_General\Watermain Long Sections.dwg



FITTINGS

PIPE SIZE & MATERIAL: OD355 PE100 PN16

GRADE: -3.62% | -10.79% | -8.90% | -4.97% | -7.11% | -4.34% | -0.37% | 5.94% | 5.89% | 27.01% | 4.11% | -0.29% | -0.84%

DATUM 42

DEPTH TO INVERT (P.F.S.L.)	1.17	1.06	1.11	1.03	1.19	1.25	1.17	1.22	1.21	1.40	1.17	1.07		1.18	1.03	
INVERT LEVEL	61.72	61.30	57.15	52.70	52.00	46.60	45.60	45.50	48.50	49.06	52.30	53.58		53.50	53.40	
PROPOSED FINISHED SURFACE LEVELS (P.F.S.L.)	62.89	62.36	58.26	53.73	53.19	47.85	46.77	46.72	49.71	50.45	53.47	54.65		54.68	54.43	
CHAINAGE	1200.00	1211.55	1250.00	1300.00	1314.07	1320.00	1390.00	1413.03	1440.00	1490.51	1500.00	1512.00	1543.17	1560.00	1571.13	1583.00

LONGITUDINAL SECTION

1:1000 HORIZONTAL
1:100 VERTICAL

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

No.	AMENDMENT DESCRIPTION	BY	DATE
1		##	
A	PRELIMINARY ISSUE	AM	24/07/20
No.	REVISION DETAILS	DWN	DATE

CONSULTANT DETAILS:
CARDNO

1:1000 0 50 100m

SIZE: A1 | SCALE FACTOR: N.T.S. | CO-ORDINATE SYSTEM: MGA Zone 56 | HEIGHT DATUM: AHD

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APPROVED:	DATE:	COMPANY:	

TITLE:
MOSS VALE POTABLE WATER MAIN

POTABLE WATER - LONGITUDINAL SECTION

SHEET 3 OF 3

CONSULTANT REFERENCE No.	INDEX No.	DRAWING No.	SHEET	REV No.
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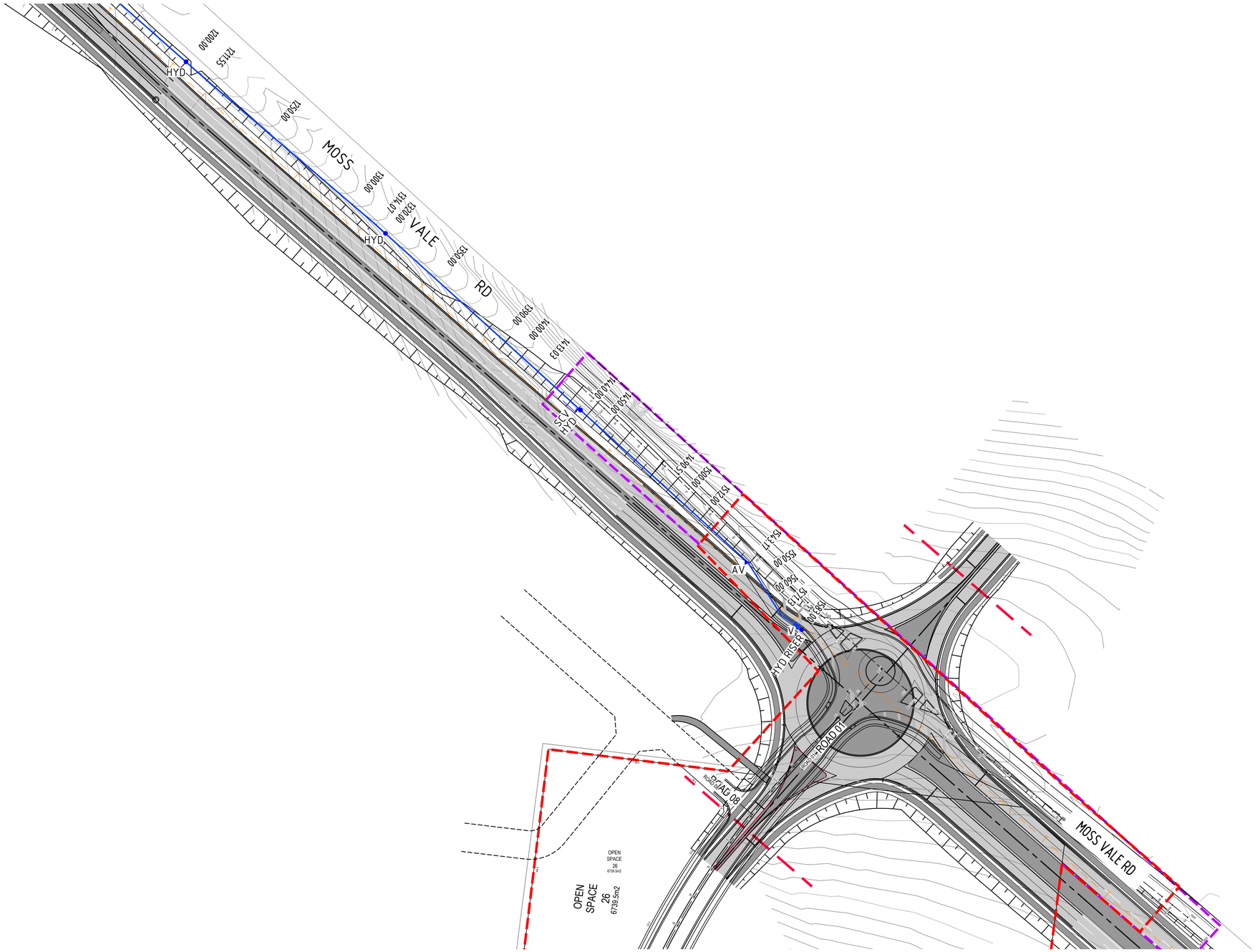
100 mm on original

Plotted: 24/07/20 - 10:37 CAD File: \\cardno.corp\global\AU\NSW\DirectoryStructure\Projects\820\FY20\197_Moss Vale Rd Concept Design\Des-An_General\Watermain Long Sections.dwg



LAYOUT PLAN
SCALE 1:1000

LEGEND

PROPOSED
- WATER MAIN
- V — VALVE
- AV — AIR VALVE
- SCV — SCOUR VALVE
- HYD — HYDRANT

EXISTING
- W — WATER MAIN
- W — AIR VALVE
- W — HYDRANT
- SR — SEWER RISING MAIN
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- S — SEWER MANHOLE
- T — TELSTRA

PRELIMINARY ISSUE
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1:1000 0 50 100m

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CHECKED:			
APPROVED:			

TITLE:
MOSS VALE POTABLE WATER MAIN

POTABLE WATER - LAYOUT PLAN

SHEET 3 OF 3

CONSULTANT REFERENCE No.	INDEX No.	DRAWING No.	SHEET	REV No.
	xxxxx	SK-05	4	A

100 mm on original

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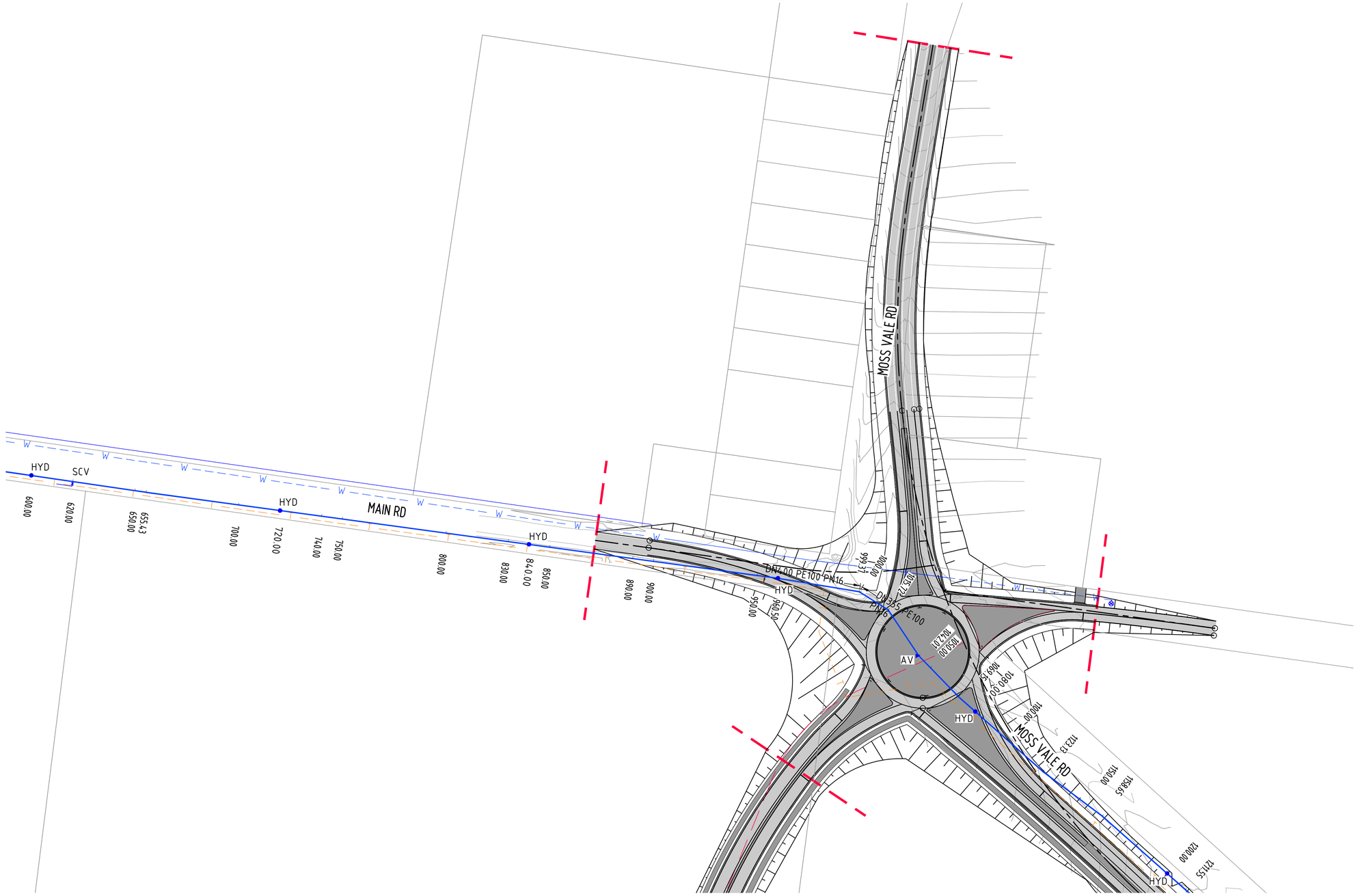

LAYOUT PLAN
SCALE 1:1000

LEGEND

PROPOSED
- WATER MAIN
- V — VALVE
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- HYD — HYDRANT

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CHECKED:	DATE:	COMPANY:	
APPROVED:	DATE:	COMPANY:	

TITLE:
MOSS VALE POTABLE WATER MAIN

POTABLE WATER - LAYOUT PLAN

SHEET 2 OF 3

CONSULTANT REFERENCE No.	INDEX No.	DRAWING No.	SHEET	REV No.
	xxxxx	SK-04	3	A

Plotted: 08/09/20 - 10:23 CAD File: \\AUWOLCFS03\Projects\FY20\197_Moss Vale Rd Concept Design\Des-An_General\Watermain Alignment.dwg

APPENDIX B

Likelihood of Occurrence Table (NSW Threatened Species)

NSW Threatened Species Likelihood of Occurrence Table

The table of likelihood of occurrence evaluates the likelihood of threatened species to occur on the subject site. This list is derived from previously recorded species within a 5 km radius (taken from NSW BioNet Atlas) around the subject site. Ecology information unless otherwise stated, has been obtained from the *Threatened Biodiversity Profile Search* on the NSW OEH (Office of Environment & Heritage) online database (https://www.environment.nsw.gov.au/threatenedspeciesapp/).

Likelihood of occurrence in study area

1. Unlikely – Species, population or ecological community is not likely to occur. Lack of previous recent (<25 years) records and suitable potential habitat limited or not available in the study area.
2. Likely – Species, population or ecological community could occur and study area is likely to provide suitable habitat. Previous records in the locality and/or suitable potential habitat in the study area.
3. Present – Species, population or ecological community was recorded during the field investigations.

Possibility of impact

1. Unlikely – The proposal would be unlikely to impact this species or its habitats. No NSW *Biodiversity Conservation Act 2016* “Test of Significance” or EPBC Act significance assessment is necessary for this species.
2. Likely – The proposal could impact this species, population or ecological community or its habitats. A NSW *Biodiversity Conservation Act 2016* “Test of Significance” and/or EPBC Act significance assessment is required for this species, population or ecological community.

Endangered Ecological Community name	*Status*	*Likelihood of presence within areas impacted by the activity*
Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered - *NSW* BC *Act*	Does not occur on-site and is not mapped as occurring in close proximity to the site (nearest mapped record approx. 4km to the south-east).
Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion	Endangered - *NSW* BC *Act* Critically Endangered - Commonwealth *EPBC Act*	Occurs in the surrounding area (nearest mapped record approx. 980m south-east of the site), however site survey confirmed that the EEC does not occur in close proximity to the site, such that it is at risk of impact directly or indirectly.
Illawarra Subtropical Rainforest in the Sydney Basin Bioregion	Endangered - *NSW* BC *Act*	Does not occur on-site and is not mapped as occurring in close proximity to the site (nearest mapped record approx. 1.2km to the north).
Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered - *NSW* BC *Act* Endangered - Commonwealth *EPBC Act*	Does not occur on-site and is not mapped as occurring in close proximity to the site (nearest mapped records approx. 3.9km to the south-west and south-east).

Species name	*Status*	*Habitat requirements (www.environment.nsw.gov.au)*	*Likelihood of presence within areas impacted by the activity*
FLORA			
Bauer's Midge Orchid *Genoplesium baueri*	Endangered *EPBC Act* Endangered *NSW* BC *Act*	Grows in dry sclerophyll forest and moss gardens over sandstone.	No – no suitable habitat present
Bomaderry Zieria *Zieria baeuerlenii*	NSW BC Act Endangered EPBC Act Endangered	Occurs on skeletal sandy loam overlaying sandstone, on a rocky plateau amongst sandstone boulders in either shrubby open forest, shrubby woodland or closed shrub.	No – no suitable habitat present
Albatross Mallee *Eucalyptus langleyi*	NSW BC Act Vulnerable EPBC Act Vulnerable	Found in Mallee shrub land on poorly drained, shallow, sandy soils on sandstone.	No – no mallee shrubland on site. Conspicuous species. Not observed during surveys.
Hibbertia stricta subsp. *furcatula*	Endangered *NSW* BC *Act*	Habitat of the Southern Sydney population is broadly dry eucalypt forest and woodland. This population appears to occur mainly on upper slopes and above the Woronora River gorge escarpment, at or near the interface between the Lucas Heights soil landscape and Hawkesbury sandstone. Toelken & Miller (2012) note that the species usually grows in 'gravelly loam or clay soil in heath under open woodland'.	No – no suitable habitat present

		Habitat of the South Coast population is poorly recorded, but appears to be dry sclerophyll forest or woodland associations in sandy soils over sandstone.	
Leafless tongue Orchid *Cryptostylis hunteriana*	*Vulnerable EPBC Act* *Vulnerable NSW* BC *Act*	Occurs in a wide variety of habitats from moist sandy soil to dense heathland, sedgeland and verges of fire trails. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	No – no suitable habitat present
Nowra Heath Myrtle *Triplarina nowraensis*	NSW BC Act Endangered EPBC Act Endangered	Nowra Heath Myrtle occurs on poorly drained, gently sloping sandstone shelves or along creek lines underlain by Nowra Sandstone. The sites are often treeless or have a very open tree canopy due to the impeded drainage.	No – no suitable habitat present
Pterostylis pulchella Waterfall Greenhood	NSW BC ACT Vulnerable EPBC Act Vulnerable	The Waterfall Greenhood is found on cliff faces close to waterfalls and creek banks and mossy rocks alongside running water. Flowers appear from February to May	No – no suitable habitat present

Pterostylis ventricosa	Critically endangered NSW BC Act	Predominantly in more open areas of tall coastal eucalypt forest often dominated by one or more of the following tree species:- Turpentine, Spotted Gum, Grey Ironbark, Blackbutt, White Stringybark, Scribbly Gum and Sydney Peppermint. Often favours more open areas such as along powerline easements and on road verges where the tree overstorey has been removed or thinned. Grows in a range of groundcover types, including moderatley dense low heath, open sedges and grasses, leaf litter, and mosses on outcropping rock. Soil type ranges from moisture retentive grey silty loams to grey sandy loams. Sometimes found in skeletal soils on sandstone rock shelves	No – no suitable habitat present
Rhodamnia rubescens Scrub Turpentine	Critically Endangered NSW BC Act	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	No – no suitable habitat present
Solanum celatum	NSW BC Act Endangered	Grows in rainforest clearings or in wet sclerophyll forests. Flowers August to October and produces fruit between December and January. Normally recorded in disturbed margins and clearings.	No – no suitable habitat present. Easily detected species. Not observed during surveys.
Warty Zieria *Zieria tuberculata*	NSW BC Act Vulnerable EPBC Act Vulnerable	Grows in heath amongst rocky outcrops on rain forest edges and in tall forest and shrubland.	No – no suitable habitat present

AMPHIBIANS			
Giant Burrowing Frog *Heleioporus australiacus*	Vulnerable EPBC Act Vulnerable NSW BC Act	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water.	Unlikely. Poor quality habitat present. Generally not found away from sandstone (G.Daly pers.comm.) so unlikely to occur on loamy alluvial soils.
REPTILES (None recorded)			
Broad-headed Snake *Hoplocephalus bungaroides*	Endangered *NSW* BC *Act* Vulnerable *EPBC Act*	The Broad-headed snake is largely confined to Triassic and Permian sandstones, including Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney. They are a nocturnal species that shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. It moves from the sandstone rocks to shelter in crevices or hollows in large trees within 500 m of escarpments in summer. Feeds mostly on geckoes and small skinks; will also eat frogs and small mammals occasionally.	Unlikely to occur – no suitable habitat present on site
BIRDS			
Black Bittern *Ixobrychus flavicollis*	Vulnerable *NSW* BC *Act*	Terrestrial and estuarine wetlands generally in areas of permanent water and dense vegetation	Unlikely to occur – no suitable habitat present on site

		that may comprise grassland, woodland forest rainforest and mangroves. Roosts in trees or on ground amongst dense reeds, nests in branches overhanging water	
Bush Stone-curlew *Burhinus grallarius*	NSW BC Act Endangered	Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Nest on the ground in a scrape or small bare patch.	Unlikely to occur – no suitable habitat present on site
Eastern Bristlebird- *Dasyornis brachypterus*	Endangered EPBC Act Endangered NSW BC Act	Sedgeland/heathland/dry sclerophyll and woodlands- / requires thick shrub/heath layer for shelter, nesting and foraging	Unlikely to occur – no suitable habitat present on site
Flame Robin *Petroica phoenicea*	Vulnerable NSW BC ACT	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The ground layer of the breeding habitat is dominated by native grasses and the shrub layer may be wither sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valley below the ranges, and to the western slopes and plains. Often occurs in recently burnt areas; however, habitat becomes unsuitable as vegetation closes up following revegetation. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. In winter, occasionally seen in heathland or other scrublands in coastal areas.	Unlikely to occur – no suitable habitat present on site
Gang-gang Cockatoo *Callocephalon fimbriatum*	*Vulnerable NSW* BC *Act*	Tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in	Possibly occurring transiently through the site but would not be affected by the proposal. No potential breeding habitat (HBTs) or important foraging habitat would be removed or otherwise impacted.

		urban areas. preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. Favours old growth attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.	
Glossy Black-cockatoo *Calyptorhynchus lathami*	Vulnerable *NSW* BC *Act*	The GBC inhabits open forest and woodlands of the coast where stands of she-oak occur. In the Jervis Bay region they feed almost exclusively on the seeds of the black she-oak *Allocasuarina littoralis*, shredding the cones with their bill	Possibly occurring transiently through the site but would not be affected by the proposal. No potential breeding habitat (HBTs) or important foraging habitat (*Allocasuarina littoralis*) would be removed or otherwise impacted.
Little Lorikeet *Glossopsitta pusilla*	Vulnerable NSW BC ACT	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like Allocasuarina	Possibly occurring transiently through the site but would not be affected by the proposal. No potential breeding habitat (HBTs) or important foraging habitat would be removed or otherwise impacted.

Masked Owl – *Tyto novaehollandiae*	Vulnerable *NSW* BC *Act*	Dry eucalypt forests and woodlands from sea level to 1100 m. Inhabits forest but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting requires old growth elements-hollow bearing tree resources for nesting and prey source	Possibly occurring transiently through the site but would not be affected by the proposal. No potential breeding habitat (HBTs) or important foraging habitat would be removed or otherwise impacted.
Olive Whistler *Pachycephala olivacea*	Vulnerable *NSW* BC *Act*	The Olive Whistler inhabits the wet forests on the ranges of the east coast. It has a disjunct distribution in NSW chiefly occupying the beech forests around Barrington Tops and the MacPherson Ranges in the north and wet forests from Illawarra south to Victoria. In the south it is found inland to the Snowy Mountains and the Brindabella Range. Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes. Forage in trees and shrubs and on the ground, feeding on berries and insects. Make nests of twigs and grass in low forks of shrubs. Lay two or three eggs between September and January.	Unlikely to occur – no suitable habitat present on site
Powerful Owl – *Ninox strenua*	Vulnerable NSW BC Act	Coastal Woodland, Dry Sclerophyll Forest, wet sclerophyll forest and rainforest- Can occur in fragmented landscapes Roosts in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda,* Cherry Ballart Exocarpus cupressiformis and a number of eucalypt species. requires old growth elements-hollow	Possibly occurring transiently through the site but would not be affected by the proposal. No potential breeding habitat (HBTs) or important foraging habitat would be removed or otherwise impacted.

		bearing tree resources for nesting and prey resource. Nests in large tree hollows in large eucalypts that are at least 150yrs old. Often in riparian areas. Large home range	
Scarlet Robin *Petroica boodang*	Vulnerable *NSW* BC *Act*	The Scarlet Robin is primarily a resident in dry forests and woodlands, but some adults and young birds disperse to more open habitats after breeding.	Possibly occurring transiently through the site but unlikely to rely on or breed in the degraded habitats offered within the site.
Sooty Owl *Tyto tenebricosa*	Vulnerable *NSW* BC *Act*	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests	Unlikely to occur – no suitable habitat present on site
Spotted Harrier *Circus assimilis*	Vulnerable *NSW* BC *Act*	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats or the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population.	Possibly occurring transiently through the site and foraging in proximity to the site, but unlikely to rely on or breed in the degraded habitats offered within the site.
Square-Tailed Kite *Lophoictinia isura*	*Vulnerable NSW* BC *Act*	Summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses large hunting ranges of more than 100km2 Nest within large hollow bearing trees generally within 200m of riparian areas.	Possibly occurring transiently through the site and foraging in proximity to the site, but unlikely to rely on or breed in the degraded habitats offered within the site.
Varied Sittella *Daphoenositta chrysoptera*	Vulnerable *NSW* BC *Act*	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland	Unlikely to occur – no suitable habitat present on site
White-bellied Sea-Eagle *Haliaeetus leucogaster*	*NSW* BC *Act* Vulnerable Migratory *EPBC Act*	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterized by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Birds have been	Possibly occurring transiently through the site and foraging in proximity to the site, but unlikely to rely on or breed in the degraded habitats offered within the site.

		recorded in (or flying over) a variety of terrestrial habitats. The species is mostly recorded in coastal lowlands, but can occupy habitats up to 1400 m above sea level on the Northern Tablelands of NSW and up to 800 m above sea level in Tasmania and South Australia. Birds have been recorded at or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs, saltmarsh and sewage ponds. They also occur at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest (including rainforest) and even urban areas. Breeding has been recorded on the coast, at inland sites, and on offshore islands. Breeding territories are located close to water, and mainly in tall open forest or woodland, although nests are sometimes located in other habitats such as dense forest (including rainforest), closed scrub or in remnant trees on cleared land. Forages over large expanses of open water; this is particularly true of birds that occur in coastal environments close to the sea-shore, where they forage over in-shore waters. However, the White-bellied Sea-Eagle will also forage over open terrestrial habitats (such as grasslands). Birds may move to and congregate in favorable sites during drought or food shortage.	
MAMMALS			
Brush-tailed Rock-wallaby *Petrogale penicillata*	NSW BC Act Endangered EPBC Act Vulnerable	Occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	No – no habitat present

		Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night. Highly territorial and have strong site fidelity with an average home range size of about 15 ha.	
Eastern Pygmy-possum *Cercatetus nanus*	Vulnerable NSW BC Act	Rainforest, sclerophylla forest & woodland to heath – but heath & woodland preferred. Forages on banksias, eucalypts & bottlebrushes.	No – no habitat present
Greater Glider *Petauroides Volans*	Vulnerable EPBC Act	Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelter during the day in tree hollows and will use up to 18 hollows in their home range. Occupy a relatively small home range with an average size of 1 to 3 ha. Give birth to a single young in late autumn or early winter which remains in the pouch for approximately 4 months and is independent at 9 months of age. Usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent. Can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees. Very loyal to their territory.	No – no habitat present
Grey-headed Flying-fox *Pteropus poliocephalus*	Vulnerable *EPBC Act* Vulnerable *NSW* BC *Act*	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Possibly occurring transiently through the site and foraging in proximity to the site, but unlikely to rely on the degraded habitats offered within the site. The site is not known as - and does not occur in close proximity to - a known breeding camp.
Long-nosed Potoroo *Potorous tridactylus*	Vulnerable EPBC Act Vulnerable NSW BC Act	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or	No – no habitat present

		melaleucas. A sandy loam soil is also a common feature. The fruit-bodies of hypogeous (underground-fruiting) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. Often digs small holes in the ground in a similar way to bandicoots. Mainly nocturnal, hiding by day in dense vegetation - however, during the winter months animals may forage during daylight hours. Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5 ha.	
Parma Wallaby *Macropus parma*	NSW BC Act Vulnerable	Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	No – no habitat present.
Southern Brown Bandicoot (eastern) *Isoodon obesulus obesulus*	Endangered EPBC Act Endangered NSW BC Act	Southern Brown Bandicoots are largely crepuscular (active mainly after dusk and/or before dawn). They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruiting) fungi. Their searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares. Nest during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees Xanthorrhoea spp., blackberry bushes and other shrubs, or in rabbit burrows. The upper surface of the nest may be mixed with earth to waterproof the inside of the nest.	No – no habitat present

Spotted-tailed Quoll *Dasyurus maculatus*	Endangered *EPBC Act* Vulnerable *NSW* BC *Act*	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. Are known to traverse their home ranges along densely vegetated creeklines.	Unlikely – no suitable habitat present on site. Marginal habitat occurring within the Good Dog Creek riparian corridor. This habitat would not be impacted and does not provide ready connectivity at the bridge location where the pipeline will cross the riparian corridor. Any marginally suitable habitat will not be affected. The riparian corridor connectivity will not be further degraded.
Yellow-bellied Glider - *Petaurus Australis*	Vulnerable *NSW* BC *Act*	Forest with old growth elements. Large Eucalypt Hollows for denning- Inhabits mature or old growth Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia mid storey. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.	Unlikely to occur – no suitable habitat present on site
MAMMALS - MICROBATS			

Large Bentwing-bat *Miniopterus orianae oceanensis*	Vulnerable *EPBC Act*	Specific caves are known maternity sites with other caves being primary roosting habitat outside breeding period. Also uses derelict mines, storm-water tunnels, buildings and other man-made structures. Hunts in forested areas, catching moths and other flying insects above the tree tops.	Potential habitat occurring in the vicinity of the Good Dog Creek bridge and riparian corridor. Further assessment is required.
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	Vulnerable *NSW* BC *Act*	Prefers moist habitat that contains trees greater than 20 m high with a dense undertstorey. They are fast flyers. Roosts in hollow trunks of eucalyptus trees, in colonies of 3 – 80. Also may roost in caves and old wooden buildings. This species changes roost every night. Roosts on consecutive nights are usually less than 750 m apart. This species has a home range of up to 136 ha (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW). Although they prefer habitat with a dense understorey, they prefer to forage along flyways to avoid the thick understorey. They prefer continuous forest and avoid remnant vegetation. However, they have been recorded in open forests (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW).	Possibly occurring transiently through the site and foraging in proximity to the site. No potential breeding habitat (HBTs) occurs within the site.
Eastern Freetail-Bat *Mormopterus norfolkensis*	Vulnerable *EPBC Act*	Small tree hollows/fissures in bark for roosting in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Possibly occurring transiently through the site and foraging in proximity to the site. No potential breeding habitat (HBTs) occurs within the site.
Large –eared Pied Bat *Chalinobolus dwyeri*	Vulnerable *NSW* BC *Act* Vulnerable *EPBC Act*	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England	Possibly occurring transiently through the site and foraging in proximity to the site. No potential breeding habitat (caves) occurs within the site.

		Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features	
Greater Broad-nosed Bat *Scoteanaux ruepelli*	Vulnerable *NSW* BC *Act*	Found mainly in gullies and river systems that drain the Great Dividing Range, it utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, below 500m, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m	Possibly occurring transiently through the site and foraging in proximity to the site. No potential breeding habitat (caves) occurs within the site.
Southern Myotis (Large-footed Myotis) *Myotis macropus*	Vulnerable *NSW* BC *Act*	This species is predominantly roosts in caves, however, is known to roost in trees and man-made structures close to water. Roosts are generally located close to water, where the bats forage in small groups of three or four. They have a strong association with streams and permanent waterways in areas that are vegetated rather than cleared (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW They feed on small fish, prawns and aquatic macroinvertebrates. They have a preference towards large still pools, rather than flowing streams. They will also forage an aerial insects flying over water. They use their large feet to capture prey items (Churchill 2008).	Potential habitat occurring in the vicinity of the Good Dog Creek bridge and riparian corridor. Further assessment is required.