



Pacific Highway Upgrade through Wyong Town Centre

Soil and Water Technical Paper

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CONTACT DETAILS

SMEC Australia Pty Ltd | www.smec.com

Level 5, 20 Berry Street
 North Sydney NSW 2060
 Tel: 02 9925 5555
 Fax: 02 9925 5566

Representative:

Name: Michael Corrigan
 P: 02 9925 5431
 E: Michael.Corrigan@smec.com

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1. INTRODUCTION

1.1 Purpose

Roads and Maritime Services (Roads and Maritime) propose to upgrade around 2.4 kilometres of the Pacific Highway from the intersection with Johnson Road, Wyong to about 50 metres north of Cutler Drive, Wyong (the proposal). The proposal is located in the Wyong local government area (LGA) and Roads and Maritime Hunter Region. An overview of the proposal and ancillary sites is shown in the inset on Figure 1.

This technical paper describes the existing soil and water environment, identifies the potential impacts that the proposal may have on soil and water environments and the management measures that would be appropriate to apply to mitigate the potential impacts. The report has been prepared to support a Review of Environmental Factors (REF) for the proposal.

1.2 The proposal

1.2.1 Overview

The proposal would generally involve the following:

- The current road would be widened to a two lane carriageway in each direction with central median between Johnson Road and north of Cutler Drive
- Replacement of the existing Wyong River road bridge with new twin road bridges over the Wyong River for northbound and southbound traffic including pedestrians and cyclists
- A shared cycle/pedestrian path provided along the Pacific Highway between Johnson Road and Cutler Drive
- Reconfiguration of on-road parking provisions throughout the proposal extents
- A pedestrian refuge across the highway is provided with the partial closure of Bakers Lane to vehicles at the highway
- The Pacific Highway connection with Wyong Station is redefined at a higher level by a new pedestrian bridge link connecting the Pacific Highway to the existing Wyong Station pedestrian overbridge
- Upgrade of key Pacific Highway intersections at McPherson Road, Church Street, Rose Street, Anzac Avenue, North Road and Cutler Drive
- Intersection adjustments at River Road, Alison Road and Apex Park
- Replacement of the Rose Street rail overbridge with a new bridge that is longer and wider
- Upgrade of Howarth Street intersections at Rose Street and Warner Avenue
- Dedicated bus stops along the subject length of the Pacific Highway in both directions and relocation of bus layover facilities to the east of Wyong Station

- Provision of a dedicated area for disabled commuter parking and taxi services east of Wyong Station located close to station access lifts and stairs
- Provision of a dedicated rail commuter parking facility east of Wyong Station
- Improvements to River Road and South Tacoma Road that include pedestrian paths within the proposal extents and improved clearance heights under the Wyong River Pacific Highway road bridges
- Incorporating the existing palm trees, with the aim of retaining as many of the existing palm trees as reasonably practicable
- Demolition and removal of the locally heritage listed former Station Master's Cottage and Warner Shops
- Property adjustments along the upgrade corridor
- Retaining walls at various locations and heights.

A more detailed description of the proposal is provided in Chapter 3 of the REF that this technical paper supports.

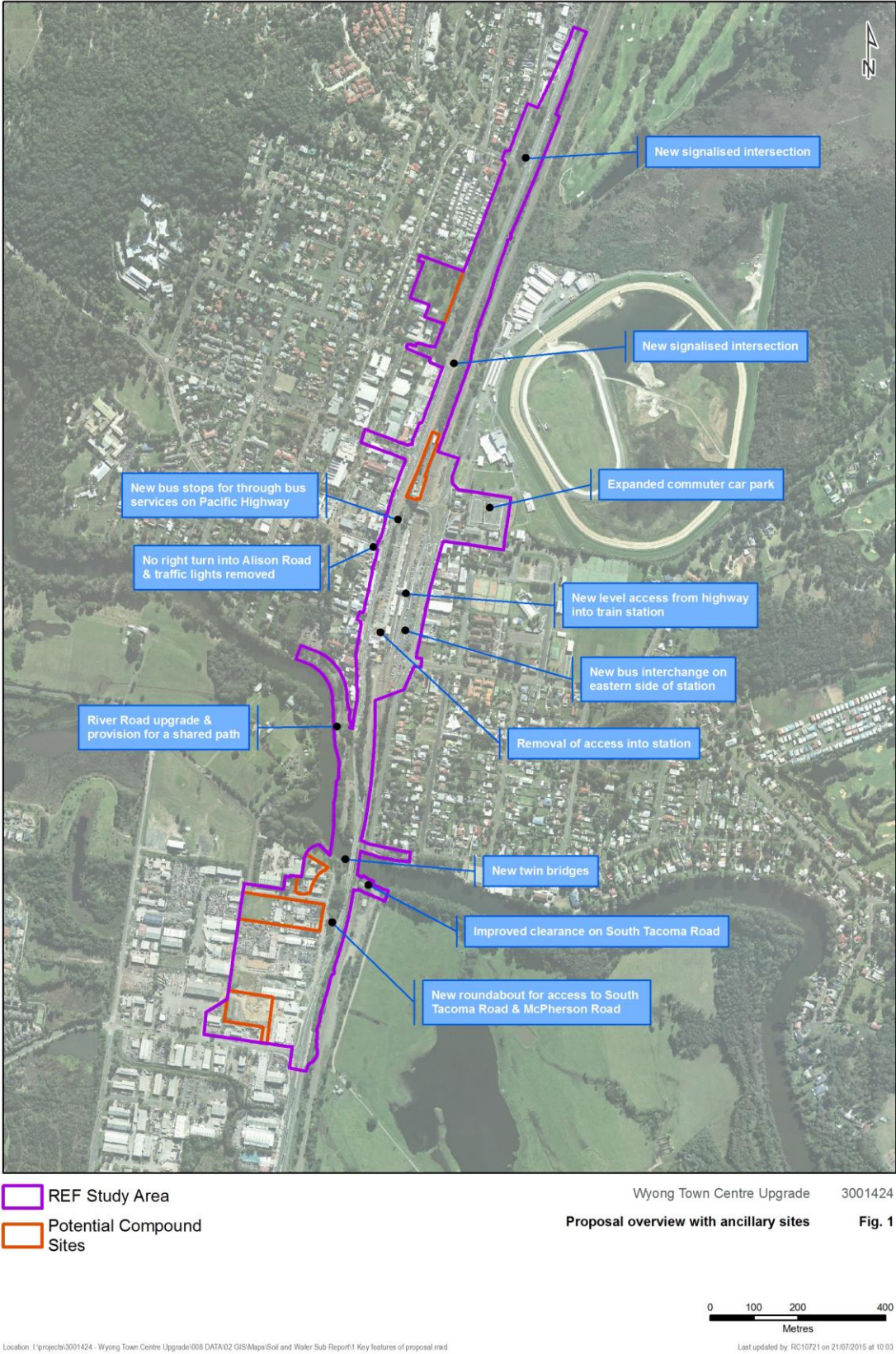


Figure 1. Proposal overview with ancillary sites

2. POLICY SETTING

2.1 Statutory requirements

Legislation relating to soil and water management has been considered in the context of the proposal. The outcomes of this legislation review are discussed in this section.

2.1.1 *Protection of the Environment Operations Act 1997 (POEO Act)*

The POEO Act sets the framework for environment protection during the construction and operation of a development or during the undertaking of an activity. The POEO Act consolidates key pollution statutes relating to air, water and noise pollution and environmental offences, and establishes a duty to notify either the Environment Protection Authority (EPA) or the local council where incidents are likely to cause material harm to the environment.

Part 3.2 of the *POEO Act* requires an Environment Protection Licence (EPL) for scheduled development work and the carrying out of scheduled activities. The proposal includes replacement of the Rose Street rail over bridge. Schedule 1 of the Act identifies the construction of over track structures as a scheduled activity in accordance with 'Rail System Activities'. It is likely that an EPL would be required for the rail bridge component of the proposal.

Under the *Protection of the Environment Operations (Waste) Regulation 2014* the EPA may grant permission for a waste to be used for the specified purpose, subject to strict conditions. This usually applies where it can be demonstrated that a specific type of waste can safely be used for another purpose, rather than being disposed of in accordance with the waste regulations. Under the new provisions of the 2014 Waste Regulation, the EPA will now issue two separate documents: a resource recovery order and a resource recovery exemption.

There are a number of resource recovery orders and resource recovery exemptions currently in force which may be used by anyone in NSW, without seeking approval from the EPA, provided the waste generators, processors and consumers fully comply with the conditions. Current resource recovery and exemptions can be found on the NSW EPA Website <http://www.epa.nsw.gov.au/wasteregulation/orders-exemptions.htm>. Where possible the proposal would seek to reuse waste in accordance with the current resource recovery and exemptions.

2.1.2 *Soil Conservation Act 1938 (SC Act)*

The SC Act provides for the conservation of soil resources and farm water resources and for the mitigation of erosion. The Act allows the Minister to declare an area a protected area if it is land within a catchment area with a slope of greater than 18 degrees from the horizontal; land which is within 20 metres of the bed or bank of a river or lake.

The proposal area has not been declared a protected area, however as the proposed works have the potential to cause soil erosion, soil and water management controls will be required to mitigate environmental impacts.

2.1.3 *Dangerous Goods (Road and Rail Transport) Act 2008 (RRT Act)*

The purpose of this Act is to regulate the transport of dangerous goods by road and rail in order to promote public safety and protect property and the environment.

The fuel requirements of ancillary sites and construction plant to be used in the construction phase is classified as dangerous goods by the Australian Dangerous Goods Code and would require transport to each ancillary site and plant by road. The RRT Act would require both the vehicle transporting dangerous goods and the driver of the vehicle to be licensed under the RRT Act.

2.1.4 *Water Management Act 2000 (WM Act)*

The WM Act provides for the protection of river and lakeside land in NSW and aims to provide for the sustainable management of the water resources throughout NSW. It identifies provisions relating to 'controlled activities' which includes (among other definitions) the carrying out of any activity that affects the quantity or flow of water in a water source' or affects land fronting a waterway.

In accordance with clause 39A(1) of the Water Management (General) Regulation 2004, Roads and Maritime, as a public authority, is permitted to undertake works within 40 metres of a watercourse without obtaining a permit under the WM Act. A notification of the activity would need to be provided to the NSW Office of Water at least 30 days before the activity commences.

If groundwater extraction is required for the proposal, an aquifer interference approval would be required for the work under clause 91F of the WM Act.

2.1.5 *Contaminated Land Management Act 1997 (CLM Act)*

The CLM Act establishes the processes for investigating and, where appropriate, remediating contaminated land and contaminated groundwater. Section 60 of the CLM Act imposes a duty for proponents to report to the NSW EPA if land contamination poses significant risk of harm. The CLM Act also regulates the provision of Investigation Orders (Section 17) and Remediation Orders (Section 23). SEPP 55 – Remediation of Land provides for the implementation of the CLM Act through the planning and environmental assessment process.

In undertaking activities, Roads and Maritime must demonstrate appropriate management of contaminated land during the acquisition, management and divestment of property. The proposal would present a risk of potentially contaminated land being encountered during construction activity within the proposed area of works. In accordance with Section 60 of the Act, if contamination is identified which poses significant risk of harm, reporting to the EPA must occur.

2.2 Standards and guidelines

The Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) have formulated the National Water Quality Management Strategy (NWQMS) with the objective of achieving sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development.

The NWQMS contains guidelines for setting water quality objectives to sustain current or likely future environmental values for water resources (ANZECC and ARMCANZ, 2000). These guidelines have been used in this study to determine the existing condition of rivers and creeks along the highway upgrade.

2.2.1 **Construction phase**

The following guidelines are relevant to the management of land degradation and water pollution for road construction in NSW. These guidelines have been considered in the development of this technical study. They have been used to identify appropriate procedures and controls to mitigate potential soil and water impacts associated with the construction phase of the proposal.

- Managing Urban Stormwater - Volume 2D Main Road Construction (DECCW, 2008)
- Managing Urban Stormwater - Soils and Construction, Volume 1, 4th Edition (Landcom, 2004)
- NSW Acid Sulfate Soils Management Advisory Committee, Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998)
- Code of Practice for Water Management - Road Development and Management (Roads and Traffic Authority, 1999)
- Stockpile Site Management Guideline (Roads and Maritime Services, 2011)
- Road Design Guideline: Section 8 Erosion and Sediment (Roads and Traffic Authority, 2003)
- Guideline for Construction Water Quality Monitoring (Roads and Traffic Authority, 2003)
- Guidelines for the Management of Acid Sulfate Materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze (Roads and Traffic Authority, 2005)
- Erosion and Sediment Management Procedure (Roads and Traffic Authority, 2009)
- Technical Guideline: Temporary Stormwater Drainage for Road Construction (Roads and Maritime Services, 2011)
- Technical Guideline: Environmental Management of Construction Site Dewatering (Roads and Maritime Services, 2011)
- Environmental Direction: Management of Tannins from Vegetation Mulch (Roads and Maritime Services, 2012)
- Storing and handling liquids: Environmental Protection – Participants Manual' (DECC, 2007)

2.2.2 **Operational phase**

The following guidelines have been considered in the development of this technical study. They are concerned with how road development relates to land degradation and water pollution management.

- Road Runoff and Drainage: Environmental Impacts and Management Options, Austroads AP-R180 (Austroads, 2001)
- Guidelines for Treatment of Stormwater Runoff from the Road Infrastructure, Austroads AP-R232 (Austroads, 2003)

- Guide to Road Design, Part 5: Drainage Design (Austroads, 2010)
- Managing Urban Stormwater, Soils and Construction, Volume 2, Main Road Construction (DECC, 2008)
- Water Policy (Roads and Traffic Authority, 1997)
- Code of Practice for Water Management - Road Development and Management (Roads and Traffic Authority, 1999)
- Procedures for Selecting Treatment Strategies to Control Road Runoff (Roads and Traffic Authority, 2003)

These documents provide guidance on soil and water management including conservation practices related to the design, operation and maintenance of road infrastructure. In addition, they provide guidance on designing permanent water quality treatment in order to protect waterways and water quality where practicable and feasible. The design for the proposed upgrade would address the sensitivity of receiving waters and local environment within the catchments of the Pacific Highway upgrade.

3. LANDFORM, GEOLOGY AND SOILS

3.1 Overview

The proposal study area has an elevation of between five metres and 20 metres and has been previously modified as result of the existing Pacific Highway construction and as a consequence is relatively flat grade due to the existing formation.

The proposal is located within the Wyong area within the larger Hornsby Plateau subdivision of the Sydney Basin and is comprised of consolidated sediments of the Triassic Hawkesbury and Narrabeen sandstone series. Extensive areas of unconsolidated alluvial soils also occur along major valleys and streams, and large deposits of Quaternary marine and aeolian sands occur along the coastline.

The soil landscape as described in the Soil Landscapes of the Gosford-Lake Macquarie 1:100,000 Sheet (Murphy, 1993) identifies the proposal corridor as being part of the Central Coast Lowlands. This physiographic region is described as relatively low-lying terrain with low rises and alluvial plains. Table 1 identifies the lineal chainages where different soil landscapes are encountered along the proposal corridor. This table is supported by a soil landscape map, located in Figure 2.

The proposal would require ground engaging works encountering the Central Coast Lowlands to where there are soil landscapes associated with Woodburys Bridge, Gorokan and Wyong.

The Gorokan soil landscapes are derived from the Terrigal formation of the Narrabeen Group of lithic and quartz sandstone, siltstone, claystone and conglomerate. The soil materials found in these landscapes exhibit erodibility ranging from moderate to high for non-concentrated flows, and up to very high for concentrated flows. The erosion hazard for both non-concentrated and concentrated flows is considered to be very high, however wind erosion hazard is considered slight.

The Woodburys Bridge soil landscape is a residual landscape formed on the Patonga Claystone formation and is often found to be overlayed by the Erina soil landscape, making the interface between these soil landscape quite variable.

The Wyong soil landscape is generally poorly drained deltaic floodplains and alluvial flats. The geology of the Wyong soil landscape is identified as consisting of quaternary sediments. The soil materials found in this landscape exhibit erodibility ranging from high to extreme. The erosion hazard is slight for both non-concentrated flows and wind. For concentrated flows it is considered slight moderate.

No salinity risk has been identified for the proposal and the area is not identified as vulnerable land (steep) according to the soil landscape mapping (Murphy, 1993).

Table 1 - Characteristics of soils within the study area

Soil Unit	Characteristics			
	Occurrence	Erosion Hazard	Water Permeability	Fertility/ Nutrient Status
Wyong (wy)	Alluvial Soil Landscape Includes level to gently undulating alluvial plane with terraces and backswamps Quaternary sediments Chainage 0 to 440 Chainage 520 to 620	Severe stream bank erosion	Seasonal waterlogging poorly drained and impermeable.	Strongly acidic acid sulfate potential Saline subsoil
Woodburys Bridge (wo)	Residual Landscape Gently undulating low rolling rises and low hills over Patonga Claystone Chainage 620 to 1,460	Extreme	Seasonal waterlogging	Strongly acidic and low fertility
Gorokan (gk)	Erosional Landscape Gently undulating low rolling rises lithic sandstone Tuggerah Formation (Sandstone) Chainage 1,460 to 2,000	High	Seasonal waterlogging and impermeable soil	Strongly acidic and low fertility

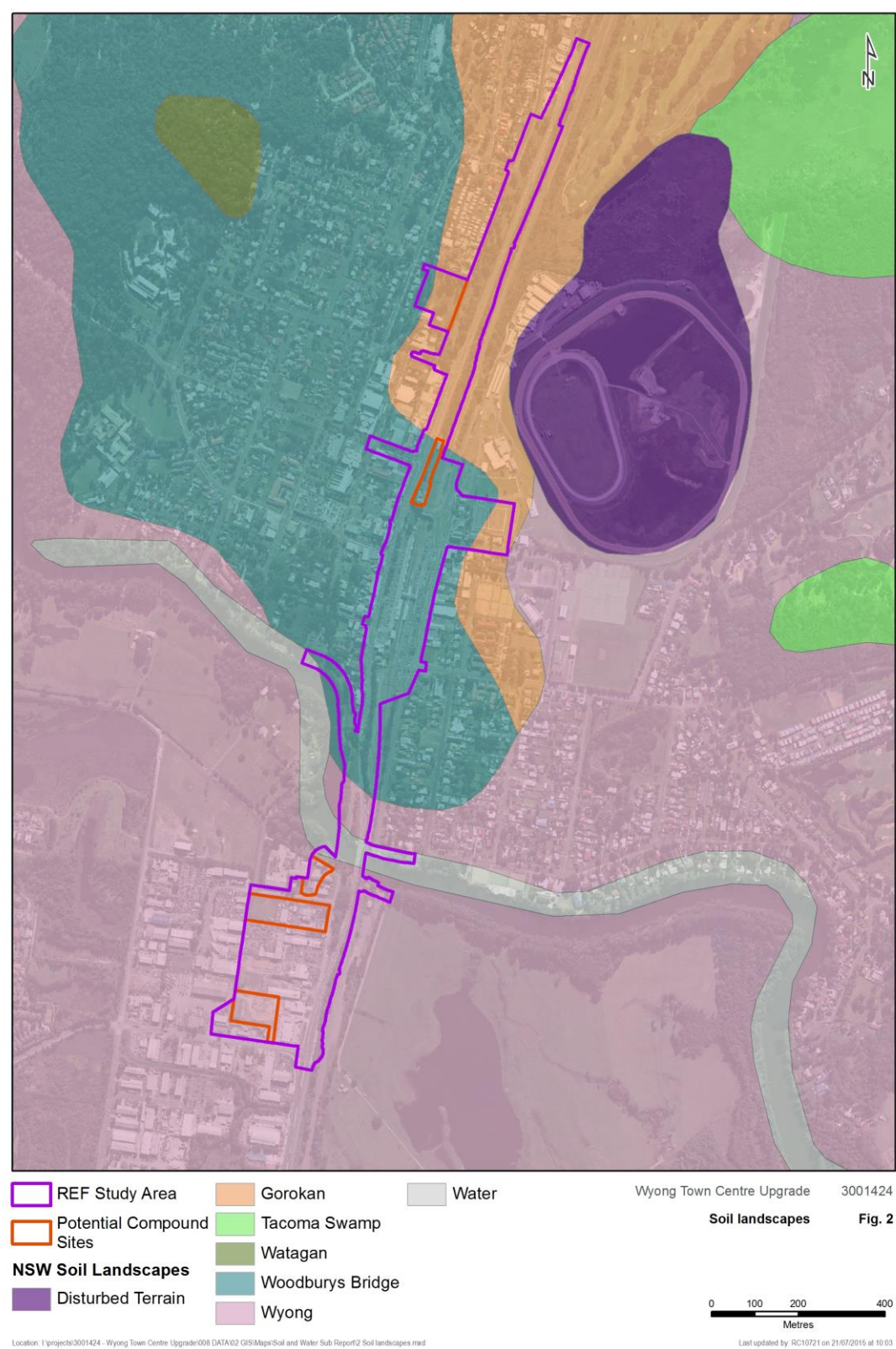


Figure 2. Soil Landscapes

3.2 Contaminated land

The natural soil formations have been generally overlaid with fill materials associated with the construction and replacement of the low level timber road bridge in the 1960s, fill placement associated with the rail formation circa 1880 and rail overpass structures and commuter carparks. The imported fill materials for the highway and rail formations are likely to have been sourced for their engineering properties such as high compaction and load strength as required by geotechnical requirements for civil construction. Contamination of these areas is unlikely, however temporary or permanent works compounds and ancillary facilities used during construction of the highway and rail sites may provide a higher risk profile associated with potentially land contaminating activities at these locations.

The proposed alignment encroaches on the existing urban features for the length of the Wyong town centre commercial area. The proposed works will impact on existing underground service corridors, existing drainage structures and building footprints associated with buildings and structures identified for removal. The proposed works in the north-western section of the study area sees building setback from the road reduced in areas where historically service station sites and other automotive industries with underground storage tanks have been identified in the Phase 1 Assessment (Parsons Brinkerhoff, 2014) between Anzac Avenue and North Road. These former land uses may present as potential sources of volatile chemicals being present as contaminants in soils or groundwater. Volatile chemicals have the potential to partition into the air in the soil pore spaces and can move into buildings, ambient air, confined spaces or excavations on a site.

All construction activities prior to 1986 have the potential for asbestos containing materials to be present. The manufacture and use of asbestos products was banned nationally from 31 December 2003. Construction activities associated with the proposal could potentially encounter telecommunications pits, conduits and water mains piping manufactured with asbestos containing materials.

The Main North Line rail corridor, located within and adjacent to the proposal study area, has been in operation for over 100 years. The rail corridor is a highly disturbed environment and potentially contains waste including:

- Disused rail infrastructure and equipment
- Ash and coal residual from steam train locomotive activity
- Herbicide residual from management of corridor vegetation
- Windblown litter and illegally dumped materials.

There is also the potential for the rail corridor to contain the historical legacy associated with high voltage electricity distribution, hazardous materials like asbestos, lead based paints and polychlorinated biphenyls (PCBs). The proposal itself will generate solid waste including surplus fill material from cuttings and the removal of rail equipment associated with modifications.

Road corridors can be subject to uncontrolled filling events from unknown sources, particularly in urban areas. Uncontrolled fill material from unknown sources may have contaminant concentrations that exceed the allowable criteria for the currently zoned or intended land use for the site.

The new road alignment requires acquisition of railway corridor land to the east of the Pacific Highway north of the existing Wyong River bridge. These locations have been identified as potentially contaminated in a preliminary environmental site assessment conducted by Wyong Town Centre Phase 1 Assessment (Parsons Brinkerhoff, 2014) for the concept design documentation. The Phase 1 report recommends that this area requires an additional contaminated land survey to assess if land has been impacted.

Contamination risk associated with the temporary occupation of proposed ancillary sites are unknown and therefore any proposed ancillary site facilities would require a contaminated land survey to assess if land has been impacted by contamination.

A search of the EPA contaminated land record of notices returned no records for the proposal study area or within the proposed ancillary sites.

Potentially contaminating land uses identified within the corridor and adjoining areas include the following Areas of Environmental Concern (AEC).

- Total petroleum hydrocarbons/total recoverable hydrocarbons (TPH/TRH), potentially associated with bitumen and road base, the storage and distribution of petroleum and diesel at service stations, caryards and the repair shop
- Benzene, toluene, ethylbenzene, xylene (BTEX) compounds, potentially associated with bitumen and the storage and distribution of petroleum and diesel at service stations, caryards and the repair shop
- Polycyclic aromatic hydrocarbons (PAHs) potentially associated with the storage and distribution of petroleum and diesel service stations and caryards, coal tar bitumen and road base and buried fill materials
- Phenols potentially associated with the storage and distribution of petroleum and diesel products at the service stations, repair shop and caryards
- Heavy metals associated with buried fill materials, rail infrastructure, bitumen and road base.

Asbestos containing materials may also have been used during the construction of the existing highway. Construction materials containing asbestos were still used until 1986. The main highway easement is likely to contain potentially asbestos containing materials in road assets like service conduits and communication pits. An asbestos containing water main has also been identified extending from Panonia Road to North Road along the western side of the Pacific Highway.

A level of low, medium or high risk from a contamination perspective has been based on qualitative judgment from observations made during the site inspection conducted on 10 April 2014 and information obtained during the desktop review. Table 2 provides the risk summary criteria developed to assess the AEC.

Table 2 - Risk Summary Criteria for AEC

Risk Summary	AEC Risk Assessment Criteria
Low	Low potential of residual soil and/or groundwater contamination to exist within the extent concept proposal footprint. Low probability of engaging any potential contaminated land associated with identified AEC due to extent of proposed works.
Medium	Medium potential of residual soil and/or groundwater contamination to exist within the extent concept proposal footprint. Contaminated soil and / or groundwater associated with identified AEC may be engaged due to the extent of the proposed works.
High	High potential of some level of residual soil and/or groundwater contamination to exist within the extent concept proposal footprint. Contaminated soil and / or groundwater associated with identified AEC are likely to be engaged due to the extent of the proposed works. Further investigations recommended.

It should be noted that although the risk ranking system categorises the various AEC as ‘high’ to ‘low’ risk, this does not indicate that contamination has or has not occurred but instead highlights the need that further assessment may be required. Further data would give greater confidence on these risk levels. The location of each identified AEC is presented in Figure 3.

Table 3 Identifies the AEC which present a risk of impact associated with construction of the proposal, details the potential impacts on the proposal and the risk of occurrence identified from the AEC.

Table 3 - Summary of AEC

Approximate Chainage (m)	AEC	Contaminates of concern (CoC)	Proposal Element	Disturbance Type	Contamination Risk of Occurrence
0 – 400	Demolition of existing buildings	Asbestos, pesticides, heavy metals, PAH's	Pavement development Culvert drainage	Extension and realignment of pavement and associated drainage and culverts	Low Probability
500 – 600	Demolition of existing buildings Potential Uncontrolled Fill	Asbestos, pesticides, Metals, PAHs, TPH, BTEX and PCB's	Bridge abutment and bridge piles	Excavation of footings and piles	Low Probability
600 – 900	Rail corridor	Asbestos, pesticides, metals, PAH's	Pavement development Culvert drainage	Extension and realignment of pavement and associated drainage and culverts	Low Probability
600 - 1600	Asbestos water main	Asbestos	Pavement development Culvert drainage	Extension and realignment of pavement and associated drainage and culverts	Low probability
900 – 1400	Rail corridor Demolition of existing buildings Potential Uncontrolled Fill	Asbestos, pesticides, Metals, PAHs, TPH, BTEX and PCBs	Pavement development Culvert drainage Bridge abutment and bridge piles	Extension and realignment of pavement and associated drainage and culverts Excavation of footings and piles	Low Probability
1400 – 1600	Areas impacted by underground petroleum storage systems (UPSS) Rail corridor	PAHs, TPH, BTEX and Metals	Pavement development Culvert drainage	Extension and realignment of pavement and associated drainage and culverts	Medium Probability
Entire proposal area	Existing pavement	Coal Tar, PAHs.	Pavement development	Extension and realignment of pavement	Low Probability

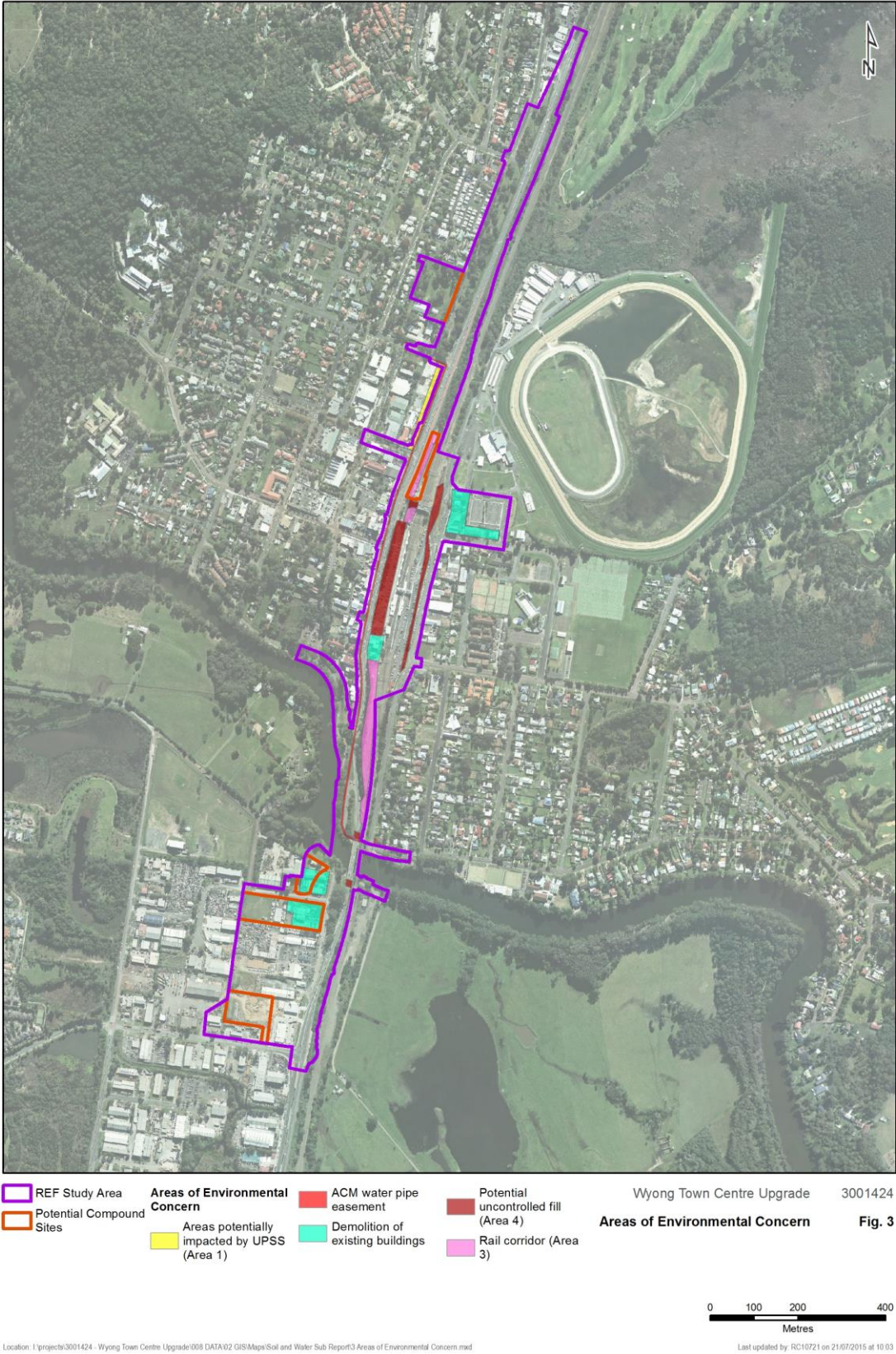


Figure 3. Areas of Environmental Concern

3.3 Acid sulfate soils

The landform in the study area is identified by the soil maps as containing high risk of Acid Sulfate Soil (ASS) conditions occurring. ASS risk occurs within the study area for an estimated 0.5 kilometres within proposal corridor. Geotechnical investigations undertaken for Roads and Maritime (Parsons Brinkerhoff, 2014) identified the potential for ASS to occur at varying depths within 260 metres north and up to 160 metres south of the existing Wyong River bridge crossing. The ASS risk is generally associated within the Wyong soil landscapes (refer to Figure 2) that form the Central Coast Lowlands as part of the Wyong River floodplains.

The proposal does not engage the natural soil horizons significantly in areas where this ASS risk occurs. The extent of ground engagement in risk areas is limited to bridge piles and abutments, retaining wall, culvert extensions and culvert surface stabilisation works as listed in Table 3 below. A map of the proposal's full ASS risk and locations of ground engaging activities is presented in Figure 4.

Table 4 - Ground engaging elements of the proposal affected by acid sulfate risk

Approximate Chainage (m)	Proposal Element	Disturbance Type	Acid Sulfate Soil Risk of Occurrence
260 – 380	South Tacoma Road Culvert drainage	Extension and realignment of culverts	High Probability
0 – 500	Panonia / River Road Culvert drainage	Extension and realignment of culverts	High Probability
400	Bridge abutment	Excavation of footings	High Probability
420 – 500	Bridge piles	Excavation piles	High Probability
260 – 600	High pressure gas underbore	Drilling	High Probability

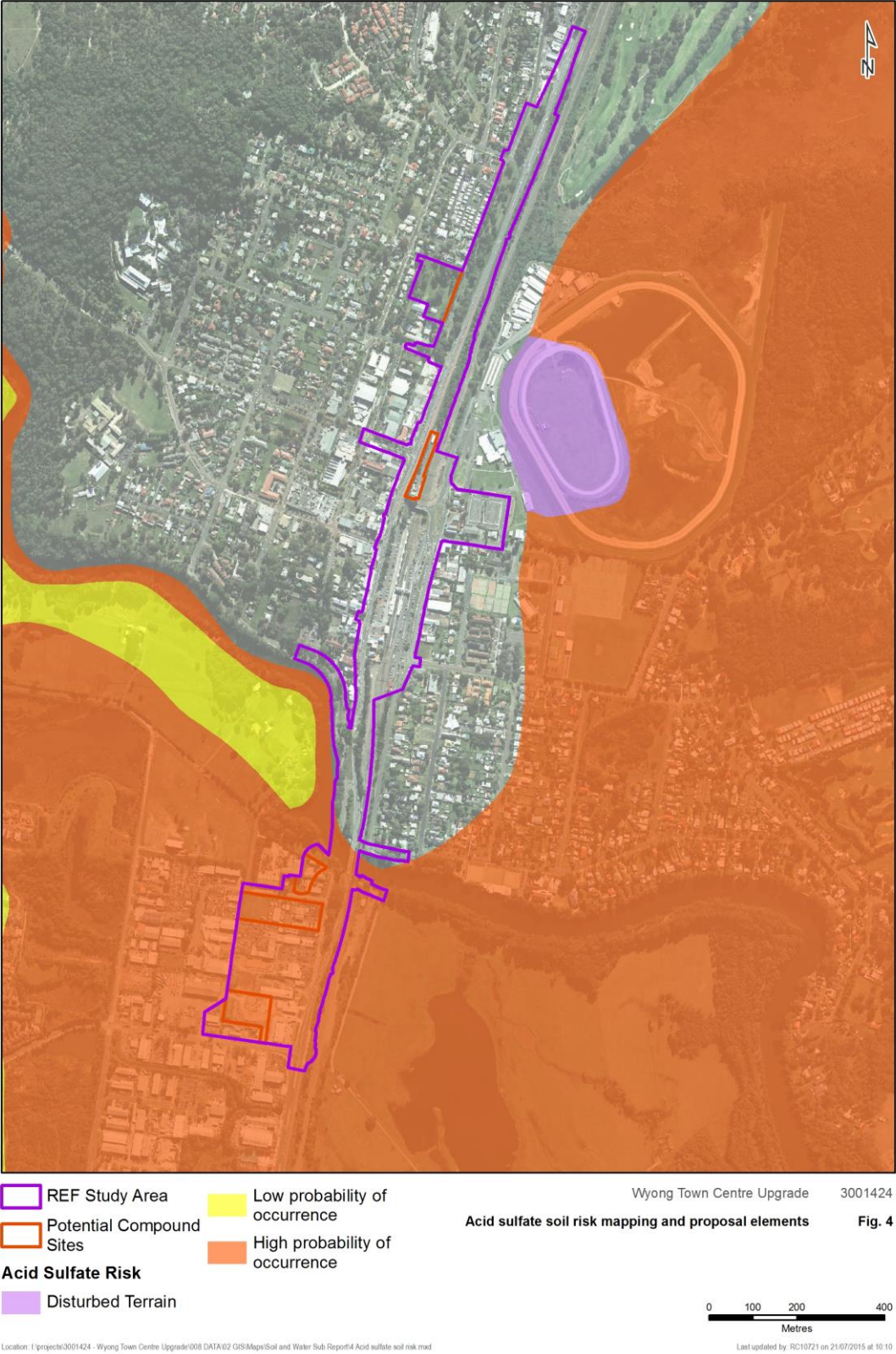


Figure 4. Acid sulfate soil risk mapping and proposal elements

4. HYDROLOGY AND WATER QUALITY

4.1 Surface water

The proposal is located within the Hunter-Central Rivers Catchment Management Authority and managed within the Macquarie Tuggerah Lakes river basin area. Surface water across the majority of the proposal is inferred to flow south-east in accordance with the general topography of the catchments within the Wyong River and Race Course Swamp.

The Wyong River runs south-east for 48 kilometres to meet Tuggerah Lake at Tacoma. The Wyong River's major tributaries include Jilliby and Cedar Brush creeks. Above the Wyong River Weir, the Wyong River has a catchment of about 350 square kilometres. The weir's catchment includes important agricultural land. Agricultural activities include cattle grazing, turf production, small-scale horticulture and orchard enterprises. Other features within the Wyong River catchment include the small rural villages of Dooralong, Jilliby and Yarramalong. The entire proposal is located within the Wyong River catchment as identified in Figure 5.

Racecourse Swamp, listed as a State Environmental Planning Policy (SEPP) 14 wetland, is located 70 metres east of the proposal site at its closest point. The wetland is connected to flows from the proposal area via a culvert under the railway line adjacent to the proposal site. While the proposal area is not directly within Racecourse Swamp, surface flows from the culvert would originate from the proposal site.

Surface water features that cross the proposal area and their flow direction are listed in Table 4 and mapped in Figure 5.

Table 5 - Surface water features crossing the proposal corridor

Feature	Chainage	Flow Direction
Unnamed Open Drainage Line 1	260 - 400	North
Wyong River	440 - 500	East
Unnamed Open Drainage Line 2	1950	East

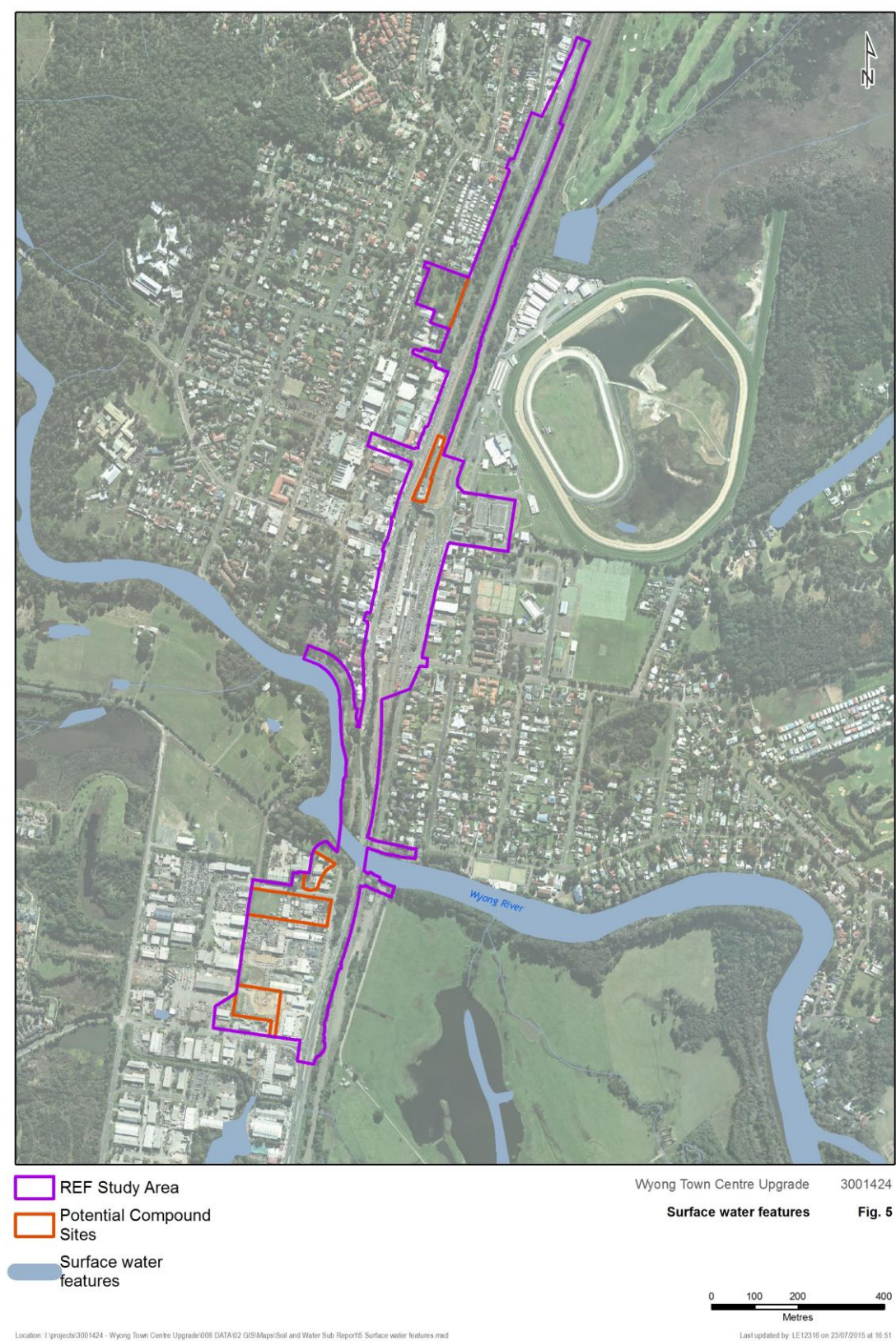


Figure 5. Surface water features that the proposal crosses

4.2 Groundwater

A preliminary search of the Office of Water's 'Online Database' (DPI, 2014) was undertaken to identify groundwater wells (bores) within the vicinity of the proposal. The search indicated that there are six registered well within a one kilometre radius of the proposal. The register describes the characteristics and locations of these registered wells and contains water quality data and or drilling log details.

The limited groundwater characteristics yielded in this search are summarised in Table 5, and locations mapped in Figure 6. Given the proximity of the proposal to the Wyong River and Racecourse Swamp, it is possible that groundwater will be encountered within alluvial sediments at approximately three metres below ground level (BGL) based on the well logs observed. Perched groundwater might also occur nearer to the surface along the proposal corridor.

Table 6 - Summary of groundwater bore information

Well ID	Standing Water Level (m BGL)	Water Bearing Zone (m BGL)	Yield (L/s)	Direction from proposal and use
GW080568	3.00	--	--	200 m NW - Domestic
GW200100	--	--	--	500 m E - Testbore
GW200841	0.80	--	--	400 m E - Testbore
GW202378	4.00	--	--	400 m E - Recreation
GW202635	3.00	--	--	100 m SW - Monitoring
GW202636	3.25	--	--	100 m SW - Monitoring

4.3 Environmental significance of receiving water

The northern portion of the proposal is located on the western edge of Racecourse Swamp. This wetland, which is protected by the provisions of State Environmental Planning Policy No.14 (SEPP 14), is the largest remaining freshwater wetland on the Central Coast of NSW. It plays an important role in filtering water on its way to the Wyong River, which in turn flows into Tuggerah Lakes through a connected series of shallow estuarine lagoons that open to the sea at The Entrance. These waterways provide habitat for a diversity of flora and fauna, support fishing and tourism enterprises and public recreational opportunities.

There is limited water quality data available for the subject catchments however it can be noted that water quality is affected by runoff from surrounding urban development and agricultural uses. Urban stormwater is generally not treated (except for gross pollutants) and drains to local creeks. The quality of the water entering local waterways is therefore a function of the contaminants in the stormwater system. Common stormwater pollutants include litter, chemicals (detergents, oils, fertilizers) and organic matter.

The water quality indicators provided by the Tuggerah Lakes Estuary Management Plan (Muston, 2006) show that water quality in Tuggerah Lakes exceeds ANZECC guidelines for estuaries for total and biologically available nitrogen concentrations. Tuggerah Lakes also have higher turbidity and phosphorous concentrations than other estuaries in the region although these are generally below the ANZECC guidelines.



Figure 6. Ground water well locations

5. POTENTIAL IMPACTS

5.1 Construction phase

The proposed upgrade as described in Section 1.2 would be predominantly constructed to incorporate the existing Pacific Highway alignment and adjoining local road connections. Bridge works including demolition of existing structures would be undertaken within the Wyong River and widening of an existing bridge at Rose Street would occur across the existing rail corridor. Pavement construction would involve traffic diversions and potentially some temporary pavement crossovers subject to construction staging. Ancillary sites as detailed in Section 5.1.3 may be required to assist in the construction of the proposal and would be predominantly used for material stockpiling, office accommodation and site compounds.

Construction activities that have the potential to impact on soil and water quality include:

- General excavation and filling for the new highway alignment
- Wyong River bridge works including demolition of existing structures, excavations for footings, abutments and instream works
- Underground service relocation
- Culvert construction and stabilisation
- Pavement removal
- Ancillary site preparation and operation
- Generation of building and construction waste
- Importing, handling, stockpiling and transporting material resources
- Plant maintenance
- General waste generation from compounds.

5.1.1 *Soil and water quality*

During construction, the proposal has the potential to generate sediment and nutrient runoff during rainfall events due to ground disturbance associated with construction activity. These activities would include vegetation removal and excavation. Sediment mobilisation from soil deposited on the road pavement during works is a further potential impact. A Preliminary Erosion and Sedimentation Assessment (PESA) has been undertaken for the proposed works undertaken in accordance with the Erosion and Sedimentation Risk Assessment Procedure (RTA, 2004). This procedure considers the proposal works to be high risk due to the following criteria being encountered:

- Areas of land greater than two hectares would likely be disturbed
- Soil erodability and erosion hazard has been mapped as very high for some parts of the proposal
- SEPP 14 wetlands are located to the east of the proposal in Racecourse Swamp

- Bridge works (including demolition of old bridge infrastructure) occurring instream within Wyong River.

Potential soil and water impacts include:

- Change to the local surface water system resulting in temporary loss of floodplain storage and temporary redistribution of flood flows as a result of material stockpiles and works within flow paths and at culvert crossings
- Impacts to bank stability (e.g. scouring, under cutting) from preparation of bridge abutments and demolition of existing and construction of the new road bridge within Wyong River.
- Water quality impacts related to potential pollution of stormwater run-off with sediments, fuels and other hazardous materials from the construction site and equipment
- Impacts associated with increased sediment loading, including increased turbidity, and an increased potential for the transport of contaminants bound to sediment particles
- Soil erosion as a result of exposure to wind and water runoff, removal of topsoil, exposure of buried structures, sedimentation, increased turbidity levels in waterways and the local stormwater system and reduced air and water quality.

Wyong River catchment

Construction activities associated with the demolition of the existing road bridge and construction of new twin bridges the Wyong River, pose an elevated risk to water quality within Wyong River and downstream environments. The construction of the road bridge would involve instream works to establish bridge piles including excavation and filling on the north and southern embankments to form the bridge abutments. Potential impacts include:

- Decline in water quality and aquatic ecology from discharge of sediment and other pollutants e.g. concrete, construction waste, curing mixtures and hazardous substances
- Disturbance of ASS leading to potential acid runoff
- Bank instability, scouring and flooding from changes in river flow due to instream construction.

Racecourse Swamp

There is potential to impact Racecourse Swamp SEPP 14 wetlands as drainage from the proposal (south of Cutler Road) would be channelled east toward the wetland via an existing culvert within the rail corridor. Construction activities associated with pavement widening construction of new culverts and establishing a new drainage channel to the west of the highway in this area may result in increased surface runoff, sediment and other pollutants discharging into SEPP 14 wetlands.

5.1.2 Groundwater

Given the expected depth of groundwater in the vicinity of the proposal (between three metres and 3.25 metres BGL), it is considered unlikely that groundwater would be directly intercepted

as a result of the proposal. During construction groundwater quality may be affected if recharge water carries pollutants generated from the proposed construction work. Sources of potential pollution could include acidic water generated from ASS runoff, in-situ ASS generation, drainage from contaminated soil stockpiles or from spills of fuels, oil or other chemicals used in construction.

5.1.3 *Ancillary sites*

A number of potential ancillary sites identified in Figure 1 have been identified for use in supporting construction activities as nominated in Table 6. These potential activities may be revised as site requirements become more definitive.

Table 7 - Proposed ancillary site activities

Ancillary Site	Potential Facility Activity
Johnson Road	Site compound, office accommodation, and stockpile storage
McPherson Road	Site compound and office accommodation.
Former Rail Maintenance Depot opposite Anzac Avenue and Pacific Highway	Site compound, and stockpile storage
Former Wyong Grove Public School oval near Apex Park	Site compound, office accommodation

The proposed ancillary sites include activities that have potential to impact downstream water quality include:

- Storage of chemicals
- Vehicle wash down areas
- Vehicle refuelling areas
- High frequency of vehicle movements
- Material storage and stockpile areas
- Office compounds.

5.1.4 *Contaminated lands*

The findings of the preliminary soil contamination survey (Parsons Brinkerhoff, 2014) indicate soil qualities within the survey area are low risk for contamination, with the exception of the former service station locations located between Anzac Avenue and North Road where risk of engaging potentially contaminated soil or groundwater is medium risk for contamination. The site survey did identify potentially asbestos containing materials within service conduits and communications pits and land associated with former rail corridor activities. Asbestos has also been identified within the water main extending from Panonia Road to North Road along the western side of the Pacific Highway.

There is the potential for contaminated land to be disturbed as a result of construction activities. The construction phase of works requires ancillary sites to be temporarily occupied for the purposes of construction. These ancillary sites provide individual contamination risk profiles that are to be assessed prior to occupation to establish benchmark conditions for the site.

Potential environmental impacts associated with the proposal in relation to contaminated land management include:

- Increasing waste amounts from improper practices such as poor fill management
- Contaminated or hazardous waste not being correctly disposed of
- Adverse effects on human health (construction personnel, travelling public or nearby communities)
- Release of contaminant into underlying soils
- Release of contaminant into groundwater
- Release or build-up of hazardous soil vapours in confined space locations
- Movement of contaminated sediments into waterways
- Adverse effects on flora and fauna.

5.1.5 ***Acid sulfate soil***

There is potential for ASS to be encountered during construction where ASS risk has been identified (refer to Figure 4). Disturbance of ASS is most likely to occur during construction activities associated with the Wyong River road bridge including construction of bridge piles, bridge abutments and excavation for drainage structures. The handling of ASS material including excavation, loading, transportation and storage and stockpiling has the potential to generate acid leachate runoff if not properly managed. Generally, ASS may also be impacted in other areas of the proposal during excavation and dewatering activities. Disturbance of ASS has the potential to result in:

- Impacts to terrestrial flora and decline in soil structure from acidic runoff
- Impacts to surface and ground water of receiving waters including lowering of pH and elevation of dissolved metals
- Impacts to aquatic flora and fauna
- Impacts on agriculture and aquaculture industries.
- Damage to buildings and infrastructure due to aggressivity to structures (e.g. corrosion etc.)

5.2 Operational phase

5.2.1 *Soil and water quality*

Impacts on water quality from road operation can be directly influenced by road maintenance activities, vehicle movement and wear.

The receiving water quality within the proposal area may be impacted as a result of the proposal due to increased surface runoff volume from changes in road catchments and drainage. Wyong River and Racecourse Swamp (SEPP 14 Wetlands) would be particularly sensitive to increased pollutant loads. Increased volumes of vehicular traffic would increase pollutant levels within road surface runoff. Heavy metals of concern in road runoff include cadmium, chromium, copper, nickel, lead and zinc. The concentrations of metals found in road runoff, especially from heavily trafficked areas are usually in excess of current ANZECC guidelines for the protection of fresh and marine waters.

Elevated levels of nutrients such as phosphorous and nitrogen are also found in road runoff and can contribute to the accelerated growth of nuisance aquatic plants and cause a reduction in the levels of dissolved oxygen. Nutrients are usually associated with the fine suspended sediment in runoff.

5.2.2 *Groundwater*

During operation, the proposal has a low potential to result in changes in local recharge of groundwater. This is predominantly due to the existing land use characteristics of the study area being a town centre within a larger rural and natural environmental setting. The change in impervious area as a result of the proposal would be minor in comparison to the large area available for recharge in the catchment.

5.2.3 *Contaminated land*

There is potential for accidental spillage of hazardous materials during the operational stage of the proposal. Without satisfactory means of containment, the spillage of contaminants could pass rapidly into the drainage system and impact downstream ecosystems. Spills of chemicals or petrol as a result of traffic incidents can impact the ecology of aquatic and terrestrial ecosystems. The likelihood of a potential spill of hazardous substances would be reduced as a result of the proposed upgrade and improved road design standards.

6. SAFEGUARDS AND MANAGEMENT MEASURES

6.1 Design phase

6.1.1 Wyong River Bridge

Consideration would be given during detailed design to minimising potential impacts associated with the bridge construction and operation including but not limited to bank instability and scouring, flow alteration and increased risk of flooding.

The presence of ASS and potential impact on new bridge structures within the Wyong River should be further considered during the detailed design phase.

6.2 Construction phase

6.2.1 Soil and water management

Soil and Water Management Plan

A Soil and Water Management Plan (SWMP) would be developed for the proposed works. The SWMP would be developed by a suitably qualified and experienced soil conservationist or a certified practitioner in erosion control (CPESC) in accordance with the principles and practises detailed in *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004). The SWMP would contain include the following elements:

- An Erosion and Sediment Management Report (ESMR) (see erosion and sediment control measures).
- Dewatering procedure to detail how collected surface water runoff and groundwater recharge would be managed.
- Identification of site conditions and construction activities that could potentially result in erosion and associated sediment runoff.
- Procedure to manage acid sulfate soils in accordance with the Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998).
- Detailed construction methodology for the proposed bridge works within Wyong River to minimise the potential for bank instability, scour, flooding and other adverse impacts of construction activities on the water quality within the Wyong River. Details of measures to inform site personnel of the requirements of the SWMP by providing information within induction, toolbox and training sessions.

The SWMP would form part of the Construction Environmental Management Plan (CEMP) for the proposal.

Soil and water management measures

The following management measures would be implemented to control soil and water impacts:

- Preference is to be given to the reuse of surface water collected post rainfall within site works (e.g. excavations, temporary basins etc.). Where reuse (e.g. in compaction

activities or for dust suppression etc.) is not feasible, water discharge is to be managed in accordance with legislation.

- Early installation of cross drainage controls to manage onsite and offsite stormwater.
- Water quality control measures are to be used to prevent any materials (e.g. concrete, grout, sediment etc.) entering drain inlets.
- Spills of oil, fuel and chemicals etc. are to be contained and cleaned up immediately in accordance with spill response procedures.
- Construction plant is not be washed down or cleaned outside of formal containment structures (e.g. wash bay).

Erosion and sediment control measures

An Erosion and Sediment Management Report (ESMR) would be developed and included as part of the SWMP to address the control of soil erosion and sedimentation during construction. The report would consider soil and water quality impact risk associated with the construction of the proposal with specific focus on works occurring in areas of environmental sensitivity (e.g. Wyong River and Racecourse Swamp catchments). The report would be aligned with the construction program and staging of works to identify the type of control and timing of installation required to mitigate potential soil and water impacts.

The ESCS would include the following requirements:

- Development of Progressive Erosion and Sediment Control Plans (ESCP's) detailing control measures to manage site works and use of ancillary sites
- Erosion and sediment control measures in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) are to be implemented and maintained
- Erosion and sediment control measures specific to areas draining to Racecourse Swamp and bridge works occurring within the Wyong River
- Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request
- Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised
- Work areas are to be stabilised progressively during the works
- Vegetation clearing and grubbing should be staged in order to maintain as much natural vegetation as possible during construction
- Disturbed areas would be progressively re-vegetated during construction.

6.2.2 Groundwater

If groundwater is encountered during the construction of the proposal it would be managed and disposed of in accordance with legislation.

6.2.3 ***Contaminated lands***

Further investigation

Where ancillary sites are proposed to facilitate construction works (refer to Section 5.1.3), additional contaminated land assessment in accordance with the relevant EPA guidelines would be undertaken to assess the suitability of the site and any management measures that may be required.

An assessment should be undertaken during detail design to assess soil vapour risk in relation to the proposed construction works occurring between North Street and Anzac Avenue. The assessment would consider disturbance of potentially contaminated soils impacted from underground petroleum storage structures (UPSS) located on the western side of the proposal upgrade.

Contaminated Land Management Plan

A Contaminated Land Management Plan (CLMP) would be developed to comply with the *Contaminated Land Management Act 1997* and relevant EPA guidelines in relation to disturbance or treatment of potentially contaminated land. The CLMP would detail the following:

- Procedure for identifying contamination by monitoring for:
 - Discolouration or staining of soil.
 - Bare soil patches both on-site, and off-site adjacent to site boundary.
 - Visible signs of plant stress.
 - Presence of drums or other waste material.
 - Presence of stockpiles or fill material.
 - Soil vapour risk
 - Odours.
- An Unexpected Finds Procedure to address the management of potentially contaminated material if encountered during works.
- Contaminated land legislation and guidelines including any relevant licences and approvals to be obtained.
- Identification of locations of known or potential contamination and preparation of a map showing these locations.
- Identification of rehabilitation requirements, classification, transport and disposal requirements of any contaminated land within the construction footprint.
- A process for reviewing and updating the plan.
- Contamination management measures including:
 - Waste classification and reuse procedures

- In the event that indications of contamination are encountered (known and unexpected, including odorous or visual indicators), work in the immediate area will immediately cease until a contamination assessment can be prepared to advise on the need for remediation or other action, as deemed appropriate
- Investigate potentially contaminated land to determine the concentration and type of contaminants and the extent of contamination
- Protect the environment by implementing control measures to divert surface runoff away from any identified contaminated land
- Capture and manage any surface runoff impacted by exposure to an AEC or other identified contaminated land
- Assess the requirement to notify relevant authorities, including the EPA
- Manage the remediation and subsequent validation of the contaminated land, including any certification required.

6.2.4 ***Asbestos management***

An Asbestos Management Plan to control known areas of asbestos contamination (refer to Section 5.1.4), would be developed in accordance with the Road and Maritime Procedure Asbestos Related Work No. 066P25 (RMS, 2013). If previously unidentified asbestos contamination is discovered during construction, work in the affected area would cease immediately, and an investigation must be undertaken and report prepared to determine the nature, extent and degree of the asbestos contamination. The level of reporting must be appropriate for the identified contamination in accordance with Guidelines for Consultants Reporting on Contaminated Sites (OEH, 2011), any relevant WorkCover Guidelines and include the proposed methodology for the remediation of the asbestos contamination. Remediation activities must not take place until receipt of the investigation report by an occupational health professional.

Works may only recommence upon receipt of a validation report from a suitably qualified contamination specialist that the remediation activities have been undertaken in accordance with the investigation report and remediation methodology.

6.2.5 ***Waste management***

Excavated material that is not suitable for on-site reuse or recycling, such as contaminated material should be transported to a site that may legally accept that material for reuse or disposal. Soils leaving the site should be waste classified so that correct resource recovery and or off-site disposal occur.

The provisions of the current EPA resource recovery orders and resource recovery exemptions (as detailed in Section 2.1.1) would be applied where material (e.g. virgin excavated natural material, excavated public road material or recovered aggregate) meets the waste criteria for reuse within the road corridor by the project. The following exemptions documents apply:

- Excavated Public Road Material Exemption (EPA, 2014)
- Excavated Natural Material Exemption (EPA, 2014)

- Recovered Railway Ballast Exemption (EPA, 2014)
- Reclaimed Asphalt Pavement Exemption (EPA, 2014)
- Recovered Aggregate Exemption (EPA, 2014)
- The Raw Mulch Exemption (EPA, 2014)

Where excavated material has been classified as contaminated requiring disposal (when it cannot be re-used), it must be taken to an appropriately licensed facility in accordance with the Waste Classification Guidelines – Part 1: Classifying Waste (DECCW, 2009) and Part 2: Immobilisation of Waste (DECC, 2008).

6.2.6 *Ancillary facilities*

The following management measures would be implemented for ancillary facilities:

- Bulk stockpiles of materials or storage of fuels or chemicals should be located greater than 100 metres from any drainage line
- Vehicles and machinery should be properly maintained to minimise the risk of fuel/oil leaks
- All fuels, chemicals and hazardous liquids should be stored within impervious bunded areas in accordance with Australian Standards (AS 1940-2004 and AS 4452B-1997) and EPA Guidelines 'Storing and handling liquids: Environmental Protection – Participants Manual' (DECC, 2007).

6.3 Operational phase

6.3.1 *Proposed water quality controls*

It is proposed to provide water quality treatment measures to manage runoff from the highway only. The proposal would not provide specific treatment measures for runoff from side roads and local roads.

The operational water quality controls proposed are detailed in Table 8. The location and details would be refined in detailed design.

Table 8 – Proposed operational water quality controls

Location (Ch.)	Proposed control	Comments
0-280	None	Reconfiguration of Tuggerah Straight drainage. No real opportunity for introduction of water quality measures. Existing drainage regime to remain.
280-470	Water quality basin	Space permits the inclusion of a water quality basin in the loop between the Pacific Highway, McPherson Road and South Tacoma Road. Runoff from the Pacific Highway bridges over the Wyong River and the new roundabout would be captured and discharged to Wyong River. It would provide a minimum of

Location (Ch.)	Proposed control	Comments
		40,000 litres spillage containment. (refer to drawings in Appendix B)
1650-2400	Existing and new grassed swales.	The inclusion of basins would not be suitable due to low-lying land. Kerbs have been removed where possible to allow use of grassed verges for treatment.
Rose Street Commuter Car Park	Connect to existing water quality improvement device.	Existing water quality improvement device was constructed as part of TfNSW commuter car park.

6.3.2 *Wyong River and Racecourse Swamp*

Consideration should be given in the detailed design phase to providing water quality controls in the following locations:

- Southern side of Wyong River to control pavement drainage discharge
- Northern side of Wyong River to control pavement drainage
- South of Cutler Drive, where drainage from the proposed upgrade will discharge east via the rail culverts towards SEPP 14 wetlands.

The water quality control measures are required to minimise further potential environmental impacts from increase pollutant loads from the upgraded road surface.

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