4.2 Surface water

4.2.1 Receiving waters and sensitive receiving environments

The project area drains to three main watercourses, all of which are tributaries of Lake Illawarra:

- Duck Creek
- Macquarie Rivulet, which is fed by Marshall Mount Creek and Frazers Creek
- Horsley Creek.

These watercourses are characterised by largely rural landscapes which are predominantly cleared for rural purposes such as grazing. As these watercourses reach Lake Illawarra they are flow through townships located adjacent to the shoreline, where they are influenced by directed stormwater from urban areas. Some commercial and industrial facilities are also located in the catchment for these watercourses. Large scale land development in West Dapto and Calderwood in the upstream of the catchments also has the potential to result in impacts to these watercourses both from existing works (e.g. via erosion and sedimentation related to construction works) and into the future (e.g. due to changes to stormwater quality from these new urban areas) (EIS, p497).

These watercourses, and Lake Illawarra, comprise the receiving waters for the project, and have the potential to be impacted by the project during its construction and/or operation.

These receiving waters comprise a range of sensitive riparian and aquatic ecosystems that support a diverse range of flora and fauna. They may have high conservation value, be highly valued by the community, support human uses (such as fishing or aquaculture), or be susceptible to water pollution. These sensitive ecosystems are referred to as sensitive receiving environments (EIS, p497).

Sensitive receiving environments for the project area are mapped inFigure 4-4. Those that have potential to be indirectly impacted by the project via water quality impacts are located within and downstream of the project area and include (EIS, p497):

- The aquatic and riparian ecosystems of Duck Creek, Macquarie Rivulet and Horsley Creek. The Macquarie Rivulet and Horsley Creek also comprise of key fish habitat
- Freshwater wetlands and saltmarsh threatened ecological communities
- State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP). The Coastal Management SEPP commenced on 3 April 2018. It aims to promote an integrated and coordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the *Coastal Management Act 2016*. The Coastal Management SEPP consolidates and consequently repeals SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection)
- Groundwater dependent ecosystems
- Lake Illawarra, which is a Nationally Important Wetland (NSW081), a key fish habitat, and a popular place for recreational fishing and swimming.
- Seagrass beds located in Lake Illawarra.

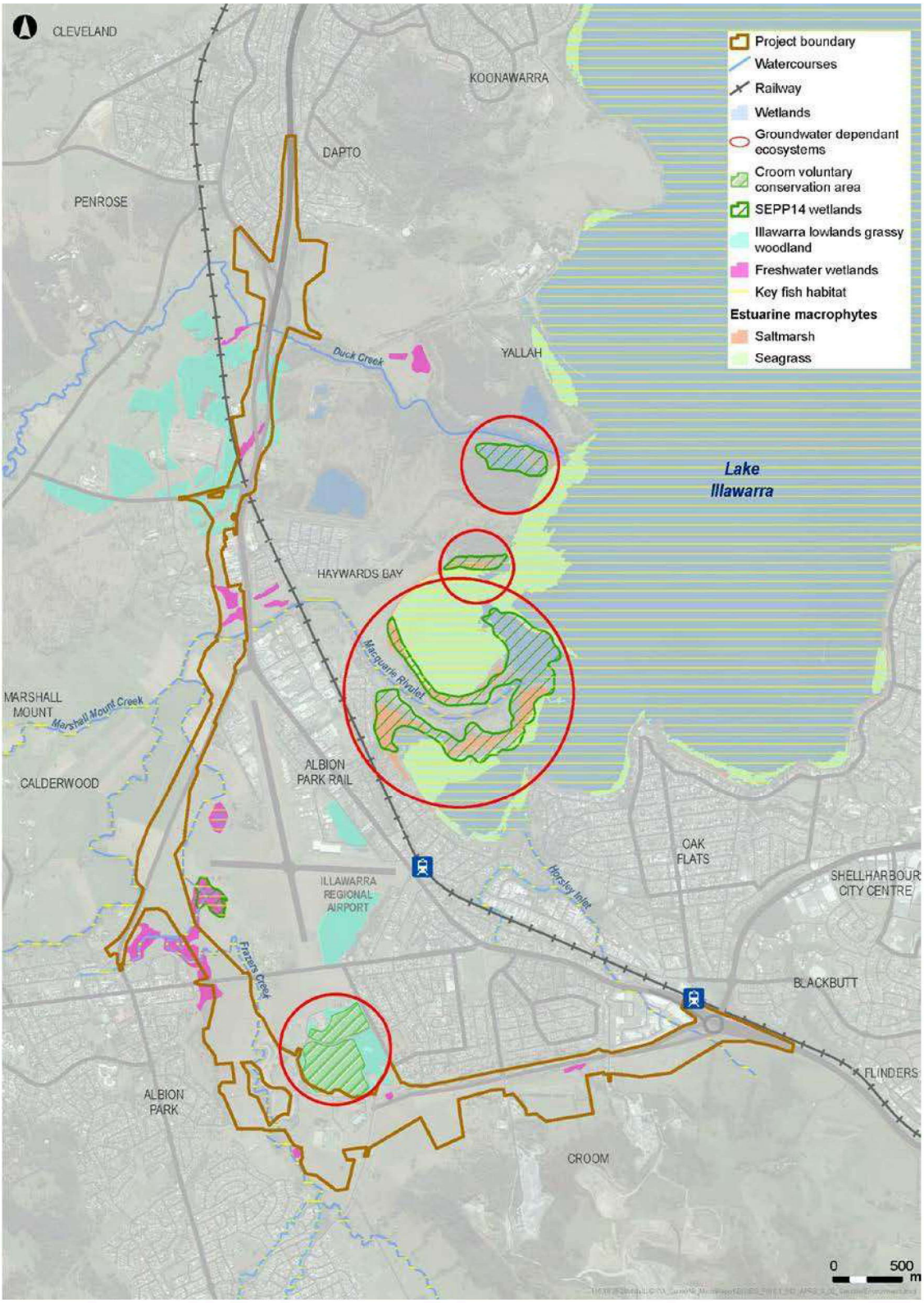

Figure 4-4 Sensitive receiving environments (EIS, p498)[4]

[4] It is noted that the project boundary in the SPIR (not the EIS) is the approved project boundary for the overall approved State Significant Infrastructure (SSI 6878). However, the Project forms Stage 2 of SSI 6878 only. Stage 2 comprises the extension of the Princes Motorway between Yallah and Oak Flats and all associated works including bridges, interchanges and local road changes or upgrades (excluding Stage 3 – Yallah Interchange; and any work as part of Stage 1 - Croom Regional Sporting Complex reconfiguration). For additional details refer to the Albion Park Rail bypass Staging Report (Roads and Maritime, March 2018).

4.2.2 Surface water quality

The most recently published State of the Environment Report by Shellharbour City Council is for 2010–2011 (Shellharbour City Council, 2011). It presents water quality data for the lower reaches of both Horsley Creek and the Macquarie Rivulet, which is summarised in Table 4-1. Values shown in red text represent exceedances of the trigger levels for aquatic ecosystem health guidelines, with the exception of the dissolved oxygen concentration for lower Horsley Creek, which is below the desirable range for estuaries. The Australian and New Zealand Environment and Conservation Council (2000) Guideline values for fresh and marine water quality are (EIS, p499):

- Chlorophyll a: Four micrograms per litre
- Total nitrogen: 0.3 milligrams per litre
- Total phosphorus: 0.03 milligrams per litre
- Dissolved oxygen 80-110 per cent.

The State of the Catchment 2010 Riverine Ecosystems report for the Southern Rivers Region (NSW Government, 2010a) states that the Macquarie Rivulet had numerous exceedances of the guidelines for concentrations of total nitrogen and total phosphorous during the reporting period, and that turbidity levels were high. This is generally consistent with the results presented in the State of the Environment Report (Shellharbour City Council, 2011).

This data indicates that both the Macquarie Rivulet and Horsley Creek are subject to an existing level of impact from the road network and other activities in the catchment. It is noted that the existing road network has limited provision for treating stormwater runoff from the road surface. This is likely contributing to some of the observed water quality issues, along with other land uses in the catchment, including the railway, urban development, agriculture and sporting fields (EIS, p499).

Table 4-1 Existing water quality - Horsley Creek and Macquarie Rivulet (EIS, p500)

Watercourse	Chlorophyll-a (µg/L)		Total Nitrogen (mg/L)		Total phosphorous (mg/L)		Dissolved oxygen (%)	
	2009-2010	2010-2011	2009-2010	2010-2011	2009-2010	2010-2011	2009-2010	2010-2011
Lower Horsley Creek	5.4	6.6	0.41	0.7	0.07	0.31	Not available	70.6
Lower Macquarie Rivulet	1.05	1.3	0.74	0.5	0.11	0.08	Not available	85.8

There was no publicly available water quality data for Duck Creek to enable a similar assessment of existing water quality. The environmental impact statement assumes that the water quality would be subject to a similar level of impact as the Macquarie Rivulet and Horsley Creek.

4.3 Groundwater

This chapter is summarised from Chapter 17 of the EIS.

4.3.1 Groundwater characteristics

The project area is located within the Sydney Basin South Groundwater Source, which is bounded by the Illawarra Range to the north, the Turpentine Range to the south and east, and the geological boundary of the Goulburn Fractured Rock to the west. The groundwater source has a total area of just over 3000 square kilometres. Bores accessing the groundwater source are mainly limited to the northern half of its extent, with National Parks covering much of the southern part (NSW Office of Water, 2011a). The relatively high rainfall and considerable topographical relief suggest that the groundwater contours can be expected to follow the topography. Groundwater discharge is therefore most likely to occur in the low lying coastal area. The study area and project location are mapped in Figure 4-5, which also shows the distribution of bores (EIS, p517).

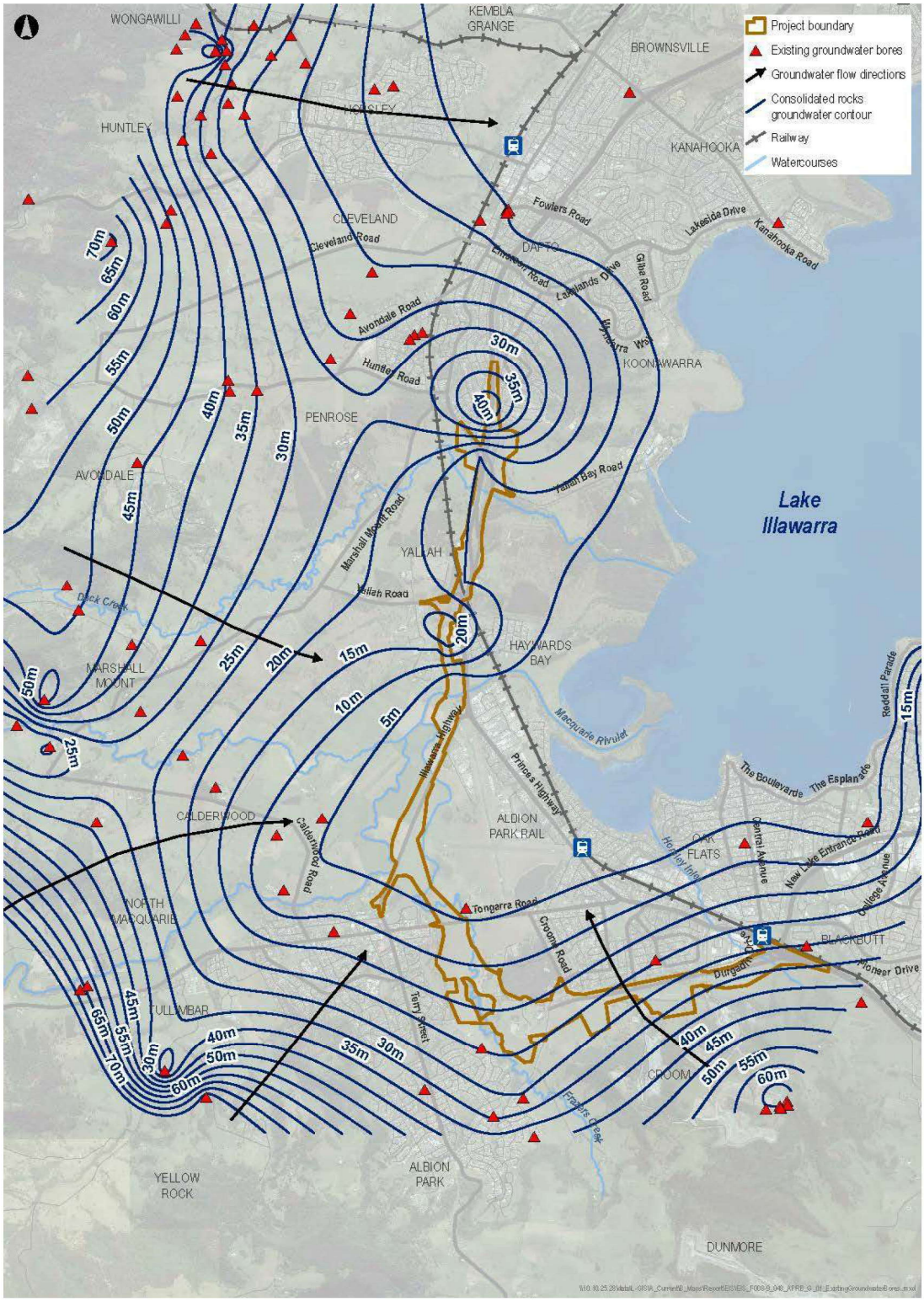

Figure 4-5 Groundwater assessment study area showing existing groundwater bores (EIS, p518)[5]

[5] It is noted that the project boundary in the SPIR (not the EIS) is the approved project boundary for the overall approved State Significant Infrastructure (SSI 6878). However, the Project forms Stage 2 of SSI 6878 only. Stage 2 comprises the extension of the Princes Motorway between Yallah and Oak Flats and all associated works including bridges, interchanges and local road changes or upgrades (excluding Stage 3 – Yallah Interchange; and any work as part of Stage 1 - Croom Regional Sporting Complex reconfiguration). For additional details refer to the Albion Park Rail bypass Staging Report (Roads and Maritime, March 2018).

4.3.2 Groundwater use

The EIS (p519) identified that there are 104 bores located in the groundwater study area, of which a total of 66 are used for water supply. None of the bores used for water supply are located within the project boundary; and most are located further to the west and north-west of the project area.

The licences for water supply bores indicate that they are typically used for watering stock, domestic use and monitoring groundwater. A total of 36 bores used for monitoring are located on five properties, appear to be associated with industrial activity on the subject sites (EIS, p519).

Of the 66 licenced producing bores, 28 are targeting the consolidated rock formation and only two bores are targeting alluvium formations. This reflects the bore yield and groundwater characteristics described in Section 17.2.1 of the EIS, namely that better groundwater resources are found in the fractured rock units of the consolidated formation.

A total of nine bores are used for recreational, industrial and irrigation purposes. Those bores are licenced and have a defined water allocation. Groundwater allocations range from one to 19 megalitres per year (or equivalent share units). The larger groundwater allocation is for recreation purpose with 19 megalitres per year (or equivalent share units) of groundwater allocation.

It is noted that this information is based on a review of the groundwater licences, and does not necessarily reflect the current and ongoing use of the bores (EIS, p519).

4.3.3 Groundwater quality

Based on the fact that the data collation and review in relation to contaminated soils did not identify any known sites of contamination (refer Section 16.2.1 of the EIS), it is considered that there is a low likelihood of encountering contaminated groundwater (EIS, p519).

4.3.4 Groundwater dependent ecosystems

Within the Greater Metropolitan Region for the Sydney Basin South groundwater source, the Macquarie Rivulet estuary wetland is the only defined groundwater dependent ecosystem of high significance near the project (EIS, p520). It is located 1.3 kilometres east of the project and adjacent to Lake Illawarra. The groundwater levels would be close to the surface near Lake Illawarra, and would contribute to the groundwater dependent of the Coastal Management SEPP in this location (EIS, p520).

Other freshwater wetlands (such as the Freshwater Wetlands endangered ecological community) may be only partly sustained by groundwater, relying primarily on surface water flows. A Coastal Management SEPP on Frazers Creek, located directly east of the project, supports low-level vegetation and freshwater fauna, and is potentially partially supported by groundwater. Based on a review of the information presented in Technical Paper 4- Biodiversity Assessment Report, it is not considered to be a high-value groundwater dependent ecosystem (EIS, p520).

It is expected that only deep rooted freshwater wetland communities are expected to be reliant on groundwater. This would include the Illawarra Lowland Grassy Woodland endangered ecological community, which is thought to be partially reliant on groundwater. One Illawarra Lowland Grassy Woodland community located close to the project in Croom Reserve is identified as having a high priority for conservation due to its status as an endangered ecological community that forms part of the Voluntary Conservation Area (see Chapter 9 of the EIS). This community is therefore considered to be a groundwater dependent ecosystem.

The groundwater dependent ecosystems are mapped in Figure 4-6.

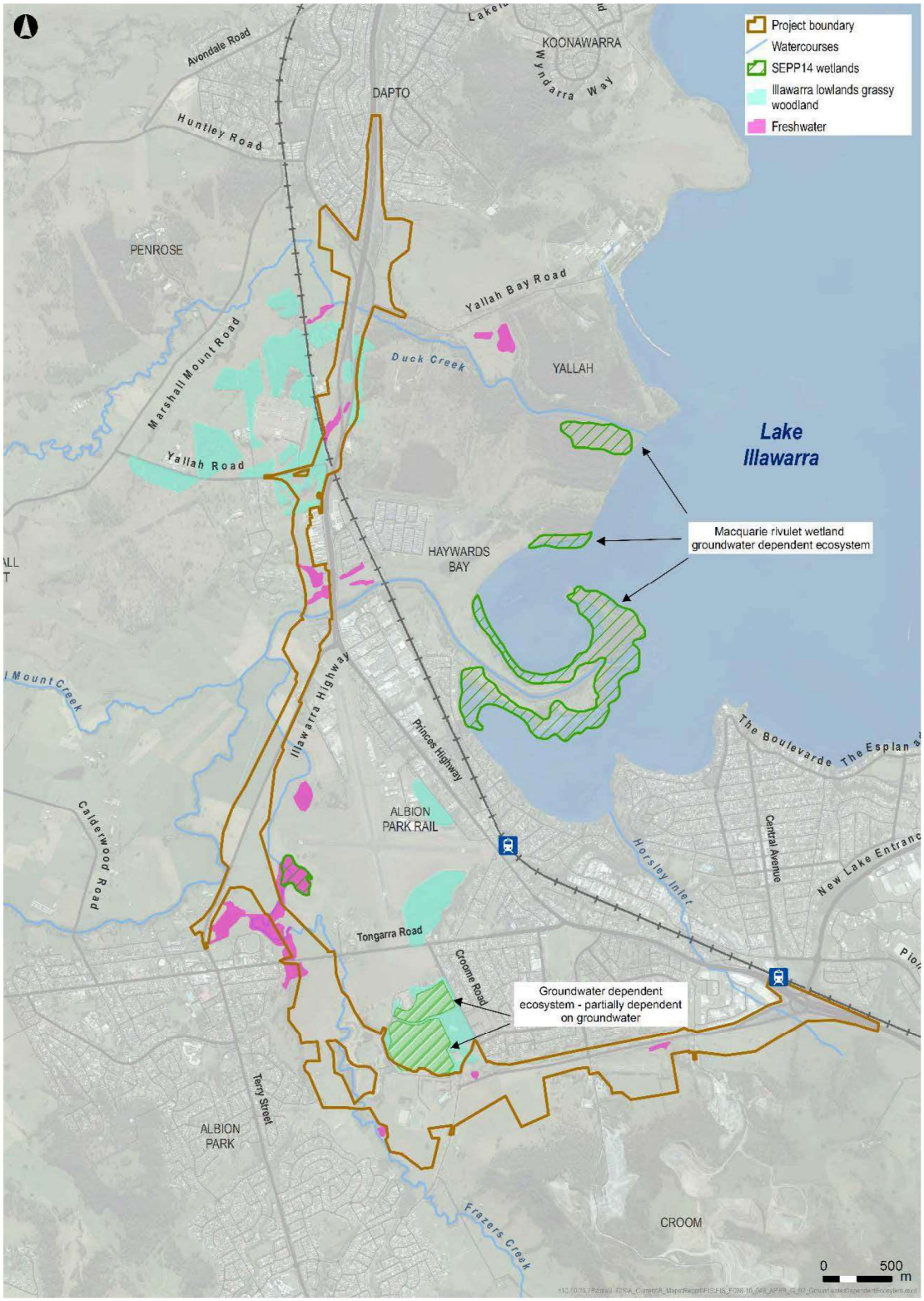

Figure 4-6 Groundwater dependent ecosystems and wetlands (EIS, p521)[6]

[6] It is noted that the project boundary in the SPIR (not the EIS) is the approved project boundary for the overall approved State Significant Infrastructure (SSI 6878). However, the Project forms Stage 2 of SSI 6878 only. Stage 2 comprises the extension of the Princes Motorway between Yallah and Oak Flats and all associated works including bridges, interchanges and local road changes or upgrades (excluding Stage 3 – Yallah Interchange; and any work as part of Stage 1 - Croom Regional Sporting Complex reconfiguration). For additional details refer to the Albion Park Rail bypass Staging Report (Roads and Maritime, March 2018).

4.4 Rainfall

The rainfall records from Albion Park have been selected to reflect the potential rainfall conditions across the project site due to its proximity to the overall site, and extent of available data (from 1888 to present). A summary of the rainfall records from the Bureau of Meteorology is provided in

Table 4-2 Summary of rainfall records

Summary of rainfall record from 1892 to present													
	Summer / Autumn						Winter / Spring						
	Dec	Jan	Feb	Mar	Apr	Ma	Jun	July	Aug	Sep	Oct	Nov	Year
Mean rainfall (mm)	78.6	103.3	125.3	132.0	100.2	91.5	107.4	69.0	67.2	59.6	76.4	84.3	1095.8
Mean rain days	7.3	8.0	8.2	8.6	7.0	6.9	7.0	5.7	5.8	6.3	6.9	7.7	85.3

Source: Bureau of Meteorology Website, Accessed 27 April 2020

4.5 Rainfall erosivity factor

The rainfall erosivity factor is a measure of the ability of rainfall to cause erosion (referred as “R” in the revised universal soil loss equation (RUSLE)). The rainfall erosivity factor is used to determine the soil loss in tonnes per hectare over one year, and is used in calculations when sizing construction sediment basins. The rainfall erosivity factor forms part of the soil loss calculations made during development of the erosion and sediment control plan contained in Appendix A.

5 Environmental aspects and impacts

The key construction activities and the associated potential sources of soil and water impacts are identified through a risk management approach. The consequence and likelihood of each activity's impact on the environment has been assessed to prioritise its significance. The results of this risk assessment are included in Appendix A2 of the CEMP.

Ongoing environmental risk analysis during construction will be undertaken through regular monitoring, inspections and auditing as described in Chapter 7.

5.1 Construction activities

Key aspects of the project that could result in adverse impacts to soils, sediments and water (Chapters 16.3.1 and 16.3.2 in the EIS) are presented in Table 5-1.

Table 5-1 Potential construction activities and associated environmental issues

Environmental Issue	Construction activity
Soil erosion and sediment transport	• The excavation and transport of soils • The construction of subgrade, embankments and culverts • The temporary stockpiling of material.
Landslip	• Cuttings to achieve required road grades • Construction of embankment • Localised excavations, typically for drainage structures.
ASS and acid sulfate rock	• Dewatering activities designed to lower the groundwater table • Drainage work to temporarily and permanently manage surface water flows • Excavation of ASS/ acid sulfate rock and stockpiling of untreated materials, particularly deep soil strata and those situated below the groundwater table • Piling activities, particularly the installation of solid piles that displace ASS • Reuse of ASS and acid sulfate rock within permanent embankments and for landscape rehabilitation • Excavation of sediments around creek crossings • Exposure of in-situ soils and rock to the atmosphere in trenches, excavations and cuttings.
Settlement of soft soils	• Excavation and replacement of unsuitable soft materials • Construction of raised embankments • Soil consolidation • Ground improvement measures such as wick drainage.
Salinity and acidity	• Vegetation clearing • Earthworks.
Water quality	• Stockpiling of vegetation • Vegetation clearing and the exposure of soils • Earthworks or dewatering • Disturbance of contaminated materials • Use of vehicles, plant and machinery on site • Work activities • Construction of adjusted Frazers Creek • Activities at ancillary sites • Generation of waste and spoil • Installation of working platforms in waterways (Macquarie Rivulet, Frazers Creek, Duck Creek).

5.2 Impacts

The potential for impacts on soil and water will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts on soil and water as a result of the project are presented in Table 5-2.

Table 5-2 Potential impacts on soil and water

Environmental Issue	Action/Impact
Soil erosion and sediment transport	• Increased risk of soil erosion • Transportation of soils and sediments via stormwater runoff and wind to nearby waterways and sensitive receiving environments • Adverse impacts on the health of ecosystems by smothering benthic habitats • Increasing turbidity in the water column • Decreasing light penetration • Introducing sediment bound nutrients, trace materials and other toxicants.
Landslip	• Rise to risk of landslips and mass material movement
ASS and acid sulfate rock	• Exposure of ASS that were previously submerged below the groundwater table • Soil and groundwater acidification in ASS landscapes • Modification of groundwater levels in ASS landscapes pose a risk of disturbing ASS by exposing them to oxygen, which can increase the potential for sulfide oxidation and consequent acid generation.
Contaminated land	• Lateral migration of contaminants into the environment via stormwater runoff and vertical infiltration of contaminants into previously unaffected soils and groundwater • Increased risks of exposure for human receptors (workers, and members of the public) via the pathways of skin contact, ingestion and inhalation of volatile or airborne contaminants due to increased proximity to the contaminated materials.
Settlement of soft soils	• Soft soils underneath engineered embankments are expected to settle during the construction phase of the project with a typical consolidation time of three to six months following the application of treatments such as wick drainage • A total settlement of about 1350 millimetres is expected for soft soils • Reduction of water content within shallow soils • Minor changes to shallow groundwater levels • Localised reductions in soil permeability and moisture levels.
Salinity and acidity	• Deeper saline soils being brought to the surface • Risk to vegetation growth • Risk of erosion • Salt export to surface water bodies.
Water quality	• Tannin leachates from stockpiled vegetation, which could enter watercourses, resulting in increased acidity, reduced water clarity and light penetration, and increased biological oxygen demand • Soil erosion by the action of wind or stormwater, and transport into waterways, leading to increased turbidity, sedimentation, and potentially the introduction of nutrients and any other pollutants associated with the sediments. • There is an increased risk where vegetation clearing and / or earthworks are proposed adjacent to or within a watercourse (such as for bridge works or culverts). These activities could result in bank instability • Exposure of potential or actual ASS in some parts of the project area could result in the mobilisation of acidic runoff into watercourses. This would result in increased acidity of surface water and / or groundwater. This work could cause the mobilisation of heavy metals into the environment • The mobilisation of contaminants into surface water and / or groundwater, negatively impacting aquatic ecosystems • Potential for an accidental spill or leak of fuel, oil, greases or other chemicals, which could pollute surface water and / or groundwater • Potential for stagnation of waters, which could lead to water quality issues such as stratification, changes in nutrient cycling and decreased oxygen concentrations. Where flow modification leads to exposure of potential or actual ASS, this could lead to acid generation, with resultant negative impacts on surface water and groundwater

Environmental Issue	Action/Impact
	• Adjusting Frazers Creek north of the existing Croom Regional Sporting Complex could result in soil erosion and sediment transport into waterways, leading to increased turbidity, sedimentation, and potentially the introduction of nutrients and any other pollutants associated with the sediments • Activities at ancillary sites could adversely impact surface water and groundwater.
Impacts on sensitive receiving environments	• Short-term, localised losses of terrestrial and aquatic species • Short-term to medium-term declines in aquatic and riparian habitat condition • Short-term localised impacts on the suitability of waterways for recreation • Minor effects on the quality of water for usage by humans and / or livestock.

Some impacts on soil and water attributable to the project are anticipated. Relevant aspects and the potential for related impacts have been considered in a risk assessment at Appendix A2 of the CEMP. Chapter 6 provides a suite of mitigation measures that will be implemented to avoid or minimise those impacts.

6 Environmental mitigation measures

Specific mitigation measures to address impacts on soil and water are outlined in Table 6-1.

Table 6-1 Soil and water mitigation measures

ID	Mitigation measure	Responsibility
SWMM1	Engage a soil conservationist selected from the Roads and Maritime' Registered Category of 'Soil Conservation Consultancy Services', to review erosion and sediment control plans where required.	Environmental Manager
SWMM2	Install erosion and sediment controls in all construction areas where soil disturbance is going to occur, prior to soil disturbance occurring.	Environmental Manager Project Engineers Foreman
SWMM3	Design, install and maintain all erosion and sediment controls in accordance with the Erosion and sediment control plan (ESCP) included in Appendix A of this plan. The ESCP has been prepared in accordance with the Blue Book (Landcom, 2004 and DECC, 2008) and includes relevant standard drawings and details from these texts.	Environmental Manager Project Engineers Foreman
SWMM4	Consult with the required, plus optional additional agencies as relevant. For example, ensure permanent and temporary watercourse crossings and stream diversions, drainage swales and depressions are undertaken in consultation with DPI Fisheries and the EPA. Ensure Frazers Creek adjustment is designed and constructed in consultation with DPI Fisheries and DPI Water.	Environmental Manager
SWMM5	In addition to the overarching primary ESCP (refer to Appendix A) prepare Progressive Erosion and Sediment Control Plans (PESCPs) prior to commencing each stage or parcel of work where there is a risk of erosion and sediment loss.	Environmental Manager Project Engineers
SWMM6	Implement appropriate erosion and sediment control measures for each particular section of works in accordance with the PESCP, prior to the commencement of any clearing, stripping or earthworks.	Project Engineers Foreman
SWMM7	Install certain structures and controls (i.e. sediment basins, pipes and culverts) early (i.e. prior to clearing and stripping) to promote successful erosion and sediment control during construction (principally, during clearing, stripping and earthworks).	Project Engineers Foreman
SWMM8	Update PESCPs as required and as the works progress and the site changes.	Environmental Manager
SWMM9	Establish clearing limits and work boundaries that are well defined using barrier tape (or equivalent) prior to any construction, clearing or stripping works commencing. Exclusion zones and fencing or other means to demarcate vegetation to be retained in close proximity to the works need to be in accordance with the Roads and Maritime Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (RTA, 2011)	Environmental Manager Project Engineers Foreman
SWMM10	Minimise the extent of clearing and retain as much groundcover as possible.	Project Engineers Foreman
SWMM11	Clearly mark all vegetation that is to be retained. Exclusion zones and fencing or other means to demarcate vegetation to be retained in close proximity to the works need to be in accordance with the Roads and Maritime Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (RTA, 2011).	Environmental Manager Project Engineers Foreman
SWMM12	Clear land progressively and clear the areas associated with the current section/stage of works only.	Project Engineers Foreman
SWMM13	Initially clear and grub leaving the soil surface in a reasonably rough condition with some surface vegetative cover.	Project Engineers Foreman
SWMM14	Maximise the separation of 'clean' (offsite) run-on water from 'dirty' (onsite) (e.g. turbid) construction area runoff as much as possible.	Environmental Manager Project Engineers

ID	Mitigation measure	Responsibility
		Foreman
SWMM15	Construct drainage structures early in the project including: • Sediment basins and traps • Catch drains, and • Culverts/ pipes and associated inlet and outlet protection (eg. dissipaters).	Project Engineers Foreman
SWMM16	Maximise the diversion of turbid construction runoff into sediment basins.	Project Engineers Foreman
SWMM17	Control runoff during the construction of embankments (e.g. fill shaping and the construction of temporary dykes and batter drains).	Project Engineers Foreman
SWMM18	Divert clean water runoff into pits and the stormwater drainage system as soon as practical to reduce surface flow lengths.	Project Engineers Foreman
SWMM19	Divert offsite run-on water around the works site as much as possible. Use permanent cut-off drains to achieve this as much as possible.	Project Engineers Foreman
SWMM20	Maintain slope lengths at appropriate lengths (refer to the standard drawings in the Primary ESCP) to reduce water velocity and minimise erosion. Use catch drains to collect and divert runoff from the slopes.	Project Engineers Foreman
SWMM21	Use geotextile linings or other surface protection methods to provide temporary surface protection in areas where appropriate (e.g. batter drains, culvert construction).	Project Engineers Foreman
SWMM22	Use check dams within diversion drains where required to reduce water velocity and minimise erosion within the drains.	Project Engineers Foreman
SWMM23	Locate stockpiles in accordance with the *Stockpile Management Protocol* included in Appendix E of this SWMP.	Project Engineers Foreman
SWMM24	Progressively stabilise exposed ground surfaces using temporary methods such as soil binders, cover crop species or other appropriate practices.	Project Engineers Foreman
SWMM25	Stabilise stockpiles and batters progressively using temporary methods such as geotextile fabric, stabilised mulch, soil binders (e.g. Gluon polymer emulsion) or cover crop species. Use Rye Corn during the months of April to August or Japanese Millet during the months of September to March as required by R178.	Project Engineers Foreman
SWMM26	Immediately commence stabilisation of waterways, including their beds and banks, after the completion of any works within these areas. All stabilised areas to mimic a naturalised creek system and the disturbed areas to be planted with native species in accordance with the Landscape Design Drawings.	Project Engineers Foreman
SWMM27	Control dust using methods such as water trucks, temporary stabilisation methods, soil binders, compaction, progressive revegetation techniques or other appropriate practices.	Project Engineers Foreman
SWMM28	Use temporary ground covers such as soil stabilisers (e.g. Gluon polymer emulsion), hydroseed or hydromulch as much as possible to stabilise batters, stockpiles and large surface areas.	Project Engineers Foreman
SWMM29	Construct sediment control measures as close to the potential source of sediment as possible.	Environmental Manager Project Engineers Foreman
SWMM30	Ensure sediment basin management of turbid water immediately after rain as required with one or a combination of: • Flocculation with gypsum (or approved alternative flocculate), and	Environmental Manager Project Engineers

ID	Mitigation measure	Responsibility
	• Pump-out for construction purposes or dust control.	Foreman
SWMM31	Do not release water from sediment basins prior to achieving acceptable water-quality standards (refer to mitigation measure ID SWMM60 for water quality criteria).	Environmental Manager Project Engineers Foreman
SWMM32	Control the tracking of mud and soil material onto local roads using shakers, rubble pads or washdown areas.	Foreman
SWMM33	Provide sediment fencing or equivalent downslope of disturbed areas that can't be directed into a designated sediment basin, trap or bund unless completely impractical (e.g. works within watercourses). Implement alternative controls (i.e. silt curtains and enhanced erosion controls) in these locations.	Environmental Manager Project Engineers Foreman
SWMM34	Use mulch bunds, earth bunds or straw bales as alternatives to sediment fencing where appropriate. However, do not use mulch in concentrated flow areas or where it has the potential to result in tannin leachate into waterways. Refer to Appendix F *Roads and Maritime Environmental Direction: Management of Tannins from Vegetation Mulch*.	Environmental Manager Project Engineers Foreman
SWMM35	Treat water accumulating within any excavation, trap or low point on site that cannot be re-used in construction or dust suppression, as per the requirements for sediment basins before discharge from site. Refer to mitigation measure ID SWMM60 for water quality criteria.	Environmental Manager Project Engineers Foreman
SWMM36	Install sediment controls around stormwater inlet pits where appropriate and where they won't cause or exacerbate flooding. Consider traffic management and safety if installing such devices on live traffic roads.	Environmental Manager Project Engineers Foreman
SWMM37	Remove sediment controls only after works are complete and 70 per cent stabilisation of disturbed surfaces is achieved.	Environmental Manager Project Engineers Foreman
SWMM38	Test sediment basins and, if required, treat, prior to discharge within 5 days of a rainfall event that causes runoff (refer to mitigation measure ID SWMM60 for water quality criteria). Alternatively, pump sediment basins out for construction or dust control purposes to ensure the required capacities remain available for future rainfall.	Environmental Manager Project Engineers Foreman
SWMM39	Carry out dust suppression whenever necessary to minimise sediments becoming air borne due to wind erosion.	Foreman
SWMM40	Design, construct and maintain temporary waterway crossings in accordance with the requirements of the Blue Book and in consultation with Fulton Hogan's Soil Conservationist where necessary.	Environmental Manager
SWMM41	Undertake all works in and around waterways in accordance with a Works in/around Waterways EWMS. This EWMS will undergo agency review and comment.	Environmental Manager Project Engineers Foreman
SWMM42	Complete any vegetation clearing and removal of topsoil near the waterways in accordance with a Clearing and Grubbing EWMS.	Environmental Manager Project Engineers Foreman
SWMM43	Minimise removal of native riparian vegetation, where practical	Environmental Manager Foreman

ID	Mitigation measure	Responsibility
SWMM44	Undertake permanent replanting/revegetation with local native species in accordance with the Landscape Design Drawings, as soon as practicable. The Vegetation Management Plan will be included in the Landscape Design Drawings.	Project Engineers Foreman
SWMM45	Design all sediment basins in accordance with the requirements of Roads and Maritime Specifications G36 and G38 and in accordance with the Blue Book (Landcom, 2004 and DECC, 2008).	Environmental Manager Project Engineers Foreman
SWMM46	Provide suitable access into sediment basin locations to allow for safe removal of sediment and maintenance operations.	Environmental Manager Project Engineers Foreman
SWMM47	Inspect all sedimentation basins at least weekly and following any rainfall event causing runoff.	Environmental Manager Project Engineers Foreman
SWMM48	Immediately schedule de-silting and water treatment if sediment accumulates to a level above 30 per cent of the sediment storage zone marker.	Environmental Manager Project Engineers Foreman
SWMM49	Apply flocculant to settle sediments within 24 hours of the conclusion of the last rainfall event causing runoff.	Environmental Manager Project Engineers Foreman
SWMM50	Include the following items on sediment basins: • A spillway constructed and stabilised to the 100-year ARI event • A marker peg (or equivalent) showing the boundary between the Sediment (Storage) and Water (Settling) zones of the basin • A sediment basin ID • Lined inlets to minimise scour, and • Measures to minimise the safety risk for site workers.	Environmental Manager Project Engineers Foreman
SWMM51	Adequately compact and stabilise sediment basin walls with appropriate protective ground cover. Provide freeboard of at least 600mm from the spillway invert to the top of any earth wall.	Environmental Manager Project Engineers Foreman
SWMM52	Source water for compaction and dust suppression preferentially from sediment basins.	Environmental Manager Project Engineers Foreman
SWMM53	Treat water in sediment basins and discharge within 5 day of a rainfall event that causes runoff. Refer to mitigation measure ID SWMM60 for water quality criteria.	Environmental Manager Project Engineers Foreman
SWMM54	Undertake all dewatering on site in accordance with the Blue Book and Roads and Maritime guideline titled Environmental Management of Construction Site Dewatering. Prepare and implement a Dewatering EWMS to ensure that the waters being discharged meet the water quality criteria specified under mitigation measure ID SWMM60.	Environmental Manager Project Engineers Foreman

ID	Mitigation measure	Responsibility
SWMM55	Issue a Dewatering Permit prior to any dewatering on site.	Environmental Manager Project Engineers Foreman
SWMM56	Where using cover crop species to progressively revegetate disturbed areas, use Rye Corn during the months of April to August or Japanese Millet during the months of September to March.	Project Engineers Foreman
SWMM57	Commence stabilisation of waterways, including their beds and banks, immediately after the completion of any works within these areas.	Project Engineers Foreman
SWMM58	Control dust through progressive revegetation techniques and by watering unsealed areas.	Project Engineers Foreman
SWMM59	Use temporary ground covers such as soil stabilisers (e.g. Gluon polymer emulsion), hydroseed or hydromulch as much as possible to stabilise batters, stockpiles and large surface areas.	Project Engineers Foreman
SWMM60	Do not release water from any discharge points (e.g. from sediment basins) until the following water quality criteria are met (unless an EPL specifies otherwise): • pH 6.5-8.5 • Total suspended solids (TSS) ≤ 50mg/L • No visible oil and grease Promptly distribute the results of water quality monitoring to relevant project staff for action and further investigate any exceedances. Where a discharge occurs solely as a result of rainfall exceeding the five day 85th percentile rainfall depth value of 41.9mm, the abovementioned pH and TSS criteria do not apply. Multiple High Efficiency Sediment (HES) Basins will be trialled across the project in consultation with the EPA and TfNSW. HES basins treat sediment laden runoff and reduce the volume of sediment leaving a site, thus protecting downstream environments from excessive sedimentation and water quality degradation during the rainfall.	Environmental Manager
SWMM61	A relationship has been developed between NTU and TSS for water quality in sediment basins. This relationship has determined that 31 NTU is the equivalent of 50 mg/L TSS. A method to enable the ongoing verification of the relationship between NTU and TSS has been developed and is being implemented. 10% of discharge samples are sent for laboratory analysis to maintain quality assurance. A copy of the statistical correlation assessment methodology and results has been provided to the EPA. The updated EPL has been provided to TfNSW (formerly Roads and Maritime) for approval of NTU in place of TSS.	Environmental Manager
SWMM62	If water is to be re-used for dust suppression or construction purposes, the above criteria do not apply providing water does not leave the site (either directly or indirectly via runoff).	Environmental Manager
SWMM63	Provide and maintain access to the sediment basins to permit: • Clear identification of each sediment basin and discharge point • Easy collection of samples • Collection of representative samples of water discharged from the sediment basin(s), and • Access to the sampling point(s) at all times by an authorised officer of the EPA.	Environmental Manager
SWMM64	Complete water quality monitoring in accordance with the *Construction Water Quality Monitoring Program* contained at Appendix B.	Environmental Manager

ID	Mitigation measure	Responsibility
SWMM65	Record and retain the results of any monitoring: • In a legible form, or in a form that can readily be reduced to a legible form • For at least four years after the monitoring or recording event to which they relate took place, and • So that they can be produced in a legible form to any authorised officer of the EPA who asks to see them.	Environmental Manager
SWMM66	Check weather forecasts daily and implement the *Heavy Rainfall Event Procedure* (included in Appendix D of this plan) where required.	Environmental Manager
SWMM67	Manage vegetation stockpiles to minimise the impact of tannins leaching into the surrounding environment in accordance with *Roads and Maritime Environmental Direction: Management of Tannins from Vegetation Mulch* included in Appendix F of this SWMP.	Environmental Manager Project Engineers Foreman
SWMM68	Where available and practicable, and of appropriate chemical and biological quality, use stormwater, recycled water or other water sources where feasible and reasonable, in preference to potable water for construction activities, including concrete mixing and dust control.	Environmental Manager Project Engineers Foreman
SWMM69	Wash concrete mixers, pumps, concrete tools and other equipment at specially designated washout areas that are constructed in a manner that will prevent storm water surface run-off from being contaminated.	Environmental Manager Foreman
SWMM70	Locate washout areas within an area that is not subject to natural surface storm water run-off and away from drainage lines. Post signs to advise workers of their locations.	Environmental Manager Foreman
SWMM71	Construct the washout areas with an impermeable type material capable of retaining any contaminated water and concrete residue.	Environmental Manager Foreman
SWMM72	Monitor the washout areas to ensure that they are not getting over full and that the washing activity is not contaminating the surrounding area.	Environmental Manager Foreman
SWMM73	As part of the project induction program, advise all personnel performing concreting or saw cutting activities of the concrete washout areas and their obligations to: • Clean their plant, tools and equipment within the designated area • Maintain the area in a clean condition, and • Ensure that contaminated water associated with their activities is appropriately controlled and prevented from reaching natural storm water surface drainage areas.	Environmental Manager
SWMM74	Properly maintain and regularly check spray sealing and asphalt paving plant, equipment and associated tools to minimise the risk of spills.	Foreman
SWMM75	Promptly contain and collect any spills of fuel or bitumen materials using spill kits. Maintain spill kits and fire extinguishers at all times in the spray trucks, tankers and associated plant.	Foreman
SWMM76	Promptly report all spills to the Environmental Manager.	Environmental Manager Foreman
SWMM77	Allocate designated equipment washdown and cleaning areas for major asphalt works with appropriate environmental controls in place (e.g. bunds) to prevent washout water from reaching the receiving environment.	Foreman

ID	Mitigation measure	Responsibility
SWMM78	Do not locate storage areas within 50 metres of any aquatic habitat, natural surface drainage areas, storm drainage systems, poorly drained or flood prone areas, or any area with a slope steeper than 10 per cent.	Project Engineers Foreman
SWMM79	Keep liquid chemicals and fuels in bunded storage areas or sheds that have the capacity to contain spills from leaky containers or from an incident involving a decanting activity. Ensure the bunded capacity is at least 120 per cent of the total capacity of all containers stored inside the bunded area or shed.	Foreman
SWMM80	Designated bunded plant refuelling areas, plant service/maintenance areas and concrete/plant wash down areas will be placed at least five metres from native vegetation and at least 50 metres from the following: -a natural surface drainage area, and -a built drainage structure such as a storm water pipe or box culvert.	Foreman
SWMM81	During site induction, advise all personnel of the following: -The location of bunded storage areas, liquid absorbent materials and other spill containment materials and kits. -Storage of large quantities of fuel for construction plant is not permitted. Licensed fuel trucks carrying emergency fuel spill kits must be used to service plant and equipment. -All drums and decanted containers must be labelled and stored within bunded areas whenever they are not in use. Whenever practical, all unattended drums/containers must be returned to the bunded storage area.	Environmental Manager
SWMM82	Provisional mitigation measure: Locate temporary batching plants (in the unlikely event they are required) in accordance with the Ancillary Facilities Management Plan required under CoA A17.	Environmental Manager
SWMM83	Provisional mitigation measure: Establish and operate concrete batching plants (in the unlikely event they are required) in accordance with a site specific environment work method statement (EWMS) for Concrete batching.	Environmental Manager Project Engineers Foreman
SWMM84	Portable toilet block systems will be regularly serviced. All effluent facilities will be positioned with consideration of vicinity of water courses, sensitive flora/fauna habitats and residents.	Environmental Manager Project Engineers Foreman
SWMM85	In the event that unexpected contamination is identified implement the Unexpected Contaminated Land and Asbestos Finds Procedure (under CoA E60).	Environmental Manager
SWMM86	Undertake all remediation works in consultation with the EPA and in accordance with the CLMP.	Environmental Manager
SWMM87	Should the presence of ASS or potential ASS (PASS) be confirmed, follow the Acid Sulfate Soil Management Procedure included in Appendix C of this SWMP. An EWMS will be developed and implemented for ASS and rock treatment and potential or actual acid sulfate soil areas.	Environmental Manager Project Engineers Foreman

7 Compliance management

7.1 Roles and responsibilities

The Fulton Hogan Project Team's organisational structure and overall roles and responsibilities are outlined in Section 3.2 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Chapter 6 of this Plan. The responsibilities of the Soil Conservationist are detailed below.

7.1.1 Soil Conservationist

The environmental responsibilities of the Soil Conservationist are to:

- Prepare the primary ESCP for the project
- Review progressive erosion and sediment control plans as required
- Provide advice on erosion and sediment control measures as required.
- Conduct regular inspections as required.

7.2 Training

All employees, sub-contractors and utility staff working on site will undergo site induction training relating to soil and water management issues, including:

- Existence and requirements of this SWMP
- Existence of sensitive area plans
- Existence of erosion and sediment control plans (primary and progressive)
- Relevant legislation
- Roles and responsibilities for soil and water management
- The location of ASS or PASS
- Water quality management and protection measures
- Procedure to be implemented in the event of an unexpected discovery of contaminated land.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in soil and water management. Examples of training topics include:

- ERSED control installation methodology
- Sediment basin construction
- Sediment basin operation
- Sediment basin maintenance
- Working near or in drainage lines and creeks
- Emergency response measures in high rainfall events
- Preparedness for high rainfall events
- Lessons learnt from incidents and other event e.g. high rainfall/flooding
- Mulch and tannin management
- Spill response
- Stockpile location criteria
- Identification of potentially contaminated spoil and fill material
- Trigger levels.

Further details regarding staff induction and training are outlined in Section 3.4 of the CEMP.

7.3 Monitoring and inspections

Regular monitoring and inspections will be undertaken during construction. Monitoring and inspections will include, but not be limited to:

- Up and downstream of the project alignment water quality monitoring at nominated locations
- Groundwater monitoring, both level and quality at nominated locations
- Monitoring of groundwater dependent endangered ecological communities to evaluate health and vitality
- Construction sediment basin water quality prior to discharge
- All erosion and sediment control measures on the project must be inspected and works undertaken to repair and/or maintain these controls:
    - weekly during standard construction hours outlined in CoA E36 and the EPL
    - daily during periods of rainfall, and
    - within 24 hours of cessation of a rainfall event causing runoff to occur on or from the project.
- Inspections to monitor and maintain erosion and sediment controls when rain or showers are forecasted to be 'heavy' or 'violent' in accordance with the Heavy Rainfall Event Procedure (included in Appendix D of this plan). The procedure outlines how to monitor rainfall forecasts and prepare site to minimise impacts as much as practicable.

The type, timing, frequency and trigger levels are detailed in the Construction Water Quality Monitoring Program attached at Appendix B. It is the responsibility of the Environmental Manager to ensure that the construction water quality monitoring program is implemented.

Additional requirements and responsibilities in relation to inspections and monitoring are documented in Section 3.7.1 and Section 3.7.2 of the CEMP.

7.4 Licences and permits

EPL 21139 has been issued by NSW EPA for the project. The EPL prescribes water quality parameters to be measured and associated discharge criteria. The EPL also details the monitoring and analytical requirements by reference to authority publications such as the Approved Methods for Sampling and Analysis of Water Pollutants in NSW, 2004 (EPA, 2004). All construction work will be undertaken in accordance with the EPL for the duration of the project.

Any other relevant licenses or permits will be obtained during construction as required.

7.5 Non-conformances

Non-conformances will be dealt with and documented in accordance with Section 3.8 of the CEMP. Also refer to Appendix B for the procedures to identify and implement additional mitigation measures where results of monitoring have exceeded the EPL criteria and/or trigger levels.

7.6 Weather monitoring

Rainfall at the premises will be measured and recorded in millimetres per 24-hour period at the same time each day.

Automatic rainfall intensity/ weather devices have been installed at two locations in the northern and southern sections on the project.

7.7 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub-plan, CoA and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 3.7.3 of the CEMP.

7.8 Reporting

Reporting requirements and responsibilities (including for the Construction Monitoring Report) are documented in Section 3.7.5 of the CEMP. Also refer to Table B-1 of the construction water quality monitoring program at Appendix B.

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this SWMP will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

8.2 SWMP update and amendment

The processes described in Section 3.7 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Any revisions outside of the amendments detailed in Section 1.4 to this SWMP will be in accordance with the process outlined in Section 1.6 of the CEMP and as required, be provided to Roads and Maritime, ER and other relevant stakeholders for review and comment and forwarded to the Secretary of NSW Department of Planning and Environment (DPIE) for approval.

A copy of the updated SWMP and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure (refer to Section 1.5 of the CEMP).

Appendix A Primary Erosion and Sediment Control Plans and Standard Blue Book Drawings

Appendix B Construction water quality monitoring program

Construction water quality monitoring program

1. Background

WSP was engaged by Transport for NSW (formerly Roads and Maritime Services) to prepare a baseline water quality monitoring program for the project. Transport for NSW (formerly Roads and Maritime Services) commenced baseline monitoring of surface water quality and groundwater quality in November 2017 at various sites along the project alignment. Transport for NSW (formerly Roads and Maritime Services) will continue to monitor background conditions until commencement of construction. Baseline monitoring data reports (including results) are provided by WSP to Transport for NSW (formerly Roads and Maritime Services) on a monthly basis separate to this SWMP. The reports are available upon request. Upon completion of baseline monitoring, surface water and groundwater results recorded will be incorporated in a baseline monitoring program summary report. This report will include a discussion of observed baseline trends in water quality and groundwater levels (WSP, 2018 p20). Once the baseline monitoring program summary report has been completed, statistical assessment of the data will be undertaken to confirm the trigger levels presented in Table B-1.

It is noted that the baseline monitoring program provides information about general ecosystem health, rather than impacts from road construction activities.

The baseline water quality monitoring program (WSP, 2018) is contained in Annexure B1 and has been considered in the development of this construction water quality monitoring program.

2. Construction monitoring locations

During the construction phase of the project, surface water and groundwater quality will be monitored at the same locations as for the baseline monitoring program with the exception of SW1 as it is not influenced by Stage 2 works. Surface water quality will be monitored at six locations (i.e. SW3-SW4, SW5A, SW6 to SW9) and groundwater quality will be monitored at four locations (i.e. GW1 to GW4). It is noted that WSP (2018, p3-5) gave consideration to the location of groundwater dependent ecosystems when siting the groundwater monitoring wells.

Removal of surface water monitoring locations SW2, SW2DS, GW5 and BH318 has occurred with consultation with NSW EPA on 20 April 2021, DPI Fisheries and NRAR on 21 April 2021 with no objections raised. Due to the completed state of the project in these catchments these monitoring locations will only provide information relevant to Motorway operational conditions and no longer represent construction related impacts. As a result, there will now be a total of eight construction surface water quality and four groundwater monitoring locations for the project.

All construction water quality monitoring locations are shown in Figure B-1 and on the Sensitive Area Plans contained in Appendix A6 of the CEMP.

The precise location (easting and northing) of each water sampling location will be determined once the project team mobilises to site and agrees the location with the various landowners (where relevant). The location of the ground water monitoring points will be chosen to ensure they are clear of permanent and temporary works areas and confirmed on site with survey to ensure they are not destroyed during the project. This is a requirement of Transport for NSW (formerly Roads and Maritime Services) Scope of Works and Technical Criteria (SWTC) Appendix 14 Clause 14.4.2. They will also be assessed with the construction team to ensure they will remain accessible throughout the project.

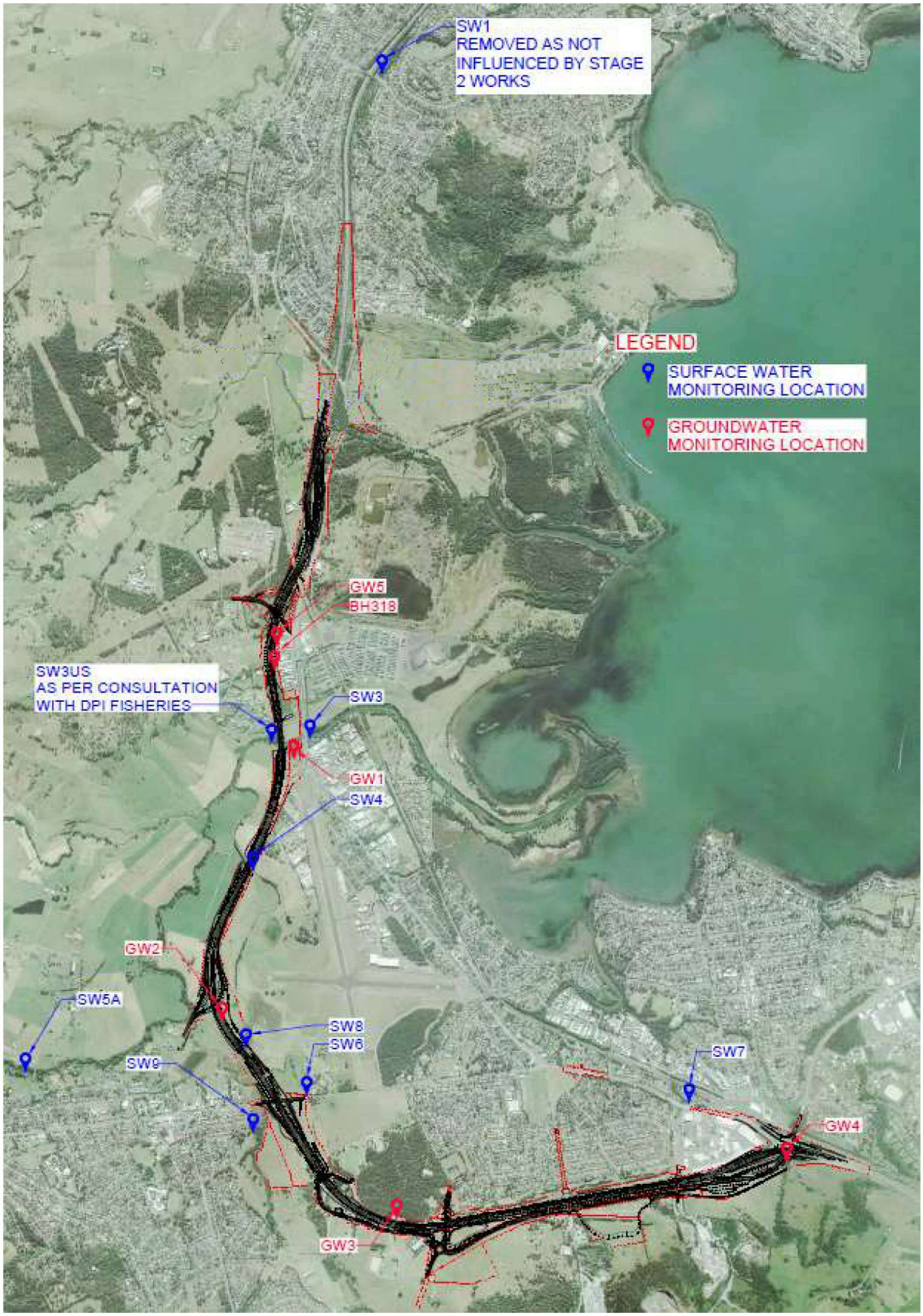

Figure B-1 Construction monitoring network (WSP, 2018) as amended to include two additional surface water monitoring locations (i.e. SW2DS and SW3US)

3. Construction monitoring parameters

The purpose of water quality monitoring during the construction phase is to determine impacts resulting from construction of the project only (i.e. road construction) and not other unrelated sources, such as agricultural operations. The potential impacts from road construction activities will most likely result from erosion and sediment control loss and spills. Nutrients from construction activities are not anticipated. The construction surface water and groundwater parameters are listed below.

In accordance with G38 Clause 2.3, a NATA accredited laboratory will be used for all testing of water quality.

Surface water

Surface water monitoring focuses on the parameters associated with road construction and include:

- Total suspended solids
- pH
- Oil and grease.

Groundwater

Groundwater monitoring focuses on the parameters associated with road construction and include:

- pH
- electrical conductivity
- temperature
- no visible oil and grease
- dissolved metals for GW2 only, which is located in a PASS risk area

Groundwater levels will also be measured at each groundwater monitoring location identified in Figure B-1.

4. Construction monitoring trigger levels

Following consultation with DPI Water, trigger levels have been included in the construction water quality monitoring program. Refer to Table B-1 below. The trigger levels identify when construction impacts are approaching the EPL criteria where relevant.

Monitoring results will be checked against the trigger levels (refer to Table B-1) and EPL criteria (refer to mitigation measure ID SWMM60) to identify any exceedances.

Refer to point 5 below for the procedures to be implemented when a monitoring result is outside of the water quality trigger level and/or EPL criteria.

5. Procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory

Implementation of the standard mitigation measures listed in Table 6-1 will ensure surface water and groundwater impacts are minimised during construction. In the event that complaints about surface water and/or groundwater are received or an exceedance of the EPL criteria (refer to mitigation measure ID SWMM60) or trigger levels (refer to Table B-1) has been identified through monitoring, site inspections or audits, Fulton Hogan will implement the following procedure:

- The Environmental Manager will investigate the issue to determine possible causes of the non-conformance (in accordance with Section 7.5) and to develop appropriate mitigation measures on a case-by-case basis.
- Surface water and/or groundwater complaints will be managed in accordance with complaints management process described in Sections 2.3 and 2.4 of the Community Communication Strategy. Where investigation confirmed clear and unambiguous impact resulting from the

construction of the project, the Environmental Manager, in consultation with the project team, will identify additional mitigation measures which may include, but not necessarily be limited to:

- Modification of the construction methods used
- Conduct unscheduled monitoring to further verify exceedance trend, where relevant

It is the responsibility of the Environmental Manager to ensure that the identified contingency measures are implemented.

6. Construction water quality monitoring program

Table B-1 summarises the construction water quality monitoring program for the Project. Information regarding non-conformances and reporting requirements are documented in Section 7.5 and 7.8 respectively of this SWMP.

Table B-1 Construction water quality monitoring program

Monitoring details	Area	Record	Responsibility	Monitoring parameters	Frequency	Trigger Level
SURFACE WATER						
Construction surface water quality at SW4, SW6, SW7, SW8, SW9.	Refer to the surface water monitoring locations identified in Figure B-1	Monthly Report Water quality sampling field record Chain of custody form (for environmental samples)/ Laboratory results	Environment Manager	Total suspended solids	Monthly	2 consecutive exceedances of the monthly average for TSS determined through assessment of the baseline data contained in the baseline monitoring program summary report
				pH	Monthly	Less than 6.6 and greater than 7.9
				Oil and grease	Monthly visual inspection and as required in response to spills on site. Laboratory testing only if sheen is visually present.	Greater than or equal to 9 mg/L
SW5a	Refer to the surface water monitoring locations identified in Figure B-1	Monthly Report Water quality sampling field record Chain of custody form (for environmental samples)/ Laboratory results	Environment Manager	Total suspended solids	Monthly	N/A. Location is an upstream control site and is not influenced by Stage 2 works.
				pH	Monthly	N/A. Location is an upstream control site and is not influenced by Stage 2 works.
				Oil and Grease	Monthly	N/A. Location is an upstream control site and is not influenced by Stage 2 works.
Upstream and downstream of the bridge works at	Refer to the surface water monitoring locations	Monthly Report Water quality sampling field	Environment Manager	Total suspended solids	Monthly	2 consecutive exceedances of the monthly average for TSS determined

Monitoring details	Area	Record	Responsibility	Monitoring parameters	Frequency	Trigger Level
Macquarie Rivulet (i.e. SW3US, SW3)	identified in Figure B-1	record Chain of custody form (for environmental samples)/ Laboratory results				through assessment of the baseline data contained in the baseline monitoring program summary report
				pH	Monthly	Less than 6.6 and greater than 7.9 Less than 6.9 and greater than 8.4 (Macquarie Rivulet only - estuarine)
				Oil and grease	Monthly visual inspection and as required in response to spills on site. Laboratory testing only if sheen is visually present.	Greater than or equal to 9 mg/L
Sediment basin discharge water quality	Refer to the discharge points specified in the EPL.	Monthly Report Dewatering record Water quality sampling field record Chain of custody form (for environmental samples)/ Laboratory results	Environment Manager	Total suspended solids (or NTU in accordance with the EPL)	Prior to discharge	48 mg/L TSS (or NTU equivalent in accordance with the EPL)
				pH	Prior to discharge	Less than 6.6 and greater than 8.4
				Oil and grease	Prior to discharge	Visible oil and grease
Monitoring Bureau of Meteorology forecast	All	Email Record to staff	Environment Manager/ Administration	Not applicable	Daily	Not applicable
GROUNDWATER						
Groundwater construction water quality monitoring	Refer to the groundwater monitoring locations identified in Figure B-1.	Quarterly Report Dewatering record Water quality sampling field record Chain of custody form (for environmental samples)/	Environment Manager	pH electrical conductivity temperature no visible oil and grease dissolved metals for GW2 only,	Quarterly	2 consecutive exceedances of the quarterly averages determined through assessment of the baseline data contained in the baseline monitoring

Monitoring details	Area	Record	Responsibility	Monitoring parameters	Frequency	Trigger Level
		Laboratory results		which is located in a PASS risk area		program summary report
Groundwater level	Refer to the groundwater monitoring locations identified in Figure B-1.	Quarterly Report	Environment Manager	Groundwater level	Quarterly	2 consecutive exceedances of the quarterly average level determined through assessment of the baseline data contained in the baseline monitoring program summary report