6. Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted by the proposal are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act
- The factors specified in the guidelines Is an EIS required? (DUAP 1995/1996) as required under Section 171 of the Environmental Planning and Assessment Regulation 2021 and the *Roads and Related Facilities EIS Guideline (DUAP 1996)*. The factors specified in Section 171 of the Environmental Planning and Assessment Regulation 2021 are also considered in Appendix A.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Surface water and groundwater

The potential impacts on surface and groundwater during construction and operation of the proposal have been assessed as part of the *Surface Water and Groundwater Technical Assessment Working Paper* (Aurecon, 2022b), provided in Appendix D.

6.1.1 Methodology

The methodology for the surface water and groundwater assessment included:

- a review of relevant planning instruments, Blue Mountains City Council management plans/strategies, licencing, or approval requirements
- a review of potential constraints and considerations relevant to key legislation and government policy, including:
  - *Environmental Planning and Assessment Act 1979*
  - *Water Management Act 2000*
  - NSW State Groundwater Quality Protection Policy (1998)
  - NSW Groundwater Dependent Ecosystems Policy (2002)
  - *Protection of the Environment Operations Act 1997*
  - NSW Aquifer Interference Policy (2012)
- a desktop review and description of key relevant physical features and baseline environmental conditions within the study area (a one-kilometre buffer around the proposal area) (see Figure 6-1), including summary of:
  - catchment context
  - local climate and weather conditions
  - local hydrology
  - flow gauging stations and flow records
  - local surface water receiving environments
  - baseline water quality data for receiving surface waters intersected by the proposal
  - soil landscape characteristics and modelled soil properties
  - geological and hydrogeological landscape characteristics
  - boreholes, groundwater dependent ecosystems and groundwater users within the study area

- a climate change assessment comprising a high-level local climate assessment
- an assessment of potential construction and operational impacts from the proposal
- recommendation of management measures to address potential construction and operational impacts of the proposal.

6.1.2 Existing environment

Climate

Rainfall data from the closest weather observation station (Katoomba, Farnells Road) shows that there is a variable annual rainfall rate, with January, February and March identified as the wettest months on average between 1886 and 2017. The long term 50 year mean rainfall was 1140 millimetres of rain per year, with as little as 800 millimetres and as much as 2100 millimetres recorded in some years.

Temperature near the proposal area varies between mild to warm summers (average maximum temperatures between 20 and 24 degrees Celsius) and cold winter periods with average maximum temperatures below 15 degrees Celsius. In winter, minimum temperatures average around three degrees Celsius.

Topography

Topography is varied across the study area. Natural slope gradients range from around two per cent on plateau surfaces and ridgelines to around 35 per cent. Within the proposal area, steep slopes are located near the twin bridges and on the Woodlands Road ancillary facility site. Steep slopes (greater than 20 per cent) significantly increase the risk of erosion on disturbed ground.

The proposal area is within the elevated Blue Mountains, with the Great Western Highway traversing multiple undulating hills. The elevation of the Katoomba to Medlow Bath section is between 1029 metres in Australian Height Datum (mAHD) at the southern end to 1061 mAHD at the northern end of the proposal. The Medlow Bath to Blackheath section occurs along the crest of a hill, with elevation ranging from roughly 1048 mAHD at the southern end to 1071 mAHD towards the northern end of the proposal.

Surface water

Catchment and waterways

The proposal is located within the Hawkesbury-Nepean catchment, the longest coastal catchment in NSW, draining around 21,400 square kilometres. There are no water bodies within the proposal area.

No major watercourses occur within the proposal area. There are, however, several surface waterways which intersect the study area including the Megalong Creek, Back Creek, Adams Creek and Relton Creek (refer to Figure 6-1).

The creeks on the eastern side of the Great Western Highway are tributaries of the Grose River while the creeks on the western side are tributaries of Coxs River. The Grose River and Coxs River are both perennial rivers that are part of the Hawkesbury-Nepean catchment.

The creeks on the eastern side of the Katoomba to Medlow Bath and Medlow Bath to Blackheath sections flow into the Upper Cascade Creek Dam and Lake Medlow respectively. These dams are located within the Katoomba and Blackheath Special Catchment Areas respectively.

Water sharing plan and drinking water catchments

The proposal is located within the Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011. To the west of the proposal is the Upper Nepean and Upstream Warragamba Water Source and to the east of the proposal is the Hawkesbury and Lower Nepean Rivers Water Source. The proposal also intercepts the Sydney Drinking Water Catchment as defined by State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011.

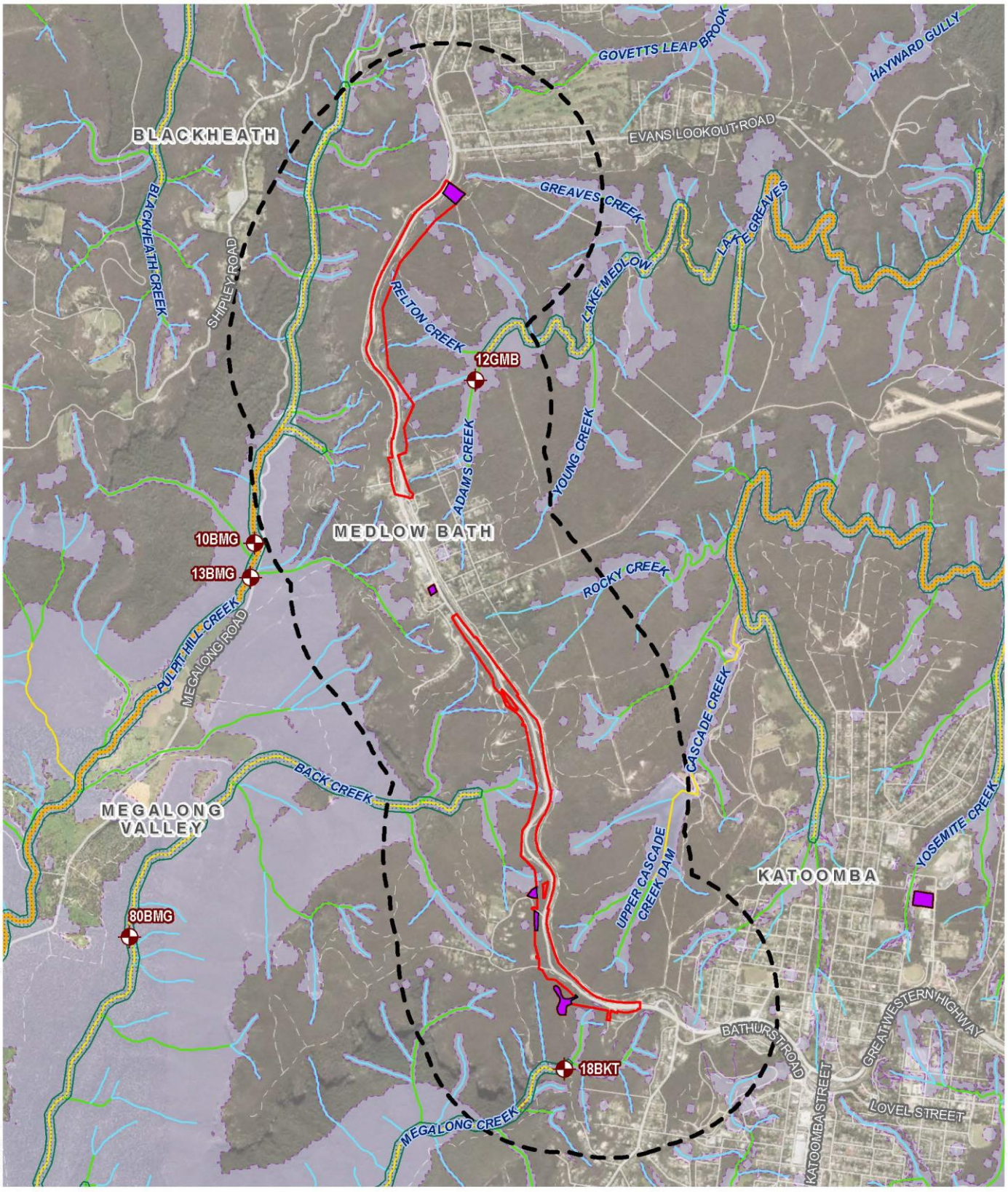
The Katoomba to Medlow Bath section passes through the Katoomba Special Catchment Area, while the Medlow Bath to Blackheath section passes through the Blackheath Special Catchment Area (refer to Section 4.2.12). Special and Controlled Areas are declared under the *Water NSW Act 2014* and WaterNSW regulates certain activities in these areas through the Water NSW Regulation 2020. The Special Catchment Areas are mostly native bushland around water storages and infrastructure. Public access and activities are restricted to protect water quality in these areas. However, it is noted that the Special Catchment Areas that intersect the proposal also cover some residential areas and road and rail infrastructure.

Sensitive receiving environments

The proposal is near the Blue Mountains National Park and much of the surface water that runs off or is discharged from the proposal area (particularly from the Medlow Bath to Blackheath section) would flow into the Blue Mountains National Park and the identified special catchment areas.

Key Fish Habitats (as defined in the *Fisheries Management Act 1991*) are present within waterways identified in the study area, including Megalong Creek, Back Creek, Pulpit Hill Creek and Adams Creek, however no Key Fish Habitats are present within the proposal area (Figure 6-1).

The biodiversity assessment carried out for the proposal identified one threatened ecological community within the proposal area. This is the Blue Mountains Swamp TEC (Plant Community Type 1078). Refer to Section 6.3 for further details.



P:\GIS\Project-4\project\511168_GWH\GWHE_REF_Fig_6_5_KeySurfaceWaterFeaturesNearTheProposal.mxd\JOB No.\12-10-21\Virgil.Robinson\Rev 0

- Proposal area
- Study area
- Proposed ancillary facilities
- Key fish habitat
- High Ecological Value waterways and water dependent ecosystems
- Council surface water monitoring locations

Strahler Stream Order

- 1
- 2
- 3
- 4

Source: Aurecon, LPI, DPIE, BoM

1:40,000 @A4

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Great Western Highway East **Review of Environmental Factors**

Projection: GDA2020 MGA Zone 56

FIGURE 6-1: Key surface water features

Hydrogeology

Aquifers and aquifer properties

In the study area, higher permeability areas are present in Banks Wall sandstone. In these areas, shallow aquifers form and groundwater flows are predominantly horizontal with vertical flow occurring via fissures/fractures that cross-cut bedding. These are local groundwater flow systems of typically fresh groundwater, and relatively short flow paths and residence times. Regional groundwater flow direction is expected to be consistent with the topography, flowing generally to the west and east of the Great Western Highway towards the creeks on either side of the highway.

Hydrogeological landscape

Hydrogeological Landscapes (HGL) are defined by similar areas of salt stores and pathways for salt mobilisation and are characterised by geology, soils, slope, regolith depth and climate. The proposal is located on Hawkesbury Sandstone HGL, with Megalong Valley HGL to the west of the study area. These HGLs are described in Table 6-1.

Table 6-1: Descriptions of hydrogeological landscapes within the study area

HGL	Description
Hawkesbury Sandstone	• Characterised by plateau, scarps, benches and hills on sandstone. • Moderately weathered, comprising consolidated sedimentary rocks from the Triassic period. • Contains the following key lithologies; Hawkesbury Sandstone, Narrabeen Group and Volcanic diatremes. • Groundwater flow is unconfined along structural features (bedding, joints, faults etc) in the fractured bedrock and through interbedded sandstone and sandstone fracturing. • Lateral flow occurs through unconsolidated colluvial sediments on slopes. • Hydraulic conductivity is high. • Transmissivity is moderate to high. • Depth to water table is deep (more than eight metres below ground level). • No salt observed in this landscape. • Groundwater is high quality and relatively fresh.
Megalong Valley	• Characterised by flat lying Permo-Triassic sandstone, claystone, coal, conglomerate and shale within the Hartley and Lithgow Valleys. • Moderately weathered • Layered stratigraphy of bedded and fractured siliceous sandstone, claystone and shale of the Shoalhaven, Illawarra and Narrabeen Groups. • Groundwater flow is unconfined along structural features (bedding, joints, faults etc) in the fractured bedrock and through interbedded sandstone and sandstone fracturing. • Lateral flow occurs through unconsolidated colluvial sediments on slopes. • Depth to water table is deep (more than ten metres below ground level). • No salt observed in this landscape. • Groundwater is high quality and relatively fresh.

Groundwater supply and quality

The proposal occurs across two groundwater sources, with the Sydney Basin Blue Mountains Groundwater Source to the east and the Sydney Basin Coxs River Groundwater Source to the west.

According to Realtime Water NSW, in July 2021, there were 27 registered boreholes within the surface water and groundwater study area. 25 of these boreholes are used for stock, domestic or general use water supply. The registered bores have groundwater levels between 11 and 60 metres below ground level.

One registered groundwater bore was identified within the Katoomba to Medlow Bath section on the Bureau of Meteorology Australian Groundwater Explorer register. This bore is used for stock and domestic water supply. No bores were identified within or near the Medlow Bath to Blackheath section.

No historic groundwater quality data is available for the proposal area.

Groundwater dependent ecosystems

The Groundwater Dependent Ecosystems (GDE) Atlas (Bureau of Meteorology, 2021) was reviewed on 30 July 2021 to identify GDEs within the study area. The identified GDEs included “aquatic” ecosystems that rely on the surface expression of groundwater, and “terrestrial” ecosystems that rely on the subsurface presence of groundwater.

There are numerous terrestrial and aquatic potential GDEs on both sides of the proposal, including Blue Mountains Swamp threatened ecological community (TEC) and other TECs. The swamps are identified as a TEC, the Temperate Highland Peat Swamps on Sandstone, which are listed as endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

One swamp is located in and adjacent to the proposal area under the proposed twin bridges in the Katoomba to Medlow Bath section. They occur on steep valley sides or cliffs and are mostly reliant on groundwater discharge that seeps out along bedding planes and low-permeability layers in the sandstone. Swamps occur at the interface between higher and lower permeability sandstone layers.

There were also many terrestrial GDEs identified on the western side of the study area, with GDE potential ranging from Low to High. No subterranean GDEs are present within the study area or downstream from it.

6.1.3 Potential impacts

Construction

The key potential construction impacts of the proposal on surface water and groundwater include:

- surface water quality impacts due to sediment laden runoff being released to waterways during construction activities such as vegetation removal, earthworks, stockpiling, bridge construction (Katoomba to Medlow Bath section only) and transportation of materials
- potential localised interception of groundwater and resulting groundwater quality impacts to GDEs near construction activities
- surface water and groundwater quality impacts as a result of accidental leaks and spills.

To minimise these potential impacts, a Soil and Water Management Plan (SWMP) would be prepared and implemented during construction. This plan would include the requirement for several erosion and sediment control measures to be maintained during construction.

Surface water

Table 6-2 provides further detail on the potential surface water impacts during construction of the proposal.

Table 6-2: Summary of potential surface water impacts during construction of the proposal

Construction activity	Potential impacts
Vegetation, topsoil removal and earthworks	Removal of vegetation, stripping of topsoil and earthworks, along the entire length of the proposal could potentially lead to erosion of soils and mobilisation of sediment to nearby creeks and unnamed tributaries. This may lead to increased turbidity and other water quality impacts in the following creeks: • Katoomba to Medlow Bath section – Megalong Creek and Back Creek, which are identified as key fish habitats and are located within the Sydney Drinking Water Catchment (Coxs River) and pass through Blue Mountains National Park. • Medlow Bath to Blackheath section – Adams Creek (which drains directly into Lake Medlow, the local water drinking resource), which is identified as key fish habitat downstream to the proposal and is located within the Sydney Drinking Water Catchment (Grose River) and Blue Mountains National Park. Removal of vegetation and earthworks due to the proposal, especially near these creeks, presents the greatest risk to water quality impacts. A Preliminary Erosion and Sedimentation Assessment (PESA) was carried out to assess the erosion hazard of the proposal area. The PESA found that both sections of the proposal represent a high erosion risk (Appendix D).
Construction near or across waterways	Construction activities, including the construction of drainage basins, are expected to occur near or adjacent to waterways within the proposal area and may impact these waterways. There is a risk of blockages of the waterways and drainage lines due to earthworks and other construction activities. Diversion of drainage lines may also create localised areas of flooding and scour. These impacts are expected to be temporary and minor and would be managed through the implementation of standard construction techniques and mitigation measures discussed in Section 6.1.4. The construction of new concrete twin bridges within the Katoomba to Medlow Bath section would cross a tributary to Back Creek. If not managed appropriately, overland flow could wash construction materials, fuels and chemicals into the natural drainage line from the areas of the bridge construction and adjacent road work construction. The downstream environment is within the Katoomba Special Catchment Area, which is a sensitive receiving environment and at high risk of contamination without appropriate safeguards. The removal of vegetation and earthworks at this location would also increase the erosion and sedimentation risk of this tributary causing water quality issues. Removal of vegetation and the construction work would increase the area of impervious surfaces increasing the possibility of scouring for the tributary below the bridge. These impacts and risks also apply to the tributary of Megalong Creek at the south of the Katoomba to Medlow Bath section. For the Medlow Bath to Blackheath section, overland flow could wash construction materials, fuels and chemicals into the natural drainage line from the areas of road work construction if not appropriately managed. The downstream environment is within the Blackheath Special Catchment Area, which is a sensitive receiving environment and at high risk of contamination without appropriate safeguards. Five construction basins are proposed along the length to capture runoff to manage this potential impact. Removal of vegetation and the construction work would increase the area of impervious surfaces increasing the possibility of scouring for the tributaries downstream of the section. Control measures would be installed in accordance with the Blue Book, to minimise any potential impacts.
Construction and use of ancillary facilities	The location and the topography of the Katoomba to Medlow Bath and Medlow Bath to Blackheath sections mean that runoff or leaks may end up in local waterways if not managed correctly. This would pose a risk to water quality if construction materials including fuel, chemicals and ablution from toilet facilities are mobilised by overland flows into adjacent waterways and appropriate procedures are not in place in regard to storage of materials including stockpiles. However, identified ancillary facilities are located more than 40 metres away from local waterways to avoid any potential impacts and management measures would be implemented (refer to Section 6.1.4).

Construction activity	Potential impacts
Stockpiles	If placed in an unsuitable position, stockpiles of raw materials or spoil may obstruct local flow paths and lead to the mobilisation of materials offsite. Stockpile site locations would be confirmed during detailed design and sediment management measures would be used on the stockpile sites to minimise the potential for sediment laden runoff to be discharged offsite and lead to sedimentation impacts to receiving waters.
Leaks and spills	There is the potential for harmful chemicals and substances to accidentally be released to the surface water environment during construction spills or as a result of maintenance work, refuelling and inappropriate storage or handling. Leakage from construction worker facilities or wastewater collection points may occur and produce runoff into receiving waterways. Contamination of exposed soils or mobilisation of contaminated soils and liquids into local watercourses could result in water quality impacts and impact sensitive receiving environments. Refer to Section 6.2.3 for further details. Measures to minimise the potential impacts associated with accidental leaks and spills during construction would be incorporated into a site-specific emergency spill plan.
Discharges	Discharges from the construction area have the potential to cause turbidity and other impacts in the receiving waterways which have been identified as drinking water catchments and sensitive receiving environments. To manage this issue, sediment basins form part of construction management measures to intercept stormwater flows and capture the sediments, before discharging to waterways. Further mitigation measures proposed to minimise or prevent impacts as a result of these discharges are discussed in Section 6.1.4.
Transportation of material	Spillage of waste or construction materials during transportation may lead to pollutants being conveyed in surface run-off to nearby drainage pathways and downstream waterways. Vehicle movements in the area also creates disturbances to sediment increasing the risk of sediment transport either immediately through vehicle movements or subsequently through wind and water runoff. Measures to manage materials during transport would be included within the future CEMP.
Flooding	The proposal area is not located within a floodplain. It runs along a ridgeline between two floodplains. While there would not be any impacts to flood behaviour or additional flood impacts, there is a risk of blockages of waterways and drainage lines due to erosion and sedimentation from earthworks or other activities. This may cause localised flooding and change the ultimate discharge location of overland flows into the receiving watercourses. These temporary impacts are expected to be minor and would be managed through the implementation of standard construction techniques.

Groundwater

Table 6-3 provides further detail on the potential groundwater impacts during construction of the proposal.

Table 6-3: Summary of potential groundwater impacts during construction of the proposal

Construction activity	Potential impacts
Earthworks, piling and dewatering	Groundwater is present at between 15 and 35 metres below ground level according to the search of registered bores within the study area. Earthworks associated with road construction are generally likely to be shallow and include cutting and filling of embankments, utility work and draining work so larger groundwater systems are unlikely to be intercepted during most construction activities. However, due to the potential for perched aquifers in the proposal, it is possible that groundwater could be intercepted in localised areas. Dewatering is not anticipated, however, where shallow groundwater is intercepted, the quality of the groundwater would be considered during groundwater dewatering, management, and release. Piling for bridge and retaining wall construction in the Katoomba to Medlow Bath section may be more likely to intercept groundwater resources due to the increased depth of ground penetration. Groundwater flow interruption is not anticipated due to the localised nature of the piling work during construction. If groundwater was to be intercepted during piling, construction contaminants may be introduced into the groundwater aquifers. These impacts would be short-term. Further monitoring would be carried out to evaluate the existing condition and monitor impacts of the proposal on groundwater, as discussed in Section 6.1.4.
Groundwater quality / GDE impacts	During construction, hydrocarbon spills or leaks may contaminate the perched aquifers or terrestrial GDEs downstream of the proposal. For the Katoomba to Medlow Bath section: • Aquatic GDEs and the Blue Mountains Swamp TEC within or near the proposal area have the potential to be impacted should groundwater contamination occur. However, groundwater contamination is not expected to occur with the proposed mitigation measures in place. These GDEs would also experience potential surface water impacts (including increased flow, reduction in water quality) as many of them are located within local waterways. • Potential impacts to the two aquatic GDEs located downstream of the bridge construction would be high due to potential of experiencing both surface and groundwater impacts if controls are not implemented. However, managing impacts to surface water and groundwater by implementing water quality treatment measures discussed in Section 6.1.4 would reduce the impacts to the aquatic GDEs. • Due to the hydrological soil type in the south of the section, potential for seepage is high and so there may be impacts as a result of seepage to groundwater to these aquatic GDEs. Contamination and spills would be managed within the SWMP and site-specific emergency spill plans as part of the CEMP as discussed in Section 6.1.4. For the Medlow Bath to Blackheath section: • Potential impacts due to construction work and potential leaks and spills to the identified GDE near the proposed northernmost drainage basin would be high due to potential of experiencing both surface and groundwater impacts if controls are not implemented. However, managing impacts to surface water and groundwater by implementing water quality treatment measures discussed in Section 6.1.4 would reduce the impacts to the aquatic GDEs. • Due to the hydrological soil type in this section, potential for seepage is low and so impacts on aquatic GDEs due to seepage of contaminants is low.

Operation

Surface water

The following operational activities could potentially lead to adverse impacts on groundwater and surface water:

- increased impervious surfaces as a result of the highway upgrade, including roadway and pavements, resulting in increased stormwater runoff volume, frequency and rate and associated increases in pollutant loading to receiving waterways.
- scour and erosion at new drainage outlets, downstream of new culverts and within grass drains and channel realignment work if poorly stabilised or if scour protection is poorly constructed
- accidental spills from motorists and personnel undertaking management tasks

The increase in pollutants could result in water quality impacts such as sedimentation, reduced water clarity, increased toxicant and nutrient concentrations and lower dissolved oxygen levels within the receiving waterways. Increases in frequency, rate and volume of flows due to an increase in impervious area may also impact waterway health.

To minimise these impacts, the proposal includes several Gross Pollutant Traps (GPT), water quality basins and swales to retain and treat stormwater runoff (refer to Section 3.2.3). The drainage design includes drainage pipes diverting dirty road water to six bioretention basins along the Katoomba to Medlow Bath section and five bioretention basins along the Medlow Bath to Blackheath section.

A high-level MUSIC model was developed to estimate the change in pollutant load and annual runoff volume as a result of the proposal with consideration to the proposed stormwater treatment strategy. These results are outlined for each section of the proposal in Table 6-4. The modelling found that that the proposal with no treatment would result in a major increase in TSS, total phosphorus (TP), total nitrogen (TN) and gross pollutant loads from the local drainage catchments. However, when the proposed water quality treatments were included in the modelling, the results identified a net beneficial effect on water quality, as per the neutral or beneficial effect on water quality (NorBE) assessment carried out for the proposal (refer to Appendix C).

The proposed water quality treatments would result in a major reduction in gross pollutant loads across both sections of the proposal. There would be a net reduction of 99.6 per cent of total gross pollutants for the Katoomba to Medlow Bath section and 99.2 per cent for the Medlow Bath to Blackheath section, when compared to the existing scenario. Across both sections of the proposal, this would comprise reductions of about:

- 90 per cent in TSS pollutant loads
- 70 per cent in TP pollutant loads
- 50 per cent in TN pollutant loads.

Both sections would meet and exceed Transport's Sustainable Design Guidelines targets.

Table 6-4: MUSIC modelling results

Section	Condition	Total Suspended Solids (kg/yr)	Total Phosphorous (kg/yr)	Total Nitrogen (kg/yr)	Total Gross Pollutants (kg/yr)
Katoomba to Medlow Bath section	Existing scenario	18,950	33.28	144.96	1,218.1
	With proposal (without treatment)	40,476	67.94	276.65	2,971.9
	With proposal (with treatment)	3,352	17.21	126.87	13.3
	% removal in average annual loads	91.7%	74.7%	54.1%	99.6%
Medlow Bath to Blackheath section	Existing scenario	37,820	66.20	286.20	2,404.0
	With proposal (without treatment)	53,600	93.80	398.10	4,229.0
	With proposal (with treatment)	7,051	30.37	207.40	34.4
	% removal in average annual loads	86.8%	67.6%	47.9%	99.2%

While not captured in the MUSIC modelling, the proposed water quality treatments would also reduce concentrations of heavy metals and hydrocarbons compared to existing levels.

Scour and erosion could occur within the local waterways near the proposal. If poorly stabilised or constructed, this could occur at:

- new drainage outlets
- downstream of the new culverts
- adjacent to the bridge pile caps (Katoomba to Medlow Bath section)
- within the grass drains
- near channel realignment work.

However, these features would be designed to minimise potential scour and erosion impacts.

The proposal could cause minor operational flood impacts downstream due to increases in volume, frequency and rate of stormwater runoff as a result of the increased road footprint. Downstream flooding impacts would be limited through the design of the proposal by using:

- detention basins downstream of some cross-drainage locations where the peak major flow rate arriving at the receiving watercourse would otherwise increase due to the proposal
- flow spreaders at discharge locations to limit the velocity of flows at receiving watercourses.

Accidental spills of oils or other chemicals by motorists or personnel carrying out maintenance work could lead to contaminants being released into drainage lines and the receiving waterways. Spills and water quality impacts would be contained within the drainage system and water quality treatment basins.

Groundwater

Operation of the proposal is unlikely to impact the groundwater in the study area. Minor potential operational impacts that may impact upon groundwater are related to hydrocarbon leakages from road users, which are likely to be short term and localised due to the soil type within the proposal area. Any impacts to groundwater, if not mitigated, have the potential to impacts the Blue Mountains Swamp TEC. However, these impacts are unlikely and would be limited due to the proposed water quality strategy implemented as part of the proposal, which includes hydrocarbon traps.

6.1.4 Safeguards and management measures

Safeguards and management measures for surface water and groundwater are outlined in Table 6-5.

Table 6-5: Safeguards and management measures – surface water and groundwater

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil and water	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will: • identify all reasonably foreseeable risks relating to soil erosion and water pollution, including runoff and the design and construction of waterway crossings • describe how these risks will be addressed during construction • include a construction surface water quality monitoring plan prepared in accordance with the Guideline for Construction Water Quality (Transport, n.d.) and Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (NSW EPA, 2004) • include a construction groundwater monitoring plan, which will provide information on groundwater conditions for design, construction and operation of water quality basins and enable monitor pollution originating from the stormwater seeping into the groundwater The Soil and Water Management Plan (SWMP) will be reviewed by a soil conservationist on the Transport for NSW list of Registered Contractors for Erosion, Sedimentation and Soil Conservation Consultancy Services. The SWMP will then be revised to address the outcomes of the review.	Contractor	Detailed design / pre-construction	Section 2.1 of QA *G38 Soil and Water Management*
Soil and water	The preliminary Erosion and Sedimentation Management Plan (ESMR) and Erosion and Sedimentation Control Plans (ESCP) produced for the proposal (Appendix D to the REF) will be updated during the detailed design phase to confirm the erosion and sedimentation controls for both sections of the proposal, including the construction of progressive ESCPs and the continual updating of these plans.	Transport / Contractor	Detailed design / Pre-construction	Section 2.2 of QA *G38 Soil and Water Management*
Soil and water	An assessment of construction sediment basin discharges will be prepared during detailed design to assess the appropriate water quality limits for sediment basin discharges and ensure consistency with the Water Quality Objectives for this location or agreed upon guideline values in consultation with Blue Mountains City Council.	Transport	Detailed design	Additional safeguard
Soil and water	An assessment to determine appropriate water quality limits for sediment basin discharges will be undertaken as part of detailed design, with reference to the Water Discharge and Reuse Guideline (Transport, 2016b).	Transport	Detailed design	Additional safeguard
Soil and water	Periodic wet weather monitoring will be undertaken within the tributaries of Back Creek and Megalong Creek (Katoomba to Medlow Bath section) and Relton Creek and Adams Creek (Medlow Bath to Blackheath section) that intercept the proposal and the sedimentation discharge points, before and during construction.	Contractor	Pre-construction / Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil and water	Where possible, permanent drainage structures will be installed as early as possible to facilitate effective separation of clean offsite and dirty onsite water.	Contractor	Construction	Additional safeguard
Soil and water	The water quality treatment system will be developed further during detailed design in consultation with Water NSW and Blue Mountains City Council. This will include: • layout and detail of the drainage system including outlet design • minimisation of discharge flows should also be minimised in the basin outflows, to limit scouring in the drainage channels • design within and around the waterways • assessment of culverts and stormwater inlets in the local waterways and recommendation for scour protection within the Medlow Bath to Blackheath section.	Transport	Detailed design	Additional safeguard