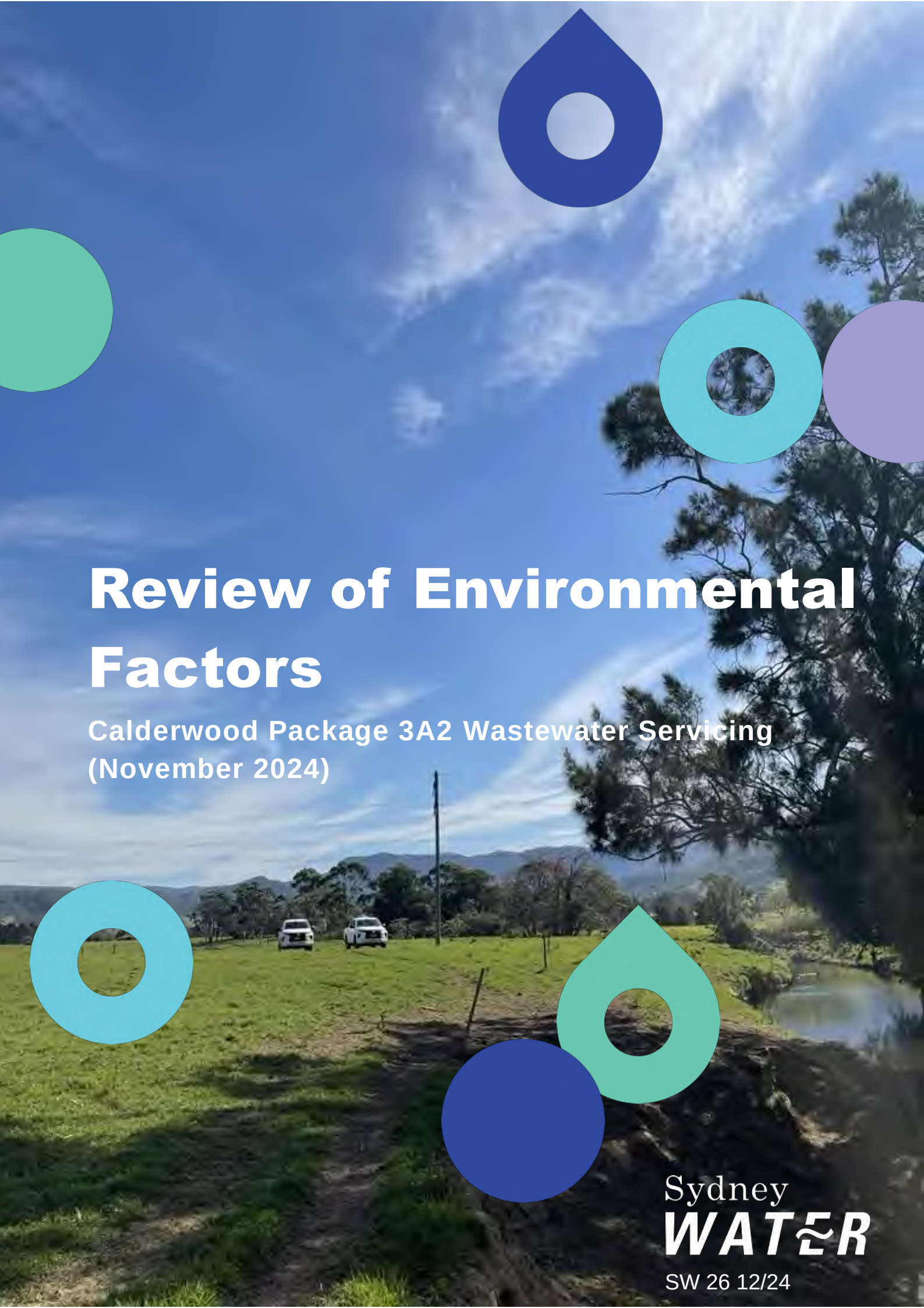

Review of Environmental Factors

Calderwood Package 3A2 Wastewater Servicing (November 2024)

Sydney WATER

SW 26 12/24

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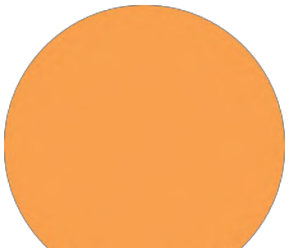

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Determination

This Review of Environmental Factors (REF) assesses potential environmental impacts of Calderwood Package 3A2 Wastewater Servicing and was prepared under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), with Sydney Water both the proponent and determining authority.

The Sydney Water Project Manager is accountable to ensure the proposal is carried out as described in this REF. If the scope of work or work methods described in this REF change significantly following determination, additional environmental impact assessment may be required.

Decision Statement

The main potential construction environmental impacts of the proposal include impacts to ecology, Aboriginal heritage, water quality, soil, and from traffic and noise. During operation, the infrastructure will comply with the existing Environment Protection Licence (EPL) and noise from the pumping station will comply with industry standards. The proposal will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats. Therefore, a Species Impact Statement (SIS) and/or Biodiversity Development Assessment Report (BDAR) is not required.

Given the nature, scale and extent of impacts and implementation of the mitigation measures outlined in this REF, the proposal is unlikely to have a significant impact on the environment. Therefore, we do not require an Environmental Impact Statement (EIS) and the proposal may proceed.

Certification

I certify that I have reviewed and endorsed this REF and, to the best of my knowledge, it is in accordance with the EP&A Act and the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation). The proposal has been considered against matters listed in section 171 (Appendix A) and the guidelines approved under section 170 of the EP&A Regulation. The information it contains is neither false nor misleading.

Prepared by:	Reviewed by:	Endorsed by:	Approved by:
Stuart Dawson Environmental Scientist Sydney Water Date: 22/10/2024	Sarah Mitchell Environment Representative Sydney Water Date: 22/10/2024	Sam Ali Project Manager Sydney Water Date:23/10/2024	Sally Spedding A/Senior Manager Environment and Heritage Sydney Water Date11/11/2024

1 Executive summary

The Calderwood Precinct is one of the development areas of the West Lake Illawarra Growth area, formerly known as the West Dapto Urban Release Area (WDURA) and Adjacent Growth Areas (AGAs). Sydney Water has progressively been delivering wastewater servicing throughout the Calderwood Precinct. This REF assesses the construction of wastewater infrastructure for the 3A2 area (Calderwood 3A2) which is primarily located at 1 Cattle Road and across adjacent properties at the northern end of the precinct. The Calderwood 3A2 wastewater servicing package (the proposal), would support future development by constructing and operating:

- a new wastewater pumping station (SP1193)
- 1.3 km of gravity main (comprising DN300, DN375, DN600 and OD620)
- 1.3 km of rising main (comprising OD335 and DN375).

Construction is expected to start in early 2025 and will be completed by early 2027. Sydney Water has prepared this REF to satisfy its obligations under Part 5 of the EP&A Act. The REF assesses the potential environmental impacts of the proposal and provides measures to avoid, minimise and mitigate impacts on the environment.

In addition, this REF will assess the installation of electrical transmission infrastructure from SP1193 to the intersection of Cattle Road and Calderwood Road. This will connect to a substation located at 163 Calderwood Road and will supply power to SP1193.The delivery of this electrical infrastructure will be undertaken by the developer.

During construction, the main potential environmental impacts of the proposal include impacts to ecology, Aboriginal heritage, water quality, soil, and from traffic and noise.

About 0.84 ha of native vegetation communities will be cleared and offset as part of the proposal. The proposal has been designed to avoid and minimise impacts to sensitive ecological features as much as possible. Located within areas that have already been developed, historically cleared, or contain degraded vegetation, the proposal occurs mostly within cleared paddocks with a section of the rising main proposed in an existing road corridor.

The proposal overlaps areas that have been identified to have Aboriginal archaeological features including Aboriginal artefacts and potential archaeological deposits. Mitigation measures, including salvage activities, will be implemented if impacts to Aboriginal archaeological sites cannot be avoided. An Aboriginal Heritage Impact Permit (AHIP) would be required prior to impacting any Aboriginal archaeological sites.

During operation, the mains and SP1193 will comply with the existing Environment Protection Licence (EPL) and noise from SP1193 will comply with industry standards.

Given the nature, scale and extent of impacts and with the implementation of the mitigation measures outlined in this document, it is considered that the proposal is unlikely to have a significant impact on the environment. An environmental impact statement is not required under Division 5.1 of the EP&A Act.

2 Introduction

2.1 Context

Sydney Water provide water, wastewater, recycled water and some stormwater services to over five million people. We operate under the *Sydney Water Act 1994* and have three equal objectives to: protect public health, protect the environment and be a successful business.

We are a statutory State-owned corporation and are classified as a public authority, and a determining authority for the proposed work under Division 5.1 of the EP&A Act. This REF assesses the potential environmental impacts associated with the Calderwood 3A2 wastewater servicing package and identifies mitigation measures that avoid or minimise potential impacts.

2.2 Proposal background and need

Table 2-1 summarises the proposal need, objectives and consideration of alternatives.

Table 2-1 Proposal need, objectives and consideration of alternatives

Aspect	Relevance to proposal
Proposal need	The West Lake Illawarra Growth Area covers about 5,500 hectares and will include the construction of 30,000 homes and non-residential development by 2048. The Calderwood Urban Development Project (Calderwood Precinct) forms part of this growth area and will include the development of about 700 hectares of rural lands to the north-west of Albion Park. There are multiple developers for the precinct. Currently Lendlease are the primary developer, however Stockland are expected to take over Lendlease's operations in the precinct soon. The Calderwood Precinct spans both the Shellharbour (593 hectares) and Wollongong (107 hectares) Local Government Areas (LGAs). The precinct is expected to include 6,500 dwellings and 50 hectares of commercial land including village/town centres and a business park. Sydney Water is responsible for providing wastewater infrastructure in the Illawarra region and has been progressively delivering services a development occurs within the Calderwood Precinct. Sydney Water proposes to install wastewater infrastructure for the 3A2 area (Calderwood 3A2) which is primarily located at 1 Cattle Road and across adjacent properties. Ultimately, wastewater flows will be transferred to the Shellharbour wastewater system via the existing wastewater pumping station SP1192. The proposal is shown in Figure 3-1. The key driver for the proposal is to ensure there is sufficient wastewater system capacity to service the Governments planned development of the West Lake Illawarra Growth area up to 2048. This proposal is required to meet Sydney Water's commitment to service continuing growth in Calderwood as stated in the Growth Servicing Plan (2019-2024).

Aspect	Relevance to proposal
Proposal objectives	The proposal objectives are to: • provide the timely delivery of wastewater services to Calderwood 3A2 • support the orderly roll out of land release and infrastructure • meet Sydney Waters statutory and regulatory obligations. The secondary objectives are to provide services that: • protect public health • protect catchment and river health • provide affordable and efficient wastewater services • provide resource and energy efficient wastewater services.
Consideration of alternatives/options	It was identified early in planning that the preferred servicing strategy for Calderwood 3A2 would be the transfer of wastewater flows to the Shellharbour wastewater system via SP1192. A total of four wastewater servicing options (WW1-4) were developed and were subject to a high-level fatal flaw analysis to eliminate options that were not considered viable. These options included: • WW1 – construction of a new pumping station (SP1193) located south of Marshall Mount Creek and to pump directly to SP1192. Areas to the north of Marshall Mount Creek would drain to SP1193 via gravity. Wastewater would drain into SP1193 from two separate lead-ins which would be constructed at different times to service different stages. This option was largely limited by the same environmental and geotechnical constraints as other options. • WW2 – constructing a longer pressure main and only one creek crossing however it was eliminated due to increased odour risk and because the location of SP1193 would not meet the developer's staging timeframe. • WW3 - same as WW1 however the staging element was removed and consisted of a single lead-in. This option, like WW1 was also limited largely by the same environmental and geotechnical constraints. • WW4 - offered one creek crossing with the addition of a pumping station on the northern side of Marshall Mount Creek. This option was eliminated due to the high relative cost and the additional operational and maintenance burden it would pose. Due to the similarity in the short-listed options, options WW1 and WW3 were combined into a single option. The two lead-ins were the most appropriate design and would be delivered during the same period. This preferred option was refined and developed further in response to developer changes to the precinct plan and environmental constraints, including the presence of Aboriginal heritage and threatened ecological communities (TEC). These

Aspect	Relevance to proposal
	refinements included changes to construction methodology and the location and footprint of both SP1193 and the mains.

2.3 Consideration of Ecologically Sustainable Development

The proposal has been considered against the principles of ecologically sustainable development (ESD) (refer to Table below)

Table 2-2 Consideration of principles of ecologically sustainable development (ESD)

Principle	Consideration in proposal
Precautionary principle - *if there are threats of serious or irreversible environmental damage, lack of scientific uncertainty should not be a reason for postponing measures to prevent environmental degradation. Public and private decisions should be guided by careful evaluation to avoid serious or irreversible damage to the environment where practicable, and an assessment of the risk-weighted consequences of various options.*	The proposal will not result in serious or irreversible environmental damage and there is no scientific uncertainty relating to the proposal. For example, there is a high level of scientific confidence relating to the site types, contents, and archaeological significance for the archaeological investigations (Appendix D). The REF has been prepared based on the results of specialist assessments, including fieldwork. The proposal has been developed to avoid environmental impacts where possible, and mitigation measures will be implemented to minimise impacts. This proposal is therefore considered to be consistent with the precautionary principle. Once operational, the proposal would connect new properties into the wastewater network. The proposal would support continued compliance with the EPL, which would reduce the risk of any serious or irreversible environmental damage from the new assets.
Inter-generational equity - *the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*	The proposal would not result in any impacts that are likely to significantly impact on the health, diversity or productivity of the environment for future generations. The proposal involves activities that have the potential for environmental and social disturbance, however these would be managed by implementing the mitigation measures provided in this REF. The proposal would benefit future generations as it would provide wastewater infrastructure to service future residents and businesses within the precinct. The development of the Calderwood area requires water and wastewater servicing. This proposal provides the infrastructure necessary to support the development of the area in a way that protects the environment, by managing predicted wastewater volumes. The proposal has also been developed to

Principle	Consideration in proposal
	avoid or minimise environmental impacts where possible, such as avoiding direct impacts to Key Fish habitat (KFH), coastal wetlands and TECs.
Conservation of biological diversity and ecological integrity - *conservation of the biological diversity and ecological integrity should be a fundamental consideration in environmental planning and decision-making processes.*	The proposal will not significantly impact on biological diversity or impact ecological integrity. Planning and design elements have been developed to conserve ecological integrity. Where viable micro tunnelling has been proposed, for example underneath Marshall Mount Creek and in areas adjacent to mapped Coastal Wetland to limit surface disturbance. Additionally, the location of the rising main was refined to avoid and ensure the protection of the TEC adjacent to Calderwood Christian School. The construction corridor has been designed to avoid and minimise impacts to sensitive ecological features as much as possible. This includes having no-go zones to reduce impacts to vegetation and avoiding direct impacts to coastal wetlands. Additionally, implementing non-statutory biodiversity offsets will also support future improvement of the biological diversity and ecological integrity of the area.
Improved valuation, pricing and incentive mechanisms - *environmental factors should be included in the valuation of assets and services, such as 'polluter pays', the users of goods and services should pay prices based on the full life cycle costs (including use of natural resources and ultimate disposal of waste) and environmental goals*	The proposal will provide cost efficient use of resources and provide optimum outcomes for the community and environment. This has been achieved through actions including: • sizing the mains based on growth predictions to reduce the risk of needing future duplication or upgrade • identifying cost-efficient use of resources during construction, e.g. re-use of waste material • identifying non-intrusive construction methodologies such as trenchless construction in specific areas to minimise environmental impacts to waterways and other sensitive areas • providing suitable wastewater infrastructure for future population demands.

3 Proposal description

3.1 Proposal details

Table 3-1 describes the proposal and Figure 3-1 shows the proposal location.

Table 3-1 Description of proposal

Scope of work	Detailed description of work/ activity
Proposal description	The proposal (Figure 3-1) involves the installation of: • 1.3 km of gravity main (comprising DN300, DN375, DN600 and OD620) • 1.3 km of rising main (comprising OD335 and DN375) • 12 Maintenance Holes (MH) to be constructed along the gravity mains and 1 MH at the termination of the rising main, connecting to MH 11444939 south of Calderwood Road. As well as the construction of SP1193 at 1 Cattle Road, that includes: • emergency relief structure (ERS) • valve chamber • electrical switchroom • chemical dosing unit (CDU) • chemical delivery bund • emergency storage structure • wet well • inlet maintenance hole • temporary access road (about 340 m). Some of these structures will be below ground. Additionally, electrical transmission infrastructure will be delivered which will provide power to SP1193. This will connect to existing infrastructure near the intersection of Cattle Road and Calderwood Road.
Location and land ownership	The proposal is in the suburb of Calderwood and is located within two LGAs. SP1193 and most of the proposed pipelines occur south of Marshall Mount Creek within the Shellharbour LGA. Two smaller sections of the pipeline, including 2 MHs and an access road, are located north of Marshall Mount Creek within the Wollongong LGA. The table below details the address and lots within the construction corridor.

Scope of work	Detailed description of work/ activity

Address	Lot/DP	Proposal Component
1 Cattle Rd, Calderwood 2527	33/-/DP1233491	SP1193 Gravity main Rising main Access track - north Access track - west
258 Calderwood Rd, Calderwood 2527	32/-/DP1233491	Gravity main Rising main
317 Calderwood Rd, Calderwood 2527	3328/-/DP1225478	Gravity main
179 Calderwood Rd, Calderwood 2527	11/-/DP1237642	Electricity transmission infrastructure
Cattle Rd/N Macquarie Rd road alignment (south of Calderwood Road), Calderwood 2527	501/-/DP1257451	Electricity transmission infrastructure
320 Calderwood Rd, Calderwood 2527	35/-/DP1233491	Access track - west
Lot 34 Cattle Rd, Calderwood 2527	34/-/DP1233491	Access track - north

The proposal is adjacent to Calderwood Christian School, 234 Calderwood Road (111/-/DP851153).

All properties within the construction corridor are currently privately owned. Calderwood Road and Escarpment Drive are local roads administered and managed by Shellharbour Council.

Site establishment and access tracks	Site establishment would involve: • establishing no-go areas as outlined in Section 6 and in accordance with the Construction Environment Management Plan (CEMP), such as at the

Scope of work	Detailed description of work/ activity
	boundary of the Coastal Wetland, AHIMS sites and PADs located outside of the AHIP area, and sensitive vegetation • marking out and establishing designated areas of the proposal such as the alignment route, SP1193 construction corridor, access tracks and compounds • establishing erosion and sediment controls • stripping and stockpiling of topsoil for reuse during restoration • removal of vegetation to be cleared. The primary access point to the construction corridor would be off Calderwood Road and Cattle Road. The movement of machinery and vehicles will occur across the construction corridor. However, to minimise the impacts associated with machinery and vehicular movements, existing access tracks will be utilised where available. Two existing access tracks have been identified for use. For the purposes of this REF, they will be referred to as the western and northern access tracks, as shown in Figure 3-1. Minor upgrades will be required in some sections of these existing access tracks. These updates will include: • raising the existing concrete bed-level crossing on northern crossing in accordance with the current Blue Book standards (Landcom, 2004). • where required, laying rigid, non-polluting aggregate or gravel for road surface. These access roads will remain within the construction corridor and will not include any vegetation removal other than exotic pasture. During construction, a range of vehicles would be required. It is expected that up to 20 heavy vehicles would be required each day during the peak construction period to deliver materials and equipment to the construction site and remove excess spoil. In addition, up to 30 light vehicles each day are likely to be required to transport staff and small items of equipment to and from the work site.
Ancillary facilities (compounds)	A construction compound will be required to house site sheds, construction amenities and material laydown. An indicative location for the compound is shown in Figure 3-1. The exact location of the construction compound will be chosen by the Delivery Contractor and remain within the construction corridor. The location will be chosen in consultation with the landowners and will be approved by Sydney Water's Project Manager as described in the mitigation measures in Section 6.

Scope of work	Detailed description of work/ activity
Methodology	**SP1193** SP1193 will be situated south of Marshall Mount Creek. The construction of SP1193 includes: • bulk earthworks to establish required levels and install underground assets • earthworks to elevate pumping station site by about one metre • construct concrete pad and pumping station building • construct inlet maintenance hole • construct wet well • construct emergency storage structure • construct valve chamber • install pumps and switchroom • install connecting mains • install Emergency Relief Structure (ERS) at Marshall Mount Creek • install Chemical Dosing Unit (CDU) and chemical delivery bund • perform electrical and mechanical fitout • construct permanent site access and any landscaping, including security fencing and lighting • perform site commissioning • demobilise and restore site. Permanent access to SP1193 would be confirmed during detailed design and delivered by the developer at a later date. A semi-permanent all weather access road will be constructed to provide access to the site until development is completed in the area. **Pipeline Construction Method** The wastewater pipelines will be installed through a combination of conventional open trenching and trenchless methodologies. Open cut trenching will be used to install the proposed rising main and sections of the proposed gravity main. This would involve: • stringing pipes along the construction corridor • excavating trenches, including stockpiling spoil material beside trenches • shoring trenches or benching the trench profile, depending upon trench depths

Scope of work	Detailed description of work/ activity
	• spreading granular bedding material such as sand or gravel along the base of the trench before pipe laying • installing the pipeline • pressure/vacuum testing pipeline • connecting to existing wastewater network • backfilling the trench with compacted bedding material and excavated soil • restoring areas disturbed by construction works and replacing topsoil • reinstating the road surface in accordance with Shellharbour City Council requirements. Micro tunnelling will be used to install sections of the proposed gravity main, which will involve: • bulk excavation for launch and receival pits, including excavation of rock • stockpiling of excavated material besides launch and receival pits • benching or similar of excavation • inserting a drilling rig into pit with rods subsequently inserted as drilling head progresses into the earth • retracting the drilling head • slip lining the pipe into the micro tunnel and grouting the annulus space • removing of the drilling rig • constructing of MH and maintenance shafts. **Installation of electricity transmission infrastructure** • excavating appropriate footings for pylons • installing pylons and electrical wires. The specific location, and number of pylons to be installed will be confirmed at a later stage.

Commissioning	Commissioning involves testing and running the new equipment to ensure it works correctly and is integrated with existing plant operations. The exact commissioning steps depend on the type of equipment, but typically include:
	• pipelines
	  ○ test pressure leaks and repair any leaks if found
	  ○ check all equipment and safety devices
	  ○ performance testing including sampling where required.

Scope of work	Detailed description of work/ activity

	• pumping station
	  ○ disinfect and pressure test pipes
	  ○ perform acceptance testing on pumps
	  ○ dewater pipes and repair leaks if any are found
	  ○ install signage and labelling of equipment
	  ○ train operators and prepare maintenance manuals.

Restoration	The construction corridor will be restored to the pre-existing or better condition following construction in consultation with relevant stakeholders. This may include re-planting, re-turfing, and/or re-installing hardstand. The proposal will largely occur within cleared agricultural landscape and road reserve. Any native vegetation removed during construction would be restored according to Sydney Water SWEMS0025.11 Guideline for native revegetation following construction.
Materials/ equipment	The machinery and equipment to be used during construction will be confirmed by the Delivery Contractor and is likely to include: • air compressors • backhoes • compactor • concrete agitator trucks • concrete pumps • concrete saws • confined spaces safety equipment (e.g. gantry/davit) • cranes • dozers • excavators • generators • grader • grinders • hand tools • horizontal borers • hydraulic pipe jackers • hydro-excavators • jackhammers • light vehicles • padfoot and rollers • rescue equipment • semi-trailers and large delivery truck • shoring • signage • skid steer loader • skip bins • storage containers • telehandlers • tip truck • tunnelling equipment • vacuum trucks • water carts and pump.

Scope of work	Detailed description of work/ activity
Work hours	Deliveries and the majority of work will be scheduled to occur during standard daytime hours: • 7am to 6pm, Monday to Friday • 8am to 1pm, Saturdays. Pending approval conditions and to minimise disruptions to local traffic and safety risks, the following works may occur outside of standard daytime hours: • trenched construction and pipe installation across Calderwood Road and Escarpment Drive • dewatering of excavations (potential for pump use over 24-hour periods). Sydney Water's Project Manager can approve work outside of standard daytime hours, following the approval process described in the mitigation measures in Section 6.
Proposal timing	Construction is expected to start in February 2025 and take about 26 months to complete.
Operational requirements	The proposal will be constructed, operated and maintained to meet Sydney Water's obligations under the Environment Protection Licence (EPL) No. 211 for the treatment of wastewater within the Shellharbour Water Resource Recovery Facility Treatment System. During operation, Sydney Water will access SP1193 on a regular basis via Cattle Road to deliver chemicals for the chemical dosing unit, undertake maintenance and deliver materials. General maintenance activities will include but not be limited to: • clearing weeds and long grass around surface fittings within the SP1193 site • cleaning internal walls of the wet well and overflow weir crests to reduce the build-up of waste and allow them to operate smoothly • painting of SP1193 and associated infrastructure • draining and cleaning the pipelines during the initial periods to maintain the integrity of the pipes and reduce slime build up. Maintenance activities will be undertaken in line with Sydney Water's existing maintenance procedures. The emergency overflow to Marshall Mount Creek would only be triggered during extreme wet weather events where capacity within SP1193 is exceeded. The wastewater infrastructure will be operated in compliance with the EPL No. 211.

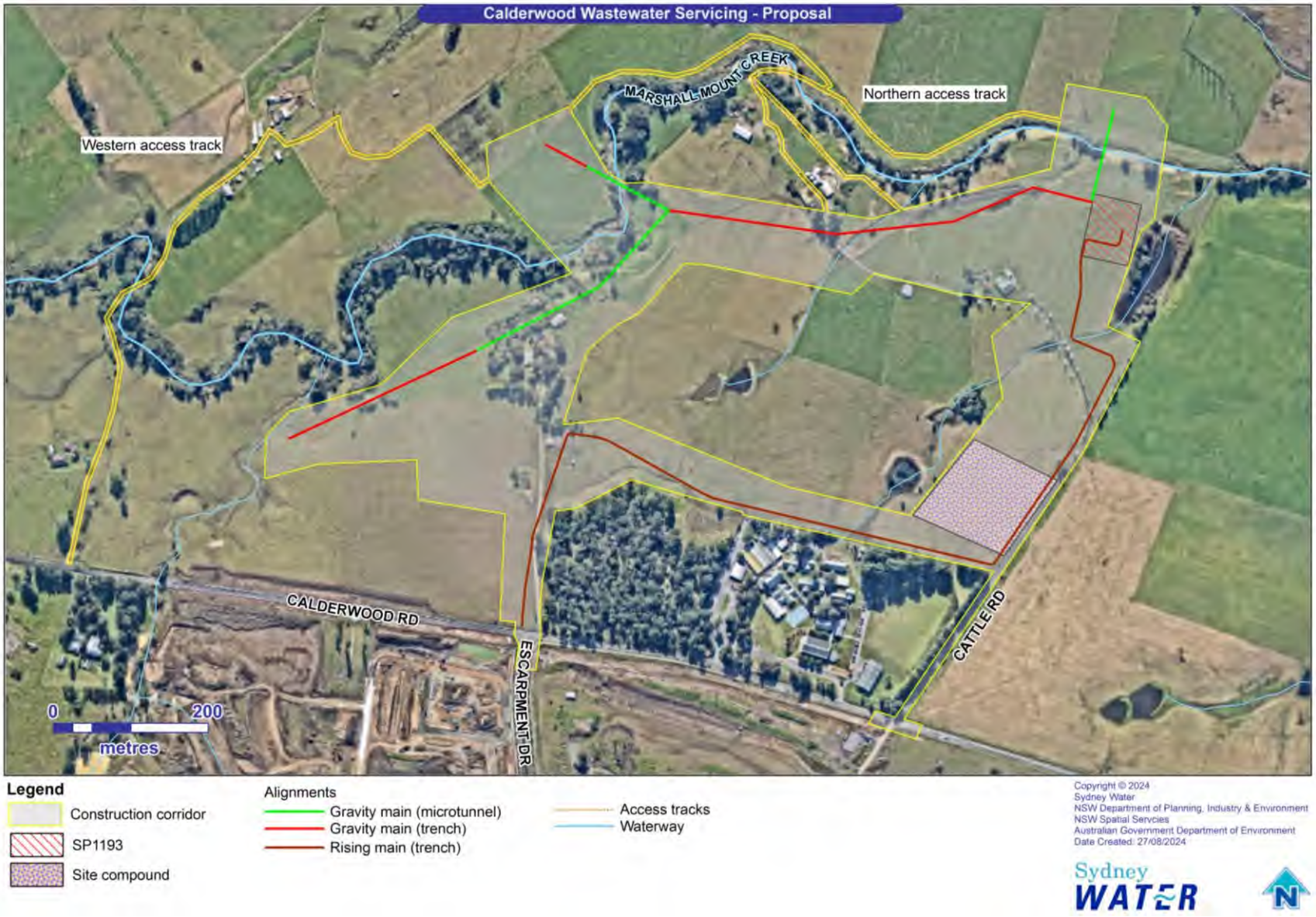

Figure 3-1 Location and construction corridor of proposal

3.2 Study area and changes to the scope of work

For the purposes of this REF the following definitions have been used:

- The ‘proposal’ refers to all the activities and ancillary sites detailed in the REF scope of works, including SP1193, proposed alignments, launch/receival pits, compound areas and access roads.
- The ‘construction corridor ’ is defined as the area that will be directly impacted by the proposal.
- The ‘study area’ refers to an area which incorporates all the proposal components and the wider area that may be indirectly impacted by the proposal. This area was defined for specialist studies for ecology and Aboriginal Heritage Due Diligence.

The proposal shown in this REF is indicative and based on the latest design at the time of REF preparation. The final design may change based on detailed design and/ or construction planning. If the scope of work, construction methods or construction timing described in this document change significantly, supplementary environmental impact assessment must be prepared for the amended components in accordance with SWEMS0019. An addendum is not required provided the change:

- remains within the construction corridor of the REF and has no net additional environmental impact; or
- is outside the construction corridor of the REF but reduces the overall environmental impact of the proposal (subsection 5.4(a) of the EP&A Act).

Changes to the proposal outside the construction corridor can only occur:

- to reduce impacts to biodiversity, heritage or human amenity, or
- to avoid engineering (for example, geological, topographical) constraints, and
- after consultation with any potentially affected landowners and relevant agencies.

The Delivery Contractor will demonstrate in writing how the changes meet these requirements, for approval by Sydney Water’s Project Manager, in consultation with the environmental and community representatives.

4 Consultation

4.1 Community and stakeholder consultation

Our approach to community and stakeholder consultation is guided by Sydney Water's community and stakeholder engagement guidelines.

Stakeholder and community engagement is a planned process of initiating and maintaining relationships with external parties who have an interest in our activities. Community and stakeholder engagement:

- enables us to explain strategy, policy, proposals, projects or programs
- gives the community and stakeholders the opportunity to share their knowledge, issues and concerns
- enables us to understand community and stakeholder views in our decision-making processes alongside safety, environment, economic, technical and operational factors.

The nature, scale and extent of the proposal's potential impact has been evaluated in this REF. If our work impacts the community in some way, we will consult with affected groups throughout the proposal. This includes engaging the broader community and stakeholders during plan or strategy development or before making key decisions. Consultation will be performed in accordance with a project-specific Community and Stakeholder Action Plan (CSAP) and Communication Strategy.

Key stakeholders identified to date include:

- councils
- utility owners
- developers
- property owners and adjacent residential receivers impacted by the proposal
- registered Aboriginal parties as part of the Aboriginal Cultural Heritage Assessment Report (ACHAR) (Appendix D).

A summary of recent consultation performed for the proposal, including some consultation outcomes, is detailed in Table 4-1.

Table 4-1 Consultation summary

Stakeholder	Consultation type	Queries	Outcomes
Developers	Regular meetings	• Sharing of developer plans, design drawings.	• Location of infrastructure has been changed during design to accommodate changes to neighbourhood plans and to locate structures within future road

Stakeholder	Consultation type	Queries	Outcomes
		• Discussions on timeframes of different approvals. • Discussion on location of proposed wastewater infrastructure. • Discussions on servicing and ensuring designs capture all catchments. • Vent shaft placement in relation to the main entry into the Calderwood development. • Existing Lendlease approvals such as AHIPS approvals.	alignments in other suitable locations. • Pump station footprint has been adjusted and moved southwards to accommodate future emergency storage. • Adjustment of proposed MH near Escarpment Drive to avoid public park and retention basin. • A memorandum of understanding will be required so the Sydney Water can work under existing AHIPs in some areas. • Sydney Water will explore options to reduce visual impact of proposed vent shaft.
Registered Aboriginal Parties	Kelleher Nightingale Consulted (KNC), with stakeholders about the test excavation methodology for the ACHAR. The draft ACHAR was provided to these stakeholders for review.	KNC's response to queries from these stakeholders about the test methodology is detailed in Section 5 of Appendix D. No responses opposed the methodology. Details about the replies to the draft ACHAR are provided in Section 5 of Appendix C.	No issues were raised with the outcomes of the ACHAR.
Impacted properties	Individual meetings	• Current tenants may remain on the property. They want to continue to run livestock during construction, what	• The Delivery Contractor will coordinate any changes to fencing and gates with tenants to ensure access tracks remain available for cattle trucks.

Stakeholder	Consultation type	Queries	Outcomes
		measures will be taken to manage impacts to their operations • The safety of livestock • Compensation for above-ground structures • The restoration of impacted land.	• Access to the creek for cattle will be maintained to enable them to drink, and this will be coordinated with tenants. • Ongoing consultation will help minimise impacts to farming activities. • Installation of two layers of fencing around excavations to ensure the safety of livestock and 100 metres fenced off at any one time which will move progressively along with the work front. • The one-off standard compensation payment will be paid at the completion of the project once all the infrastructure has been installed, tested and becomes operational. Sydney Water will contact all property owners who are eligible for compensation to discuss payment options. • The construction corridor and trenched areas will have grass and topsoil removed at the start of construction which will be restored at the completion of construction. The area may be grassed or seeded depending on size of disturbance. Where excavations or vehicle movements disturb the ground, we will restore the area to a pre-construction condition where appropriate.

We also continue to provide local councils with reasonable notice when we would like to commence works, regardless of the need for development consent. Both Wollongong and Shellharbour councils were notified in April 2018 of Sydney Water's work in the Calderwood development area as part of the broader servicing strategy for WDURA. Updates regarding the development of concept design were provided in May 2020. Since then consultation has been ongoing.

4.2 Consultation required under State Environmental Planning Policies and other legislation

Sydney Water must consult with councils and other authorities for work in sensitive locations or where the work may impact other agencies infrastructure or land (specified in Part 2.2 Division 1 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP).

The proposal involves excavations and the installation of pipes across Calderwood Road and along Escarpment Drive. The works will be undertaken outside of standard work hours to minimise impacts to local traffic. As such, impacts are not expected to be more than minor. Therefore, formal consultation with Shellharbour Council is not required.

Sydney Water and/or the Delivery Contractor will continue to consult with council throughout pre-construction and construction as part of Sydney Waters standard consultation procedures.

The proposal occurs on flood liable land, however it will not result in changes to flood patterns greater than a minor extent. Therefore, formal consultation with council is not required in accordance with section 2.12 of the TISEPP. Additionally, as the proposal is not being undertaken under a relevant provision as defined in section 2.13(2) of the TISEPP, consultation with State Emergency Services is not required.

Notification to Fisheries is required under section 199 of the *Fisheries Management Act 1994* as part of the REF phase, as the work involves crossing or dredging of Marshall Mount Creek, a waterway classified as Key Fish Habitat (KFH). The Department of Primary Industries (DPI Fisheries) was notified about the proposal on 21 August 2024. Fisheries responded on 02 September 2024 stating they were supportive of the proposed works and the associated mitigation measures. DPI Fisheries noted that they support the installation of a temporary crossing for access over Marshall Mount Creek for the duration of the works. However, they do not consider the temporary crossing suitable for long-term use and requested that the original crossing be reinstated post-construction.

As detailed in Appendix B, no other TISEPP consultation was required.

5 Legislative requirements

5.1 Strategic context

5.1.1 Illawarra Shoalhaven Regional Plan 2041

This plan (DPIE, 2021) aims to protect and enhance the region's assets and plan for a sustainable future. It is the overarching policy document guiding strategic land use planning in the region. It applies to the local government areas of Wollongong, Shellharbour, Kiama, and Shoalhaven. Among other aspects, the plan informs local councils' land use planning, assists agencies in asset and infrastructure planning for future growth, and informs the wider community of the NSW government's approach to creating a connected, sustainable, innovative, and vibrant region.

This plan identifies 15 regionally significant precincts that will drive job creation, housing diversity, and vibrant communities. In total, these precincts represent more than 2,300 hectares of land and opportunity for around 38,000 new homes.

Table 5-1 West Lake Illawarra Growth Area. Source - NSW Department of Planning

One of these precincts is the West Lake Illawarra Growth Area. The proposal is within this growth area. To realise the vision for the region and deliver more homes and space for business, the area will require essential utility services. Sydney Water is planning to deliver water and wastewater infrastructure throughout the region to service this planned future growth. This proposal is consistent with this regional plan by supporting future development in the area.

5.1.2 Shellharbour City Local Strategic Planning Statement (LSPS) 2022

The Shellharbour City LSPS guides the future of land use planning in the city. The LSPS creates a vision on which council can base planning decisions and assist with managing the future growth of the city based on economic, social and environmental needs over the next 20 years. It demonstrates and understanding of the changes that will shape Shellharbour City's future, so that council, Councillors and the community can create a future that is desirable to the community and visitors.

Planning Priority P11 (P11) relates to the efficient management of water, energy, and waste to ensure a sustainable environment. The proposal aligns with P11 as it would provide long-term sustainable wastewater infrastructure to the Calderwood precinct to meet future population demands and provide optimum outcomes for the community and the environment.

5.1.3 Wollongong Local Strategic Planning Statement 2020

This Planning Statement demonstrates how council will continue to implement the actions contained in the Illawarra Shoalhaven Regional Plan and other state government policy documents as required and as applicable. It provides the 20-year vision for the area that is informed by the findings and recommendations of key studies. The Statement will be used to identify future land use actions, studies as strategies to be undertaken by Council. It will be used as a guide in the assessment of planning proposals to ensure they have strategic merit and are consistent with Council's vision for the local government area.

To facilitate the planned growth in the area the Planning Statement recognises infrastructure as a key consideration in future land use planning.

The Planning Statement also notes that most of the existing residential properties are connected to Sydney Water's water and wastewater networks. The proposal would support the land use planning identified in the Planning Statement by providing connection to Sydney Water's network.

5.2 Environmental legislation

Sydney Water is the proponent and determining authority under the EP&A Act. The proposal does not require development consent and is not classified as State significant infrastructure. We have assessed this proposal under Division 5.1 of the EP&A Act. This REF has concluded that the proposal is unlikely to have a significant impact on the environment.

The following environmental planning instruments (Table 5-2) and legislation (Table 5-3) are relevant to the proposal. Table 5-3 also documents any licences and permits required, and timing and responsibility for obtaining them.

Table 5-2 Environmental planning instruments relevant to the proposal

Environmental Planning Instrument	Relevance to proposal
Shellharbour Local Environmental Plan 2013	Marshall Mount Creek forms the border between two Local Government Areas (LGAs). Shellharbour LGA is south of Marshall Mount Creek. The proposal is located on land zoned RU1 – Primary Production.
Wollongong Local Environmental Plan 2009	Wollongong LGA is north of Marshall Mount Creek. The proposal is located in land zoned DM – Deferred Matter.
State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP)	**Wastewater infrastructure** Section 2.126(1a) of the TISEPP defines a prescribed circumstance as development carried out by or on behalf of a

Environmental Planning Instrument	Relevance to proposal
	public authority. Section 2.126(6) permits development for the purpose of sewerage without consent on any land in the prescribed circumstance. **Electricity infrastructure** Section 2.44(1) of the TISEPP permits development for the purpose of an electricity transmission or distribution network without consent by a public authority. Section 2.44(2a) lists installation of overhead wires and associated component parts, including support structures as permitted development. The proposal involves the development of a sewerage system and the development of electrical transmission network, and as Sydney Water is a public authority, the proposal is permissible without consent.
State Environmental Planning Policy (Precincts – Regional) 2021 (Precincts SEPP)	The proposal is on land zoned: • C2 – Environmental Conservation • C3 – Environmental Management • R1 – General Residential • B4 – Mixed use. The Precincts – Regional SEPP does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted without development consent under TISEPP. As the proposal is permissible without consent under the TISEPP, the consent requirements of Precincts – Regional SEPP do not apply.
SEPP (Biodiversity and Conservation) 2021	**Vegetation in non-rural areas (Chapter 2)** Chapter 2 of this SEPP applies as it is in an area or zone listed in subsection 2.3(1). However, subsection 2.4(1) states: '*This Policy does not affect the provisions of any other SEPP….*', and as the works are permissible under the TISEPP a Council permit to clear vegetation under this SEPP is not required. **Koala habitat protection (2020 and 2021) (Chapters 3 & 4)** The proposal is partly located within the Wollongong LGA which forms part of the South Coast Koala Management Area. The proposal involves excavation, construction and limited vegetation removal in pre-disturbed land which is predominately open paddock and would not be considered

Environmental Planning Instrument	Relevance to proposal
	viable Koala habitat. As such no impacts on Koala habitat would occur as a result of the proposed works.
SEPP (Resilience and Hazards) 2021 (RH SEPP)	**Coastal Management (Chapter 2)** The excavation footprint of micro tunnelling launch/receival pits are located within an area mapped as Coastal Wetland Proximity Area under this SEPP. Most work within coastal wetlands requires development consent (designated development) to ensure the biophysical, hydrological and ecological integrity of the wetland is protected. A small section of the northern access road is mapped as coastal wetland under the RH SEPP (see Figure 6-4). This is an existing concrete access road. Section 2.7(4) of the TISEPP states that *'a provision of this Chapter that permits development for the purpose of… routine maintenance works to be carried out without consent, or that provides that development for that purpose is exempt development prevails over clauses 10 and 11 of the State Environmental Planning Policy (Coastal Management) 2018* (now clause 2.7 and 2.8 of the RH SEPP) *to the extent of any inconsistency, but only if the adverse effect on the land concerned is restricted to the minimum possible to allow the works to be carried out'*. Under section 2.127 (b)(v) of the TISEPP exempt development in connection with a sewerage system includes routine maintenance of access tracks (including access tracks along or to corridors). Any works within the mapped coastal wetland on this existing access tracks will: • not impact vegetation • only include changes to make the existing access road work safe and be restricted to the minimum possible extent to allow the works to be carried out. The potential impacts to coastal wetlands from maintenance of this access road have been assessed in Section 6.2.2 and Section 6.2.3 of this REF. In accordance with section 2.8 of this SEPP, the proposal will not have a significant impact on: • the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or • the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

Environmental Planning Instrument	Relevance to proposal
	As such, the works are permitted as exempt development/ development without consent in these areas.

Table 5-3 Consideration of key environmental legislation

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
Protection of the Environment Operations (POEO) Act 1997	The proposal would connect to, and be operated as part of, the Shellharbour Wastewater System. The Shellharbour Wastewater System is operated in accordance with EPL No. 211. The proposal is consistent with an existing activity under EPL No. 211 and existing compliance requirements. A variation to the EPL is not required for operation. There is a requirement under Part 5.7 of the POEO Act to immediately report any pollution incidents to the relevant authority where material harm to the environment is caused or threatened. The definition of material harm and the relevant authorities are defined in Part 5.7 of the POEO Act. The Delivery Contractor is responsible for immediately reporting such incidents in accordance with SWEMS0009 Responding to incidents with an environmental impact. Section 6.2.2 and 6.2.11 provide further detail and mitigation measure for items relating to the POEO Act.	NA	NA
Biodiversity Conservation (BC) Act 2016	The BC Act lists species and ecological communities which are protected in NSW. Under section 7.3 the BC Act requires that the significance of the impact on threatened species and endangered ecological communities or their habitats is assessed using a five-part test. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Environment Agency Head's requirements, or a Biodiversity Development Assessment Report (BDAR)	REF	Pre-construction, Sydney Water

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
	must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM). Assessments of significance were conducted for threatened entities with the potential to occur in the study area (Appendix C). These assessments concluded that the proposed works are not likely to result in a significant impact upon any threatened entity listed under the BC Act. Therefore, a SIS or BDAR is not required. The impact of the proposal on threatened species, communities and their habitats has been assessed in Section 6.2.3.		
Biosecurity Act 2015	This Act provides the framework to protect our community from the adverse effects from animal and plant pests, diseases and weeds to maintain market access and protect infrastructure and other important assets. The Act also provides the framework to help protect our environment from invasive pests and diseases. The Act is tenure neutral. This means that all land managers, regardless of whether it is private or public land, have the same responsibilities. The action taken by the land manager will be guided by legislation, regional strategic management plans (including weed and pest animal plans) and what is reasonably practicable to eliminate, prevent or minimise a risk. The site contains priority weeds listed under the Biosecurity Act. Under the Act, *Lantana camara* and *Senecio madagascariensis* must not be stockpiled onsite and must be disposed of at a licenced waste facility. These weeds and appropriate mitigation measures are discussed in more detail in Section 6.2.3.	REF	Pre-construction, during construction, Sydney Water

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
National Parks and Wildlife (NPW) Act 1974	The proposal does not fall within land owned by National Parks and Wildlife. Under section 86 of this Act, it is an offence to harm or desecrate an Aboriginal place or object unless authorised by an Aboriginal heritage impact permit (AHIP) or where it is reasonably determined that no Aboriginal object would be harmed. Under section 90(1) of the Act "the Director-General may issue an Aboriginal heritage impact permit". The regulation of AHIPs is provided in Part 6 Division 2 of the Act, including requirements relating to consultation (section 90N). An AHIP is required for an activity which will harm an Aboriginal object. Under section 87(1) it is a defence against prosecution if "(a) the harm or desecration concerned was authorised by an AHIP and (b) the conditions to which that AHIP was subject were not contravened". Section 87(2) provides a defence if "the defendant exercised due diligence to determine whether the act or omission constituting the alleged offence would harm an Aboriginal object and reasonably determined that no Aboriginal object would be harmed". An ACHAR was undertaken for the REF (Appendix D). Based on the results of the test excavation and impact assessment, 6 archaeological sites were identified to be at least partly impacted. Therefore, a AHIP under section 90 of the NPW Act is required. Section 6.2.4 provides further information in relation to the proposal's potential impact to Aboriginal heritage.	AHIP	Pre-construction, Sydney Water
Fisheries Management (FM) Act 1994	The FM Act protects threatened species, populations, and communities of fish and marine vegetation, as well as commercial and recreational fishing areas, in NSW waters. If the proposal involves dredging	notification	Pre-construction, Sydney Water

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
	work (excavation in water land) or obstructs fish passage in KFH, and/or harms marine vegetation then a permit from NSW Department of Primary Industries Fisheries may be needed. Construction of the overflow to Marshall Mount Creek would involve work within the bank of the watercourse which is listed as KFH. Receival pits for the micro-tunnelling machinery would also involve work in areas listed as KFH. DPI Fisheries have been notified in accordance with section 199 of the FM Act. Section 6.2.2 and 6.2.3 of this REF provides further details on any sites impacting KFH.		
Water Act 1912/ Water Management Act 2000	All dewatering activities require an approval under Section 91B of the *Water Management Act 2000.* Section 60A of the Water Management Act states that it is an offense to take water without a licence. A Water Access Licence (WAL) is required under section 61 where groundwater extraction will be greater than 3 ML. Dewatering of groundwater from excavations is expected during construction. It is anticipated that groundwater extractions would exceed 3 ML per year. Sydney Water will acquire a Water Supply Works Approval and a Water Access licence for the proposal. Section 6.2.2 provides further detail of the proposal anticipated dewatering activities.	Water Access Licence, Water Supply Works Approval	Pre-construction, Sydney Water
Environment Protection and Biodiversity Conservation Act 1999	*The Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the principal environmental law administered by the Commonwealth. It provides for the protection of matters of national environmental significance. Under the EPBC Act, an action that is likely to have a significant impact on a matter of	N/A	Pre-construction, Sydney Water

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
	national environmental significance (MNES) must be referred to the Commonwealth Minister for Climate Change, Energy, the Environment and Water. The Flora and Fauna assessment (Appendix C) concluded that the proposal was unlikely to have a significant impact on MNES and accordingly, referral is not required. Section 6.2.3 provides further details on the proposal's potential impact to threatened ecological communities and species.		
Roads Act 1993	This Act regulates works in, on or over a public road. Approval under Section 138(1) of this Act is required for carrying out works in, digging up, or disturbing a classified road. The works occur mostly on private land and would mostly be accessed using local roads under the control and management of Shellharbour City Council. Permits for lane closures and excavation from council would be required where works are in or near the road corridor. A section of the proposed rising main is within the road corridor of Calderwood Road and Escarpment Drive. These roads are local roads, managed by Shellharbour Council. Notification is required that includes scope of works, date and contact persons which must be provided for Council's records. All Council assets must be reinstated as per Council's Engineering code. Road closures require a S138 road opening permit/ application which is to be obtained from Shellharbour Council. Section 6.2.8 provide further detail on matters related to the proposal potential impact on roads and traffic.	Licence (Road Occupancy Licence) or equivalent approval	Delivery Contractor

6 Environmental assessment

Section 6.1 broadly describes the existing environment. Section 6.2 provides more specific descriptions of the existing environment in relation to particular environmental aspects while also assessing direct and indirect impacts of construction and operation. It also identifies mitigation measures to minimise impacts. These will be incorporated into contract documents and a Construction Environmental Management Plan (or similar) prior to starting work.

6.1 Existing environment

The proposal is in the suburb of Calderwood and within the Shellharbour and Wollongong LGAs. The surrounding land use is largely rural. Sensitive receivers in the area include rural-residential properties and Calderwood Christian School.

Most of the area is pre-disturbed and has been cleared for pasture. There are some areas of remnant native vegetation including native riparian vegetation along Marshall Mount Creek and a patch of vegetation mapped as Lowland Woollybuttt-Melaueca Forest west of Calderwood Christian School. Areas mapped as coastal wetland under the RH SEPP are located along sections of Marshall Mount Creek.

6.2 Environmental aspects, impacts and mitigation measures

6.2.1 Topography, geology and soils

Existing environment

The regional soil landscape mapping of the Kiama 1:100,000 sheet (Hazelton, 1992) indicates that the construction corridor occurs in the following soil landscape:

- Fairy Meadow (SWfa) – is a swamp landscape overlying Quaternary sediments and is characterised by alluvial plains, floodplains, valley flats and terraces with slopes.

The closest surveying sites to the proposal record Brown/Yellow Podzolic Soil (GSG), Brown Kurosol (ASC), and Soloth (Solod) soil types. In the eastern section of the construction corridor these soils are imperfectly to poorly drained, while to the west they are considered well drained. These soils exhibit a slight erosion hazard and no evidence of salting (eSPADE v2.2).

The proposal:

- is not in an area impacted by soil contamination as indicated on NSW EPA list of notified sites accessed on the 22 August 2024 (the closest listed site is the Tallawarra Power Station site, over 5.3 km northeast)
- is not in an area impacted by soil salinity as indicated on eSPADE v2.2
- is not in an area impacted by an existing exploration or mining title

- has a “low probability of ASS occurrence” mapped in the east of the site, north of Marshall Mount Creek.

Potential impacts - Construction

The main potential impact to topography, geology and soils during construction is erosion and sedimentation. During construction, there will be extensive earthworks including excavations, stockpiling of soil, some vegetation removal, and the movement of large machinery. Excavations, including some rock breaking, will be required for the construction of SP1193, the installation of the associated pipelines and for the footings of electrical transmission towers.

An excavation footprint of about 2500 m^2 is required for SP1193 with a maximum anticipated depth of 10.7 m. A typical launch/receival pit would require an excavation footprint of about 28 m^2 with depths ranging from about 5 m – 11 m. Specific footing requirements for the transmission poles will be determined later and will be based off local ground conditions and designed to meet network standards. As such stockpiling of soil is required. Soil stockpiles will be adjacent to excavations where suitable.

The SP1193 site will be raised to ensure the finished surface level is above the 1 in 100-year flood level. This will require the deposit of fill material and construction of batters around the site. The construction of the temporary road to SP1193 will also require earthworks involving cutting, filling, and batters. The total volumes of fill and cut material for establishing finished surface levels are anticipated to be about 4035 m^3 and 1105 m^3 respectively.

The trenching and installation of the rising main, sections of the gravity main and the overflow pipe will progress in sections, with excavations being progressively backfilled to minimise the duration trenches are open. The short-term stockpiling for these excavations would occur beside the alignment.

Excavation and stockpiling activities, if not adequately managed, could result in:

- erosion of exposed soil and stockpiled materials
- dust generation during excavation and vehicle movements over exposed soil
- increased sediment loads entering Marshall Mount Creek.

Sections of the gravity main will likely be installed using freebore micro tunnelling methods. The underlaying geology of the area has been preliminarily determined to be sufficiently self-supporting at the depths micro tunnelling would occur allowing for the use of freeboring. Using this method there is no need for an outer jack pipe to provide ground support. Compared with pipejacking, the freeboring method is much faster and in the event of an obstruction of the drilling head or the need for maintenance, access to the head is much easier. Micro tunnelling limits impacts on soils and geology compared to conventional trenching by reducing the overall excavation footprint and reducing the extent of disturbance along the length of the alignment.

Existing access tracks will be utilised and would require rehabilitation and extension in some areas. The use of unsealed access tracks could potentially impact on soils through erosion and the off-site movement of sediment. The use of imported certified rock and geofabric would minimise the impact on soils, limiting erosion and the movement of sediment off-site.

Generally, except for the construction of SP1193, the works will not permanently change the surface topography of the area. Following the installation of the gravity and rising mains, excavations will be backfilled, and the surface returned to its pre-existing condition or better.

Whilst the probability of ASS in the northeast of the site is recorded as being low, there is potential that excavated material may require treatment. If not adequately managed, construction activities could potentially result in the exposure of ASS resulting in the formation of sulphuric acid. This could potentially have detrimental impacts on water quality and lead to adverse environmental impacts.

Potential Impacts – Operational

Construction of the pipeline will result in negligible impacts to the local topography because excavated areas would be backfilled to match the existing ground level. SP1193 will be raised above the 1:100-year flood level and this would have a minor and localised impact on topography. Impervious areas (i.e. hardstand) would increase at the new site of SP1193. Management of the minor changes to stormwater flows due to increased hardstand and changed topography will be considered during detailed design. Stormwater at the SP1193 site will be locally managed through appropriate drainage.

Sydney Water will maintain the proposal during operation, and this may involve localised excavation to expose assets. Erosion and sedimentation mitigation measures will be implemented to ensure that maintenance activities have minimal impact on soils.

Overflows from the ERS will be directed from SP1193 to Marshall Mount Creek. There is a risk that discharge and additional surface water flows could result in scouring and increased erosion. The risk of erosion and turbulence from overflow events would be minimised during detailed design by incorporating erosion protection measures such as rip rap or dissipation structures. In addition, overflows events would only occur during wet weather and infrequently as per EPL requirements. No vegetation will be cleared downstream of the ERS (see Section 6.2.3), which would also help to dissipate flows and protect from erosion.

There is a minor risk of soil contamination due to spills of any chemicals stored at SP1193 for the CDU. This risk would be minimised by storing all chemicals in bunded and sealed areas and by ensuring that the storage area is designed in accordance with the relevant standards.

Mitigation measures

With the implementation of the mitigation measures below, impacts to topography, geology, and soils can be adequately managed, and residual impacts are expected to be minor.

Table 6-1 Environmental mitigation measures - topography, geology and soils

Mitigation measures
Prevent sediment moving offsite in accordance with *Managing Urban Stormwater, Soils and Construction, Volume 1 and 2A* (Landcom 2004 and DECC 2008), including: • develop a Soil and Water Management Plan (SWMP) as part of the CEMP

Mitigation measures

- divert surface runoff away from disturbed soil and stockpiles
- install sediment and erosion controls before construction starts
- reuse topsoil where possible and stockpile separately
- inspect controls at least weekly and immediately after rainfall
- rectify damaged controls immediately
- remove controls once surfaces have been stabilised, including removing trapped sediment in drainage lines.

Include a Stockpile Management Plan (SMP) as part of the SWMP to adequately manage any proposed temporary and permanent stockpiles. This will include detail on:

- exact location of stockpiles
- minimising stockpile size
- height, slopes and batters
- preventing mixing and cross contamination
- consideration of future maintenance
- capping
- erosion and sediment control
- restoration.

The Stockpile Management Plan will be prepared by the Delivery Contractor and approved by the Sydney Water Project Manager in consultation with the Environmental Representative and Contamination and Hazardous Materials team.

Minimise ground disturbance and stabilise disturbed areas progressively.

Delivery Contractor to ensure imported material is Virgin Excavated Natural Materials (VENM) or meets a relevant NSW EPA Resource Recovery Order and Resource Recovery Exemption, or is a commercially supplied material that is not waste.

If using materials that are subject to a NSW EPA Resource Recovery Order/Exemption the Delivery Contractor must ensure the conditions in that Order/Exemption are strictly adhered to.

Stop work in the immediate vicinity of suspected contamination. Indicators of contamination include discoloured soil, anthropogenic material within fill, asbestos, chemical or petrol odours and leachate. Contain disturbed material on an impermeable surface and cordon areas off. Notify the Sydney Water Project Manager and the Environmental Representative (who will contact the Contamination and Hazardous Materials team) to agree on proposed management approach.

Stop work if there is a high risk of sediment loss off site during heavy rainfall or in waterlogged conditions.

Mitigation measures
Sweep up any sediment/soil transferred off site at least daily, or before rainfall.
Reduce ponding and erosion by restoring natural landforms to the pre-works condition.
Erosion and sediment mitigation devices are to be erected in a manner consistent with current best management practice (i.e. Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004) to prevent entry of sediment into the waterway before any earthworks being undertaken. These are to be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal.
Where required, disturbed soil is to be levelled, smoothed and sown with a mixture of sterile/native grass seeds to encourage rapid revegetation and planted out with native endemic riparian vegetation.
If found, manage acid sulfate soils in accordance with the Acid Sulfate Soils Management Advisory Committee: Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998). Prepare an Acid Sulfate Soils Management Plan (ASSMP).

6.2.2 Water and drainage

Existing environment

Surface water and flooding

Calderwood is situated within the Macquarie Rivulet catchment which drains an area of 100 km^2, from the Illawarra escarpment in the west to Lake Illawarra in the east. The steep upper slopes of the escarpment broaden out to a large and relatively flat floodplain which flows into Lake Illawarra.

Marshall Mount Creek is a 4^{th} order Strahler Stream and is mapped as KFH. The waterways and riparian corridors within the study area were observed as being heavily degraded due to past clearing activities and ongoing grazing (further information is provided in section 6.2.3 below and in Appendix C).

The proposal is within a flood prone area. The Macquarie Rivulet Flood Study released in February 2017 indicates that some elements of the proposal (part of SP1193 and sections of the gravity main) are in a 1% Annual Exceedance Probability (AEP) flood event area. A 1% AEP flood event is a flood that has a 1% probability of occurring in any given year and is also referred to as a 1 in a 100-year flood.

Coastal wetlands

Within the study area there are multiple locations along Marshall Mount Creek mapped as coastal wetlands under the RH SEPP (Figure 6-3). Sections of both the existing western and northern access tracks are within mapped coastal wetlands. Both tracks have previously constructed access points through the creek (see Figure 6-1 and Figure 6-2 below). Several components of the proposal are also within areas mapped as coastal wetland proximity area.

Figure 6-1 Existing western access track - creek crossing

Figure 6-2 Existing northern access track - creek crossing

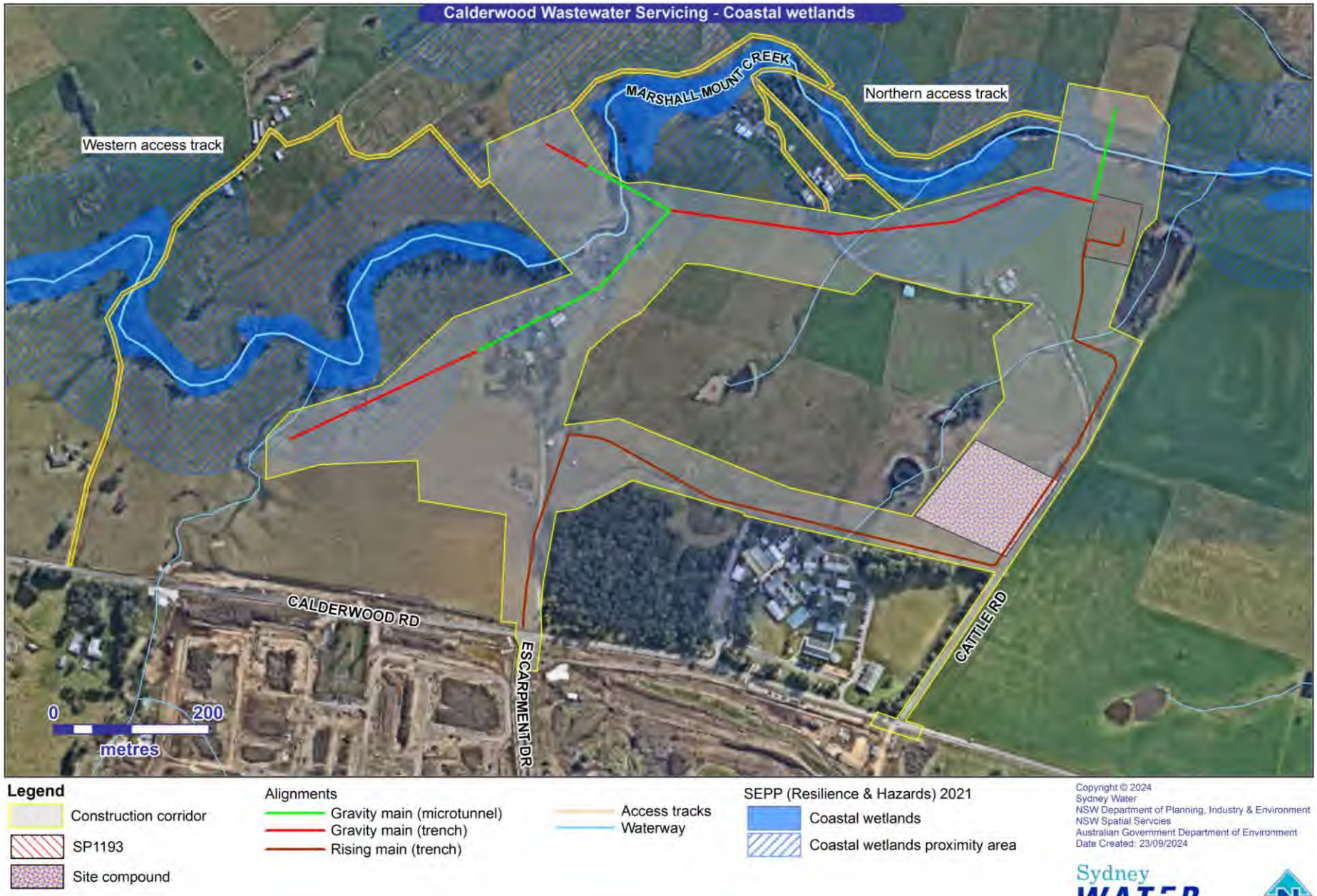

Figure 6-3 Coastal management areas under the RH SEPP

Figure 6-4 Intersection of coastal management areas by the northern access track

Groundwater

The proposal is in the Sydney Basin South groundwater source. Groundwater dependent ecosystems occur within the construction corridor and are discussed in more detail in Section 6.2.3.

Potential impacts - Construction

Surface water and flooding

Potential impacts to surface water during construction would primarily be associated with:

- erosion of soil and sediment through runoff and transportation of eroded sediments
- flooding of the construction worksites, resulting in stockpiles and/or spoil being washed into the nearby coastal wetlands and waterway
- works being undertaken in proximity to coastal wetlands with the potential to pollute the wetlands from accidental spills.

Construction of the gravity mains will not directly impact the watercourses as they will be installed via micro tunnelling. Trenchless construction via microtunneling has the potential risk of a frac-out (drilling intercepting faults and fractures in the rock) or spills where drilling fluid escapes the bore and enters the environment. The micro tunnelling process will include monitoring of the pressure of the drilling fluid to determine if there is a sudden decrease in pressure which indicates that a frac-out has occurred. The CEMP will include contingency measures to be implemented in response to a frac-out.

Open cut trenching will extend from SP1193 to the bank of Marshall Mount Creek for the installation of two pipelines for the ERS and stormwater discharge. These activities have the potential to impact on the waterway through erosion and sedimentation resulting in increased turbidity and reduced water quality. As observed during the flora and fauna field survey (Appendix C), the riparian vegetation at the discharge locations is already highly disturbed from land clearing and ongoing grazing activities and the creek bank is heavily eroded with extensive scouring (Figure 6-5). An erosion and sediment control plan will be implemented to minimise construction impacts on the Marshall Mount Creek bank.

Figure 6-5 Proposed ERS and stormwater discharge location

Where the northern access track crosses Marshall Mount Creek, the existing concrete bed crossing will be upgraded to a raised crossing in accordance with the current Blue Book standards (Landcom, 2004). This will include culverts to maintain creek flow and a rigid, non-polluting aggregate or gravel for the crossing surface. Upgrading this crossing would help reduce erosion and sedimentation potential during use. During upgrade works, appropriate erosion and sedimentation controls would help manage and minimise impacts.

Construction may result in minor impacts to flood behaviour because excavations may cause minor alterations to flow paths and drainage patterns. These impacts are unlikely to be significant due to the temporary and/or localised nature of construction activities.

Coastal Wetlands

The proposed activities within coastal wetlands proximity area include:

- installation of wastewater pipeline using micro tunnelling and open cut trenching
- use, upgrade, and extension of existing access tracks including raising the northern crossing
- the stockpiling of spoil.

The proposed activity within the coastal wetlands will include routine maintenance to the existing northern access track (Figure 6-4). Any works within the mapped coastal wetland on the northern access track will:

- not impact vegetation
- not impact surface water or groundwater flows to more then a minor extent
- not result in sedimentation or erosion into the adjacent waterway
- only include changes to make the existing northern access road work safe and be restricted to the minimum possible extent to allow the works to be carried out..

No works are permitted within mapped coastal wetland on the western access road, just access via the existing access road.

Section 2.8(1) of the RHSEPP states that the "consent authority should be satisfied that the proposed development will not significantly impact on: a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or b) the quality and quantity of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest."

Sydney Water has considered the above requirements to ensure the proposal will not significantly impact on coastal wetlands (Table 6-2). No significant impacts are expected. Direct impacts to proximity areas, and indirect impacts to both coastal wetlands and proximity areas, can be managed through the mitigation measures in this REF detailed in Table 6-3 and Table 6-8.

Table 6-2 Consideration of impacts to coastal wetlands and proximity areas

Clause	Consistency with the clause
(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or	The proposal has been positioned to avoid impacts to mapped coastal wetlands and minimise encroachment on mapped proximity areas for coastal wetlands. Native vegetation will be removed within proximity areas. However, the proposal is unlikely to result in significant impacts that modify the biophysical characteristics of the area. The ecological integrity of the proximity area may be temporarily impacted where native vegetation is being removed. Mitigation measures have been developed to minimise the risk of construction activities impacting mapped coastal wetlands. Measures have also been identified to restore disturbed areas progressively following works to minimise impacts upon the biophysical, hydrological and ecological integrity of coastal wetlands and proximity areas for coastal wetlands.
(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.	The proposal has the potential to temporarily impact surface and ground water flows in proximity areas for coastal wetlands. Construction activities upslope of coastal wetlands have the potential to increase sedimentation in surface flows, which may run into wetland areas and decrease water quality. Incorrect discharge of water upstream of coastal wetlands could cause erosion issues, sedimentation impacts to coastal wetlands and/or damage to emergent and native aquatic vegetation. Mitigation measures will be implemented to assist in controlling risks to surface and ground water flows to adjacent coastal wetland areas. Mitigation measures include actions to remediate disturbed land progressively following works.

Through the implementation of these mitigation measures, it is unlikely that there will be a significant impact to these water flows.

Groundwater

Groundwater dependent systems such as Marshall Mount Creek can be impacted by dewatering. Extensive, ongoing, and prolonged dewatering could deplete water dependant systems affecting the ecosystem integrity and reduce habitat. It can also cause the surrounding ground to lose structural integrity resulting in ground settlement.

Geotechnical information on groundwater levels indicate that the proposal will intercept groundwater and that dewatering will be required.

A drawdown assessment (Appendix E) was conducted by WSP (August 2024) to assess three construction methods for SP1193 which included two piling methods and a benched excavation method. The model used for the assessment was conservative and did not account for potential recharge rates from rainfall or surface water flow. The objective was to assess the potential drawdown effect for each at the nearby coastal wetlands. The assessment concluded that, when compared to benched excavation, piling reduced maximum drawdown at the coastal wetlands (0.15 m) by up to 83.1%. Additionally, the recovery period at the coastal wetlands (time taken for the groundwater level to return to its initial condition) was similarly reduced by up to 45.6%, at around 397 days.

Groundwater levels varied 1.42 mBGL (metres below ground level) to approximately 2.5 mBGL from dataloggers in WM04. This shows an approximate groundwater level variation of 1.08 m over the period of monitoring. The predicted drawdown value of 0.89 m at the wetland for the zero control scenario are within this natural variation, and as such within the levels tolerated historically by any groundwater dependant vegetation at the site (Appendix C).

Excavations for SP1193 would incorporate piling to limit the ingress of groundwater. The piling will be driven into the ground and extend 2 m deeper than the base of the excavations. Limiting groundwater ingress would reduce the volume of water required to be pumped out of the excavations and mitigate impacts on the surrounding environment. It is expected that the management of groundwater and its extraction will also be required along the alignment. Due to the progressive nature of the works and the short time excavations are expected to be open along the alignment, drawdown is not expected to be significant.

The extraction of groundwater can only occur with necessary approvals as per section 91B of the Water Management Act 2000. Sydney Water must obtain a Water Supply Work Approval (WSWA) and as dewatering is expected to exceed 3 ML, a Water Access Licence (WAL) must also be obtained. Dewatering activities will be carried out in accordance with the Dewatering Management Plan and dewatering approvals.

Potential impacts - Operational

Once complete, most of the proposal will be underground with limited surface infrastructure. It is not anticipated that below ground infrastructure would result in any long-term impacts on surface water, groundwater, drainage or flooding.

The above ground elements of SP1193 will be located above the one in 100-year flood extent and be consistent with the Sewerage Pumping Station Code of Australia, Sydney Water edition (WSA04-2005-2.1). Additionally, SP1193 has been designed with permeable surfaces to reduce runoff. This reduces the potential for flood events to impact on the proposal during operation. This will result in a minor change to the stormwater flows off the SP1193 site. Stormwater management of the site will be refined during detailed design.

SP1193 is designed to store wastewater during wet weather events, preventing wastewater discharges most of the time. During extreme weather events, the wastewater storage capacity at SP1193 may be exceeded and untreated wastewater could flow from an ERS. If overflows are not designed into the wastewater system, wastewater could backup in the pipelines and cause overflows to occur in residences and businesses, which is an unacceptable health risk.

SP1193 has been designed with one ERS north of SP1193. These overflow events would impact water quality of Marshall Mount Creek, contributing to an increase in background nutrient loads, pathogen levels and trace pollutant loads. The impact of these temporary and infrequent wastewater discharges would be minimised by the large catchment flows that occur during extreme wet weather events. SP1193 will be operated in compliance with EPL No. 211.

The potential for significant water quality impacts is unlikely, as wet weather overflows are typically highly diluted by the rainwater inflows to the wastewater system. Although wet weather overflows can increase the quantity of nutrients entering a watercourse, in typical watercourses most nutrients originate from stormwater runoff from the catchment. Additionally, as stormwater volumes are often higher than sewage overflow volumes, loads of most pollutants in stormwater are frequently higher. The wet weather overflows would be directed to Marshall Mount Creek to ensure that it is diluted by flow in this watercourse. This would minimise the potential for water quality impacts.

There is the potential for erosion to occur during operation of the overflow structures. The structures would be designed to include dissipation devices to reduce the velocity of flow being discharged from the overflow pipe and reduce the risk of erosion occurring. As noted previously, the condition of the creek bank in this location is poor, highly eroded and scoured. Bank stabilisation and revegetation following the construction of the overflow structure is expected to result in positive environmental outcomes as it would reduce the localised erosion potential post-construction, leaving the area in a better condition than before the works.

The mains will connect to the existing wastewater network and will be managed under existing licences (e.g. EPL) and operating procedures, ensuring no impacts to groundwater or surface water quality during operation. The proposal would be designed to comply with EPL No. 211. Modelling indicates that there would not be any dry weather overflows under normal operating conditions and this is consistent with the EPL.

Mitigation measures

Any potential impacts in relation to water, drainage and groundwater will be managed in accordance with the mitigation measures listed in Table 6-1 above, and Table 6-3 below.

Table 6-3 Environmental mitigation measures - water and drainage

Mitigation measures
Use appropriate controls to avoid potential sedimentation to waterbodies (e.g. floatation boom).
Bund potential contaminants and store on robust waterproof membrane, away from drainage lines.
Creek crossing in vehicles must be made at a reduced speed to minimise the potential of displaced water further eroding the creek bank or displacing soil and sediment.
Instream works should be limited to calm weather conditions and undertaken during periods of low flow, wherever possible.
Any plant or equipment used in-stream should be washed down and cleaned prior to and following use to reduce the translocation risk of aquatic weed species
Consider the DPI Water Guidelines for outlet structures on waterfront land during the design and construction of works within 40m of Marshall Mount Creek to protect waterfront land.
Sydney Water has consulted with Department of Primary Industries in accordance with s.199 of the Fisheries Management Act 1994. If any scope change alters the proposals potential impact to KFH the Department of Primary Industries must be notified.
Keep functioning spill kit on site for clean-up of accidental chemical/fuel spills and/or aquatic spill kit on site for clean-up of accidental chemical/fuel spills in mapped key fish habitat. Keep the spill kits stocked and located for easy access.
Locate portable site amenities, chemical storage and stockpiles of erodible materials away from watercourses, drainage lines and flood prone areas.
The stockpiling of sediment should be located as far away from the waterway as possible and managed so that it is secure against flooding. Where possible, minimise any stockpiling within 1 in 10 year flood interval and consider additional controls to mitigate the impact of possible flooding (e.g. if flooding is considered likely due to predicted storms remove material that could result in sediment entering a waterway).
Sydney Water will obtain a groundwater Water Supply Works Approval and where dewatering is >3ML per water year (from 1 July) a Water Access Licence from WaterNSW will also be obtained. The Delivery Contractor is responsible for: • providing expert hydrogeological technical information • preparing a Dewatering Management Plan at least four months prior to construction • complying with the approval conditions (such as protecting water quality; minimising aquifer extraction volumes, monitoring extraction with flow meters and recording volumes).

Mitigation measures
Discharge all water in accordance with Sydney Water's Water Quality Management During Operational Activities Policy (D0001667) including erosion controls, discharge rate, dechlorination, monitoring. Re-use potable / groundwater water where possible.
Where possible use exclusion methods to reduce groundwater ingress into open excavations.
Store all chemicals and fuels in accordance with relevant Australian Standards and Safety Data Sheets. Record stored chemicals on site register. Bunded areas to have 110% capacity of stored liquid volume and to be stored away from drainage lines. Chemicals and fuels in vehicles must be tightly secured. All chemicals to be clearly labelled.
Conduct refuelling, fuel decanting and vehicle maintenance in compounds where possible. If field refuelling is necessary, designate an area away from waterways and drainage lines with functioning spill kits close by.
Conduct any equipment wash down within a designated washout area.
Ensure equipment is leak free. Repair oil/fuel leaks immediately or remove from site and replace with a leak-free item.
The horizontal directional drilling process would include monitoring of the pressure of the drilling fluid to determine if there is a sudden decrease in pressure which indicates that a frac-out has occurred. A CEMP would be prepared and include contingency measures to be implemented to respond to a frac-out.
Undertake soil stabilisation and revegetation works around the headwall and discharge locations at the bank of Marshall Mount Creek.

Routine maintenance of the existing northern access track within mapped coastal wetlands must not occur until:
• the area has been physically delineated
• sediment and erosion controls have been installed
• the Delivery Contractor's Environmental Representative has confirmed:
  ○ consistency with approval documentation
  ○ no vegetation will be impacted
  ○ works only include changes to make the existing northern access road work safe and be restricted to the minimum possible extent to allow the works to be carried out.

6.2.3 Flora and Fauna

A Flora and Fauna Assessment (FFA) was undertaken by Ecological Australia (see Appendix C). The FFA assessed the impacts of the proposed works on native vegetation, threatened species, populations and communities listed the BC Act, EPBC Act and FM Act. The report is based on information collected from:

- a literature review of the available databases pertaining to the ecological and environmental features of the study area
- a field survey conducted on 29 August 2022 by two qualified ecologists.

The study area of the FFA, shown in Figure 6-7, includes the construction corridor and additional areas that may be indirectly affected by the proposed development, for example, edge effects, light spill, noise and dust spill. The FFA refers to the construction corridor as the subject site and assumes wholescale clearing of the construction corridor with the exception of exclusion zones.

Existing environment

Vegetation communities

Existing vegetation mapping was validated as part of the FFA. Four plant community types (PCTs) in varying condition were identified in the study area and were validated during the field survey. A summary is detailed in Table 6-4 and shown in Figure 6-7.

Table 6-4 Validated vegetation communities within the study area

PCT	Description	Area (ha) within study area
3330 South Coast Lowland Woollybutt Grassy Forest	A patch in good condition is located immediately west of Calderwood Christian School. It consists of a canopy dominated by *Melaleuca decora* and *Angophora floribunda,* a midstory dominated by native species and groundcover comprising of a mix of native and exotic species. This patch of vegetation will be avoided. Remnant paddock *A. floribunda* trees scattered throughout the construction corridor constitute as poor condition examples of this PCT and have been assessed as directly impacted. The community is currently subject to grazing pressure from horses and weed encroachment from the adjacent pasture.	4.0
4084 Southern Escarpment River Oak Forest	Present as narrow bands of tall *Casuarina cunninghamiana* subsp. *Cunninghamiana* (River Oak) with heavily grazed *Cenchrus clandestunus* (Kikuyu) understory along Marshall Mount Creek. Remnants persist as discontinuous patches along the riparian zone. The condition of the PCT is heavily degraded by past clearing and ongoing grazing activities. Where a midstory occurs, it is dominated by weeds.	6.78
4051 South Coast Lowland Red Gum-Swamp oak Forest	Occurs as a small patch on the western bank of a large dam along the eastern boundary. The community consists as a canopy of Casuarina glauca (Swamp Oak) and sparse understory of *Cynodon dactylon* (Couch) with *Juncus usitatus*	0.47

PCT	Description	Area (ha) within study area
	along the banks and is heavily degraded from past clearing and ongoing grazing activities.	
3962 Coastal Floodplain Phragmites Reedland	Occurs as *Eleocharis sphacelata* and *Typha orientalis* within the beds of two built dams. This native vegetation appears to have grown after the construction of the dams and was assigned to PCT 3962 as a best fit based on the characteristic wetland species and its location in the Illawarra IBRA subregion. PCT 3962 is associated with threatened ecological communities (TECs) listed under the BC and EPBC Act, however, this vegetation does not align with these TECs based on its presence within an artificially created environment as a single native species.	0.19
Planted native/exotic	-	3.18
Planted exotic	-	0.39
Total area		**15.01**

PCT 3330 was present within the study area in two conditions, poor (paddock trees) and good condition. The patch of PCT 3330 (good) was present in the southern section of the study area. This patch meets the composition and condition thresholds consistent with the threatened ecological communities (TECs) under the BC Act and the EPBC Act (see Table 6-5 and Figure 6-8).

Table 6-5 PCT 3330: *South Coast Lowland Woollybutt Grassy Forest* TEC listing

Listing	Status	Notes
BC Act	Endangered Ecological Community	The community is considered to meet the definition for Illawarra Grassy Woodland under this act due to its occurrence within the Wollongong LGA, the presence of key sub-canopy species *Melaleuca decora* and *Angophora floribunda* paddock trees and its location in an area where the community is known to occur. The community was present in two conditions: good condition with approximately 50% native groundcover and 50% native subcanopy cover and poor condition as remnant paddock trees.
EPBC Act	Critically Endangered Ecological Community	The patch west of Calderwood Christian School met the condition criteria thresholds for high condition classification. The vegetation met the following condition criteria:

Listing	Status	Notes
		• the patch is at least 0.5 ha (3.72 ha) • groundcover comprised of ≥ 50% native species • contained at least 6 native groundcover species in each 0.5 ha of the patch. PCT 3330 as paddock trees within the study area did not meet EPBC Act condition criteria.

The patch of PCT 3330 west of Calderwood Christian School is mapped as Category 1 Bushfire Prone Land.

Threatened flora and fauna

Desktop searches identified 116 threatened fauna species (including migratory species) and 39 threatened flora species as occurring, or having the potential to occur, within a 5 km radius of the study area. No threatened fauna or flora have been previously recorded within the study area itself.

No threatened flora or fauna species were identified or recorded within the study area during the field survey. The FFA determined that the study area is unlikely to provide habitat for any threatened flora species. Habitat features suitable for threatened fauna species were identified during the FFA. However, none of these fauna features are proposed for removal and no direct impact to threatened fauna is expected. The study area contained potential foraging habitat suitable for threatened fauna species *Pteropus poliocephalus* (Grey-headed Flying Fox).

Flora and fauna habitat

No hollow bearing trees or other significant habitat features were identified within the construction corridor during the field survey. Rural dwellings and agricultural sheds were present within the study area. However, both are considered unlikely to provide microbats habitat.

Farm dams were present in the study area with some containing *Typha orientalis* and *Eleocharis sphacelata* and could potentially provide habitat for aquatic fauna.

Aquatic and riparian habitats

As detailed in Section 6.2.2, the study area includes Marshall Mount Creek (a 4th order Strahler Stream) and several of its tributaries, including two first order streams and one second order stream.

Marshall Mount Creek is mapped as KFH under the FM Act. No threatened freshwater fish species are modelled to occur within Marshall Mount Creek or any other watercourses within the study area, according to the NSW DPI Fisheries Spatial Portal (DPI 2022).

Several farm dams occur on the properties surrounding the proposal, including within the construction corridor. *Typa orientalis* and *Eleocharis sphacelata* occur in some of these dams and could potentially provide habitat for aquatic fauna.

Groundwater dependent ecosystems (GDEs) are mapped in the study area. These are not defined as High Priority under the Water Sharing Plan for the Greater Metropolitan Region Groundwater

Sources 2023 (WSP). The nearest High Priority GDE identified in the WSP is the Macquarie Rivulet Estuary on the western side of Lake Illawarra, approximately 3.5 km east of the proposal (Appendix C).

Priority weeds

A total of 31 exotic species were recorded in the study area during the field survey. Of these, 2 are listed as 'priority weeds' under the *Biosecurity Act 2015*. These are:

- Lantana (*Lantana camara*)
- Fireweed (*Senecio madagascarensis*).

Potential impacts - Construction

Impacts to vegetation communities

The proposal would likely directly affect 0.84 ha of remnant vegetation which constitutes 3 PCTs:

- PCT 3330 South Coast Lowland Woollybutt Grassy Forest (0.05 ha)
- PCT 3962 Coastal Floodplain Phragmites Reedland (0.03 ha)
- PCT 4084 Southern Escarpment River Oak Forest (0.76 ha).

Other areas to be directly affected include planted native/exotic species (1 ha) and exotic pasture.

The study area contained a patch of Illawarra Lowlands Grassy Woodland (PCT 3330 good) in the southern section of the study area, which is listed as an endangered ecological community under the BC Act. This vegetation is proposed to be retained and will not be directly impacted by the proposal. However, this community is also present within the study area as *Angophora floribunda* paddock trees (PCT 3330 poor) which are proposed for removal. Therefore, a test of Significance was undertaken for this community to determine if significant impacts will occur.

The BC Act Test of significance concluded that the proposed activity was unlikely to constitute a significant impact on Illawarra Lowlands Grassy Woodland TEC.

An exclusion zone as shown in Figure 6-8 has been identified to avoid impacts to vegetation around 258 Calderwood Road.

A small amount of hot works are anticipated during construction of the proposal. However, provided mitigation measures are implemented, no impact to bushfire risk is expected to areas mapped as Category 1 Bushfire Prone Land.

Impact to threatened flora and fauna

None of the habitat features suitable for threatened flora species are proposed for removal and no direct impact to threatened flora is expected.

Foraging habitat suitable for the *Pteropus poliocephalus* (Grey-headed Flying Fox), a threatened fauna species listed under the BC Act, was identified. Therefore, a Test of Significance was undertaken for this species. The BC Act Test of significance concluded that the proposed activity was unlikely to constitute a significant impact on the Grey-headed Flying Fox.

The Grey-headed Flying-fox was the only Matter of National Environmental Significance (MNES) considered likely or known to occur in the study area.

The significant impact criteria in accordance with the EPBC Act was applied to this MNES and it was concluded that the proposed activity was unlikely to constitute a significant impact on this MNES entity. As such, a referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water, which is responsible for administering the EPBC Act, is not required.

Potential impacts to flora and fauna will be managed and mitigated through the implementation of mitigation measures described below.

Impacts to aquatic and riparian habitats

The proposal involves excavations and ground disturbance within the proximity area for coastal wetlands. Coastal wetlands may be indirectly impacted should uncontrolled erosion lead to increased turbidity and reduced water quality. Impacts to coastal wetlands and proximity areas, including water quality, have been assessed in Table 6-2 above.

As the proposal occurs within areas mapped as KFH, Sydney Water consulted with DPI Fisheries (2 September 2024). DPI Fisheries provided support for the proposal and the associated mitigation measures (9 October 2024). DPI Fisheries did comment that the installation of the creek crossing was not suitable for longer term use as it would not be considered fish friendly. As the crossing upgrade will be temporary, no long-term impacts to the waterway or fish are expected.

Some Farm dams contain *Typa orientalis* and *Eleocharis sphacelata* that could potentially provide habitat for aquatic fauna. It is not anticipated that dam dewatering will be required during the proposal.

There is a possibility of impacts to GDEs, including coastal wetlands, within the construction corridor. Impacts could occur through drawdown of the water table because of excavation activities requiring groundwater extraction and creation of potential barriers to underground flow. Ecological Pty Ltd consultants reviewed the drawdown assessment detailed in Section 6.2.2. They concluded that the predicted drawdown value of 0.89 m at the wetland for the zero-control scenario is within this natural variation, and as such within the levels tolerated historically by any groundwater dependent vegetation at the site.

Mitigation measures within this REF would reduce the risk of impacts to GDEs.

Other impacts

Indirect impacts are summarized in Table 6-6 below and can be mitigated by following the mitigation measures in Table 6-8.

Table 6-6 Indirect impacts from the proposal

Description of impact	Assessment of impact
Changes to hydrology and water quality through altered run off (including emergency wastewater	These impacts are manageable during construction and considered low impact if mitigation measure listed in Table 6-8 are implemented.

Description of impact	Assessment of impact
overflows), sedimentation and erosion patterns during construction	
Introduction of new weed species through increased traffic and machinery	Low impact if mitigation measure listed in Table 6-8 are implemented.
Inadvertent impacts on adjacent habitat or vegetation	Low impact if mitigation measure listed in Table 6-8 are implemented.

Potential impacts – Operational

During operation no impacts to flora or fauna are expected. Potential impacts associated with the discharge of emergency overflows and stormwater are discussed in Section 6.2.2. Revegetation and stabilisation of the creek bank would help prevent potential erosion and impacts to the waterway, riparian vegetation and the fauna that utilise them.

Biodiversity Offsets

Although formal offsets are not required under the BC Act, Sydney Water has an internal position to maintain or enhance biodiversity outcomes if the proposal has residual biodiversity impacts. Vegetation removed will be offset in accordance with Sydney Water's Biodiversity Offset Guide (SWEM0019.13).

As detailed above, a total of 0.84 ha of existing PCTs will potentially be affected as a result of the proposed works. The impact areas will be offset with a ratio of 1:3 for moderate impacts (>100m2) to threatened vegetation and 1:2 for moderate impacts (>100m2) to non-threatened vegetation. The area of each PCT to be offset based on the native vegetation offsetting methods (SWEM0019.13) are outlined in Table 6-7.

Table 6-7 Indicative maximum offset requirement

Vegetation Community	Impacted Area (ha)	Offset Multiplier	Maximum Offset Requirement (ha)
PCT 3330 South Coast Lowland Woollybutt Grassy Forest – Poor condition	0.05	3	0.15
PCT 4084 Southern Escarpment River Oak Forest – Poor Condition	0.76	2	1.52
PCT 3962 Coastal Floodplain Phragmites Reedland	0.03	3	0.06
Total	**0.84**		**1.73**

The impact areas and recommended offsets are shown in Figure 6-9. The riparian corridor will be subject to separate offset requirements as part of the Developer's approval. As such, offset locations should first replace any areas impacted within the riparian corridor at 1:1 but any additional areas required beyond that should be re-created outside the riparian corridor in areas that are not already designated for revegetation under the Developer's controlled activity approval (CAA). This approach would contribute to a more significant overall net gain. The feasibility of the recommended offset locations will be dependent upon what is proposed in the final plan of development.

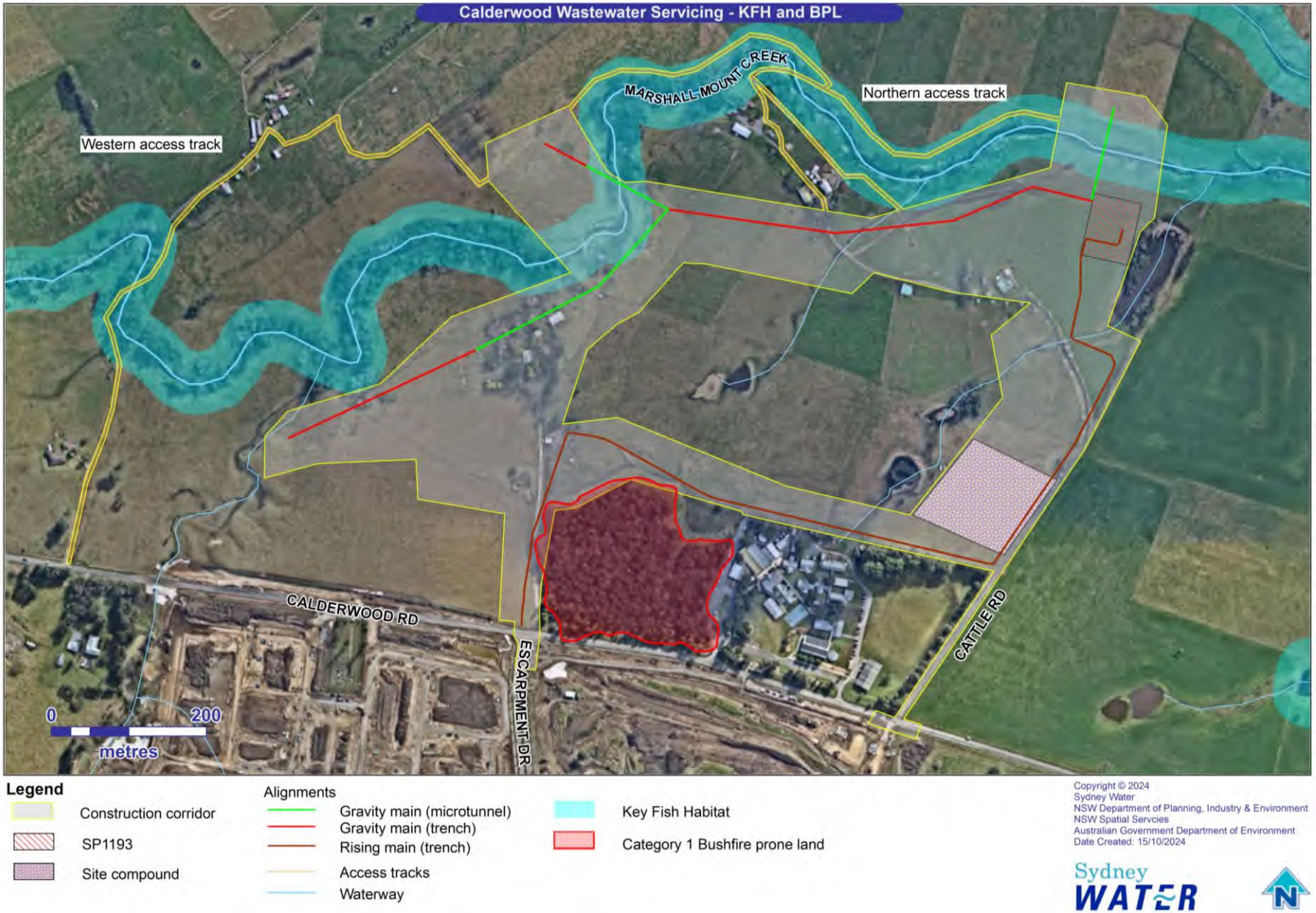

Figure 6-6 Key fish habitat and bushfire prone land

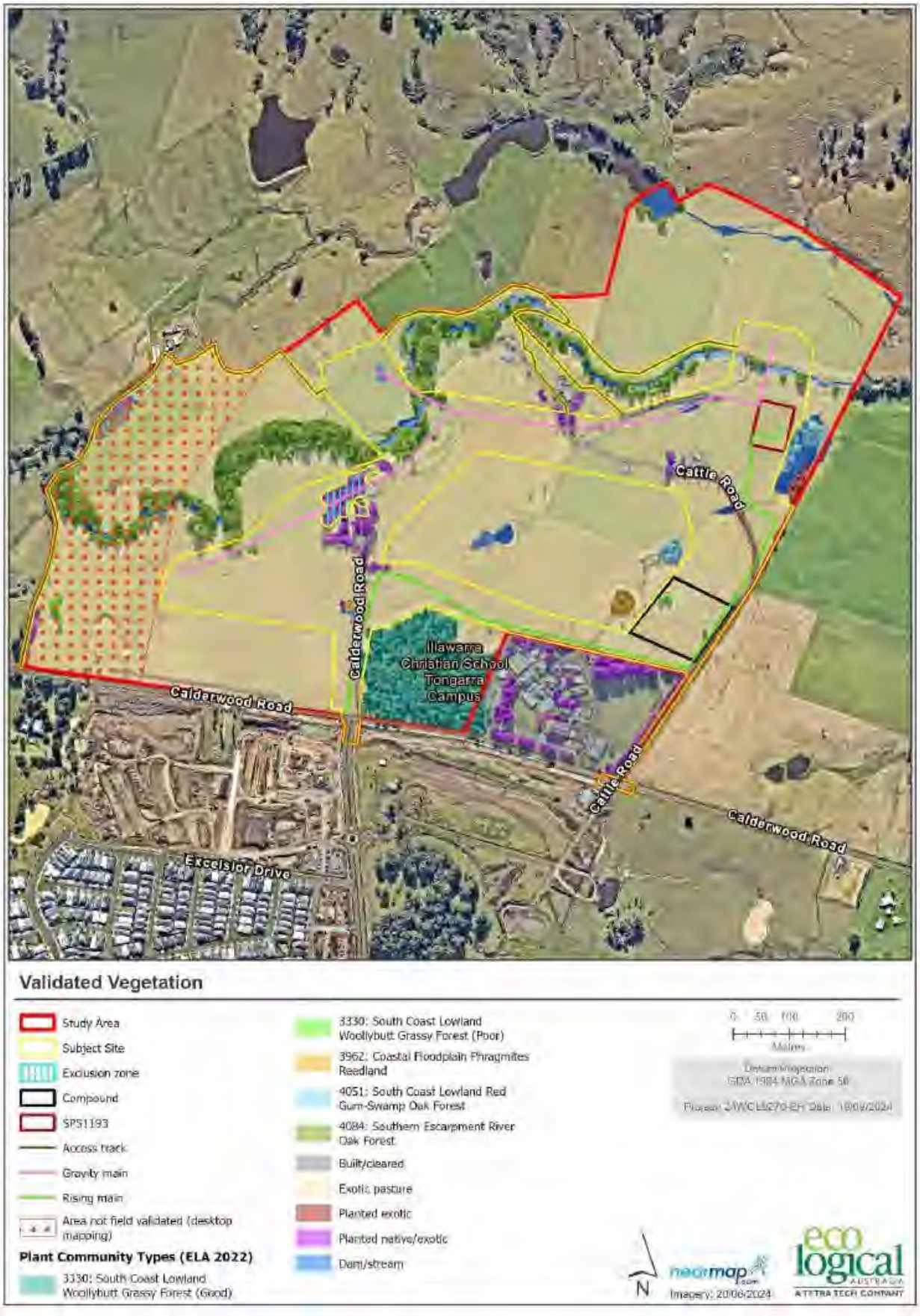

Figure 6-7 Field validation vegetation communities within the study area

Figure 6-8 Threatened ecological communities within the study area

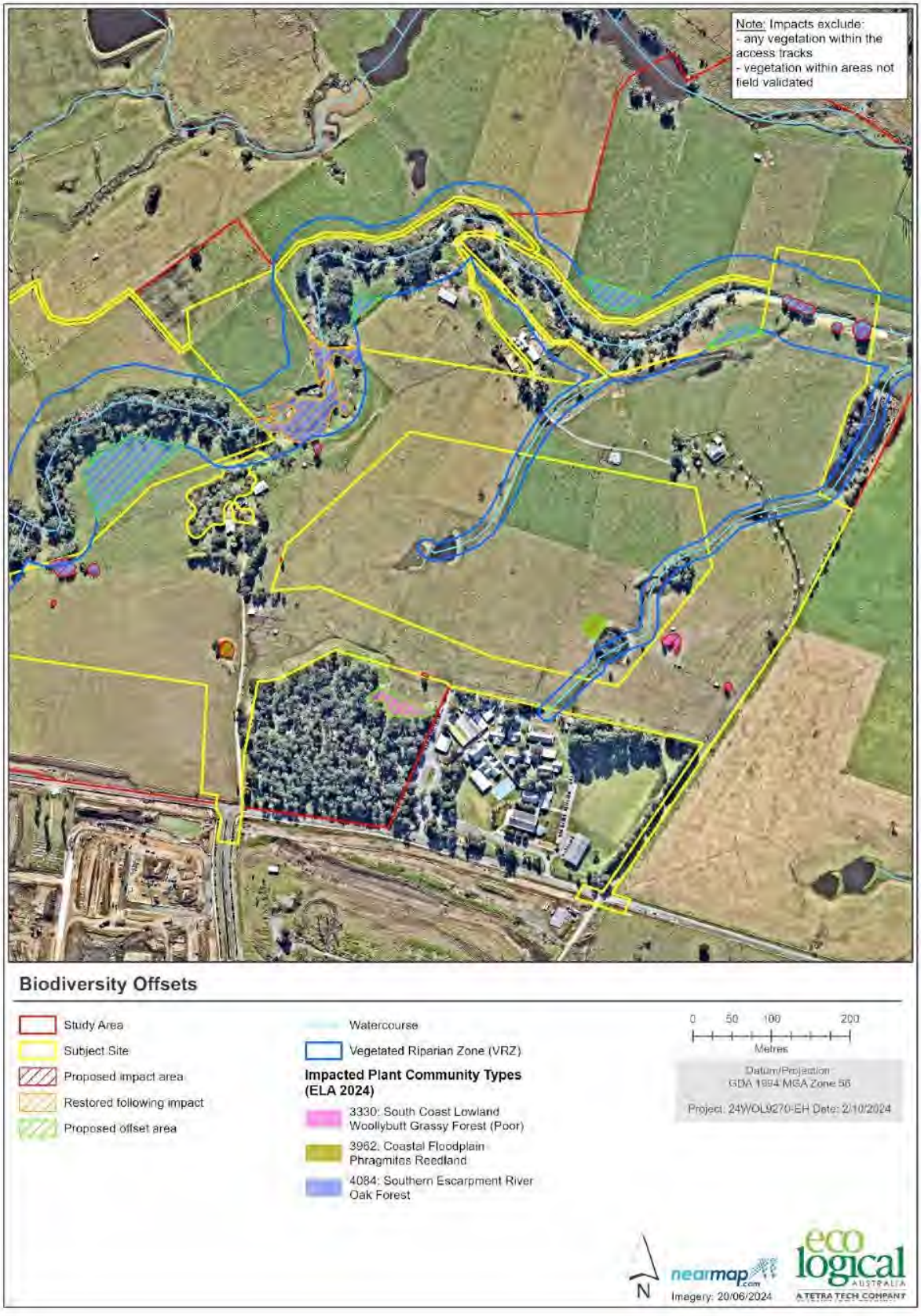

Figure 6-9 Potential biodiversity offset areas

Mitigation measures

Table 6-8 Environmental mitigation measures - fauna and flora

Mitigation measures
Provided it is essential for delivering the project, Sydney Water's Project Manager can approve the following vegetation removal and tree trimming, without additional environmental assessment (but only after consultation with the Environmental and Community Representatives and affected landowners). Sydney Water considers vegetation removal in these circumstances has minimal environmental impact. • Any minor: - vegetation trimming or - removal of exotic vegetation or - removal of planted native vegetation where the vegetation is not a threatened species (including a characteristic species of a threatened community or population), heritage listed, in declared critical habitat or in a declared area of outstanding biodiversity value. • Any removal of remnant vegetation where there is no net change to environmental impact (eg a different area of vegetation is removed but the total area is the same or less than assessed in the EIA). Written explanation of the application of this clause (including justification of the need for trimming or removal and any proposed revegetation) should be provided when seeking Project Manager approval. Any impacts to native vegetation and trees must be offset in accordance with the Biodiversity Offset Guideline (SWEMS0019.13).
Offset residual impacts to native vegetation and trees in accordance with the Biodiversity Offset Guideline (SWEMS0019.13).
Any native vegetation removed during construction would be restored according to Sydney Water SWEMS0025.11 Guideline for native revegetation following construction.
Map and report native vegetation clearing greater than 0.01 ha in extent (and any associated rehabilitation) to the Sydney Water Environmental Representative. Track vegetation clearing as per SWEMS0015.26 Contractor Native Vegetation Clearing and Rehabilitation template.
Minimise vegetation clearance and disturbance, including impacts to standing dead trees and riparian zones. Where possible, limit clearing to trimming rather than the removal of whole plants.
If replanting near Sydney Water mains refer to '*Which trees can damage wastewater pipes?'* link from Sydney Water website.
On completion of the works revegetate with endemic species.
On completion of works within key fish habitat rehabilitate and stabilise the site, including the replanting of the disturbed area with native endemic riparian vegetation.

Mitigation measures
In a TOBAN, activities involving general purpose hot works in the open (that are not essential/emergency works) require an exemption. Exemption request are to be submitted to CDResilienceProgram@sydneywater.com.au or CustomerHub.DutyManager@sydneywater.com.au
Wash down vehicles and all equipment at appropriate depot or wash down facility to limit weed and pathogen spread.
Have appropriate stockpiling, locate construction facilities and vehicle turning areas in already cleared areas.
Any unexpected threatened species or ecological communities identified during the pre-clearing assessment should be appropriately assessed through a supplementary impact assessment.
During the pre-clearance surveys, if any HBTs are found in or near the proposed pipeline, they would be marked by an ecologist so that they are retained and avoided by contractors. HBT removal should be avoided (if they are encountered).
Where fauna species are identified in vegetation to be cleared, animals would be removed and relocated to adjacent bushland before felling. If this is not possible, the tree would be sectionally dismantled or soft felled under the supervision of an ecologist or wildlife carer, before relocating the animal.
If any priority weeds are identified during construction, these would be removed and disposed of an appropriate waste facility. The equipment used for removing them would be cleaned to minimise the likelihood of transferring and exotic plant materials.
Cover open trenches overnight to avoid fauna becoming trapped. Additionally, trenches should be checked each morning for possible trapped fauna.
The Delivery Contactor will offset any impacts as a result of the proposal in accordance with the Sydney Water Biodiversity Offset Guide.
No removal of vegetation in mapped coastal wetlands.
Where possible, avoid removal of native vegetation along Marshall Mount Creek.
Minimise the removal of vegetation within proximity areas for coastal wetlands during detailed design and construction.
Physically delineate vegetation to be cleared and/or protected on site and install appropriate signage prior to works commencing.
Protect trees in accordance with the requirements of Australian Standard 4970-2009 for the Protection of Trees on Development Sites. Do not damage tree roots unless absolutely necessary, and engage a qualified arborist where roots >50mm are impacted within the Tree Protection Zone.
Where applicable, physically markup construction corridor to ensure all works do not disturb or damage: • vegetation to be retained

Mitigation measures
• streams • coastal wetlands (all coastal wetlands as a no-go zone excluding the existing access roads).
Any fish trapped within bunded trenches that require dewatering should be captured with hand nets and placed in the nearest pool, preferably upstream of the bund.
It is recommended that a Dam De-watering Plan (DDP) be implemented as best practice for any existing farm dams that are proposed to be de-watered to safely remove aquatic fauna that may be inhabiting the dams.
Manage biosecurity in accordance with: • *Biosecurity Act 2015* (see NSW Weedwise), including reporting new weed infestations or invasive pests • contemporary bush regeneration practices, including disposal of sealed bagged weeds to a licenced waste disposal facility. Record Pesticides and Herbicides use in accordance with SWEMS0017
Bag all plant parts and excavated topsoil that may be infested with weed propagules and dispose at a licensed waste disposal facility.

6.2.4 Heritage

Aboriginal heritage

In October 2024 an Aboriginal heritage assessment report (ACHAR) was undertaken by Kelleher Nightingale Consulting Pty Ltd (KNC). The ACHAR includes an assessment of:

- the context of the study area
- summaries of previous assessments in the area
- test excavation results
- stakeholder consultation outcomes.

The complete assessment is provided in Appendix D.

Existing environment

The study area has been subject to varying levels of surface and subsurface disturbance from past land use practices. Agricultural activities, including clearing and ongoing grazing, and the construction of structures in addition to flooding and alluvial processes along Marshall Mount Creek are likely to have disturbed the subsurface deposit in these areas.

The study area lies within a landscape which was important to, and intensively used by, Aboriginal peoples. The Illawarra and wider NSW South Coast offered many lakes, estuaries, sandy beaches

and intertidal zones with a diversity and abundance of resources for the local people to use. Historical accounts have recorded the use of the many creeks of the area as a key food resource. Stone resources were plentiful too, and the ubiquitous occurrence of chert and fine grained siliceous artefacts at open sites indicates that they were the most accessible stone material available to Aboriginal people in the region.

Aboriginal Heritage Due Diligence

A due diligence assessment and visual inspection (AECOM 2024) identified two previously registered open artefact AHIMS sites within the study area:

This information has been redacted to protect sensitive Aboriginal heritage information

Both sites were revisited as per the location on their respective site cards. No Aboriginal artifacts associated with the sites were observed during the inspection. This information has been redacted to protect sensitive Aboriginal heritage information

Close review of the site recording form for AHIMS site This information has been redacted to protect sensitive Aboriginal heritage information

Background review, including the previous archaeological assessment for the project, identified areas of moderate and high archaeological sensitivity within the study area.

Archaeological Test Excavation

Archaeological test excavations were carried out within the construction corridor, where PADs could not be avoided by the proposal. Testing was undertaken in eight locations identified through previous assessment as displaying moderate or high archaeological sensitivity and was undertaken in accordance with the Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010). Details of the test excavations are provided in Appendix D.

Aboriginal Community Consultation

The aim of consultation is to integrate cultural and archaeological knowledge and ensure registered stakeholders have information to make decisions on Aboriginal cultural heritage. For the preparation of this ACHAR, consultation with Aboriginal people has been undertaken in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (Department of Environment, Climate Change and Water 2010) and the requirements of Clause 60 of the National Parks and Wildlife Regulation 2019. 29 Aboriginal community individuals and groups were engaged as Registered Aboriginal Parties for project-specific consultation. Details of this stakeholder consultation is provided in Appendix D.

Aboriginal archaeological sites within the study area

Aboriginal archaeological sites within the study area, identified following test excavation, are detailed below (Table 6-9).

Table 6-9 Significance assessment of identified Aboriginal archaeological sites

This information has been redacted to protect sensitive Aboriginal heritage information

Potential Impacts - Construction

Sydney Water is committed to seeking project outcomes that protect and preserve Aboriginal heritage wherever possible. Early identification of Aboriginal heritage in the assessment process allows this to be considered during design where there is construction flexibility. For this proposal, the proposed works are largely constrained by topography/hydrology and the location of infrastructure including road corridors and developer plans.

Table 6-10 Proposed impact to Aboriginal archaeological sites within the construction corridor

This information has been redacted to protect sensitive Aboriginal heritage information

An Aboriginal Heritage Impact Permit is being sought for Aboriginal objects within the boundaries of the construction corridor. The scope of the AHIP would correspond to the degree of proposed harm, i.e., partial, or total. Where a site is subject to partial harm, the remaining portions will be designated no-go zones and will be avoided and will not be impacted by the proposal.

This information has been redacted to protect sensitive Aboriginal heritage information

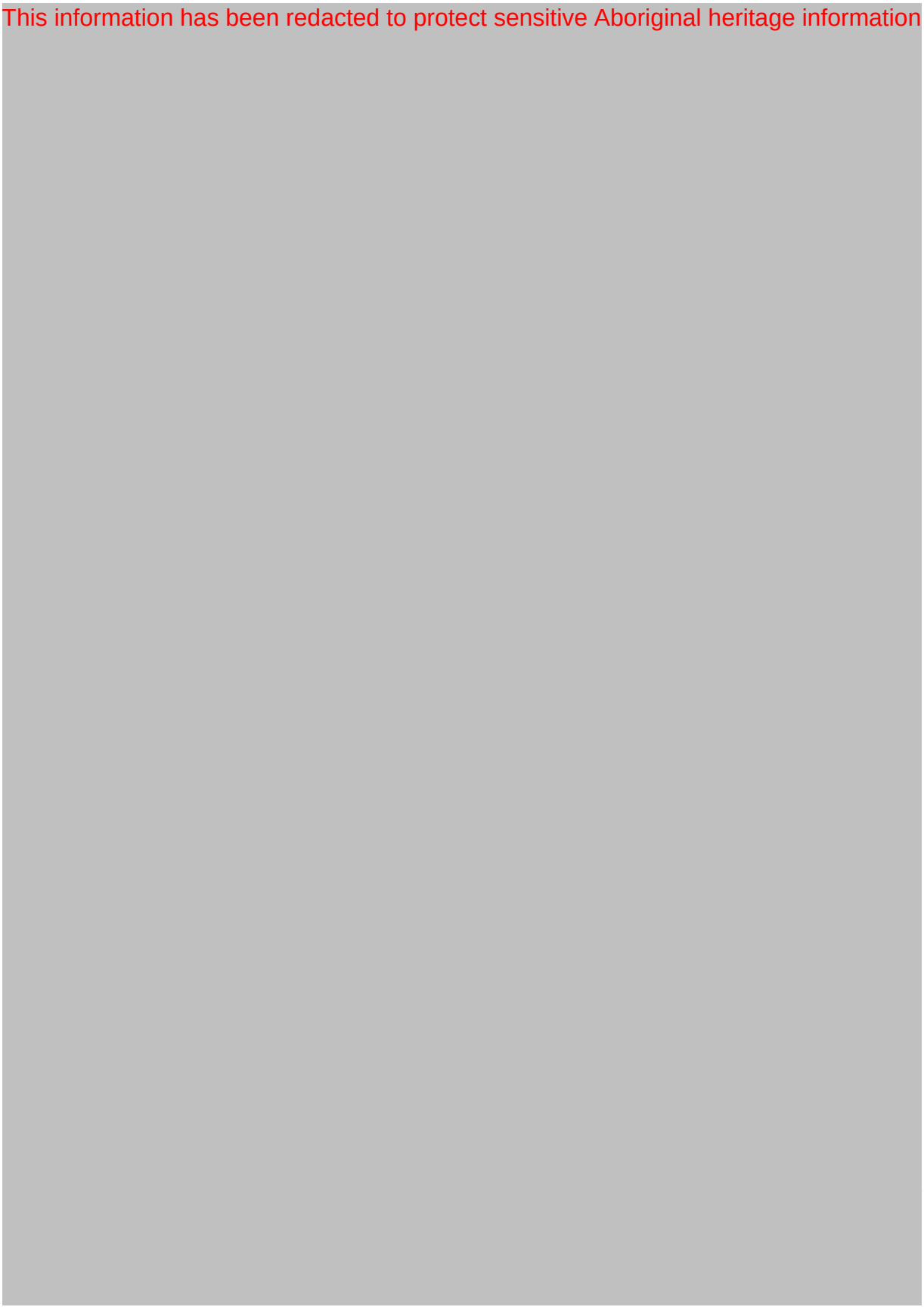

Figure 6-10 Identified Aboriginal archaeological sites within the study area

This information has been redacted to protect sensitive Aboriginal heritage information

Figure 6-11 Proposed impact to Aboriginal heritage

Potential impacts – Operation

The long-term management of collected Aboriginal objects would be determined in consultation with the projects registered Aboriginal stakeholders and in accordance with the conditions of the AHIP. No impacts to Aboriginal heritage are expected during the operation of the proposal.

Non-Aboriginal heritage

Existing environment

There is one non-aboriginal heritage item within 200 m of the proposal. This item is listed as “Marshall Mount Methodist Cemetery” in the Precincts SEPP under Item number 2. Located along Calderwood Road (1/-/DP195342), this item is within 10 m of the construction corridor but is about 200 m from the proposed rising main alignment.

The Marshall Mount Methodist Cemetery is of local significance as it holds the remains of district pioneers and their families. It dates from the boom period in the locality. The management summary for the item places importance on features such as the gravestones and historical roses.

Potential impacts – Construction

As the proposal will not occur within the heritage curtilage of the Marshall Mount Methodist Cemetery, no direct impacts to this item are expected.

Potential indirect impacts include vibration impacts to headstones and masonry. A construction noise and vibration assessment memo (Appendix F) has been completed which considers large plant machinery that may be used during the proposal. This is discussed further in Section 6.2.5 below. The largest vibratory plant that may be used for the proposal include large vibratory rollers (18 plus tonne). The minimum working distance for this plant is 25 m and up to 68 m for sensitive structures. As the heritage item is located around 200 m from the proposed rising main alignment it is unlikely to be negatively impacted by vibration.

Potential impacts – Operation

Due to the distance from the proposal, no impacts to Marshall Mount Methodist Cemetery during operation are expected.

Mitigation Measures

With the mitigation measures outlined below the proposal is not expected to impact on the significance of listed heritages items

Table 6-11 Environmental mitigation measures — heritage

Mitigation measures
Do not make publicly available or publish, in any form, Aboriginal heritage information on sites / potential archaeological deposits, particularly regarding location.
Repeat the basic AHIMS search if it is older than 12 months. Conduct additional assessment if new sites are registered and could be impacted by works outside the AHIP footprint.

Mitigation measures
If any Aboriginal object is found outside the AHIP area or before the AHIP is granted, cease all excavation or disturbance in the area and notify Sydney Water Project Manager in accordance with SWEMS0009.
Impact to Aboriginal heritage sites can only occur when an AHIP has been granted and any required surface collection and salvage has been complete. Works within the AHIP area must be undertaken in accordance with all AHIP conditions.
An approved AHIP and the associated archaeological salvage is required before starting any works in areas with known Aboriginal heritage items site/s.
Toolbox talk covering Aboriginal heritage and Cultural Awareness Training should be completed by all onsite staff, prior to commencement of all activities. The toolbox talk is to be approved by a heritage specialist and should include: • clear explanation of heritage constraints • go and no-go areas, processes and measures to avoid impacts • stop work procedures • AHIP conditions • contact details to obtain further heritage guidance if needed.
Management measures to be implemented to ensure non-impacted portions of each Aboriginal site is avoided by proposed activities (protective fencing, identification in the CEMP, toolbox talks). Where the proposal will be partially impacting Aboriginal sites, temporary protective fencing that is difficult to move/reposition is to be installed during the construction along the AHIP boundary. This temporary fencing is only necessary along the AHIP boundary where the AHIP boundary crosses an Aboriginal site.
Harm to any Aboriginal objects and declared Aboriginal places is only permitted once an Aboriginal Heritage Impact Permit (AHIP) has been granted.
All site personnel must be inducted by a heritage specialist before starting work on site. The induction should include clear explanation of heritage constraints, go and no-go areas, processes and measures to avoid impacts, stop work procedures, and contact details to obtain further heritage guidance if needed.
Avoid the use of vibratory plant and equipment in proximity to Marshall Mount Methodist Cemetery and adhere to minimum working distances for particular plant and equipment listed in section 6.2.5.
If any non-Aboriginal relic is found cease all excavation or disturbance in the area and notify Sydney Water Project Manager in accordance with SWEMS0009.

6.2.5 Noise and vibration

Existing environment

Nearby sensitive receivers include:

- large lot residential properties within the construction corridor,

    - 1 Cattle Road, 75 m west of the proposed rising main
    - 258 Calderwood Road, adjacent to proposed gravity main (under bored), 65 m east of the nearest trenched section
- Calderwood Christian School, less than 20 m south of the rising main
- large lot residential properties adjacent to the construction corridor
- Mount Marshall Methodist Pioneer Cemetery, less than 20 m south of the construction corridor
- Calderwood suburb general residential area (zoned R1) south of the proposal consisting of about 300 residential properties within 200 - 500 m of the construction corridor.

These receivers have been included in Figure 6-12 below.

The area surrounding the proposal has low background noise levels, consistent with its rural setting, with residential properties sparsely located. The dominant influences on background noise levels are general rural activities and road traffic, with nearby receivers generally experiencing higher background noise during the day.

The likelihood of noise impacts was assessed using Table 2 of the Draft Construction Noise Guideline (EPA 2020). The review indicated that the likelihood of noise impact is medium/ high risk and therefore a quantitative noise impact assessment (Appendix F) was undertaken and is summarised below. This quantitative assessment was performed using the Transport for NSW (TfNSW) Construction and Maintenance noise estimator tool (TfNSW, 2022).

The construction program and proposed use of noisy equipment is detailed in Table 6-12.

Table 6-12 Proposed scope of works and duration of activities

Scope	Activities	Duration
Site mobilisation	Install compounds and establish access, delineate construction corridor, install environmental controls, strip stockpiles, remove vegetation	1-2 months
Compound use	Ongoing use of amenities, storage, laydown, parking areas	24 months
SP1193	Construction including: • bulk earthwork excavation • overflow and stormwater outlet at Marshall Mount Creek • valve chamber • electrical switchroom • chemical dosing unit (CDU) • chemical delivery bund • emergency storage structure	18-20 months

Scope	Activities	Duration
	• wet well • inlet maintenance hole • access road.	
Gravity main, 773 m	Open trench – progressing about 5 m per shift	6-12 months
Gravity main, 727 m	Underboring – progressing about 13 m per shift, and excavation of launch/receival pits	6 months
Rising main, 1.3 km	Open trench – progressing about 10 m per shift	4-5 months
Site demobilisation	Remove compounds and restore disturbed areas	1-2 months

Potential impacts– Construction noise

The noisiest works associated with the proposal are expected to be the bulk earthworks required for the construction of SP1193. Therefore, the scenario “bulk earthworks” was chosen in the noise estimator tool, which includes plant such as a 35-tonne excavator with hammer.

Most of the proposal will occur during standard daytime work hours. However, the potential for out of hours work (OOHW) and night work has been identified for a section of the proposed rising main within Calderwood Road and Escarpment Drive. These works would include excavation of trenches, installation of pipes, filling and compacting. Based on these activities, the comparable scenario “drainage infrastructure” was chosen in the noise estimator tool.

The dewatering of excavations will be required during construction. It is anticipated that dewatering will be required over 24-hour periods across the proposal where excavations occur. Dewatering would require the use of a generator which will be used in the noise estimator tool for the assessment of this activity.

This assessment is considered appropriate to predict and assess worst-case noise impacts, since:

- The noisiest scenario considers plant and equipment that would not be used constantly each shift.
- Nightworks are limited to a relatively small component of the proposal and would not impact equally across the proposal.
- Multiple pieces of equipment may be used at any one time for different activities at different locations. Assessing use of the noisiest plant across the full construction corridor is a representation of the cumulative noise impacts that may be experienced.

Figures showing the predicted noise affected distances for each of the scenarios are in Appendix F.

Calderwood Christian School is within 60 m of the proposal and is predicted to be noise impacted during day work. Notification, phone call and respite offer are recommended measures.

Both residential receivers within the construction corridor will be impacted by noise. 258 Calderwood Road is within 60 m of the proposal and is predicted to be highly affected by noise. Measures include notification, phone call and respite offer.

During OOHW (evening), residential receivers with line of sight who are within 390 m are predicted to be impacted by noise. Those within 75 m (258 Calderwood Road and 1 Cattle Road) are predicted to experience highly intrusive noise impacts. Residential receivers up to 265 m from the proposal who have no line of sight are also predicted to experience clearly audible noise.

OOHW (night) noise impacts extend to residential receivers within 815 m where there is line of sight and 565 m without. Additionally, there is potential for highly intrusive noise impacts and sleep disturbance impacts for residential receivers within 125 m and 85 m respectively.

As the dewatering of excavations are expected to occur across the proposal over a 24-hour period this activity was specifically assessed during OOHW. During OOHW residential receivers within 25 m (evening) and 30 m (night) of a generator are predicted to be highly impacted. Dewatering locations and equipment would be placed as far from receivers as feasible during the proposal to minimise impacts.

A Sydney Water Community Engagement Advisor and the construction team determined reasonable and feasible mitigation measures. These are outlined and discussed in Appendix F and have been incorporated into the mitigation measures below.

Open trenching, underboring and dewatering are linear activities. Therefore, any one receiver would not be impacted by these activities for every shift over the 24 months of construction.

Sensitive receivers around the compound, access roads and SP1193 are likely to be noise impacted during most shifts over the 24 months of construction. These works are static and include a mix of noisier (e.g., concrete saw, excavator with hammer) and less noisy (e.g., light vehicle movement, excavator without hammer) activities.

Figure 6-12 Noise sensitive receivers

Potential impacts– Construction vibration

The noise estimator includes some indicative minimum working distances for different vibratory plant and equipment. These distances will vary depending on the particular item of plant, local geotechnical conditions, and the frequency of vibration. However, where works are performed within the minimum working distances of a structure, structural damage may occur, and additional mitigation measures are recommended. Based on the plant and equipment list in Section 3 of the REF, the following vibratory plant and equipment may be used:

- Small (5 to 12 tonne) hydraulic hammer – minimum working distance of 2 m
- Medium (12 to 18 tonne) hydraulic hammer – minimum working distance of 7 m
- Large (18 to 34 tonne) hydraulic hammer – minimum working distance of 22 m
- Handheld jackhammer – minimum working distance of 1 m (nominal)
- 1-2 tonne vibratory roller – minimum working distance of 5 m
- 2-4 tonne vibratory roller – minimum working distance of 6 m
- 4-6 tonne vibratory roller – minimum working distance of 12 m
- 7-13 tonne vibratory roller – minimum working distance of 15 m
- 13-18 tonne vibratory roller – minimum working distance of 20 m
- More than 18 tonne vibratory roller – minimum working distance of 25 m.

It is unlikely that residential buildings will be within these minimum working distances. The nearest building, 258 Calderwood Road, is about 45 m east of the gravity main alignment. Other buildings or structures may be within the minimum working distances of the larger machinery.

The heritage listed Marshall Mount Methodist Cemetery is near to the construction corridor and potential impacts are discussed in Section 6.2.4. Potential vibration impacts will be considered when choosing the size of equipment to be used. Vibration impacts are expected be minor and can be managed with the implementation of the mitigation measures listed below.

Potential impacts - Operational

During operation, the proposal would not result in any operational noise from the wastewater mains. Noise impacts would potentially occur during maintenance or emergency works. However, these would be short-term and managed by implementing the mitigation measures below.

Noise generated from SP1193 will not exceed the noise criteria in the Noise Policy for Industry (NPfI) (EPA, 2017). The detailed design of SP1193 will ensure noise levels meet the NPfI and Noise testing will occur during commissioning to confirm compliance. Any plant operating under normal conditions that does not meet the requirements for noise during site testing must be rectified and retested.

Mitigation measures

With the implementation of the mitigation measures below, impacts from noise and vibration can be adequately managed, and residual impacts are expected not expected to be significant. No impacts are anticipated during operation.

Table 6-13 Environmental mitigation measures - noise and vibration

Mitigation measures
Works must comply with the *Construction Noise Guideline* (Draft, 2021), including schedule work and deliveries during standard daytime working hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturday. No work to be scheduled on Sundays or public holidays. The Proposal will also be carried out in accordance: • with *Sydney Water's Noise Management Procedure SWEMS0056* • Noise Policy for Industry (EPA, 2017) All reasonable and feasible noise mitigation measures should be justified, documented and implemented on-site to mitigate noise impacts.

Incorporate standard daytime hours noise management safeguards into the CEMP:
• identify and consult with the potentially affected residents prior to the commencement:
  ○ describe the nature of works; the expected noise impacts; approved hours of work; duration, complaints handling and contact details.
  ○ determine need for, and appropriate timing of respite periods (e.g. times identified by the community that are less sensitive to noise such as mid-morning or mid-afternoon for works near residences)
• implement a complaints handling procedure for dealing with noise complaints
• plant or machinery will not be permitted to warm-up near residential dwellings before the nominated working hours.
• appropriate plant will be selected for each task, to minimise the noise impact (eg all stationary and mobile plant will be fitted with residential type silencers)
• engine brakes will not be used when entering or leaving the work site(s) or within work areas.
• regularly inspect and maintain equipment in good working order
• arrange work sites where possible to minimise noise (eg generators away from sensitive receivers, minimise use of vehicle reversing alarms, site amenities and/ or entrances away from noise sensitive receivers)
• use natural landforms/ mounds or site sheds as noise barriers
• schedule noisy activities around times of surrounding high background noise (local road traffic or when other noise sources are active).

If works **beyond standard daytime hours are needed**, the Delivery Contractor would:

Mitigation measures
• justify the need for out of hours work (OOHW) and why it is not possible to carry out the works during standard daytime hours • consider potential noise impacts and implement the relevant standard daytime hours safeguards; Sydney Water's Noise Management Code of Behaviour (SWEMS0056.01) and other reasonable and feasible management measures • identify community notification requirements • seek approval from the Sydney Water Project Manager in consultation with Sydney Water's Environment and communications representatives.

If night works are needed, the Delivery Contractor would:

- justify the need for night works
- consider potential noise impacts and implement the relevant standard daytime and out of hours safeguards and document consideration of all reasonable and feasible management measures
- identify community notification requirements (ie for scheduled night work (not emergency works),
- notify all potentially impacted residents and sensitive noise receivers not less than one week prior to commencing night work.
- seek approval from the Sydney Water Project Manager in consultation with the environment and communications representatives.

If works on Sundays or public holidays are required, the Delivery Contractor would:

- justify why all other times are not feasible
- consider potential noise impacts and, implement relevant standard daytime, out of hours and night-time safeguards and other reasonable and feasible management measures
- identify community notification requirements
- seek approval from the Sydney Water Project Manager in consultation with the environment and communications representatives.

Community engagement will begin before work starts, with notification to impacted residents and businesses within the zone of influence. Consider worst-case noise impact scenarios during night works and day works when identifying stakeholders to be notified.

This may also include face to face engagement and door knocks. Consultation will include number of night shifts per week and mitigation measures to be adopted (if night works are required).

Regular project updates will be sent to surrounding community and emailed to key stakeholders.

Continuous noise monitoring should be considered if complaints are received and/or when noisier works (e.g. excavator with hammer) are being performed.

Residents will be notified of night work at least seven days in advance of work starting. An Out of Hours Work Permit (OHWP) will be completed in advance of work starting

Mitigation measures
Community complaints will be managed by a Community Engagement Advisor assigned to the project and in accordance with Sydney Water's Customer Complaints Policy. All consultation with community and stakeholders will be recorded on Sydney Water's Consultation Manager database.
A daily register is to be incorporated as part of site diary entry and pre-start meetings to discuss and record potential community and environmental issues and impacts. Mitigation measures to be adopted will be discussed, based on planned construction activities, weather and site conditions. Mitigation measures will be put in place in advance to address potential issues.
Consider less noise and vibration intensive methodologies where practicable and use only the necessary sized and powered equipment.
Where agreed during consultation, attended monitoring is required to evaluate construction noise and where appropriate, vibration levels. Recordings will be measured to evaluate whether mitigation measures are adequate or require revision, and to address complaints.
Continuous monitoring should be considered if complaints are received.
Regular inspections should occur to ensure proactive management of any site issues. A Project Environmental Mentoring session will be held in advance of work starting to induct all site crew members on the requirements of the REF and CEMP.
Monitor compliance with the recommended vibration levels in DIN 4150-3 1999: Structural Vibration – Part 3; Effects of vibration on structures.
Community consultation should inform programming of construction and appropriate duration respite, if suitable.
Perform respite during the day when rock breaking (e.g. continuous blocks of up to 3 hours work, followed by at least 1 hour break).
If required, apply additional provisions (e.g. earplugs) for high impact noise affected residents identified during community engagement consultation.
Noise mitigation such as noise containment, blankets etc., will be used where practical. Noise barriers should be considered during noisy works at night.
Locate noisy equipment, such as generators, as far from sensitive receivers as practical.
Conduct a dilapidation survey/asset condition assessment prior to works which have potential to damage existing structures.

6.2.6 Air and energy

Existing environment

A search of the National Pollution Inventory identified no source of pollutant within or in proximity to the proposal. The nearest listed item is Viva Energy Albion Park Airport which is located around 3.1 km east at the Illawarra Regional Airport in Albion Park.

The air quality in the proposal site is typical of a semi-rural/rural residential area on the urban fringe. Local pollution sources include odours from agriculture, vehicle emissions, solid fuel heaters, bushfires, backyard burning and on-site wastewater systems.

The main sensitive receivers in the vicinity of the proposal are residents located on rural properties and Calderwood Christian School located within and adjacent to the project area respectively.

Potential impacts - Construction

During construction the proposal has the potential to impact on air quality by:

- dust during general construction and excavation
- emissions from machinery, equipment and vehicles used during construction.

During construction dust and exhaust gases (air emissions) have the potential to impact on air quality and amenity of nearby sensitive receivers and would be dependant upon atmospheric conditions. The proposal has the potential to generate dust from earthworks, stockpiles and the use of imported fill. Construction equipment and plant would emit exhaust fumes and would contribute to local air quality impacts. The construction of the pipelines and restoration of disturbed areas will be undertaken progressively. This will minimise potential air quality impacts and reduce the exposure of any one sensitive receiver to air emissions.

Construction of the proposal would generate greenhouse gas emissions from the combustion of fuels by:

- construction equipment
- delivery vehicles transporting materials to construction sites
- vehicles removing waste materials from construction sites
- staff vehicles.

Vegetation removal would release greenhouse gases and reduce the potential of the local environment to absorb greenhouse gases in the future. As the proposal requires minimal vegetation clearance, potential impacts are considered minimal.

These potential air quality impacts will be localised and short-term in nature, and unlikely to have a significant impact with the application of the environmental mitigation measures.

Potential impacts - Operation

Potential operational impacts on air quality would include odours from SP1193 and ventilation components such as air release valves and ventilation shafts. Offensive odours generally occur when the wastewater becomes anaerobic (lacking oxygen) due to poor ventilation or stagnant

conditions in the pipelines which may be caused by low or no flows. Designing the pipelines with adequate slope and ventilation would significantly reduce the risk of odour emissions. Air is vented from the pipelines by ventilation shafts and air release valves. The location of these components will be determined during detailed design and will consider future land use in the study area to minimise the potential for impacts on sensitive receivers.

The potential for odours is generally highest during the initial operational phase of a system when few customers have connected. The system operates more effectively as more customers connect and flows increase. As the study area becomes increasingly urbanised, it is likely that residences may be built in proximity to SP1193 and the ventilation components. However, the increased population would result in increased flows in the wastewater pipelines, and a decrease in the likelihood of anaerobic conditions developing in the pipeline that could lead to potentially offensive odours. SP1193 will be designed to minimise offensive odours and comply with EPL No. 211 for the Shellharbour Sewage Treatment System. Further, the risk of odours developing will be managed by chemical dosing.

Sydney Water will manage odour in accordance with the requirements of the POEO Act and Sydney Water's existing procedures. Sydney Water would register and investigate odour complaints. Sydney Water will implement engineering, operational or other odour reduction measures where verified complaints are received about odour releases from the wastewater system. Significant odour impacts from the proposal are considered unlikely.

The proposal will require energy to operate SP1193 and this would marginally increase Sydney Water's total energy use. The proposal will be operated in accordance with procedures relating to energy use that apply to Sydney Water's existing network.

Mitigation measures

Table 6-14 Environmental mitigation measures - air and energy

Mitigation measures
Use alternatives to fossil fuels where practical and cost-effective.
Design the mains with adequate slope and ventilation to reduce the risk of odour emission during operation.
Ensure odour control measures are available and ready to use during the works.
Maintain equipment in good working order, comply with the clean air regulations of *the Protection of the Environment Operations Act 1997*, have appropriate exhaust pollution controls, and meet Australian Standards for exhaust emissions.
Switch off vehicles/machinery when not in use.
Implement measures to prevent offsite dust impacts, for example: • Water exposed areas (using non-potable water source where possible such as water from excavation pits).

Mitigation measures
• Cover exposed areas with tarpaulins or geotextile fabric. • Modify or cease work in windy conditions. • Modify site layout (place stockpiles away from sensitive receivers). • Vegetate exposed areas using appropriate seeding
Cover all transported waste

6.2.7 Waste and hazardous materials

Existing environment

Our corporate objectives include to be a resource recovery business with an increasing portfolio of circular economy products and services. This includes reducing waste through recycling and re-use and encouraging our suppliers to minimise waste.

There are no known existing waste or hazardous materials within the construction corridor.

Potential impacts - Construction

The proposal has the potential to generate the following wastes:

- general construction waste such as excess concrete, redundant pieces of pipe/fittings,
- broken bricks, timber, paper, plastic and metal
- green waste from clearing vegetation including weeds
- domestic waste including food scraps, aluminium cans, glass bottles, plastic and paper containers, and putrescible waste generated by site construction personnel
- sewage waste and grey water from temporary amenities.
- spoil from trenching and other excavations that is not suitable for backfilling
- contaminated material such as asbestos, if it is encountered
- groundwater that needs to be dewatered from excavations
- wastewater and drilling fluid generated from trenchless construction and the compound sites.

The largest volume of waste generated by construction will be excess spoil from excavations. Wherever possible, suitable excavated spoil will be re-used on site for backfilling, landscaping and other uses. If spoil is unable to be re-used on site, opportunities for off-site re-use will be investigated. If re-use opportunities are unable to be identified, or the spoil is unsuitable for re-use due to its geotechnical or contamination characteristics (including asbestos), spoil will be tested and classified according to the Waste Classification Guidelines (NSW EPA, 2014) and disposed of at an appropriately licenced facility.

Significant volumes of liquid wastes, including oils or fuels are unlikely to be generated during construction. Cutting heads and drilling equipment used for boring will be lubricated using slurry formed from an environmentally benign substance such as bentonite. The slurry will be re-used in the drilling process, although small quantities of this liquid waste may be produced. Any waste drill cuttings and drilling fluid will be tested, classified, treated and disposed of appropriately.

General workforce waste including food packaging will be generated in minor quantities and will be classified as putrescible or non-putrescible general solid waste.

The proposal will intercept groundwater and it is likely that deeper excavations will need to be dewatered (refer to Section 6.2.2). Water that is extracted will be pumped, treated and disposed of in accordance with the POEO Act.

No hazardous wastes are expected to be generated. It is not expected that the proposal will involve managing hazardous waste or HBM. Should the works uncover asbestos or any other hazardous or contaminated material, it will be managed through an unexpected finds procedure.

Opportunities to reduce, recycle and reuse on this project would be sought with the Delivery Contractor and documented in the Waste Management Plan or CEMP.

Potential impacts - Construction

Operation of the proposal may generate minor volumes of waste during maintenance activities. Any wastewater discharged will be in accordance with Sydney Water's Discharge Protocols Standard Operating Procedure. Any operational wastes generated during maintenance will be managed and disposed of in accordance with Sydney Water's standard operating procedures and disposed of at an appropriately licensed waste disposal or recycling facility.

Table 6-15 Environmental mitigation measures - waste and hazardous materials

Mitigation measures
A Waste and Resource Recovery Plan (WRRP) must be prepared to appropriately manage and classify any materials including soils, construction/demolition wastes and associated stockpiles. The plan will be prepared by the Delivery Contractor (or nominated environmental consultant) and approved by the Sydney Water Project Manager in consultation with the Environmental Representative and Hazardous Materials and Contamination Services.
Manage waste in accordance with relevant legislation and maintain records to show compliance e.g., waste register, transport and disposal records. Record and submit SWEMS0015.27 Contractor Waste Report.
Provide adequate bins for general waste, hazardous waste and recyclable materials.
Minimise stockpile size and ensure delineation between different stockpiled materials.
Minimise the generation of waste, sort waste streams to maximise reuse/recycling in accordance with the *Waste Avoidance and Resource Recovery Act 2001*

Mitigation measures
Manage waste and excess spoil in accordance with the NSW EPA Resource Recovery Orders and Exemptions (if applicable) and / or Waste Classification Guidelines. Where materials are not suitable or cannot be reused onsite or offsite, recycle soils at a licensed soil recycling facility or dispose at an appropriately licenced landfill facility.
Prevent pollutants from escaping including covering skip bins.
Dispose excess vegetation (non-weed) that cannot be used for site stabilisation at an appropriate green waste disposal facility.
If fibro or other asbestos containing material is identified, restrict access and follow Sydney Water's Asbestos Management – Minor Works procedure, Document Number 746607 and SafeWork NSW requirements. Contact Sydney Water Project Manager (who will consult with Contamination and Hazardous Materials team).
An unexpected finds procedure to be implemented for any unexpected contamination or hazardous materials identified on site.
The Delivery Contractor should use the Sydney Water Material Stockpile and Material Receiver Dashboard and Register to identify potential opportunities for spoil reuse between projects. The Material Receiver Dashboard can also be used to identify suitable waste facilities for material that cannot be reused. It can be accessed via the SWDelivery Portal.

6.2.8 Traffic and access

Existing environment

Most of the proposal is on private land and will be accessed off Cattle Road, which is subject to minimal traffic and is used primarily for private property access. Access via the driveway of 258 Calderwood Road will be utilised as a secondary access. A section of about 25 m of rising main is located on Calderwood Road and Escarpment Drive. These roads are local roads and are managed by Shellharbour City Council.

Potential impacts - Construction

Existing access tracks that are within 1 Cattle Road and 258 Calderwood Road would be utilised. These access tracks will be upgraded and extended where required using imported rock and geofabric. The creek crossing of the northern access track requires upgrading and this is discussed in Section 6.2.2. No native vegetation removal is expected along the access tracks.

Private property access may be temporarily blocked throughout the works. Residents will be consulted and notified of any disruption.

The parking of vehicles will be limited to allocations established at the site of SP1193 and along the alignment. It is not anticipated that parking would impact on residential or community parking or access.

Calderwood Christian School has a dedicated driveway off Calderwood Road which will be unaffected by the works.

The proposal will require heavy vehicle movements during construction for the delivery of materials and plant. In addition, light vehicles will be required to transport staff and small items of equipment to and from the work sites. Floats for plants and equipment will also be required.

Community consultation has identified that during construction farm operations on several properties are expected to be ongoing. As such there is the potential for the works to impact these activities, including disrupting livestock access to paddocks and the river.

Trenching for the installation of the rising main would extend across Calderwood Road and along Escarpment Drive and would potentially require partial or full road closures. Calderwood Road provides the link from Calderwood towards Albion Park. These works will be scheduled during evening and nights to minimise impacts to traffic. Therefore, the anticipated impacts to a council road is not expected to be more than minor. The proposed works would not occur within 100 m of a TfNSW road, nor within 100 m of traffic signals. Therefore, a road occupancy issued by TfNSW would not be required.

Potential impacts - Operation

Once completed, most of the proposal will be situated below ground (except for SP1193 which will be fenced), and will not pose any above ground obstacles to livestock or ongoing farming activities should they continue up until broader development of the area begins.

During operation vehicle movements would be limited to those performing routine or emergency maintenance and impacts to traffic and access are not anticipated.

Mitigation measures

Table 6-16 Environmental mitigation measures - traffic and access

Mitigation measures
Prepare a Traffic Management Plan (TMP) in consultation with the relevant traffic authority.
Road closures require a S138 road opening permit/ application to be obtained from Shellharbour Council.
Prior to undertaking works within the road corridor notification to Council is required that includes scope of works, date and contact persons. All Council assets must be reinstated as per Council's Engineering code.
The location of temporary access roads outside the construction corridor (and as documented in this REF) would be confirmed by the Delivery Contractor and would be subject to additional environmental assessment that must be submitted to Sydney Water for approval. Property owners would be consulted regarding potential reductions in access to portions of their property and the location of access roads, and temporary access arrangements would be developed for the duration of the construction period.

Mitigation measures
Develop management measures to minimise traffic impacts near residential properties, schools and businesses by consulting with them (e.g. no major materials deliveries at school drop off or pick up times etc).
Manage sites to allow people to move safely past the works, including alternative pedestrian, bicycle, pram and wheelchair access.
Erect signs to inform road users of the proposed works and any temporary road closures.
Ensure work vehicles do not obstruct vehicular or pedestrian traffic, or private driveway, public facility or business access unless necessary and only if appropriate notification has been provided.
Where appropriate, ongoing consultation with occupants will be undertaken to coordinate any changes to fencing and gates and to minimises impacts to farm operations.
Where appropriate, and in consultation with occupants, waterway access will be maintained for livestock.

6.2.9 Social and visual

Existing environment

The proposal is in a rural residential environment and sits within an area designated for general residential and town centre development as part of the Calderwood precinct.

Due to its position to the east of the Illawarra Escarpment, the construction corridor and surrounding area is considered to have moderate to high scenic quality, particularly in areas that have views to the escarpment.

Development associated with the Calderwood precinct is ongoing and the characteristics of the area are likely to change over time from rural to urban as development progresses.

Potential impacts - Construction

The proposal could potentially impact on social amenity in a variety of ways, some of which have been assessed in other sections of this REF:

- Noise (refer to section 6.2.5)
- Air quality and dust (refer to section 6.2.6)
- Traffic and access (refer to section 6.2.8).

Construction is likely to result in minor direct and indirect impacts on amenity and views from residences. Construction is unlikely to have any significant long-term impacts on the local community. Local residents and other sensitive receivers may experience some minor and temporary disruptions to local road use and access to their properties. Adjacent receivers may be disturbed by activities that generate noise and dust. Visual impacts would be associated with the

presence of plant, machinery and construction compounds. Visual amenity will be affected by work sheds and equipment that will remain on-site during construction.

The construction of SP1193 will require a stationary construction site. Plant and equipment will be visible at these locations over a longer time period. Likewise, the construction compound will remain in use throughout the project. The compound will include ancillary facilities such as administration facilities, washrooms, meal rooms, and security fencing. The compound will be demobilised, and the areas rehabilitated once construction is complete. Some construction access roads may be re-used by future developers.

Visual and other amenity impacts at locations along the mains will occur for a shorter duration relative to SP1193 because construction will progress along the main alignments at about 5 to 13 metres per shift. Similarly, the construction of electrical transmission infrastructure is anticipated to be for shorter duration and will progress along Cattle Road. Areas disturbed by construction will be progressively rehabilitated to reduce visual impacts.

In general, while there will be some negative impacts on the community during construction, they will be short-term and minimised by implementing the mitigation measures detailed in this REF.

Potential impacts - Operation

Once operational, the proposal will have substantial social benefits, by enabling housing development in Calderwood precinct.

The wastewater mains will be below-ground. Above ground assets include:

- ventilation shafts, including one at SP1193
- ERS and stormwater overflow at Marshall Mount Creek
- some pumping station structures such as:
    - electrical switchroom
    - chemical dosing building and bund
    - electrical substation
    - bypass valves
    - various fittings and fixtures
    - hose, eye wash station and bollards.
- electricity transmission infrastructure.

The proposal will include the installation of ventilation shafts. The ventilation shafts will generally consist of a 300 mm diameter supported pipe, which would be about 8-20 m tall. The final location and height of these ventilation shafts will be confirmed during detailed design but will be in proximity to existing and future residential receivers. Currently views from nearby residents are unrestricted in all directions. Before future development starts, visual impacts of these ventilation shafts may have a moderate impact to nearby residents. Following development, the impact of these shafts will lessen and will be in keeping with residential and community areas. Ventilation shafts will be constructed from either matte stainless-steel material or glass fibre reinforced

plastics and would remain unpainted. Detailed design will consider reducing the scale of ventilation shafts where feasible.

Similarly, pylons installed for electricity transmission will constitute a new visual element to the surrounding environment. However, these will be in keeping with residential and community areas and any visual impact will lessen over time.

As outlined in section 6.2.2, elements of SP1193 will need to be located above the one in 100-year flood extent. This would be consistent with the Sewerage Pumping Station Code of Australia, Sydney Water edition (WSA04-2005-2.1) and reduces the potential for flood events to impact on operation of the proposal. This may increase the visual prominence of SP1193 for nearby and future receivers. A landscape plan will be developed for SP1193 to minimise the visual impacts.

Whilst the proposal will alter the visual characteristic of the area, as development of the area continues, it is anticipated that these above ground structures will become less prominent and so the visual impacts will reduce over time.

Mitigation measures

With the implementation of the mitigation measures below, impacts can be adequately managed and residual impacts are expected to be low/minor.

Table 6-17 Environmental mitigation measures - social and visual

Mitigation measures
Undertake works in accordance with Sydney Water Communications policies and requirements including: • notify impacted residents and businesses • erect signs to inform the public on nature of work • personnel treat community enquiries appropriately.
Work sites will be restored to pre-existing condition or better.
Minimise visual impacts (e.g. retain existing vegetation where possible).
Direct artificial light away from sensitive receivers where possible (i.e. residents, fauna or roadways).
Maintain work areas in a clean and tidy condition.
The scale of ventilation shafts, and their final locations, would be confirmed during detailed design and would consider visual impacts on receivers. Consultation with affected landowners would be undertaken, and if required, painting of ventilation shafts in a sympathetic colour would be considered.
Site restoration including roads, verges and vegetation is to be performed in consultation with private property owners and council.
Restoration of excavation within the road verge is to comply with council's standard restoration requirements.

Mitigation measures
Sydney Water would incorporate measures to minimise the visual impact of SP1193 and this would consider the future land use in the immediate vicinity of SP1193.
Develop a landscape plan for SP1193 that includes native flora to minimise visual impacts. Maintain any plantings for at least 18 months to help with successful establishment as per SWEMS0025.11 Guideline for managing native re-vegetation for construction projects.

6.2.10 Cumulative and future trends

Potential environmental impacts

The proposal is in an area that is subject to ongoing development which will continue until the completion of the Calderwood Precinct. Nearby developments currently in construction include:

- Calderwood Valley Development: Town Centre South – south of proposal, bounded by Calderwood Road and Excelsior Drive
- Stage 2C2 Education Precinct Calderwood Valley Development – south of Calderwood Christian School and Calderwood Road
- Sekisui House Calderwood – south-west of the proposal, south of Calderwood Road.

It is anticipated that current developments will be ongoing throughout the duration of the proposal. Further development is expected in the areas surrounding the proposal, though start dates for these areas is currently unknown, it is expected that the proposal will be completed before these are underway.

There is the potential for cumulative impacts associated with works within the development area, however cumulative impacts are likely to be negligible given the small scale of the proposal relative to the overall works and the proposed timeline of the broader precinct development. Construction within the precinct by the developer is not anticipated to begin until the proposal is complete.

A search of the major project's registers maintained by the Department of Planning and Environment for major projects in Shellharbour City Council and Wollongong City Council was undertaken. Currently only the Calderwood Mixed Use Development – Stage 1 (located in the southern portion of the Calderwood Precinct), and associated modifications are displayed within one kilometre of the proposal.

There may be other local development occurring in the area, but it is not anticipated that a cumulative impact would result. The Delivery Contractor will work with local developers to reduce impacts as required.

Climate change is causing increases in the severity and likelihood of climate hazards and impacts which include heat waves and droughts, bushfires, storms, flooding and sea level rise. Sydney Water has adopted a formal position to plan and invest prudently to ensure we can maintain service levels by managing our climate risk. Generally, an increase in climate hazards and impacts may limit access to assets, damage assets or increase pressure on services provided by Sydney Water. Those factors relevant to the proposal are summarised below:

- Heat waves and drought – heat waves are predicted to increase in frequency, intensity and duration. Heat waves increase pressure on water and energy supplies. When coupled with periods of drought, these conditions increase bushfire risk.
- Bushfire – Bushfire risk is likely to increase in risk in all locations in Australia. The average annual days with 'severe' fire danger ratings across NSW are predicted to increase by 2 by 2030, and 5 by 2070. An increase in bushfires may increase demand and pressures on water supply and poses risks to energy supplies.
- Flooding and extreme rainfall – The intensity of rainfall events will likely increase due to higher temperatures, which increases potential volume of water the atmosphere can hold. Rainfall is predicted to be more variable with longer periods between rainfall but with more intense rainfall events. Elements of the proposal are within flood prone land (see section 6.2.2). Extreme weather events may increase pressure on wastewater infrastructure due to infiltration.

The proposal has considered future trends and is unlikely to further exacerbate future trends as it is a comprises mostly of underground asset installed to support wastewater servicing in a growth area. The proposal will expand Sydney Water's network of wastewater infrastructure to ensure there is sufficient capacity to meet the demands of projected population growth.

Mitigation measures

With the implementation of the mitigation measures below, cumulative impacts can be adequately managed, and residual impacts are expected to be low. No impacts are anticipated during operation.

Table 6-18 Environmental mitigation measures - cumulative and future trends

Mitigation measures
Liaise with Calderwood precinct developer to reduce the construction impact due to concurrent work schedules, timing of work, access to site etc.

6.2.11 General Environmental Management

Mitigation measures
Prepare a CEMP addressing the requirements of this environmental assessment. The CEMP should identify licence, approval and notification requirements. Prior to the start of work, all project staff and contractors will be inducted in the CEMP. The CEMP must be readily available on site and include a site plan which shows: • go/ no go areas and boundaries of the work area (these are to include PAD areas outside of the AHIP area, coastal wetlands and the exclusion zone identified in Appendix C) • location of environmental controls (including erosion and sediment controls, any fences or other measures to protect vegetation or fauna, spill kits, stockpile areas)

Mitigation measures
• location and full extent of any vegetation disturbance.

Sydney Water's Project Manager (after consultation with the Project's environment and community representatives and affected landowners) can approve temporary ancillary construction facilities (such as compounds and access tracks), without additional environmental assessment or approval if the facilities meet the following principles:

- limit proximity to sensitive receivers
- no disruption to property access
- no impact to known items of non-Aboriginal and Aboriginal heritage
- outside high-risk areas for Aboriginal heritage
- use existing cleared areas and existing access tracks
- no impacts to remnant native vegetation or key habitat features
- no disturbance to waterways
- potential environmental impacts can be managed using the safeguards in this REF
- no disturbance of contaminated land or acid sulfate soils
- will be rehabilitated at the end of construction.

The Delivery Contractor must demonstrate in writing how the proposed ancillary facilities meet these principles. Any facilities that do not meet these principles will require additional environmental impact assessment.

The agreed location of these facilities must be shown on the CEMP site plan and appropriate environmental controls installed.

Prepare an Incident Management Plan (IMP) outlining actions and responsibilities during:

- predicted/ onset of heavy rain during works
- spills
- unexpected finds (eg. heritage and contamination)
- other potential incidents relevant to the scope of works

To ensure compliance with legislative requirements for incident notification (eg. *Protection of the Environment Operations Act 1997*), Sydney Water's employees and contractors will follow SWEMS0009 Responding to incidents with an environmental impact procedure.

All site personnel should be inducted into the IMP.

To ensure compliance with legislative requirements for incident management (eg Protection of the Environment Operations Act 1997), Sydney Water's employees and contractors will follow SWEMS0009. Attach SWEMS0009 to the CEMP.

Mitigation measures
Complaints to be managed in accordance with Sydney Water's Complaints Procedure and Community Engagement Plan.
Assign single person with accountability for coordinating communication and information flow across contractors and consultants and provide the contact details of this person in the CEMP.

7 Conclusion

Sydney Water has prepared this REF to assess the potential environmental impacts of the Calderwood 3A2 Wastewater Servicing project (the proposal). The proposal is required to provide necessary wastewater infrastructure to enable development in the Calderwood precinct.

During construction, the main potential environmental impacts of the proposal are typical construction impacts such as impacts to ecology, Aboriginal heritage, water quality, soil, and from traffic and noise. During operation, SP1193 and the wastewater mains will operate in compliance with the existing EPL and noise from SP1193 will comply with industry standards.

Given the nature, scale and extent of impacts and with the implementation of the mitigation measures outlined in this REF, the proposal is unlikely to have a significant impact on the environment. Therefore, an environmental impact statement is not required under Division 5.1 of the EP&A Act.

The proposal has been considered in accordance with the principles of ESD. The proposal will result in positive long-term environmental improvements. The proposal will not result in the degradation of the quality of the environment and will not pose a risk to the safety of the environment.

8 References

AECOM (2024) Aboriginal archaeological due diligence assessment for proposed wastewater infrastructure located at Calderwood, NSW

Department of Environment, Climate Change and Water (2010) Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW

Department of Planning, Housing and Infrastructure (2021) Illawarra Shoalhaven Regional Plan 2041

Environmental Protection Agency (2020) Draft Construction Noise Guideline

Landcom (2004) Managing Urban Stormwater: Soils and construction - Volume 1, 4th Edition

Shellharbour City Council (2022) Local Strategic Planning Statement 2022

Transport for NSW (2022) Construction and Maintenance noise estimator tool

WMA (2017) Macquarie Rivulet Flood Study

Wollongong City Council (2020) Local Strategic Planning Statement 2020

WSP (2024) SEEP/W dewatering modelling for Calderwood Package 3A2 Pumping Station SP1193

Appendices

Appendix A – Section 171 checklist

Section 171 checklist	REF finding
Any environmental impact on a community	The proposal will involve temporary disturbance in the form of noise, air quality, visual impacts, and occasional residential access disruptions. The affected residence and Calderwood Christian School would be notified of these disturbances prior to the start of works. The most adverse impacts would be temporary and limited to noise impacts on the nearby sensitive receivers during construction. Once operational minor impacts to residents and Calderwood Christian School through the establishment of new above ground infrastructure, including SP1193, and the provision of additional infrastructure such as security fencing and lighting will persist. Sydney Water will prepare a landscape plan for SP1193 to minimise the visual impacts. However, it is not anticipated that these impacts will cause significant disruption to the community. Further, the surrounding area will be subject to ongoing changes as the development plans for the Calderwood Precinct are realised, changing the area to a more urban character. There will be environmental improvements by providing a reliable wastewater service to the local community.
Any transformation of a locality	Facilities associated with SP1193 will increase the visual prominence of the site for current and future sensitive receivers. For example, ventilation shafts will be installed, which will have a minor impact on the locality. Opportunities to screen views through screening vegetation or landscape planting will be considered during detailed design and in consultation with affected landowners. All other elements of the proposal within the public realm will be located below ground.
Any environmental impact on the ecosystems of the locality	The proposal will not result in environmental impacts to ecosystems of the locality. Controls would be implemented to ensure construction of the proposal does not impact on the coastal wetland. There will be environmental improvements by ensuring a reliable wastewater service will collect and treat wastewater, minimising any impacts on the ecosystem.

Section 171 checklist	REF finding
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	The proposal will not result in a reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality.
Any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations	The proposal will not have any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations. Controls will be implemented to prevent any impacts to the Aboriginal heritage identified. In addition, controls would be implemented to protect coastal wetlands during construction.
Any impact on the habitat of any protected animals (within the meaning of the *Biodiversity Conservation Act 2016*)	The proposal will not have any impact on animal habitat.
Any endangering of any species of animal or plant or other form of life, whether living on land, in water or in the air	The proposal will not be endangering any species of animal, plant or other form of life, whether living on land, in water or in the air.
Any long-term effects on the environment	The proposal will not have any long-term impacts on the environment. It will have a long-term benefit by providing a reliable and modern wastewater service for the area.
Any degradation of the quality of the environment	The proposal will not cause the degradation of the quality of the environment.
Any risk to the safety of the environment	The proposal will not result in any risk to the safety of the environment. Specific controls, which include sediment and erosions controls, will be implemented to protect the waterways and coastal wetlands from indirect impacts during construction.
Any reduction in the range of beneficial uses of the environment	The proposed work will not have any reduction in the range of beneficial uses of the environment.
Any pollution of the environment	The proposal has been designed to comply with the requirements of EPL 211. Environmental mitigation measures will mitigate the potential for the proposed work to pollute the environment. No pollution of the environment is expected.

Section 171 checklist	REF finding
Any environmental problems associated with the disposal of waste	The disposal of wastes will be conducted in accordance with the environmental mitigation measures, and no environmental problems associated with the disposal of waste are expected.
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply	The proposed work will not increase demand on resources, that are, or are likely to become, in short supply.
Any cumulative environmental effect with other existing or likely future activities	The proposed work forms a critical part of the West Lake Illawarra Growth area, formerly known as the WDURA, strategic plan. It is understood that the Calderwood Precinct will be subject to ongoing development as part of these growth plans. However, it is not anticipated that broader development of the precinct will be concurrent with the proposed works. Therefore, cumulative environmental impact unlikely. The proposed works have been designed to comply with the requirements of EPL 211 and is unlikely to contribute to any cumulative environmental effects during operation. There will be environmental improvements by providing a reliable wastewater service to the local community
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions	The proposed work will not have any impact on coastal processes or hazards, and coastal processes and coastal hazards will not have any impact on the proposed activity.
Any applicable local strategic planning statements, regional strategic plans or district strategic plans made under the EP&A Act, Division 3.1	The proposed works are to service growth and the applicable strategic planning statements or plans have been considered in the system planning and options selection process.
Any other relevant environmental factors.	The proposed work has been assessed against the factors listed above, and there are no other relevant environmental factors to consider.

Appendix B – Consideration of TISEPP consultation

TISEPP section	Yes	No
Section 2.10, council related infrastructure or services – consultation with council		
Will the work:		
Potentially have a substantial impact on stormwater management services provided by council?		✓
Be likely to generate traffic that will strain the capacity of the road system in the LGA?		✓
Involve connection to, and have a substantial impact on, the capacity of a council owned sewerage system?		✓
Involve connection to, and use of a substantial volume of water from a council owned water supply system?		✓
Involve installation of a temporary structure on, or enclosing, a public space under council's control that will cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential?		✓
Involve excavation of the surface of, or a footpath adjacent to, a road for which the council is the roads authority that is not minor or inconsequential?		✓
Section 2.11, local heritage – consultation with council		
Is the work likely to affect the heritage significance of a local heritage item, or of a heritage conservation area (not also a State heritage item) more than a minor or inconsequential amount?		✓
Section 2.12, flood liable land – consultation with council		
Will the work be located on flood liable land (that is land that is susceptible to flooding by the probable maximum flood event) and will they alter flood patterns other than to a minor extent?		✓
Section 2.13, flood liable land – consultation with State Emergency Services		
Will the work be located on flood liable land (i.e.. land that is susceptible to flooding by the probable maximum flood event) and undertaken under a relevant provision*, but not the carrying out of minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance? * (e) Div.14 (Public admin buildings), (g) Div. 16 (Research/ monitoring stations), (i) Div. 20 (Stormwater systems)?		✓
Section 2.14, development with impacts on certain land within the coastal zone– council consultation		
Is the work on land mapped as coastal vulnerability area and inconsistent with a certified coastal management program?		✓
Section 2.15, consultation with public authorities other than councils		
Will the proposal be located on land adjacent to land reserved under the *National Parks and Wildlife Act 1974* or to land acquired under Part 11 of that Act*? If so, consult with DPIE (NPWS).*		✓
Will the proposal be located on land in Zone E1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone? *If so, consult with DPIE (NPWS)*		✓
Will the proposal comprise a fixed or floating structure in or over navigable waters? If so, consult *TfNSW*		✓
Will the proposal be located on land in a mine subsidence district within the meaning of the *Coal Mine Subsidence Compensation Act 2017*? *If so, consult with Subsidence Advisory NSW.*		✓
Will the proposal involve clearing of native vegetation on land that is not subject land (ie non-certified land)? *If so, notify DPIE at least 21 days prior to work commencing. (Requirement under s3.24 Chapter 3 Sydney Region Growth Centres - of the SEPP (Precincts – Central River City) 2021.*		✓

Appendix C – Flora and fauna assessment

Appendix D – Aboriginal Cultural Heritage Assessment Report

Aboriginal heritage information must not be made publicly available or be published in any form or by any means by Sydney Water or our contractors / joint ventures, unless where approval has been sought from DPC's AHIMS Registrar and provided in writing to Sydney Water.

For those REFs which are being publicly displayed, all Aboriginal heritage information which identifies individual sites must be removed.

Appendix E – Dewatering drawdown assessment for proposed SP1133

Appendix F – Construction noise and vibration assessment memo

Title:

Construction noise and vibration assessment memo, Calderwood 3A2 Wastewater Servicing

Prepared by:

Stuart Dawson

Environmental Scientist

Sydney Water

Date:

22 October 2024

Reviewed by:

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Senior Environmental Scientist

Sydney Water

Date

22 October 2024