MEMO

ARCADIS Design & Consultancy for natural and built assets

Date	21/08/2020
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Subject	Kings Hill Water and Wastewater Infrastructure (DA 16-2020-81-1) Compilation of Mitigation Measures

Introduction

This memorandum has been prepared to provide Port Stephens Council (Council) with a consolidated list of mitigation measures for the Kings Hill Water and Wastewater Infrastructure Proposal (DA 16-2020-81-1) (the Proposal).

The mitigation measures listed in Table 1 are consistent with those provided in Section 6 of the Response to Submissions (RtS) submitted to Council on 22 July 2020.

Although previously submitted to Council, mitigation measure 3G (in relation to microbats) has been amended to provide further clarity on the location to which the measure applies based on a discussion with Council on 19 August 2020.

It is envisaged that these mitigation measures will form the basis for the Conditions of Consent which would be provided for the Proposal, subject to approval.

Implementation staging

The 'implementation stage' column of Table 1 details the timing as to when the specific mitigation measures would be undertaken. For example, a CEMP may be prepared prior to construction, but would not be 'implemented' until the construction phase. For the purpose of this compilation of mitigation measures, the following definitions apply to the terms used in the implementation phase column:

- *Pre-construction phase* – initial stage of physical works for the Proposal, which are not included within the definition of construction
- *Construction phase* – either prior to, or during construction of all physical works for the Proposal
- *Operation phase* – either prior to, or during the operation of the Proposal.

Table 1 Mitigation measures

No.	Mitigation measure	Implementation stage
0.	**General environmental management**	
0A	Pre-construction requirements for the Proposal include: • Finalise the detailed design of the Proposal • Undertake intrusive geotechnical and groundwater investigation as part of detailed design • An Arborist Report is to be prepared by a suitable qualified arborist • Undertake Detailed Site Investigation (DSI) as required under *SEPP 55 – Remediation of Land* • Apply and obtain approval under s138 of the *Roads Act 1993* for construction works located on public road reserves • Apply and obtain approval for 'dredging and reclamation' as required under Clause 201 of the *Fisheries Management Act 1994* • Apply and obtain approval under s91 of the *Water Management Act 2000* for works that involve 'aquifer interference' • Apply and obtain 'controlled activity approval' as required under s91 of the *Water Management Act 2000* • Apply and obtain an Aboriginal Heritage Impact Permit (AHIP) under s90 of the *National Parks and Wildlife Act 1974*, if required • Apply and obtain s139 exemption for archaeological test excavation and/or s140 permit under the *Heritage Act 1977*, as required	Pre-construction
0B	Detailed design would be undertaken in accordance with HWC specifications and provided to HWC for comment.	Pre-construction
0C	A consistency review would be undertaken to ensure environmental impacts identified within the EIS are consistent with the detailed design.	Pre-construction
0D	A Construction Environmental Management Plan (CEMP) would be prepared to manage impacts on the environment during the construction phase. This would address management of the following: • Contamination and acid sulphate soils • Soil erosion, surface water and groundwater • Flora and fauna preservation and protection • Heritage (including unexpected finds during excavations)	Construction

No.	Mitigation measure	Implementation stage
	• Waste management • Air (odour and dust) emissions • Noise and vibration • Traffic and access • Bushfire management • Hazard and risk management • Community consultation.	
0E	The design and operation of the Proposal would be in accordance with the conditions in the current Raymond Terrace Waste Water Treatment Works (WWTW) Environmental Protection Licence (EPL) (No. 217). This EPL includes both the WWTW and the associated reticulation system that is owned and operated by HWC.	Operation
1.	**Soils and contamination**	
1A	Whilst there is a low risk of contamination, given that some potential onsite sources of contamination have been identified (i.e. potential fill, acid sulfate soils and presence of herbicides and pesticides), a protocol for managing contamination (if it is uncovered) is to be detailed within the CEMP.	Construction
1B	In order to confirm that contamination will not pose a risk to human health or the environment, the following measures should be undertaken: • A DSI of the site soils prior to any excavation works to confirm that risk to human health or the environmental is removed or minimised within the Proposal site. The DSI should be completed in accordance with the *NSW OEH (2011) Guidelines for Consultants Reporting on Contaminated Sites* and the *NEPC (2013)*; and/or • Having an experienced contaminated land professional present on the Proposal site throughout the excavation works to screen the soils and manage the stockpiling of excavated materials.	Construction
1C	All materials requiring removal from the Proposal site will need to be classified in accordance with the *NSW EPA (2014) Waste Classification Guidelines*. This material should only be transported from the Proposal site to an appropriately licensed landfill for disposal or to an appropriately licenced recycling facility which is licenced to receive this material, and waste disposal dockets kept for 'cradle to grave' waste tracking purposes.	Construction
1D	The Acid Sulfate Soil Management Plan (ASSMP) (prepared as part of this RtS) would be utilised (and updated as necessary) as part of the CEMP for any Classed 3 category soils to be excavated within the Proposal site.	Construction

No.	Mitigation measure	Implementation stage
2.	**Water and hydrology**	
2A	Detailed topographic survey would be undertaken during detail design to ensure any constructability issues and impacts on the existing drainage, catchment areas and topography are identified and minimised as far as practicable.	Pre-construction
2B	The proposed wastewater pumping station (WWPS) would require on-site detention to mitigate peak flows to existing conditions in accordance with the Port Stephens DCP requirements. Additional water quality treatment may also be required. This would be determined during detailed design based on the size and configuration of the aboveground footprint in accordance with Port Stephens Council requirements.	Pre-construction
2C	Staging and timing of works are particularly important when working in higher risk areas for impacts such as near concentrated flow paths (existing or temporary), watercourses and riparian corridors, spillways, the existing pit and pipe drainage network and areas below the flood planning level. Construction activities will be staged and timed (where possible) to limit the area and duration of disturbance, as well as avoid wet weather periods.	Construction
2D	Any concentrated sewer overflow from the pumping station would be controlled by being directed through the overflow relief structure to the second order stream (referred to as Kings Hill URA watercourse in the EIS) that lies east of the RDA site, which ultimately drains into Irrawang Swamp.	Construction
2E	The WWPS and overflow relief structure would be designed and constructed in accordance with HWC specifications and in consultation with HWC. Generally, the design would include: • Alarms to notify of potential risk of overflow • Additional storage capacity of the WWPS wet well (a minimum of 8 hours storage would be included) • Potential bunding of the area immediately downstream of the overflow relief structure to minimise impact to the wetland • Backup generators in case of power outages.	Construction
2F	Any concentrated stormwater discharge would be directed east. Stormwater outlets to the watercourse would be strategically positioned to minimise the potential for localised scouring due to point discharge with scour protection provided where required.	Construction
2G	A Soil and Water Management Plan (SWMP) and Erosion and Sediment Control Plan (ESCP), or equivalent, would be incorporated into the Construction Environmental Management Plan (CEMP) for the construction of the Proposal. The SWMP and ESCP would be developed in accordance with the principles and requirements of the 'Blue Book'. The ESCP will be progressively updated to reflect the changing nature of the Proposal site as construction activities progress. The following aspects would be addressed within the SWMP and ESCP: • Appropriate sediment and erosion controls to be implemented prior to soil disturbance	Construction

No.	Mitigation measure	Implementation stage
	• Demarcation of vegetation clearing boundaries, sensitive areas and vegetation within vicinity of the construction footprint that is to be retained prior to construction, clearing or stripping works commencing • Stormwater management to avoid flow overexposed soils • Location of stockpiles to be outside of localised depressions, overland flow paths, riparian corridors and areas below the flood planning level as far as practicable • Inspection of all erosion and sedimentation control works prior to and post rainfall events • Reinstatement of disturbed areas is to be undertaken as soon as practicable progressively throughout the phased works to minimise disturbed areas exposed to the forces of erosion at any one time • Wheel wash or rumble grid systems installed at exit points to minimise dirt on roads • Construction traffic restricted to delineated access tracks and maintained until construction complete • Pre-start checks, as well as maintenance in accordance with manufacturers requirements to be undertaken on equipment to minimise the potential for leaks and spills from vehicles • Storage of materials on-site to be minimised • Suitable waste receptacles to be provided and maintained • Storage of any fuels, oils, lubricants, chemicals and Dangerous Goods and similar products will be stored in accordance with appropriate standards with emergency spill kits maintained on-site. • Wet weather monitoring protocol including Grahamstown Dam water levels as well as predicted rainfall events • Site boundary controls will be implemented (e.g. sediment fencing, earth banks, mulch bunds, swales and table/diversion drains) around the perimeter of the site, as early in the construction process as possible • Temporary construction erosion and sediment control measures that would be implemented prior to construction of the Proposal include sediment fences, temporary sediment ponds, shaker grids and/or wash down areas at all vehicle access points, and sandbags (or similar) for protection of all existing stormwater infrastructure • In addition, the SWMP will include the protocol and specific mitigation measures related to the pipeline commissioning in accordance with HWC requirements • Inspection and monitoring of erosion and sediment control measures, pipeline performance, watercourses and downstream water quality will be undertaken regularly throughout the construction period and following large rainfall events.	
2H	The commissioning of the pipelines, ongoing inspection of the pipelines and management of the WWPS overflow relief would be in accordance with HWC standards.	Operation

No.	Mitigation measure	Implementation stage
2I	For a period of six (6) months following construction, regular monitoring will be undertaken for the Proposal site rehabilitation, pipeline performance, watercourses and downstream water quality. Any scour, vegetation or water quality issues that arise would be investigated and rectified.	Operation
3.	**Biodiversity**	
3A	Where fauna species are identified in vegetation to be cleared, animals would be removed and relocated to adjacent bushland prior to 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.	Pre-construction
3B	Pre-clearance surveys would be undertaken as follows: • Determine and mark exclusion zones (identified EECs and threatened species habitat) • Prior to commencement of clearing, a Fauna Ecologist is to conduct a pre-clearance survey (including spotlighting and stagwatching) of the hollow-bearing trees within the construction corridor to ascertain whether hollows are being used by hollow- dependent fauna such as possums, gliders, microbats and forest owls • Prior to commencement of tree removal works, ensure that suitable equipment is readily available for handling injured or young fauna, i.e. gloves, handling bag (e.g. pillow case), box. Fauna are only to be handled by an experience ecologist or wildlife handler • The pre-clearance survey is to also include a diurnal inspection of tree hollows to determine whether any are being utilized by native bees. Where hollows are found to be utilised by native bees, the hollow is to be relocated to a reserve at least 10 km from the proposed works site to prevent the species returning to the site • Immediately prior to tree-felling check the canopy of each tree to ensure no nests or roosting fauna are present • The pre-clearance survey is to also include a diurnal inspection of tree hollows to determine whether any are being utilized by native bees. Where hollows are found to be utilised by native bees, the hollow is to be relocated to a reserve at least 10 km from the proposed works site to prevent the species returning to the site • Immediately prior to tree-felling check the canopy of each tree to ensure no nests or roosting fauna are present • If roosting fauna are detected, the tree is to be left until the animal has relocated of its own accord (generally within 24 to 48 hours) • If a nest with dependent young is detected, contact Native Animal Trust Fund / Hunter Wildlife Rescue on 0418 628 483 to arrange for the nestlings to be taken into care • A nominated site staff member is to act as a Koala spotter to check the canopy of all trees requiring removal to ensure no Koalas are present. If a Koala is present, the following steps are to be undertaken:	Pre-construction

No.	Mitigation measure	Implementation stage
	– If a Koala is found within a tree that requires removal / lopping, notify the Project Ecologist / Environmental Management Representative and follow the following procedure: ▪ Observe the Koala to ascertain whether it is showing signs of Chlamydia i.e. wet bottom, red weepy eyes / conjunctivitis ▪ If Koala is showing signs of Chlamydia, contact Port Stephens Koala on 1800 775 625 or 1800 PS Koalas to arrange for the animal to be taken into care ▪ If Koala is not showing signs of Chlamydia, leave tree for 24 to 48 hrs to allow the animal to move on ▪ If the Koala has not moved on after 48 hrs, consult with the Project Ecologist / Environmental Management Representative for further advice • Locate nearby habitat suitable for the release of fauna that may be encountered during the pre-clearing process or habitat removal.	
3C	Prior to clearing, all hollow-bearing trees would be marked by an ecologist so that they are retained and avoided by contractors. Their location would be recorded using a GPS.	Pre-construction
3D	A two-stage clearing process for the removal of hollow-bearing trees would occur.	Pre-construction
3E	The pipeline trench would be microsited to avoid tree driplines. If tree driplines cannot be avoided, measures would be put in place in accordance with *AS4970-2009 Protection of trees on development sites*.	Pre-construction
3F	A pre-start-up check for sheltering native fauna of all infrastructure, plant and equipment and/or during relocation of stored construction materials would be undertaken.	Pre-construction
3G	A pre-construction check of the bridge and culverts (over Irrawang and Grahamstown Spillways) would be undertaken for the presence of microbats. In the event that microbats are identified, a stop works procedure would be implemented in the vicinity of the bridge or culvert, DPIE would be contacted and management and or avoidance measures would be determined and implemented.	Pre-construction and Construction
3H	Hollow-bearing tree removal and disturbance of the tree drip line of any hollow-bearing trees would be avoided.	Pre-construction and Construction
3I	Appropriate sediment and erosion controls would be installed prior to the commencement of earthworks and construction, around the impact area, to reduce run-off into adjoining vegetation and downstream to the Coastal Wetland.	Pre-construction and Construction
3J	Soil or mulch stockpiles would be located away from key stormwater flow paths to limit potential transport of these substances into waterways and Irrawang Swamp.	Pre-construction and Construction

No.	Mitigation measure	Implementation stage
3K	A Flora and Fauna Management Plan would be prepared and implemented as part of the CEMP. It will include, but not be limited to: • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • pre-clearing survey requirements • procedures for unexpected threatened species finds and fauna handling • procedures addressing relevant matters specified in the Policy and guidelines for fish habitat conservation and management (DPI Fisheries, 2013) • protocols to manage weeds and pathogens.	Construction
3L	Site inductions for construction staff will include a briefing on the potential presence of threatened species and their habitat adjacent to the Proposal site, their significance and locations and extents of no-go zones.	Construction
3M	Clearance of native vegetation would be minimised as far as is practicable.	Construction
3N	The limits of vegetation clearing would be marked on plans and on site with signed fencing so that clearing activities are constrained to approved areas only.	Construction
3O	Eucalypts in Newbury Park and Boomerang Park adjacent to the subject land would be protected during construction.	Construction
3P	If any pits/trenches are to remain open overnight adjacent to native vegetation, they would be securely covered, if possible. Alternatively, fauna ramps (logs or wooden planks) would be installed to provide an escape for trapped fauna.	Construction
3Q	Discharge of water into watercourses and overland flow paths that drain to Irrawang Swamp during commissioning of pipes would be avoided. HWC's *Procedure EP0112 – Dechlorination of discharge water* would be followed.	Construction
3R	Where possible, earthworks would be undertaken during dry weather conditions. Clearing of vegetation should be avoided during overland flow events.	Construction
3S	Works at the Kings Hill URA watercourse would be undertaken during periods of no flow so that fish passage is not blocked.	Construction
3T	Stabilisation of disturbed areas would be undertaken as soon as practicable after disturbance.	Construction

No.	Mitigation measure	Implementation stage
3U	Construction activities within 250 metres of the Grey-headed Flying-fox Camp as shown in Figure 7-8 (Section 7.3.3 of this EIS) would only occur between March and July.	Construction
3V	Reasonable and feasible noise mitigation measures would be implemented when any works occur within 250 metres of the Grey-headed Flying-fox Camp (between March and July) and would include the installation of temporary noise barriers where construction activities result in generating noise above average background levels (as outlined in Section 2.4 of the *Noise and Vibration Assessment* at Appendix N).	Construction
3W	The Grey-headed Flying-fox camp would be monitored at regular intervals (daily) by a suitably qualified ecologist during any construction activities occurring within 250 metres of the camp (between March and July) to detect any stress response signs. Noise monitoring would occur concurrently. If a stress response is detected, works would cease and mitigation measures would be reviewed/amended. Construction activities within 100 metres of the Grey-headed Flying-fox camp as shown in Figure 7-8 (Section 7.3.3 of this EIS) generating noise above average background levels (as outlined in Section 2.4 of the *Noise and Vibration Assessment at* Appendix N) would be limited to a maximum of 2.5 hours in any 12 hour period, preferably at sunrise or sunset or during the night.	Construction
3X	Equipment used for treating weed infestation would be cleaned prior to undertaking work in the Proposal site to minimise the likelihood of transferring any exotic plant material and soil.	Construction
3Y	Soil stripped and stockpiled from areas containing known weed infestations would be stored separately and is not to be moved to areas free of weeds.	Construction
3Z	Vehicles, equipment, materials and footwear are to be clean on entry (free of soil, mud and/or seeds) on entry to and exit from the proposal site to minimise the introduction or spread of weeds and / *Phytophthora cinnamomi*.	Construction
3AA	Restrict movement of vehicles and machinery to designated access roads and tracks, to prevent damage to vegetation outside the construction corridor and to minimise the risk of weed spread.	Construction
3AB	Priority weeds within areas disturbed are to be removed in accordance with the control measures prescribed in the weed profile for each species on the NSW WeedWise website (*https://weeds.dpi.nsw.gov.au/*).	Construction
3AC	Regular inspections of the areas disturbed are to be undertaken to identify and treat weeds.	Construction
3AD	Pre-start check of catch-points for weed seeds / propagules (such as trays, grills, tyres, etc.) on vehicles / machinery / equipment is to be undertaken each day and all weed material removed, placed in a sealed bag or container and disposed of at a waste management facility licenced to accept green waste.	Construction
3AF	Construction traffic (within the proposal site) would be kept to 40 kph or less speed limit to minimise impacts on Koalas.	Construction
3AG	Species selection for any revegetation works within the Proposal site would include species commensurate with the mapped Plant Community Type (PCT).	Operation

No.	Mitigation measure	Implementation stage
3AH	Regular maintenance checks are to occur along the pipelines to prevent leaks.	Operation
4.	**Aboriginal heritage**	
4A	A program of test excavation under the *Code of Practice* will be undertaken at AHIMS ID 38-4-2023 - KHW01 (if impacts cannot be avoided), AHIMS ID 38-4-2025 - KHW02 and Area A (adjacent to AHIMS ID 38-4-2025 - KHW02) prior to commencement of earthworks in these areas to determine if there are subsurface artefacts present and to determine their extent. Any newly identified sites will be submitted to AHIMS. Further discussion would be undertaken with Heritage NSW to confirm the most suitable approach to testing (for AHIMS ID 38-4-2025 - KHW02) prior to test excavations been undertaken.	Pre-construction
4B	If impact to any artefacts cannot be avoided, an Aboriginal Heritage Impact Permit (AHIP) will be sought from the heritage division of DPIE for surface salvage of artefacts and/or subsurface archaeological excavation. Any AHIP works will be undertaken in accordance with DPIE requirements.	Pre-construction
4C	A portion of AHIMS ID 38-4-2025 - KHW02 and Area A is in close proximity to a historic archaeological site. Due to the overlap, the methodology for archaeological test excavation will take into consideration the protection of relics under the *Heritage Act 1977* and the conditions of any s139 exemption and/or s140 permit issues for investigation and/or impact to historic archaeological remains. Non-Aboriginal relics cannot be impacted under an AHIP and historical archaeological investigations cannot impact Aboriginal Objects. Hence, historic heritage and AHIP approvals will need to be held concurrently to allow for the excavation of Aboriginal and non-Aboriginal contexts.	Pre-construction
4D	If works do not impact AHIMS ID 38-4-2023 - KHW01, site boundaries for the scatter and PAD will be delineated by temporary fencing or other visual markers. A heritage consultant is to be on site to determine where the fencing will be installed. Fencing will remain until completion of construction.	Pre-construction and Construction
4E	A heritage induction will be provided to all onsite personnel so that they are aware of their obligations under the *National Parks and Wildlife Act 1974* with respect to archaeological artefacts or human remains, including 'stop-work' conditions applicable in the event that any identified or suspected heritage artefacts or human remains are discovered at any time.	Construction
4F	In the event identified or suspected historical artefacts or human remains are detected at any time, all disturbance work should immediately cease within 20 metres of the find and temporary protective fencing erected around this 'no-go zone' pending further management advice from the heritage division of DPIE. If the find consists of or includes human remains, the NSW Police Department and NSW Coroner's office would be contacted.	Construction and Operation
5.	**Non-Aboriginal heritage**	
5A	A program of archaeological test excavation will be undertaken either prior to approval or at detailed design to identify if relics are present and if there is a possibility of avoiding them by refining the pipeline alignment. The archaeological test	Pre-construction

No.	Mitigation measure	Implementation stage
	excavation program will be conducted in accordance with a Section 139 (s139) exception issued by NSW Heritage (Department of Premier and Cabinet) under the *Heritage Act 1977*. The application for the s139 exception will be supported by the Statement of Heritage Impact (SoHI) and a standalone excavation methodology (Archaeological Research Design [ARD]). The excavation methodology will include detailed assessment of potential archaeological remains, archaeological potential mapping, and detailed significance assessment.	
5B	An updated heritage report will be prepared that provides a final assessment of impacts to significant archaeological remains that may result from installation of the pipeline. The updated heritage report will provide recommendations for further approvals and archaeological investigation that may be required.	Pre-construction
5C	Where there will be impacts to relics as a result of construction of the Proposal, a Section 140 (s140) permit issued by NSW Heritage under the *Heritage Act 1977* must be in place prior to commencement of works. Archaeological salvage excavation may also be required under the s140 permit prior to commencement of pipeline installation works	Pre-construction
5D	Any archaeological remains identified through background research and the s139 archaeological test excavation program in the immediate vicinity of the works area will be identified and mapped in the CEMP and physically cordoned off during works to prevent any inadvertent impacts.	Pre-construction and Construction
5E	A qualified arborist will prepare a report as part of detailed design, post approval and as relevant, to determine whether there will be impacts to the root zones of the heritage listed trees in Boomerang Park. Advised additional mitigation measures from this report are to be implemented as required.	Pre-construction and Construction
5F	Based on the results of the s139 archaeological testing, the final pipeline alignment may be refined to avoid as much impact as possible to significant archaeological remains. Depending on the results of the s139 archaeological testing a call-out procedure and/or archaeological monitoring may be required during construction works.	Pre-construction and Construction
5G	A heritage induction will be provided to all onsite personnel so that they are aware of their obligations under the *Heritage Act 1977*.	Construction
5H	A stop work procedure for unexpected heritage finds will be included in the CEMP for the Proposal to ensure the appropriate management of historic heritage finds. This involves the obligation to stop ground disturbing works in the area of the find, contacting the project heritage consultant, implementing management strategies as directed by the heritage consultant and/or heritage division of DPIE (formerly OEH) and recommencing works in that area only once clearance has been obtained from the heritage consultant and/or DPIE.	Construction
5I	Vibration impacts to heritage items must not exceed the recommended screening level of 7.5 millimetres per second. Vibration monitoring occurs during works in the vicinity of heritage items is recommended. Vibration monitoring and inspection by a structural engineer who is familiar with heritage structures should be undertaken (where required) if the predicted ground-borne vibration levels exceed the anticipated rating and/or cause impacts to significant fabric.	Construction

No.	Mitigation measure	Implementation stage
6.	**Waste management**	
6A	Measures to mitigate the effect of the construction waste streams would be incorporated into the Proposal's CEMP, including the following information: • Characterisation of construction waste streams • Procedures to manage construction waste streams, including handling, storage, classification, reuse and tracking • Mitigation measures for avoidance and minimisation (including reuse) of waste materials • Roles and responsibilities for ensuring compliance with the mitigation measures • Training, monitoring, reporting and reviewing requirements to ensure compliance with the mitigation measures.	Pre-construction and Construction
6B	The major sources of waste during operation would be limited to maintenance works. Where feasible and reasonable, waste would be managed, reused and recycled in accordance with the *Waste Avoidance and Resource Recovery Strategy 2014-2021*.	Operation
7.	**Air quality and odour**	
7A	Implementation of dust protection measures during construction activities, such as solid screens or barriers around dust generating activities. Other measures include covering or fencing stockpiles to prevent wind erosion.	Construction
7B	Construction vehicles would comply with relevant vehicle emission standards, where applicable. Speed limits would also be established and enforced.	Construction
7C	Vehicles entering and leaving the Proposal site are to be covered and secured to prevent escape of materials during transport.	Construction
7D	Reinstatement of areas impacted during the construction of the Proposal and rehabilitation works would be undertaken progressively during the construction phase, as soon as practicable.	Construction
7E	Dust suppression (water cart), and wheel wash/shakedown will be implemented during construction works. Details on these measures will be included in the CEMP.	Construction
7F	Air quality monitoring is not considered necessary for the Proposal. However, it may be undertaken to assure that the impacts are as predicted within the *Air Quality Assessment* at Appendix M.	Construction
7G	Mitigation and management measures identified for construction activities would be impended during operation and maintenance activities, where necessary and applicable.	Operation

No.	Mitigation measure	Implementation stage
7H	Maintenance activities would involve the use of cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques, such as water sprays or local extraction, e.g. suitable for local exhaust ventilation systems.	Operation
7I	Any potential operational impacts can be managed through good design and adherence to HWC standards, including the use of odour control units which can assist in ensuring that odour emissions are maintained at the minimum during routine operation and maintenance.	Operation
7J	Ongoing air quality/odour monitoring is not considered necessary. However, an air quality and odour complaints log should be kept, allowing identification of any issues which may arise and require rectification.	Operation
8.	**Noise and vibration**	
8A	Operational noise emissions from all potential sources in the context of the final position of the WWPS would be assessed at detailed design to ensure that compliance with the NPI criteria is achieved.	Pre-construction
8B	During construction works it is recommended that best practice management strategies, where feasible and reasonable, are applied to manage any potential noise impacts. A Construction Noise and Vibration Management Plan (CNVMP) will be developed as part of the CEMP. The CNVMP will contain the following measures: • Construction activities will be generally undertaken between the nominated construction hours, between 7:00am-6:00pm Monday to Friday, and 8:00am-1:00pm Saturday, with no work on Sundays or public holidays • If works must occur out of hours for justified reasons (e.g. worker safety or reduction of impact on traffic), preference would be given to day and/or evening time works (i.e. between 7 am and 10 pm). Noise intrusive works would be completed before 10 pm where feasible to do so. Additionally, a site specific out of hours assessment of impacts would be required in order to determine appropriate noise and vibration mitigation measures. Potential noise receivers would be notified within ten (10) days prior any construction activity in accordance with HWC requirements • Where practicable, particularly noisy construction works will be staged with consideration to the least sensitive time of day for the closest receivers, providing respite periods as necessary – particularly during works adjacent to surrounding receivers • Where practicable, equipment and work areas will be strategically positioned to reduce the noise emission to noise sensitive receivers. • Construction machinery will be well maintained and equipment not in use would be shut down • All plant would be properly maintained and low vibration alternatives for plant would be implemented where practicable. Plant that have high and low vibration operating settings should be run on the lowest effective vibration setting • Where vibration intensive works are required to be undertaken within the specified minimum working distances, vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied	Construction

No.	Mitigation measure	Implementation stage
	• Construction within the 250 metre radius of the Grey-headed Flying-fox camp should be limited to the months of March to July to minimise potential impacts on the camp. If this cannot be achieved, noise monitoring and acoustic barriers are recommended to mitigate construction noise impacts as outlined in the *Noise and Vibration Impact Assessment* at Appendix N of the EIS. • A noise and vibration complaints log should be kept, allowing identification of any issues which may arise and require rectification.	
8C	Operational noise from the WWPS would be managed through the use of the design requirements established within Section 5.6.13 of the *Hunter Water Corporation Water and Sewer Design Manual (Water Pumping Stations)*. The Proposal would implement HWC's acoustic control measures to ensure compliance with NPI criteria.	Operation
9.	**Traffic and transport**	
9A	A preliminary Construction Traffic Management Plan (CTMP) has been provided as part of the Transport Impact Assessment. This preliminary TMP provides a guide to be used for the final CTMP.	Construction
9B	The preparation of a final CTMP should be developed in relation to the requirements provided by the *Roads and Maritime Services Traffic Control at Work Sites Manual Technical Manual* (2018). Consultation is required with Council, NSW Police and nearby schools during development of the final CTMP, addressing concerns such as (but not limited to) access locations, Council owned assets, the surrounding environment, and other transport modes.	Construction
9C	Access along the road network through work sites will be provided for emergency service vehicles.	Construction
9D	Temporary circulation roadways to the compounds should be designed to accommodate the swept path of the largest design vehicle using the facility plus the specified clearances from the vehicle body to vertical obstructions and other vehicles. This should be in line with *AS2890.2 Off Street Commercial Vehicle Facilities*.	Construction
9E	Construction compound accesses would be designed with the assumption that the construction traffic heavy vehicles accessing the compounds would consist of Heavy Rigid Vehicles (HRVs). This would include the provision of a temporary access pavement and no lane lines or right-turn arrows marked on the minor road pavement for a basic right turn treatment. It should be noted that site constraints such as utilities should be taken into consideration during design stages which would ultimately inform the required access arrangements.	Construction
9F	Signage where required, should be displayed during both daytime and at night with the retroreflective material used for the signs meeting the necessary requirements. Advisory truck turning signage shall be installed at the compound area access locations where heavy vehicle turn movements would occur, including the use of any advisory variable message signs for slow-moving heavy vehicles.	Construction

No.	Mitigation measure	Implementation stage
9G	The final CTMP should also indicate how the impact to pedestrians would be managed to ensure safety. Construction traffic operators should be made aware of pedestrian movements within a detailed CTMP clearly indicating crossing locations, walkable desire lines and peak time of pedestrian movement.	Construction
9H	It is not expected that the frequency and service times of public bus services would be impacted by construction traffic. However, it is proposed that the wider community and public transport service providers and users be notified in advance of expected construction activities and durations.	Construction
9I	Parking on local residential street is to be avoided. To manage parking, the final CTMP would designate available parking locations to be used during construction activities.	Construction
9J	Traffic management measures be put in place for the duration of construction to manage delays at the Pacific Highway/Laydown Access Road intersection such as avoiding travel of staff during peak background traffic hours and should be detailed in a final CTMP prior to construction.	Construction
10.	**Bushfire**	
10A	Safe work procedures during construction would include means to limit smoking within bushfire risk areas to predetermined safer areas, appropriate signage, maintenance of plant and equipment, operator awareness program and bushfire policy for Hot Work operations and ignition prevention, or fuel reduction in Hot Work areas.	Construction
10B	A Hot Work Permit would be required if Hot Work is undertaken in the open within a hazardous area, or if a Total Fire Ban (TOBAN) is in force, regardless of whether the Hot Work is in a hazardous area or not. It would be prohibited to carry out any Hot Work activity in the open during a TOBAN, unless authorised under an exemption issued by Rural Fire Service (RFS).	Construction
10C	The contractor would include Safe Work Method Statement and Procedure Policies that address bushfire safety during construction (e.g. human activity and hot work).	Construction
10D	The aboveground components in the WWPS are to be constructed with the following material to withstand ember attack and radiant heat impact: • Aboveground pipes, vent shafts, and services and equipment enclosures would be made from non-combustible material • Any wiring would be installed in non-combustible conduit or enclosed metal services gantry trays • The electrical connection box and switch board enclosures would be ember proof. There should be no gaps greater than 2 millimetres into the internal side of the enclosures • Electrical transmission lines would be located underground and installed with short pole spacing (30 metres), unless crossing gullies, gorges or riparian areas	Construction

No.	Mitigation measure	Implementation stage
	• *BAL 29 Construction under AS3959 – 2009 or 2018* 'Construction of buildings in bushfire prone areas' may be used as a guide only.	
10E	Interim asset protection zones (APZs) would ensure defendable space is maintained until Kings Hill URA is fully developed. In this regard, APZs are recommended with a minimum of 12 metres to the north, west and south, and 29 meters to the east of the WWPS footprint (refer to Figure 7-33 in Section 7.10.3 of this EIS). These APZs would be located within R2 zoned land and outside any environmental conservation zones. APZs around the vent shafts pipes are unnecessary as the risk of ignition is considered low around those components.	Construction
10F	Access to the WWPS for fire vehicles would be provided in accordance with the specifications in the Bushfire Assessment Report, which include: ▪ A minimum carriageway width of 4 metres ▪ Passing bays every 200 metres that are 20 metres long by 2 metres wide, making a minimum trafficable width of 6 metres at the passing bay ▪ A minimum vertical clearance of 4 metres to any overhanging obstructions, including tree branches ▪ Access must provide loop around the WWPS compound or a suitable turning area ▪ Curves must have a minimum inner radius of 6 metres and are minimal in number to allow for rapid access and egress ▪ The minimum distance between inner and outer curves is 6 metres ▪ The crossfall is not more than 10 degrees ▪ Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads ▪ An RFS compatible lock is provided within any locked gate system.	Construction and Operation
10G	The contractor would include Safe Work Method Statement and Procedure Policies that address bushfire safety during operation and maintenance of plant and equipment.	Operation
10H	Management of the landscaped areas within the Proposal site would be undertaken to reduce bushfire risk.	Operation
11.	**Hazard and risk**	
11A	Hazards associated with the construction of the Proposal would be managed through the implementation of a CEMP. In addition, construction will be undertaken in accordance with the *Work Health and Safety (WHS) Act 2011*.	Construction

No.	Mitigation measure	Implementation stage
11B	During construction, fuels, glues, sealants and other hazardous goods would be stored on site, in accordance with relevant specifications to ensure these substances do not spill into the surrounding environment during refuelling activities, transport and delivery.	Construction
11C	The chlorine injection point will be designed and managed in accordance with *HWC Standard Technical Specification – Chemical Storage and Delivery Systems* (STS 670) and the relevant Australian Standards and legislation requirements (e.g. POEO Act).	Operation
12.	**Landscape and visual amenity**	
12A	Where feasible and reasonable, structures and materials in the construction compounds, such as stockpiles and machinery, would be sited to minimise temporary visual impacts occurring during construction works.	Construction
12B	The Proposal site would be kept in clean and orderly state to minimise any visual impacts that may arise during construction activities.	Construction
12C	Suitable material and finishes, including those which are non-reflective and blend with the surrounding landscape, would be selected for the aboveground components of the Proposal (i.e. WWPS and ventilation stacks). Materials and finishes of these components would be selected at detailed design to ensure low visual intrusion on surrounding areas.	Operation