North West Treatment Hub Aquatic Impact Assessment

Sydney Water

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Contents

List of Figures

List of Tables

1. Introduction

1.1. Project description

Sydney Water needs to upgrade the Castle Hill Water Recycling Plant (WRP), Rouse Hill WRP and Riverstone Wastewater Treatment Plant (WWTP) to accommodate growth and development in the Metro Northwest Growth Corridor (MNGC) and North West Growth Area (NWGA).

These proposed works are known collectively as the North West Treatment Hub (NWTH) project. Sydney Water also need to ensure that the NWTH project meets licence requirements under the Hawkesbury Nepean Nutrient Framework, and will comply with odour and water quality guidelines. The preferred option includes:

- Liquid stream upgrades at each treatment plant with temporary interconnection between sites to use available capacity to defer investment where possible.
- A centralised biosolids facility at Riverstone to maximise energy recovery and potential for co-treatment of imported food waste
- Sludge transfer system including a sludge pipeline from Castle Hill WRP to Rouse Hill WRP and then to Riverstone WWTP.

1.2. Scope of works

Eco Logical Australia (ELA) was engaged to assess the impact of the NWTH project on the aquatic ecology of Eastern Creek, Second Ponds Creek and Cattai Creek. This report provides an assessment of potential impacts from the NWTH to sensitive aquatic habitat, as well as any threatened aquatic species or communities present in the area. It includes:

- Results of the desktop assessment and field survey
- Map of each subject site showing the extent and type of key fish habitat where applicable
- Impact of the proposed works on aquatic habitats, including assessments of significance for aquatic species under the *Fisheries Management Act 1994* (FM Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) if required
- Discussion of the Environmental Protection Agency's Hawkesbury-Nepean nutrient licensing framework and the project's consistency with that framework
- Recommendations and mitigation measures to protect the immediate and surrounding aquatic and riparian environment from direct and indirect impacts
- Conclusion on the need for permit requirements or consultation with DPI Fisheries.

1.3. Legislative context

The aquatic ecology assessment aims to evaluate the impacts on aquatic biota and key freshwater fish habitat, and address potential impacts to any threatened or protected aquatic species listed under the FM Act, NSW *Biodiversity Conservation Act 2016* (BC Act) and the EPBC Act.

2. Methods

A desktop review considered the likelihood of occurrence for threatened species, populations and communities. Likelihood of occurrence is assessed based on records within 5 km of the site and within the broader catchment for migratory fish. Databases accessed include:

- EPBC Act Protected Matters Search Tool for aquatic species
- BC Act threatened species search tool (BioNet Atlas) for aquatic species
- DPI Fisheries Spatial Portal for protected and threatened aquatic species and populations, including species profiles, 'Primefact' publications and expected distribution maps
- Online Zoological Collections of Australian Museums (OZCAM).

Site visits were conducted by ELA staff Claire Wheeler on 27 May and 8 June 2021. The inspection involved walking the banks of the affected creeks and mapping aquatic habitat. At the time of survey, water was flowing steadily in all creeks.

3. Existing conditions

3.1. Eastern Creek

Eastern Creek is located to the west of the Riverstone WWTP and receives treated wastewater through a discharge point on the right bank of the creek (Figure 1).

The creek is described in Table 1and site photos are shown in Figure 2 to Figure 7.

Eastern Creek is mapped as key fish habitat on the Fisheries NSW Spatial Data Portal upstream and downstream of the discharge location.

Figure 1: Eastern Creek Aquatic Habitat

Table 1: Features of Eastern Creek downstream of wastewater treatment plant discharge

Reach	Hydrology	Physical form	Instream habitat	Streamside vegetation	Overall condition
Eastern Creek Downstream of WWTP discharge point	4th order stream. Predominantly cleared catchment used for agriculture. Continual flows. Evidence of very high previous flows, with flood debris evident in trees. No impoundments or significant barriers to flow, apart from a fallen tree across the creek.	Channel up to 10 m wide. Banks up to 2 m high, mostly 45° slope. Channel had low grade and low sinuosity, and was well defined through a predominantly grassed floodplain. Some bank erosion observed where stock have accessed the creek (Photo point 5) and where banks have been undercut and a large tree had fallen into the creek. Substrate likely silt and clay with relatively little vegetation stabilising the bank, meaning there is a high potential for erosion in areas where vegetation is absent.	Key fish habitat – *Type 1 highly sensitive* where native macrophytes are present and *Type 2 Moderately sensitive key fish habitat* due to continuous flows. Flowing at time of survey. 100% run habitat, no pools or riffles observed. Some large submerged woody debris, contributing to habitat. Channel suited to amphibians and small fish, though none observed. Unlikely to provide habitat to threatened species due to absence of complex habitat and connectivity to known populations. Limited native macrophytes, mainly in clumps alongside right bank. Water relatively turbid.	Poor riparian extent and continuity, typically dominated by the exotic species *Erythrina* sp. (Coral Tree). No evidence of native recruitment. Riparian structure notably absent of a native canopy, midstorey and groundcover: • 15% tree cover • 5% shrub cover • 80% exotic grass	Poor condition, stabilised bank only by exotic canopy trees.

Figure 2: Photo point 1 - Eastern Creek immediately downstream of WWTP discharge point, looking west

Figure 3: Photo point 2 - Sparse riparian vegetation along Eastern Creek, looking upstream

Figure 4: Photo point 3 - Riparian vegetation along the left bank of Eastern Creek

Figure 5: Photo point 4 - Wide channel with limited aquatic habitat, looking downstream

Figure 6: Photo point 5 - Bank of Eastern Creek eroded by cattle trampling

Figure 7: Photo point 6 - Section of macrophytes adjacent to right bank of Eastern Creek

3.2. Second Ponds Creek

Second Ponds Creek is located downstream of the Rouse Hill WRP. Currently, treated wastewater is discharged into a rock-lined channel that flows into Second Ponds Creek, downstream of the constructed wetlands to the west of the plant (Figure 8).

Second Ponds Creek is mapped as key fish habitat on the Fisheries NSW Spatial Data Portal upstream and downstream of the discharge location.

The creek is described in Table 2 and site photos are shown in Figure 9 to Figure 14.

Figure 8: Second Ponds Creek Aquatic Habitat

Table 2: Features of Second Ponds Creek downstream of discharge point

Reach	Hydrology	Physical form	Instream habitat	Streamside vegetation	Overall condition
Second Ponds Creek Downstream of WRP discharge point and constructed wetlands	3rd order stream. Predominantly developed catchment. Continual flows. Some evidence of high previous flows, with flood debris evident in trees. No impoundments or significant barriers to flow. Some instream woody debris providing habitat.	Channel typically 2-3 m wide Banks <1 m high, mostly <30° slope. Channel had low grade and low sinuosity, and was well defined through tree-lined riparian corridor. Small pockets of localised erosion and one area of substantial bank erosion. No obvious explanation for bank erosion. Substrate dominated by boulders and bedrock.	Key fish habitat – *Type 1 highly sensitive key fish habitat* due to native macrophytes and *Type 2 Moderately sensitive key fish habitat* due to lack of aquatic plants. Flowing at time of survey, typically <10 cm deep. 50% pool, 50% riffle/run sequence. Minor large woody debris contributing to habitat. Channel suited to amphibians and small fish although none were observed. Unlikely to provide habitat for threatened aquatic fauna. One large area of native submerged macrophytes (*Vallisneria australis*) near discharge point (Photo point 3). Otherwise very little instream vegetation. Water slightly turbid in pools with blue-grey tint, otherwise clear.	Good riparian extent and continuity, however vegetation was primarily exotic, dominated by *Ligustrum sinense* (Small-leaved Privet) Little evidence of natural recruitment of woody natives: • 70% tree cover • 5% shrub cover • 30% grass/ground cover.	Moderate condition, stabilised by bedrock in some areas.

Figure 9: Photo point 1 - Riffle section immediately upstream of discharge point

Figure 10: Photo point 2 - Weed of National Significance *Ludwigia peruviana* on edge of creek

Figure 11: Photo point 3 - Large well-established patch of *Vallisneria australis*. at the downstream extent of discharge channel

Figure 12: Photo point 4 - Long pool downstream of discharge point

Figure 13: Photo point 5 - Flows over bedrock outcrops were common

Figure 14: Photo point 6 - Deposition of sand in the channel became more evident downstream

3.3. Cattai Creek

Cattai Creek is located downstream of the Castle Hill WRP. Currently, treated wastewater is discharged into the main creek channel (Figure 15).

Cattai Creek is mapped as key fish habitat on the Fisheries NSW Spatial Data Portal upstream and downstream of the discharge location.

The creek is described in Table 3 and site photos are shown in Figure 16 to Figure 21.

Figure 15: Cattai Creek Aquatic Habitat. Note that the hydroline is slightly misaligned.

Table 3: Habitat features of Cattai Creek

Reach	Hydrology	Physical form	Instream habitat	Streamside vegetation	Overall condition
Cattai Creek Downstream of WRP discharge point	3rd order stream. Predominantly cleared or developed catchment Continual flows. Some evidence of high previous flows, with flood debris evident in trees. No impoundments or significant barriers to flow. Some instream woody debris providing habitat.	Channel typically 4-5 m wide. Banks <1 m high, mostly <30° slope. Channel had low grade and low sinuosity, and was well-defined at the base of a steep valley Small pockets of moderate bank erosion such as Photo point 3. Substrate dominated by gravel and bedrock.	Key fish habitat – *Type 1 highly sensitive key fish habitat* due to large instream woody debris and *Type 2 Moderately sensitive key fish habitat* due to lack of aquatic plants. Flowing at time of survey, typically <30 cm deep. 60% pool, 40% riffle/run sequence. Minor large woody debris contributing to habitat. Channel suited to amphibians and small fish. One Goldfish observed. Very little instream vegetation. Water slightly turbid in pools with blue-grey tint, otherwise clear.	Good riparian extent and continuity, vegetation was a mix of native and exotic species Some evidence of natural recruitment of woody natives: • 80% tree cover • 40% shrub cover • 40% grass/ground cover. Large amount of dumped rubbish in riparian area.	Good condition, stabilised by bedrock bed in some areas.

Figure 16: Photo point 1 - Discharge point into Cattai Creek

Figure 17: Photo point 2 - Long riffle-run sequence

Figure 18: Photo point 3 - Bank erosion was observed where there was no bank protection

Figure 19: Photo point 4 - Small pockets of accumulated sand were observed

Figure 20: Photo point 5 - Flood runner carved out on right bank

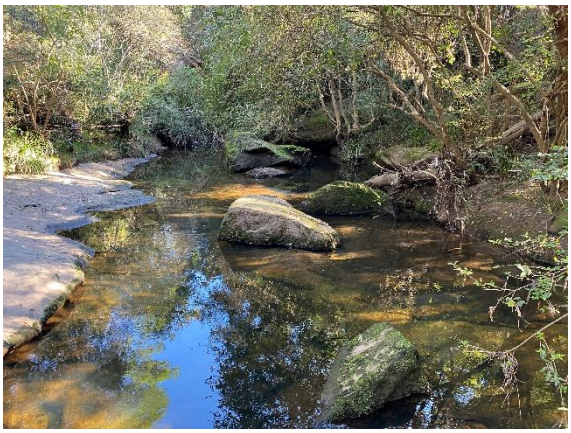

Figure 21: Photo point 6 - Shallow runs and pools

3.4. Aquatic vegetation at sites

The following species of macrophytes were observed growing in and adjacent to the watercourses during ELA's site visits.

Native

- *Persicaria decipiens* (Slender Knotweed) (EC, SPC)
- *Typha orientalis* (Typha) (SPC)
- *Vallisneria australis* (Ribbonweed) (SPC)

Exotic

- *Alternanthera philoxeroides* (Alligator Weed) (CC)
- *Ludwigia peruviana* (Peruvian Primrose) (EC)

Key: EC = Eastern Creek, SPC = Second Ponds Creek and CC = Cattai Creek

Additional data for Riverstone were provided by Sydney Water from surveys conducted in November 2020, May 2021 and October 2021. At these sites, the following macrophytes were present:

- *Alternanthera philoxeroides*
- *Egeria densa*
- *Einchhorn crassipes*
- *Juncus usitatus*
- *Lemna disperma*
- *Lemna minor*
- *Ludwigia peploides*
- *Phragmites australis*
- *Vallisneria* sp.

3.5. Aquatic fauna with potential to occur at the sites

The extensive range of aquatic and riparian habitat in the Hawkesbury-Nepean catchment supports a diverse assemblage of species, including over 50 species of finfish (NSW DPI 2006; Baumgartner and Reynoldson 2007). Nine of these species are introduced. Of the native species, seven are listed as threatened in NSW waters (FM Act), with five also listed federally (EPBC Act).

Important indigenous freshwater species in the Hawkesbury-Nepean catchment include *Macquarie australasica* (Macquarie Perch) and *Prototroctes maraena* (Australian Grayling), which generally use streams in forested catchments with intact riparian zones and undisturbed channel features. Their populations are affected by habitat degradation, competition, and predation from introduced fish. Three other threatened species also recorded from the Hawkesbury-Nepean catchment – *Bidyanus bidyanus* (Silver Perch), *Maccullochella peelii peelii* (Murray Cod) and *Maccullochella macquariensis* (Trout Cod) – are present as a result of stocking (NSW DPI 2006), mostly in reservoir lakes near the Illawarra Escarpment.

The region also supports an array of aquatic macroinvertebrates including insects, prawns, crayfish and freshwater mussels. The macroinvertebrate communities of the Hawkesbury-Nepean catchment are

moderately to significantly altered, predominantly due to the pressures associated with river regulation, water extraction and agricultural land use (Bishop et al. 2002). Both the threatened *Archaeophya adamsi* (Adams Emerald Dragonfly) and *Austrocordulia leonardi* (Sydney Hawk Dragonfly) have an expected distribution within the Hawkesbury-Nepean catchment, with records indicating their presence in forested catchments of the broader region. These rare dragonflies (with an aquatic life history stage) have been recorded on only a few occasions. Activities such as habitat degradation and water pollution significantly affect their populations (NSW DPI 2006) and neither species are unlikely to occur in the study reaches.

A search of the DPI Fisheries NSW Spatial Data Portal (Geocortex Viewer for HTML5 (nsw.gov.au)) indicates that there are no threatened aquatic species mapped for the project area, although it does not include dragonflies due to insufficient modelling data (Riches et al 2016). Likewise, no species listed as threatened under the EPBC Act occur in the area. Therefore, no further assessments for listed species are required.

The following non-threatened fish and mammals have the potential to occur in the project area. A summary of their required habitat and potential threats are provided below.

Australian Bass (*Macquaria novemaculeata)*

- Potential to occur at Eastern Creek, Second Ponds Creek and Cattai Creek
- Prefers pools with submerged woody debris, undercut banks and overhanging vegetation
- Threats include loss of aquatic and riparian vegetation as well as removal of instream woody debris
- Protection needs to maintain complex habitat features like instream woody debris.

Long-finned eel (*Anguilla reinhardtii*) and Short-finned eel (*Anguilla australis*)

- Likely to occur at all sites
- Spawning run likely triggered by water level rise
- Prefers habitats that have undercut banks, macrophytes and woody debris
- When migrating upstream, young eels remain close to the banks and avoid fast flowing water.

Freshwater mullet (***Trachystoma petardi*)**

- Potential to occur at Eastern Creek
- Feeds mostly on algae and other plant material as well as detritus and benthic macroinvertebrates.

Freshwater herring (*Potamalosa richmondia*)

- Potential to occur at Second Ponds Creek and Cattai Creek
- Prefers clear to turbid, moderately flowing streams
- Prefers diet of worms, small crustaceans and insects.

Gudgeon

- Potential to occur at Eastern Creek

- Includes carp gudgeon, cox's gudgeon, empire gudgeon, firetail gudgeon and flathead gudgeon
- Usually found around aquatic vegetation in slow-moving, often turbid creeks
- Spawning triggered by low flows and rises in water temperatures above 21°C.

Australian smelt (*Retropinna semoni*)

- Potential to occur at all sites
- Usually found in flowing water
- Aquatic vegetation is an important location for egg laying
- Prefers diet of insects, micro-crustaceans and algae.

Platypus (*Ornithorhynchus anatinus*)

- Potential to occur at Cattai Creek
- Feeds in slow-moving and riffle habitats, but prefer coarse substrates such as cobbles and gravel
- Uses rocky crevices and stream debris as shelters, or they burrow under the roots of vegetation near the stream.

Additional fish data for Riverstone were provided by Sydney Water from four surveys conducted between June 2019 and December 2021. At these sites, the following species were present:

- Striped gudgeon (*Gobiomorphus australis*)
- Cox's gudgeon (*Gobiomorphus coxii*)
- Empire gudgeon (*Hypseleotris compressa*)
- Gambusia (*Gambusia holbrooki*)
- Long-finned eel (*Anguilla reinhardtii*)
- Australian smelt (*Retropinna semoni*)

Macroinvertebrate communities were also sampled as part of Riverstone monitoring works (data supplied by Sydney Water). A total of 78 macroinvertebrate genera were collected (see Appendix A).

4. Impact Assessment and Mitigation

Hydrology and geomorphology impact assessments were conducted for Eastern Creek, Second Ponds Creek, and Cattai Creek by Aurecon (2022a, 2022b). Ecological impacts and mitigation measures are summarised in Table 4.

To reduce impacts during the construction phase of the project, sediment control structures such as sediment fences should be used around areas of exposed earth that are close to waterways. Adequate drainage can also be used to divert flow around works areas.

The upgrade of Riverstone WWTP will increase treatment capacity from 14.2 ML/d to 36 ML/d by 2036, which is expected to increase the average discharge rate substantially. Potential hydrological and geomorphological impacts from these increased flows were considered to be low to moderate, and where moderate will only be temporary. The increased flows potentially result in the following impacts to Eastern Creek:

- Localised increases in velocity in the channel centre
- Increased shear stress, increasing the frequency of erosive events and increasing the rate of downstream sediment migration. This would likely lead to widening and deepening of channel in some locations, including from the discharge location to the confluence with Wianamatta-South Creek. Localised areas of higher erosion will also occur.
- Fish passage time will potentially be reduced due to an increase in flow velocity, to a point where it may exceed the swimming speed of some species. This will occur mainly in the centre of the channel, but the edges will remain at acceptable velocities.

Average discharge rate at Rouse Hill WRP is expected to increase from 16 to 31 ML/day, resulting in a large change in flow at the discharge outlet into Second Ponds Creek. This is likely to increase bank erosion along the creek, and could dislodge macrophytes along the edges and bed of the creek. Erosion will increase turbidity in the creek, but sediments will likely be swept downstream. Scouring may also result in bank slump, changing bed and edge topography.

Scouring and erosion of the bed and banks can be reduced by armouring the channel with large boulders or similar solid structures. This will require the placement of material in the bed of the creeks, so that proposal would need concurrence from DPI Fisheries under s.199 of the FM Act.

The potential for high flows to obstruct the upstream movement of fish may constitute a barrier to fish passage under the FM Act. As a Public Authority, Sydney Water are required to give the Minister written notice of the proposed works under s.199 of the FM Act. As blockages will be only for short periods, and are reversable, the impact on fish passage will be minor.

Macrophytes are important components of aquatic ecosystems, providing habitat for invertebrates and fish. Placing large boulders or logs in the stream may create pockets of slow flow that can reduce localised scouring of macrophytes. However, if macrophytes are left to smother reaches of homogenous slow flow, they can grow to densities where they fill pools. This reduces the amount of available open water and can restrict flow. Scouring of macrophytes with varying flow can prevent densities increasing to problematic levels. It is unlikely that the level of scouring will be such that all macrophytes are

removed. Instead, only small sections of macrophytes will be lost, and will likely grow back in periods of low flow.

Modelling also indicates that fish passage is likely to be impeded by high flows in some parts of Second Ponds Creek. This occurs at flows exceeding the 50th, 75th, and 90th percentile flows. This is likely to be temporary, and fish passage will resume once flow returns below 50th percentile.

Only a minor increase in flow is expected at the Castle Hill WRP, with discharge to Cattai Creek going from 6.9 to 7.0 ML/day. Discharge patterns will change only slightly, and ranges will remain similar to current. This is not likely to have a significant impact on fish passage or other ecological processes.

Aurecon (2022b) also considered the hydrological and geomorphic impacts of the sludge pipeline linking Riverstone and Rouse Hill treatment plants. Most of the predicted impacts result from construction activities and subsequent sedimentation. Impacts may include:

- potential scouring of stream bed due to changed hydrology from disturbance to riparian corridor
- increased sediment loads due to improper dewatering works from direct drilling pits
- erosion risk from soils exposed during topsoil stripping and earthworks
- inappropriate riparian rehabilitation.

Once works are completed, the riparian zone should be rehabilitated to help stabilise the bank and reduce erosion. Native shrubs and trees should be planted using species endemic to the local area. Native grasses and herbs could be seeded or allowed to colonise naturally from the surrounding landscape. Boulders and logs could be placed along the stream edge to provide structure and to buffer against erosive flow.

Table 4: Potential ecological impacts and mitigation measures

Location of impact	Potential impact	Significance of impact		Mitigation measures	Residual impact	
		Likelihood	Magnitude		Likelihood	Magnitude
Eastern Creek	Flow velocity exceeds fish ability to swim upstream	Likely	Minor	Install boulders or logs along edges of fast reaches to give fish pockets of slower water.	Unlikely	Minor
	Increased turbidity from runoff of sediment-laden water from works area	Likely	Minor	Follow construction management plans. Install sediment control devices around exposed earthworks. Avoid large machinery in riparian corridor.	Unlikely	Minor
	Declining invertebrate and fish diversity due to changes in water quality from releases from WWTP	Possible	Minor	Ensure treatment process is effective in removing nutrients, salts, bacteria, and other contaminants. Comply with licencing requirements.	Unlikely	Minor
	Smothering of aquatic habitat by Increased rate of downstream sediment migration, or scouring of aquatic vegetation by widening and deepening of channel	Likely	Moderate	Provide structure (rocks, boulders, fountain) to reduce flow velocity from discharge source. Install bank stabilisation features, and bank and bed armouring.	Unlikely	Minor
Second Ponds Creek	Flow velocity exceeds fish ability to swim upstream	Likely	Minor	Install boulders or logs along fast reaches to give fish pockets of slower water.	Unlikely	Minor

Location of impact	Potential impact	Significance of impact		Mitigation measures	Residual impact	
		Likelihood	Magnitude		Likelihood	Magnitude
	Scouring of aquatic vegetation	Possible	Moderate	Allow instream vegetation to re-establish naturally and adapt to new flow patterns over time.	Unlikely	Minor
	Increased turbidity from bank erosion and run-in of sediment laden water from works area	Likely	Minor	Follow construction management plans. Install sediment control devices. Install bed and bank armouring.	Unlikely	Minor
Cattai Creek	Small increase in flow velocity by 0.1 ML/day	Unlikely	Minor	None needed	Unlikely	Minor
	Changes in water quality from releases from WRP	Unlikely	Minor	Ensure treatment process is effective in removing nutrients, salts, bacteria, and other contaminants. Comply with licencing requirements.	Unlikely	Minor
	Increased turbidity from run-in of sediment laden water from works area	Possible	Minor	Follow construction management plans. Install sediment control devices, and drainage to divert water around erosive locations.	Unlikely	Minor
Sludge pipeline	Disturbance to riparian corridor	Possible	Moderate	Riparian zone is already highly modified. Minimise surface works and direct drilling in the riparian zone, and avoid roots while passing beneath riparian zone. Appropriate rehabilitation of riparian zone.	Minor	Minor

Location of impact	Potential impact	Significance of impact		Mitigation measures	Residual impact	
		Likelihood	Magnitude		Likelihood	Magnitude
	Increased sediment load from dewatering of groundwater from drilling holes	Likely	Moderate	Follow dewatering management plan. Irrigate sediment-laden water over land rather than disposing in creek.	Minor	Minor
	Increase turbidity in stream from exposed sediments around drilling area and access tracks	Likely	Minor	Install sediment control barriers Divert runoff around exposed sediment. Rehabilitate tracks where possible	Minor	Minor
	Inappropriate riparian rehabilitation	Possible	Moderate	Rehabilitation should include structural features (logs, rocks) as well as vegetation. Native species local to the area should be planted. Provide barriers to vehicle access. Control weeds.	Minor	Minor

5. Conclusion

The proposed changes to Castle Hill Water WRP, Rouse Hill WRP and Riverstone WWTP are not likely to have an impact on threatened species, populations, or ecological communities as there are none known to occur in the project area or immediately downstream. The three main waterways impacted by the project are Eastern Creek, Second Ponds Creek and Cattai Creek.

The implementation of mitigation measures summarised in Table 4 will minimise potential impacts from the upgrade. Significant increases to flow are predicted for Eastern Creek and Second Ponds Creek, which could restrict fish passage and cause scouring of bed and bank. Under s.199 of the FM Act, Sydney Water are required to provide the Minister of Department of Primary Industries a written notice of the proposed impacts to fish passage from the project.

To reduce the extent of bed and bank scouring, we propose the installation of bed and bank armouring structures, such as large boulders, riprap, and logs. The installation of these devices would require a permit for dredging and reclamation under Part 7 of the FM Act.

The proposed increase in discharge at Cattai Creek is only 0.1 ML/d, so impacts to aquatic ecology in this creek would be minor.

6. References

Aurecon 2022a *North West Treatment Hub Review of Environmental Factors: Hydrology and Geomorphology Impact Assessment – Riverstone WWTP Upgrade*.

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Appendix A

Riverstone macroinvertebrate taxa collected autumn 2019 to spring 2021 (data provided by Sydney Water)

Order	Family	Genus
Acarina	Arrenuridae	*Arrenurus*
Acarina	Hydrodromidae	*Hydrodroma*
Acarina	Unionicolidae	*Recifella*
Amphipoda	Corophiidae	*Corophium*
Amphipoda	Talitridae	*Eorchestia*
Amphipoda	Talitridae	indeterminate genus
Arhynchobdellida	Erpobdellidae	*Vivabdella*
Coleoptera	Dytiscidae	indeterminate genus
Coleoptera	Dytiscidae	*Liodessus*
Coleoptera	Hydraenidae	*Gymnochthebius*
Coleoptera	Hydraenidae	*Hydraena*
Coleoptera	Hydraenidae	*Ochthebius*
Coleoptera	Hydrochidae	*Hydrochus*
Coleoptera	Hydrophilidae	*Enochrus*
Coleoptera	Hydrophilidae	*Helochares*
Coleoptera	Hydrophilidae	*Helochares*
Decapoda	Atyidae	*Paratya*
Decapoda	Penaeidae	*Metapenaeus*
Diptera	Chironomidae	*Chironomus*
Diptera	Chironomidae	*Cladotanytarsus*
Diptera	Chironomidae	*Cricotopus*
Diptera	Chironomidae	*Cryptochironomus*
Diptera	Chironomidae	*Dicrotendipes*
Diptera	Chironomidae	*Kiefferulus*
Diptera	Chironomidae	*Microtendipes*
Diptera	Chironomidae	*Nanocladius*
Diptera	Chironomidae	*Parachironomus*
Diptera	Chironomidae	*Paratanytarsus*
Diptera	Chironomidae	*Polypedilum*
Diptera	Chironomidae	*Procladius*
Diptera	Chironomidae	*Rheocricotopus*
Diptera	Chironomidae	*Rheotanytarsus*
Diptera	Chironomidae	*Riethia*

Order	Family	Genus
Diptera	Chironomidae	S.F. Chironominae
Diptera	Chironomidae	*Tanytarsus*
Diptera	Chironomidae	*Thienemanniella*
Diptera	Culicidae	*Anopheles*
Diptera	Simuliidae	*Simulium*
Diptera	Stratiomyidae	*Odontomyia*
Diptera	Tipulidae	indeterminate genus
Ephemeroptera	Baetidae	*Cloeon*
Hemiptera	Belostomatidae	*Diplonychus*
Hemiptera	Belostomatidae	*Diplonychus*
Hemiptera	Corixidae/Micronectidae	indeterminate genus
Hemiptera	Gerridae	*Tenagogerris*
Hemiptera	Micronectidae	*Micronecta*
Hemiptera	Naucoridae	*Naucoris*
Hemiptera	Notonectidae	*Enithares*
Hemiptera	Notonectidae	indeterminate genus
Hemiptera	Pleidae	*Paraplea*
Hemiptera	Veliidae	indeterminate genus
Hemiptera	Veliidae	*Microvelia*
Hemiptera	Veliidae	*Phoreticovelia*
Hygrophila	Lymnaeidae	*Lymnaea*
Hygrophila	Lymnaeidae	*Pseudosuccinea*
Hygrophila	Physidae	*Physella*
Hygrophila	Planorbidae	*Ferrissia*
Hygrophila	Planorbidae	*Helicorbis*
Hypsogastropoda	Tateidae	*Posticobia*
Isopoda	Sphaeromatidae	*Cymodetta*
Isopoda	Sphaeromatidae	*Ptyosphaera*
Isopoda	Sphaeromatidae	*Sphaeroma*
Odonata	Coenagrionidae	indeterminate genus
Odonata	Coenagrionidae	*Ischnura*
Odonata	Coenagrionidae	*Pseudagrion*
Odonata	Coenagrionidae	*Xanthagrion*
Odonata	Corduliidae	*Hemicordulia*
Odonata	Isostictidae	*Rhadinosticta*
Odonata	Libellulidae	*Diplacodes*

Order	Family	Genus
Odonata	Libellulidae	*Nannophlebia*
Odonata	Platycnemididae	*Nososticta*
Odonata	Zygoptera indeterminate	indeterminate genus
Oligochaeta	Lumbriculidae	*Lumbriculus*
Oligochaeta	Naididae	*Branchiura*
Rhyncobdellida	Glossiphoniidae	*Alboglossiphonia*
Rhyncobdellida	Glossiphoniidae	*Helobdella*
Trichoptera	Ecnomidae	*Ecnomus*
Trichoptera	Leptoceridae	*Triplectides*

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