Transgrid

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Appendix E Water Quality Monitoring Program

Snowy 2.0 Transmission Connection Project
(December 2021)

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1. Introduction

1.1 Background

TransGrid is the manager and operator of the major high-voltage electricity transmission network in New South Wales (NSW) and the Australian Capital Territory (ACT).

TransGrid is seeking approval under Part 5 Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction and operation of an overhead transmission connection and substation to enable the grid connection of the Snowy 2.0 pumped hydro generation project (Snowy 2.0).

The Snowy 2.0 Transmission Connection Project (the project) has been declared critical State Significant Infrastructure (SSI) under the State Environmental Planning Policy (State and Regional Development) 2011 and is subject to assessment and determination by the Minister for Planning.

This water quality monitoring program has been developed in support of the Environmental Impact Statement (EIS) for the project.

The mitigation measure presented in the Environmental Impact Statement (EIS) commits to a soil and water management plan (SWMP) to be prepared by the construction contractor and in consultation with agencies, including EPA. This document will detail proposed mitigation and management measures for construction water and include also include a surface water quality monitoring program.

The purpose of this document is to provide an overview of the proposed parameters and protocols for water quality monitoring to manage the impacts of the construction and operational phases on local surface water environments due to the amended project (referred to as the project in this document).

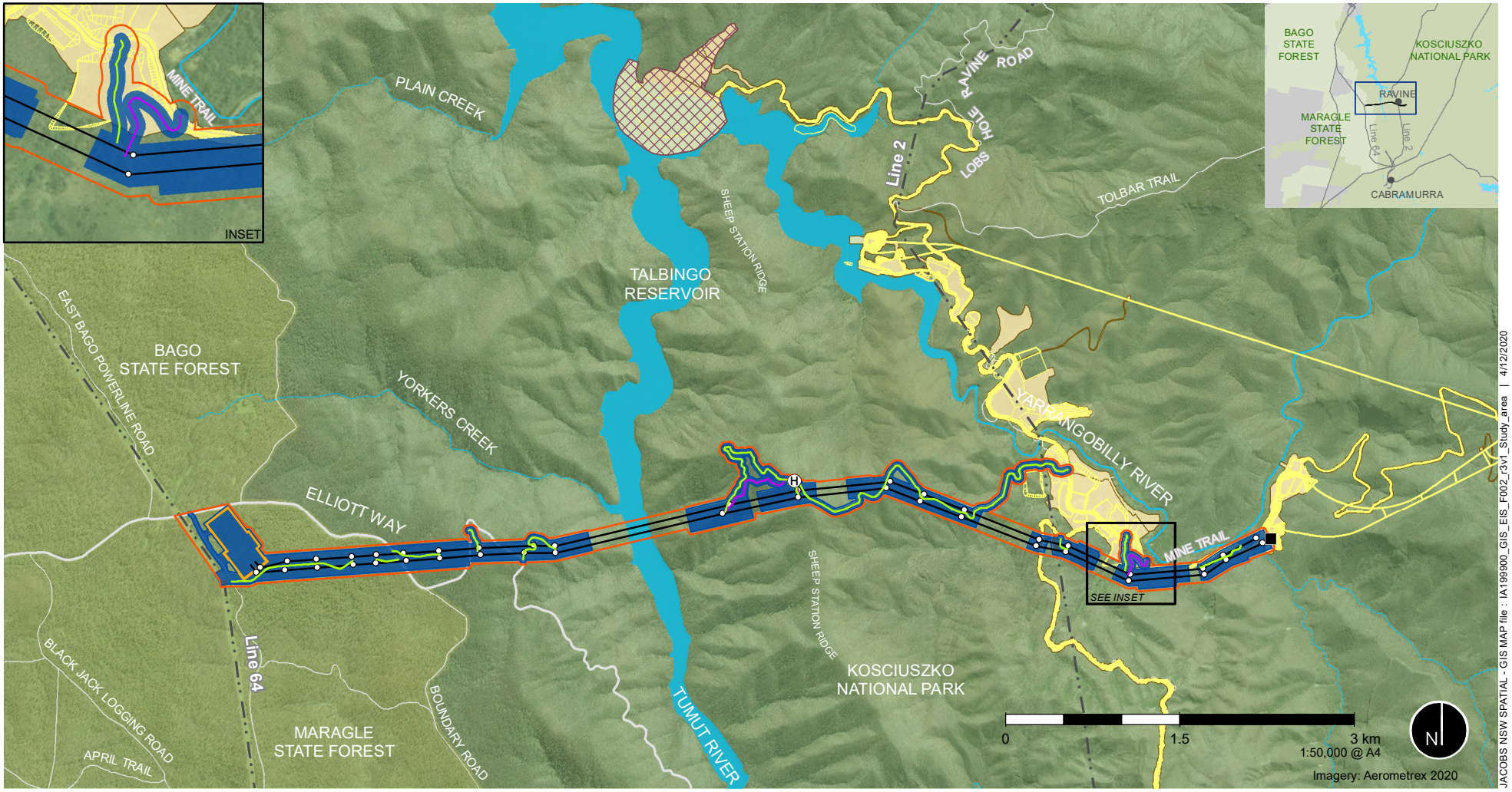
1.2 The project

The key elements of project are shown on Figure 1.1 and include:

- A new substation located within Bago State Forest and adjacent to TransGrid's existing Line 64, which forms a 330 kV connection between Upper Tumut and Lower Tumut switching stations. The substation would occupy a footprint of about 230 metres wide by 530 metres long, surrounded by an approximate 80 metre to 100 metre wide cleared APZ
- Upgrade and widening of an existing access road off Elliott Way to the substation including the construction of new driveways into the 330 kV and 500 kV switchyards
- Two new 330 kV overhead double-circuit transmission lines from the Snowy 2.0 cable yard to the new substation:
  - Total length of each line is approximately nine kilometres
  - Located in a transmission corridor ranging in width from approximately 120 metres to 150 metres
  - Each line would comprise approximately 21 steel lattice structures up to 75 metres in height
- Short overhead 330 kV transmission line connection (approximately 300 metres in length) comprising both steel lattice structures and pole structures as required between the substation and Line 64
- Construction of approximately 7.5 kilometres of new access tracks to the transmission structures, and upgrade to existing access tracks where required. The access tracks would remain following the completion of construction to service ongoing maintenance activities along the transmission lines
- Ancillary construction activities, including the establishment of tensioning and pulling sites for conductor and earth wire stringing, crane pads, site compounds and equipment laydown areas, and the transport and haulage of equipment and waste to and from the project area

- The accommodation of up to 20 construction workers at the Snowy 2.0 works accommodation at Lobs Hole with the remainder of the construction workforce being accommodated as required in the nearby townships of Tumbarumba, Talbingo, Tumut, Adaminaby, Providence Portal and Cooma.

The full project description is provided in Appendix A of the Snowy 2.0 Connection Project Amendment Report (TransGrid,2021).



- Project area
- Disturbance area
- Proposed 500kV substation
- Potential helipad location
- Proposed structure
- Proposed transmission line
- Proposed access track - Option A
- Proposed access track - Option B
- Snowy 2.0 cable yard
- Snowy 2.0 element
- Ravine Bay Emplacement Area
- Snowy 2.0 Disturbance footprint
- Electricity transmission line
- Waterway
- Water body
- State forest
- NPWS estate

Figure 1-1 | The project overview as displayed in the EIS

Data source:
Jacobs 2020, TransGrid, EMM 2020,
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1.3 Objectives

The key objectives of water quality monitoring of surface waters are to:

- Protect downstream aquatic ecosystem
- Maintain visual amenity
- Maintain downstream water quality for primary and secondary contact recreation, water supply and consumption of aquatic foods (cooked).

The implementation of water quality monitoring will assist in ensuring that both the construction and operation of the project will minimise potential negative impacts on sensitive receiving environments.

2. Existing water quality

Surface water monitoring has been carried out at several monitoring sites on waterways within the project area as part of the Snowy 2.0 Main Works and Exploratory Works This monitoring commenced in February 2018 and included the Talbingo Reservoir and waterways to the east. Waterways in the western part of the project area such as New Zealand Gully and Yorkers Creek and have not been previously monitored. Water quality data where available is discussed below to provide an understanding of existing water quality. It should be noted that the significant bushfires that occurred in January 2020 may have impacted on existing water quality and therefore discussion is separated into existing water quality pre bushfires and post bushfires. Monitoring data provided by Snowy 2.0 Main Works included data collected between February 2018 and July 2020.

2.1.1 Yarrangobilly River

The Yarrangobilly River is monitored at a number of sites as part of Snowy 2.0, including a number of environmental protection licence (EPL) monitoring sites (EPL5, EPL8, EPL9, EPL12, EPL14, EPL15, EPL16 and EPL19). The sites are located at various points along the river, with data from approximately one kilometre upstream of the project area to the Yarrangobilly River arm of Talbingo Reservoir. The water quality of the Yarrangobilly River prior to January 2020 was generally good with low turbidity, acceptable electrical conductivity, low nutrients and very low, to no detection of most metals (total and dissolved). Median pH and dissolved oxygen was within the recommended Australian and New Zealand guidelines (ANZG) (2018) for upland rivers at most sites although some sites did have median pH that were slightly above the upper limit of 8 and dissolved oxygen that was below the lower limit of 90 percent (%) saturation. Nutrient concentrations were low and below the recommended ANZG (2018) guideline limits for upland rivers. Median dissolved aluminum and chromium was slightly elevated at some sites and above the recommended ANZG (2018) limits for 99% species protection.

Water quality monitoring post January 2020 was generally similar with the exception of turbidity which was notably higher at all sites with median levels exceeding the upper limit of 25NTU at most sites. Median pH was slightly lower but compliant with the recommended guideline limits and dissolved oxygen also compiled with the recommended limits at all but one site. Median nutrient concentrations in Yarrangobilly River were notably higher post bushfires, with oxidised nitrogen, and both reactive and total phosphorus exceeding the recommend ANZG (2018) limits for protection of upland river aquatic ecosystems. Metal concentrations were similar to before the bushfires with the exception of arsenic (total and dissolved) which was recorded in higher concentrations and exceeded the recommend limits for 99% species protection at most sites.

Monitoring of some of the unnamed tributaries of Yarrangobilly River was also undertaken (EPL13, EPL22, EPL23, EPL24). These tributaries showed similar trends in water quality, with low turbidity, neutral pH and low nutrients prior to the bushfires. Dissolved oxygen levels however generally fell below the lower limit of 90% saturation. Metals were recorded in low concentration or not detected with the exception of aluminum and chromium which was slightly elevated and above the recommended ANZG (2018) limits for 99% species protection. Monitoring that has occurred post bushfires shows an increase in turbidity levels and elevated nutrient concentrations, which exceeded the recommended limits at a number of sites. Similarly, to Yarrangobilly River, metal concentrations were similar post bushfire, however arsenic concentrations also increased marginally but complied with the ANZG (2018) at all but one site.

2.1.2 Wallaces Creek

Wallaces Creek has been monitored at two locations (EPL6 and EPL7), upstream of the confluence with Yarrangobilly River. Monitoring has been undertaken as part of Snowy 2.0 Main Works and Exploratory Works. Prior to the bushfires, the water quality of Wallace Creek was generally good, with low turbidity, neutral pH and low nutrients. Dissolved oxygen was generally compliant although levels did at times fall below the lower limit of 90 % saturation. Total and filtered metal concentrations were below the 99% species protection limit for most indicators, with the exception of total aluminium, and total and filtered chromium which exceeded the recommended guideline limits. Monitoring following the bushfires, shows a deterioration in water quality with nutrients recorded in notably higher concentrations, which exceed the respective ANZG (2018) guideline values.

Turbidity was also elevated compared to pre bushfire conditions, however still remained below the upper limit of 25NTU. Metal concentrations increased with total and filtered aluminum and arsenic generally 3-4 times and 10 times pre bushfire concentrations respectively and above the ANZG (2018) 99% species protection limit. Chromium concentrations were similar to pre-bushfires but still exceeded the ANZG (2018) guideline. Total iron concentrations increased by more than seven times, and median concentrations post bushfires exceeded the recommended limit of 300µg/L.

2.1.3 Lick Hole Gully

Lick Hole Gully has been monitored at two locations (EPL17 and EPL18), upstream of the confluence with Yarrangobilly River and Mine Trail Road. The water quality of Lick Hole Gully prior to the bushfires was generally good although median electrical conductivity exceeded the upper limit of 350µS/cm for upland rivers and median dissolved oxygen fell below the lower limit of 90 % saturation. Nutrients were low and compliant with the recommend guideline limits as were most metals (total and filtered). Similar to other waterways, median concentrations of total aluminum and total and filtered chromium were recorded above the recommended limits for 99% species protection. Median filtered zinc and copper were also recorded in elevated concentrations at one site. Monitoring since the bushfires has shown an increase in nutrient concentrations and turbidity. With the exception of filtered aluminium, there has been little change in the concentrations of metals. Filtered aluminium increased at EPL18 to exceed the recommend limits.

2.1.4 Talbingo Reservoir

Talbingo Reservoir has been monitored within the Yarrangobilly River Arm at two locations EPL10 and EPL11 with EPL10 being upstream of EPL11. The water quality of the reservoir is reflective of the catchment streams and the Yarrangobilly River itself that discharge into the reservoir which pre bushfires could be considered good with low turbidity, neutral pH, acceptable dissolved oxygen levels, low nutrients, and low metal concentrations which were not detected or below the recommended limit for 95% species protection with the exception of total aluminum which marginally exceeded the limit at EPL10. Following the bushfires, nutrient concentration have increased to exceed the recommended ANZG (2018) guidelines for reservoirs, particularly at EPL10, although concentrations are notably lower than the catchment streams. Total aluminium concentrations increased post bushfire to exceed the recommended limit, but filtered aluminium remained similar. Median total arsenic concentrations generally tripled in the reservoir post bushfires but remained below the recommend limits for 95% species protection.

2.1.5 Tumut River

The Tumut River was monitored pre bushfires at its downstream end where it flows into Talbingo Reservoir (TalS_SW_001) during both the Snowy Hydro 2.0 Exploratory Works and Main Works EIS investigations. Tumut River exhibited similar water quality to the Yarrangobilly River with low turbidity, neutral pH and slightly lower than recommended dissolved oxygen concentrations. Nutrient concentrations were also low, complying with the limit recommend for protection of environmental values. Metal concentrations were generally lower in the Tumut River, with only silver and zinc recorded in concentrations greater than the recommended limit for 99 per cent species protection.

3. Proposed water quality controls

There is potential for impacts to the water quality of local waterways during the initial phase of construction when the greatest area of disturbance would occur due to surface construction activities. Suitable erosion and sediment controls would be implemented during construction to minimise the risk. These water quality controls would be developed and finalised during detailed design in a SWMP.

The erosion and sediment control measures to be impacted during the construction stage of the project would be based on five principles:

- Controlling the occurrence of erosion
- Controlling the movement of sediment
- Diverting offsite "clean" water away from construction areas
- Diverting onsite "dirty' water towards a sediment basin
- Capturing sediments that are transported through diversion drains in basins.

To achieve these principles, the following measures are being considered and will be further refined and detailed in a SWMP:

- Design and inclusion of best erosion and sedimentation management techniques specific to the project and its location. These would be developed in consultation with the EPA and to their satisfaction during the preparation of the SWMP
- Mechanisms to modify erosion and sedimentation controls with consideration to the sections of steep terrain within the amended project area and minimise vegetation clearing in these area.as far as practicable
- implement enhanced controls to reduce the risk of erosion wherever possible. These would include but limited to:
    - Staging construction activities to minimise land disturbance at any one time
    - Designing temporary drainage and sediment control measures to have non-erosive hydraulic capacity
    - Applying enhanced erosion controls where significant risks are identified
    - Directing runoff and seepage from stockpile or disturbed areas to sediment basins designed in accordance with the Blue Book
    - Consideration and application of appropriate practical temporary stabilisation methods
    - Retaining vegetation within flow lines for as long as possible
    - Retaining groundcover on soils to minimise the potential loss of sediment
    - Treating topsoils with a high level of care to enable reuse in the rehabilitation phases
    - Using surface covers and binders to limit soil loss
    - Installing clean water diversions early
    - Ensuring prompt stabilisation and rehabilitation of the site
    - Using sediment sumps at critical locations on the disturbed site in addition to the end of line sediment basins
    - Using sediment fences along the contour lines at reduced spacing, with an 80 metre spacing in flat areas and down to 10 metres or 20 metres spacing in steeper areas depending on the length of the sloping area
    - Using straw bales (weed and seed free) in conjunction with the sediment fences to reinforce the capture of sediments on site

- Consideration of alternative controls on steeper slopes may also be considered including:
  - the use of berms or swale drains placed across the access road or transmission corridor to divert water to vegetation or spoon drains
  - Check dams that could be installed along the length of the drainage lines to reduce velocity, decrease the potential for scour or erosion, and to increase the retention of sediments
  - The use of deeper sediment traps could be installed as required.

Should there be a possibility of sediment laden runoff after all reasonable and practicable measures have been investigated and implemented to avoid the discharge of such water, the use of super fine gypsum (naturally occurring) flocculation to improve the settlement of dispersible soil particles in the sediment basins will be considered. Application of gypsum will be in accordance with relevant guidelines and the pH and electrical conductivity will be monitored to ensure compliance with the ANZG (2018) prior to discharge to minimise any impact to aquatic organisms.

The SWMP would also consider the reuse of any water collected within sediment controls to avoid or minimise discharge to the receiving environment. Reuse options could include using the water (after primary treatment, i.e. settlement) during construction for dust suppression and rehabilitation irrigation. Consideration into reuse of water for not related to the project such as other irrigation uses will also be considered.

Any storm water runoff or water captured from the project is not expected to contain pollutants other than 'clean' sediment at non-trivial levels (e.g., oils and grease, metals), as such no additional treatment measures would be required.

The specifications and locations of these control and measures would be determined by the construction contractor before construction commences.

3.1 Performance criteria

The waterbodies potentially impacted by the project are within the Murrumbidgee River and Lake George Catchment. The streams in the project area west are in the Bago State Forest and classified as National Parks, Nature Reserves and State Forest and streams in the project area east are classified as streams affected by the snowy scheme. The approach for assigning Water Quality Objectives (WQO) for watercourse is based on the NSW Water Quality and River Flow Objectives (DECCW 2006).

The water quality objectives are consistent with the agreed national framework for assessing water quality set out in the ANZG (2018) Guidelines. These guidelines provide an agreed framework to assess water quality in terms of whether the water is suitable for a range of environmental values (including human uses). The WQO provide environmental values for NSW waters and the ANZG (2018) Guidelines provide the technical guidance to assess the water quality needed to protect those values (DECCW 2006). It is proposed to adopt the default WQO as opposed to developing site specific trigger values due to the lack of 24 months of water quality data at the project area west and the impact that the bushfires on water quality around the project area east. Hence the WQOs and default water quality guideline values are provided in Table 3.1. It should be noted that this approach is consistent to what Snowy 2.0 Main Works has adopted. For waterways that flow through the Bago State Forest, within and in proximity to project area west, the 95% species protection limit has been adopted. All other streams have adopted the 99% species protection limit.

Table 3.1: Water quality objectives for receiving waters

Category	Analyte	Default Guideline Value	
		Upland Rivers – National Parks, Nature Reserves and State Forests[1]	Upland Rivers – streams affected by the Snowy Scheme
Physico-chemical	pH	6.5-8	6.5-8
	Electrical conductivity (µS/cm)	30-350	30-350
	Turbidity (NTU)	2-25	2-25
	Dissolved oxygen (% saturation)	90-110	90-110
	Total suspended solids (mg/L)	No guideline	No guideline
	Total hardness (as $CaCO_3$) (mg/L)	No guideline	No guideline
Nutrients	Ammonia (NH_4^+) (mg/L)	0.013	0.013
	Oxidised nitrogen (NO_x) (mg/L)	0.015	0.015
	Total Nitrogen (TN) (mg/L)	0.25	0.25
	Total kjeldhal nitrogen (mg/L)	No guideline	No guideline
	Filterable reactive phosphorus (FRP) (mg/L)	0.015	0.015
	Total phosphorus (TP) (mg/L)	0.02	0.02
Inorganics (total and dissolved)	Cyanide (mg/L)	0.004	0.004
Metals and metalloids (total and dissolved)	Aluminium (Al)[2] (mg/L)	0.055	0.027
	Arsenic (As)[3] (mg/L)	0.013	0.0008
	Chromium (Cr)[4] (mg/L)	0.001	0.00001
	Copper (Cu) (mg/L)	0.0014	0.001
	Manganese (Mn) (mg/L)	1.9	1.2
	Nickel (Ni) (mg/L)	0.011	0.008
	Lead (Pb) (mg/L)	0.0034	0.001
	Silver (Ag) (mg/L)	0.00005	0.00002
	Zinc (Zn) (mg/L)	0.008	0.0024
	Iron (Fe) (mg/L)	0.3	0.3

1. DGVs for metals and metalloids 95% Species protection (ANZG 2018)
2. DGV Al for pH >6.5 (ANZG 2018)
3. For As (V) (ANZG 2018)
4. For Cr (VI) (ANZG 2018)

3.2 Surface water quality monitoring program

The surface water quality monitoring program will be developed and implemented to gain an appreciation of background water quality, to observe any changes in surface water quality that may be attributable to the project and inform appropriate management response.

The monitoring program is based on assessing water quality associated with the construction activities. As a progressive construction approach is proposed, water quality monitoring of sites may be staged with monitoring occurring in advance of commencement of the relevant construction activities.

The surface water quality monitoring program will be carried out during the pre-construction, construction, and operational stages of the project. The surface water quality indicators to be monitored are common to all stages of the monitoring program and would include those outlined in Table 3.1 with the addition of temperature and visible oil and grease. If oil or grease is visible, samples would be assessed for total petroleum hydrocarbons (TPH).

3.2.1 Monitoring locations

Monitoring sites would be located on waterways with potential to be impacted by project activities and will be selected during detailed design. Furthermore, due to the high conservation status of the KNP, additional reference sites will be identified and monitored throughout all phases of the project. These sites are useful for determining impacts of a disturbance or pollution event and will assist to verify water quality impacts which are related to project activities.

The selection of monitoring sites has considered remoteness and accessibility to waterways, variability of flows with many of the waterways in the footprint exhibiting intermittent or ephemeral flow conditions and location of Snowy 2.0 Main Works monitoring sties. As such some sites may be located further away from the project area where likelihood of flows is more likely and monitoring sites in the project area east have been located (where possible) upstream or in-between Snowy 2.0 Main Works impact and Trigger, Action, Response Plan (TARP) monitoring sites.

Monitoring of Talbingo Reservoir is not proposed as the project has no direct discharge points into the reservoir and instead monitoring of streams that discharge into the reservoir itself will be undertaken. Additionally, Snowy 2.0 Main Works are currently monitoring the water quality of the reservoir due to their licence to discharge treated wastewater and process water into the storage.

Monitoring locations for surface water quality during pre-construction (baseline), construction and operation are shown in Table 3.2 and Figure A.

Sampling locations will be named according to Table 3-2 and it is proposed to sample a select number of reference sites (where possible) located upstream of project works as well as impact sites, being those that are downstream of the project works. Monitoring locations may be refined during initial investigations subject to site access and availability of water. In addition to the proposed sites in Table 3.2, monitoring sites (and data) sampled under the Snowy 2.0 Main Works will be utilised where relevant, particularly where they can act as a TARP site for the proposed monitoring sites.

Table 3.2: Surface water quality monitoring location details

Monitoring Site^	Site type	Monitoring nomenclature	Latitude	Longitude	Description and location details
Yorkers Creek upstream (u/s)	Reference	YK-RS	35°48'4.97"S	148°17'52.41"E	Reference site for Yorkers Creek and tributaries that have potential to be impacted by works downstream. Access via Black Jack Logging Road, off Elliott Way.
Yorkers Creek at Western end of alignment	Impact	YK-IS	35°47'32.34"	148°18'32.89"E	Access via Elliott Way.
Yorkers Creek downstream (d/s)	Impact	YK-IS (d/s)	35°46'57.41"S	148°19'12.47"E	Access via Brown Fire Trail (off Elliott Way) downstream of disturbance area and YK-IS
New Zealand Gully	Impact	NZG-IS	35°48'4.84"S	148°19'5.21"E	Access via unnamed road off Elliott Way
Tumut River u/s O'Hares Creek	Reference	TR-RS	35°49'58.49"S	148°21'41.10"E	Reference site for water quality downstream. Access via Goat Ridge Road
Lick Hole Gully u/s alignment	Reference	LHG-RS	35°48'4.43"S	148°23'40.44"E	Reference site of for Lick Hole Gully downstream of disturbance areas. Access via Lobs Hole Ravine Road.
Lick Hole Gully d/s alignment	Impact	LHG-IS	35°47'34.17"S	148°24'2.61"E	Downstream of disturbance area and proposed access track (option A). Access via Mine Trail
Sheep Station Creek	Impact	SSC-IS	35°47'14.32"S	148°23'27.46"E	Within disturbance area and proposed access track. Access via unnamed road of Lobs Hole Ravine Road.
Cave Gully	Impact	CG-IS	35°47'43.68"S	148°24'24.43"E	Within disturbance area and proposed access track. Access via Mine Trail.
Yarrangobilly River at alignment	Impact	YR1-IS	35°47'34.57"S	148°24'34.03"E	Adjacent to disturbance area and proposed access Road (option A). Access via Mine Trail.
Yarrangobilly River d/s alignment	Impact	YR2-IS	35°47'5.80"S	148°23'33.76"E	Downstream of disturbance area and proposed access Road (option A). Access via Lobs Hole Ravine Road.
Wallaces Creek	Impact	WC-IS	35°47'33.74"S	148°24'46.39"E	Within disturbance area. Access via Mine Trail
^ Additional water quality monitoring points may be implemented in consultation with NWPS and BCS that are downhill of the construction footprint and upstream of the Booroolong Frog habitat.					

3.2.2 Baseline monitoring

The surface water monitoring program would include collection of baseline water quality data during the pre-construction phase of the project. Baseline water quality would be monitored and compared to recommended ANZG (2018) guidelines in order to accurately define existing water quality conditions and determine if WQO are currently being met. The baseline data can also be used for comparison to construction and operational monitoring data to characterise and inform an appropriate response (in accordance with the Trigger, Action, Responses Plan) to any changes to water quality that may be associated with project activities.

To capture seasonal variability, sampling frequency of the baseline monitoring is recommended to be monthly and timed to coincide with Snowy 2.0 Main Works monitoring.

Following the completion of six months of baseline monitoring, the EPA would be consulted to discuss the current monitoring program and any refinements to the program design.

3.2.3 Construction monitoring

Monthly surface water monitoring would occur throughout the duration of construction phase and will be carried out at all nominated monitoring sites via a staged approach that is reflective of works being undertaken at that time. Visual monitoring of other points of release will also be carried out during construction particularly following rainfall.

Data collected during construction at monitoring sites with the potential to be impacted by the project will be compared to the respective default guidelines values to determine if sampling result is within acceptable range.

If downstream sampling results are outside the acceptable range, then the results will be compared to upstream sampling results from reference and TARP sites relevant to the location of exceedance. If downstream results are less than or within acceptable threshold of the upstream results, then no further action would be required. However, if downstream results are greater than upstream results then further investigation of the existing water quality control measures would be carried out to determine the potential cause of the impact and relevant authorities and stakeholders would be notified of the exceedance.

3.2.4 Operational monitoring

Monthly monitoring would occur for a minimum of 12 months during operation of the project. The operational surface water monitoring period shall continue following the completion of construction until the affected waterways are certified by an independent expert as being rehabilitated to an acceptable condition and/or the permanent water quality structures are deemed to be operating satisfactorily. During operation, a similar approach to exceedance of water quality criteria outlined for construction will be adopted.

3.2.5 Trigger, Action, Response Plan (TARP)

A TARP for water quality impacts related to the project will be developed and detailed within the project Construction Environmental Management Plan. Water quality triggers will take into consideration:

- The ANZG (2018) water quality guideline trigger values for 99% species protection and 95% species protection (for waterways that flow through State Forests)
- the baseline water quality monitoring data (for waterways which are determined to not be meeting the relevant WQOs based on baseline water quality data)
- elevated total suspended sediment concentrations that have the potential to be detrimental to the Booroolong Frog.

If an indicator is determined to exceed the nominated trigger value (or outside background water quality for some indicators), an investigation will be carried out to identify the cause and subsequently an appropriate management response will be implemented to rectify the issue. Locating monitoring sites in the project area east upstream of Snowy 2.0 Main Works monitoring sites (but downstream of the TARP sites) will provide

differentiation between the two projects. This will allow for determining the project cause of poor water quality should results fall outside acceptable range.

3.2.6 Sampling parameters

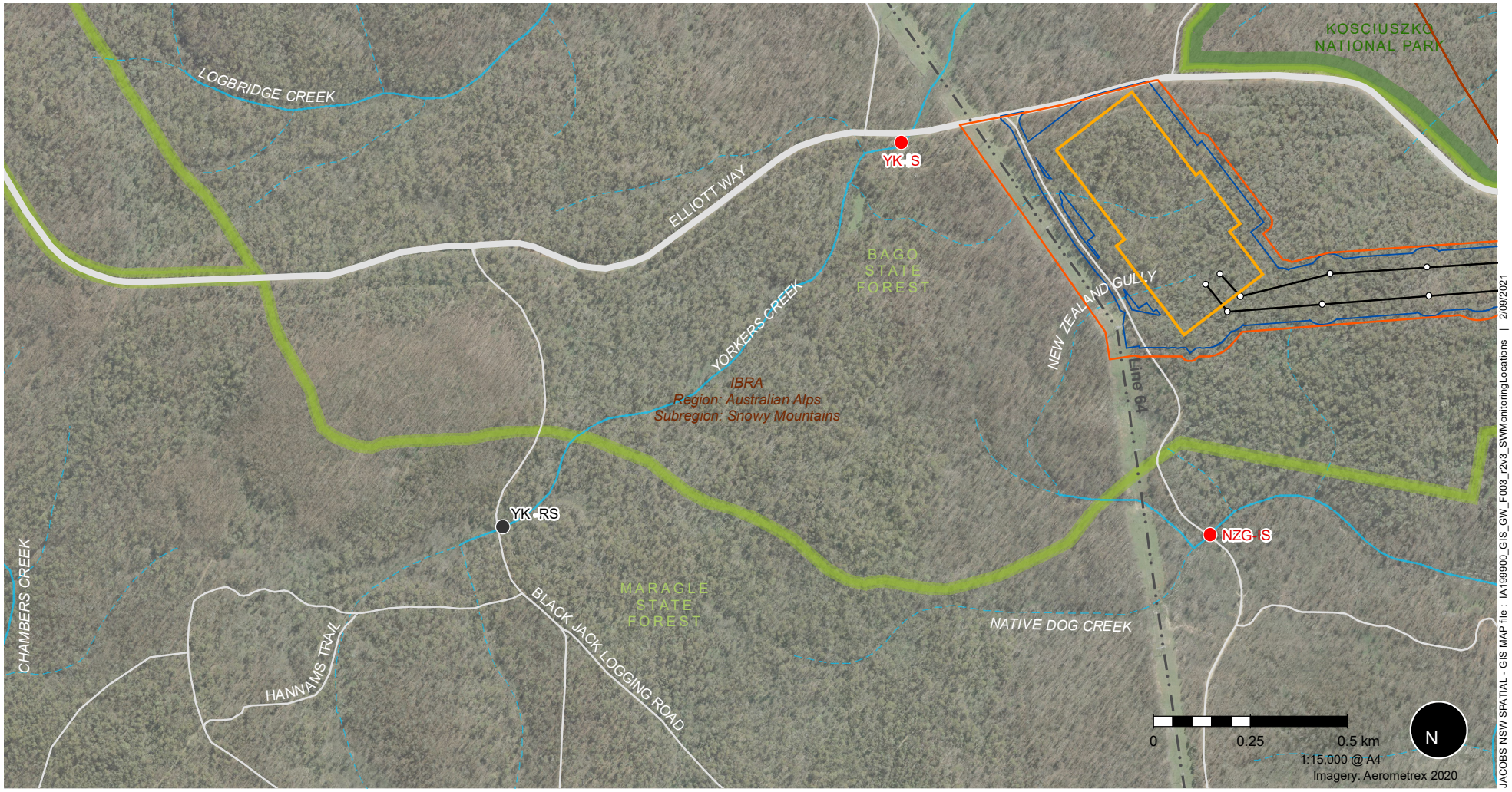
Surface water quality monitoring will include both field parameters and laboratory analysis. The analytical suite is presented in Table 3.3 and is based on those parameters that have the potential to be modified by the project and is consistent with the analytic suite provided in the Snowy 2.0 Main Works surface water monitoring program.

Table 3.3: Surface water sampling – analytical suite

Field parameters	Laboratory Analysis
pH	Total suspended Solids (TSS)
Turbidity (NTU)	Total dissolved solids (TDS)
Temperature (°C)	Total nitrogen (TN)
Dissolved oxygen (% saturation and mg/L)	Total phosphorus (TP)
Electrical conductivity (µS/cm)	Dissolved metal (Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, Fe, Ag and Mn)
Redox potential (eH)	Cyanide
Oil and grease (visual inspection)	

Details regarding Quality Assurance (QA) and Quality Control (QC) can be provided.

Appendix A. Monitoring sites

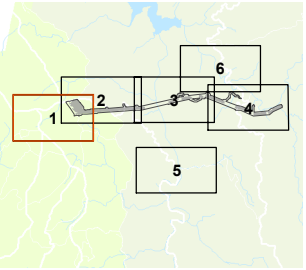


Project area
Disturbance area
Proposed 500kV substation
Snowy 2.0 Structures
Proposed transmission line

Monitoring Site
Impact Site
Reference Site

Electricity transmission line

Minor road
Major road
NPWS estate
State Forest
IBRA



Data sources:
Jacobs 2020, EMM 202, DPI 2019, DPE 2018,
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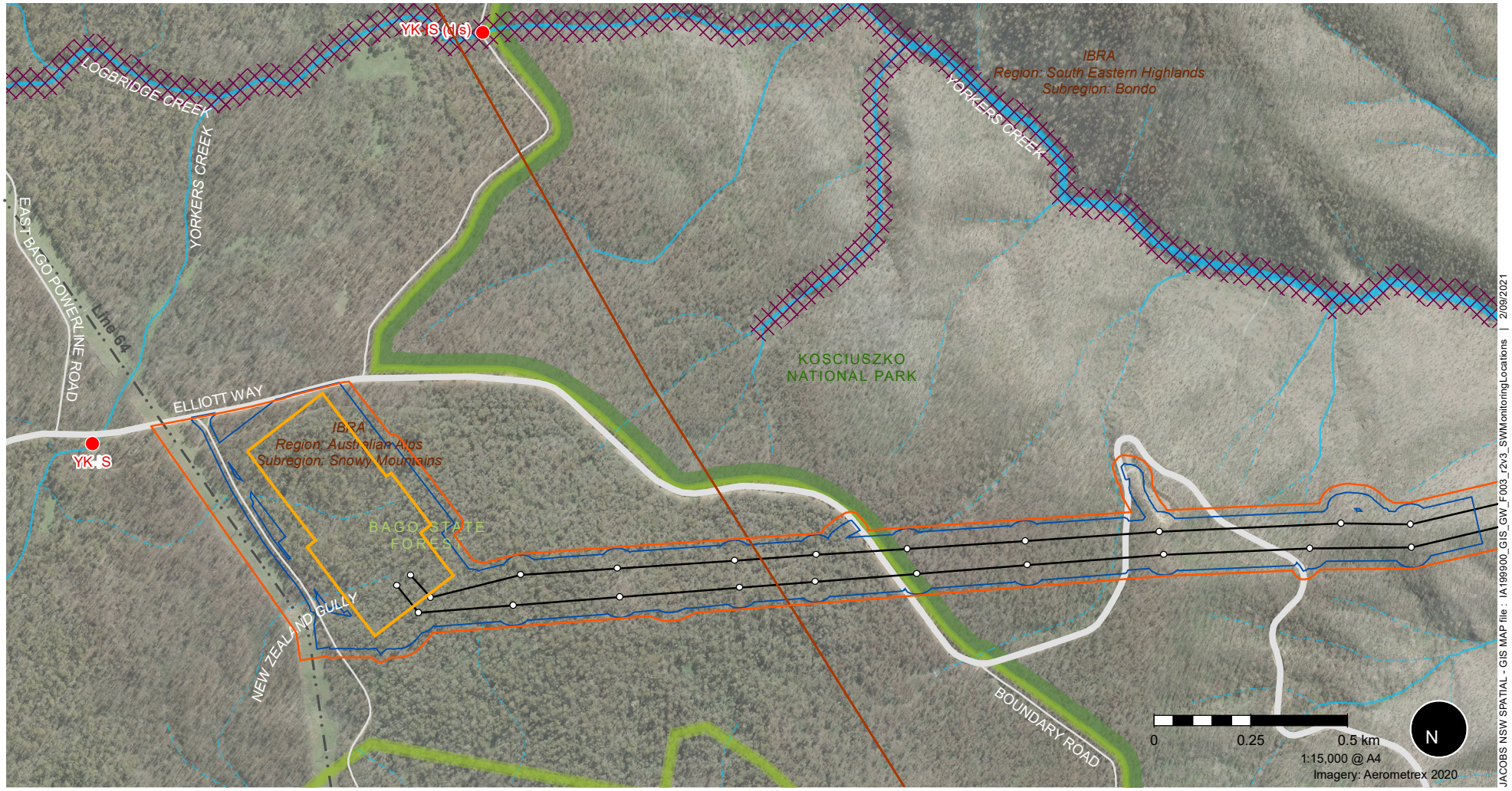
Metromap (Aerometrex) Apr 2020

Figure A | Monitoring sites **Page 1 of 6**

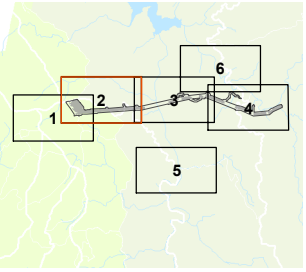


- Project area
- Disturbance area
- Proposed 500kV substation
- Snowy 2.0 Structures
- Proposed transmission line

Monitoring Site
- Impact Site
- Key Fish Habitat

- Electricity transmission line

- Minor road
- Major road
- Waterway
- NPWS estate
- State Forest
- IBRA



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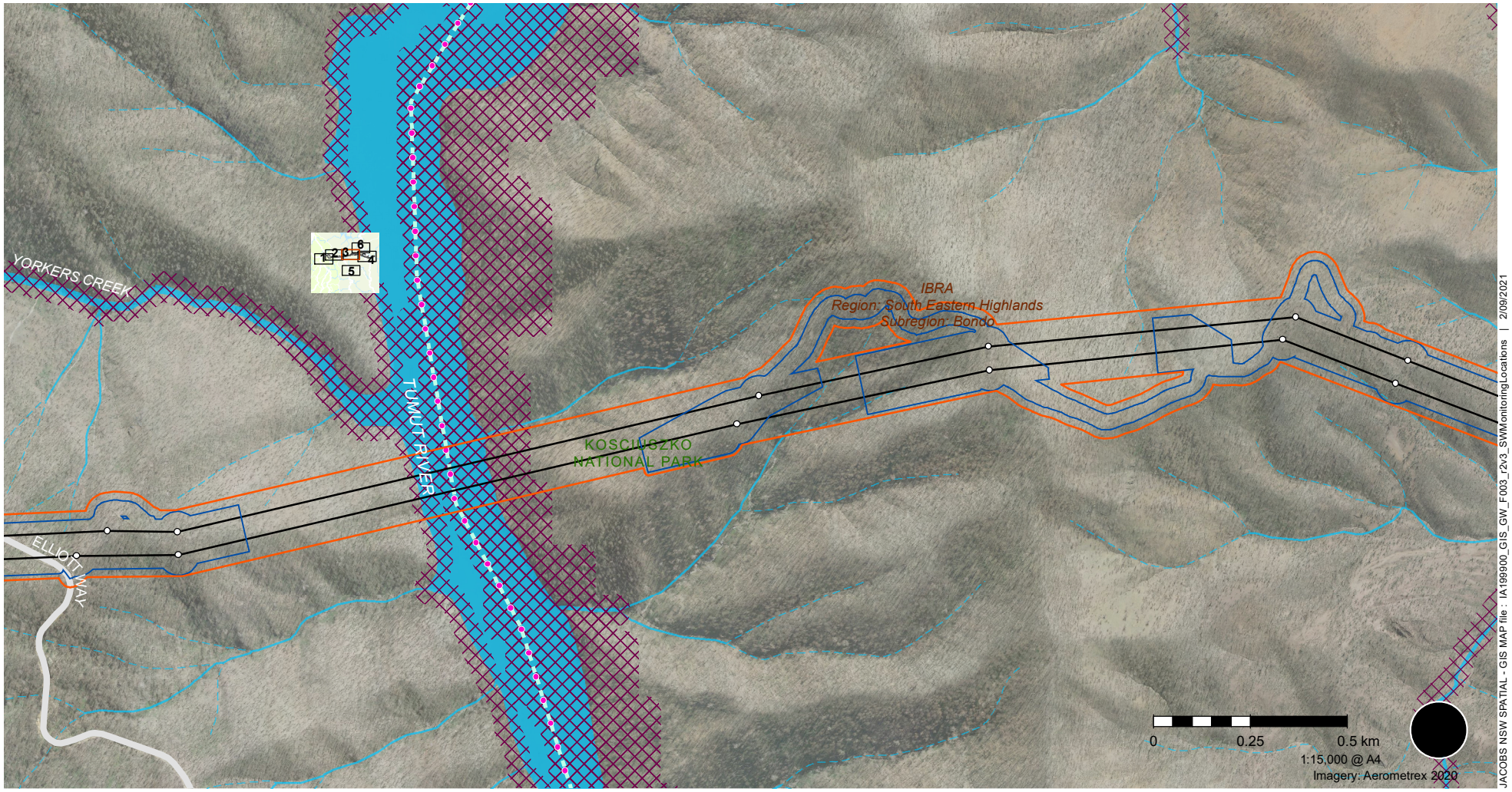
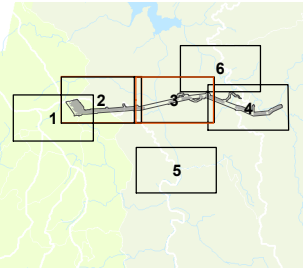


- Project area
- Disturbance area
- Snowy 2.0 Structures
- Proposed transmission line
- Murray Crayfish (Tumut River)
- Macquarie Perch (Tumut River and Yarrangobilly River)
- Key Fish Habitat
- Major road
- Waterway
- NPWS estate
- IBRA



Data sources:
Jacobs 2020, EMM 202, DPI 2019, DPE 2018,
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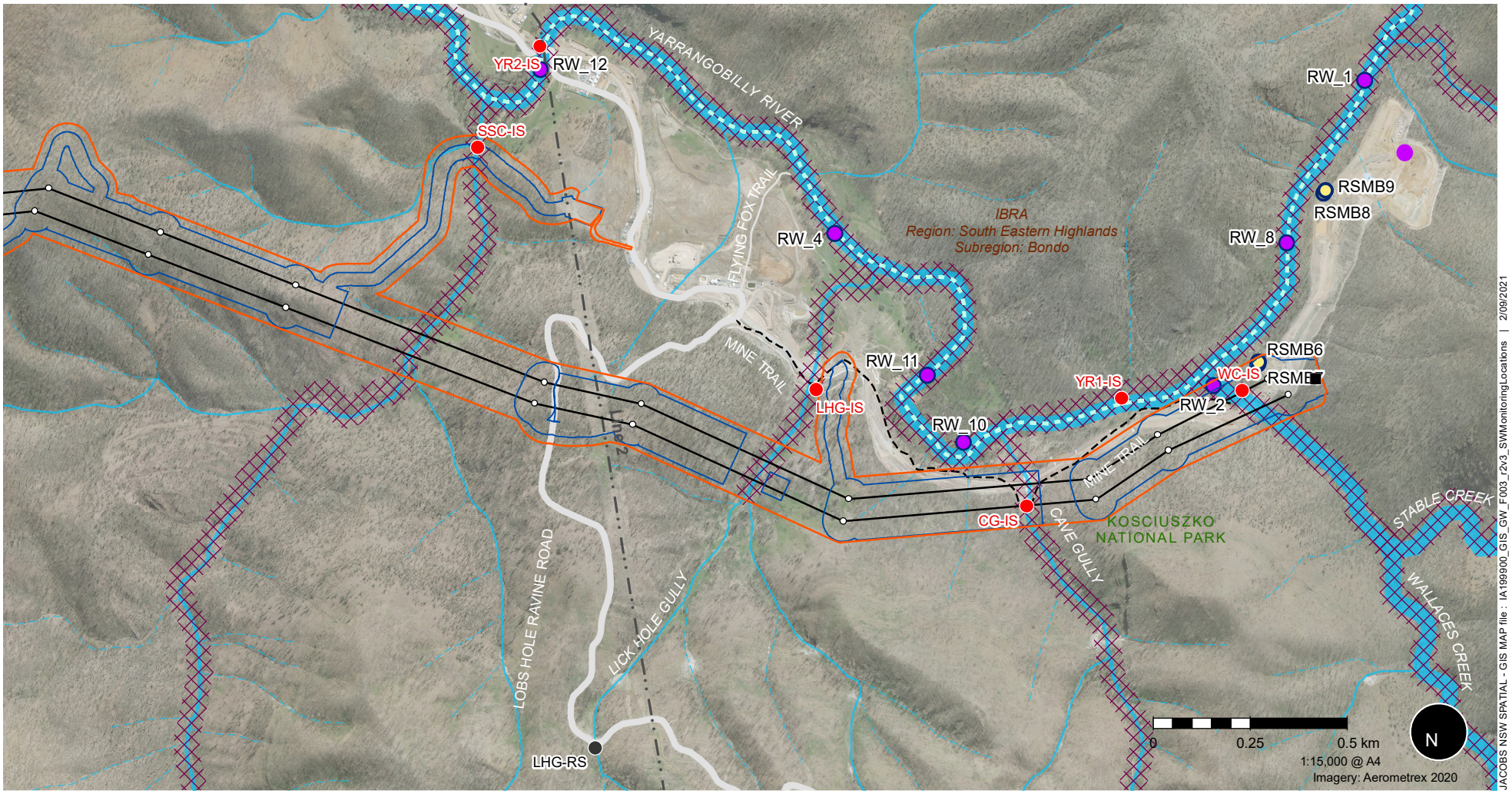
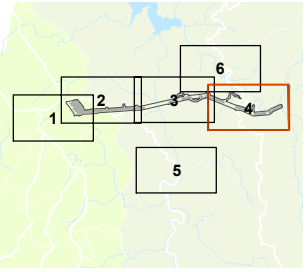


Project area
Disturbance area
Snowy 2.0 Structures
Proposed transmission line
Snowy 2.0 cable yard

Monitoring Site
Impact Site
Reference Site
Water quality monitoring locations (Snowy Hydro)
Existing: Groundwater bore
Existing: Surface Water
Surface Water
Macquarie Perch
(Tumut River and Yarrangobilly River)
Key Fish Habitat

Electricity transmission line

Minor road
Major road
Trail
NPWS estate
IBRA



Data sources:
Jacobs 2020, EMM 202, DPI 2019, DPE 2018,
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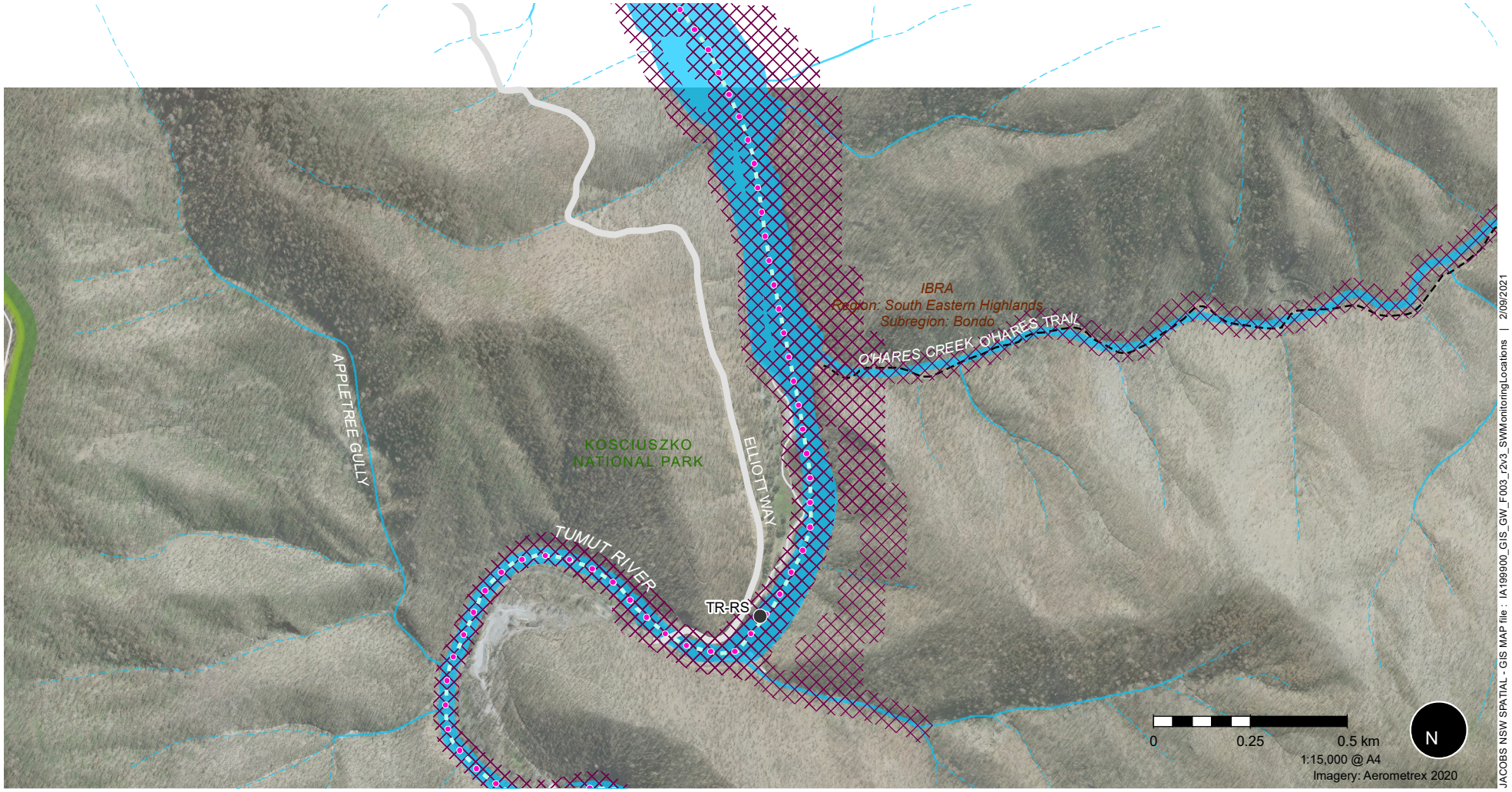
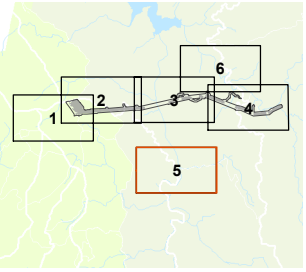


Monitoring Site
- Reference Site

- Murray Crayfish (Tumut River)
- Macquarie Perch (Tumut River and Yarrangobilly River)
- Key Fish Habitat

- Minor road
- Major road
- Trail
- Waterway
- NPWS estate
- IBRA



Data sources:
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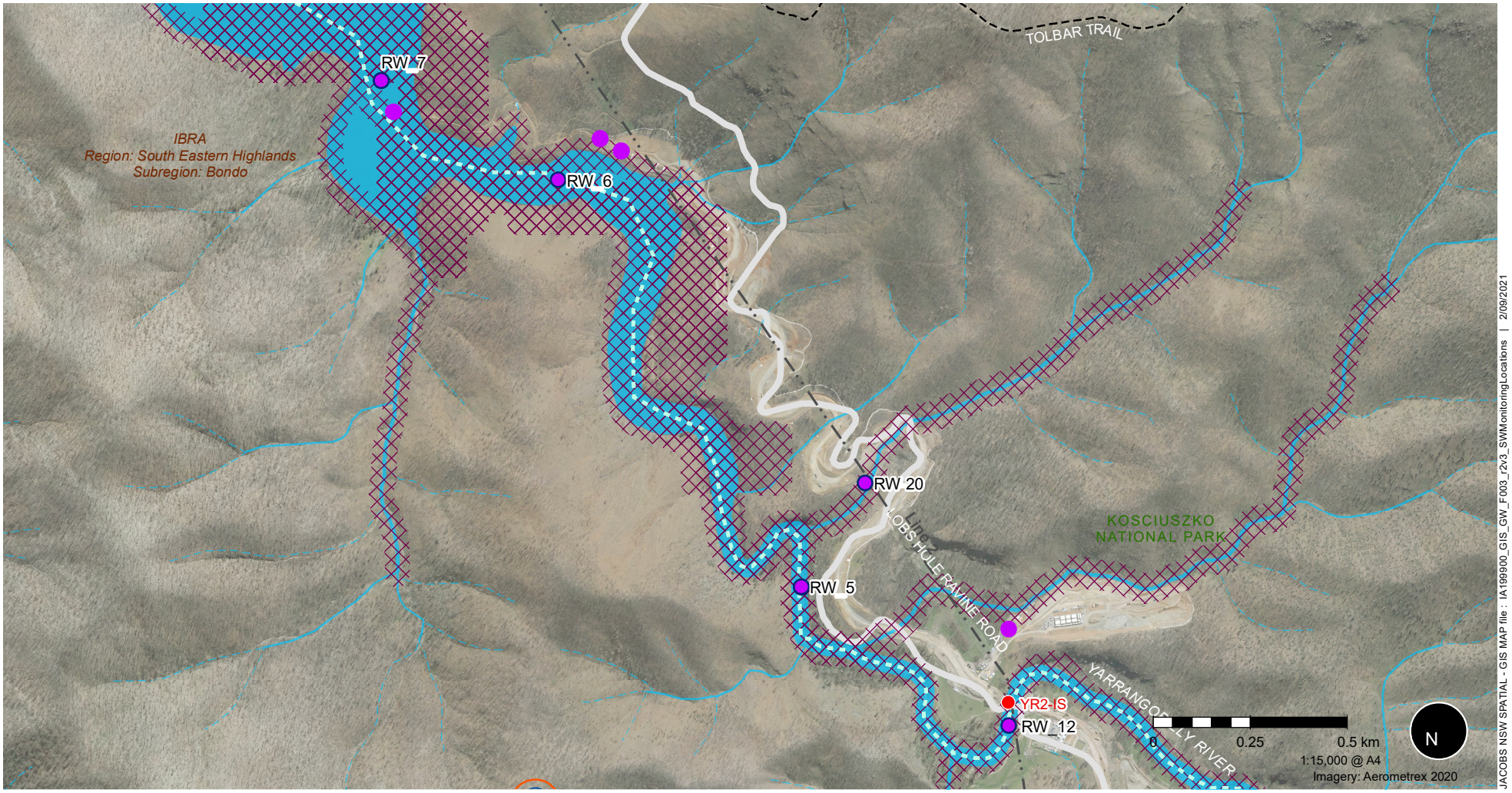


Project area
Disturbance area

Monitoring Site
- Impact Site

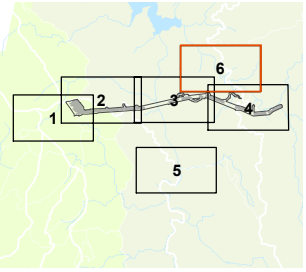
Water quality monitoring locations (Snowy Hydro)
- Existing: Surface Water
- Surface Water

Macquarie Perch
(Tumut River and Yarrangobilly River)

Key Fish Habitat

Electricity transmission line

Major road
Trail
NPWS estate
IBRA



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