REPORT

Tonkin+Taylor

Glenbrook Steel Mill

Water Discharges and Industrial or Trade Activity Assessment

Prepared for

New Zealand Steel Ltd

Prepared by

Tonkin & Taylor Ltd

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Glossary

Term	Meaning / description
Aggregate and Co-product processing yards	Aggregate and co-product processing yards recover a range of iron-rich materials which are generated in the manufacturing facilities, in order to avoid or minimise landfilling. This includes slag storage and processing, mill scale storage, scrap steel cutting, tipping and recovery of RPCC, and the Metal Recovery Plant (MR).
Aggregate Plant	Where Steelserv Limited, a NZ Steel subsidiary, processes Melter slag to produce a synthetic aggregate. This plant incorporates crushing and screening units and washing plant, to reduce the size of reclaimed slag and produce a variety of grades of roading and drainage aggregates.
Acid Regeneration Plant	Ancillary plant associated with the Pickle Line in which spent acid is regenerated through roasting for re-use. This plant is a facility within the Finishing Plant.
Ancillary activities	Supporting activities, including movement of molten iron and steel products between manufacturing plants; stockpiling and processing of raw materials, co-products and waste; tipping of slag, iron and RPCC; and all supporting vehicle movements.
Best Practicable Option	Defined in section 2(1) of the Resource Management Act 1991 (RMA), as: *"in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to —* *(a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and* *(b) the financial implications, and the effects on the environment, of that option when compared with other options; and* *(c) the current state of technical knowledge and the likelihood that the option can be successfully applied."*
Brackish Water	Water occurring in a natural environment which has more salinity than freshwater, but not as much as seawater.
Char	Partially burned coal produced at the Kilns, a component of RPCC.
Compensation	Compensation is any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to compensate for any adverse effects on the environment that will or may result from allowing the activity.
Conductivity	Conductivity is a measure of the ability of water to pass an electrical current. It is an indirect measure of charged particles, such as dissolved salts and other inorganic chemicals. High conductivity is an indication of high salinity.
Consent Limit	A measurable restriction for individual environmental parameters specified by Schedule 1 of the conditions of consent (proposed at Appendix Q of the Assessment of Effects on the Environment). These restrictions are required by consent to be complied with to ensure adverse effects are appropriately managed.

Term	Meaning / description
Contaminant	Defined in section 2(1) of the Resource Management Act 1991 (RMA), as: *“including any substance (including gases, odorous compounds, liquids, solids, and micro— organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat—* *(a) when discharged into water, changes or is likely to change the physical, chemical, or biological condition of water; or* *(b) when discharged onto or into land or into air, changes or is likely to change the physical, chemical or biological condition of the land or air onto or into which it is discharged.”*
Cumulative effects	Changes to the environment that are caused by an action in combination with other past, present and future human actions.
Current Environment	The environment as it currently exists. Monitoring data and investigations undertaken during the preparation of this application describe the Current Environment, which reflects the effects of the operation of the Steel Mill over the past 53 years.
Dewatering Plant	Where the ironsand (or PC) slurry received from the ironsand mine is dewatered before stockpiling. This plant also includes a dedicated water treatment facility.
Default Guideline Value	A guideline value recommended for generic application in the absence of a more specific guideline value in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZWQG)
Electric Arc Furnace (EAF)	A furnace that heats material by directly exposing it to an electric arc and the current from the furnace terminals passes through the charged material. The EAF will enable reduced use of virgin steelmaking materials (including coal) and instead recycle Ferrous Scrap using electricity.
East Landfill	NZ Steel’s existing active landfill located on the eastern side of Brookside Road within the Site. This is subject to a separate suite of resource consents and is not within the scope of this replacement consents application.
Existing Consents	NZ Steel’s existing discharge consents authorise the discharge of stormwater from the ITA Area, process water from the Steel Mill, and leachate from the East and West Landfills: • Permit 41027 – Industrial or Trade Activity (ITA) discharges • Permit 21575 – Northside Outfall discharge • Permit 21576 – Southside Outfall discharge • Permit 21577 – Dewatering Plant discharge These discharge consents all expire on 31 December 2021.
External Scrap	Ferrous scrap that is sourced from sources other than the Steel Mill (i.e. from external sources). External Scrap will be processed off-site by Suppliers (including removal of non-ferrous material, shredding, cutting and grading) prior to arrival on Site.
Ferrous Scrap	Ferrous Scrap will be used in the EAF. It will consist of scrap from two sources: • NZ Steel’s steel making and finishing processes (this scrap is referred to throughout this application as “uprisings”); and • Parties other than NZ Steel (this scrap is referred to throughout this application as “external scrap”).

Term	Meaning / description
Finishing Plants	Metal coating and painting of steel coil from the Rolling MIlls, into a range of pre-painted steel (Colorsteel®) and metal coated steel products (Zincalume® and GalvSteel®).
Hot Strip Mill	Processes slabs from the Steel Plant into hot rolled coils and plate for further processing. This process is part of the Rolling Mills.
Trigger Investigation Levels	A numerical value above which investigation actions will be taken. Trigger Investigation Levels are included in the existing Stormwater Monitoring and Management Programme required by the Existing Consents and are proposed in consent conditions to be specified in the Water Quality Management Plan.
Iron Plant	Where NZ Steel manufactures molten iron from the raw materials such as Primary Concentrate, coal and lime. This plant includes the MHF, Kilns, Melters and Cogeneration facilities.
ITA Area	The ITA Area is the area from which the ITA stormwater is discharged. It includes all ITA activities and stockpiling landholdings, including provisional areas for potential future expansion. The area is bound to the north by Brookside Road, to the east by Mission Bush Road., and to the west by the Waiuku Estuary.
ITA Stormwater Discharges	Rainfall runoff from ITA activity areas.
Kahawai Stream	The Kahawai Stream is a small watercourse that that lies to the north of the Steel Mill and discharges to the Waiuku Estuary. The stream is approximately 1 km in length and lies immediately to the north of a consented, but not constructed, Managed Fill Site. The Kahawai Stream is not officially named and has been previously known, by NZ Steel, as the MFS Stream.
Kahawai Stream ITA Catchment	The portion of the ITA Area where stormwater drains to the Kahawai Stream. Previously referred to as the Metal Cutting Yard.
Kilns	Coal, Ironsand (Primary Concentrate) and Lime are converted into prime Hot Metal that meets customer (Slabmaking Business Unit) quality and delivery requirements.
KOBM / Oxygen Steel Making Furnace	Vessel within which molten iron and scrap steel is turned into liquid steel (Klockner Oxygen Blown Maxhutte)
Lower North Stream	The Lower North Stream is located to the north of the Glenbrook Steel Mill Precinct and flows in a generally northerly direction between the East and West Landfills. Much of the original Lower North Stream was diverted to its current alignment along the West Landfill access road. The Lower North Stream is not officially named. It was previously (erroneously) known as the Northside Stream; however, this was incorrect as the Northside Stream was a historical watercourse that flowed through the site to discharge at the current location of the Northside Outfall. The Northside Stream and valley were removed in the 1980s to facilitate the expansion of the Steel Mill.
Ladle Treatment Stations	A station where ferro-alloy additions are made to the ladle of steel to bring the steel to composition required for slab casting.
Macrophyte	An aquatic plant large enough to be seen with the naked eye.
Macroinvertebrate	Instream freshwater invertebrate fauna large enough to be visible to the eye without the use of a microscope.

Term	Meaning / description
Macroinvertebrate Community Index	An *index* used in New Zealand to measure the water and habitat quality of freshwater streams. The presence or lack of *macroinvertebrates* such as insects, worms and snails in a river or stream can give a biological indicator on the health of that waterway.
Metal Recovery Plant	Where Steelserv Limited, a NZ Steel subsidiary, processes some of the co-products from the iron and steelmaking process, to recover ferrous for return to the steelmaking process. Residual material may be used as an "unspecified" roading material (variable grade) or landfilled. KOBM Slag is also screened in this plant.
Metal Coating Line	The line cleans, anneals, coats and surface treats the steel in a continuous operation.
Multi Hearth Furnace Hearth Furnace	The first process in the Iron Plant, which raises the temperature of the raw materials (primary concentrate, lime and coal) to 650°C and removes volatile compounds from the coal.
North Drain	The North Drain is a constructed drain that was constructed in the 1980s to convey Steel Mill discharges and is considered to be an artificial watercourse. The North Drain flows entirely within the ITA Area and discharges into the Lower North Stream north of Brookside Road.
North Drain ITA Catchment	The portion of the ITA Area where stormwater drains to the North Drain.
Northside ITA Catchment	The portion of the ITA area where stormwater drains to the Northside Ponds and Northside Outfall.
Northside Ponds	Two large water quality treatment ponds that receive process water from the Steel Mill, including the Primary Plants, stormwater from the Northside ITA Catchment, and leachate from the West and East Landfills. Treated water from the Northside Ponds discharge to the coastal marine area via the Northside Outfall.
Northside Outfall Structure	The outfall structure from the Northside Ponds to the Waiuku Estuary.
Primary Concentrate (PC)	Ironsand (titanomagnetite) (from the Waikato) that has been through separation processes (magnetic/gravity) to increase the iron content and reduce any mineral impurities.
Pickle Line	A series of pickling tanks containing hydrochloric acid solutions and wash water that removes the fine layer of iron oxide scale that is generated during hot rolling and produces a strip surface suitable for cold rolling. This process is part of the Rolling Mills.
Plating	Process whereby molten iron is poured into pits to solidify.
Primary Plants/Operations	Consists of the Iron Plant, Steel Plant and associated raw material handling. The Multi Hearth Furnace (MHF) and Kilns Cogeneration facilities are also closely associated with these facilities.
Process water	Process water is water that is used for a variety of manufacturing processes at the Steel Mill. Includes waste process water and landfill leachate.
Rainfall event	A 'rain event' is when water is discharged through the NZ Steel stormwater system at a rate of generally greater than 15 mm in 24 hours or 6 mm in an hour.
Riparian margin	An area of land immediately adjacent to a permanent or intermittent river or stream.

Term	Meaning / description
Rolling Mills	The Rolling Mills consist of a hot and cold rolling mill and associated facilities to mechanically form steel slab into flat product. Steel coil from the Rolling Mills may be directly exported or further processed in NZ Steel's Finishing Plants.
Ruakohua Stream	The Ruakohua Stream (sometimes known as Ruakohua Stream) is located to the south of the Steel Mill. It is approximately 4 km in length and flows in a south westerly direction to discharge to NZ Steel's Ruakohua Dam. The lower reaches of the Ruakohua Stream were diverted around the NZ Steel development area during the 1970s/ 1980s.
Ruakohua Stream ITA Catchment	The portion of the ITA Area where stormwater drains to the Ruakohua Stream and Ruakohua Dam.
Receiving Environment	The environment against which the effects of the proposed discharges are assessed. The manner in which the Receiving Environment has been determined in this application is described in detail in Section 3 of this report. However, by way of brief summary it is the Current Environment, modified to exclude ongoing effects of the activity that are the subject of the application but including legacy effects of the past discharges associated with the Existing Consents (e.g. build-up of metals in sediment, diversion of water in the North Drain, coastal structures).
Scrap Yards	Areas where External Scrap is proposed to be stored, as follows: • Local Yard- North; • Local Yard – South; • Yard A; and • Buffer Scrap Yard (Option 1 or Option 2)
Scrubber	Scrubber systems are air pollution control devices that remove particulates and/or gases from industrial exhaust streams through the application of a scrubbing solution (wet scrubbers).
Site	Includes all NZ Steel landholdings in relation to the Steel Mill at Glenbrook, which includes the Steel Mill (Glenbrook Steel Mill Precinct), industrial landfills and farming activities, as well as the adjoining coastal esplanade strip owned by Auckland Council.
Slag	A co-product of the iron and steel making. Slag is a mixture of non-metallic and metallic materials that float on top of the molten iron or steel (removing impurities such as silicon, titanium and sulphur). Melter Slag is a co-product of the iron making process, that is similar in character to volcanic rock. KOBM Slag is a co-product of the steel making process, formed in the KOBM. It has cementitious properties and is used to partly replace limestone on Site. Vanadium Slag is a co-product of the steel making process, formed after oxygen is blown into a ladle of molten iron at the VRU. Steelmaking Slag means both KOBM Slag and Vanadium Slag.
Southside ITA Catchment	The portion of the ITA area where stormwater drains to the Southside Ponds and/or Southside Outfall.
Southside Ponds	Two water quality treatment ponds that receive treated process water from the Rolling Mills, primarily the Acid Regeneration Plant (ARP), and stormwater from the Southside ITA Catchment. Treated water from the Southside Ponds is recycled to the Ruakohua Dam, however some discharges to the coastal marine area via the Southside Outfall.

Term	Meaning / description
Southside Outfall Structure	The outfall structure from the Southside Ponds to the Waiuku Estuary.
Species Protection Level	The degree of protection afforded to a water body based on the condition of the ecosystem relative to the degree of human disturbance. Associated with the Australia New Zealand Water Quality Guidelines (ANZWQG).
SRNZ Ponds	Two large intermediate water quality treatment ponds within the Northside ITA Catchment, that receive a limited amount of process water and stormwater from the Steel Mill. Formerly known as the Slag Ponds. Treated water from the SRNZ Ponds discharge to the Northside Ponds for additional treatment.
Steel Mill/Glenbrook Steel Mill	The integrated steel making facility in Glenbrook and ancillary activities on the Site.
Steel Plant	Where NZS manufactures steel slabs and billets made from iron produced at the Iron Plant.
Steelserv Limited	Company that operates large mobile equipment for the Steel Mill and provides a range of services, including stockpiling and handling of coal, movement of iron ladles to the Steel Plant, slag ladles and bins to the tipping banks, waste and co-products to processing areas. Steelserv also operates the NZ Steel landfill and the screening and crushing facilities for production of a range of slag products for direct sale.
Stormwater	Rainfall runoff from land, including constructed impervious areas such as roads, pavement, roofs and urban areas which may contain dissolved or entrained contaminants, and which is diverted and discharged to land and water.
Stream Ecological Valuation (SEV)	A method for assessing the ecological condition of streams based on the performance of their key ecological functions.
Substrate	The material that rests at the bottom of a stream.
Total suspended solids	The total amount of particulate matter that is suspended in the water column, that is not dissolved, that can be trapped by a filter.
Turbidity	A measure of the clarity of water. Turbidity is the measurement of the amount of light scattered by suspended particulates present in the water when a light is shined through the water. The more total suspended particulates in the water, the murkier it can appear and the higher the turbidity.
Vanadium	A high-value metallic co-product entrained in slag.
Vanadium Recovery Unit	Produces a vanadium rich slag from molten iron prior to steel making in the KOBM.
Waiuku Estuary	The Steel Mill is located on the eastern bank of the Waiuku River which, despite its name, is a long and relatively narrow tidal arm (estuary) of the Manukau Harbour. For the avoidance of confusion, the term "Waiuku Estuary" is therefore used in this report to describe this area.
Wastewater Treatment Plant (WWTP)	A facility in which a combination of various processes (physical, chemical and biological) are used to treat industrial wastewater and remove pollutants. There are multiple industrial wastewater treatment plants at the Steel Mill to treat process water discharges from a variety of plant. The processes used are dependent on the characteristics of the wastewater at each plant.

Term	Meaning / description
West Landfill	NZ Steel's closed landfill located on the western side of Brookside Road within the Site. This is subject to a separate suite of resource consents and is not within the scope of this replacement consents application.
Zone of Influence	The areas/resources that may be affected by the biophysical changes caused by the Proposal and associated activities.

Abbreviations

Abbreviation	Meaning / description
AEE	Assessment of Effects on the Environment
ARP	Acid Regeneration Plant
ANZWQG	Australia and New Zealand Water Quality Guidelines (formerly ANZECC).
AUP	Auckland Unitary Plan
BAT	Best Available Techniques
BPO	Best Practicable Option
Council/AC	Auckland Council
CMA	Coastal Marine Environment
CY19	Coal Yard 19, previously known as the emergency coal stockpile
CY1/2	Coal Yards 1 and 2, previously known as the imported coal stockpile
CY5/6	Coal Yards 5 and 6, previously known as the aggregate, and PC stockpile
EAF	Electric Arc Furnace
EcIAG	Ecological Impact Assessment Guidelines, from the Environment Institute of Australia and New Zealand
EIANZ	Environment Institute of Australia and New Zealand Inc.
EDV	Extended detention volume
EMS	Environmental Management Systems
DGV	Default Guideline Value
ITA	Industrial and Trade Activity
KOBM	Klockner Oxygen Blown Maxhutte
LTS	Ladle Treatment Stations
MCI	Macroinvertebrate Community Index
MCL	Metal Coating Line
MR	Metal Recovery Plant
MHF	Multi hearth furnace
NPS-FM	National Policy Statement for Freshwater Management 2020
NTU	Nephelometric Turbidity Units
NZ Steel	New Zealand Steel Limited
PC	Primary concentrate
RMA	Resource Management Act 1991
RPCC	Reduced primary concentrate and char
SEA(s)	Significant Ecological Area(s)
SEA-M	Significant Ecological Area Marine
SEV	Stream Ecological Valuation
SPL	Species protection limit
TSS	Total suspended solids
VRU	Vanadium Recovery Unit
WQV	Water Quality Volume

Abbreviation	Meaning / description
WWTP	Wastewater Treatment Plant
ZOI	Zone of Influence

Executive summary

Introduction and setting

report provides a technical assessment of discharges of stormwater and process water (including leachate from the East and West landfills) discharged from an Industrial and Trade Activity (ITA), being New Zealand Steel's (NZ Steel) Glenbrook Steel Mill (Steel Mill) (the Site). It describes the proposed stormwater and process water management controls and the potential discharges from the on-going Steel Mill operation.

The Steel Mill is a fully integrated facility that converts ironsand and coal to produce steel slab, billets and a range of processed steel products. The Steel Mill has operated at the Site since 1968.

The present resource consent application seeks to reconsent the existing Steel Mill ITA Stormwater Discharges and to authorise changes to the current Steel Mill configuration which are required to install and operation an EAF as part of the Steel Mill.

Consequently, the Steel Mill for the purposes of the present application comprises the:

- Iron Plant, which converts the raw materials, ironsand, lime and coal, to pig iron;
- Steel Plant, which converts the iron to steel and then into steel slab and billet;
- Proposed EAF: which will convert ferrous scrap and pig iron to and convert them to steel which will then be cast into steel slab and billet;
- Rolling Mills, where the cast steel slab is rolled into coils for further processing or direct sale;
- Finishing Plants, where a range of metal-coated and pre-painted products are produced; and
- Ancillary activities, including movement of iron and steel between manufacturing plants, transport, stockpiling and processing raw materials, co-products and waste.

NZ Steel currently holds resource consents (Existing Consents) for the use of land and discharge of contaminants from an ITA and the discharge of ITA stormwater and process water from the Northside and Southside Outfalls and the Dewatering Plant. This report supports the application to replace the Existing Consents.

NZ Steel has recently secured co-funding from the New Zealand Government to enable the substantial decarbonisation of its steel making process through the installation of an Electric Arc Furnace (EAF) at the Site. The present application seeks to authorise the effects of the EAF as part of the replacement of the Existing Consents. This application therefore also provides a technical assessment of discharges and proposed management controls associated with the EAF.

NZ Steel owns approximately 550 ha of land at Glenbrook. The Steel Mill occupies an area of approximately 190 ha (see Figure W1, Appendix E of the Assessment of Effects on the Environment (AEE)). NZ Steel's land to the north, east and south of the Steel Mill includes an operational landfill (the East Landfill) and two closed landfills (the North and West Landfills) with the remainder of the land grazed. The discharges from the operational and closed landfills are authorised separately under landfill-specific consents, with the exception of the leachate from the East and West Landfills which is pumped to the Northside Ponds.

The discharges from the Site include:

- Process water discharges from the Northside ITA Catchment to the Waiuku Estuary which includes the Iron Plant, Steel Plant, (including the proposed EAF) and part of the Finishing Plants;
- Process water discharges from the Southside ITA Catchment to the Waiuku Estuary which includes the Rolling Mills and part of the Finishing Plants;

- Water from the Dewatering Plant to the Lower North Stream;
- Discharges from ITA Areas including stormwater to the Waiuku Estuary, the Ruakohua and Kahawai Streams and North Drain (referred to as ITA stormwater discharges); and
- Leachate from the East and West Landfills.

Following various treatment measures outlined below, the ITA Areas discharge to the Waiuku Estuary and to three watercourses: the North Drain, which flows into the Lower North Stream, the Ruakohua Stream, and the Kahawai Stream; all three sub-catchments contain wetlands which primarily comprise riparian wetlands, and all of which ultimately discharge into the Waiuku Estuary.

The Waiuku Estuary is described in detail in the Marine Ecological Assessment (Appendix I to the AEE) and the streams and wetlands are described in detail in the Freshwater Ecological Assessment (Appendix H to the AEE). In summary:

- To the west of the Steel Mill is the Waiuku Estuary, which is a long and relatively narrow tidal arm of the Manukau Harbour;
- The North Drain is an artificial watercourse established during the 1980s that flows north through the ITA Area in a concrete-lined channel (see Figure W9, Appendix E of the AEE). The North Drain flows into the modified Lower North Stream downstream of Brookside Road. The Lower North Stream was diverted during the establishment of the West Landfill, and now flows between the East and West Landfills. The riparian margins of the lower reaches of the Lower North Stream have been planted with native vegetation. The lower North Stream includes multiple wetlands with a high diversity of wetland vegetation;
- The Ruakohua Stream is located to the south and east of the Steel Mill (see Figure W10, Appendix E of the AEE). The main stem is approximately 4 km in length, flowing in a south-westerly direction. The Lower Ruakohua Stream was diverted around the south-eastern part of the Steel Mill in the 1980s, and the stream was dammed to form a reservoir (Ruakohua Dam). The Ruakohua Dam is a storage reservoir for water required by the Steel Mill. Aside from the Steel Mill, catchment land use is predominantly rural and where the Ruakohua Stream is on NZ Steel property the riparian margins are planted with native species; and
- The Kahawai Stream is located to the north-west of the Steel Mill (see Figure W11, Appendix E of the AEE) and flows in a north-westerly direction. The Kahawai Stream is surrounded mostly by agricultural land currently used for cattle grazing. Almost the full length of the riparian margin of Kahawai Stream is planted in native species. There are several wetlands within the Kahawai Stream catchment, mainly in the lower reaches and coinciding with the riparian planting.

Discharges to water and treatment systems

Northside ITA Catchment

The Northside Outfall discharges water from the Northside Ponds which receives treated process water from the Steel Mill, stormwater from the largest ITA Area on Site (approximately 69 ha) and landfill leachate (see Appendix A Figure W-ITA4).

The activities with the largest contaminant load occur within the Northside ITA Catchment including discharges from the Primary Plant processes (iron and steelmaking). The key sources of process water include blowdown water from the various scrubbers (which are used to reduce discharges to air), as well as from cooling water systems. The primary treatment for Primary Plant process water is provided in the wastewater treatment plants consisting of large clarifiers, chemical addition and a thickener. Most of the water in the circuit is recycled (98%) and the remainder is discharged to the Northside Ponds. The key contaminants include suspended solids and heavy metals, in particular copper, iron, and zinc.

Stormwater from the Northside ITA Catchment includes roof runoff and surface runoff from raw material stockpiles, co-product and waste processing areas, sealed and unsealed roads and yards, metal scrap yards and the iron and slag tipping bays. Should the EAF be installed and operated, the Northside ITA Catchment stormwater runoff will also include stormwater from three[1] new Scrap Yards required to store the imported scrap.

The primary stormwater treatment method for the Northside ITA Catchment is the Northside Ponds, however there are also various other settlement ponds within this catchment which provide pre-treatment or enable recycling of water. The key stormwater contaminants of interest include suspended solids, temperature, pH and heavy metals (in particular copper, iron and zinc) and, if the three new EAF Scrap Yards are established, PAHs.

Leachate from the East and West Landfills[2] is also pumped to the Northside Ponds prior to being discharged to the Northside Outfall. The key contaminants associated with the landfill leachate are elevated pH and heavy metals (in particular boron, aluminium, copper, vanadium and zinc).

The Northside Ponds comprise two large settlement ponds (combined capacity of 30,000 m^3), which incorporate oil skimmers, the use of chemical treatment including coagulants and flocculant and baffles to optimise performance. Melter aggregate filter beds provide additional treatment for a proportion of the flow above the Northside Outfall. In addition, part of the stormwater and treated process water flows through smaller ponds (SRNZ Ponds) before discharging into the Northside Ponds, which also include Melter aggregate filtration. Following consultation with Iwi, investigation into the conversion of one of the SRNZ ponds to a constructed treatment wetland is underway. If the conversion is feasible, this may reduce the contaminant loads discharged via the Northside Outfall.

The Northside Ponds discharge via the Northside Outfall, which includes a range of monitoring equipment, including both continuous monitoring and automatic daily composite sampling, for a range of parameters.

Southside ITA catchment

The Southside Outfall predominantly receives treated process water from the Acid Regeneration Plant and occasionally receives stormwater from the Southside ITA Catchment (approximately 41 ha, see Appendix A, Figure W-ITA5) via the Southside Ponds.

The Acid Regeneration Plant (ARP) is an ancillary plant associated with the pickle line in which spent acid is recovered for re-use. Water is treated via the ARP Wastewater Treatment Plant (WWTP) and discharged either directly to the Southside Outfall, or to the Southside Ponds in the event that the turbidity is elevated or that the pH is outside the defined range; the key contaminant is low pH.

ITA stormwater in this catchment consists of roof runoff and surface runoff from sealed and unsealed roads, carparks and yards. Stormwater from the Southside ITA Catchment flows via gravity to the Southside Ponds. Water from these ponds is typically recycled to the Ruakohua Dam reservoir for reuse in the Steel Mill. On rare occasions, during periods of high rainfall, discharge occurs to the Waiuku Estuary when outflow can exceed the capacity of the recycle lines and Southside Ponds.

The Southside Ponds comprise two settlement ponds (combined capacity of 13,000 m^3). The Southside Outfall discharge includes a range of monitoring equipment, including both continuous monitoring, and automatic daily composite sampling, for a range of parameters. The key stormwater

[1] Being the Local Yard – North, Local Yard – South and Yard A

[2] Permit 34089 (expires 18 May 2044) authorises the discharge of leachate from the East Landfill to the Northside Ponds (it authorises the discharge of contaminants from the East Landfill to land and water, including groundwater). The discharge of leachate to the CMA from the Northside Ponds is authorised by Permit 21575 (expires 31 December 2021). NZ Steel is currently seeking resource consent to authorise the discharge of leachate from the closed West Landfill and active East Landfill to the CMA via the Northside Ponds.

contaminants of interest include suspended solids, temperature, pH and heavy metals (in particular copper, iron and zinc).

North Drain ITA catchment

The North Drain receives treated process water from the Dewatering Plant and stormwater from the North Drain ITA catchment (approximately 44 ha). Both treated process water and ITA stormwater discharge into the North Drain, which then flows into the top of the Lower North Stream (see Appendix A, Figure W-ITA6).

The Dewatering Plant removes water from the Primary Concentrate (PC) slurry. The water for use in PC slurry pumping is extracted at the base of the Waikato River and therefore is brackish in nature. In the Dewatering Plant, PC is firstly separated from the slurry, then is treated in a clarifier with chemical addition. The treated process water then either discharges directly to the North Drain or passes through settlement ponds. The treated process water is continuously monitored for turbidity at both the clarifier outlet and the point of discharge to the North Drain. The key contaminants associated with the Dewatering Plant process water are some heavy metals (in particular aluminium, copper, iron, vanadium and zinc), turbidity and salinity.

The North Drain catchment includes existing ITA Areas and a Future ITA Area. Stormwater runoff is mainly surface runoff from raw materials stockpiles, including coal and co-product aggregates, a contractors' yard, and the rail siding. The Future ITA Area is currently farmland but could potentially be developed for ancillary industrial use should onsite operations necessitate. The North Drain ITA catchment has been split into various sub-catchments each of which are served by specific settlement ponds. Some of the ponds include the use of chemical treatment including coagulant and can be diverted to the Northside Ponds during periods of elevated turbidity. The key contaminants of concern from stormwater in the North Drain catchment are suspended solids, pH, and heavy metals (aluminium, boron, copper, iron and zinc).

Should the EAF be installed and operated, the key changes in the North Drain ITA Catchment will be a reduction in discharge from the Dewatering Plant (due to the reduction in use of raw materials) and the conversion of one of the raw material yards (either Coal Yards 5 and 6 (CY5/6) or Coal Yard 19 (CY19) to a storage yard for external scrap (Buffer Scrap Yard). The key contaminants of concern from stormwater from the Buffer Scrap Yard will include suspended solids, heavy metals and PAHs.

Ruakohua Stream ITA catchment

The Ruakohua Stream receives ITA stormwater discharges from approximately 10 ha of the ITA Area (see Figure W10, Appendix E of the AEE). The catchment does not receive process water. Stormwater runoff is received from two sub-catchments in the south-east of the Steel Mill: the Contractors' Compound and Yard 31 (see Appendix A, Figure W-ITA7).

The Contractors' Compound comprises offices, sealed carparking and roads, short-term storage of equipment and small workshops. Stormwater is treated via three Melter aggregate filter beds which operate in series, and discharge to the Ruakohua Stream.

Yard 31 comprises various activities including a rail yard, storage for finished steel products (such as billet and coils) and equipment, packing of sea-freight containers and metal scrap cutting. Activities in this yard may change periodically. Yard 31 discharges via settlement ponds to the Ruakohua tributary, which flows to the Ruakohua Dam reservoir. This catchment includes an area of grass which may be expanded into for the same activity; with stormwater flowing to existing settlement ponds for treatment.

In addition, there is a small area to the north of the dam identified as a Future ITA Area.

The key contaminants of concern from stormwater in the Ruakohua Stream catchment are suspended solids and heavy metals (copper, iron and zinc).

Kahawai Stream

The Kahawai Stream previously received ITA stormwater discharges from approximately 2 ha of the ITA Area (see Appendix A, Figure W-ITA8). There are no longer any existing ITA Stormwater Discharges to the Kahawai Stream, but activities may occur in the future and therefore this area has been identified as a Future ITA area.

Monitoring within the Kahawai Stream indicates that the discharges from current and historic activities are impacting water quality in the Kahawai Stream, despite in recent years NZ Steel have implemented measures to improve water quality.

Additional areas

There are two areas of the ITA Area that discharge directly to land, including the Slab Yard to the south-east of the Southside Ponds; and an area of internal unsealed roads, which is used for storage (see Appendix A, Figure W-ITA9). These areas are used for storage of equipment and finished products (steel slabs), and therefore have low contaminant generation potential. The areas discharge via informal vegetated swales and filter strips, with any runoff soaking into the ground. No direct discharge to any streams or the Waiuku Estuary occurs from these areas.

Long-term monitoring

Water discharges from the Site are monitored regularly for a range of contaminants. NZ Steel's Existing Consents place limits on the discharges from the Northside Outfall, Southside Outfall, and Dewatering Plant discharges in terms of flow volume and concentrations and loads of contaminants. The long-term historical monitoring has been compared to the Existing Permit limits and the Australia and New Zealand Water Quality Guideline (ANZWQG) default values for the protection of 80% and/or 95% of freshwater species (SPL).

On-going monitoring is proposed to be continued as part of the current application and is set out in the proposed conditions of consent.

Control of contaminants

NZ Steel operates under an Environment Management System (EMS) that covers all aspects of its operations, including contractors working on the Site. The EMS is certified in accordance with ISO 14001 and includes requirements to identify significant aspects and impacts at the Site. As part of the EMS, NZ Steel has specific policies and procedures to manage environmental risk, including documenting roles, responsibilities and practices in operating and maintenance procedures, training personnel and regular competency review and auditing.

NZ Steel undertakes regular reviews of water monitoring and management across the Site to identify areas for improvement and priorities for capital expenditure. Various improvements have been implemented since the Existing Consents were issued. Notable improvements that have been implemented include:

- The automation of flow diversions;
- Chemical treatment dosing;
- An audit to identify stormwater contaminant sources;
- Reconfiguring the settlement ponds to enhance treatment; and
- The installation of new drains and ponds.

The Site will also be operated under a Water Quality Management Plan (WQMP) (a draft is included in the AEE) which will set out the activities undertaken on the site, the potential contaminants and relevant controls. This will include on-going monitoring of discharges that will be undertaken and maintenance of the stormwater management and treatment systems.

From the time the EAF is installed, commissioned and operated, a key control of contaminants will be the scrap acceptance procedures for External Scrap to minimise contaminants and residues that could be entrained in stormwater. The WQMP will include a Ferrous Scrap Management procedure and associated conditions of consent are also proposed.

Assessment of effects on the environment

Overall, the effects of discharges from an Industrial and Trade Activity and process water discharges are considered to be no more than minor. The following sections summarise the key findings from the assessment.

Flooding effects

The effects on downstream flooding are negligible as discharges are either directly to the coastal environment, or to watercourses at locations where there are no downstream users/properties.

Freshwater effects

The effects on freshwater environments have been assessed based on the ecological effects outlined in the Freshwater Report (Appendix H to the AEE), monitoring results and consideration of the existing and proposed management methods and controls.

The assessment of effects of the ITA stormwater and process water discharges on freshwater concludes that:

- The potential effects associated with the discharges of contaminants and stormwater to the Ruakohua Stream and wetlands are considered less than minor. This is due to water quality monitoring showing no significant change in contaminant concentrations downstream of the discharges, 'Low' level of ecological effect to the stream habitat and wetlands, the presence of stormwater quality treatment for all Steel Mill discharges, and the high level of riparian planting of the stream on the Site;
- There are currently no discharges to the Kahawai Stream, but if activities were to commence in the future the potential effects associated with the discharges of contaminants and stormwater to the Kahawai Stream are considered to be no more than minor. This is due to water quality monitoring showing no significant change in contaminant concentrations downstream of the discharges and the provision of stormwater treatment for any new discharges;
- The potential effects of discharges to the North Drain and Lower North Stream are considered to be no more than minor. This is based on:
  - The adverse effects of the Dewatering Plant and ITA stormwater discharges on the North Drain and Lower North Stream will be avoided and mitigated to the greatest practicable extent, and the Freshwater Ecological Assessment concludes adverse effects will be 'Low'. In addition, the proposed wetland enhancement package will have incidental benefits to the instream communities of the Lower North Stream;
  - As monitoring of ITA Stormwater Discharges has historically been undertaken at the discharge location, a targeted programme of composite sampling has been undertaken within the Lower North Stream – for reconsenting purposes – to gain a greater understanding of the long-term contaminant concentrations and to understand variability in concentrations between short term and long term averages. Results showed that the majority of parameters reduced downstream to meet the Australian and New Zealand Water Quality Guidelines at the 95% SPL when considering long term averages.
  - In the event that future monitoring at the Site 1 in the downstream (northern) extent of the North Drain shows that long term averages result in exceedances of the relevant

DGV (80% SPL) additional controls may need to be implemented through the Water Quality Management Plan including additional treatment and further use of chemical treatment in the North Drain ITA catchment;

- There are no practicable measures to reduce the salinity of the Dewatering Plant discharge. The complete removal of the Dewatering Plant water would result in a reduction in the overall habitat through the reduction in stream flows, resulting in a greater level of ecological effect to the Lower North Stream than the retention of the discharge; and
- The enabled continuation of the discharge quantity resulting from the Dewatering Plant provides numerous positive benefits to the freshwater and wetland ecological values of the Lower North Stream, including increasing the extent and values of wetland complexes.

Marine effects

The potential effects of the process water and ITA stormwater discharges on the marine environment have been assessed based on the ecological effects outlined in the Marine Assessment (Appendix I to the AEE), with consideration of the existing and proposed management methods and controls. This includes assessment of effects both within the mixing zone surrounding the outfall locations and within the broader Waiuku Estuary.

The overall effects of discharges to the marine environment have been assessed as no more than minor. This is based on:

- The overall level of effect, based on the EIANZ framework on marine ecology, is very low to low for all habitat and species types over the Waiuku and Taihiki Estuaries over the duration of the consent, with the exception of coastal birds which has been assessed as moderate due to the very high ecological values;
- Given the spatial scale of the mixing zone relative to the wider Waiuku Estuary, the scale of the activity, the current controls in place, the amount of similar habitat type outside of the mixing zone, and NZ Steel's ongoing commitment to continual improvement, the size of the modelled mixing zone is considered reasonable from a water and sediment quality perspective;
- The current controls at the Site are considered to be consistent with the Best Practicable Option (BPO), with comprehensive treatment systems both of process water through the wastewater treatment plants and stormwater, leachate and ITA Stormwater Discharges through the established settlement ponds; and
- Compensation for residual adverse effects on birds through the implementation of a Coastal Bird Management Programme (CBMP) using either, or a combination of, construction and enhancement of bird roosts, mangrove and coastal vegetation management.

Overall effects

Overall the effects associated with discharges to Waiuku Estuary, the Ruakohua, Kahawai and Lower North Stream have been assessed as no more than minor on the basis of:

- The implementation of a WQMP to identify activities, contaminants and procedures to reduce or minimise the discharge of contaminants from the site including both ITA Stormwater Discharges and process water discharges;
- The Steel Mill operating under an ISO 14001 certified EMS that includes a continual improvement programme, to continue to identify and consider improvements over the term of the consent;

- A comprehensive monitoring programme to monitor effects on the Receiving Environment and provide a mechanism to identify potential changes in effects over the term of the consent;
- That the current controls and procedures are consistent with the BPO based on the nature and scale of operations at the Site; and
- The ecological effects based on the current discharges and contaminant loads have been assessed as very low to moderate, with additional wetland enhancement measures proposed as well as additional management measures proposed for those with moderate effects including additional monitoring and compensation measures.
- The effects assessments present a 'worst case scenario' based on the current operations. It is expected that overall effects on the Receiving Environment will be less should an EAF be installed.

1 Introduction

1.1 General

This report describes the proposed stormwater and process water (including leachate from the East and West landfills) discharges and management controls for the on-going Steel Mill operation. It has been prepared to support New Zealand Steel Ltd's (NZ Steel) application to replace its expiring Industrial or Trade Activity (ITA), Stormwater and Process Water resource consents for these discharges.

The figures supporting this report are contained in Appendix A.

1.2 Background

NZ Steel is the New Zealand-based subsidiary of Australasian company BlueScope Steel. NZ Steel owns and operates a fully integrated Steel Mill at Mission Bush Road, Glenbrook. The ITA Area of the Steel Mill is within a wider landholding (the Site) approximately 40 km south-southwest of Auckland.

Commercial operations have been undertaken at the Site since 1968, with commencement of production from a continuous galvanising line with imported feed coil, construction and operation of a Pipe Mill from 1972 (which operated at the Site until 2020) and construction and operation of the Paint Line from 1982.

Major investment in the 1980s saw the commissioning of the existing ironmaking facilities (four Multi Hearth Furnaces (MHFs), four Kilns and two Melters), the Steel Plant continuous slab-casting facilities and the Rolling Mills. By 1987, NZ Steel was operating as a fully integrated Steel Mill, producing flat steel products predominantly for the domestic market. The continuous galvanising line (in the Metal Coating Line) was modified in 1994 to produce ZINCALUME®, in addition to GALVSTEEL®. In 1997, investment was made in a second and larger Cogeneration Plant to recover energy from the Iron Plant waste heat, which together with the MHF cogen, now provides around 60 percent of the Steel Mill's electricity requirements. In 2015 a billet caster was installed to produce billet for the NZ Steel facilities in Otahuhu (producing reinforcing rod and bar) and more recently its Fiji Rolling Mill facilities.

NZ Steel has also recently secured co-funding from the New Zealand Government to enable the installation of an electric arc furnace (EAF) at the Site. The EAF is a significant step-change in steel making at Glenbrook. It is expected to reduce direct greenhouse gas emissions at the Site by approximately 45 percent and substantially contribute to New Zealand's emission reduction targets. Those reductions are due to the EAF enabling reduced use of virgin steelmaking materials (including coal) and recycling Ferrous Scrap using electricity instead. The EAF also provides a range of other economic, social and environmental benefits. Importantly, because much of New Zealand's domestic ferrous scrap is currently exported, the EAF represents an efficient circular economy opportunity for ferrous scrap within New Zealand and provides for continued steel manufacturing in New Zealand over the long term.

1.3 Existing resource consents

NZ Steel currently holds resource consents for discharge of stormwater and process water from the Site as shown in Table 1.1, which are referred to as the Existing Consents in this report.

Table 1.1: Existing consents and applications

Common name	Consent reference	Description	Expiry
EAF Scrap Yards Industrial or Trade Activity (ITA) discharges	BUN60142 2451	To authorise the ITA land use and discharges from the Scrap Yards associated with the EAF.	27 November 2028
Industrial or Trade Activity (ITA) discharges	41027	To discharge contaminants from an industrial or trade activity.	31 December 2021
Northside Outfall discharge	21575	To authorise the discharge of treated process water and stormwater into the coastal marine area from the Northside Outfall.	31 December 2021
Southside Outfall discharge	21576	To authorise the treated process water and stormwater into the coastal marine area from the Southside Outfall.	31 December 2021
Dewatering Plant discharge	21577	To authorise the discharge of clarified wastewater from the ironsand slurry dewatering plant to the North Drain.	31 December 2021

2 Steel Mill operations and process water discharges

2.1 Steel Mill operation overview

This section provides a summary of the Steel Mill Operations and process water discharges. A schematic of the process water system is included as Appendix B.

The fully integrated Steel Mill has a number of manufacturing plants (see Figure W7, Appendix E of the Assessment of Effects on the Environment (AEE)), with the following main operational components:[3]

- Iron plant: which converts the ironsand and coal to iron;
- Steel Plant: which converts the iron to steel and then into steel slab and billet. The proposed EAF will convert Ferrous Scrap and pig iron to steel which will then be cast into steel slab and billet;
- Rolling Mills: where the cast slab is rolled into coil for direct sale or further processing in the Finishing Plants; and
- Finishing Plants: where a range of finished products are produced including but not limited to pre-painted COLORSTEEL® and metal-coated ZINCALUME® and GALVSTEEL®.

In addition, there are ancillary activities across the Site that support the manufacturing process, such as raw materials storage and handling, co-product production, storage and handling and landfills.

The Steel Mill requires large quantities of clean water for the manufacturing and ancillary operations, including equipment cooling, waste gas cleaning (air pollution control), product rinsing and descaling, chemical process, heat exchange, steam generation, and general cleaning. Most of the Process Water in the circuit is recycled (in the vicinity of 98%) and the remainder is treated before discharge. As outlined in Section 4, stormwater collected from around manufacturing plants and areas containing ancillary activities, is captured for treatment and may also be used on Site or discharged.

2.2 Iron and steel making

2.2.1 Primary Plants

The Primary Plants consist of the Iron and Steel Plants, where raw materials are converted first into iron and then the molten steel is cast into steel slabs and billet. Iron and steelmaking slags are also produced in these processes.

The key sources of water include blow down water from the various scrubbers as well as blowdown from the cooling water systems. The Iron and Steel Plant process water is treated at the associated WWTPs. Most of the water in the systems is recycled and the remainder is discharged to the Northside Ponds. The key contaminants include suspended solids and heavy metals including zinc and copper.

2.2.1.1 Iron Plant: converting iron oxide to molten iron

The blended PC, coal, limestone and KOBM slag is sent to four Multi-Hearth Furnaces, operating at over 1000 degrees C, where it is heated so that moisture evaporates. The hot product is then fed directly into four rotary Kilns where the iron oxides in the ironsand are reduced to 80% metallic iron.

[3] Activities at the adjacent BOC Ltd site and Transpower substation are covered by separate resource consents and are not part of this application.

The product known as Reduced Primary Concentrate and Char (RPCC) is transferred without cooling into two electric melting furnaces (the Melters).

The two Melters convert the RPCC to molten iron ("pig iron") and Melter slag (see Section 2.3.2.1). Should an EAF be operated, only two Kilns and two Multi Hearth Furnaces (MHF) and one melter will operate at any one time.

The main use of process water in the Iron Plant is in air pollution control equipment, essential for ensuring discharges to air meet air quality standards and Air Permit emission limits. Waste gases from the Kilns and Melters are cleaned within scrubbers, which wash out solids from the gas stream. This generates a metal-rich water, which is transferred to the Iron Plant WWTP and the Steel Plant WWTP.

The WWTP plant consists of large twin clarifiers (22 metre and 14 metre diameter) and associated pumping systems. Along with chemical treatment, the clarifiers treat the process water before returning the "clarified water" back to the Iron Plant for reuse. The overflow from the WWTP is to the Northside Ponds, where further treatment occurs as the treated process water combines with stormwater. Solids removed from the treated process water (for both the Iron and Steel Plant WWTP's) are transferred to a thickener to form a sludge which is pumped to sludge dewatering ponds and subsequently the sludge is disposed to the East landfill.

Process water is also used for cooling very hot equipment and after temperature reduction in large cooling towers, is largely recirculated. Some discharge occurs from cooling towers to the Northside Ponds, to maintain process water quality.

2.2.2 Steel Plant: converting iron to steel

2.2.2.1 Current operations

At the Steel Plant, the molten iron is transferred to an oxygen steelmaking furnace (the KOBM) where scrap steel and various ferro-alloys and gases are added to turn the molten pig iron into molten steel. After tapping from the KOBM and further customisation at the Ladle Treatment Station and Ladle Metallurgical Furnace, the molten steel is sent to the caster to be made into slabs or billets and then cooled. A vanadium-rich slag is recovered from the molten iron (see Section 2.3.2.1).

The main source of water discharging from the Steel Plant is from the KOBM scrubber, required for cleaning the waste gases (in order to meet the conditions of NZ Steel's air discharge permit) Scrubber water discharges to the Steel Plant WWTP for treatment, as described for the Iron Plant WWTP (Section 2.2.1.1). Treated water is recirculated to the KOBM scrubbers and the overflow from the WWTP is directed to the Northside Ponds. Solids are transferred to the Iron Plant WWTP thickener, as described in Section 2.2.1.1.

2.2.2.2 Electric Arc Furnace

The EAF will melt Ferrous Scrap in addition to pig iron from the iron plant to make slab and billet. The EAF will be fed by internal scrap uprisings (as currently occurs in KOBM) and external scrap. The use of external scrap will reduce the amount of steel manufactured from raw materials at the Site. The EAF will replace the existing oxygen steel making furnace (KOBM) which would be decommissioned. The molten steel from the EAF will be sent to the existing caster to be made into slabs or billets and then cooled.

The proposed Scrap Yards (as discussed further at Section 2.3.1) will store the External Scrap required to be fed to the EAF.

2.2.3 Rolling Mills

2.2.3.1 Hot Mill

The Hot Mill reheats the cooled slabs from the Steel Plant in the reheat furnace before reducing the thickness via a rolling process. The Hot Mill uses water for surface descaling, to remove oxidised layers, and cooling. At the end of the hot rolling process the rolled steel is water cooled and coiled or cut into heavy plate for further processing.

The process water in the Hot Mill is treated in the Rolling Mills WWTP, which also removes any residual oils collected in the rolling process. Majority of treated process water is recycled either within the Steel Mill or via the Southside Ponds to the Ruakohua water supply dam.

The contaminants in this water are oxidised metals.

2.2.3.2 Cold Mill

Coil from the Hot Mill is sent to the Cold Mill for further rolling to produce a thinner strip, with a surface finish suitable for a wide range of coated and non-coated applications.

Cold rolled steel may then be pickled and oiled for distribution to customers or sent for further processing in the Finishing Plants. The Pickle Line discharges to the Acid Waste Plant WWTP, described in Section 2.2.3.3.

They key contaminants are metals and low pH; and possibly oils and grease.

Any oil waste is treated in the Oily Waste Plant and this discharge (once treated) returns to the Ruakohua Dam.

2.2.3.3 Acid regeneration plant

The Acid Regeneration Plant (ARP) is an ancillary plant associated with the Pickle Line in which spent acid is recovered for re-use. Wastewater from the ARP discharges to the ARP WWTP.

The treatment process consists of neutralising the weak acid arising from the ARP and the wastewater from the Pickle Line. In the WWTP, chemicals are dosed to neutralise the acid and the waste products are collected in a clarifier and periodically removed by truck for disposal at the East Landfill. The watery sludge product is made up of mainly iron oxide.

Treated wastewater from the (ARP is discharged either directly to the Southside Outfall Structure, or occasionally to the Southside Ponds when treated water does not meet the water quality consent limits.

The key contaminant is low pH, although the ARP discharge is only discharged via the Southside Outfall when the pH is within specification.

2.2.4 Finishing Plants

There are facilities in the ITA Area for finishing steel strip that are completely separate from the ironmaking, steel making and rolling sections of the Steel Mill. These facilities are:

- Metal Coating Line; and
- Paint Line.

2.2.4.1 Metal Coating Line

The Metal Coating Line is where the steel strip is metal coated in molten zinc or zinc-aluminium alloy baths, processed and recoiled, then treated with chromic acid to prevent rust.

In the Metal Coating Line, water is used for strip cleaning, prior to coating the surface of the steel strip. Process water flows into a holding tank, from which water is pumped to a larger tank for treatment (pH adjustment). Treated process water discharges to the site drainage system, flowing either to be recycled or discharged to the to the Northside Ponds.

2.2.4.2 Paint Line

The Paint Line is where organic paint coatings and laminate are applied to cold rolled steel products, before being recoiled.

The Paint Line uses water for surface cleaning, prior to painting the steel strip. There are two separate water treatment plants associated with the Paint Line pre-treatment section and the strip cleaning section. The two WWTPs are very similar, treating small volumes of water as a batch process. They include an oil removal tank, a dosing tank and a clarifier. Treated process water discharges to the stormwater network, flowing to the Northside Ponds.

2.3 Ancillary activities

Ancillary activities are supporting activities to the production of iron and steel and includes the movement of molten iron and steel slabs between manufacturing plants; stockpiling and processing of raw materials, co-products and waste; tipping of slag, iron and RPCC; and all supporting vehicle movements.

2.3.1 Scrap yards

When the EAF is operated, External Scrap will be stored within proposed Scrap Yards prior to being fed into the EAF, this will ensure consistent supply for the EAF operation.

The proposed Scrap Yards will comprise:

- Local Yards – North and South;
- Yard A; and
- Buffer Scrap Yard:
  - Option 1 – conversion of the existing CY19 coal yard; or
  - Option 2 - conversion of the existing CY5/6 coal yard.

A buffer scrap yard may be necessary to ensure there is sufficient storage to manage delivery inconsistencies (particularly in the initial years of deliveries). This buffer storage yard would support delivery of External Scrap where a large volume may be delivered within a short period. The final location of the Buffer Scrap Yard has not been specified but two options are being considered. This consent application therefore seeks authorisation for both options, however only one may be constructed.

It is noted that, to date, NZ Steel has processed its existing uprisings of scrap (from internal processes) in the KOBM and this will be fully diverted to the EAF when the KOBM is decommissioned.

External scrap will be processed off-site by Suppliers (including removal of non-ferrous material, shredding, cutting and grading) prior to arrival on site by truck and train. The two main sources of external scrap will be:

- Shredded scrap - which is predominantly sourced from shredded vehicles, and typically comprises small fist size pieces of scrap.

- Heavy melt scrap (HSM) - which comprises a mix of recovered structural steel from demolition sites and recovered materials from industrial metal processing. HSM is more variable in size and shape.

A scrap specification included will clearly set out quality requirements to meet manufacturing requirements and to also minimise or avoid materials harmful to people and the environment. As such contaminants from these sources in the external scrap delivered to the Site will only be residual.

2.3.2 Bulk raw materials storage and handling

The northern portion of the ITA Area is used for raw material stockpiling on an ongoing basis. Each of the following material stockpiles contributes to ITA stormwater runoff:

- Primary Concentrate (PC) is refined ironsand, which is pumped as a slurry (via the slurry pipeline) from the Waikato North Head mine and is dewatered and stockpiled before use;
- Coal, which is delivered by both by train and trucks to the Site. Locally sourced coal delivered by train is directly transferred to the working stockpile via the coal reception hopper. Whereas coal delivered by trucks is stockpiled in intermediary stockpiles prior to being transferred by loader to the coal reception hopper, for transfer to the working stockpile; and
- Limestone and KOBM Slag, are stockpiled prior to transfer by loader to the coal reception hopper to be deposited onto the working coal stockpile. In recent years some purchased limestone has been replaced by KOBM slag produced in the Steel Plant, as it is lime rich. Limestone and KOBM slag are fed onto the working coal stockpile to ensure correct blending.

Material from the PC and coal working stockpile (containing KOBM Slag and limestone) is recovered and transferred by conveyor belts into bins to feed the MHF, at the start of the iron making process.

Runoff from the stockpiles is treated in specific settlement ponds. Discharge from these settlement ponds is monitored continuously for turbidity, and chemical treatment is added to improve settlement. It is noted that from when the EAF is fully operational (around mid-2026), the storage of bulk raw materials will be reduced (to make way for the Scrap Yards identified above). The ITA stormwater catchments, treatment and discharge points are discussed in Section 4.

2.3.2.1 Dewatering plan discharge

The Dewatering Plant removes water from the PC slurry which has been pumped from the NZ Steel mine at the mouth of the Waikato River. At the Dewatering Plant, Hydrocyclones and a constant density tank separate the liquid from the PC. The separated water is treated through a high-rate thickener (clarifier) and treated water is either directly discharged to the North Drain or is discharged to the Dewatering Plant settlement ponds for additional treatment before discharge[4]. The water is continuously monitored for turbidity at both the clarifier outlet and the point of discharge. It is noted that when the EAF is fully operational, the operating hours for the Dewatering Plant discharge will reduce by up to half with a subsequent reduction in total volume.

The key contaminants associated with the Dewatering Plant discharge include suspended solids and salinity due to the brackish water.

[4] The Dewatering Plant discharge permit (Permit 21577) places limits on the discharge: Condition 2.1 limits the daily discharge volume (measured as a monthly average), and Condition 2.3 limits the turbidity of the discharge (measured as a daily flow-weighted average).

2.3.3 Co-product production, storage and handling

To avoid or minimise landfilling, NZ Steel has introduced recovery of a range of iron-rich materials which are generated in the manufacturing facilities. In addition, slag generated in the iron making process has been developed into valuable aggregate products for roading and drainage markets.

2.3.3.1 Slag production and processing

Slag is a non-metallic residue produced from the iron and steelmaking processes. The three main slags are:

- Melter Slag from the Iron Plant;
- Vanadium Slag from the Steel Plant; and
- KOBM Slag from the Steel Plant.

These slags are tipped into open pits while still hot and then water quenched. The slags are then further air cooled and crushed into a range of aggregates by SteelServ NZ Ltd (SteelServ[5]). The Melter and Vanadium Slag is crushed at the Steelserv Aggregate Crushing and Screening Plant.

Much of the process cooling water remains within the pits and evaporates, however some runs off via sheetflow to the Northside Ponds for treatment.

Stormwater from the cooling pits, stockpiling areas and Aggregate Plant discharges to the Northside Ponds for treatment.

Melting Slag

A by-product of the Iron Plant is slag. Slag is tipped from the Iron Plant Melters into lades which are tipped into open pits and cooled with water. Once cool, the reclaimed slag is stockpiled for weathering before further size reduction in the Aggregate Plant. The material is then screened to produce a variety of grades of roading and drainage aggregates, largely for the Auckland market.

Vanadium Slag

Within the Steel Plant, a vanadium-rich slag is recovered from the molten iron in the Vanadium Recovery Unit. Vanadium Slag is raked off the iron ladle (following controlled oxygen blowing) into skips. After transfer to an area outside of the Steel Plant building the slag is tipped out for cooling. Once cooled, it is transferred to the processing areas and then bagged for export sale.

KOBM Slag

KOBM Slag is produced in the KOBM Oxygen Blowing Furnace, where the iron is converted to steel. It is transferred in a ladle and tipped into an open pit, to allow for cooling. It is then recovered and screened at the Metal Recovery Plant. A significant volume of KOBM slag is placed onto the coal stockpiles to replace purchased limestone. The balance is either sold or landfilled.

EAF Slag

EAF Slag is produced in the EAF, where the iron is converted to steel and mixed with Ferrous Scrap. The Slag is tapped (poured) and then will be tipped onto the existing tipping banks to cool. It will then be recovered and screened at the Metal Recovery Plant.

[5] SteelServ is a subsidiary of NZ Steel and its activities at the Site will continue to be managed under the resource consents held by NZ Steel.

2.3.3.2 Millscale

Millscale is the term for flaked iron oxide generated on the surface of the steel during the rolling of slabs in the Hot Mills. Millscale is removed in the Rolling Mills as part of the water treatment processes and stockpiled for addition in the iron and steel making processes.

2.3.3.3 Internal scrap steel cutting

Scrap steel arising from the manufacturing processes at the Site is sorted, graded and cut to size for recycling in the steelmaking process. A small washing plant may be used to remove fines from scrap. Solids from this process are collected in the settling pond and the water flows to the Northside Ponds.

2.3.3.4 Works debris

Works debris is a collective term for the debris that can be recovered from around the Primary Plants. It may consist of ferrous scrap, slag, launder sand, broken refractory brick and other residue from the iron and steel making processes. The Metal Recovery Plant screens works debris to recover the ferrous and grade the remaining product. The latter may be used as a stabilised aggregate or used in the landfill for forming the cells (to receive wet sludges) or form the final contour of rehabilitated cells.

Stormwater from these areas discharges to the Northside Ponds for treatment.

2.3.3.5 Iron plating

Iron plating is the pouring of molten iron into specially prepared, open-air pits. Plating of molten iron from the Melters currently occurs in two circumstances, plating due to process disruption ('process iron plating') and plating for commercial sale ('commercial iron plating').

Water is used at the excavated bed to cool the iron so the plate iron can be recovered. Plate iron is then transferred to a Scrap Yard for processing, either for use on Site manufacturing plants or for export sale. Water from these areas is either evaporated as it is sprayed over 1000^{o}C iron or discharges to the Northside Ponds for treatment.

2.3.3.6 RPCC tipping and recovery

In the event of operational problems at the Melters, or a breakdown of the RPCC transfer system, RPCC produced cannot be transferred directly to the Melters, which results in the tipping of RPCC.

When RPCC is tipped into excavated beds, water is sprayed onto it for cooling. The RPCC is then recovered for screening and recycling back into the Ironmaking process. As part of these processes, water is sprayed over the molten metal to assist with cooling. Runoff from the tipping banks is collected in a small pond and then discharged to the Northside Ponds.

Stormwater from the cooling pits, stockpiling and screening areas discharge to the Northside Ponds for treatment.

2.3.4 Workshops

There are two main workshops within the Site:

- The Central Workshops; and
- The Steelserv Workshops.

The Central Workshops are adjacent to the MCL and the Steelserv Workshops are north of the Hot Mill. The activities in these workshops include maintenance of equipment and large vehicles used on the Site.

There is storage of oils, gases and chemicals for use in the Workshops. There are no process water discharges from these Workshops. Oil traps are installed in the yards around the Steelserv vehicle workshop for pre-treatment of yard stormwater, which will flow to the Northside Ponds.

Potential spills of oils or chemicals are contained within the building in engineered storage cabinets or within a secondary containment system. Both workshops have spill kits adjacent to where substances are stored and used, and "Hazardous awareness training" is completed by all staff.

2.3.5 Car parks, access roads, and non-process buildings

Yard, carparks and roads across the Site can be sealed or unsealed (hardstand).

The access roads, car parks, and non-process related buildings, such as offices, laboratories and the Contractors' Compounds at the Steel Mill do not discharge process water. However, stormwater runoff from the hardstand contains suspended sediment and metals, similar to other industrial and commercial properties within the Auckland region.

Majority of this stormwater is discharged via the Northside or Southside Ponds depending on the catchment. The ITA stormwater catchments, land use and treatment are discussed in Section 4.

2.3.6 Landfills

NZ Steel has three industrial mono-fills (landfills) at the Site:

- The active East Landfill;
- The closed West Landfill; and
- The closed North Landfill.

The active and closed landfills have only accepted waste materials from the Steel Mill including from the Iron and Steel Plants, WWTPs, air pollution control systems, stormwater treatment and administration areas. The landfills have not received any municipal waste or external waste materials. The materials disposed of to the landfills comprise alluvial silts, baghouse dusts, iron-bearing sludge and works debris (which is a mixture of residual iron sand, char, slag, aggregates and bricks) from manufacturing process and administration areas. Further detail on this is provided in C10 of Appendix C.

The active East Landfill and the closed West Landfill are located adjacent to the Lower North Stream. There are two separate leachate collection ponds for each of the East and West Landfills. Leachate is pumped to the Northside Ponds for treatment where it mixes with other process water and ITA Stormwater Discharges prior to discharge from the Northside Outfall.

Leachate from the North Landfill historically drained to a leachate collection pond and was then pumped to the Northside Ponds for treatment prior to discharge. As the North Landfill was closed around 1992, there are no observed flows from this landfill to the leachate collection pond. (We note that the former North Landfill leachate pond is now used for other purposes but has not been renamed).

The landfill operations are covered by separate consents. However, as the East and West Landfill leachate is included in the discharge from the Northside Ponds, and NZ Steel is seeking a discharge permit for discharges from the Northside Ponds to the CMA, the cumulative effects of the leachate in the Northside Ponds discharge are included within this assessment.

The leachate from the East and West Landfill is significantly different from leachate from municipal landfills, with limited putrescible material. Regular monitoring of the leachate from the East and West Landfill shows elevated pH, aluminium, copper and zinc. A full analysis of the leachate is included in the monitoring data review report in Appendix C.

The contaminants identified in the landfill leachate are also key contaminants resulting from various processes around the Steel Mill (as expected since the waste sources are generated from activities within the Site). Therefore, the overall assessment of the effects of the combined discharge from the Northside Outfall includes the key contaminants from the leachate (see Section 9.4).

2.3.7 Ruakohua Dam

The Ruakohua Dam is a reservoir within the Site that is used to store water for use in the Steel Mill processes, as well as for firewater. The water within the Ruakohua Dam reservoir includes direct flows from the Ruakohua Stream catchment, recycled treated ITA stormwater and process water from the Steel Mill, and water piped from the Waikato River.

The Ruakohua Dam and spillway are covered by separate resource consents[6] and are therefore not part of this application. However, as ITA stormwater discharges to the dam via discharges to the Ruakohua Stream, the effects of ITA areas to the Ruakohua Stream and Dam are included in this assessment.

[6] Permit 40650 (to dam the Ruakohua Stream with the Ruakohua Dam), Permit 40651 (to take water from the Ruakohua Dam to use in the Steel Mill), Permit 40652 (for the diversion of the Ruakohua Stream), and Permit 40653 (to discharge water from the Waikato River into a stream channel to the dam, discharge from the dam scour valve to freshwater, and discharge from the dam spillway to freshwater). These resource consents all expire on 31 May 2048.

3 Environmental setting and current environment

This section provides a summary of the environmental setting and Current Environment from for the ITA Area discharges.

3.1 Site location

NZ Steel owns approximately 550 ha of land in Glenbrook, as shown in Figure W1, Appendix E of the AEE. The Steel Mill occupies an area of approximately 190 ha, which is zoned Business – Heavy Industry Zone in the Auckland Unitary Plan (AUP) (see Figure W3, Appendix E of the AEE). NZ Steel's land to the north, east and south of the Steel Mill is farmed and contains the operational East landfill and the closed West landfill. The farm forms a greenbelt around the Steel Mill and acts as a buffer between the Steel Mill and the surrounding farmland and communities (and potential sensitive receivers).

To the west of the Site is the Waiuku Estuary, which is a long and relatively narrow tidal arm of the Manukau Harbour. Waiuku township is approximately 5 km by road south-west of the Steel Mill and the settlement of Glenbrook Beach is 3 km to the north of the Steel Mill. Access to the Site from the south is via Mission Bush Road and access from the east is via Glenbrook Beach Road and Glenbrook Road.

3.2 Rainfall

NZ Steel measures rainfall with an on-site rain gauge. Average rainfall is around 1300 mm per year, which is comparable to the Auckland average of 1240 mm/ year[7].

The closest National Climate Database weather station with good data coverage is at Pukekohe, approximately 16 km east of the site[8]. Readings from the Site and Pukekohe stations are in good agreement. Over the period January 2010 to August 2019, the Glenbrook rain gauge recorded 1296 mm/year and the Pukekohe rain gauge recorded 1284 mm/ year.

3.2.1 North Drain and Lower North Stream

3.2.1.1 Location and catchment characteristics

The North Drain ITA catchment discharges into the North Drain which flows into the top of the Lower North Stream. The Lower North Stream is located to the north of the Steel Mill and flows in northerly direction towards the Waiuku Estuary (see Figure W9, Appendix E of the AEE).

3.2.1.1.1 North Drain

The North Drain was constructed to convey Steel Mill stormwater and Dewatering Plant treated discharge to the Lower North Stream[9]. It was constructed after the former Northside Stream had been filled in as part of Steel Mill development from the 1960s to the 1980s.

The North Drain is approximately 1.4 km in length and is located entirely within the ITA area boundary. It is a concrete-lined channel at its downstream end (0.4 km), and a straight channel with a soft sediment substrate at its upstream end (0.8 km). The North Drain is piped for a small section near the Transpower Sub-Station and is culverted under Brookside Road. No riparian vegetation is present along the North Drain.

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[7] 1971-2000 average, sourced from https://niwa.co.nz/education-and-training/schools/resources/climate/summary
[8] Agent No. 2006, Network Number C74283, accessed from https://cliflo.niwa.co.nz/
[9] Tonkin & Taylor Ltd & Bioresearches Ltd, June 1983. New Zealand Steel Limited Woolf Fisher Works application for water rights renewal, 1983. Report Prepared for New Zealand Steel Ltd. Reference 5744

The North Drain catchment is 56.7 ha, of which approximately 44 ha is the ITA area. The North Drain receives ITA stormwater from the Steel Mill raw materials yards, process water from the Dewatering Plant, adjacent farmland within the ITA area, and runoff from the Transpower Switchyard and the BOC site[10]. During dry periods, flow is dominated by water from the Dewatering Plant.

Flows from the Dewatering Plant can be up to 7,400 m^3/day with an annual average daily flow from the Dewatering Plant of around 3,915 m^3/day[11]. The plant operates daily with regular maintenance shut downs and may also stop due to operational issues. The North Drain also receives stormwater from the surrounding catchment.

3.2.1.1.2 Lower North Stream

The Lower North Stream comprises an unmodified (natural) lower section and a modified upper section with a total catchment of 195 ha. The Lower North Stream catchment historically extended to Brookside Road, at a location further west than the present-day channel. The development of the West Landfill resulted in modification and realignment of Lower North Stream, with the channel shifted east of the original channel.

Downstream of the Steel Mill and Brookside Road, the Lower North Stream flows between the East and West Landfills. The riparian margins of Lower North Stream have been planted with native vegetation. A small unnamed tributary (referenced as the landfill gully stream in NZ Steel monitoring) at the base of the East Landfill flows into the Lower North Stream approximately 1 km downstream of Brookside Road. From this point the Lower North Stream continues for approximately 200 metres until it discharges to the Waiuku Estuary. The riparian margins in this lower 200 metre section of stream have previously been fenced to exclude stock access and planted with native vegetation.

A high level assessment using flows from the Council's Freshwater Management Tool[12] and recorded Dewatering Plant flows indicates that, when the Dewatering Plant is operating, it contributes on average 80% of the total flow within the Lower North Stream at the stream mouth (at 50th percentile flow).

3.2.1.2 Water quality and ecology

Receiving environment water quality has been monitored in the North Drain and Lower North Stream since 2010, primarily associated with the consenting and operation of the East Landfill. Monitoring associated with the ITA activities focussed on monitoring of the discharges to the North Drain. Regular monitoring from September 2019- September 2021 has been used in this assessment. Monitoring locations are described below from upstream to downstream:

- Site 1C: this is a location for grab samples in the North Drain. A requirement of the East Landfill consents, it was initially selected to represent conditions upstream of the discharge to the Lower North Stream from the two landfill access road ponds. This is immediately upstream of the Brookside Road culvert and represents water quality within the North Drain and includes ITA Stormwater Discharges after reasonable mixing.
- Site 1: To support the consent application a composite sampler was set up downstream of the Brookside Road culvert and landfill access road ponds for daily composite monitoring, after

[10] This ITA consent application does not cover the BOC and Transpower sites.
[11] Dewatering Plant discharge quantities to the North Drain between January 2016 and July 2020 have been supplied by NZ Steel. The average daily Dewatering Plant discharge between 2016 and 2020 was 3,915 m^3 per day on the 5 or 6 days each week that it is operating.
[12] The Freshwater Management Tool is an Auckland Council hydrological model that estimates flows and water quality for watercourses in the Auckland Region. In the case of the Lower North Stream, the flows account for only the unmodified, 'natural' stream catchment, and therefore provide a basis for the stream flows without the site stormwater or Dewatering Plant discharge.

reasonable mixing of the ITA Stormwater Discharges in the North Drain (this site will remain as part of the on-going monitoring programme).

- Site 4: To support the consent application, a composite sampler was set up in the lower reaches of the Lower North Stream, downstream of the confluence with the tributary from the East Landfill (this site will be discontinued following the granting of the consent).

The water quality monitoring results are in Appendix C discussed further in Section 6.3 below. A summary of the data is compared to the Australia New Zealand Water Quality Guidelines (ANZWQG) values for freshwater.

Water quality in the North Drain and Lower North Stream reflects its modified nature with the monitoring showing that water quality at Site 1 (in the North Drain) generally meeting the 80% Species Protection Level (SPL), and at Site 4 (in the Lower North Stream), meets the 95% SPL for most contaminants.

Electrical conductivity is elevated along the entire length of the North Drain and Lower North Stream due to the Dewatering Plant discharge, which varies between freshwater and brackish water.

An ecological assessment of the North Drain and Lower North Stream is detailed in the Freshwater Ecological Assessment (Appendix H of AEE) and summarised below:

- North Drain: Ecological value (SEV) is low, due to the lack of favourable habitat, especially in the concrete-lined section. The low ecological value is due to the artificial channel that acts as a stormwater conveyance, with no functional stream habitat; and
- Lower North Stream: Ecological value varies between low to moderate, improving downstream. The modified upper reach is classified as having a 'poor' abundance and diversity of habitat, due to the lack of riparian shading and the modified nature of the stream, which has resulted in macrophyte growth across the stream. The downstream section has a more natural form and a higher ecological value. This is primarily due to the established native riparian vegetation that was planted approximately 20 years ago. While the freshwater fish diversity in Lower North Stream is low, longfin eels and inanga are present in the downstream reach.

3.2.2 Ruakohua Stream

3.2.2.1 Location and catchment characteristics

The Ruakohua Stream flows in a south-westerly direction to the south of the Steel Mill. Ruakohua Stream's main stem is approximately 4 km in length, flowing in a south-westerly direction to the Ruakohua Dam (see Figure W8, Appendix E of the AEE).

Ruakohua Stream has been dammed at the Steel Mill to form a reservoir (Ruakohua Dam), which is used for Steel Mill process water and firefighting water. Other sources of water to the Ruakohua Dam reservoir are a tributary to the Ruakohua Stream (referred to as the Ruakohua Tributary), treated water from the Southside Ponds, and water piped from the Waikato River into the Ruakohua Tributary.

The Ruakohua Dam discharges intermittently via an emergency spillway to the Waiuku Estuary. Analysis of historical photographs and design plans indicate that a section of the Ruakohua Stream was diverted around the NZ Steel development area between 1977 and 1980, following the approval of a diversion water right. The Ruakohua Stream's headwaters lie approximately 2.5 km beyond the eastern Site boundary and around 3 km from the Steel Mill. The Ruakohua Stream drains a total catchment of approximately 325 ha, approximately 220 ha of that (80%) is upstream of the Site boundary. This upper catchment land use is predominantly rural, including beef and dairy farming, and market gardens, the lower catchment land use includes the Steel Mill Site. The Ruakohua Stream on the Site has previously been riparian planted, and now includes a dense riparian zone.

3.2.2.2 Water quality and ecology

ITA stormwater discharges to the stream are monitored, as required by Existing Consents. The results of this monitoring are summarised in Appendix C and discussed in Section 6.3.5. ITA discharge monitoring locations are described below from upstream to downstream:

- Contractors compound: ITA stormwater sampling location for grab sampling.
- Yard 31: ITA stormwater sampling location for grab sampling.

For the recent reporting period, water quality monitoring was undertaken monthly between November 2019 and September 2021. The results indicate elevated aluminium, copper, iron, zinc and total suspended solids, indicating that there are some sources of these contaminants upstream of the Site.

Given that the stream feeds into a dam, there will be a significant settlement of sediment prior to discharge to the Waiuku Estuary.

Ecological monitoring has been carried out at three locations along the stream; the results are contained in the Freshwater Ecological Assessment (Appendix H of AEE), and summarised below:

- The ecological value is 'poor' along on surveyed reaches;
- Ecological monitoring indicates that upstream of the Site had lower ecological scores than downstream, which indicates that the stream is impacted by upstream sources;
- It is expected that as the riparian planting matures, a greater level of channel shading is likely to improve the habitat within the lower reach of the stream; and
- As part of re-consenting the Ruakohua Dam, fish passage enhancement was undertaken in 2015 in the lower part of the Ruakohua Stream and on the dam spillway. Despite this, native fish diversity is low in the Ruakohua Stream although longfin eel (an 'At-Risk' species) are present.

3.2.3 Kahawai Stream

3.2.3.1 Location and catchment characteristics

Kahawai Stream is on the northern margin of the Steel Mill Heavy Industry Zone. It flows in a general north-westerly direction for approximately 1.2 kilometres before flowing into the Waiuku Estuary (see Figure W9, Appendix E of the AEE). The majority of the Kahawai Stream is fenced to exclude stock access and there is mature riparian vegetation along most of the stream. Kahawai Stream is surrounded mostly by agricultural land currently used for cattle grazing. Within the existing Kahawai Stream ITA sub-catchment (2 ha area) there are no longer any direct ITA Stormwater Discharges[13]. The balance of the Heavy Industry Zone, also within the Kahawai Stream catchment, is undeveloped.

3.2.3.2 Water quality

Water quality has been monitored at four locations in the Kahawai Stream. Data from 2019 to 2021 has been included in this report which relates to when discharges from the Kahawai Future ITA area were occurring. Monitoring locations are described below from upstream to downstream:

- Kahawai Culvert: A receiving environment monitoring location for grab samples that reflects the discharge location of the tributary of the Kahawai Stream;

[13] This ITA catchment formerly included the Metal Cutting Yard (MCY) which has been remediated in 2023.

- Kahawai Upstream: A within stream monitoring location for grab samples, upstream of the Kahawai ITA discharge location.
- Kahawai Downstream: A within stream monitoring location for grab samples, downstream of the ITA discharge.
- Kahawai ITA (previously known as Metal Cutting Yard): A former ITA stormwater sampling location for grab samples (there are no longer any direct ITA Stormwater Discharges to the Kahawai stream).

Water quality monitoring results are in Appendix C and are discussed further in Section 6.3.4 below. The data has been compared to the ANZWQG values for freshwater.

The long-term mean exceeds the ANZWQG 80% SPL for most parameters, both upstream and downstream of the previous ITA discharge in the Kahawai Stream. The stream does not achieve 80% SPL for metals (aluminium boron, copper, iron and zinc); the source of this has not been confirmed but there are no ITA stormwater discharges into the upstream reach which indicates the source is not associated with on-going ITA activities but may be associated with on-going passive discharges from below the existing ground level.

An ecological assessment of the Kahawai Stream is detailed in the Freshwater Ecological Assessment (Appendix H of AEE) and summarised below:

- The ecological value is 'moderate'; and has increased over the last 15 years which is attributed to the riparian planting that has been undertaken by NZ Steel; and
- No 'At Risk' or 'Threatened' freshwater fish species were caught in the Kahawai Stream.

3.2.4 Freshwater Wetlands

The Freshwater Ecological Assessment (Appendix H of AEE) has assessed wetlands within each of the receiving freshwater catchments. Approximately 3.0 ha of wetlands have been identified, the majority of which are riparian wetlands that border defined stream channels and together form stream-wetland complexes. Most of these wetlands are dominated by exotic species however, several smaller native-dominated wetland types are also present.

There are no wetlands observed to be present within the ITA Area. Wetlands are present within the Lower North Drain, the Ruakohua Stream and the Kahawai Stream river channels, generally within the lower reaches and associated with riparian planting. The Lower North Stream wetland complexes have the highest ecological values, due to the presence of established native riparian planting, diversity of vegetation types and connectivity to coastal wetlands.

3.3 Waiuku Estuary

Stormwater and process water from the ITA Area discharges go to the Waiuku Estuary (see Figures W4 and W5, Appendix E of the AEE). The ecological characteristics of the marine environment is described in the Marine Ecological Assessment.

3.3.1 Location and catchment characteristics

The Waiuku Estuary is the ultimate receiving environment of the ITA and freshwater discharges. It is discussed in the Marine Ecological Assessment (Appendix I of AEE) and the following sub-sections provide a brief summary.

The Waiuku Estuary is one of the four main arms of the Manukau Harbour. It extends about 11 km from Waiuku Township downstream to Clarks Beach. The Taihiki Estuary, which flows in a westerly direction to the mouth of the Waiuku Estuary, is a major offshoot of the Waiuku Estuary.

The Waiuku and Taihiki Estuaries drain at low tide. They receive freshwater inputs from a catchment of approximately 300 km^2. The land use of the estuary is predominantly rural and includes Waiuku township, rural settlements and the Site.

Freshwater stream inlets enter the Waiuku Estuary along its length, including the Lower North Stream, Kahawai Stream and Ruakohua Stream.

3.3.2 Water quality

Marine water quality monitoring has been undertaken by Council at the Waiuku Town basin (upstream) and at Clarks Beach (downstream). Council monitors for sediments and nutrients, but metals are not tested in the Council water quality monitoring programme.

The water quality values under the Council monitoring programme are very poor to moderate. This is due to elevated suspended sediment and nutrients (nitrogen, phosphorus and chlorophyll a), likely due to horticulture, pastoral farming, and potentially the Waiuku and Clarks Beach wastewater treatment plants (WWTP) discharge.

NZ Steel has carried out continuous metals and suspended solids monitoring at the Northside and Southside Outfall discharge points. To support NZ Steel's consent application DHI has carried out modelling of metals, temperature, and salinity in the Waiuku Estuary (Annex to Appendix I of AEE). The model indicates that the background levels of copper and zinc in the Waiuku Estuary can be elevated above the ANZWQG marine 99% SPL in areas directly adjacent to discharges from major river catchments.

3.3.3 Ecological assessment

An ecological assessment of the marine environment is detailed in the Marine Ecological Assessment (Appendix I of AEE) and the key points summarised below:

- The Waiuku and Taihiki Estuaries have a number of important estuarine and marine ecological values. While benthic habitats are degraded in many areas through sedimentation, and in some areas also due to metal contaminants, they still support a number of High value fish species and coastal birds, as does the coastal fringe vegetation. The area may also be visited by marine mammals, although no official sightings have been made; and
- The Waiuku and Taihiki Estuaries are recognised nationally as a hotspot for coastal bird diversity and constitute one of the most important areas within the Manukau Harbour for seabirds. This is acknowledged in the AUP, with a number of Significant Ecological Areas – Marine in the Waiuku and Taihiki Estuaries recognised both for the extensive intertidal flats that provide foraging habitat for birds, and for the high tide roost sites that provide roosting habitat for 'Threatened' and 'At Risk' endemic and migratory species. Fringing mangrove forest and saltmarsh vegetation also provides habitat for cryptic bird species.

4 Stormwater catchment, treatment systems and discharge locations

4.1 Introduction

This section provides a description of the stormwater catchments, treatment systems and associated discharges within each ITA Area. The ITA Area has five discrete stormwater catchments as shown on Appendix A Figure W-ITA3:

- The Northside Outfall;
- The Southside Outfall;
- North Drain;
- Ruakohua Stream; and
- Kahawai Stream.

The Northside and Southside ITA catchments flow through the Northside or Southside Ponds and discharge via a single outfall location at each. The Ruakohua and North Drain catchments have several discharge locations associated with different activities and treatment devices. The Kahawai Stream catchment currently has one discharge location via a tributary. There are also two small additional ITA areas, adjacent to the Southside catchment, which are outside of these five catchments.

The ITA Area stormwater catchments, land use, treatment systems and discharge points are summarised in Table 4.1 (below), with detail and definitions provided in the following sections. Process water sources and treatments are discussed in Section 2.

The activities within each catchment may change over time during the duration of the consent, depending upon the operational requirements of the Steel Mill. This section identifies the current ITA catchments, activities and ITA stormwater treatment to be able to provide a benchmark for stormwater treatment. Changes to activities may result in altered ITA stormwater catchments and treatment devices. These will, as a minimum, provide treatment to the same efficiency as the current devices, and will follow the Best Practicable Option (BPO).

Table 4.1: Overview of current ITA stormwater catchments, treatment systems and discharge locations

	ITA Areas and land use	Primary stormwater treatment device(s)	Discharge and monitoring
Northside ITA Catchment	The Northside ITA Catchment: • Process buildings; • Administration buildings; • Bulk raw material stockpiling and handling; • Co-product production, storage and handling; • Slab cooling yards; and	Northside Ponds comprise: • Two ponds, both have a capacity of 15,000 m^3; and • Ponds include additional treatment measures. • Other treatment devices are pumped to the Northside Ponds.	The primary outflow is to the Manukau Harbour CMA, via a controlled discharge. Water quality is monitored at the outlet (daily grab and composite samples) and grab samples at one inlet location (chute). The outlet has real-time monitoring to control room.

	ITA Areas and land use	Primary stormwater treatment device(s)	Discharge and monitoring
	• Sealed and unsealed roads. Approximate area of 69 ha.	SRNZ ponds: • Comprise two ponds, with capacity of 8,000 m^3 and 5,000 m^3 (surge). • Water enters Pond 1 then flows to Pond 2. • Pond 2 has two Melter Aggregate filter walls providing additional treatment.	Pond 2 water either flows by gravity to Northside Ponds or is pumped to Southside Outfall. When pumped to Southside Outfall, the outfall continuous monitoring is monitored.
Southside ITA Catchment	The Southside ITA catchment: • Process buildings, • Administration buildings; • Sealed and unsealed roads; • Sealed car parks; and • Slab cooling yards. Approximate area of 41 ha.	Southside Ponds, comprise two ponds: • Southside duty pond with a capacity of 8,000 m^3; and • The Southside surge pond has a capacity of 5,000 m^3.	Water is generally recycled to the Ruakohua Dam reservoir. During periods of high rainfall, excess flow is discharged to the CMA. Water quality is monitored at the outlet (daily grab and composite samples).
North Drain ITA Catchment	East Pond sub-catchment: • Coal Yard 5/6; • Coal Yard ½; and • Stores building roof. Approximate area of 5.4 ha.	East Pond: • Capacity of 1,310 m^3; • Includes additional treatment measures; and • Additional devices generally provide conveyance.	The East Pond discharges to the North Drain. Water quality is monitored at the outlet (grab samples) following a rain event.
	Y56K Pond sub-catchment: • Aggregate stockpiling yard. Approximate catchment area of 1.2 ha.	Y56K Pond: • Capacity of 230 m^{3b}.	Y56K pond outlets to the North Drain. Water quality is monitored at the outlet (grab sample) following a rain event.
	Coal Yard 19 sub-catchment: • Coal Yard 19. Approximate area of 3.3 ha.	CY19 Pond: • Approximate capacity of 745 m^3; and • Includes additional treatment measures.	At low turbidity it discharges to North Drain. Automatically diverts to the Northside Ponds for higher turbidity. Water quality is monitored at the outlet (grab sample) following a rain event.
	North contractors' yard sub-catchment: • Administrative building roofs; and • Car parks. Approximate area of 2.5 ha.	The sub-catchment does not incorporate a formal treatment device. ITA stormwater flows to North Drain via road ditch/swale.	Flows to the North Drain via an informal drain/swale. Water quality is monitored in the receiving North Drain (Site 1C) following a rain event.
	Rail siding sub-catchment: • Train movements; and • Rail car storage. Approximate area of 4.1 ha.	There is no formal stormwater device. There are underflow drains, majority of stormwater infiltrates to ground.	Flows to the North Drain. Water quality is monitored in the receiving North Drain (Site 1C) following a rain event.

	ITA Areas and land use	Primary stormwater treatment device(s)	Discharge and monitoring
	North Drain Future ITA sub-catchment: • Pasture; and • Future ita use. Approximate area of 25 ha.	No formal stormwater device due to no current activities.	Flows to the North Drain via overland flow.
Kahawai Stream	Kahawai ITA sub-catchment: No current activities undertaken.		
Ruakohua Stream ITA Catchment	Contractors' Compound sub-catchment: • Office roofs; • Carparking; and • Short-term equipment storage. Approximate area of 1.9 ha.	Contractors' Compound filter beds comprise: • Three filter beds.	The filter beds discharge to the Ruakohua Stream. Water quality is monitored at the outlet (grab sample) following a rain event.
Ruakohua Stream ITA Catchment	Yard 31 sub-catchment: • A rail siding; • Storage of equipment and finished steel products (including packing in sea-freight containers) and ; • Imported container laydown; • Metal scrap cutting (NZS uprisings); and • Grass area. Approximate area of 11.5 ha.	Yard 31 settlement ponds: • Pond 1 is operational and has an approximate capacity of 2543 m^3; and • Pond 2 approximate capacity is 490 m^3	Yard 31 discharges to the Ruakohua Tributary. Water quality is monitored within Pond 1 (grab sample) following a rain event.
Ruakohua Stream ITA Catchment	Ruakohua Future ITA Area sub-catchment: dam raw water treatment plant; and future ITA use. Approximate area of 5.0 ha.		
Additional areas	Southern Slab yard • Storage area (steel slabs). Approximate area of 2.1 ha.	Discharge via informal vegetated swales and filter strips.	Runoff expected to soak to ground.
Additional areas	Coastal Road • Unsealed access road. Approximate area of 0.9 ha.	Discharge via informal vegetated swales and filter strips.	Runoff expected to soak to ground.

4.2 Northside ITA Catchment

The Northside Outfall discharge includes stormwater from the largest catchment in the ITA Area (approximately 68 ha), shown on Appendix A Figure W-ITA4.

The Primary Plants and their associated processes are in this catchment. ITA stormwater from the Northside ITA Catchment includes:

- Roof runoff from the process buildings, including the Iron Plant and the Steel Plant;

- Surface runoff from the bulk raw materials stockpiling area in the north of the ITA area;
- Surface runoff from the co-product and waste processing, storage and handling areas, including:
  - The slag Aggregate Plant;
  - Co-product and waste processing operations;
  - Steelserv workshop;
  - Existing ferrous scrap storage;
  - Proposed Scrap Yards for externally-sourced ferrous scrap to feed the EAF;
  - Slag and iron tipping bays; and
- Surface runoff from sealed and unsealed roads and yards.

It is noted that when the EAF is installed, some of the existing surface runoff areas described above will change to surface runoff from the Scrap Yards, specifically the Local Yards (North and South) and Yard A.

Process water discharges are discussed in Section 2.

The two Northside Ponds are the primary treatment measure for ITA stormwater discharges in the Northside ITA Catchment. Each pond has a capacity of 15,000 m^3. Measures to enhance treatment include oil skimmers, the addition of coagulant and flocculant to the inflow, and baffles that increase the length of the flow path (and hence the water residence time). Melter aggregate filter beds provide additional treatment for a proportion of the flow above the outfall.

The Northside Ponds discharge via the Northside Outfall, which includes automatic flow and water quality measuring devices. The discharge is gravity fed and is controlled by the volume of water entering the ponds and recycled, with flows increasing during rainfall events where stormwater flows increase. There is no mechanism at the outfall to control or cease the discharge.

Stormwater from the Northside ITA Catchment is conveyed via gravity pipes, sheet flow, bunds, drains, and pumps to the Northside Ponds. The process water and ITA stormwater from the process buildings enters the Northside Ponds and SRNZ Ponds, via gravity. Outflow from other water treatment devices in this catchment (e.g. the SRNZ ponds and the truck washdown ponds) directs to the Northside Ponds.

The SRNZ ponds receive some ITA stormwater runoff from a portion of the Northern Catchment. These ponds operate in series, with Melter aggregate filters installed in one of the ponds to enhance metals removal. These ponds then predominantly discharge via gravity to the Northside Ponds prior to discharge; however water can be pumped to the Southside ponds to comply with discharge volume limits.

During consultation with Ngāti Te Ata and Ngāti Tamaoho, both iwi indicated a preference for the use of wetlands for stormwater treatment. Investigations into converting one of the existing SRNZ ponds to a constructed wetland are underway as part of the on-going continuous improvement programme. While the conversion of one of the SRNZ ponds if feasible would not provide treatment for all runoff from the Northside ITA catchment, it may result in an improvement in overall water quality by providing additional treatment for a proportion of the overall flows. When the EAF is installed, then some of the existing surface runoff areas described above will change to surface runoff from the Scrap Yards, specifically Local Yards North and South and Yard A. At source treatment comprising coarse solids and hydrocarbon treatment will be installed (as per proposed conditions).

4.3 Southside ITA Catchment

The Southside ITA Catchment is roughly 41 ha (Appendix A Figure W-ITA5). Stormwater in this catchment consists of:

- Roof runoff from administrative buildings, the central workshop, Rolling Mills buildings, the Finishing Plant buildings; and
- Surface flow from predominantly sealed roads and car parks and unsealed slab cooling yards.
- Stormwater from the Southside ITA Catchment flows into two settling ponds (the Southside Ponds):
- The Southside duty pond, capacity 8,000 m^3; and
- The Southside surge pond, capacity 5,000 m^3.

The Southside Ponds are operated separately, with one online and one held for surge capacity. The ponds allow for settlement of bulk solids from ITA stormwater. The Southside Ponds discharge predominantly to the Ruakohua Dam reservoir via recycle lines. In addition, flows from the Northside and SRNZ Ponds are pumped to the Southside Outfall to assist in managing peak flows from the Northside Outfall. The Southside Outfall has in-situ water quality monitoring.

The main continuous discharge from the Southside Outfall is the ARP treated process water, which is discussed in Section 2.2.3.3.

4.4 North Drain ITA Catchment

The North Drain ITA Catchment (upstream of Brookside Road) is approximately 44 ha[14], shown on Appendix A Figure W-ITA6. This includes existing ITA areas and a future ITA area, defined in the following sub-sections, as well as the footprint of the North Drain.

Activities in the North Drain ITA Catchment currently comprise:

- Surface water runoff from stockpiling of raw materials, including coal and co-product aggregates, a contractors' yard and transfer station for recyclables, and a rail siding; and
- Roof runoff from a stores building.

Process water from within this catchment primarily includes the Dewatering Plant, which receives ironsand slurry, dewaters the ironsand and treats the remaining slurry water before discharge.

Stormwater from the North Drain ITA Catchment is treated via a series of settlement ponds. Decant arms have been installed at each of the ponds and one pond has the capacity to pump to the Northside Ponds.

The North Drain ITA Catchment has been split into the following sub-catchments, based on the current activities and treatment devices:

- East Pond sub-catchment;
- Y56K Pond sub-catchment;
- North contractor's yard sub-catchment;
- Yard 19 sub-catchment;
- Rail siding sub-catchment; and
- Future ITA sub-catchment.

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[14] Total catchment area of the North Drain is 56.7 ha, of which 44.0 ha comprises the ITA area. The remaining catchment area outside of the ITA area includes the Transpower Switchyard and the BOC site, which was not covered by this application.

The activities within each sub-catchment may change over time, depending upon the operational requirements of the Steel Mill.

EAF changes within the North Drain ITA Catchment

When the EAF is installed, the changes within the North Drain ITA Area will include a reduction (approximately 50%) in process water discharge from the Dewatering Plant (relative to the reduction in raw material required as a result of the EAF).

Additionally, two options have been considered for buffer storage of External Scrap for the EAF operation. This includes either the existing CY 19 coal stockpile location (Option 1) or the CY 5/6 coal stockpile location (Option 2) which currently is part of the East Pond sub-catchment. As part of the change from coal storage to Ferrous Scrap storage, modifications to the existing treatment systems will be undertaken comprising conversion of the existing CY 19 pond or modification of an existing drain/ ponding area downgradient of CY 5/6. The modifications will involve providing a sediment pond and wetland in series, with hydrocarbon removal at the inlet. These potential changes are also identified in the relevant sections below.

4.4.1 East Pond sub-catchment

The East Pond sub-catchment currently contains a number of coal stockpile yards: these are currently known as Coal Yards 1 and 2 (CY1/2), and Coal Yards 5 and 6 (CY5/6). The sub-catchment is approximately 5.4 ha and is treated via the East Pond. Concrete barriers and silt fencing along sides of the coal stockpiles minimise sediment transport to the stormwater network.

ITA stormwater from the coal stockpiles yards is currently conveyed by a combination of sheet flow and open drains directly to the East Pond for treatment. The East Pond forebay has an automated chemical treatment dosing system. The East Pond discharges to the North Drain via its own outlet pipe. Under Existing Permit 41027, water quality monitoring was required at ITA Catchpit CY5 and the ITA Outlet L Drain. Due to reconfiguration of stormwater treatment in this catchment in October 2021 to ensure all flows are treated through East Pond to improve overall water quality, stormwater no longer discharges directly via either of these locations. Instead, it is diverted to the East Pond for treatment prior to discharging to the North Drain. Receiving environment water quality monitoring occurs at this location.

As described above, when the EAF is fully operational, CY 5/6 may be converted to storage of External Scrap (Buffer Scrap Yard Option 2). If CY 5/6 is converted to a Scrap Yard, additional treatment is proposed comprising a standalone sediment pond and wetland which will discharge directly to the North Drain. The overall East Pond sub-catchment will also be reduced.

4.4.2 Y56K Pond sub-catchment

The Y56K Pond sub-catchment (previously known as Jurie's Pond) currently comprises an aggregate yard. The catchment is 1.2 ha and drains via gravity to Y56K Pond for treatment, which has a capacity of 200 m^3, which then discharges to the North Drain.

4.4.3 North Contractor's Yard sub-catchment

The North Contractors' Yard sub-catchment is approximately 2.5 ha and currently includes an unsealed contractor's yard, a recyclable materials transfer station and a sealed entrance to the northern weighbridge. Stormwater is conveyed by sheet flow to the north, where it flows along a Melter aggregate lined drain that runs alongside Brookside Road, to discharge to the North Drain. This area does not currently have a formal treatment device, given that there is no materials storage in this area.

4.4.4 Coal Yard 19 sub-catchment

The Coal Yard 19 (CY19) is a 3.3 ha sub-catchment east of the North Drain. Currently coal is stockpiled in this area, and stormwater is conveyed via sheet flow to the CY19 pond. A concrete barrier and an aggregate filter bund is located along the south of the coal stockpile to minimise sediment transport.

The CY19 pond has a capacity of 750 m^3 as well as a forebay and automatic chemical treatment. The majority of coal fines settle out in the forebay, and water then flows into the pond. The water level in the CY19 pond is controlled by a level switch and two submersible pumps in a decant tower. The outlet of the pond is sampled from the decant tower and turbidity is measured automatically nearby. The turbidity meter determines where the water is pumped to. If the turbidity is less than a pre-set value (currently 60 NTU), the water is pumped to the North Drain. If it is greater than this value, the water is pumped to the Northside Ponds, where it is treated further.

As described above, when the EAF is fully operational, CY 19 may be converted to storage of externally sourced ferrous scrap (Buffer Scrap Yard Option 1). If CY 19 is converted to a Scrap Yard, modifications to the pond will be undertaken including splitting the pond into a sediment pond and wetland in series prior to discharge to the North Drain.

4.4.5 Rail Siding sub-catchment

The Rail Siding sub-catchment is approximately 4.1 ha. It is where train movements and rail car storage occur, with coal brought in by rail and steel distributed to customers off site.

There are 18 underflow drains under the Rail Siding sub-catchment, which discharge directly to the Northside Drain. Runoff from the Rail Siding sub-catchment could contain suspended solids and metals. During monitoring, only two of the subsurface drains provided sufficient discharge for a sample to be collected and provide water quality results. This indicates that the majority of stormwater infiltrates into the ground.

4.4.6 North Drain Future ITA sub-catchment

The future ITA area is located within the North Drain ITA Catchment, and comprises the farmland located between the North Drain, Brookside Road and west of Mission Bush Road. This area lies within the existing ITA Area, and while it is not currently used for industrial or trade activities, it could be developed for ancillary industrial use, should onsite operations necessitate. The future ITA area is estimated to be 25 hectares and is shown in the AEE Appendix E Figure W7.

This area is presently farmland, grazed by livestock and may also be planted in crops. Surface water from the area presently flows westerly over grassed pasture before discharging to the North Drain. A number of sub-surface drains that discharge to the North Drain are present in this area.

While there are presently no specific proposals to develop this area, the area is set aside to support potential future expansion. Activities that could reasonably be expected to be undertaken in this area in the future would include, for example, the following:

- Storage of raw materials, or of finished steel products;
- Sea freight container laydown and packing / unpacking;
- Site access and weighbridge activities;
- Waste processing and recycling activities; and
- Activities ancillary to the above, such as roads and staff amenities.

Expansion into this area would result in various changes to the land form and drainage. As such, the relevant construction and drainage resource consents will be applied for, prior to expansion. The treatment applied would be subject to the activities occurring and will follow the NZS Framework for Environmental Management Systems (Section 5.2).

4.5 Ruakohua Stream Catchment

ITA stormwater from two sub-catchments in the south-east of the Steel Mill discharge to the Ruakohua Stream and Tributary: The Contractors' Compound and Yard 31. These comprise a total ITA Area of 13.5 ha, shown on Appendix A Figure W-ITA7 and so account for a small fraction of total Ruakohua Stream catchment (280 ha).

The Contractors' Compound sub-catchment is approximately 2 ha. It currently comprises offices, vehicle parking and short-term storage of equipment. Stormwater from the predominantly sealed Contractors' Compound drains via sheet flow and a piped treatment system to three Melter aggregate filter beds, which operate in sequence and then the treated ITA stormwater discharges to the Ruakohua Stream.

The Yard 31 sub-catchment is approximately 11.5 ha. It comprises a rail yard and currently includes storage of equipment and finished steel products (including packing in sea-freight containers), imported sea-freight container laydown and metal scrap cutting (NZ Steel uprisings). ITA stormwater from this area flows via sheet flow and a series of drains and culverts to the two Yard 31 settlement ponds. The ponds discharge to a southern tributary of the Ruakohua Stream which flows to the Ruakohua Dam (Site water supply reservoir).

In addition to the two existing ITA sub-catchments there is an area to the north of the dam which has been identified as a Future ITA Area (approximately 5 ha). No activities are currently undertaken in this area, with the exception of the raw water treatment plant. In the future, the area may be used for storage of finished steel products and as a sea freight container laydown.

4.6 Kahawai Stream ITA Catchment

The Kahawai Stream ITA Catchment[15] is approximately 2.0 ha, which is a small fraction of the total Kahawai Stream catchment of 50 ha, as shown on Appendix A Figures W-ITA8.

Up until early 2022, activities in this catchment included metal recycling and storage (no external scrap is stored in the area), and gas cutting. Melter slag was historically stored in the catchment, but runoff from this stockpile was diverted to the Northside Ponds in 2015 (reducing the size of the ITA catchment). Placement of fill occurred in the 1990s which comprised a range of materials to create the working platform, including lime-based co-products. The majority of this fill was removed around 2008 and 2011.

Since the ITA consent for this discharge was issued in 2013, NZ Steel has undertaken a suite of improvement activities to meet the Existing Permit consent water quality Trigger Investigation Levels outlined in the Stormwater Monitoring and Management Plan. In February 2022 work commenced on removing the remaining fill material. This work has now been completed. A cut-off drain has been constructed to divert discharges from a portion of the ITA Area to the existing North Landfill Pond, for treatment and discharge via the Northside Outfall.

If any future ITA activities are established below the cut-off drain where diversion to the Northside Ponds is not possible, appropriate treatment and controls will be implanted and incorporated into the WQMP.

[15] The Kahawai Stream ITA Catchment was previously referred to as the Metal Cutting Yard

4.7 Additional ITA Areas

There are two areas of the ITA Area which discharge directly to land:

- The existing Southern Slab Yard, which is a storage area for steel slabs, to the south of the Rolling Mills, which has an approximate area of 2.3 ha; and
- An unsealed access road which has an approximate area of 1 ha.

This has a total area of 3.3 ha and is shown on Appendix A Figure W-ITA9.

The existing slab yard is used for the storage of steel slabs before processing n the Rolling Mills, and discharges to land via informal vegetated swales and filter strips. The majority of runoff soaks into the ground. The runoff is expected to have slightly elevated TSS, however is not a significant source of contamination.

The access road discharges to land via informal vegetated swales and filter strips, with any runoff soaking to ground prior to reaching the CMA. The runoff is expected to have slightly elevated TSS, however the activities are not a significant source of contamination.

4.8 Auckland Council Stormwater guidance

The existing treatment system volumes have been compared with Auckland Council stormwater guidance to check whether equivalent volumes have been provided. The full assessment is contained in Appendix D.

The following guidance has been considered:

- Stormwater Management Devices in the Auckland Region (GD01) (2017);
- Stormwater Management Devices: Design Guidelines Manual (TP10) (2nd edition, May 2003); and
- Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05) (2017).
- To assist in this assessment, the design stormwater volumes from the various sub-catchments across the ITA area have been calculated and compared to the existing capacity and function of the stormwater treatment devices. Process water is excluded from this assessment, as the Auckland Council guidance specifically relates to treatment of stormwater.

The ITA Area is unique, due to the activities and the stockpiling of materials. The stormwater treatment ponds and devices were designed, and have been upgraded, to achieve water quality objectives and improve the quality of discharge to the receiving environment.

A programme of water quality monitoring has been used to inform pond upgrades, changes to the stormwater treatment cycle, and improvements to the stormwater treatment operation (i.e. the addition of chemical treatment). In some cases, due to the nature of the ITA Area, the pond size is not the controlling factor over settlement of fines and improvements in water quality.

4.8.1 Stormwater treatment system compliance

The potential stormwater volumes for each of the sub-catchments have been analysed using the TP108 manual methodology for a variety of 24-hour storm events, including the water quality volume (WQV) (90^{th} percentile). Full details are contained in Appendix D.

The TP108 manual methodologies have been applied to calculate the WQV. The resulting stormwater volumes for the design storm events for each catchment are contained in Table 4.2. The existing stormwater treatment system devices are compared to the TP10 and GD05 treatment volume requirements below in Table 4.2.

The Contractor's yard sub-catchment is not included within this table, as the treatment device is a filter not a pond; however, discharge monitoring indicates good function.

Table 4.2: Existing stormwater treatment volumes compliance with TP10 and GD05

<table>
<tr><th rowspan="2">Catchment / Sub-catchment</th><th colspan="2">Primary treatment device(s)</th><th rowspan="2">Process water?</th><th colspan="2">Required treatment volume (m^3)</th><th rowspan="2">Compliance</th></tr>
<tr><th>Name</th><th>Volume (m^3)</th><th>TP10 WQV</th><th>GD05</th></tr>
<tr><td rowspan="4">Northside ITA Catchment</td><td>Northside pond (north)</td><td>15,000</td><td rowspan="4">Yes</td><td rowspan="4">10,360</td><td rowspan="4">20,708</td><td rowspan="4">Exceeds TP10 volume in each pond. GD05 is provided with combination.</td></tr>
<tr><td>Northside pond (south)</td><td>15,000</td></tr>
<tr><td>SRNZ Ponds (east)</td><td>12,000</td></tr>
<tr><td>SRNZ Ponds (west)</td><td>8,000</td></tr>
<tr><td rowspan="2">Southside ITA Catchment</td><td>Southside surge pond</td><td>5,000</td><td rowspan="2">Yes</td><td rowspan="2">8,505</td><td rowspan="2">12,336</td><td rowspan="2">Exceeds TP10 and GD05 volumes with combination of both ponds.</td></tr>
<tr><td>Southside duty pond</td><td>8,000</td></tr>
<tr><td>East Pond sub-catchment</td><td>East Pond</td><td>1,310</td><td>No</td><td>649</td><td>1,071</td><td>Exceeds TP10 and GD05 volumes.</td></tr>
<tr><td>Y56K pond sub-catchment</td><td>Y56K</td><td>230</td><td>No</td><td>104</td><td>236</td><td>Exceeds TP10 WQV, similar to GD05 volume.</td></tr>
<tr><td>Coal Yard 19 (CY19) sub-catchment</td><td>CY19 Pond</td><td>743</td><td>No</td><td>262</td><td>661</td><td>Exceeds TP10 and GD05 volumes.</td></tr>
<tr><td rowspan="2">Yard 31</td><td>Yard 31 Pond 1</td><td>2543</td><td>No</td><td rowspan="2">955</td><td rowspan="2">2,293</td><td rowspan="2">Exceeds TP10 and GD05 volumes.</td></tr>
<tr><td>Yard 31 Pond 2</td><td>490</td><td>No</td></tr>
</table>

Note: The colours indicate whether each pond complies with relevant guidelines. Green indicates full compliance, yellow indicates that the pond is not large enough for the flows.

Table 4.3: EAF Scrap Yards stormwater treatment devices and volumes (if scrap yards are installed)

<table>
<tr><th rowspan="2">Scrap yard</th><th rowspan="2">Coarse solids</th><th rowspan="2">Hydrocarbons</th><th>Wetland (GD01)</th></tr>
<tr><th>Minimum Wetland area</th></tr>
<tr><td>Local Yard - North</td><td>Downstream defender (DD3.1200) max flow 120 l/s</td><td>2 x ESK40-1200 (flow 80 l/s)</td><td rowspan="2">n/a</td></tr>
<tr><td>Local Yard - South</td><td>Downstream defender</td><td>ESK40-1200 (flow 40 l/s)</td></tr>
</table>

	(DD3.1200) max flow 120 l/s		
Yard A	Downstream defender (DD3.1800) max flow 270 l/s	ESK40-1200 (max 40 flow l/s)	
Buffer Scrap yard – CY 19	Sediment Pond min area 205 m^2 (based on 2% of catchment area)	Hydrocarbon booms	200 m^2 (based on an average depth of 1 metre).
Buffer Scrap yard – CY 5/6	Sediment Pond min area 360 m^2 (based on 2% of catchment area)	Hydrocarbon booms	405 m^2 (based on an average depth of 1 metre).

5 Control of contaminants

5.1 Introduction

This section provides a summary of the existing controls of contaminants from the Steel Mill.

An overview of NZ Steel's Environmental Management System is provided, as it relates to potential water treatment and contaminant sources and outlines key engineering and administration controls currently used across the Steel Mill, including:

- Administrative controls, such as:
  - Coal stockpiles management procedures;
  - External Scrap acceptance and management procedures;
  - Housekeeping procedures;
  - Hazardous substances procedures;
  - Spill preparedness and response plans;
  - Incident response, investigation and reporting;
  - Environmental training and competence;
  - Change management assessment procedure; and
  - Maintenance plans and procedures for water treatment facilities.
- Engineering controls, which includes significant investment in:
  - Seven wastewater treatment plants;
  - Eight large settling Ponds and up-stream catch-pits and subsidiary ponds; and
  - Real-time monitoring for chemical dosing and flow control.

NZ Steel will maintain the above control methods and as required introduce improvements to meet discharge water quality standards. The Draft Water Quality Management Plan, included in Appendix K to AEE, outlines these current controls and will be updated to reflect new ITA consents. An assessment of these controls and practices is contained in Section 8.

5.2 NZ Steel's Environmental Management System

The key method for managing the environmental aspects of Steel Mill's operations is the implementation of the existing EMS, which has been externally certified to ISO 14001 since 2003. NZ Steel also has a mature quality management system (which is certified to ISO 9001), combined with the EMS this forms the Steel Mill's Integrated Management System (IMS).

The IMS is an overarching management system, embedded within NZ Steel business practices and aligned with the policy, strategy and procedures of its parent company, Bluescope. NZ Steel's IMS provides checks and balances at all levels of the organisation.

The IMS is annually audited by external auditors to ensure continuing compliance with the international standards ISO 14001:2015 and ISO 9001:2015.

Other key aspects of the IMS include:

- Environmental Policy (issued by parent company Bluescope) and governance protocols;
- Environmental planning for continuous improvement, based on risk evaluation, compliance and strategic direction;
- Setting of objectives and targets to minimise environmental effects, which are included in annual and medium-term plans;

- Risk assessment and management documents to reflect detailed legal requirements and environmental effects assessments (such as this AEE);
- Internal auditing of key environmental controls to ensure continued compliance with resource consents and the certified EMS;
- Management of change protocols to assess any proposed changes to people, processes and facilities, which may have a positive or negative environmental impact;
- Environmental monitoring requirements, to provide operational control and demonstrate compliance;
- Compliance review, incident investigation and reporting to Council, NZ Steel Senior Leadership Team and Environment Committee;
- Operational roles, responsibilities and functions, set out in controlled procedures and management plans;
- Training and competency checks, to ensure employees and contractors are aware of resource consent and regulatory requirements and the specified controls for the activities in which they are engaged;
- Procurement practices and contract conditions specifying relevant items and matters to ensure activities are compliant with resource consents;
- Equipment maintenance programs and operational procedures, including critical process checks to ensure treatment control equipment continues to be fit for purpose; and
- Record keeping in relation to above matters and to demonstrate continuing compliance.

As part of the IMS, auditing of both the management practices and operational procedures are undertaken by suitably qualified experts, including both internal and external auditors. An auditor's objective is to ensure that NZ Steel is appropriately managing environmental effects. The audit program includes consideration of the continuing suitability and effectiveness of the organisational structure and administration and operational procedures, a training and competency evaluation, work areas, operations and processes.

For the complex operation of the Steel Mill there is an extensive range of engineering (e.g. water treatment facilities, monitoring and alarming) and administration controls (e.g. training, auditing and documentation). As improvements are made across the spectrum of these controls, aspects of the NZ Steel EMS are reviewed and updated. NZ Steel maintains controlled documents to ensure consistency in operation and activity.

5.3 Water Quality Management Plan

For the purposes of this application NZ Steel has prepared a draft Water Quality Management Plan (WQMP) found in Appendix K of the AEE, to describe the practices and procedures adopted, including the ISO 14001 certified EMS, to ensure compliance with the water discharge consent conditions.

An updated draft WQMP (dated October 2022) has been prepared, which sets out the requirements of Proposed Conditions to manage contaminants from activities undertaken at the Steel Mill before they enter the environment and includes the draft Trigger Investigation Levels based on monitoring data for the period September 2019 to September 2021.

The WQMP describes:

- Key personnel accountable for implementing the WQMP and their responsibilities;
- Activities undertaken at the Steel Mill which are sources of potential contaminants to land and water environments;

- Key mitigation and prevention mechanisms and controls;
- Site-specific management controls for the External Scrap handling and storage including scrap acceptance procedures which are discussed further in Section 5.4 below;
- Water quality monitoring program:
  - Framework to develop and update Trigger Investigation Levels to identify short term peaks in contaminant discharges at monitoring sites across the site, and associated incident reporting;
  - Water quality sampling and monitoring locations and contaminants to be monitored.
- Maintenance programme of ITA stormwater management and treatment systems;
- Methods for managing incidents and complaints; and
- Compliance reporting and records relating to the compliance.
- Requirements for assessing the impact of changes to facilities, processes and activities.

The WQMP is intended to be a living document for the duration of the consent and it is proposed to be reviewed at least on a five-yearly basis and in the event of any material changes to activities in the ITA Area.

5.4 Scrap acceptance procedures for External Scrap

All External Scrap will have been processed by the external suppliers before being delivered to the Site. To ensure that External Scrap received at the Site is of acceptable quality, a scrap acceptance specification will be developed as set out in the WQMP. The specification will clearly set out the quality standards for External Scrap to meet manufacturing requirements and to also minimise or avoid materials harmful to people and the environment. This includes requirements such as the below supplier pre-acceptance processes and Site reception controls.

<u>Supplier pre-acceptance processes</u>:

- Only ferrous scrap from pre-approved suppliers will be accepted at the Site.
- Require suppliers to prepare and maintain an 'Inspection and Verification Plan' that describes the engineering and management controls to exclude, as far as practicable, materials identified as 'Specified Materials'.
- The supply agreement will define the External Scrap specification and list Specified Materials, which will include:
  - Radioactive materials;
  - Opened or sealed containers of any type of fluid;
  - Sealed containers;
  - Pipe or cut in such a way as to crimp the ends;
  - Sealed bearing housings;
  - Lead coated scrap or lead in any form;
  - Any contaminant associated with hazardous air pollutants (including chlorinated plastics, free liquids, lead, or mercury);
  - Chemicals, organic liquids, chlorinated plastics, asbestos, hazardous waste in any form; and
  - Wood and putrescible materials.

<u>Site reception controls:</u>

- Radiation detection devices will be installed at the point of reception (gate house or train reception).

- Inspections of loads delivered to the Site will be carried out for quality control and to identify potential out-of-specification ferrous scrap or other contamination risk prior to use on-site.
- Any loads which do not meet the specification will be isolated and may be returned to the supplier.

On-site inspections:

- When External Scrap is delivered to a Scrap Yard it will be subject to further visual inspection. Out of specification materials will be separated and depending on the nature of non-conformance returned to the supplier or blended with other material.

The External Scrap acceptance procedures have been designed to ensure that potential contaminants that could impact on stormwater runoff (and air emissions) are minimised. These procedures will minimise residual contaminants including fuels, oils and grease, PAHs and coolants on shredded scrap sourced from shredded cars.

5.5 Contaminant sources and controls

As part of the site-specific IMS, the activities with the potential to generate contaminants are identified so that appropriate controls are designed and implemented to avoid or minimise the potential environmental effects. Operational controls to meet specified standards, training and competency evaluation for operators, and the maintenance of physical controls, is critical to ensure continuing compliance and improvement in water quality.

A summary of the environmental aspects as related to the ITA areas subject to this application, and the existing procedural controls in place to minimise environmental effects are attached in Appendix E and will be outlined in the Draft WQMP in Appendix K to AEE.

An overview of key sources, contaminants and physical controls are summarised in Table 5.1 below. Section 5.5 outlines the main engineering controls and Section 5.6 the key administrative controls.

Table 5.1: Summary of contaminant sources, key contaminants and physical controls

Activity	Key contaminants	Key physical controls
Site wide		
Sealed roads and yards	Metals, suspended solids	Sweeping to remove sediment Sumps and catch-pits for collection of heavy solids
Hazardous substances and oil storage and use	Various, including pH and hydrocarbons	Secondary containment at storage locations and capture within ponds on site
Southside ITA Catchment		
Southside ITA stormwater	Metals, suspended solids	Area is largely sealed Regular sweeping of sealed roads Settling solids in Southside Ponds Surge pond and recycle line to Water Supply Dam, to minimise occurrence of overflow to Southside Outfall
ARP WWTP	pH and TSS	Continuous monitoring and adjustment of chemical treatment Contingency measure is diversion to Southside Ponds
Oily waste treatment plant	Hydrocarbons	Continuous monitoring and adjustment of chemical treatment Recycling to Southside Ponds

Activity	Key contaminants	Key physical controls
		Treatment through Southside Ponds and recycling to Water Supply Dam Oil recovery and recycling
Northside ITA Catchment		
Product tipping, co-product and waste processing and stockpiling	Metals, suspended solids	Northside Ponds and subsidiary ponds
Iron Plant	Metals, suspended solids	WWTP Continuous monitoring and adjustment of chemical treatment Recycling to the Iron Plant Wedge pits for heavy sediment collection Northside Ponds
Steel Plant	Metals, suspended solids	WWTP Continuous monitoring and adjustment of chemical treatment Recycling to the Steel and Iron Plant Northside Ponds
EAF (process water aspect)	Metals, suspended solids	Discharged to the Steel or Iron plant WWTP Northside Ponds
WWTP sludge dewatering	Metals	Sludge dewatering plant filter weirs Northside Ponds
Iron Plant raw materials including coal and PC stockpiles	Metals, suspended solids	Subsidiary ponds and sediment fencing in coal yards Northside Ponds
Landfill leachate	Metals, pH	Leachate ponds at landfills Northside Ponds
Metal Coating Line	Chromium, pH and zinc	Wastewater treatment plant Continuous monitoring and adjustment of chemical treatment Northside Ponds
EAF Scrap Yards (Local Yard – North, Local Yard – South and Yard A)	Metals, suspended solids, PAHs, hydrocarbons	At source treatment for coarse sediment and hydrocarbons Recycling to the Steel and Iron Plant Northside Ponds
North Drain ITA catchment		
Dewatering Plant	Suspended solids, conductivity	Slurry water treatment plant and ponds Continuous monitoring and adjustment of chemical treatment
CY19 Coal stockpiles	Metals, suspended solids	CY19 Pond Continuous monitoring and adjustment of chemical treatment Contingency for diversion to Northside Ponds
CY1/2 and CY 5/6 coal stockpiles	Metals, suspended solids	East Pond Continuous monitoring and adjustment of chemical treatment

Activity	Key contaminants	Key physical controls
EAF Buffer Scrap Yard (either CY19 or CY 5/6)	Metals, suspended solids, PAHs, hydrocarbons	At source treatment for coarse sediment and hydrocarbons and wetland
Future ITA area	Heavy metals, suspended solids	Conversion of existing settling pond or development of new treatment if area is developed.
Other catchments		
Kahawai Stream Future ITA catchment	Heavy metals, suspended solids	Site specific treatment based on nature of activities
Contractors' Compound catchment	Heavy metals, suspended solids	Melter Aggregate filter beds
Yard 31 catchment	Heavy metals, suspended solids	Sediment ponds
Southern slab yard and adjoining access road	Heavy metals, suspended solids	Discharge to planted area (filter strip)

5.6 At-source engineering controls

5.6.1 Wastewater treatment plants (WWTP)

The engineering controls for water treatment consist mainly of WWTPs, settling ponds and Melter aggregate filter beds. There may also be other engineering controls in the upper catchment, such as swales, check-dams, catch-pits and oil separators.

The WWTPs on Site vary in size and complexity depending on the contaminant loading and flow volume. Typically, a WWTP provides settlement of solids, through the addition of water treatment chemicals and by the nature of the equipment design. The solids are discharged from the WWTP to sludge dewatering ponds for disposal to landfill or larger iron-rich particles may be recovered for return the Primary Plants process.

Water treatment chemicals have been selected to ensure the most appropriate level of treatment before water is either recycled within the Primary Plants and excess water flows to settling ponds, where additional treatment occurs before or discharge. (Four in via the Northside ITA Catchment and two in Ponds.

5.6.1.1 Iron plan WWTP

The Iron Plant WWTP is the key control of process water discharges from the Iron Plant. The WWTP receives process water from a range of sources. Key sources include the MHF scrubbers and the Kiln scrubbers, as outlined in Section 2 and identified in the Water Flow Schematic in Appendix B).

A large volume of treated process water is returned into the Iron Plant for reuse. Solids are transferred (via the IPWT thickener) to the Sludge Dewatering Ponds.

5.6.1.2 Steel plant WWTP

The Steel Plant WWTP is the key control of process water discharges from the Steel Plant. The WWTP receives process water from the Southside ITA Catchment.) Melter scrubbers and the KOBM scrubbers as outlined in Section 2. When the EAF is fully commissioned, the existing WWTP's will also control any process water discharges associated with the EAF operations.

A large volume of treated water is returned into the Steel Plant and Melters for reuse. Solids are transferred (via the IPWT thickener) to the Sludge Dewatering Ponds.

Water treatment chemicals have been selected to ensure the most appropriate level of treatment before water is either reused or discharged via the Northside Ponds.

5.6.2 Settling Ponds

In total, there are currently eight large settling ponds and four subsidiary ponds on Site, for ITA stormwater treatment and additional treatment (polishing) of process water. Water treatment chemicals are used in settling ponds to ensure the most appropriate level of treatment before water is either recycled, or discharge via an outfall.

Melter aggregate filter beds are installed for smaller stormwater catchments and are also installed for partial treatment of the combined Northside ITA Catchment stormwater and process water.

5.7 Administrative controls

5.7.1 Raw material and co-product stockpiles management

NZ Steel has a raw materials management plan (which will be incorporated into the WQMP) which outlines the operational procedures associated with the various stockpiles at the ITA Area. The key controls include both operational and physical controls as follows:

- Controlling stockpile heights and slopes to minimise runoff during rain events;
- Use of silt fences around the coal stockpiles;
- Maintenance of roads and yards to reduce sediment loads to ponds and drains;
- Bunding around the stockpiles to retain runoff within the stockpile areas during rain events; and
- Discharge of runoff to sumps and ponds with chemical treatment.

5.7.2 Externally sourced Scrap Yard management (when EAF is installed)

The key controls in place to minimise the potential discharge of contaminants from the Scrap Yards, include:

- Controls over the quality of External Scrap (as discussed at Section 5.4 above);
- Regular cleaning of the Scrap Yard surfaces (via sweeping and scraping) to minimise the accumulation of fine material which can be captured by stormwater runoff;
- Ensuring External Scrap is stored within defined stockpiles and bunkers to minimise tracking of material; and
- Provide appropriate stormwater treatment for runoff (discussed in more detail in Section 4).

5.7.3 Housekeeping

NZ Steel has a housekeeping policy that covers all areas of the Site, including the ITA Areas subject to this Consent application.

The policy requires that all areas are to be maintained to a high standard of housekeeping. It aims to ensure that the layout of working areas is safe, that the marking of walkways and storage areas is well defined, that adequate storage facilities are provided, and that regular cleaning and tidying is completed.

General housekeeping is a component of NZ Steel's working practices, and the internal auditing will review the process and is reviewed as part of the overall audit effectiveness of this control process.

5.7.4 Hazardous substances management

NZ Steel has hazardous substance management procedures that covers all hazardous substances at the Site, including the areas subject to the ITA Consent application. The procedure covers all activities and staff including contractors on-site.

Before introduction of a new substance or change to an existing substance (or storage of either) staff and contractors are required to initiate an assessment to determine the risks to appropriate handling and controls are implemented. Hazardous substances stored across the site are recorded in a site inventory. Location and tank certification is required annually, by a third-party auditor.

5.7.5 Waste management

NZ Steel has waste management procedures that covers all wastes treated, handled and stored within the ITA Area, including recyclables. The procedure covers all activities and staff including contractors on-site.

The procedure requires all staff and contractors to identify wastes and to seek approval for the appropriate location for recycling or disposal (documented as a Waste Declaration).

NZ Steel operates the East Landfill on-site for disposal of certain wastes arising from Steel Mil activities. External providers undertake services for collection of hazardous waste, liquid and general waste and recycling.

5.7.6 Spill preparedness and response

As required under Hazardous Substances and New Organisms Act 1996 (HSNO Act) regulation tanks and storage locations are appropriately bunded to minimise spill to waterways and land. NZ Steel assesses all hazardous substances and requires specific spill response plans for the relevant hazardous substances. The main category of hazardous substances used within the ITA Areas relevant to this application is fuels, solvents, paint and acids. The Site also has a generic spill response plan for substances that are not covered by the HSW Regulations but are still environmentally hazardous as defined in the AUP.

5.7.7 Environmental training and competency

Environmental training for all staff is undertaken as part of the NZ Steel site induction program. This requires all new staff to go through a training session before they commence work at NZ Steel, including environmental awareness. Environmental training, where environmental controls are outlined and competency checked, is an ongoing process, with regular refresher training provided, as well as specific updates in light of any changes.

The objective of all environmental training carried out at NZ Steel is to ensure that all employees and contractors understand the following:

- Significant environmental risks and impacts relevant to the Site;
- Key aspects of the EMS;
- Potential consequences associated with deviation from the EMS;
- Contractors must also attend the NZ Steel induction prior to working on Site and sign a contract agreement to adhere to a set of “site licence conditions”. The “site licence conditions” issued to contractor companies includes information on the following aspects:
    - Use and disposal of chemicals on-site;
    - Procedures to be followed in the event of a spill;
    - Cleaning and waste management procedures; and

- Responsibilities.

5.7.8 Change management

NZ Steel has a change management procedure which covers all types of changes proposed for the Site. Changes include trials and/or modifications to plant, materials and equipment, new installations, change in practices, chemicals used, procedures or software relating to operations and activities within NZ Steel.

The purpose of the procedure is to ensure that potential safety, environmental, operational or business risks are assessed prior to the change being carried out and that appropriate actions are taken to manage any associated risk and ensure ongoing compliance with legal requirements.

5.8 Continual improvement

Continual improvement is a core part of NZ Steel's environmental management system. NZ Steel undertakes regular reviews of water monitoring data, performance of its wastewater treatment plants and other devices, and the management within the various catchments across the Site, to identify areas for improvement and priorities for capital expenditure. Appendix F summarises some notable water management improvements that NZ Steel has implemented since the existing discharge consents were issued in 2003 and 2013. Section 8 also outlines the best practicable option approach undertaken for the NZ Steel water treatment facilities.

Overall, there have been a considerable number of incremental improvements in the multiple WWTP's and settling ponds, as well as a number of substantial projects since the Existing Consents were issued (2003). These built on the earlier improvements throughout the period of the previous consent.

In summary, the period from 2003 to 2009 saw a particular improvement focus on the following:

- For Northside Outfall and Southside Outfall catchments, improvements achieved a reduction in suspended solids and zinc concentrations. By way of example, a number of areas were converted from hardstand to gardens, or were concreted to reduce sediment load from traffic and activity in laydown areas, and there were a range of improvements to the WWTP;
- Maintaining high levels of water recycling and a water balance across the Site to reduce discharge volume at the Northside Outfall, particularly during winter periods where Utilities have reduced control of the runoff volume during rainfall events. This included installation of a line to recycle water to the Ruakohua Dam; and
- The Dewatering Plant discharge improvements focussed on automation of slurry line shut-down and installation of a settling pond to provide for additional treatment during start up, to reduce the frequency of exceedances for suspended solids and turbidity.

For the period 2013 to 2022 there was considerable focus on improvements in ITA stormwater discharges to the North Drain in response to change in raw material handling in the area. The improvements included:

- Modification of existing ponds and drains to provide for improved water quality including installation of sediment fences and barriers to protect fences, to collect gross sediment entering drains;
- Establishing a monitoring program for ITA Stormwater Discharges – grab samples and continuous turbidity - to evaluate effectiveness of incremental improvement;
- Extension of East Pond and reconfiguration of decant device in 2019; and
- Automated flow-based chemical dosing for East and CY19 Ponds from 2018 (change from rain-activated) and incremental adjustments continue.

In the Northside and Southside catchments, continual improvement activities from 2017-2022 have included:

- Melter slag filtration walls installed in SRNZ ponds to provide for direct discharge to Southside Outfall, reducing load on Northside Ponds and discharge volume during rain events;
- Additional recycle lines in Southside Pond were installed to avoid overflow of ponds, reducing potential for elevated suspended solids during high-intensity rain events;
- Sealing main road to north weighbridge gate, installation of a wheel bath where high volumes of trucks leave unsealed yards onto northern sealed road and purchase of a high-performance road sweeper for sealed roads, supports reduction in sediment loading to drains and ponds;
- Trialled alternative treatment chemicals in the Iron Plant WWTP, in Chute and in Northside Ponds to improve settling of suspended solids and reduce in particular zinc in discharge;
- Installation of permanent floating baffles in Northside Ponds to increase residence time of ponds, which assists with improved settlement of solids; and
- Optimisation of Iron Plant WWTP clarifier treatment to reduce zinc load, in anticipation of a lower consent limit.

As part of NZ Steel's environmental management system there is a 3-year water quality improvement plan, which has been refreshed recently for the period July 2022 to June 2025 (aligned with the business financial year). Progress on the activities included in the plan is reviewed regularly by a management steering committee. So, over the term of a new consent continual focus on improving water quality to ensure consistently low levels of contaminants will remain. Key items included in the current 3-year plan are:

- Steel Plant WWTP - review of chemical dosing and pH adjustment; and
- SRNZ Pond – evaluation of direct discharge to Northside Outfall stilling basin to reduce contaminant load on Northside Ponds and avoid need for pumping to Southside Outfall.

New continuous composite and turbidity monitoring program for North Drain (Site 1) and response protocols to assist with earlier identification of issues affecting water quality.

6 Long term monitoring

6.1 Introduction

This section summarises the long-term monitoring that has been undertaken by NZ Steel of the Steel Mill water discharges.

The results of monitoring over recent years have been collated to summarise the long-term compliance with the Existing Consents, and to aid in the understanding state of water discharges from the Steel Mill. Therefore, the results have been compared to the applicable Existing Permit consent limits and Stormwater Monitoring and Management Plan Investigation Trigger Levels, as well as relevant water quality guidelines.

Monitoring is undertaken of both the ITA and process water discharges prior to mixing as well as the receiving environment monitoring (including the North Drain, Lower North Stream, Kahawai and Ruakohua Streams).

6.2 Monitoring programme

NZ Steel holds four existing resource consents (the Existing Permits) for the discharge of water and contaminants from the ITA Area, including suspended solids and metals. Each of the Existing Consents relating to water discharges, requires that a programme of regular water quality monitoring be carried out. The monitoring conducted is summarised in Table 6.1 below.

Table 6.1: Sampling parameters

Permit	Activity	Location	Frequency	Parameters
21575	Discharge of stormwater and process water	Northside Outfall discharge	Daily (grab and composite)	Flow, pH, temperature, TSS[1], dissolved oxygen[4], oil & grease[4], cadmium, chromium, copper, iron, lead, nickel, zinc
21576	Discharge of stormwater and process water	Southside Outfall discharge		
21577	Discharge of dewatering water	Dewatering Plant discharge	Continuous (reported daily)	Flow, turbidity
41027	Discharge of contaminants from an Industrial or Trade Activity	ITA Catchpit CY5 (flows are now directed to East Pond)	Monthly during or following a rainfall event[3]	pH, TSS, TPH[2], aluminium, boron, chromium, copper, iron, lead, nickel, zinc
		ITA Culvert Kahawai (receiving environment monitoring)		
		ITA CY19 Pond		
		ITA East Pond (receiving environment monitoring)		
		ITA Metal Cutting Yard Pond		
		ITA Outlet L Drain (flows are now directed to East Pond)		
		ITA Runoff Y56K		
		Kahawai Downstream 2		
		Kahawai Upstream 1		
		ITA Contractors' Compound (receiving environment monitoring)	3-monthly	

Permit	Activity	Location	Frequency	Parameters
		ITA Yard 31 (receiving environment monitoring)		

Notes
1. Total suspended solids
2. Total petroleum hydrocarbons
3. Frequency of ITA monitoring was set based on the Stormwater Monitoring and Management Programme, not defined by the Resource Permit conditions
4. Dissolved Oxygen and Oil & grease are only able to be analysed on the daily grab sample

The monthly monitoring conducted under the Industrial or Trade Activity (ITA) consent is typically carried out as rainfall event-based sampling, though some locations are monitored more frequently.

The sections below provide further details of this existing monitoring programme, and a summary of the historical results is provided in Section 6.3.

6.2.1 Dewatering Plan discharge

The Dewatering Plant takes in PC slurry and separates the liquid and solid components. Process water is treated through a high-rate thickener, then discharged to the North Drain. The water is continuously monitored for turbidity at both the thickener outlet and the point of discharge. The Dewatering Plant discharge permit (21577) places limits on the daily volume and turbidity of the discharge, measured as monthly averages and as a daily flow-weighted average for turbidity.

In addition to the monitoring required by the resource consent, water quality results for a broader range of contaminants were measured from November 2019 to September 2021.

6.2.2 Northside and Southside Outfalls

The discharges from the Northside and Southside Outfalls are monitored daily by taking both grab and 24-hour composite samples at a location immediately upstream of discharge to the CMA. Results from the composite sampling only are shown below. The Northside and Southside Outfall discharge consents (21575 and 21576 respectively) place limits on the quality and quantity of the discharge from each outfall, measured as monthly average concentrations, daily maximum concentrations, and daily mass loads. All metals are measured as total fraction (dissolved and particulate).

6.2.3 North Drain

ITA stormwater within the North Drain Catchment is regularly monitored in the North Drain at three discharge points from ponds, East Pond, CY19 Outlet, and Runoff Y56K. In NZ Steel's annual reports required under the existing ITA consent, discharges for the East Pond discharge are used to assess discharges to the North Drain. NZ Steel reports that Yard 56K Pond only discharges intermittently, following heavy rainfall. These six points were monitored weekly until November 2015 and monthly thereafter, when there has been sufficient rainfall.

6.2.4 Kahawai Stream

Discharges to the Kahawai Stream are monitored at four locations: in the stream upstream of the discharge, at the treatment pond, at the Kahawai Tributary culvert prior to discharge to the main stream, and in the stream around 500 m downstream of the discharge. These points were monitored quarterly until August 2015 and monthly thereafter, when there has been sufficient rainfall.

6.2.5 Ruakohua Stream

ITA stormwater from two areas in the south-east of the ITA Area discharges to the Ruakohua Stream: the Contractors' Compound and Yard 31. The discharge points of the Contractors' Compound Melter Aggregate beds, and Yard 31 settlement ponds are monitored quarterly, when there has been sufficient rainfall.

6.3 Summary of historical water monitoring results

A summary of the monitoring results between 2019 and 2021 is contained in Appendix C, including tables showing the minimum, maximum, mean and median values for each monitoring location. The monitoring results have been compared to the ANZWQG values, and where these values are not relevant, compared to existing consent limits. The ANZWQG are currently under review, and the monitoring results have been compared to the proposed default guideline values.

Results are also compared to the relevant National Policy Statement for Freshwater Management 2020 (NPS-FM) quality bands, to classify the quality of the water historically discharging from the site.

While we have used the ANZWQG guideline value for vanadium, we note this is a default guideline only. Default guideline values (DGVs) are classified as very high, high, moderate, low, very low or unknown. Classification is mainly based on the number and type (chronic, acute or a mix of both) of data used to derive the guideline value. In this instance vanadium had less than five data types available to classify the guideline value. Therefore, the guideline value has an unknown reliability and should only be used as an indicative interim working level.

6.3.1 Northside Outfall results

The discharge monitoring results for the last two years (2019-2021) were analysed and compared to the existing resource consent limits, and the daily average results were compared to ANZWQG for marine water species protection limits (SPL) of 95% and 80%.

The Northside Outfall monitoring results, when compared to the Existing Permit limits, shows that NZ Steel have generally been compliant.

When compared to the ANZWQG, the discharge monitoring results show that the discharge (with no allowance for mixing), exceeded the 95% SPL for dissolved copper (16.2% of samples), total copper (28.4%), iron (73.5%), dissolved zinc (55.3%), and total zinc (99.9%). When compared to the ANZWQG 80% SPL, the discharge monitoring results show that discharge (with no allowance for mixing) exceeded for total copper (1.9%), iron (6.1%), dissolved zinc (22.1%) and total zinc (98.8%) with the average and median for total copper, dissolved copper, iron and dissolved zinc being below the 80% SPL.

Concentrations of cadmium, chromium, and nickel were all low, with the vast majority of samples returning non-detect results.

When compared to historical results, being the previous monitoring round from 2015-2020, a trend of reduction is noticeable for all contaminants. Of note is copper (33.8% reduction), TSS (15.4%) and zinc (15.9%). This is likely due to the commitment of NZ Steel to its practice of continual improvement, outlined in Appendix F.

Further information, including graphs and summary tables, are provided in Appendix C.

6.3.2 Southside Outfall results

The results from the last two years (2019-2021) for the Southside Outfall discharges were analysed and compared to the Existing Permit limits, and the daily average results were compared to ANZWQG for marine water species protection limits (SPL) of 95% and 80%.

The Southside Outfall monitoring, when compared to the Existing Permits, shows that NZ Steel have generally been compliant.

Compared to the ANZWQG, the discharge monitoring results (with no allowance for mixing) exceed the 95% SPLs for total copper (17.2% of samples), iron (68.1%) and total zinc (29.9%); While some results exceed the 95% SPL, the average and median for total zinc was below the 95% SPL. When compared to the ANZWQG 80% SPL, the discharge monitoring results show that discharge (with no allowance for mixing) exceed for copper (1.8% of samples), iron (14.3%) and total zinc (7.2%). While some results exceed the 80% SPL, the average and median for total copper, iron and total zinc were below the 80% SPL.

Concentrations of cadmium, chromium and nickel were all low, with the vast majority of samples returning non-detect results.

When compared to historical results, being the previous monitoring round from 2015- 2020, a trend of reduction is noticeable for most contaminants. Of note is copper (19.4% reduction) and zinc (8.3%). However, for some contaminants, there has been an increase. These include iron (41.3% increase), TSS (14.8%) and temperature (24.1%). While there has been an increase in iron and TSS the monitoring results shows that the mean and median are still well below the relevant guideline value or consent limit.

In recent years, to meet the Northside Outfall discharge volume and mass load limits under the existing consent, water from the Northside catchment has been pumped from the SRNZ ponds to the Southside Outfall. This is likely to have influenced the changes noted in the historical comparisons.

Further information, including graphs and summary tables, are provided in Appendix C.

6.3.3 North Drain and Lower North Stream results

6.3.3.1 Dewatering Plant discharge

The results from the last two years (2019-2021) for the Dewatering Plant discharges, were analysed and compared to the Existing Permit limits, and the average results were compared to ANZWQG for freshwater SPLs 80%.

The Dewatering Plant discharge monitoring, when compared to the Existing Permit limits, shows generally good compliance, with average results for daily flow and turbidity being below the limit. The maximum limit for daily flow exceeding on occasion.

The Dewatering Plant discharge is of interest as this is a significant flow and relatively constant discharge to the North Drain.

When comparing the recent water quality monitoring results against the ANZWQG, the 80% SPL for freshwater was exceeded (prior to reasonable mixing) for aluminium (80% of samples), copper (20%), iron (17.5%), vanadium (12.5%) and zinc (7.5%). When compared to the 80% SPL, the average and median for copper, iron and zinc were below the 80% SPL. Monitoring of aluminium and vanadium is discussed further in Section 6.3.3.2 below in relation to monitoring within the North Drain after mixing.

6.3.3.2 North Drain and ITA Stormwater Dishcarges

The results from the past two years' monitoring data (2019-2021) for ITA Stormwater Discharges were analysed and compared to the existing Investigation Trigger Levels, and where relevant the ANZWQG. As these results represent discharges prior to mixing (i.e. discharge outlet monitoring) and the North Drain is highly modified, the results have been compared to the 80% SPL. For receiving environment monitoring at Sites 1 and 4 (i.e. after mixing), the data has been compared to 80% SPL at Site 1 and 95% SPL at Site 4 downstream.

The results for heavy metals showed frequent exceedances of ANZWQG DVG for most ITA discharge monitoring locations in the North Drain. This is expected as these are grab samples that have been typically taken during rain events, when stormwater contaminants are elevated. They are not necessarily representative of long-term, ambient concentrations that the guidelines are intended to manage. Nonetheless, these results show which contaminants are of greatest concern. This comment also applies to discharges to the Kahawai and Ruakohua Streams and is shown in greater detail in Appendix C.

A large portion of the rain-event grab samples (discharge samples, not receiving environment) were above the existing Trigger Investigation Levels for multiple contaminants in the North Drain ITA Catchment.

A summary of the recent ITA discharge and receiving environment results are as follows:

- We note that the existing ITA discharge monitoring represents the discharges prior to mixing, and therefore to further understand the combined effects on the receiving environment of the discharges after mixing, additional monitoring has been established at Site 1 and Site 4 at the upstream and downstream end of Lower North Stream (refer Appendix A, Figure W-ITA2 for locations). The monitoring commenced in July 2021, with the results for the period to June 2022 reviewed.
- When compared to the ANZWQG 80% SPL, at the East Pond outlet, most frequent elevated contaminants were aluminium, boron, iron, zinc, and copper.
- At the Y56K Pond Outlet and CY19 Pond outlet, concentrations were elevated above ANZWQG for 80% SPL for aluminium, boron, chromium (for Y56K Pond only), copper, iron and zinc.
- A comparison of historical results (2015- 2020) to current results (2019- 2021) for ITA receiving environment monitoring (at North Drain 1C which are grab samples collected for purpose of landfill consents) showed that concentrations of most sampled metals (Al, B, Cr, Cu, Fe, Ni, Zn) and oil and grease increased.
- The receiving environment monitoring showed that at Site 1 (daily composite), parameters which exceeded the ANZWQG 80% SPL were limited to aluminium, iron and vanadium. (Note that there is only one default guideline value for vanadium and one proposed guideline value for iron, with low reliability.) Most other parameters were below the ANZWQG 95% SPL, apart from zinc and chromium which were below the 90% SPL. At Site 4 (daily composite), further downstream, the majority of metals were below the 95% SPL. Aluminium exceeded the 95% SPL however was below the 80% SPL. We note that vanadium also exceeded the default guideline value, although as discussed earlier, this is low reliability.

Further discussion on key contaminants identified as part of the monitoring review are discussed below.

Aluminium is a key contaminant across ITA monitoring sites, with samples exceeding the ANZWQG 80% SPL all of the time from the East Pond and 80% of the time from the Dewatering Plant. When comparing the results for aluminium composite samples between Site 1 (984 µg/L) and Site 4 (149 µg/L), there is an 84.8% decrease after reasonable mixing, and the result is below the 80% SPL at Site 4. The high concentration of aluminium across the site is likely a result of the high concentration within Ironsand and due to the use of Poly aluminium chloride chemical treatment in the ponds to improve the treatment efficiency, rather than associated with a specific contaminant source.

Vanadium has been identified as a contaminant of concern at the Dewatering Plant. The ANZWQG SPL for vanadium has been identified as having low reliability and should only be used as an indicative interim level. Vanadium is also naturally occurring in high concentrations within the Waikato River (water supply to Site) and Ironsand.

Zinc and copper have been identified as key contaminants from the ITA Stormwater Discharges, however we note that both contaminants reduced between Site 1 and Site 4 (38.5% decrease for copper, and 63.5% for zinc). The average copper concentrations for composite samples at Site 1 (1.9 µg/L) was below the 80% SPL and below the 95% SPL at Site 4 (1.2 µg/L). The average zinc concentrations for composite samples at Site 1 (17.5 µg/L) was below the 80% SPL and was below the 95% SPL for Site 4 (6.4 µg/L).

Grab sample monitoring (not continuous) of suspended solids discharges to the North Drain show elevated levels during rain events, with average concentrations of 120 mg/L from East Pond with maximum concentrations of TSS at 500 mg/L. Monitoring within the North Drain and Lower North Stream shows that concentrations at Site 1C have an average concentration of 46 mg/L for TSS with levels up to 393 mg/L reported during rain events. However, daily composite sampling undertaken at Sites 1 and 4 shows an average TSS of 21.3 mg/L and 5.5 mg/L respectively, with a decrease of 74% downstream.

Grab sample monitoring at Site 1C (North Drain) and Site 4c (Lower North Stream) show that conductivity is higher downstream. Biggs (1988)[16] recommends a guideline value of less than 175 uS/ cm. When compared to this guideline for conductivity, 100% of samples exceed. Average conductivity at Site 1C and Site 4c were 921 uS/ cm and 1473 uS/ cm respectively. Given the high salinity of the water that is discharged from the Dewatering Plant (1345 uS/ cm), these values are not unexpected. The impacts of saline water on the Lower North Stream are discussed further in Section 6.2.1 of the Freshwater Ecological Assessment (Appendix H of the AEE).

6.3.4 Kahawai Stream results

The results from the past two years' monitoring show that a large portion of the rain-event grab samples were above the 80% SPL for multiple contaminants.

At the Kahawai Culvert, where the Kahawai Tributary flows into the Kahawai Stream, the most frequent elevated levels were aluminium, boron, copper, iron, zinc, pH and total suspended solids. Concentrations of cadmium, chromium, lead, and nickel were generally low for all ITA Stormwater Discharges. All pH exceedances were above the maximum; no results were below the minimum pH trigger level. There has been an improvement when compared to historical results, being the previous monitoring round from 2015-2020.

Some of the contaminants of concern in the Kahawai Stream were present upstream of the discharge point (notably iron).

6.3.5 Ruakohua Stream results

Discharges from the Ruakohua Stream Catchment exceeded the 80% SPL for freshwater on occasion at Yard 31 (for aluminium, copper, iron, zinc and pH) although the longer-term average and median concentrations met the 80% SPL. There were also exceedances above the 80% SPL for Contractors Compound as well (for aluminium, copper and zinc). Concentrations of chromium, cadmium, lead, and nickel were generally low meeting the 95% SPL.

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[16] Biggs, B.J.F., 1988. Algal proliferations in New Zealand's shallow stony foothills-fed rivers: towards a predictive model.

Discharges to the Ruakohua Stream were generally of better quality than those to the North Drain and Kahawai Stream.

6.4 Observed stormwater device efficiency

The majority of the stormwater treatment devices are monitored at the outlets only. Historically the following two treatment systems include monitoring towards the upper part of the system (inlets) and at the outfall:

- The Northside Pond chute and Northside Outfall; and
- The East Pond and North Drain Site 1C.

The available inlet and outlet contaminant concentrations for metals and total suspended sediment have been compared to estimate device treatment removal rates.

6.4.1 Northside Pond chute

The Northside Ponds has stormwater monitoring at the outlet (grab and composite samples) and grab samples at the chute inlet. The chute conveys process water, from the Steel Plant and Iron Plant, landfill leachate and ITA stormwater from a portion of the Northside Yard areas. The chute flows into the western end of the Northside Ponds. There are additional significantly smaller inflows into the Northside Ponds, which are not monitored.

The grab samples for copper, lead, zinc and total suspended solids, from both locations have been compared to estimate a Northside Ponds device treatment removal rate, this is contained in Table 6.2. This is only available between the chute and the outlet and does not account for the effects of the other inflows, whether that is dilution or additional contamination.

Table 6.2: Estimate of Northside Ponds removal efficiency (Northside Pond Chute comparison with Northside Outfall 2019-2021)

Parameter		Northside Pond Chute (inlet)	Northside Grab (outlet)	Removal efficiency (%)
Total copper (mg/L)	Min	0.0008	0.0015	100%
	Median	0.0170	0.0015	-91%
	Mean	0.0324	0.0029	-91%
	Max	1.1180	0.0150	-99%
Total lead (mg/L)	Min	0.0100	0.0004	-96%
	Median	0.0202	0.0100	-50%
	Mean	0.0631	0.0099	-84%
	Max	1.9600	0.0228	-99%
Total zinc (mg/L)	Min	0.001	0.017	1600%
	Median	1.880	0.087	-95%
	Mean	4.163	0.120	-97%
	Max	77.800	0.859	-99%
Total suspended solids (mg/L)	Min	2.5	2.5	0%
	Median	328	10	-97%
	Mean	642	10	-98%
	Max	27812	28	-100%

The comparison indicates that the concentration reduced significantly between the chute intlet and the Northside Outfall, with reductions for total copper of 91%, total lead of 84%, total zinc of 97% and TSS of 98%.

Although this is only a comparison of one inlet to the pond compared with the outlet, it indicates that a high removal efficiency of total suspended solids and zinc is occurring (> 90%) and other metals are also being decreased from the discharge to the CMA.

6.4.2 Coal yards CY1/2 and CY5/6

The East Pond sub-catchment currently contains a number of coal stockpile yards: these are currently known as Coal Yards 1 and 2 (CY1/2), and Coal Yards 5 and 6 (CY5/6). Historically, runoff from CY5/6 area was conveyed via sheet flow and open drains to CY5 catch pit and then discharged to the North Drain. Improvement work was completed in late 2021 which provided for the CY5/6 yard surface flows to now be conveyed to the head of the East Pond (via a small pond and pipe) for chemical treatment prior to discharge.

6.5 EAF anticipated changes in contaminant loads and flows

While the nature and character of the key contaminants associated with the EAF are generally the same as the existing activities, the total process water discharges and associated contaminant loads may change. Overall, the installation and operation of an EAF would be expected to result in a reduction in contaminant loads to the North Drain and subsequently to the Lower North Stream due to the reduction in area used for coal stockpiling, the provision of stormwater treatment for Scrap Yards and a reduction in the Dewatering Plant flows.

The exact changes will depend on a range of factors including the on-going contribution from stormwater runoff from existing impervious surfaces and the amount of re-use and recycling of water required for on-going activities. To understand if any contaminant loads are likely to increase, a high-level review of potential changes in contaminant loads has been undertaken. This has included an evaluation of likely changes in process water volumes from the main process water sources including the iron and steel water treatment plants.

The key changes that will impact on water discharges and associated contaminant loads include:

- Reduction to two Kilns, two MHF and one melter operating at any one time;
- The decommissioning of the KOBM steelmaking vessel;
- A reduction in the overall volume of coal utilised and stored on the Site;
- A reduction in the volume of iron sand pumped to Site and used;
- The storage of External Scrap;
- Potential changes in the wastes to landfill; and
- Operation of the EAF.

The potential implications in terms of contaminant loads and volume are discussed below.

6.5.1 Northside Outfall

To understand the potential magnitude of change associated with contaminant loads from the Northside Outfall, consideration of the potential loads from the main sources is required.

As outlined above, the main changes are associated with the reduction in Iron Plant operations and the decommissioning of the KOBM. In terms of potential sources, discharges from the Iron Plant clarified water tank, the Steel Plant clarified water tank, Devansco scrubbers and Melter dedust scrubber are the main process water sources discharging to the Northside Ponds via the chute.

Cumulatively these sources contribute approximately 50% of the total volume discharged via the chute, but over 80% of the zinc loads and 60% of the copper loads.

With the operation of an EAF and subsequent changes to the current Iron and Steel Plants, the zinc loads from the main sources will be reduced by approximately half and copper loads by approximately a third. In addition to the reduction in contaminant loads, under an EAF operating scenario the reduced volume discharged to the existing ponds will enable an increase in overall residence time within the Northside Pond system. This Increased residence time will should support an increase in treatment performance and further reduction in contaminant loads discharged to the Waiuku Estuary.

As noted above, the EAF will also require new Scrap Yards which will be established within existing yard areas (adjacent to Iron and Steel Plants). Therefore, the change will not increase the runoff volumes, and with the at source treatment comprising coarse sediment and hydrocarbon removal, it is not expected that the Scrap Yards would materially impact on contaminant loads to the Northside Ponds and Outfall.

Changes to the volumes and materials disposed to landfill may also change, although as the contribution from the landfill is relatively low (at less than 4%), any change is anticipated to be limited and would not impact on the discharges from the Northside outfall.

6.5.2 North Drain (and subsequently the Lower North Stream)

The main potential changes in contaminant loads discharged to the North Drain with the proposed EAF are associated with the reduction in the area used for coal stockpiling, the additional stockpiling of External Scrap in the Buffer Scrap Yard, and a reduction in the operation of the Dewatering Plant (as a direct result of requiring less ironsand).

The reduction in coal use is expected to reduce the total area required for stockpiling of coal. Therefore, any reduction in area used for coal stockpiling will reduce the contaminant loads from coal stockpiling as the runoff is directly linked to total stockpiling area, although the areas will likely be used for other activities. This may include stockpiling of external Scrap or aggregates. If one of the existing coal yards (CY 5/6 or CY 19) is converted to a Scrap Yard, additional stormwater treatment will be provided as outlined in Section 4.4 above including the conversion of existing ponds into a sediment pond/ wetland treatment series. Therefore, the changes associated with the stockpiling of materials within the North Drain ITA Catchment are likely to result in a reduction in the overall contaminant loads. Should CY 5/6 be chosen as the Buffer Scrap Yard area, this will include potential improvements in the performance of the East Pond due to a reduction in the area discharging to the pond.

In terms of the Dewatering Plant discharge, the proposed EAF will reduce the demand for iron sand by approximately half. This would result in a reduction in the overall pumping hours, although the pumping volume per hour would not reduce. Based on the current operation, this would mean the variability or ‘flashiness’ in flow within the North Drain would change, with an increased period where no pumping would be occurring. To reduce the potential increased variability in flow in the North Drain, once the EAF is operational, all Dewatering Plant water is proposed to be discharged discharge into the existing Dewatering Plant ponds to buffer the discharge. This will provide for an overall reduced, but steady, flow to the North Drain. Existing flushing flows during rain events would still occur, with no change in the overall catchment area proposed as part of the EAF operation. The reduction in the Dewatering Plant volume will also reduce the contaminant loads, although any reduction in the concentration of contaminants is likely to be minimal (although some reduction may be achieved by directing all flows through the Dewatering Plant ponds).

7 Key contaminants

7.1 Introduction

A review of the environmental effects of the key contaminants is outlined in the following sub-sections. The descriptions of the effects are from the ANZWQG (2000) and technical briefs, which describe the toxicity of each of the contaminants outlined.

7.2 Suspended solids

Suspended solids may have effects on both the freshwater and marine environments.

Suspended solids reduce water clarity and can discolour water. Cloudy water can reduce the ability for fish to see, interfering with their ability to see prey or detect predators. It also lowers light penetration to aquatic plants, inhibiting or reducing their growth and, therefore, reducing their ability to act as a habitat and food source and produce oxygen (in the form of dissolved oxygen) for those species reliant on these plants.

Suspended solids, given the right low flow conditions, may also settle out to the bed of the waterbody or coastal area. This can smother organisms that live on the bed such as aquatic plants and benthic organisms.

7.3 Heavy metals

The following metals have not been considered, due to the long-term monitoring indicating that the concentrations are generally not above ANZWQ guidelines: arsenic, chromium, cobalt, and nickel.

7.3.1 Aluminium

Aluminium has little known biological function, but is toxic to aquatic fish, invertebrates and plants. In Auckland Regional Council's TP227 *The Use of Flocculants and Coagulants to Aid the Settlement of Suspended Sediment in Earthworks Runoff: Trials, Methodology and Design* it is concluded that toxic aluminium ions from coagulants are rapidly precipitated out of flocculated water which minimises the toxicity to species.

7.3.2 Boron

Boron is a natural constituent of minerals, in particular clay-rich sedimentary rocks, coal and shale. Boron is an essential nutrient for a range of species including plants. Boron in marine water plays an important role as a buffer in maintaining marine water pH. It typically exists as Boric acid (the predominant form of boron in natural freshwater). The influence of pH in toxicity is unclear, and boron is not impacted by changes in water hardness.

7.3.3 Copper

Copper is a trace element that is essential to most aquatic organisms. While essential to most aquatic organisms, toxic concentrations are only slightly above copper concentrations required for the optimum growth of algae.

The toxicity of copper can be influenced by the levels of dissolved organic matter, pH, water hardness, alkalinity and salinity. Copper forms complexes with dissolved organic matter, which can decrease the bioavailability, and therefore toxicity, of copper concentrations that may otherwise exceed guidelines. Generally, the uptake and toxicity of copper decreases with decreasing pH, however some studies have shown an increase in toxicity with decreasing pH over the pH range of

6.0 - 8.5. In freshwater organisms, toxicity generally decreases with increasing water hardness and alkalinity and generally increases as salinity decreases.

7.3.4 Iron

Iron is one of the most abundant elements in the earth's crust. Iron is an essential trace element for both plants and animals and is required by most organisms for essential growth and development, with iron deficiency resulting in adverse biological effects. Some studies have shown that in the presence of oxygen, iron his found as ferric hydroxide which can have similar issues to suspended solids in terms of decreased light penetration and smothering of benthic organisms.

7.3.5 Vanadium

Vanadium is an essential micronutrient for many organisms, stimulating growth in low concentrations. However, it is toxic to many aquatic plants, fish and invertebrates in very high concentrations.

Vanadium can exist in two forms, vanadium (V) and vanadium (IV). Vanadium (V) is the form which is more toxic to aquatic life. Vanadium toxicity is primarily impacted by pH and water hardness, with the toxicity of vanadium to be the greatest within normal pH ranges of 6 - 9. It is also generally observed that the toxicity of vanadium decreases with increased water hardness.

7.3.6 Zinc

Zinc is a trace element that is essential to many aquatic organisms for their growth and development. While essential, zinc can also be toxic to freshwater, marine fish, invertebrate and plant species at higher concentrations. Toxicity of zinc can be influenced by a number of factors including the levels of dissolved organic matter, salinity and alkalinity of waters. In freshwater zinc forms complexes with organic matter, decreasing the concentration available in the water. Zinc is found to decrease in toxicity with increasing salinity. The toxicity of zinc is found to generally decrease with pH below 8.

7.4 Salinity

In estuarine and marine environments, salinity protects invertebrates against negative effects caused by metals. However, salinity in freshwater, estuarine and marine environments is harmful to organisms when concentrations are beyond the natural fluctuations for the organism within the specific environments as it exceeds their ability to balance salt concentrations, and therefore water, within their own internal fluids. This can affect the metabolic rates of these organisms.

7.5 pH

Most organisms require pH to range between 6.5 and 9.0, with many organisms requiring pH to be within a smaller subset range of this. pH exceeding the tolerable levels for aquatic species is lethal. As well as this, pH can affect the solubility and toxicity of many other chemicals and heavy metals.

7.6 Temperature

Most aquatic species are cold-blooded and therefore their physiology is affected by the temperature of their surrounding environment. It affects their metabolic rate, and therefore their energy and behaviour. This includes their ability to obtain food and process it through digestion, nutrient absorption and excess energy storage. Temperature effects are dependent on timing, duration and exposure and are organism specific.

7.7 Poly aromatic hydrocarbons (PAHs)

Most aquatic species are cold-blooded and therefore their physiology is affected by the temperature of their surrounding environment. It affects their metabolic rate, and therefore their energy and behaviour. This includes their ability to obtain food and process it through digestion, nutrient absorption and excess energy storage. Temperature effects are dependent on timing, duration and exposure and are organism specific.

8 Best practicable option

8.1 Introduction

There is a range of engineering operational and management controls used to manage discharges to water from the Steel Mill as summarised in Section 5. The appropriateness of this suite of measures can be evaluated by considering the extent to which it constitutes the 'best practicable option' (BPO). BPO is defined in section 2 of the RMA as follows:

> *best practicable option, in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to—*
>
> *(a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and*
>
> *(b) the financial implications, and the effects on the environment, of that option when compared with other options; and*
>
> *(c) the current state of technical knowledge and the likelihood that the option can be successfully applied*

The concept of BPO is consistent with the RMA framework, which is focussed on avoiding, remedying, or mitigating adverse effects. This is a different approach to concepts used internationally such as "Best Available Technique" (BAT), which are focussed on identifying the best technically and financially viable technologies as the basis for setting limits (regardless of the nature and scale of effects). BPO is determined on a site-specific basis, taking into account the nature of the discharge and the environmental context.

8.2 Ruakohua Stream

The activities undertaken within sub-catchments that drain to the Ruakohua Stream are predominantly low risk, with no significant contaminant loads expected. Stormwater treatment is also provided prior to discharge via either filters or ponds which are consistent with current good practice to further reduce contaminant loads. Alternative treatment methods such as sandfilters, wetlands or raingardens would provide a similar level of treatment. There is also insufficient space for the construction of treatment methods such as a wetland or raingarden. Therefore, any additional costs would not be justified on the basis that there would not be any improvements in water quality.

In addition, the Ruakohua Stream feeds into the Ruakohua Dam which provides water for the Steel Mill and only rarely discharges to the Waiuku Estuary.

Therefore, the current controls and discharge locations are considered to be consistent with BPO.

8.3 Kahawai Stream

Monitoring within the Kahawai Stream indicates that the discharges from current and historic activities are impacting on water quality in the Kahawai Stream, despite in recent years NZ Steel implementing measures to improve water quality. In response, NZ Steel has removed historical fill and returned the area to grass to reduce on-going contaminant loads through avoidance of ITA discharge from the Site to the Kahawai Stream.

8.4 North Drain ITA discharge

The main ITA stormwater discharges to the North Drain, which in turn discharges to the Lower North Stream, include runoff from coal, PC (ironsand) and aggregate stockpiles. The key contaminants from these are suspended sediment due to the nature of the material, along with heavy metals associated with large vehicle movements, coal runoff and metals within the ironsand (predominantly iron but also aluminium and vanadium).

The current treatment systems comprise a range of measures with the primary settlement devices being ponds and drains where sediment can settle out. In terms of the contribution from the aggregate and PC stockpiles, the material is reasonably coarse and readily settles out. Bench top testing has been undertaken to confirm that the material rapidly settles out with no chemical treatment required and therefore, the controls required are similar to earthworks activities.

The key contaminants in the runoff from the coal stockpiles are similar to those from earthworks, being sediment and heavy metals (bound to the sediment). However, the sediment from the coal stockpiles has a lower density (i.e. it is lighter) and is finer. This means it is more difficult to settle out and significantly longer residence times are required without the use of additional measures such as chemical treatment or filtration. This means that typical controls associated with quarrying and earthworks activities cannot be used to determine best practice for the runoff into the North Drain.

While focused on earthworks activities, Auckland Council Guideline Document GD05, Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05) sets out current guidance on best practice for erosion and sediment control within the Auckland Region. Section D1.2 of GD05, which sets out what is considered current best practice, is reproduced below.

Table 4: Best practice methods and measures covered by this document

Erosion control practices E	Non-structural approaches	E1.0		Section
	Water management controls	E2.0	Clean water' diversion channels and bunds	E2.1
			Dirty water' diversion channels and bunds	E2.2
			Contour drains (cut-offs)	E2.3
			Check dams	E2.4
			Pipe drop structures and flumes	E2.5
			Stabilised entranceways	E2.6
			Surface roughening	E2.7
	Soil and surface stabilisation practices	E3.0	Top soiling and grass seeding	E3.1
			Hydroseeding	E3.2
			Turfing	E3.3
			Mulching	E3.4
			Geotextiles and erosion control blankets	E3.5
Sediment control practices F	Structural approaches	F1.0	Sediment retention ponds	F1.1
			Decanting earth bunds (including T bars)	F1.2
			Silt fences	F1.3
			Super silt fences	F1.4
			Silt socks	F1.5
			Stormwater inlet protection	F1.5
	Coagulant and flocculant treatment	F2.0		

In terms of sediment control, best practice includes sediment retention ponds, decanting earth bunds, silt fences, super silt fences, silt socks and inlet protection. The current controls at the Site include the use of silt fences around stockpiles, decanting earth bunds, check-dams, sediment ponds and chemical treatment, which are consistent with the GD05 guidance.

As outlined in Section 4 above, we have also compared the size of the ponds against the design criteria within GD05, and the current pond capacities exceed the recommendations outlined in GD05.

Therefore, in terms of sediment control from the aggregate and PC stockpiles, the current controls are consistent with current best practice. In addition, the effects of sediment are limited to the North Drain, with TSS concentrations within the Lower North Stream and loads to the Waiuku Estuary being low, the current controls are considered to be BPO for the Site.

While the controls for the PC and aggregate stockpiles are considered to be BPO, the nature of coal means additional controls may be more appropriate. To identify current best practice with respect to managing ITA stormwater runoff from coal stockpiles, a review has been completed of controls at other sites within New Zealand, as well as other steel mills internationally.

There are a limited number of sites within New Zealand that stockpile large quantities of coal. The main sites are the Genesis Huntly Power Station and the Port of Lyttelton. The coal stockpiles at both these facilities are larger than the Site, with the Port of Lyttelton having an area nearly two and a half times bigger and the Huntly site nearly four times bigger. Therefore, the potential loads from both sites are much larger than the Site.

Stormwater runoff from the Port of Lyttleton coal stockpile is treated via a Lamella clarifier system. Stormwater runoff from the Huntly Power station is treated via a clarifier and a settling pond system.

Information provided by the WorldSteel Association regarding the management of coal stockpile runoff from 19 steel mills[17] shows that nine sites re-use the runoff from coal stockpiles (which requires large ponds for capture and retention). These uses include spraying stockpiles and dampening roads for dust suppression and feeding the runoff into the coke ovens or for use in cooling processes (following desalination and treatment). The remaining sites discharge the runoff with treatment including sedimentation, sedimentation with chemical treatments, sand filters and clarifier systems.

The best performance is reported to be from sites with sediment ponds with chemical treatment, and additional treatment such as sand filters or clarifiers. It is noted that a number of sites utilising sedimentation and chemical treatment are achieving low discharge concentrations without additional treatment.

The reported ratios of pond volume to stockpile area showed large variations, with ratios between 25% of the contributing catchment and 0.25% of the contributing catchment. The average was 7% of the contributing catchment. At the Site, the pond volume represents 3% of the contributing catchment area, which puts it at the lower end of the range. Further, New Zealand rainfall rates are at the higher end of the reported range.

Based on the review of treatment at other sites in New Zealand, as well as internationally, the current treatment systems at the Site for ITA stormwater runoff from the coal stockpile areas are not current best practice. However, the use of Ponds with chemical treatment are not inconsistent with the controls at other sites.

[17] From a self -reported survey of over 19 sites throughout the world

In terms of whether the current controls are BPO requires consideration of the adequacy of the controls in terms of managing the potential effects.

As outlined in Section 6 above, the discharge is resulting in elevated concentrations of contaminants within discharges to the North Drain, although after consideration of reasonable mixing there were no results at Site 1 (daily composite samples) above the Trigger Investigation Levels under the current consent. Concentrations of TSS and heavy metals at Site 1C within the North Drain are elevated during rain events but are low at grab sample Sites 4 and 6 within the Lower North Stream.

It is noted that while the results at sites 4 and 6 are low, the monitoring was focused on understanding the effects of the landfills and was not focused on understanding the variability in concentrations over longer periods and during storm events.

Therefore, the change in sediment concentrations along the length of the North Drain and effectiveness of additional maintenance such as sediment removal on the North Drain has not been fully investigated.[18] Consequently, a monitoring programme has recently been commenced by NZ Steel to further understand this relationship and to gain greater understanding of the variability in water quality and provide greater confidence that the relevant guidelines are being met within the Lower North Stream.

In the event that the additional monitoring (as proposed in Section 11.3) indicates that the long-term contaminant concentrations are not consistently met, additional controls will be implemented, such as:

- The addition of further treatment capacity including temporary surge-ponding at the coal stockpiles;
- Optimisation of chemical treatment, which may involve change in location of dosing and use of a coagulant in addition to the current chemical; and
- Installing an aggregate filter, to provide additional treatment.

Overall, the current controls and on-going optimisation of the existing infrastructure, is considered to be BPO for ITA Stormwater Discharges.

8.5 Dewatering Plant discharge

The Dewatering Plant discharge consists of the separated slurry water used to move the ironsand from the Mine site to the Steel Mill.

The current Dewatering Plant includes separation of the PC from the slurry water through a hydrocyclone; and then either treatment of the separated water through a clarifier and/ or pond system (depending on the turbidity of the outlet from the clarifier). The discharged water has a relatively low suspended solids concentrations, with additional treatment used if the consent conditions cannot be complied with. Therefore, in terms of turbidity and heavy metals the current controls are considered to be BPO.

In addition to the discharge of suspended sediment, the source of slurry water being the tidal reaches of the Waikato River means the slurry water has elevated salinity. The alternative options have been considered and detailed in Section 10, which consist predominantly of discharging to an alternative location. The use of a desalination plant could also be used to desalinate the water but is likely to cost in the vicinity of $6 million dollars and would require significant on-going energy use.

[18] Note that the current monitoring data within the lower reaches of the stream (sites 4 and 6) has been collected as part of the landfill consents, and not for the purpose of understanding effects from the ITA stormwater discharges.

The freshwater ecological assessment has assessed the effects on the Lower North Stream from the discharges as moderate and proposed some mitigation and has determined that the effects of removing the discharge would be greater than the level of effect from the elevated salinity due to the loss of habitat.

Therefore, it is considered that the current controls are considered to be BPO.

8.6 Northside outfall

The current physical controls at the Site are outlined in Section 5 and incremental improvements made over the period 2003-2022 are outlined in Section 5.7 and Appendix F. These include:

- The use of WWTPs for the process water discharges from the Iron Plant and Steel Plant, including clarifiers and chemical dosing, with recirculation of treated water within the Iron and Steel Plants;
- The Northside Ponds to provide treatment of both process water and stormwater runoff;
- Recycling of water from the Northside Ponds to Iron Plant and diversion of Northside Pond water to the Southside Outfall, to reduce the volume and loads discharged from the Northside Outfall;
- Use of chemical treatment upstream of the Northside Ponds in the Iron and Steel Plant WWTP's to increase the performance of the Northside Ponds (further improvements were completed since 2020);
- Operating the Northside Ponds so that one pond is available for storm-event surge capacity to provide additional capacity with high pond inflows;
- Use of floating baffles to improve removal of sediment, by slowing the flow so that the majority of deposition occurs near the end of the pond receiving the inflow (the head of the pond);
- Regular cleaning of the head of the pond (i.e. three to four times a year) and lowering the pond once a year to confirm capacity and undertake full removal of sediment if required;
- The use of Melter aggregate filters to provide additional treatment, at the Northside Outfall and within the SRNZ Ponds;
- Additional ponds, oil traps and catch-pits within the catchment to provide additional upstream treatment where possible;
- On-going monitoring including real-time continuous monitoring of key contaminants and volume reported to the Utilities control room, with warning alarms for key contaminants;
- Daily composite sampling and grab sampling of discharges from the Northside Outfall; and
- Review of monitoring trends and thorough investigation of elevated volumes or contaminant loads.

The current controls can be compared to current best practice, including the guidance in the European Union, Best Available Techniques (BAT)[19] which includes maximising internal recycling, and using treatment for final flows through filtration or sedimentation.

As outlined above, the Site utilises extensive recycling systems both within the Iron Plant and Steel Plant and within the broader Site, reducing the overall volume of water discharged. The remaining water is then treated via the treatment plants, settlement within the Northside Ponds and filtration through the melter aggregate bed filters. Chemical treatment is also utilised to maximise the potential settlement of solids. Therefore, the Site is consistent with current best practice guidance.

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[19] Best available techniques (BAT) reference document for iron and steel production Industrial emissions Directive 2010/75/EU: integrated pollution prevention and control

Although it is considered that the current controls are consistent with best practice, whether the Site is consistent with BPO includes consideration of opportunities to reduce the contaminant loads of the discharge and therefore reduce the size of the mixing zone over the term of the consent.

NZ Steel uses the "Lean Manufacturing" philosophy of continual improvement, which focuses on the purpose, process and people to enable on-going improvements and optimisation of processes as outlined in Section 5.7. This approach has been demonstrated by NZ Steel over the term of the Existing Consents. Additional improvements currently underway, or being investigated include:

- Ongoing improvements within the Northside ITA Catchment, including:
  - Optimisation of the chemical dosing in the Steel Plant and Iron Plant WWTPs;
  - Pre-treatment for, or avoiding high-zinc overflows from sludge dewatering facilities; and
  - Additional treatment devices within the Iron Plant WWTP, including the use of sand filters.
- Improvements of the settling ponds treatment systems, including:
  - Evaluation of direct discharge from SRNZ Pond (with existing Melter Slag filtration walls) to reduce load on Northside Ponds; and
  - Review of requirement for further upstream catchpits to collect gross-sediment load at source.

Overall, it is considered that the current site management methods, controls and continuous improvement reviews associated with the discharges from the Northside Outfalls are consistent with BPO. To support this conclusion and ensure it remains correct over the duration of the sought consents, the WQMP and associated monitoring programme are proposed as conditions of consent. Throughout these processes, NZ Steel will continue to manage and monitor the discharges to ensure the treatment methods and controls continue to be effective and consistent with BPO.

8.7 Southside Outfall

The current methods in place to minimise discharges outlined in Section 5 from the Southside Outfall include:

- The use of wwtps for the process water discharges from the ARP;
- Recycling of water to minimise the volume discharges;
- The use of stormwater treatment through the wet ponds to reduce contaminant loads;
- On-going monitoring including real-time continuous monitoring of key contaminants reported to the Utilities control room, with warning alarms for key contaminants;
- Daily composite sampling and grab sampling of discharges from the Southside Outfall; and
- Review of monitoring trends and thorough investigation of elevated volumes or contaminant loads.

The marine ecological assessment has also identified that the effects associated with the discharges from the Southside Outfall are not significant. Overall, the methods in place to manage the discharges from the Southside Outfall are also considered to be consistent with BPO.

8.8 Landfill leachate

Leachate from the landfill ponds is pumped across to the Northside Ponds where it is mixed with both process water and stormwater from the Northside Catchment.

Due to the nature of the landfill operation and waste types (being an industrial monofill), the nature of the leachate is significantly different. Within municipal landfills, a key source of contaminants within leachate is associated with biological degradation of the waste material. This includes a range of biological and organic compounds such as ammonia and nitrates. In terms of emerging contaminants, this is also due to the nature of waste include plastics, personal cosmetics and pesticides which are not anticipated to be present in any significant quantities at the site.

In comparison, the waste material at the NZ Steel landfills is not degradable. Therefore, the approaches to managing leachate at other landfills such as recirculation (which is used to encourage waste degradation) are not appropriate in evaluating BPO.

As already noted, leachate monitoring shows that the contaminants present in the landfill leachate are the same as those associated with other activities at the Site (which is expected as the material placed in the landfill is sourced from the Steel Mill activities). Therefore, the approaches used to manage the contaminants more broadly across the Site are also appropriate for managing discharges from the landfill. Further, as the discharges from the landfill leachate ponds are pumped to the Northside Ponds where the sources are mixed, then considering the overall approach to managing discharges from the site is considered appropriate.

Ultimately, due to the elevated pH of the leachate and that the contaminants are the same as those within the Northside Catchment buffering and treatment via the Northside Ponds is considered to be BPO.

8.9 EAF Scrap Yards

Although an External Scrap specification will set out the requirement to minimise contaminants and avoid specified materials as far as practicable, there is likely to be low levels of residual contaminants. The key contaminants from the External Scrap Yards may therefore be:

- Suspended sediment due to both handling of the ferrous scrap, as well as dust from the broader site;
- Heavy metals associated with residual paints and coatings and other residues; and
- Residual PAHs and hydrocarbons, including oil and grease from lubricants and coolants used in the original vehicles the external scrap is sourced from.

Where there are a range of contaminants, the concept of a ‘treatment train’ approach is recommended where a single treatment device or approach cannot effectively manage all of the contaminants. In this circumstance, the majority of the contaminants are the same as those already present on-site through the existing operations (including the presence of oils and grease, metals and suspended solids). In addition, PAHs will be present (although with low loads) from existing processes and activities. When considering BPO for the introduction of External Scrap, where the stormwater will discharge via existing treatment systems, the focus is on understanding the potential changes.

Potential changes to contaminant levels

In terms of overall loads of suspended solids and metals, the tight controls over the quality of the External Scrap will ensure that runoff from the Scrap Yards is unlikely to result in an increase in the contaminant loads. Considering the existing activities undertaken in the proposed Scrap Yards, an overall reduction in suspended solids and metal loads is anticipated. As outlined in the sections above, the existing treatment systems are considered BPO for the existing activities, therefore the existing treatment systems will also be BPO for the proposed external Scrap Yards in terms of suspended solids and metals. For hydrocarbons and oils and greases, the introduction of External Scrap means that the overall loads of these contaminants may increase. Although the current Northside Ponds include provision for some hydrocarbon and oil and grease removal, at source treatment is proposed at each Scrap Yard that will store External Scrap.

At present, the existing treatment for CY 5/6 and CY 19 do not have any hydrocarbon treatment. If there is conversion of either of these yards to Scrap Yards for External Scraps, provision for hydrocarbon and oil and grease removal will be required. PAHs are also likely to be present in runoff from the Scrap Yards, due to the potential presence from oils, greases and lubricants within the External Scrap (particularly car bodies and painted coatings). The existing treatment at the Site has been focused on suspended sediment and metals and therefore has been designed around encouraging the precipitation and settlement of contaminants. While these methods will have some efficiency in removal of PAHs, particularly where they are bound to particles, they are not fully effective. Therefore, the existing treatment systems may not be consistent with BPO if sufficient contaminant loads of PAHs are present.

Improving the existing treatment system

In terms of the Northside Ponds, the contribution from the Scrap Yards will be limited when considering the overall catchment size and contribution sources. Therefore, with the controls in place around External Scrap acceptance and the discharge from the Scrap Yards being mixed with other sources and precipitation and settlement of solids within the pond systems and significant recycling of water, the actual contaminant loads of PAHs discharged via the Northside Outfall are unlikely to be significant. Therefore, for discharges to the Northside Outfall, the proposed at source treatment comprising coarse solids and hydrocarbon removal and treatment through the Northside Ponds are considered BPO.

As discussed above NZ Steel is investigating the conversion of one of the existing SRNZ ponds to a treatment wetland. While the existing and proposed treatment is BPO, the further incorporation of a constructed wetland to treat a proportion of the Northside Outfall flows will further reduce contaminants discharged. The driver for the change is a response to the iwi consultation undertaken as part of the process where both iwi groups highlighted a preference for wetlands in terms of treatment.

In relation to the discharges from the Buffer Scrap Yards to the North Drain, the existing ponds would not be consistent with BPO. However, the further incorporation of constructed wetlands at this catchment and will therefore be modified, as a set out previously, with at-source of treatment would constitute best practice. The use of constructed wetlands have also been shown to be effective for the removal of PAHs from wastewater treatment plants where PAHs may be present in the wastewater. The scrap processing yard in Otahuhu currently utilises a wetland for treatment, which has proven to be effective for the treatment of runoff from their site, although as the activity includes cutting and shredding of scrap the overall loads would be expected to be higher than from NZ Steel Scrap Yards.

Therefore, the proposed treatment through at source treatment for coarse solid and hydrocarbons, treatment via a wetland for the Buffer Scrap Yards and treatment via the existing Northside Ponds with some of the flows being treated through the constructed wetland at the SRNZ pond is considered to be BPO.

9 Assessment of effects

9.1 Flooding effects

The potential for flooding effects occurs where there are susceptible downstream properties. The Northside and Southside Outfalls discharge directly into the coastal environment and therefore, there are no flooding effects associated with these discharges.

There are no properties downstream of the Lower North Stream, the Ruakohua Stream and Kahawai Stream that are susceptible to flooding. Also, the ITA Area discharges having limited stream lengths and pass entirely through NZ Steel property before flowing into the Waiuku Estuary. Therefore, any effects on flooding are considered to be negligible.

9.2 Industrial and Trade Activity management methods

Inappropriate management practices from Industrial or Trade Activities can result in discharges of environmentally hazardous substances associated with the activity onto or into land or water. These environmentally hazardous substances potentially accumulate within receiving environments leading to adverse environmental effects.

The key method for addressing this issue is the preparation and implementation of site-specific EMS and associated management plans and procedures. These identify environmentally hazardous substances associated with a particular Industrial or Trade Activity, and set out methods to avoid, remedy or mitigate the effects from discharges. Section 5.2 lists the management methods in place at the site. Also, as described in Section 5.2, the EMS identifies the activities with the potential to generate contaminants and outlines methods to avoid or minimise potential effects.

9.3 Freshwater effects

9.3.1 Introduction

The potential discharges to freshwater environments include discharges to the Ruakohua Stream, the Kahawai Stream and the North Drain (which in turn discharges to the Lower North Stream). The effects on freshwater environments have been assessed based on consideration of the ecological effects outlined in the Freshwater Ecological Assessment (Appendix H of AEE) and the management methods and controls. The freshwater ecological assessment undertaken is based on the Environmental Institute of Australia and New Zealand (EIANZ) framework which assesses the values of the receiving environments, the magnitude of effects of associated with the proposed activity (in the terms of this application being the ITA stormwater and process water discharges) to evaluate the overall level of ecological effect (varying from negligible to very high).

9.3.2 Effects of ITA stormwater discharges to the Ruakohua Stream and wetlands

The environmental effects of the ITA stormwater discharges to the Ruakohua Stream need to be considered in terms of the overall stream environment. In terms of the freshwater impacts on the Ruakohua Stream, there are a number of other potential sources of contaminants associated with existing land uses. The main land uses within the broader environment include beef and dairy farming and cropping activities. In addition to these rural activities, runoff from roadways will also contribute contaminants to the stream.

The main contaminants from rural activities are primarily associated with suspended solids and nutrients including nitrogen and phosphorus. Runoff from roadways includes suspended solids and heavy metals in particular copper and zinc.

While nutrients from rural activities are a significant issue within waterways throughout New Zealand, the ITA Areas do not have any significant sources of nutrients and therefore, there are no cumulative effects from these sources.

Monitoring undertaken as part of the freshwater ecological assessment indicates that the monitoring location upstream of the Site is of lower ecological value than monitoring locations downstream of the Site discharges with the Site water quality, MCI scores and the SEV scores all improving at the downstream sites/ with distance downstream.

The Freshwater Ecological Assessment has assessed the overall level of effect on the Ruakohua Stream as low, which in terms of the EIANZ framework indicates that no further actions to avoid, remedy or mitigate potential effects are required. The Freshwater Ecological Assessment also assessed the effects to wetlands within the Ruakohua Stream catchment as low.

The main discharges into the Ruakohua Stream from the ITA Area are discussed in Section 4.5 and comprise the Contractors' Compound and the Yard 31. Runoff from both areas pass through stormwater treatment prior to discharging into the stream, with no significant sources of contaminants present in the catchments.

Considering the water quality upstream of the Site, the limited sources of contaminants from the ITA Area water discharges, the presence of stormwater quality treatment for all ITA Stormwater Discharges and the high level of riparian planting on NZ Steel landholdings, the potential effects associated with the discharges of contaminants and stormwater to the Ruakohua Stream are considered less than minor.

9.3.3 Effects of Discharges to the North Drain and Lower North Stream

9.3.3.1 Effects of contaminants from the Dewatering Plant and ITA stormwater discharges to the North Drain and Lower North Stream

The main existing treatment methods utilised for discharges into the North Drain are settlement ponds, which are effective in removal of coarse sediment as well as heavy metals, with improvements made in recent years through the addition of chemical treatment. It should be noted that the majority of the ponds within the North Drain ITA area have been upgraded within the last few years, and the ponds are sized in accordance with appropriate best practice guidelines (see Section 4.8.1).

Notwithstanding the good removal efficiencies, the high incoming loads and the fine nature of the materials mean that the discharge concentrations may still contain relatively high sediment and suspended metal loads during heavy rainfall events which will result in short term impacts on water quality within the North Drain and Lower North Stream.

Monitoring undertaken at ITA stormwater discharge locations have shown concentrations above the ANZWQG 80% SPL (without any allowance for mixing), although monitoring within the receiving environment at North Drain and Lower North Stream show that most contaminants meet the 90% or 95% SPL for ANZWQG in the Lower North Stream, with only aluminium and vanadium exceeding the 80% SPL (refer Section 6.2.3).

As discussed in Section 6.3.3 above, the ANZWQG SPL for vanadium has been identified as having low reliability and should only be used as an indicative interim level. Vanadium is also naturally occurring in high concentrations within the Waikato River and Ironsand The high concentration of aluminium across the site is likely a result of the high concentration within Ironsand and due to the use of poly aluminium chloride chemical treatment in the ponds to improve the treatment efficiency, rather than associated with a specific contaminant source. Therefore, the effects associated with the elevated levels of aluminium and vanadium are not considered to be significant.

Grab sample monitoring (not continuous) of suspended solids of ITA stormwater discharges to the North Drain show elevated levels of suspended solids during rain events (refer Section 6.2.3). Monitoring within the North Drain within the ITA Area also show relatively high suspended solids; however, these concentrations reduce significantly further downstream to the Lower North Stream, with low TSS concentrations in the lower reaches. The monitoring shows that the North Drain and upper reaches of the Lower North Stream provide additional stormwater treatment, with sediment depositing within the North Drain and the upper reaches of the Lower North Stream. This was confirmed with continuous monitoring during 2021- 2022 for Sites 1 and 4.

Monitoring of water quality has been undertaken both at the ITA stormwater discharge locations into the North Drain and along the Lower North Stream itself. While monitoring has historically been limited to rainfall events, continuous sampling was undertaken in 2021- 2022 which provided more accurate readings of the long-term effects of ITA Stormwater Discharges on the Lower North Stream. This has given NZ Steel confidence that while there are short term exceedances of the relevant ANZWQG during heavy rain, the longer-term averages meet the relevant ANZWQG within the lower North Stream. Results indicated that when looking at contaminants of interest for composite samples, when compared to grab samples, these were at least 33.7% lower for heavy metals. When comparing composite samples, only chromium and copper exceeded the 95% SPL at the Site 1 location (North Drain), whereas for grab samples, nearly all metals exceeded the 95% SPL.

When the EAF is fully operational and should a Buffer Scrap Yard be constructed at either the CY 19 and CY 5/6 yards, including providing additional treatment through constructed wetlands, the overall contaminant loads to the North Drain are expected to be lower. This is due to the change in nature of material being stored, with the storage of External Scrap anticipated to result in lower suspended solids and metals than coal storage. The implementation of treatment consistent with BPO will also ensure that the different contaminants (mainly focused on PAHs) will be minimised and discharges are expected to meet the relevant ecological based guidelines.

The Freshwater Ecological Assessment found in the AEE considered the effects of the ITA stormwater discharges to the Lower North Stream to be low based on the relevant ANZWQG values being met.

9.3.3.2 Effects of flow and salinity from the Dewatering Plan discharge to the North Drain and Lower North stream

The key issues associated with the Dewatering Plant discharge include the near-continuous flow to the North Drain, which controls the hydrological regime, and the discharge of brackish water to the freshwater environment.

The Dewatering Plant discharge currently provides most of the flows in the North Drain and Lower North Stream due to the limited upstream catchment area, contributing on average 80%[20] of the total flow within the Lower North Stream at the stream mouth when it is operating. When the EAF is operational, the overall Dewatering Plant discharge will reduce by up to half, reducing the contribution to 40% of the total flow although it will still be the main source during dry periods. If the resource consent to authorise the ongoing discharge was not replaced, the removal of the Dewatering Plant discharge from the North Drain and Lower North Stream would significantly change the flow regime from a permanent stream to intermittent stream. This would reduce the quantity and quality of instream and wetland habitat, including for wetland bird species.

The brackish nature of the discharge is also having effects on the Lower North Stream with changes to salinity within the stream. Increased salinity within freshwater environments can be harmful to organisms when concentrations exceed natural fluctuations. As the on-going discharge will change the salinity for the duration of the consent, effects due to short term fluctuations are unlikely, but

[20] Calculated using the long-term median (50th percentile) flow.

the discharge means that only saline tolerant macroinvertebrate taxa are present. However, the Freshwater Ecological Report considers it unlikely that this change in macroinvertebrate taxa would impact the availability of prey for the fish species that are present. Furthermore, the salinity (and associated water hardness) regulates the toxicity of metals concentrations present in the watercourse, which reduces the potential ecological effects of the metals concentrations in the discharges.

Measures to reduce the salinity of the discharge have been considered by NZ Steel (refer to the alternatives consideration in Section 10.4.1). However, all of the alternative methods are not considered practicable, and the removal of the Dewatering Plant water would likely result in a reduction in the overall habitat through the removal of the discharge and reduction in flows resulting in a greater level of ecological effect to the Lower North Stream.

The Freshwater Ecological Assessment has assessed the effects of the saline discharge to the Lower North Stream as Low, and the cumulative effect of the saline discharge and ITA Stormwater Discharges to the wetlands as Low.

9.3.3.3 Overall effects to the North Drain and Lower North Stream

The potential effects of discharges to the North Drain and Lower North Stream are no more than minor. This is based on:

- The adverse effects of the Dewatering Plant and ITA stormwater discharges on the North Drain and Lower North Stream will be avoided and mitigated to the greatest practicable extent, and the Freshwater Ecological Assessment concludes adverse effects will be Low. In addition, the proposed wetland enhancement package will have additional benefits to the instream communities of the Lower North Stream;
- As monitoring of ITA Stormwater Discharges has historically been undertaken at the discharge location, with limited grab sampling within the Lower North Stream, a composite sampling monitoring programme has been implemented to gain a greater understanding of the long-term contaminant concentrations within the Lower North Stream. This will also enable NZ Steel to understand the variability in concentrations due to both short term changes due to rainfall and long-term averages. Results from continuous monitoring have, as a long-term average, met ANZWQG for 80% SPL across most contaminants;
- In the event that future monitoring shows that the long-term averages result in exceedances of the relevant DGV (80% SPL downstream of Brookside Road and 95% for zinc in the lower reach) additional controls will be implemented including additional treatment and further use of chemical treatment as part of the on-going improvement programme at the site;
- Measures to reduce the salinity of the Dewatering Plant discharge have been considered by NZ Steel. However, all of the alternative methods are not considered practicable. The removal of the Dewatering Plant flows would result in a reduction in the overall habitat through the reduction in stream flows, resulting in a greater level of ecological effect to the Lower North Stream than the retention of the discharge; and
- The enabled continuation of the quantity aspect of the Dewatering Plant discharge provides numerous positive benefits to the freshwater and wetland ecological values of the Lower North Stream, including maintaining the current extent and values of wetland complexes.

The installation and operation of an EAF would be expected to result in a reduction in contaminant loads to the North Drain and subsequently to the Lower North Stream due to the reduction in area used for coal stockpiling, the provision of stormwater treatment for the External Scrap Yards and a reduction in the Dewatering Plant flows. While the Freshwater Ecological Assessment concludes that the proposed discharges will have an overall Low level of effect on wetlands and offsetting or compensation is therefore not required by the EcIAG framework, in recognition of the sensitivity of wetlands and the policy support for their protection and restoration, NZ Steel proposes to undertake ecological enhancement of wetlands.

9.4 Marine effects

9.4.1 Introduction

The key discharges to the marine environment include the discharges from the Northside and Southside Outfalls. In addition, the Lower North Stream, the Kahawai Stream and the Ruakohua Dam spillway discharge to the marine environment. The key contaminants of interest in these discharges have been identified as heavy metals, in particular copper and zinc, sediment, temperature and changes to salinity due to the volume of freshwater being discharged into the marine environment. PAHs will also likely be a key contaminant of interest in these discharges if an EAF goes ahead due to external scrap potentially containing PAHs.

The Marine Ecological Assessment (Appendix I of AEE) has assessed the potential effects associated with the discharges on the marine environment, both within the modelled mixing zone surrounding the outfall locations and the broader Waiuku Estuary. The assessments generally follow the frameworks set out in the EIANZ Ecological Impact Assessment Guidelines (EcIAG). The potential effects of the discharges include:

- Effects associated with the discharge of contaminants and sediment, including changes in water quality within the water column;
- Sedimentation and accumulation of metals in the sediment within the estuarine environment, in particular the marine significant ecological areas (SEA-MS) located to the north and south of the Northside and Southside Outfall locations (Kahawai Stream and Lower North Drain discharge directly to the SEA-MS);
- Effects of both sediment and metals on benthic ecology and shellfish; and
- Effects on fish and effects on birds due to the changes in the environment from increased sediment and contamination of food sources, including the benthic ecology and shellfish.

As outlined in Section 5, the discharges of process water and stormwater are managed through a range of physical and procedural controls. The main controls are the Iron Plant and Steel Plant WWTPs and the various settling ponds, including the Northside and Southside Ponds.

Monitoring of the quality of the discharge from the Northside and Southside Outfalls shows that the discharge has elevated levels of zinc and copper when compared to the ANZWQG Guidelines. Without consideration of mixing, concentrations of these contaminants exceed the 80% SPL. In addition, due to the volume of water discharged from the ITA area, there are changes to salinity and temperature around the Northside and Southside Outfalls.

9.4.2 Marine ecology effects

The Marine Ecological Assessment has assessed the effects outside the mixing zone and stream settling zones to be 'very low' to 'low' for all effects with the exception of coastal birds, which have a 'moderate' effect. Based on the EIANZ framework, this level of residual effects warrants efforts to offset or compensate for adverse effects on ecology. The effects on coastal birds are discussed further in Section 9.4.3 below.

Within the mixing the zone, the ecological effects have been assessed as 'very low' to 'high', although the size of the mixing zone is considered acceptable from a water and sediment quality perspective. This is due to the spatial scale of the mixing zone in terms of the overall Waiuku Estuary, the scale of the activity, the current controls in place and the amount of similar habitat type outside of the mixing zone.

Overall, the marine ecological effects have been assessed as 'very low' to 'low' for all effects except those on coastal birds.

9.4.3 Effects on coastal birds

The potential effects on birds are associated with impacts on foraging habitat quality and quantity (including both benthic ecology and water column ecology) and potential impacts on saline vegetation that provide habitat for birds (roosting or nesting). The Marine Ecological Assessment has identified that the magnitude of effect on birds is 'negligible' to 'low', however due to the presence of SEA-MS and threatened bird species in the Waiuku Estuary, the overall effects are 'moderate'. Therefore, even with a reduction in both sediment and contaminant loads in the discharges, the overall effects will still be 'moderate' for coastal birds.

The presence of threatened bird species and the SEA-MS indicate that compensation for residual effects on birds is appropriate. Proposed compensation comprises improvements to degraded marine areas using either, or a combination of, coastal vegetation restoration, enhancement and weed control, predator control, or construction or enhancement of bird roosts. Monitoring of coastal birds is recommended to track benefits from implemented compensation measures. Overall, it is considered that taking into consideration the proposed monitoring and enhancement the overall effect of the project on coastal birds is no more than minor.

9.4.4 Overall marine effects

The overall effects of discharges to the marine environment have been assessed as no more than minor. This is based on:

- The overall level of effect based on the EIANZ framework on marine ecology is 'very low' to 'low' for all habitat and species types over the Waiuku and Taihiki Estuaries over the duration of the consent with or without the EAF operating with the exception of birds which has been assessed as moderate due to the very high ecological values;
- The Marine Ecological Assessment concludes that the size of the mixing zone is reasonable from a water and sediment quality perspective, due to the spatial scale of the mixing zone relative to the wider Waiuku Estuary, the scale of the activity, the current controls in place, the amount of similar habitat type outside of the mixing zone, and NZ Steel's ongoing commitment to continual improvement;
- The current controls at the site are considered to be consistent with the Best Practicable Option, with comprehensive treatment systems both of process water through the iron and steel plant treatment plants and ITA stormwater, leachate and process discharges through the Northside and Southside Ponds;
- The Steel Mill is operated under an ISO 14001 certified EMS which includes a framework around continual improvement; and

Compensation for residual adverse effects on birds through the implementation of a Coastal Bird Management Programme (CBMP) using either, or a combination of, construction and enhancement of bird roosts, mangrove and coastal vegetation management, and predator control.

9.5 Overall effects

Overall, the effects associated with discharges to Waiuku Estuary, the Ruakohua, Kahawai and Lower North Stream have been assessed as no more than minor on the basis of:

- The implementation of a Water Quality Management Plan to identify activities, contaminants and procedures to reduce or minimise the discharge of contaminants from the site including both ITA Stormwater Discharges and process water discharges;

- The site operating under an ISO 14001 certified EMS that includes continual improvement to continue to identify and consider improvements over the term of the consent;
- A comprehensive monitoring programme to monitor effects on the receiving environment and provide a mechanism to identify potential changes in effects over the term of the consent; and
- That the current controls and procedures are consistent with the Best Practicable Option based on the nature and scale of operations at the site.

The ecological effects based on the current discharges and contaminant loads and proposed EAF have been assessed as very low to moderate, with additional management measures proposed for those with moderate effects (being coastal birds) including additional monitoring undertaken and compensation measures.

10 Alternatives

10.1 Introduction

Section 105 and Schedule 1 of the RMA require consideration of alternative methods of discharge including discharge in any other receiving environment. This section addresses the consideration of alternatives to the proposed discharge.

The effects of the discharges on the freshwater and marine environments have been assessed and are summarised in Sections 9.3 and 9.4. While the overall effects are no more than minor, the only discharges from the Site that have been assessed as having minor adverse environmental effects are:

- The ITA stormwater discharges and the Dewatering Plant discharge to the North Drain, which in turn discharges to the Lower North Stream; and
- Discharges from the Northside Outfall to the CMA in relation to effects within the mixing zone.

Therefore, while alternatives to all discharges have been considered, a more detailed consideration has been undertaken of alternatives for the two above discharges. This has included alternative discharge locations or controls to reduce the discharges.

10.2 Ruakohua Stream

Possible alternatives could include different treatment methods or discharge locations.

In terms of alternative discharge locations, the only source of runoff is stormwater. There are no other practicable discharge locations due to the need for gravity flow following natural ground contours.

Alternative treatment options could include the use of constructed wetlands or sandfilters which are commonly used at other ITA sites within the Auckland Region. All of these alternative treatment options would be expected to result in the same or similar discharge with the same (less than minor) effects on the environment. Moreover, these alternative methods could involve greater uncertainty regarding their efficacy at the Site, by comparison to the current treatment systems, which are established and operate well. Given the above, the additional costs and increased uncertainty would not be justified by the minimal (if any) reduction of effects on the Receiving Environment.

10.3 North Drain and Lower North Stream

10.3.1 North Drain ITA stormwater discharges

The assessment of effects has identified that the controls for ITA Stormwater Discharges from the North Drain Catchment are consistent with best practice with the exception of coal runoff.

Alternative treatment options could include the use of constructed wetlands or sandfilters which are commonly used at other ITA sites within the Auckland Region. These types of devices are not suitable due to the sediment loads anticipated and therefore would not be practicable.

Therefore, within the terms of the alternatives assessment, the focus is on the management of coal runoff.

In terms of alternative discharge methods, information provided by the WorldSteel Association regarding the management of coal stockpile runoff from 19 steel mills[21] shows that nine sites re-use the runoff from coal stockpiles (include spraying stockpiles, dampening roads for dust suppression or

[21] From a self -reported survey of over 19 sites throughout the world.

for use in cooling processes). The remaining sites discharge the runoff with treatment including sedimentation, sedimentation with flocculants, sand filters and clarifier systems.

As set out in Section 8.5, the Genesis Huntly Power Station and the Port of Lyttelton provide useful domestic comparisons of methods to manage coal stockpiles (albeit substantially larger than at the Site). In terms of alternatives, both of these facilities use clarifiers in addition to sediment ponds, which indicates this is the key alternative for consideration, along with either increasing the overall pond capacity at the Site (CY19 pond, East Pond and Y56K pond) and the use of sand-filters or other treatment to further treat the discharge.

Such potential alternative options would require significant capital investment, with costs in the range of up to $20 million, along with significant modifications to the Site due to existing Site constraints and land availability.

As outlined in Section 8, an overall focus on on-going optimisation of the existing infrastructure is considered to be the BPO, with options including additional implementation of controls at the stockpiles to increase temporary ponding at the stockpiles, optimisation of the chemical dosing system, and the diversion of runoff during periods of high loads to the Northside Ponds.

While the alternative options would provide a reduction in overall sediment and contaminants loads, whether this is effective in terms of the environmental effects depends on the current level of effects and what the additional benefit would be achieved with the alternative.

Overall, it would be expected that a reduction in loads would mostly impact the modified reaches of the Lower North Stream. However, the benefit to more sensitive receiving environments (being the Waiuku Estuary and the more natural downstream reaches of the Lower North Stream) would be limited. Therefore, the significant capital cost (in the range of $20 million) of implementing these alternatives for limited additional benefit would not be justified.

10.3.2 Dewatering Plan discharge alternatives

As outlined in Section 2.3.2.1, the Dewatering Plant discharge is separated water from the slurry line, which conveys ironsand from the mine to the Site. The only option for completely avoiding the discharge is by replacing the slurry line with direct transport of ironsand via trucks. This is not practicable due to the volume of ironsand and therefore has not been considered further.

A number of alternative discharge locations have been considered including:

- Pipe to the base of the Lower North Stream;
- Redirect to the Northside Ponds;
- Redirect to the Ruakohua Dam;
- Diversion to slag tipping area for use as cooling water sprays;
- Diversion to Site firewater reservoir; and
- Pumping back to the mine site.

In addition to alternative discharge locations, measures to reduce the sediment within the discharge and reduce the salinity have been considered as well as desalination of the slurry water.

10.3.2.1 Redirect to alternative location

NZ Steel has investigated the possibility of diverting the Dewatering Plant discharge to an alternative location including the base of the Lower North Stream, the Northside Ponds, the Northside Outfall and the Ruakohua Dam.

All of the options which would divert the Dewatering Plant flows to an alternative location would result in changes to the Lower North Stream. The changes include the removal of the permanent flow within the North Drain and Lower North Stream, with inflows only occurring during rainfall events. While some baseflow may exist, this is not likely to be significant due to the landfills on both sides of the catchment being capped to prevent infiltration of stormwater. The reduction in permanent flow would likely result in a large section of the stream and the drain running dry at various times and the stream becoming one that only intermittently flowed, with potential impacts on both existing flora and fauna and an overall reduction of habitat.

In addition, the continuation of flows to wetland complexes are necessary to maintain their current extent and values, including through the provision of flow regimes that have enabled the establishment of the wetlands (most notably in the Lower North Stream where the Dewatering Plant discharges contribute on average 80% of the total flow).

10.3.2.1.1 Redirect to base of Lower North Stream or Northside Outfall

The route to the Lower North Stream would involve laying a new pipeline adjacent to the Lower North Stream. The route to the base of the Lower North Stream would run by gravity. This would require a new outfall structure either in the CMA or at the base of the stream.

The route to the Northside Outfall would involve running a new pipe from the Dewatering Plant across to the Northside Ponds area and discharging the water into the harbour adjacent to the Northside Outfall, via a new dedicated outfall and dissipation structure.

The change in discharge location would not impact the sediment loads into the CMA, with possible increases due to reduced sediment drop out along the length of the North Drain and Lower North Stream. NZ Steel has undertaken some preliminary costing, with the estimated cost at over $1 million to undertake either option which is not justified given the potential negative effects due to the reduction in flows in the North Stream.

10.3.2.1.2 Redirect to the Northside Ponds

This involves running a new pipe into the existing drainage system. While this option avoids any discharges from the Dewatering Plant into the Lower North Stream and the CMA at the Lower North Stream discharge location, the increased volume of water through the Northside Ponds would reduce the residence time in the Northside Ponds, which would reduce the efficiency and therefore increase the loads from the Northside Ponds to the CMA. This option has been previously considered and dismissed as part of the previous reconsenting process due to the impact on the Northside Ponds discharge.

10.3.2.1.3 Redirect to the Ruakohua Dam

Diverting the discharge to the Ruakohua Dam has been considered but ultimately dismissed due to the elevated salinity of the water, resulting in impacts on the Site cogeneration boilers and potential corrosion of existing pipework.

10.3.2.1.4 Redirect to slag tipping area

The Dewatering Plant discharge could be used to supply the slag tipping bays with cooling spray water (currently recycle water from the Northside Ponds is used). This alternative has been considered but ultimately dismissed as the intermittent delivery of the water and the separate intermittent use of the tipping bays means a very imbalanced supply and demand. This would necessitate construction of a large buffer tank between the two areas. Given the proximity of the slag tipping bays, this is impractical.

10.3.2.1.5 Redirect to firewater reservoir

This alternative involves sending the Dewatering Plant discharge to the firewater reservoir where it can be used, or overflow to the Northside Ponds. The route could be along the coal conveyor and then drop down a trestle leg to tie in at an existing underground line going to the firewater reservoir. This option would increase the conductivity of the firewater, and so corrosion of the firewater system is a concern. The overflow from the reservoir would then impact on flows to the Northside Ponds.

10.3.2.1.6 Redirect to mine site

Pumping water back to the mine site would involve the construction of a second pumping line. This would require significant infrastructure including new pumping system, including negotiations with landowners for placement of the pipeline as well as additional consenting requirements. Overall, it is considered that pumping the water back to the mine site would be impractical due to the significant cost and difficulty in obtaining the necessary approvals.

10.3.2.2 Reduction of salinity at the mine site

The water used for the slurry pipeline is sourced from the Waikato River. The salinity will vary depending on the tide and amount of saltwater present in the river at the discharge location. The mine site takes water from the river during lower tides and pumps the water to the slurry pond. Investigations into the variation in salinity at the intake has identified that even during low tide the salinity of the river water is still elevated and would not be within normal ranges for freshwater streams.

10.3.2.3 Desalination of slurry water

The water used to make the slurry at the mine site could be desalinated to a quality suitable for secondary water recycling. Without any modifications at the Dewatering Plant, this would result in a freshwater (rather than brackish) discharge to the North Drain. It would also allow for future internal water recycling within the Site via the Ruakohua Dam.

NZ Steel has undertaken a preliminary investigation into the cost of this option. Including construction and installation, costs are likely to be in the order of $6 million, plus ongoing costs between $0.75 million to $1 million dollars each year. In addition, the plant would require significant energy to run, which would increase carbon emissions unless renewable sources could be developed. Due to the significant up front and on-going costs, this option has not been considered further.

10.4 Northside Outfall Alternatives

The key contaminants of concern in the discharges from the Northside ITA Catchment to the Waiuku Estuary include suspended solids and heavy metals, particularly zinc, as well as the volume effects associated with changes in salinity and temperature of process water and storm water.

As discussed in Section 8.6, the current controls at the Site are generally consistent with best practice, and therefore the focus is on on-going improvements. As the infrastructure is over 35 years old, opportunities to improve the existing controls and reduce the volume or load of contaminants have been considered. To identify any further alternatives or improvements, a workshop was held with NZ Steel and T+T Staff. This identified a wide range of options, although many were discounted due to the low level of effectiveness, limited practicability, and/or significant cost/ capital outlay.

Following the workshop, NZ Steel is continuing to undertake further investigations into several options to understand the potential practicability, cost and likely reduction in contaminant loads. The key options being considered are detailed in Section 8.6.

While additional improvement measures are being considered, there are constraints that need to be understood before any can be progressed including limitations to power availability for pumping systems, physical constraints with limited land available within the Iron Plant and Steel Plants and at the Northside Ponds and Outfall locations, cost implications and the likely reduction in loads and effectiveness.

In addition to the above measures, a number of options have been considered as part of previous applications and reviewed in terms of this application. This includes the discharge to land, and discharge to alternative locations.

Discharging to land is not considered to be a viable alternative because:

- A significant landholding is required to do this. Based on the current daily average consented flow volume of 9,000 m^3/day and experience at other sites, in excess of 50 hectares would be required for discharging the water from the Northside Ponds;
- Stormwater makes up a high proportion of the water in the Northside Ponds and therefore holding and discharging to land during all storm events would not be possible. In addition, irrigation to land would therefore be required during or after heavy rainfall events at which point, the land is likely already saturated. Irrigation to land would risk ponding/flooding or inundation due to over-saturation, and increase other risks such as erosion; and
- Irrigated water would still contain metals and would contaminate soil and possibly surrounding waterways (which may not be acceptable from a cultural perspective).

The construction of the associated infrastructure would be significant (in excess of $20 million). In terms of discharging to streams or the CMA, the CMA provides much greater dilution for the discharge from the Northside and Southside Outfalls than streams, and the CMA is therefore the preferred discharge location. Extending the discharge outlet into the subtidal channel of the Waiuku Estuary would be unlikely to reduce environmental effects within the zone of interest (ZOI), and it may increase the extent of the ZOI. Improved mixing and dilution would occur, however given the modelled mixing zone is considered reasonable this option is not warranted.

In terms of recycling, the site currently recycles water from the Northside Ponds to the Southside Ponds which then drain to the Ruakohua Dam. The site recycles as much water as possible, but capacity constraints and the variation in volumes due to the Northside Ponds receiving both process water and stormwater restricts the ability to increase the volume of recycled water.

The Northside Outfall and the other water treatment devices within the catchment are over 35 years old and there are a number of constraints including physical constraints with limited land available within the Site, cost implications and the likely reduction in loads and effectiveness. On this basis, alternative discharge locations are impractical and therefore the consideration of alternatives have been limited to opportunities to improve the existing controls and reduce the volume or load of contaminants in line with the best practicable option.

As part of the application for the previous stormwater consents, consideration of replacing the wet scrubbers with dry treatment options was discussed. The costs associated with this would be significant (in excess of $50 million) and would impact on the discharges to air. Therefore, this option has been discounted for consideration.

Conditions 3.3(a)-(g) of Existing Permit 21575 also required a trial wetland treatment system on the Northside discharge. The wetland trial resulted in the establishment of surface gravel filter beds which take a small portion of the flow from the Northside Ponds. The filter beds are still operational. Overall, the ponds were found to be effective, but it was determined that insufficient rooms was available to install any further filter beds or replace the flows treated by the Northside Ponds.

As outlined in Section 9.4.2 and the Marine Ecological Assessment, the level of environmental effects within the broader Waiuku Estuary are low, with the key effects within the immediate vicinity of the outfall location within the mixing zone and therefore no further consideration of alternatives beyond what is already being considered is appropriate.

10.4.1 Landfill leachate alternatives

The key contaminants of concern from the landfills are aluminium, copper, vanadium, zinc and pH. Leachate from the East and West Landfills contain the same contaminants found in surface water from the broader Site (which is expected as the nature of the materials disposed are the same or similar as those within the process and on-site).

In terms of alternative options for leachate discharges, alternatives these would be the same as for other discharges from the site, including discharge to land via irrigation, and discharge to alternative locations.

An alternative discharge location for the leachate would be the Lower North Stream, given its location adjacent to the landfills. However, due to the elevated pH of the leachate of around 12, discharging to the Stream is not appropriate.

Discharging to land is also not considered to be a viable alternative for the following reasons:

- A significant landholding is required to do this. Based on the current daily average flow pumping volume of around 1,000 m^3/day and experience at other sites, around 5 hectares would be required for discharging of leachate which is not available within the Site given constraints (such as separation from waterways and drains);
- Irrigation to land has associated risks of ponding/flooding or inundation due to over-saturation, and increases other risks such as erosion;
- Irrigated water would contain metals and would contaminate soil and possibly surrounding waterways (which likely would not be acceptable from a cultural perspective). Landfill leachate is high pH, which may result in downstream effects compared to the existing treatment within the Northside Ponds. The land may also not be useable for pastural farming due to the resulting high pH in the soil; and
- The cost related to the construction and operation of the associated infrastructure to irrigate would be significant.

As such, the most appropriate location for the discharge of landfill leachate is to the Northside Ponds for treatment via dilution, where the high pH water is mixed with the ITA Stormwater and Process Water flows.

10.5 Southside Outfall alternatives

With respect to the Southside Outfall, the current controls are consistent with BPO and the majority of water is recycled within the system.

ITA stormwater discharges to the Waiuku Estuary via the Southside Outfall are rare, as water from the Southside Ponds predominantly discharges to the Ruakohua Dam reservoir for re-use at the Steel Mill. Process water discharges from the ARP (and at times from recycle line from the SRNZ Ponds) can discharge directly to the Southside Outfall, which is a mostly continuous flow (but a significantly lower volume than the Northside Outfall). In terms of alternative locations and methods for the discharge, the same comments made for the Northside Outfall above also apply to the Southside Outfall.

Alternative treatment options could include the use of constructed wetlands or sandfilters which are commonly used at other ITA sites within the Auckland Region. All of these alternative treatment options would be expected to result in the same or similar discharge with the same (less than minor) effects on the environment. Moreover, these alternative methods could involve greater uncertainty regarding their efficacy at the Site, by comparison to the current treatment systems, which are established and operate well. Given the above, the additional costs and increased uncertainty would not be justified by the minimal (if any) reduction of effects on the Receiving Environment.

11 On-going monitoring and mitigation

11.1 Overview

NZ Steel have had a comprehensive monitoring programme at the site, with some of the monitoring going back for other 20 years. This has allowed for a comprehensive review of the existing monitoring data and approaches to ensure and identify an appropriate monitoring programme for the future.

The monitoring requirements are dependent on the purpose of the monitoring.

In general, the purpose of the on-going monitoring include:

a Monitoring potential effects on the environment including:
   - changes in long term trends where they demonstrate effectiveness of ongoing improvements or where further investigation, or actions are required.
   - demonstrate continued compliance for key contaminants which the assessment has been based on. This primarily is focused on zinc and suspended solids.
   - monitor for changes in the marine receiving environment.
   - confirm that current controls associated with discharges to the North Drain are adequate to ensure the concentration of zinc and suspended solids meet the relevant guidelines and consent limits.

b Monitoring as a management tool including:
   - to identify any potential abnormal events which require response (such as a failure of controls).
   - where improvements may be required, to understand the effectiveness and adequacy of controls.

The type and resolution of monitoring varies depending on a range of factors including the variability in historic results, the level of responsiveness required and evaluation of longer-term trend, and whether monitoring is to enable comparison to Investigation Trigger Levels of consent compliance.

A thorough review of the monitoring data has been undertaken to update the monitoring programme (as set out in Schedule 1 to the proposed consent conditions, Appendix R to the AEE) to ensure this is appropriate for the future requirements.

The review has included the following key factors:

- The comprehensiveness of the existing dataset;
- The variability in results and comparison to relevant guidelines;
- The purpose of the monitoring and appropriateness going forward; and
- The resolution required for the required purpose.

11.2 Northside and Southside Outfall monitoring

In terms of the existing Northside and Southside Outfall monitoring, the monitoring records are extensive and comprise daily grab and composite sampling.

For cadmium, chromium, nickel and lead the monitoring results have been consistently below the relevant guidelines and a number of options were considered including:

- Discontinuing monitoring for contaminants that have been consistently low on the basis that the historical monitoring has demonstrated that these are not key contaminants for the site;

- Reducing the monitoring frequency to quarterly (which is the standard frequency applied to ITA and Stormwater discharges which requires seasonal monitoring);
- Reducing the monitoring frequency to monthly grab samples; or
- Maintaining daily composite sampling.

For these contaminants, reducing the monitoring frequency to quarterly is initially proposed, which allows for identification of any changes in longer term trends.

Aluminium, boron, and oil and grease have no relevant guideline value to enable comparison against, but both are key contaminants in terms of the activities on the site with both contaminants present in coal and primary concentrate. On-going monitoring is considered appropriate to understand longer term trends at the site and therefore, monthly monitoring is proposed.

The remaining parameters of interest included in the current monitoring programme include volume, copper, iron, vanadium, TSS and zinc, pH, turbidity, temperature, conductivity and dissolved oxygen. These are key contaminants at the Site as well as the broader environment, therefore, the current daily composite monitoring is proposed to continue. In addition, daily composite monitoring of hardness is proposed to enable the correction for zinc.

It is proposed that the daily composite sample results can be used for comparison with Trigger Investigation Levels as well as for understanding longer term trends and compliance with Consent Limits by looking at longer term averages. Currently, both daily grab samples and daily composite samples are being collected. The grab samples are collected at around 8 am each day at the same time the composite samples are collected for analysis. The review of the historical monitoring data has identified that both sampling methods show the same trends. Therefore, it is proposed to discontinue the daily Northside Outfall grab samples.

The introduction of External Scrap at the Site, when the EAF is fully operational, means additional contaminants are likely, with the main contaminant not currently being monitored being PAHs. Therefore, the inclusion of PAHs within the monitoring programme is proposed.

11.3 North Drain and Lower North Stream monitoring

Existing monitoring within the North Drain and Lower North Stream has been focussed on monitoring of individual discharges to the North Drain (ITA stormwater and Dewatering Plant discharges), and grab sample monitoring within the Lower North Stream required by the landfill consents. Monitoring of the individual ITA discharge sources is currently undertaken monthly, during rain events.

For the purposes of this consent application, to provide a greater resolution and understanding of the effects of discharges to the North Drain and Lower North Stream, daily composite sampling has been commissioned within two sites in the Lower North Stream. These sites represent the water quality at the downstream (northern) extent of the North Drain (at Site 1) and within the lower extent of the Lower North Stream (at Site 4). Monitoring commenced in July 2021 and the results for the period July 2021 to June 2022 have been evaluated to date, and this data set has informed the assessment of effects and proposed monitoring programme for this application.

The monitoring of both the individual ITA stormwater discharges and the daily composite monitoring at Sites 1 and 4 have shown that concentrations of cadmium, chromium, lead and nickel are consistently well below the relevant guidelines (with the exception of Y56K Pond).

It is proposed to continue the daily composite monitoring at Site 1, as this is representative of the discharges after reasonable mixing, as well as continuous monitoring of turbidity.

While insufficient data has been collected to date to establish a relationship between turbidity, TSS and metals at Site 1 with the individual discharges and rainfall, it is anticipated that the higher resolution of data will enable this to be developed.

Once the relationships are understood and provided these show a clear relationship between the different factors (which is anticipated based on the nature of the contaminants and source), the on-going monitoring is proposed to be amended. The monitoring will be focused on the following aspects:

- Daily composite monitoring at Site 1 to provide information on long-term contaminant trends and monitor for short-term changes in individual contaminants (samples collected and analysed twice weekly);
- Continuous turbidity monitoring at Site 1, CY19, Dewatering Plant and the East Pond outlets to provide real time information on potential unexpected discharges or reduced performance of the on-site controls or treatment; and
- Grab sample monitoring at CY19, Dewatering Plant and East Pond, which will only be undertaken in the event of an exceedance of Trigger Investigation Levels at Site 1, or an exceedance of the turbidity Trigger Investigation Level. This event-based monitoring is a change from the current monthly monitoring.

Until sufficient data has been collected to enable the relationships to be established, the current monthly grab sampling at the East Pond and CY19 outlets will be continued including monitoring for pH, TSS, conductivity, hardness, oil and grease, aluminium, boron, copper, iron, vanadium and zinc. This is anticipated to be continued until two years of data has been collected for continuous turbidity and daily composite results at Site 1. At this point, a review of the data will be undertaken, and the outcome of the review and proposed changes to the monitoring programme will be submitted to Council.

The introduction of External Scrap at the Site, once the EAF is fully operational, means additional contaminants are likely, with the main contaminant not currently monitored being oils and greases and PAHs. Therefore, the inclusion of these contaminants within the monitoring programme is proposed.

The composite samples at Site 1 will be analysed for pH, hardness, boron, conductivity, cadmium, chromium, lead and nickel, aluminium, copper, iron, zinc, TSS and grabs samples will be analysed for oils and grease and PAHs.

The proposed monitoring programme also includes monitoring of the Buffer Scrap Yard discharge on the basis that an EAF is installed and operated.

11.4 Dewatering Plant

Existing monitoring of the Dewatering Plant discharge, required by the existing resource consent, has been limited to volume and turbidity. To support the application, additional monthly monitoring has been undertaken of the Dewatering Plant discharge, for a wider range of contaminants including heavy metals, with results from September 2019 to September 2021 summarised in Appendix C.

The monitoring has shown that concentrations of boron, cadmium, chromium, lead and nickel were consistently below the relevant guidelines, but that concentrations of aluminium, copper, iron, vanadium and zinc were occasionally above the guidelines values (between 7.5% and 80% of results above the relevant guideline).

Therefore, monitoring for boron, chromium, cadmium, lead and nickel will cease going forward. Monitoring for aluminium, copper, iron, vanadium, TSS, pH, hardness, oil and grease, and zinc will be continued to match the monitoring of other individual ITA Stormwater Discharges into the North Drain discussed in Section 11.3 above.

The monitoring has also shown that the results for conductivity, temperature, and turbidity vary. Turbidity results have exceeded the current consent limits on occasion (most very short duration < 1 hour). Conductivity, temperature, and turbidity are also key contaminants in terms of the Dewatering Plant discharge and potential effects on the North Stream. Therefore, monitoring for these contaminants will occur with the Site 1 daily composite samples. Discharge flow and turbidity monitoring will continue, with a 3-monthly flow weighted average consent limit proposed.

11.5 Ruakohua ITA Stormwater Discharges

Historically, monitoring within the Ruakohua and Kahawai Streams has been focused on monitoring of individual ITA stormwater discharges. Monitoring of the individual ITA sources is undertaken monthly during rain events.

The monitoring of both the individual ITA Stormwater Discharges have shown that concentrations of cadmium, chromium, lead and nickel are consistently well below the relevant guidelines. Monitoring of boron at the two ITA Stormwater Discharges to the Ruakohua Stream have been consistently below the relevant guideline. Therefore, it is proposed to discontinue monitoring for these parameters.

The rain-based grab samples for pH, aluminium, boron, copper, iron, zinc, hardness, temperature, conductivity, oil and grease and TSS from the individual ITA sources will continue but the frequency will reduce to quarterly.

11.6 Marine monitoring

Monitoring within the marine environment is currently undertaken including monitoring of copper and zinc concentrations in oysters, sampling of sediment within the mixing zone and monitoring of benthic health.

This monitoring is discussed in more detail in the Marine Ecology Assessment, but on-going monitoring will continue.

11.7 Trigger Investigation Levels

For the majority of contaminants, the historical results have been stable, and the purpose of the monitoring is to identify changes in water quality and proactively manage the source. Trigger Investigation Levels will be developed for the key contaminants at each discharge location to identify results or trends for which responsive actions should be taken.

The Trigger Investigation Levels will be set based on the higher of the following for the majority of contaminants (with the exception of pH):

- The average plus two standard deviations based on the previous 2 years of monitoring data; or
- The ANZWQG 95% SPL where this is higher than the monitoring results.

The exception to this is pH where the existing triggers of less than 6 and more than 9.5 will remain.

A review of the monitoring data for the period 2020 to 2021 has been undertaken to provide an initial draft Trigger Investigation Levels, with these being updated following the granting of the consent and then annually thereafter based on the previous two years of monitoring data.

The draft Trigger Investigation Levels are included in the Monitoring Data Review (Appendix C) and in the draft water monitoring programme within the Water Quality Management Plan (Appendix K of the AEE).

Refer to Section 11.9 for responses taken if a Trigger Investigation Level is exceeded.

11.8 Consent Limits

11.8.1 Northside and Southside Outfall consent limits

While the Trigger Investigation Levels will be used as a tool to drive on-going improvements, consent limits are proposed for some specific key contaminants and to set an upper limit for other contaminants at the Northside and Southside outfalls.

For a number of key contaminants including TSS, zinc and copper, the consent limits have been set based on the historical monitoring results and the modelling undertaken by DHI.

The current consents include a volume limit from both the Northside and Southside Outfalls. The documentation provided as part of the 2003 consents does not specify the purpose of the volume limit but is focused on overall zinc loads. Furthermore, we note that flows above the consented limits generally occur as a result of rainfall events, not process water, and freshwater flows from other catchments under rainfall events contribute much more freshwater to the estuary.

It is therefore proposed to have consent limits specific to zinc loads and concentration and no longer include a consent limit for volume from the Northside and Southside Outfalls. This is to ensure that the management focus is on the key contaminants, in particular zinc, rather on managing the volume as it has been in the past. While no specific volume limit is proposed, the inclusion of the consent limits on zinc concentration and load also provide an indirect restriction to the overall volume, as the concentration and load are linked through the overall volume discharged. For example, assuming the discharge was at the zinc concentration limit of 0.11 mg/L the maximum daily volume able to be discharged would be 9,090 m^3 without exceeding the zinc load limit of 1 kg/day.

For other parameters including cadmium, chromium, lead and nickel, aluminium, boron and iron the monitoring results show that on-going effects associated with these parameters are negligible. Therefore, upper limits have been developed based on the published ANZ DGV's with a factor applied to allow for mixing where applicable. There are no relevant guideline values for aluminium, boron and iron and therefore no limits are proposed.

The factor has been developed based on the difference between the discharge concentration and the outer extent of the mixing zone which gives a 13 fold difference. To ensure that an exceedance of the consent limit would not directly result in an exceedance of the relevant ANZ DGV within the environment, the factor has been set at 80% of the modelled factor. Therefore, the consent limits for cadmium, chromium, lead and nickel at the Northside and Southside outfalls have been set at 10 times the relevant ANZ DGV for the 95% SPL.

Table 11.1: Northside and Southside Outfalls proposed Consent Limits

Parameter	Northside Outfall proposed Consent Limit	Southside Outfall proposed Consent Limit
pH	6 - 9.5	6 - 9.5
TSS	15 mg/L (monthly flow weighted average)	-

Zinc concentration	0.11 mg/L (three monthly flow weighted average)	0.08 mg/L (three monthly flow weighted average)
Zinc load	1 kg/day (three monthly flow weighted average)	-
Cadmium	0.055 mg/L (three monthly flow weighted average)	0.055 mg/L (three monthly flow weighted average)
Chromium (CrIV)	0.044 mg/L (three monthly flow weighted average)	0.044 mg/L (three monthly flow weighted average)
Copper	0.013 mg/L (three monthly flow weighted average)	0.013 mg/L (three monthly flow weighted average)
Lead	0.044 mg/L (three monthly flow weighted average)	0.044 mg/L (three monthly flow weighted average)
Nickel	0.7 mg/L (three monthly flow weighted average)	0.7 mg/L (three monthly flow weighted average)

11.8.2 North Drain and Dewatering Plant

The existing ITA consent does not have any consent limits, with only Trigger Investigation Levels set at the individual discharge locations. As outlined in Section 11.3 above, the monitoring for cadmium, chromium, lead and nickel are consistently well below the relevant guidelines and therefore no consent limits for these contaminants are proposed and other parameters either have no guideline or a low reliability guideline. Therefore, consent limits are only proposed for TSS and zinc which are the key contaminants in terms of potential effects on the North Stream.

The existing limits for volume and turbidity from the Dewatering Plant are also proposed to be retained.

The proposed consent limits are summarised in Table 11.2 and Table 11.3 below.

Table 11.2: Dewatering Plan proposed Consent Limits

Parameter	Proposed Consent Limit
Volume	Average 7,400 m^3/day,
Turbidity	20 NTU (monthly flow weighted average)

Table 11.3: North Drain proposed Consent Limits

Parameter	Proposed Consent Limit
TSS	50 mg/L (monthly average)
Zinc	0.031 mg/L (80% ANZECC DGV, monthly average)

11.9 Trigger Investigation Level responses

In the event of an exceedance of a Trigger Investigation Level, the appropriate actions are outlined in the WQMP. The WQMP includes flow charts which detail the response for each discharge/ monitoring location.

In general, a Trigger Investigation Level exceedance will result in the following actions:

- An investigation into the possible source to identify any process failures or upsets;

- If an immediate source is not identified, additional monitoring will be undertaken to identify if the exceedance was a one-off event, or is still ongoing; and
- If the monitoring shows the issue is ongoing and the source has not yet been identified, NZ Steel will initiate its incident response procedure.

Reporting of the exceedance and the actions that were taken in response.

12 Applicability

This report has been prepared for the exclusive use of our client NZ Steel Ltd, with respect to the particular brief given to us and in accordance with the scope of work set out in our letter of engagement dated 17 June 2019 and associated variations. It may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application for resource consent and that Auckland Council as the consenting authority will use this report for the purpose of assessing that application.

Tonkin & Taylor Ltd

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
....	....
Rob Van de Munckhof	Jenny Simpson
Principal Environmental Engineer	Project Director

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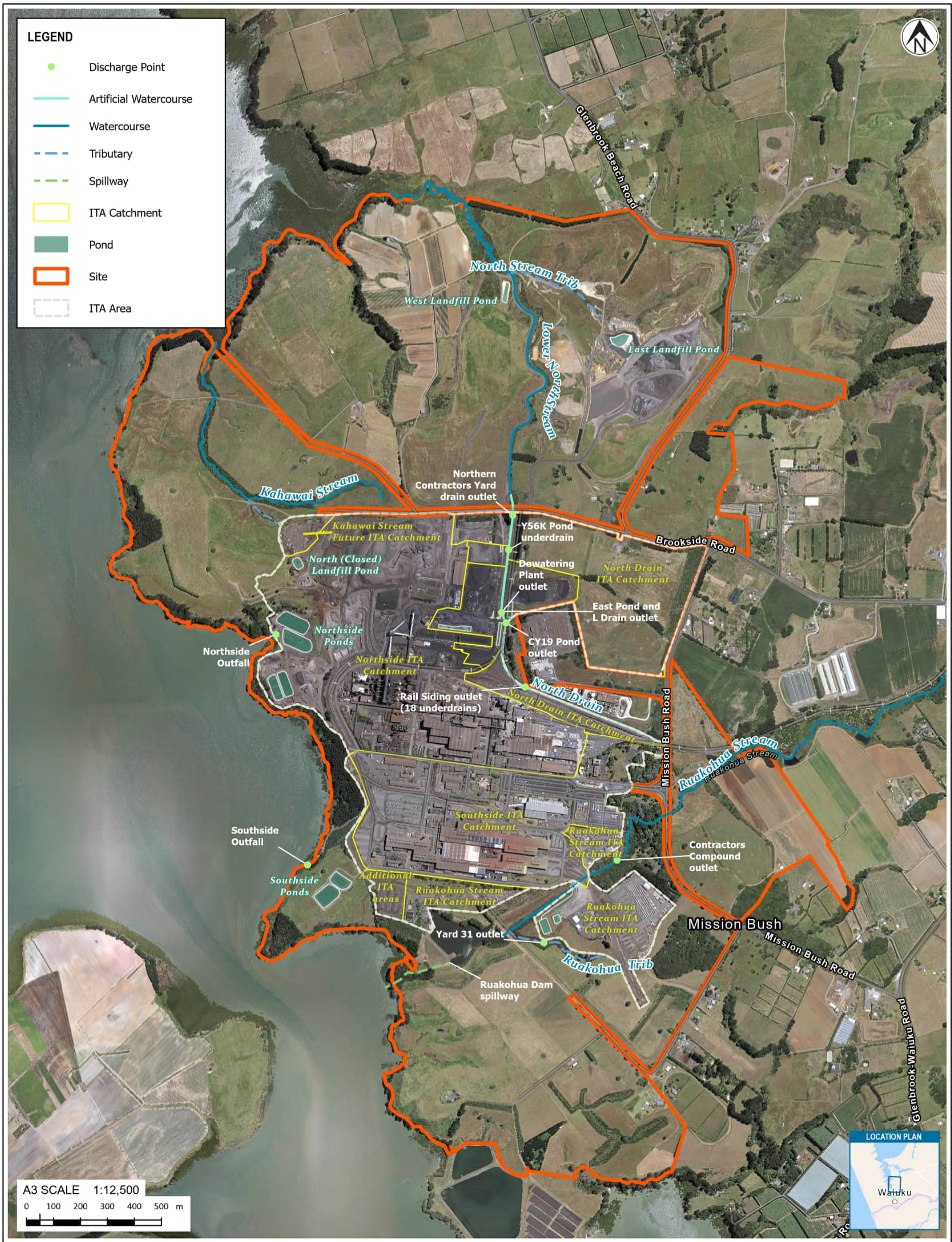
Appendix A ITA Figures



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REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE
2	Third version	JORB	CHSA	10/04/24		
1	Second version	JORB	CHSA	29/09/22		

PROJECT No.	1010577	
DESIGNED	JORB	APR.24
DRAWN	JORB	APR.24
CHECKED	CHSA	APR.24

CLIENT NZ STEEL
PROJECT RECONSENTING GLENBROOK STEEL MILL
TITLE EXISTING KEY FEATURES OVERVIEW
SCALE (A3) 1:12,500 FIG No. FIGURE W-ITA1 REV 2

\\ttgroup.local\corporate\Auckland\Projects\1010577\WorkingMaterial\GIS\Map_Documents\P1010577_Water_UpdatedApril2024.aprx Layout: W-ITA1 - Existing stormwater pond key features plan 2024-Apr-10 4:02 pm Drawn by JORB

\\ttgroup.local\corporate\Auckland\Projects\1010577\WorkingMaterial\GIS\Map_Documents\P1010577_Water_UpdatedApril2024.aprx Layout: W-ITA2 - Freshwater quality and stormwater sampling 2024-Apr-10 11:43 am Drawn by JORB

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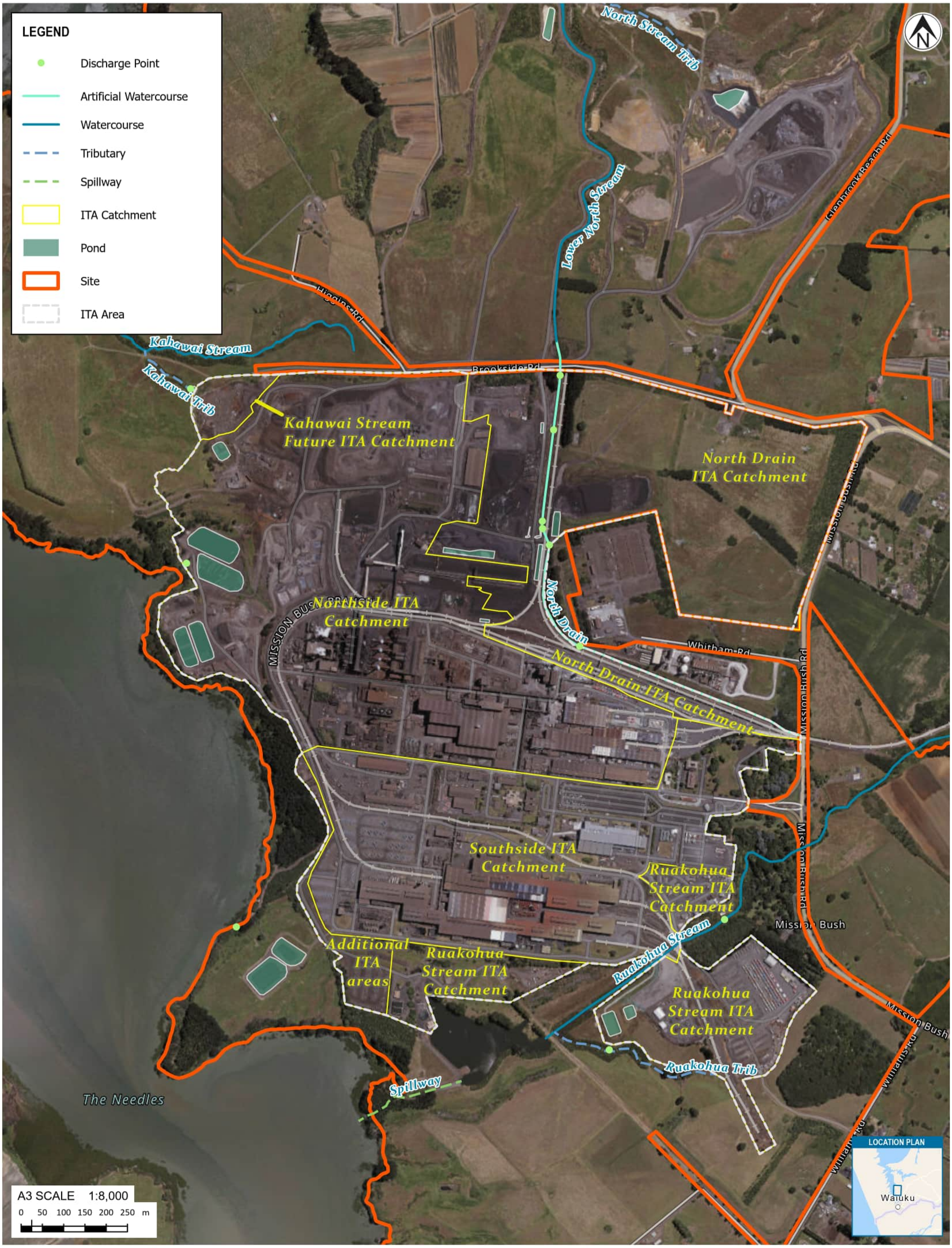
APPROVED		DATE

CLIENT NZ STEEL
PROJECT RECONSENTING GLENBROOK STEEL MILL
TITLE FRESHWATER QUALITY AND STORMWATER SAMPLING SITES (EXISTING AND HISTORICAL)
SCALE (A3) 1:12,500 FIG No. FIGURE W-ITA2 REV 2



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REV	DESCRIPTION	GIS	CHK	DATE
2	Third version	JORB	CHSA	10/04/24
1	Second version	JORB	CHSA	29/09/22

PROJECT No.	1010577	
DESIGNED	JORB	APR.24
DRAWN	JORB	APR.24
CHECKED	CHSA	APR.24
APPROVED		DATE

CLIENT NZ STEEL
PROJECT RECONSENTING GLENBROOK STEEL MILL
TITLE ITA CATCHMENT OVERVIEW

SCALE (A3) 1:8,000 FIG No. FIGURE W-ITA3 REV 2

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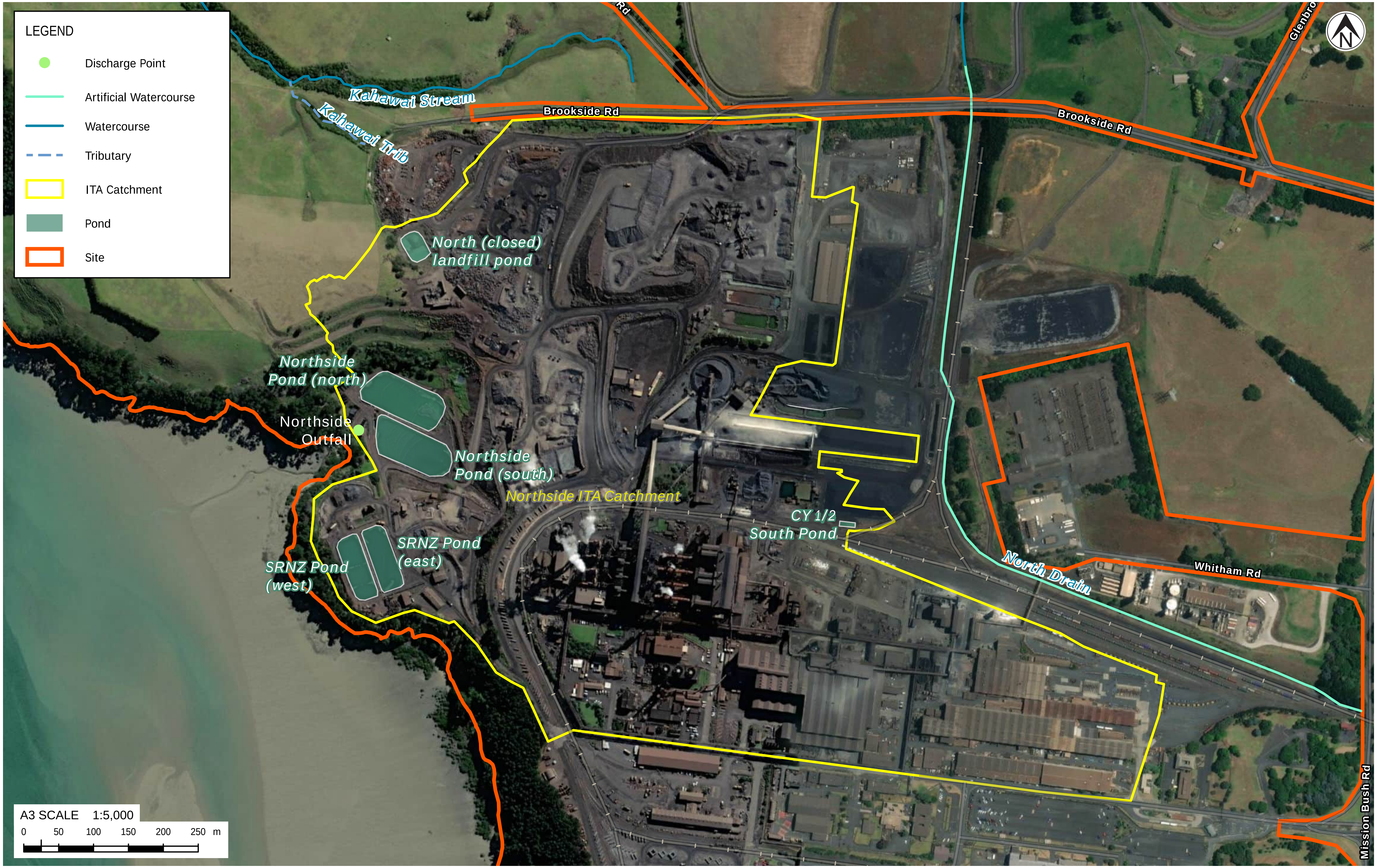

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NOTES:
Basemap Hybrid Reference Layer: Esri Community Maps Contributors, LINZ, Stats NZ, Eagle Technology, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS. World Navigation Map: LINZ, Stats NZ, Eagle Technology, Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS. World Imagery: Maxar

REV	DESCRIPTION	GIS	CHK	DATE
0	First version	JORB	ANTH	27/06/21

LOCATION PLAN: Waiuku

PROJECT No.	1010577	
DESIGNED	JORB	AUG.22
DRAWN	JORB	AUG.22
CHECKED	ANTH	AUG.22
APPROVED		DATE

CLIENT: NZ STEEL

PROJECT: RECONSENTING GLENBROOK STEEL MILL

TITLE: NORTHSIDE ITA CATCHMENT AND FEATURES (CURRENT)

SCALE (A3) 1:5,000   FIG No. FIGURE W-ITA4   REV 0

COPYRIGHT ON THIS FIGURE IS RESERVED DO NOT SCALE FROM THIS FIGURE - IF IN DOUBT, ASK. \\ttgroup.local\corporate\Auckland\Projects\1010577\WorkingMaterial\GIS\Map_Documents\P1010577_Water_Updated.aprx Layout: W-ITA5 - Landscape Southside Catchment Plan Overview 2022-Apr-07 10:40 am Drawn by JORB

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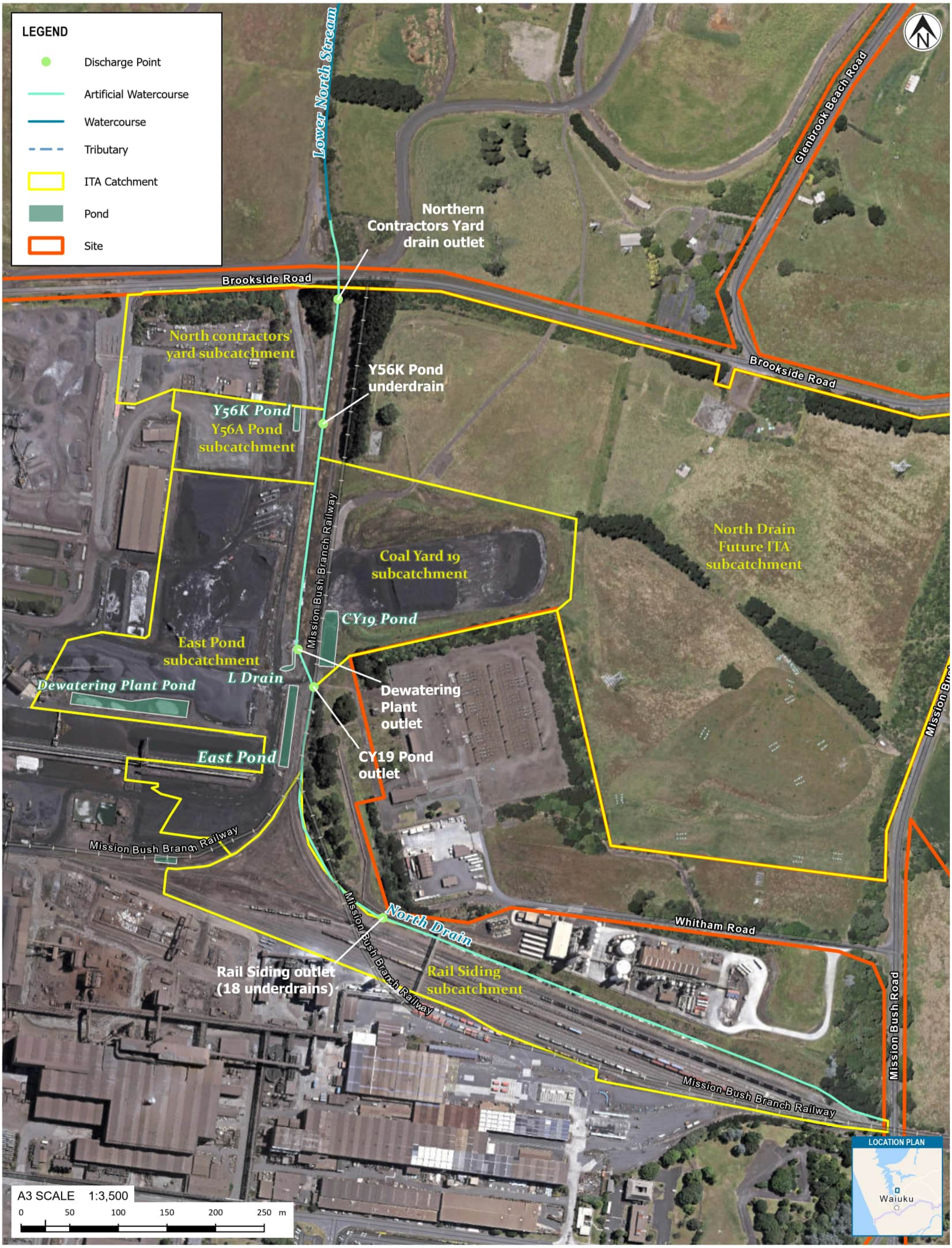
NOTES:
Basemap World Navigation Map: LINZ, Stats NZ, Eagle Technology, Esri, HERE, Garmin, FAO, METI/NASA, USGS. Hybrid Reference Layer: Esri Community Maps Contributors, LINZ, Stats NZ, Eagle Technology, Esri, HERE, Garmin, METI/NASA, USGS. World Imagery: Waikato Regional, Maxar

REV	DESCRIPTION	GIS	CHK	DATE
0	First version	JORB	ANTH	27/06/21

LOCATION PLAN: Waiuku

PROJECT No.	1010577	
DESIGNED	JORB	APR.22
DRAWN	JORB	APR.22
CHECKED	ANTH	APR.22
APPROVED		DATE

CLIENT NZ STEEL
PROJECT RECONSENTING GLENBROOK STEEL MILL
TITLE SOUTHSIDE ITA CATCHMENT AND FEATURES (CURRENT)
SCALE (A3) 1:5,000 FIG No. FIGURE W-ITA5 REV 0



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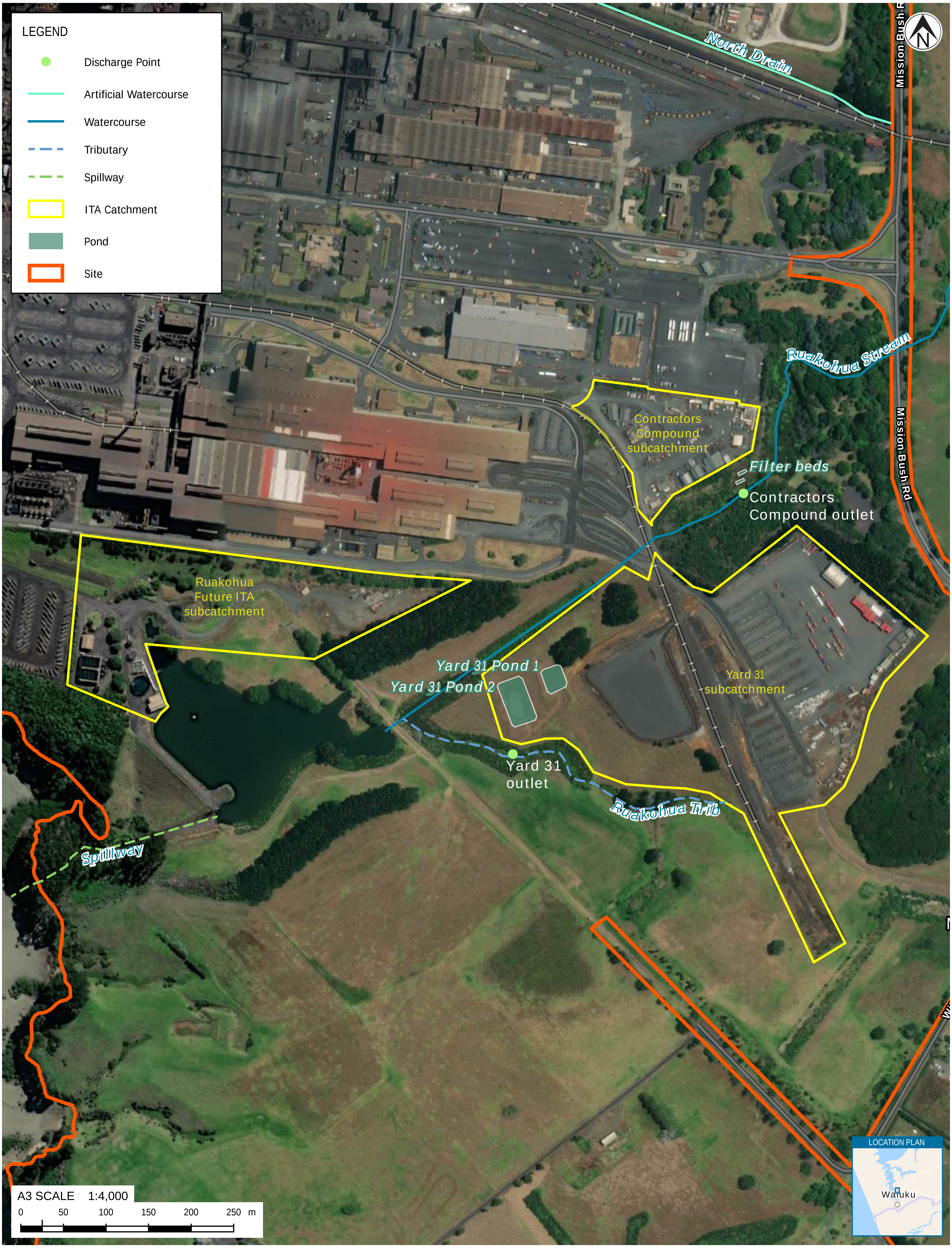
REV	DESCRIPTION	GIS	CHK	DATE
2	Third version	JORB	CHSA	10/04/24
1	Second version	JORB	CHSA	29/09/22

PROJECT No.	1010577	
DESIGNED	JORB	APR.24
DRAWN	JORB	APR.24
CHECKED	CHSA	APR.24
APPROVED		DATE

CLIENT NZ STEEL
PROJECT RECONSENTING GLENBROOK STEEL MILL
TITLE NORTH DRAIN ITA CATCHMENT AND FEATURES (CURRENT)
SCALE (A3) 1:3,500 FIG No. FIGURE W-ITA6 REV 2



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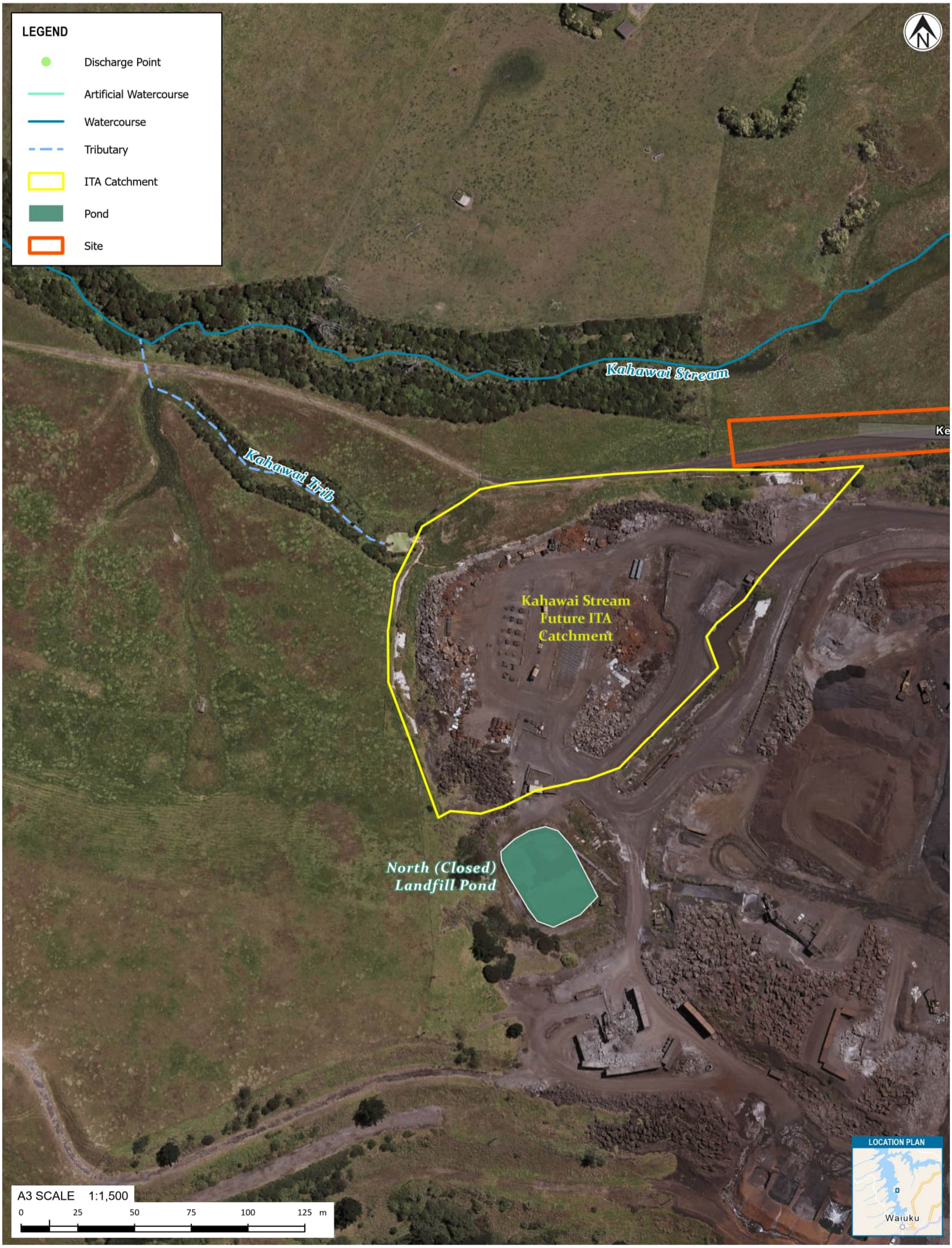
REV	DESCRIPTION	GIS	CHK	DATE
0	First version	JORB	ANTH	27/06/21
1	Second version	JORB	CHSA	29/09/22

PROJECT No. 1010577

DESIGNED	JORB	SEP.22
DRAWN	JORB	SEP.22
CHECKED	CHSA	SEP.22
APPROVED		DATE

CLIENT **NZ STEEL**
PROJECT **RECONSENTING GLENBROOK STEEL MILL**
TITLE RUAKOHUA STREAM ITA CATCHMENT AND FEATURES (CURRENT)
SCALE (A3) 1:4,000 FIG No. FIGURE W-ITA7 REV 1



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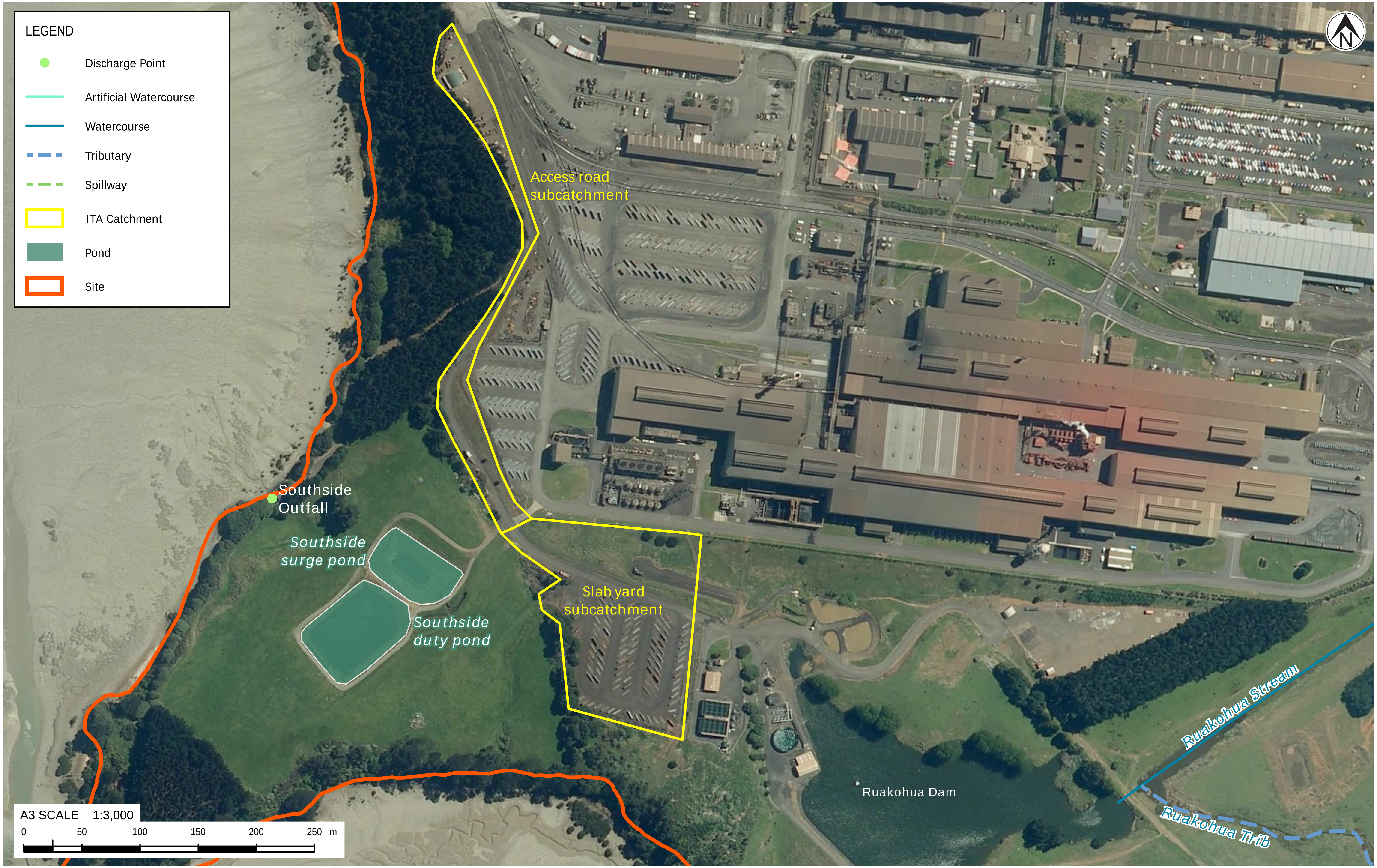
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE
2	Third version	JORB	CHSA	10/04/24		
1	Second version	JORB	CHSA	29/09/22		

PROJECT No.	1010577	
DESIGNED	JORB	APR.24
DRAWN	JORB	APR.24
CHECKED	ANTH	APR.24

CLIENT NZ STEEL
PROJECT RECONSENTING GLENBROOK STEEL MILL
TITLE KAHAWAI STREAM FUTURE ITA CATCHMENT AND FEATURES
SCALE (A3) 1:1,500 FIG No. FIGURE W-ITA8 REV 2

\\ttgroup.local\corporate\Auckland\Projects\1010577\WorkingMaterial\GIS\Map_Documents\P1010577_Water_Updated.aprx Layout: W-ITA9 - Additional ITA Areas Landscape 2022-Apr-07 10:40 am Drawn by JORB



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NOTES:
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REV	DESCRIPTION	GIS	CHK	DATE
0	First version	JORB	ANTH	28/06/21

LOCATION PLAN: Waiuku

PROJECT No.	1010577	
DESIGNED	JORB	APR.22
DRAWN	JORB	APR.22
CHECKED	ANTH	APR.22
APPROVED		DATE

CLIENT: NZ STEEL
PROJECT: RECONSENTING GLENBROOK STEEL MILL
TITLE: ADDITIONAL ITA CATCHMENT AND FEATURES (CURRENT)
SCALE (A3) 1:3,000 FIG No. FIGURE W-ITA9 REV 0

T:\Auckland\Projects\1090599\Secure2099\WorkingMaterial\GIS\MapDocuments\Map_Documents\2023_ScrapYardFigures\2023_ScrapYardFigures.aprx Layout: Scrap Yard 2024-Apr-10 4:01 pm Drawn by JORB

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REV	DESCRIPTION	GIS	CHK	DATE
0	First version	JORB	CHSA	12/04/24

LOCATION PLAN

PROJECT No. 10905599.3000

DESIGNED	JORB	APR.24
DRAWN	JORB	APR.24
CHECKED	CHSA	APR.24

APPROVED DATE

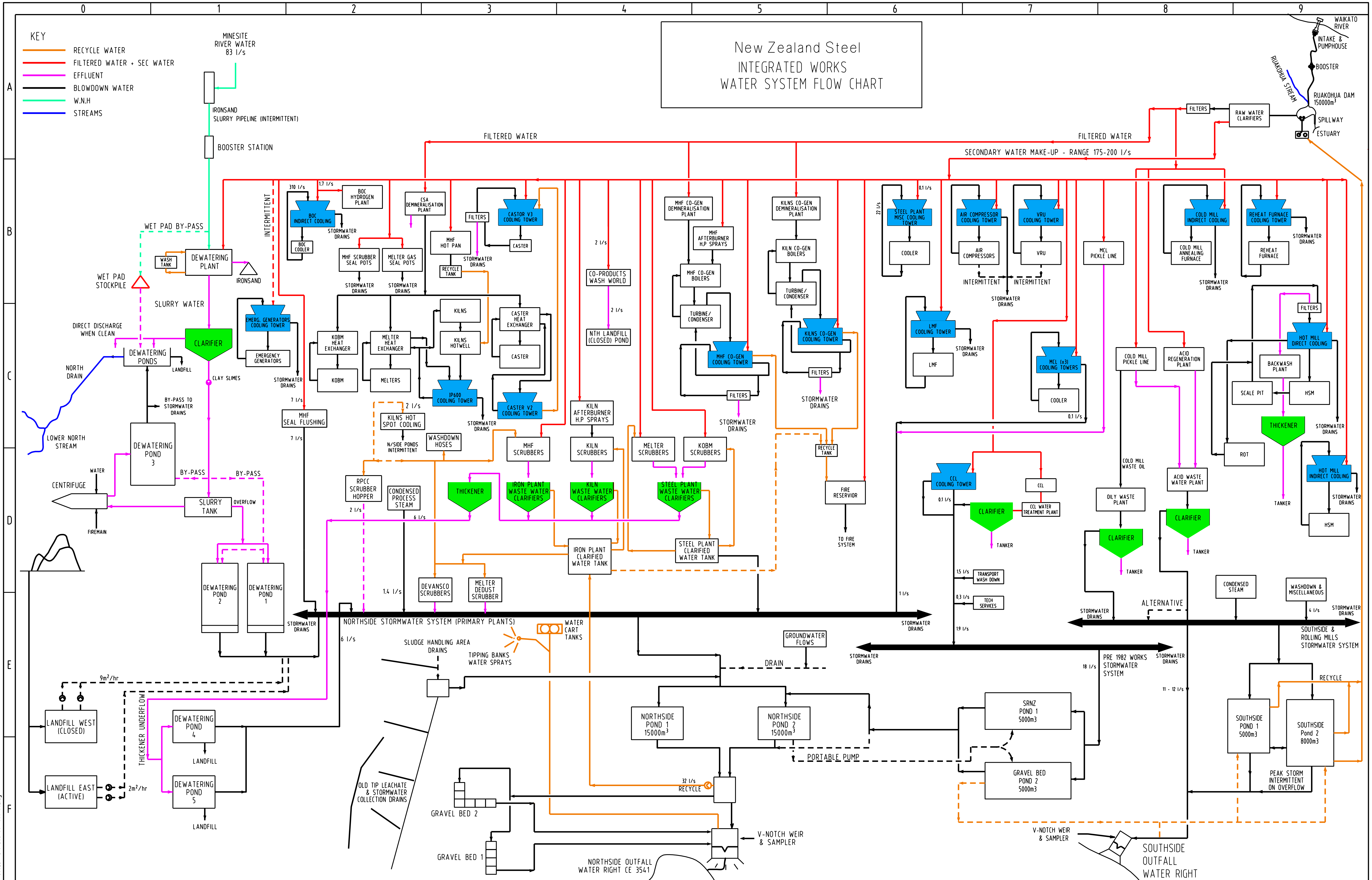
CLIENT **NZ STEEL**

PROJECT **RECONSENTING GLENBROOK STEEL MILL**

TITLE EAF PROPOSED SCRAP YARD CATCHMENTS

SCALE (A3) 1:4,500 FIG No. FIGURE W-ITA10 REV 0

Appendix B NZ Steel Flow Schematic



REV	DRN	A.A.BEER	CKD	S. HALL	REV	DRN	G. ORAM	CKD	S. HALL
L	APD	A.A.BEER	DATE 23-06-21	NZM.04032.30	J	APD	A.A.BEER	DATE 02-02-21	NZM.04032.15
AMD:	MAKE FILTERED WATER LINES RED. OTHER MINOR MODS.				AMD:	REVISED COLOUR CODES FOR PIPELINES PIPE MILL NOW REDUNDANT			
REV	DRN	A.A.BEER	CKD	S. HALL	REV	DRN	A.A.BEER	CKD	S. HALL
M	APD	A.A.BEER	DATE 28-06-21	NZM.04032.30	K	APD	A.A.BEER	DATE 15-06-21	NZM.04032.30
AMD:	LOTS OF SMALL CHANGES.				AMD:	CHANGE "STORMWATER" TO "BLOWDOWN WATER" IN KEY. CHANGE "STORMWATER" TO "TO STORMWATER DRAINS" THROUGHOUT THE DRG.			

NOTES:

CAD DRAWING. NO MANUAL REVISIONS PERMITTED

USED ON: -

ARRANGEMENT/ASSY DRG. No.

PROJECT NAME/No. N/A

CONTRACTOR: N/A

CONTRACTOR REF. No. N/A

CONTRACTOR CAD SYSTEM: N/A

NEW ZEALAND STEEL

New Zealand Steel Ltd
Private Bag 92121
Auckland, New Zealand

DESIGNED: -
DRAWN: B.P.NAIDU
DATE: 17-NOV-1987
CHECKED: S.HOLEHOUSE
APPROVED: M.LYE
CAD FILE: 510-508-001-000-002.dgn
STORES CODE No. N/A
BENTLEY MICROSTATION (VER 8)

PLANT AREA: WORKS SERVICES & UTILITIES GENERAL

TITLE: INTEGRATED WORKS WATER SYSTEM - FLOW CHART

DRG. No. 1 1 510/508/001/000/002 | SHEET - | OF - | REV M

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29-Jun-21 10:13 a.m.

Appendix C ITA discharge water quality monitoring data review

Glenbrook Steel Mill water discharges resource consent replacement – Monitoring data review

To aid in understanding the current state of water discharges from the Glenbrook Steel Mill (the Steel Mill), we have collated the results of monitoring over recent years and compared these to applicable limits and guidelines (outlined in Section C2). This report was previously prepared using data collected from 2015 - 2020 and has since been updated using recent data from September 2019 - September 2021. Additional data has been collected and included up to June 2022 for Sites 1 and 4.

Section C1 summarises the monitoring requirements under the Existing Consents for the Northside Outfall[18], Southside Outfall[22], Dewatering Plant, and ITA Stormwater Discharges. Sections C3 to C6 describe each of the discharges and summarise the results for the contaminants of interest. All monitoring results are presented graphically in Attachment 1 and summarised in tables in Attachment 2.

Following the results of each discharge, Section C7 discusses the approach for draft Trigger Investigation Levels which are proposed to be used for future monitoring of contaminants at the Steel Mill under the Water Quality Management Plan, which is found in Appendix K to the AEE.

Section C9 provides an analysis of the leachate contaminants that are discharged into the Northside Ponds for treatment prior to discharging via the Northside Outfall. This section provides a summary of the key waste sources and associated contaminants, as well as the concentrations and loads entering and discharging from the Northside Ponds.

This work has been completed in accordance with our proposal dated 17 June 2019 and variation orders Form B2 dated 6 December 2019, Form B6 dated 28 August 2020 and Form B12 dated 26 July 2021.

Summary of findings

Appendix C Table 1 lists the main contaminants of interest for each of the water discharges from the Steel Mill. These are contaminants for which more than occasional exceedances of guideline values were recorded at each monitoring location or are known to have a direct effect on discharges to the receiving environment which are considered in this report. The contaminants identified will warrant further discussion in the assessment of effects on the environment (AEE) regarding their sources, controls, and effects. More detailed discussions of the actual monitoring results are included in the following sections.

Appendix C Table 1: Contaminants of interest for each discharge

Discharge	Contaminants of interest
Northside	Copper, iron, zinc, temperature, pH, total suspended solids, oil + grease
Southside	Copper, iron, zinc, temperature, pH, total suspended solids
Dewatering Plant discharges to the North Drain	Aluminium, copper, iron, vanadium, zinc, turbidity, conductivity
ITA Stormwater Discharges to North Drain	pH, aluminium, boron, copper, chromium, iron, total suspended solids, zinc
ITA Stormwater Discharges to Kahawai Stream	pH, aluminium, boron, copper, iron, zinc, total suspended solids

[22] Referred to throughout this report as Northside and Southside.

Discharge	Contaminants of interest
ITA Stormwater Discharges to Ruakohua Stream	pH, aluminium, copper, iron, zinc, total suspended solids

C1 Monitoring

C1.1 Consent requirements

The Site holds four existing resource consents for the discharge of water and contaminants from the Site including suspended solids and metals. In addition, NZ Steel holds Permit 34089 for the discharge of contaminants to land and water from the East Landfill, which includes requirements for monitoring within the Lower North Stream.

Each of the resource consents relating to water discharges requires that a programme of regular water quality monitoring be carried out. The monitoring conducted is summarised in Appendix C Table 2 NZ Steel's location codes are included to allow for comparison with internal documentation. The existing monitoring locations are shown in the map on Figure W-ITA2 in Appendix A.

Appendix C Table 2: Sampling parameters under Existing Consents

Consent	Activity	Location	Frequency	Parameters
21575	Discharge of stormwater and process water	Northside outfall	Daily (grab and composite)	Flow, pH, temperature, TSS[a], dissolved oxygen, oil & grease, cadmium, chromium, copper, iron, lead, nickel, zinc
21576	Discharge of stormwater and process water	Southside outfall		
21577	Discharge of dewatering water	Dewatering Plant discharge	Continuous (reported daily)	Flow, turbidity
41027	Discharge of contaminants from an Industrial or Trade Activity	ITA Catchpit CY5[23]	Monthly	pH, TSS[a], TPH[b], aluminium, boron, chromium, copper, iron, lead, nickel, zinc
		ITA Culvert Kahawai		
		ITA CY19 Pond (CY19)		
		ITA East Pond		
		ITA Metal Cutting Yard Pond[2]		
		ITA Outlet L Drain[21]		
		ITA Runoff Y56K		
		Kahawai Downstream		
		Kahawai Upstream		
		ITA Contractors Compound	3-monthly	
		ITA Yard 31		
34089	Discharge of contaminants to land	Site 4	Monthly	pH, TSS[a], TPH[b], aluminium, boron,
		Site 4C		

[23] ITA Catchpit CY5, Outlet L Drain and ITA Metal Cutting Yard Pond are historical monitoring locations that are being discontinued due to reconfiguration of the stormwater treatment in these areas and are not shown on the associated plan. The ITA Metal Cutting Yard data is remaining within this factual report as a record to indicate the historical water quality across the Site.

Consent	Activity	Location	Frequency	Parameters
	and water from the East Landfill	Site 1		chromium, copper, iron, lead, nickel, zinc
		Site 1C		

The monthly monitoring conducted under the Industrial or Trade Activity (ITA) consent (Permit 41027) is typically carried out as rainfall event-based sampling, though some locations are monitored more frequently.

C2 Limits, trigger levels, and guidelines for comparison

Throughout this report, the Australia and New Zealand Guidelines for water quality (ANZWQG) are used to assess the monitoring results. These guidelines set out default guideline values (DGVs) for water quality parameters at different species protection levels (SPL). Each DGV describes the long-term, ambient concentration for a given contaminant which one can expect a given percentage of species to be protected. Lower species protection levels correspond to more degraded environments. The guidelines for protection of 95% and 80% of species in marine water and 80% of species in freshwater are used throughout this report.

Discharges from the Northside, Southside, and Dewatering Plant have limits on water quality set out in the respective resource consents.

In the resource consent for the Northside Discharge (Permit 21575), limits for metals concentrations are based on the Australia and New Zealand Environment and Conservation Council (ANZECC) (2000) guidelines[24] (except for the iron limit, which had no corresponding guideline value at the time).

For this monitoring data review period, monitoring results have been compared to ANZWQG. This reflects NZ Steel's continuous improvement approach for determining Trigger Investigation Levels (discussed further in Section C6.5), rather than setting consent limits which reflect a fixed, long-term averages approach. Where ANZQWG are not suitable, consent limits have been used for comparison. Proposed Trigger Investigation Levels, determined by results within this report, are described in Section C7.

The National Policy Statement for Freshwater Management 2020 (NPS-FM) sets water quality 'bands' for assessing 22 attributes. The bands range from A (best) to D (worst), with the threshold between bands C and D being set as national bottom lines. Of these attributes, dissolved oxygen has been compared. Results are compared with the NPS-FM in Section C8.

C2.1 Data logging and processing

The monitoring data is recorded by NZ Steel in a proprietary software package. Using this software, NZ Steel applies different lab detection limits to different metal concentrations. In some cases, the detection level is above the ANZWQ guideline values, at a level set under NZ Steel's 2014 ITA consents. This is the case for cadmium, chromium, copper, nickel and lead.

Many of the metal concentration values in the software package's dataset are reported as "< "when the actual lab result was either a real value or a non-detect at a lower detection limit. Attachment 3 shows the laboratory detection limit as well as the reported value for results.

As a result, some of the data cannot be directly compared with the ANZWQG. These are noted in the results tables in attachment 2, and the plots show both the guideline values and the detection limits.

[24] The ANZECC and ARMCANZ water quality guidelines were prepared in 2000 and were valid during the previous resource consent application. These guidelines were superseded by the Australia and New Zealand Guidelines for Fresh and Marine Water Quality (ANZWQG) in 2018. The majority of the guideline values are the same in the ANZWQG (2018) as they are in the ANZECC (2000).

Note that not all the data included are affected by this truncation (particularly if reported from an external laboratory with different detection limits) and so there are real values included.

For the purposes of this report, non-detect values are treated as equal to half the detection limit. One exclusion is that when calculating the percent of values above guidelines, non-detects are treated as non-exceedances, even if half the detection limit is above the guideline level. This is true for cadmium, copper, and lead.

C3 Northside discharge

C3.1 Description

The Northside discharge includes process water from the Steel Mill and stormwater from the largest catchment on site (around 69 hectares). The primary plant processes (iron and steelmaking) are located within this catchment. The process water is treated via onsite wastewater treatment plants or settlement ponds before discharging with the stormwater to settlement ponds (also referred to as the Northside Ponds), before discharging to the Manukau Harbour. Leachate from the landfills north of the Steel Mill is also pumped to the Northside Ponds for treatment prior to discharge.

The mixed process water and stormwater discharge is monitored daily by taking both grab and 24-hour composite samples at a location immediately upstream of the discharge to the coastal marine area (CMA). All metals are measured as total fraction (dissolved and particulate).

C3.2 Summary of results

Summaries of the discharge monitoring results are included in Attachment 2 Table 1. Results have been compared to existing consent limits and ANZWQG 80% and 95% SPL for marine water.

Compared to the ANZWQG, the discharge monitoring results for composite samples with no allowance for mixing exceed the 95% SPL for: dissolved copper (16.2% of samples) and total copper (28.4%), iron (73.5%), dissolved zinc (55.3%) and total zinc (99.9%). The 80% SPL is exceeded for total copper (1.9%), iron (6.1%), dissolved zinc (22.1%) and total zinc (98.8%). Overall, the long-term average for total zinc was 105 ug/L which is 5 times the 80% SPL and 13 times the 95% SPL with no allowance for mixing. If the same approach to allow for mixing as used in the ITA consent (10 times the relevant SPL) was applied to the Northside Outfall, the long-term average would be below the associated trigger level.

C3.3 Comparison with historical data

A comparison of the discharge monitoring results for the historical data (2015- 2020) to the current data are included in Attachment 2 Table 2. The results compare the composite samples for daily mean and medians.

When comparing the historical and current means, almost all contaminants have decreased. Notable reductions include copper (33.8%), iron (36.8%), zinc (15.9%), TSS (15.4%) and temperature (1.7%). This is discussed further in the ITA report, Section 6.3.1.

C4 Southside discharge

C4.1 Description

The Southside discharge includes process water from the Steel Mill and stormwater from a catchment roughly 41 hectares in size. The metal coating line, rolling mills, and cooling yards discharge to this area. The discharge consists primarily of treated process water from the acid regeneration plant. Stormwater from this catchment flows to two settling ponds and is typically recycled to the Ruakohua Dam reservoir.

The discharge is monitored daily by taking both grab and 24-hour composite samples at a location immediately upstream of discharge to the CMA. Results from the composite sampling only are shown below. Permit 21576 places limits on the quality and quantity of the discharge measured as monthly average concentrations, daily maximum concentrations, and average daily mass loads. All metals are measured as total fraction (dissolved and particulate).

Results have been compared to existing consent limits and ANZWQG 80% and 95% SPL for marine water.

C4.2 Summary of results

The results from the last two years' monitoring are summarised in Attachment 2 Table 3 following the same method as for the Northside discharges. Results have been compared to existing consent limits and ANZWQG 80% and 95% SPL for marine water.

Compared to the ANZWQG, the discharge monitoring results for composite samples exceed the 95% SPL for: copper (17.2% of samples), iron (68.1%) and total zinc (29.9%). The 80% SPL is exceeded for copper (1.8%), iron (14.3%) and total zinc (7.2%). Concentrations of cadmium, chromium, copper, lead, and nickel were all low, with the vast majority of samples returning non-detect results.

C4.3 Comparison with historical data

A comparison of the discharge monitoring results for the historical data to the current data are included in Attachment 2 Table 4. The results compare the composite samples for daily mean and medians for each contaminant.

When comparing the historical and current means, over half of all contaminants have decreased. Of note is copper (19.4% reduction) and zinc (8.3%). Contaminants which have increased are iron (41.3% increase), TSS (14.8%) and temperature (24.1%). This is discussed further in the ITA report, is Section 6.3.2.

C5 Dewatering Plant discharge

C5.1 Description

The Dewatering Plant takes in ironsand slurry and separates the liquid and solid components. Waste process water is treated through a clarifier and settling ponds prior to discharge to the North Drain. The waste process water is continuously monitored for turbidity at both the clarifier outlet and the point of discharge. The water can be rerouted to settling ponds for additional treatment when the turbidity at the clarifier outlet is too high. Permit 21577 places limits on the daily volume and turbidity of the discharge, measured as monthly averages and as a daily flow-weighted average for turbidity.

Water quality results for a broader range of contaminants have been measured, as shown in Attachment 2 Table 5 which compares the monitoring results to consent limits where ab and the ANZWQG 80% SPL for freshwater. All metals are measured as total fraction (dissolved and particulate).

C5.2 Summary of results

The results from the last two years' monitoring of grab samples are summarised in Attachment 2 Table 5. Results have been compared to existing consent limits and ANZWQG 80% for freshwater.

It should be noted that for zinc, one result was particularly elevated on 28th August 2020. This data point is considered to be an outliner anomaly and may not be real as the other metals were not elevated and there is no apparent explanation for this result. The individual increases the mean zinc concentration by 38%, however, it has been left in the data set to be conservative.

Compared to existing consent limits, there were no exceedances in averages for samples.

Compared to the ANZWQG, the discharge monitoring results exceed the freshwater 80% SPL for: aluminium (80% of samples), copper (20%), iron (17.5%), vanadium (12.5%) and zinc (7.5%).

The results from the last two years' monitoring show a high degree of compliance with the resource consent limits. The limit for daily flow-weighted average volume was not exceeded during this monitoring period.

C5.3 Comparison with historical data

Monitoring of heavy metals for the Dewatering Plant was conducted as an additional exercise to support this resource consent application and is not required under any Existing Consents. As such, comparison of historical results for the Dewatering Plant is not available.

C6 ITA monitoring locations

C6.1 Description

Permit 41027 authorises the discharge of contaminants in stormwater from the industrial/trade activity areas not covered by the other resource consents. These areas discharge to three watercourses that run across/adjacent to the Steel Mill site: the North Drain, Kahawai Stream, and Ruakohua Stream. The Ruakohua Stream is dammed, and the reservoir is the water source for process water across the site. The North Drain is an artificial watercourse that flows into the Lower North Stream to the north of Brookside Road. Stormwater is monitored at 10 points across the Site.

Around the North Drain, the contributing areas are mainly used for stockpiling of raw materials including coal and aggregate coproducts. Stormwater from these areas is treated via settlement ponds prior to discharge. In NZ Steel's annual reports, discharges for the *L Drain Outlet* point are used to assess discharges to the North Drain. Further improvements were made in 2021 to avoid untreated overflows and as a result this eliminated the L Drain Outlet. In 2019, the CY1/2 East Pond was upgraded, and provided with a separate outfall, the East Pond outfall. There are two other monitored discharges to the North Drain, runoff from Yards 56A and CY19 Ponds, which are monitored monthly.

Monitoring results from the point labelled *North Drain 1C* are also included in this report. This point is monitored under a separate resource consent, but samples are collected from the North Drain, downstream of the Steel Mill and upstream of discharges from the landfills. Results from this point are representative of the downstream condition of the stream receiving environment. These results include the dilution from base flow and overland flow, not just the end-of-pipe water quality of the ITA Stormwater Discharges.

A composite sampler was installed in July 2021 at Sites 1 and 4 to collect daily samples and provide a picture of the long-term water quality within the North Drain and Lower North Stream. This has been used to assess the effects downstream of the ITA monitoring sites.

Stormwater from the Kahawai Stream ITA Catchment (formerly known as the Metal Cutting Yard) in the north-western corner of the site discharges to the Kahawai Stream via a swale drain and settlement pond. Discharges to the Kahawai Stream are monitored at four locations: in the stream upstream of the discharge, at the treatment pond, at the culvert prior to discharge to the stream, and in the stream around 500 m downstream of the discharge. These points are monitored monthly.

Stormwater from two areas in the south-east of the site discharges to the Ruakohua Stream: the Contractors' Compound and Yard 31. These areas are used for administrative buildings as well as the storage of equipment, vehicles, and steel products. Stormwater from the Contractors' Compound is treated via a series of filter beds, stormwater from Yard 31 is treated via a settlement pond. These points are monitored quarterly, though results are not available for all quarters due to low or no flows/discharges from the catchments.

Results from monitoring under the ITA consent are shown in Attachment 2 Table 6, where results are compared to the existing consent limits and ANZWQG for 80% SPL. The locations are shown in different fonts to represent receiving environment samples, within stream sampling samples and point source samples. All metals are measured as total fraction (dissolved and particulate).

C6.2 Summary of results

The results from the last two years' monitoring are summarised in Attachment 2 Table 6. Results have been compared to existing Trigger Investigation Levels and ANZWQG 80% SPL for fresh water.

When compared to existing consent Trigger Investigation Levels, compliance at receiving environment locations has generally been good. Exceedances have occurred for aluminium at the Kahawai Culvert and Yard 31, iron at Yard 31, pH at Kahawai Culvert and TSS at East Pond.

When compared to the ANZWQG for 80% SPL for freshwater, contaminants exceeded at the following receiving environment locations:

- Aluminium: Kahawai Culvert (100% of samples), East Pond (100%), Contractors Compound (29.4%) and Yard 31 (100%).
- Boron: Kahawai Culvert (100%) and East Pond (89.5%).
- Copper: Kahawai Culvert (57.9%), East Pond (47.4%), Contractors Compound (17.6%) and Yard 31 (58.3%).
- Iron: Kahawai Culvert (42.1%), East Pond (52.6%) and Yard 31 (58.3%).
- Zinc: Kahawai Culvert (36.8%), East Pond (52.6%), Contractors Compound (11.8%) and Yard 31 (58.3%).

Concentrations of cadmium, chromium, lead, and nickel were generally low for all ITA Stormwater Discharges. Chromium exceeded the 80% SPL in 78.9% of samples from Yard Y56K, however this is an ITA stormwater discharge and average concentrations of chromium at Site 1C (within stream sampling) downstream are below the 80% SPL.

When compared to the ANZWQG for 80% SPL for freshwater, contaminants exceeded at the following within stream monitoring locations:

- Aluminium: Kahawai Downstream (100% of samples), Kahawai Upstream (100%), North Drain 1C (55.6%)
- Boron: Kahawai Downstream (100%), Kahawai Upstream (100%)
- Copper: Kahawai Downstream (50%), Kahawai Upstream (27.8%), North Drain 1C (25.7%)
- Iron: Kahawai Downstream (27.8%), Kahawai Upstream (61.1%), North Drain 1C (26.5%)
- Lead: North Drain 1C (2.9%)
- Zinc: Kahawai Downstream (22.2%), Kahawai Upstream (22.2%), North Drain 1C (25.7%)

While the results show that there are exceedances of the ANZWQG 80% SPL for contaminants across the ITA monitoring sites, it is important to note that the ANZWQG are set for long-term, ambient concentrations. The ITA monitoring results are typically grab samples taken during rain events thus capturing the first flush, when contaminant concentrations are expected to be higher.

Monitoring results from North Drain 1C and North Stream 4c show an increase in conductivity downstream of the North Stream. This is discussed further in the ITA report, in Section 6.3.3.

C6.3 Comparison with historical results

A comparison of the discharge monitoring results for the historical data to the current data are included in Attachment 2 Table 7. The results compare mean and median concentrations of grab samples for each parameter.

When comparing the historical and current data, the mean and median of more than half of all contaminants have decreased since the previous monitoring period of 2015 - 2020. At receiving environment monitoring locations, the following contaminants have increased in concentration since the previous monitoring round:

- Aluminium: Yard 31 (35.9%)
- Cadmium: Historical results for cadmium are not available as they were not required for monitoring under the Existing Permit
- Copper: Yard 31 (40.2%)
- Iron: Yard 31 (49%)
- Lead: Contractors Compound (1.5%)
- Zinc: Yard 31 (38.5%)
- pH: Yard 31 (1.9%)
- TSS: East Pond (122%) and Yard 31 (46.1%)
- Oil and grease: East Pond (567%)

While increases were noted across some ITA receiving environment monitoring sites, overall, once reasonable mixing occurred, most contaminants met the 95% SPL at Site 4 as described below.

At monitoring locations within streams, the following contaminants have increased in concentration since the previous monitoring round:

- Aluminium: Kahawai Upstream (increased by 99%), North Drain 1C (339%)
- Boron: North Drain 1C (61%)
- Chromium: North Drain 1C (43%)
- Copper: North Drain 1C (180%)
- Iron: North Drain 1C (337%)
- Nickel: North Drain 1C (28%)
- Zinc: Kahawai Downstream (7%), Kahawai Upstream (9%), North Drain 1C (2356%)
- Oil and Grease: North Drain 1C (563%)

North Drain 1C monitoring site experienced an increase in most contaminants for grab sampling compared to historical results. Grab samples are typically collected following rain events, so are expected to demonstrate a spike in results as catchments are flushed.

C6.4 Comparison with Site 1 and Site 1C

When comparing the grab sample results from Site 1C to the daily composite results from Site 1, there is a significant difference, as shown in Attachment 2 Table 8.

Compared to grab samples (which are taken immediately following rainfall so subject to first flush), daily collected samples typically produce a much lower concentration. Using cadmium as an example, the average result based on grab samples is 0.0013 mg/L, however the average composite sample is 0.00003 mg/L. This is a 97.8% reduction between sample types. Similarly, boron has a concentration that is 9% less in the composite sample compared to the grab sample. Aluminium and copper samples were both higher for the composite samples compared to grab samples. There was an 18.1% increase in aluminium, and 6.3% increase in iron. Both are prominent contaminants found in process water across NZ Steel and therefore fluctuations are not unexpected.

C6.5 Comparison with Site 1 and Site 4

Since the last monitoring data review, composite samples have been collected at Site 1 at North Drain and Site 4 within the Lower North Stream to provide an indication of the effects downstream from the ITA Stormwater Discharges. The monitoring period was July 2021 to June 2022. Results of the comparison between Sites 1 and 4 are shown in Attachment 2 Table 9.

At Site 1, contaminants which exceed the freshwater 80% SPL were aluminium, iron, and vanadium (vanadium has only one DGV with an unknown level of species protection). Boron, cadmium, lead and nickel were below the 95% SPL, and chromium was below the 90% SPL. Copper and zinc both met the 80% SPL but were above the 90% SPL.

At Site 4, the majority of parameters were below freshwater 95% SPL. Those that exceed the 95% SPL were aluminium (however, this was still below 80% SPL), and boron (however this was still below 90% SPL). Vanadium exceeds the DGV at Site 4, however the DGV for vanadium has been identified as having low reliability, and as such should only be used at an indicative interim working level.

C7 Trigger Investigation Levels

The secondary purpose of this monitoring review is also to be able to determine new Trigger Investigation Levels for the contaminants of interest, based on the previous two years of data. Trigger Investigation Levels have been developed by taking the average concentration plus two standard deviations, or the ANZQWG 95% SPL for freshwater or marine water where this is higher than the monitoring results. This allows for expected fluctuations above the average result to ensure Trigger Investigation Levels are set at limits that will warrant investigation.

The proposed Investigation Trigger Levels for monitoring have been included in Attachment 5. For most parameters, the proposed Investigation Trigger Levels are below the current consented limit (where set under Existing Consents) and ANZWQG value. Parameters that are above ANZWQG values have been identified as key contaminants of concern (and are discussed further in the AEE, including copper and zinc) have been assigned a proposed consent limit which warrants further monitoring and reporting under the Water Quality Management Plan (Appendix K to the AEE). The monitoring programme and development of Trigger Investigation Levels is also discussed further in Section 11.7 of the ITA Report (Appendix G of the AEE).

Draft Investigation Trigger Levels have also been incorporated into the Water Quality Management Plan.

C8 Comparison with NPS-FM

C8.1 Dissolved oxygen

Dissolved oxygen (DO) is routinely measured only at the Northside discharge. This discharge is not related to the NPS-FM as it is direct to the marine environment, however the results give some insight to the general character DO within the discharges from the Steel Mill. The NPS-FM sets bands (A to D) for DO measured as a 7-day mean minimum during the summer period (1 November to 30 April 2021). Using this approach, 96% of the Northside discharge monitoring results were in attribute band “C” for 7-day means. This band corresponds to “Moderate stress on a number of aquatic organisms”. Dissolved oxygen in the discharge was around 6.5 mg/L on average.

C8.2 Suspended fine sediment

The NPS-FM sets attribute bands for suspended fine sediment in terms of visual clarity in metres. Each attribute band is split into four specific suspended sediment classes that are derived from the watercourses River Environment Classification (“river class” in MfE, 2010). The Lower North Stream is defined as a warm-wet, low elevation, soft sedimentary river class, therefore; when comparing against the NPS-FM attribute states the Suspended Sediment Class 2 values must be used.

Freshwater discharges at the Steel Mill are measured in terms of TSS in mg/L (Northside, Southside and ITA locations) and turbidity in NTU (Dewatering Plant). As noted in the technical report by NIWA that provided the basis for the NPS-FM bands, “*visual clarity and turbidity are generally correlated with each other, but the strength of the correlation is often site-specific, and ‘one size fits all’ regressions may not be sufficiently robust to allow interconversions to be carried out with confidence*”[25].

Therefore, in terms of the discharges from the Steel Mill the assessment of effects in terms of TSS and turbidity is considered appropriate.

C9 Leachate discharges from East and West landfills

C9.1 Description

Appendix C Table 3 provides a summary of the key waste streams that typically contribute to the active East Landfill. Waste streams disposed in the closed West Landfill were of the same nature.

Appendix C Table 3: Key waste streams contributing to the East Landfill

Waste stream	Proportion of waste stream (%)	Source	Key contaminants
Alluvial silts	5	Ironsand slurry dewatering; raw water treatment plant	Heavy metals
General waste (not recyclable)	1	NZS offices, workshops	
Baghouse and other dusts	4	Air pollution control systems; Primary plant housekeeping	pH and heavy metals
Iron-bearing sludges	40	Water treatment systems; SW treatment ponds; Air pollution	pH and heavy metals

[25] NIWA. 2019. *Deriving potential fine sediment attribute thresholds for the National Objectives Framework*.

Waste stream	Proportion of waste stream (%)	Source	Key contaminants
		control systems; Process cleaning; Road sweeping	
Works debris consisting of iron sand, char, slag, brick and lime rich materials	50	Iron and steel making plants	pH and heavy metals

C9.2 Summary of results

C9.2.1 Yearly leachate volumes generated

Appendix C Table 4 shows the annual volumes of leachate pumped from the East Landfill to the Northside Ponds during 2021. As the West Landfill has been closed and capped, regular flow monitoring has not been undertaken. It is expected that the leachate volume from the West Landfill would be less than that for East landfill due to the landfill being fully capped and the age of the landfill.

Appendix C Table 4: Volume of leachate pumped from East Landfill to the Northside Ponds

Landfill	Data period	No of days reported	Total pumping volume m^3 reported	Calculated annual volume m^3
East Landfill	1 Jan 2021 to 21 March 2022	445 days	77,000	65,000

Based on a daily average discharge from the Northside Outfall of 9,000 m^3/day, the calculated volume of leachate from the East Landfill equates to 2% of the total flows and would be less or similar from the West Landfill. This does not account for any recycling of water from the Northside Ponds, which would reduce the overall contribution from the landfills further. This calculation is therefore likely to be a conservative assessment of the contribution from the landfill to the Northside Outfall.

C9.2.2 Landfill leachate contaminant concentration and loads

NZ Steel undertakes analysis of a range of contaminants present in untreated landfill leachate, i.e. before leachate is pumped to the Northside Ponds for treatment. Screening of heavy metals is undertaken, and the average concentrations of contaminants over three years are shown in Appendix C Table 5 and Appendix C Table 6 for the East and West landfills respectively. Concentrations are compared to the ANZWQG for 80% SPL of marine species. The highlighted cells indicate those parameters that exceed the 80% SPL. For the East landfill, analysis has used a sample size of 12. For the West Landfill, analysis has used a sample size of 14.

Appendix C Table 5: Yealy average total concentrations of untreated leachate from East Landfill 2018-2020

Parameters	Average (mg/L)[1]	Minimum (mg/L)	Maximum (mg/L)	ANZWQG 80% SPL Marine (mg/L)
Aluminium[2]	3.843	1.76	8.9	-
Arsenic[2]	0.011	0.011	0.011	-
Boron[2]	8.408	4.3	13.5	-
Cadmium	0.001	0.001	0.001	0.036
Cobalt	0.002	0.002	0.002	0.15
Copper	0.006	0.006	0.006	0.0008
Chromium (CrIV)	0.014	0.006	0.034	0.085
Iron	0.21	0.21	0.21	-
Lead	0.001	0.001	0.001	0.012
Nickel	0.006	0.006	0.006	0.56
Vanadium	0.543	0.151	0.96	0.16
Zinc	0.02	0.011	0.06	0.021

[1] Grey shaded cells indicate where average value exceeds ANZWQG 80% SPL.
[2] There is no ANZWQ marine guideline value.

Appendix C Table 6: Yearly average total concentrations of untreated leachate from West Landfill 2018-2020

Parameter	Average (mg/L)[1]	Minimum (mg/L)	Maximum (mg/L)	ANZWQG 80% SPL Marine (mg/L)
Aluminium[2]	5.6487	3.9111	7.0597	-
Boron[2]	6.9087	5.3105	8.3	-
Cadmium	0.0025	0.0025	0.0025	0.036
Cobalt	0.0025	0.0025	0.0025	0.15
Copper	0.0034	0.003	0.006	0.0008
Chromium (CrVI)	0.0017	0.0015	0.0037	0.085
Iron[2]	0.0779	0.0207	0.269	-
Lead	0.01	0.01	0.01	0.012
Nickel	0.0025	0.0025	0.0025	0.56
Zinc	0.0562	0.0003	0.5638	0.0210

[1] Grey shaded cells indicate where average value exceeds ANZWQG 80% SPL.
[2] There is no ANZWQG marine guideline value.
Note: Arsenic was not analysed during this sampling period for West Landfill.

For both East and West Landfills, copper exceeded the ANZWQG guidelines. For the East Landfill vanadium is above the guideline values, and for the West landfill, zinc is above the 80% SPL. Due to the nature of the material deposited in the landfills, this is expected as they are key metals used for processing and treatment within the NZ Steel systems. These results assume no dilution or treatment occurred within the Northside Ponds.

Based on the volumes and concentrations, the annual contribution to loads from the Northside Outfall have been calculated for those parameters monitoring at all locations. The calculations for the West Landfill have used the volume from the East Landfill as discussed above. These are summarised in Appendix C Table 7.

Appendix C Table 7: Average annual loads and contribution to Northside Outfall

Parameter	Annual loads kg/annum				Proportion (%)
	West Landfill	East Landfill	Total Landfills	Northside Outfall	
Aluminium	367.1655	249.795	616.9605	1115.9145	55.3
Boron	449.0655	546.52	995.5855	41062.5	2.4
Cadmium	0.1625	0.065	0.2275	11.4975	2.0
Copper	0.221	0.39	0.611	8.2125	7.4
Chromium (CrIV)	0.1105	0.91	1.0205	10.8405	9.4
Iron	5.0635	13.65	18.7135	1033.461	1.8
Lead	0.65	0.065	0.715	32.193	2.2
Nickel	0.1625	0.39	0.5525	12.1545	4.5
Zinc	3.65	1.3	4.953	361.35	1.4

The contribution of loads for boron, cadmium, iron, zinc and lead are less than the overall contribution of volumes. The contribution of leads for copper, chromium and nickel are greater than the proportion of volume, but considering the conservative nature of the calculation, are not considered significant in terms of overall loads from the Northside Outfall. The only parameter that has a load contribution that is significantly higher than the volume contribution is aluminium. It is not clear why aluminium is particularly high, but the effects of aluminium were included in the overall assessment (refer to Section 9.4).

C10 Discussion

The contaminants from the Northside Outfall discharge that present the greatest challenges for maintaining compliance with the Existing Permit limits are temperature and zinc. The other contaminants warranting consideration are copper and iron, as these exceeded marine ANZWQG on occasion, as well as TSS and pH.

The Southside Outfall discharge monitoring results exceeded some ANZWQG on occasions. These were concentrations for copper, iron and zinc. pH, TSS and temperature, which have also been identified as contaminants of interest. The overall effect of this discharge is significantly less than from the Northside Outfall due to the lower loads and large proportion of flow diverted to the Ruakohua Dam.

The Dewatering Plant discharge is of interest as this contributes a significant, relatively constant proportion of the discharges to the North Drain and Lower North Stream. Monitoring of heavy metals has indicated some elevated results from discharge points, when compared to ANZWQG for freshwater 80% SPL, including aluminium, copper, iron, vanadium and zinc. Turbidity and conductivity have also been identified as contaminants of interest.

The results from the ITA stormwater monitoring show more frequent exceedances of guideline values than for the other discharges. This is expected as these are grab samples typically taken during rain events. They are not necessarily representative of long-term, ambient concentrations that the guidelines are set for. To understand the longer-term concentrations daily composite samples are now obtained from Site 1 and further downstream at Site 4. The results to date show that the daily composite results are on average 50% less than the grab samples. Nonetheless, these results show which contaminants are of greatest interest, particularly for downstream monitoring points. Alongside several metals and TSS, high pH is a consistent contaminant of interest.

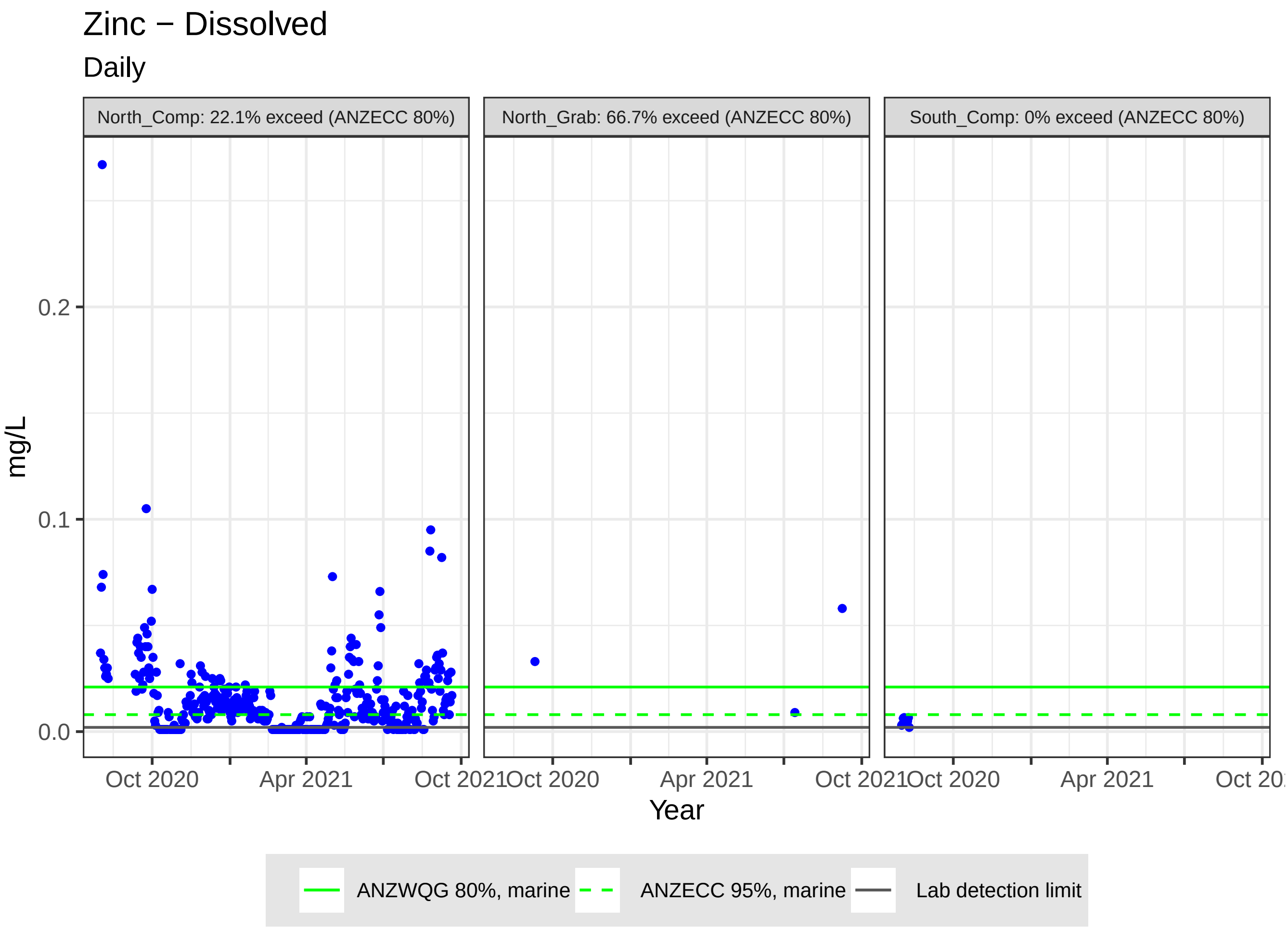
Discharges to the Ruakohua Stream were generally of better quality than those to the North Drain and Kahawai Stream. Some of the contaminants of interest in the Kahawai Stream were present in significant (and sometimes higher) concentrations upstream of the discharge point (notably iron, nickel and zinc).

The contaminants from the East and West landfills which have the highest concentrations are pH, aluminium, copper, vanadium and zinc. Aluminium has been highlighted as a contaminant of interest. Similarly, the landfills contribute high pH leachate to the Northside Ponds, and the implications of this is discussed in Section 10.5.

Attachment 1: Monitoring Results – Graphs

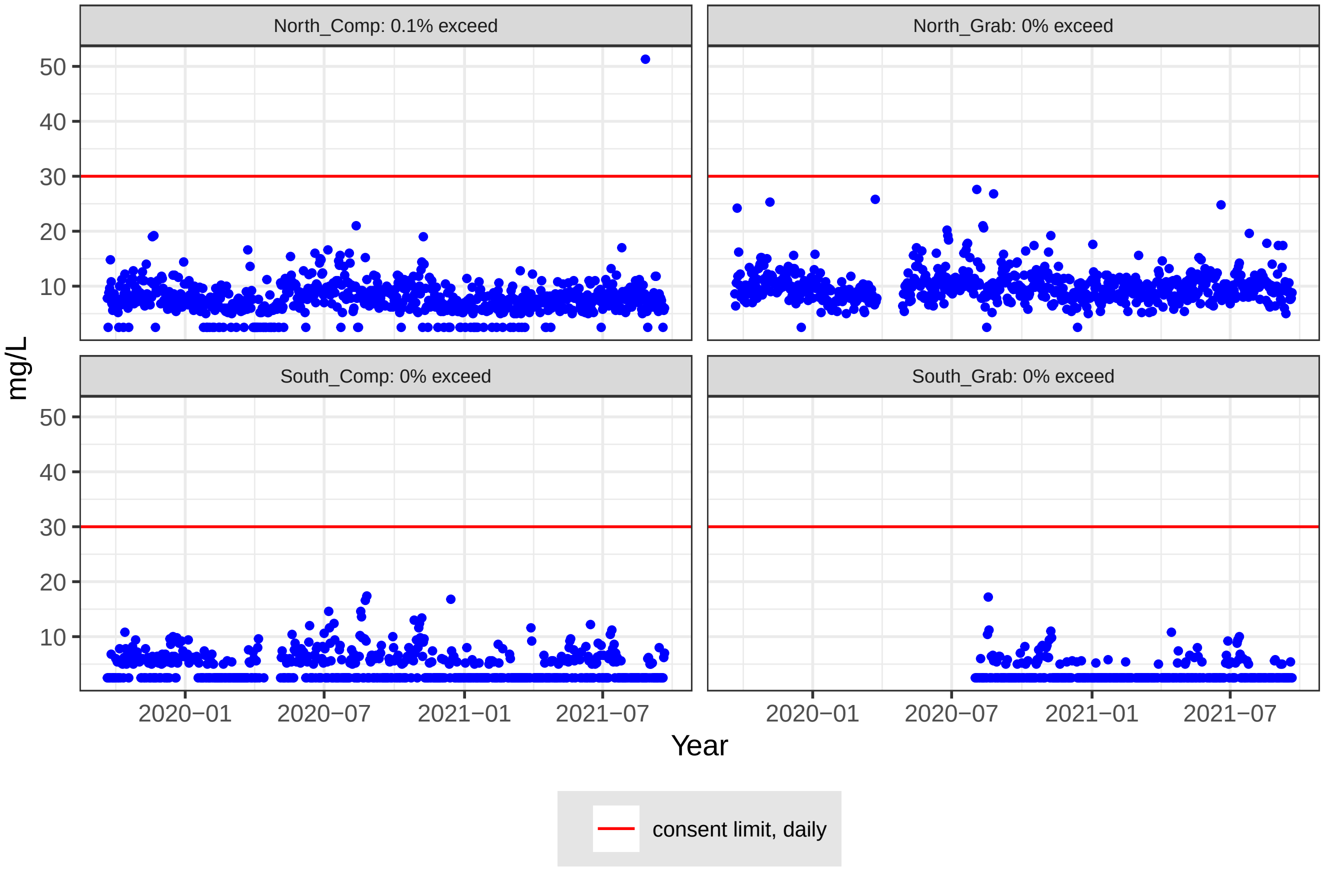
- Northside discharges
- Southside discharges
- Dewatering Plan discharges
- ITA Stormwater discharges


Zinc − Total
Daily
North_Comp: 98.8% exceed (ANZWQG 80%)
North_Grab: 99.3% exceed (ANZWQG 80%)
South_Comp: 7.2% exceed (ANZWQG 80%)
South_Grab: 7.5% exceed (ANZWQG 80%)
mg/L
0.00
0.25
0.50
0.75
2020−01
2020−07
2021−01
2021−07
Year
ANZWQG 80%, marine
ANZECC 95%, marine
Lab detection limit


Zinc − Dissolved
Daily
North_Comp: 22.1% exceed (ANZECC 80%)
North_Grab: 66.7% exceed (ANZECC 80%)
South_Comp: 0% exceed (ANZECC 80%)
mg/L
0.0
0.1
0.2
Oct 2020
Apr 2021
Oct 2021
Year
ANZWQG 80%, marine
ANZECC 95%, marine
Lab detection limit

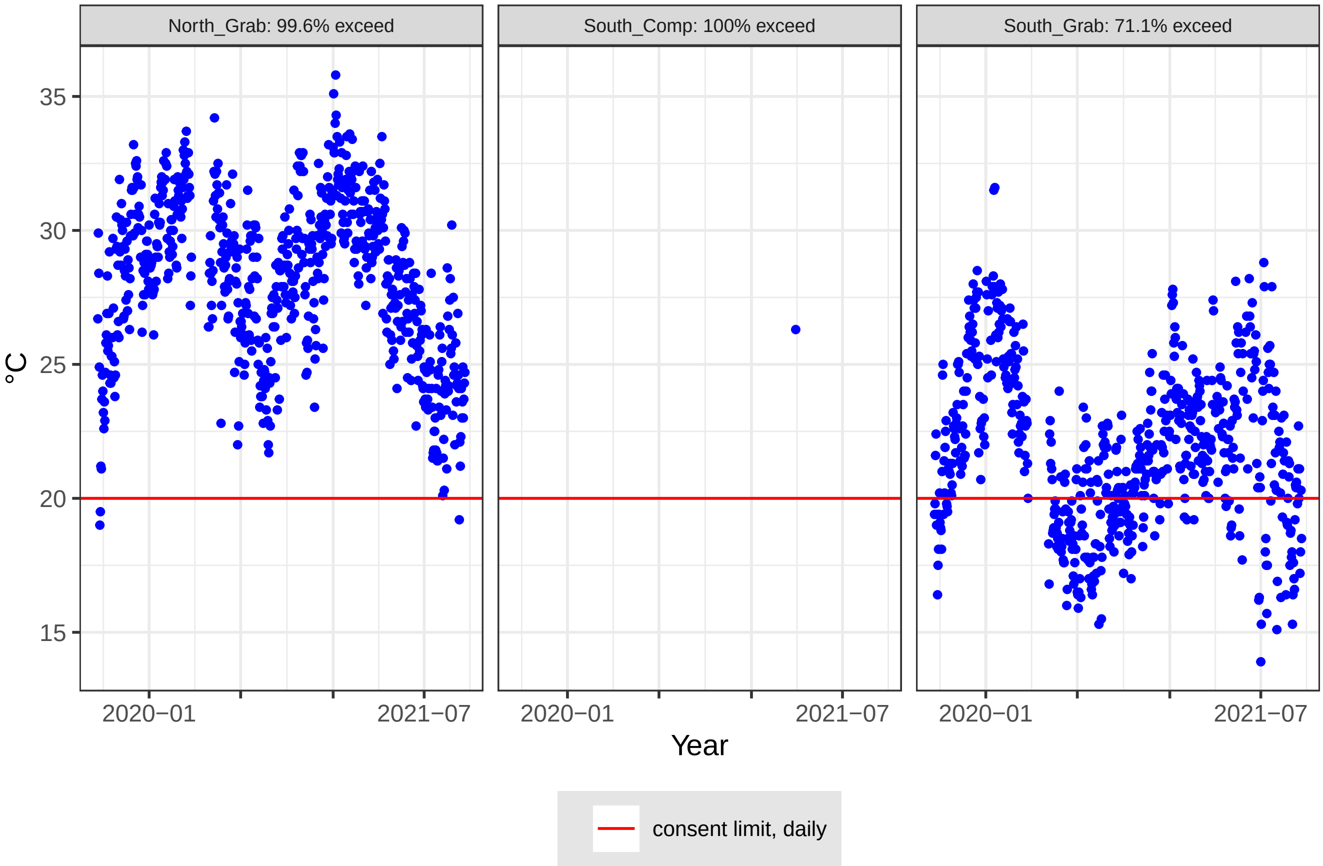
Total Suspended Solids

Daily



Temperature

Daily

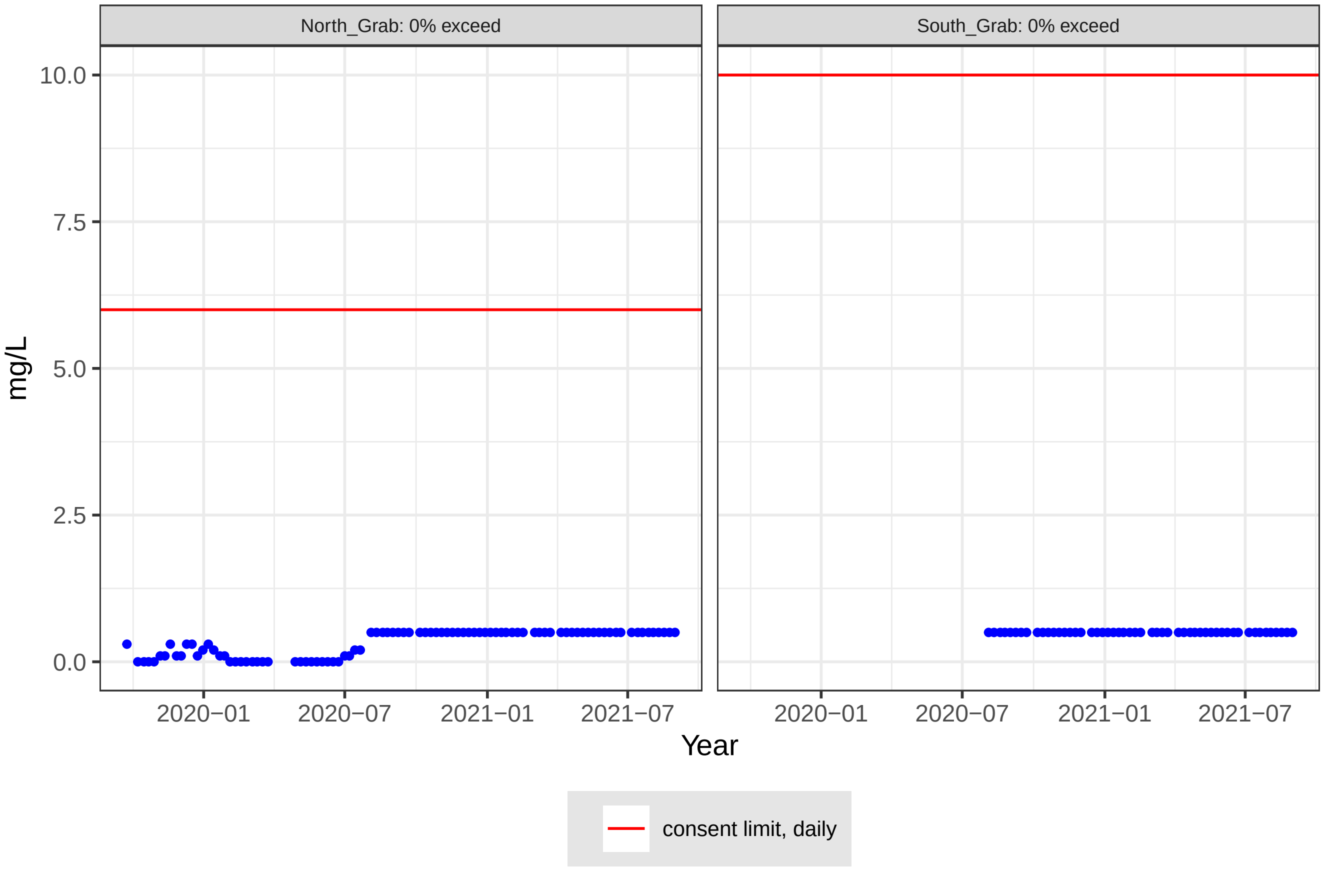


pH

Daily

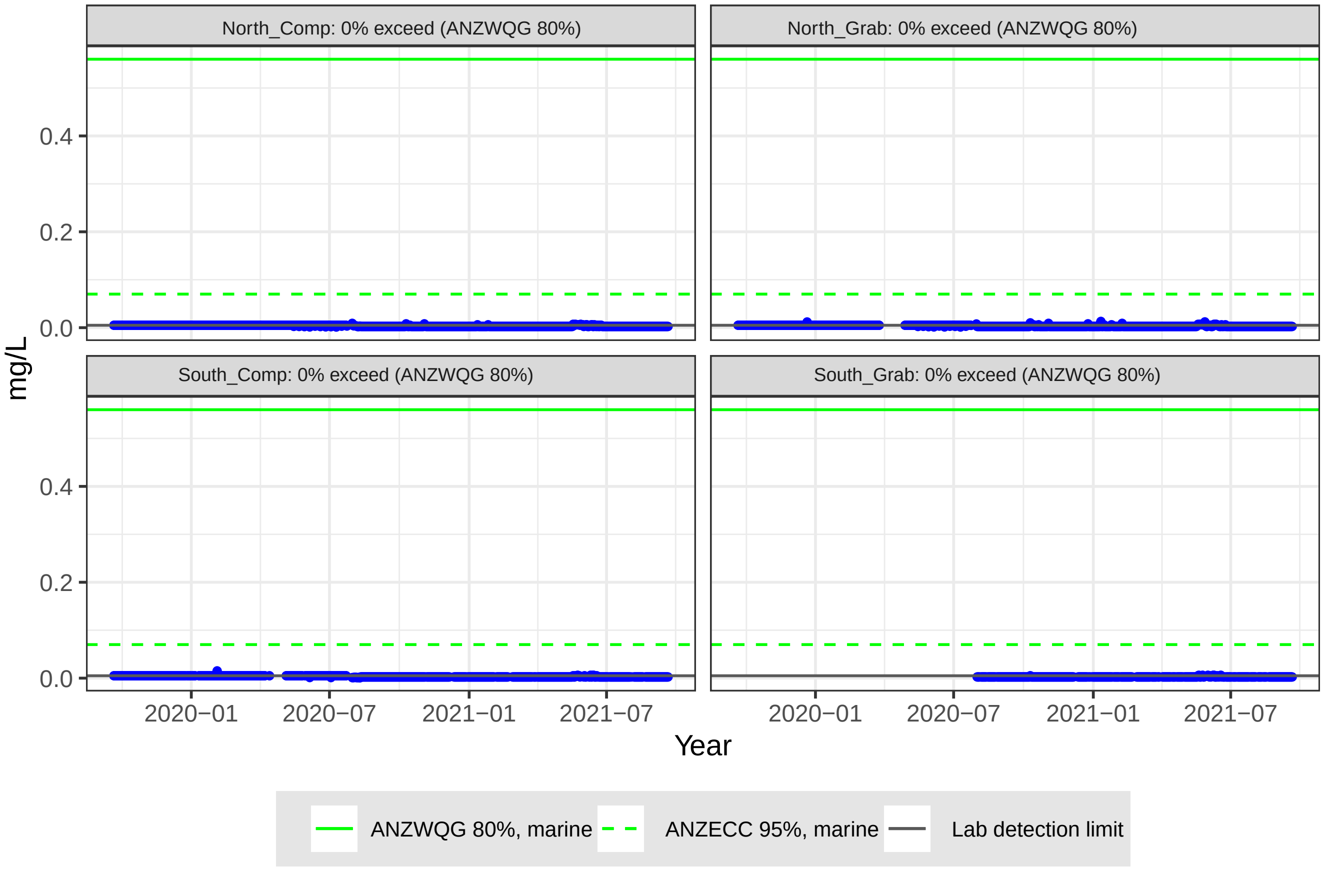
Oil and Grease

Daily



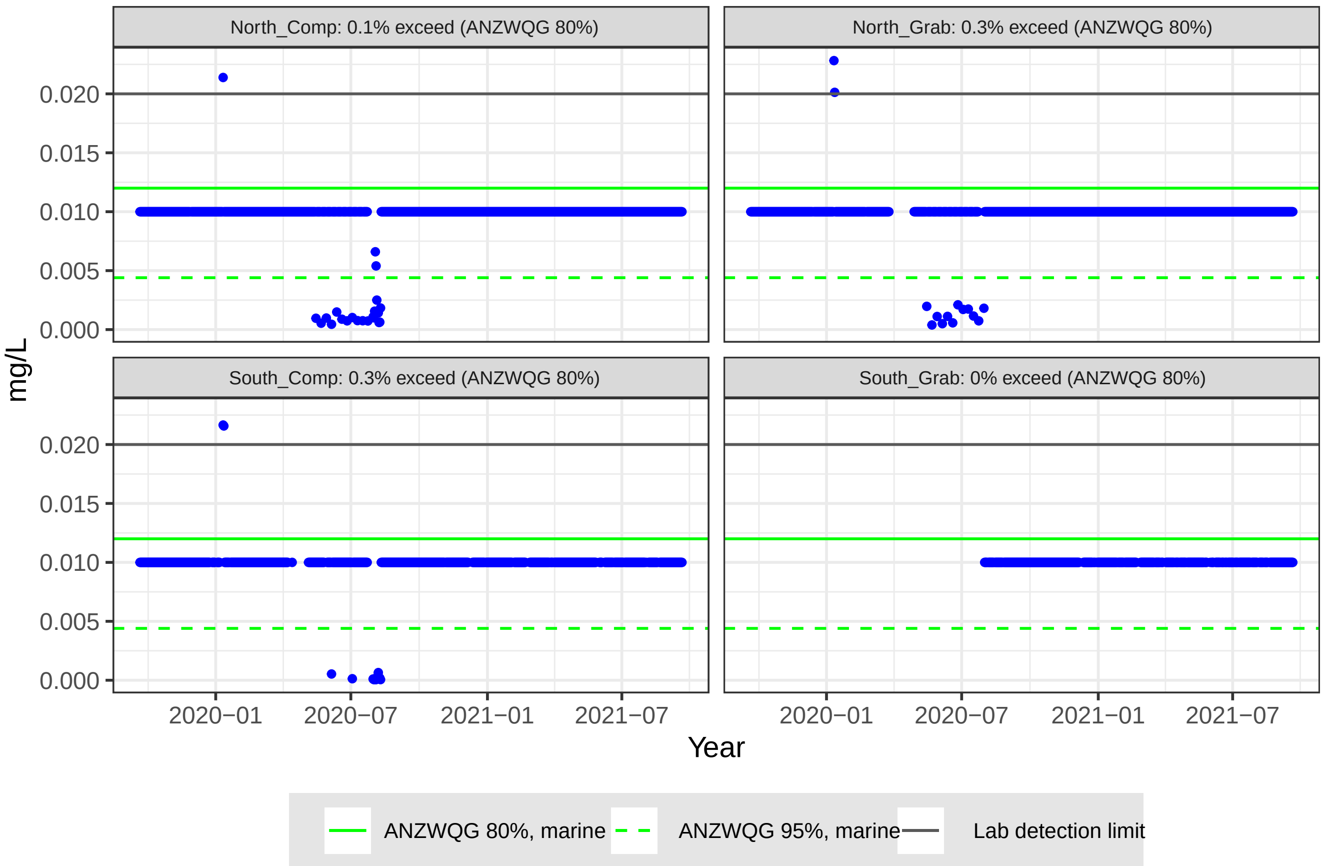
Nickel − Total

Daily



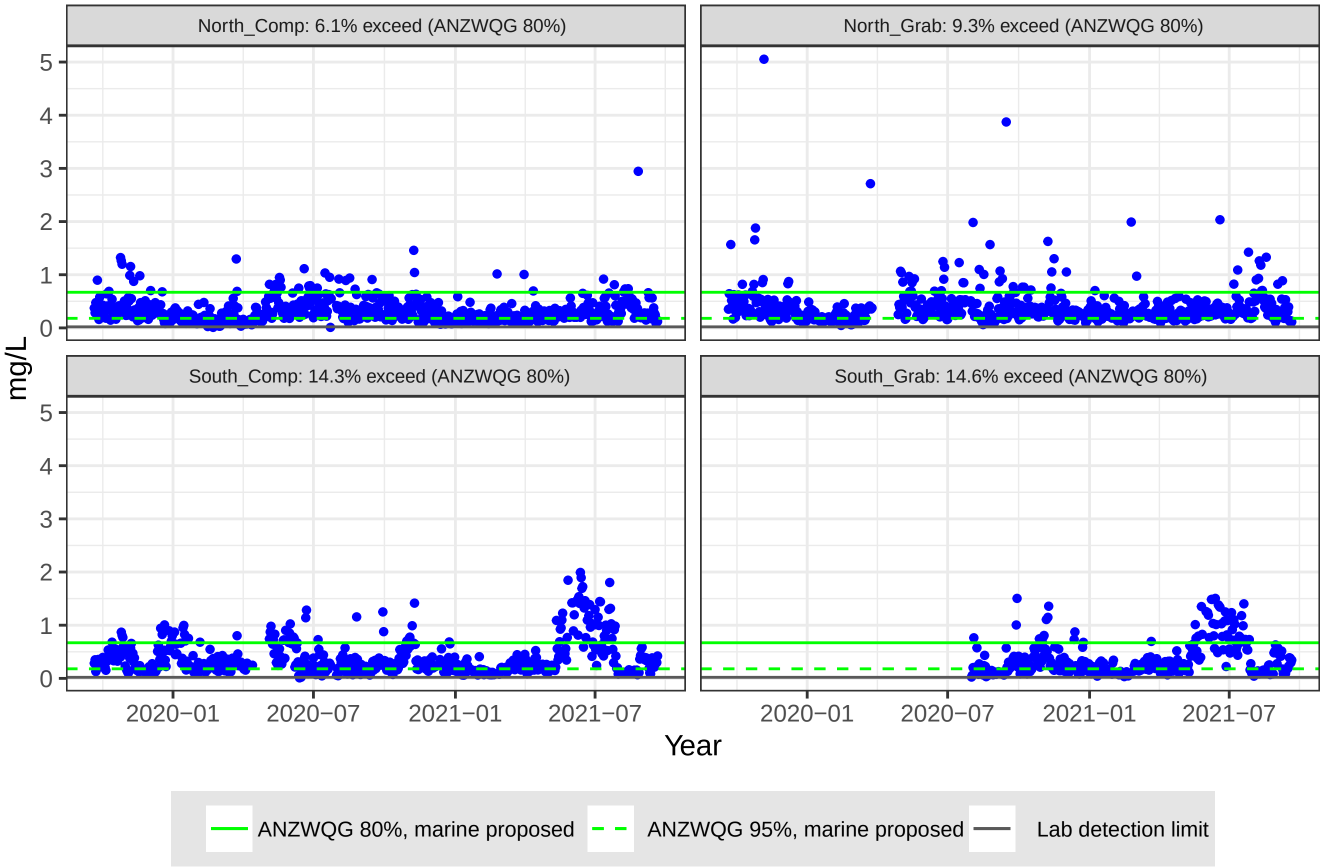
Lead − Total

Daily



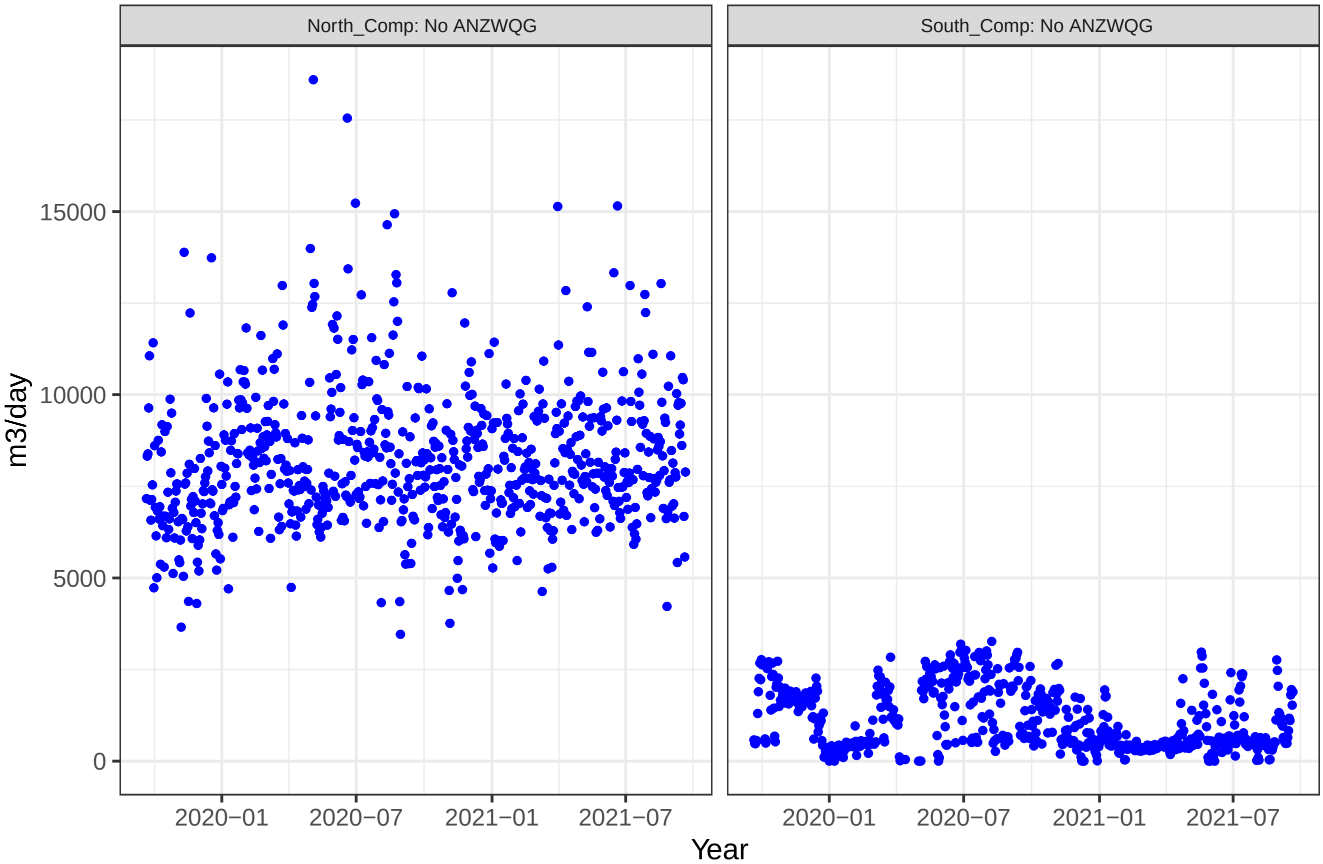
Iron − Total

Daily



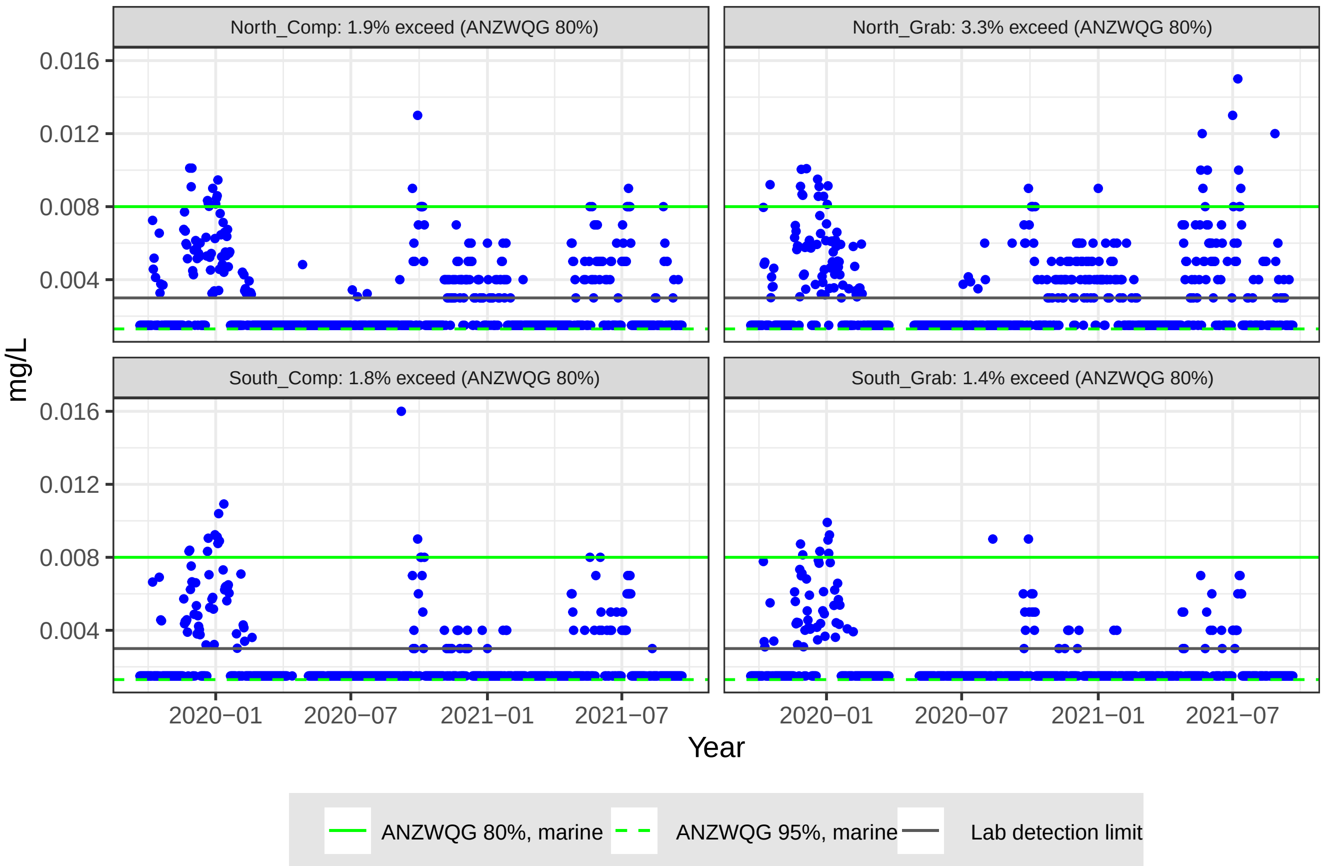
Flow (daily)

Daily



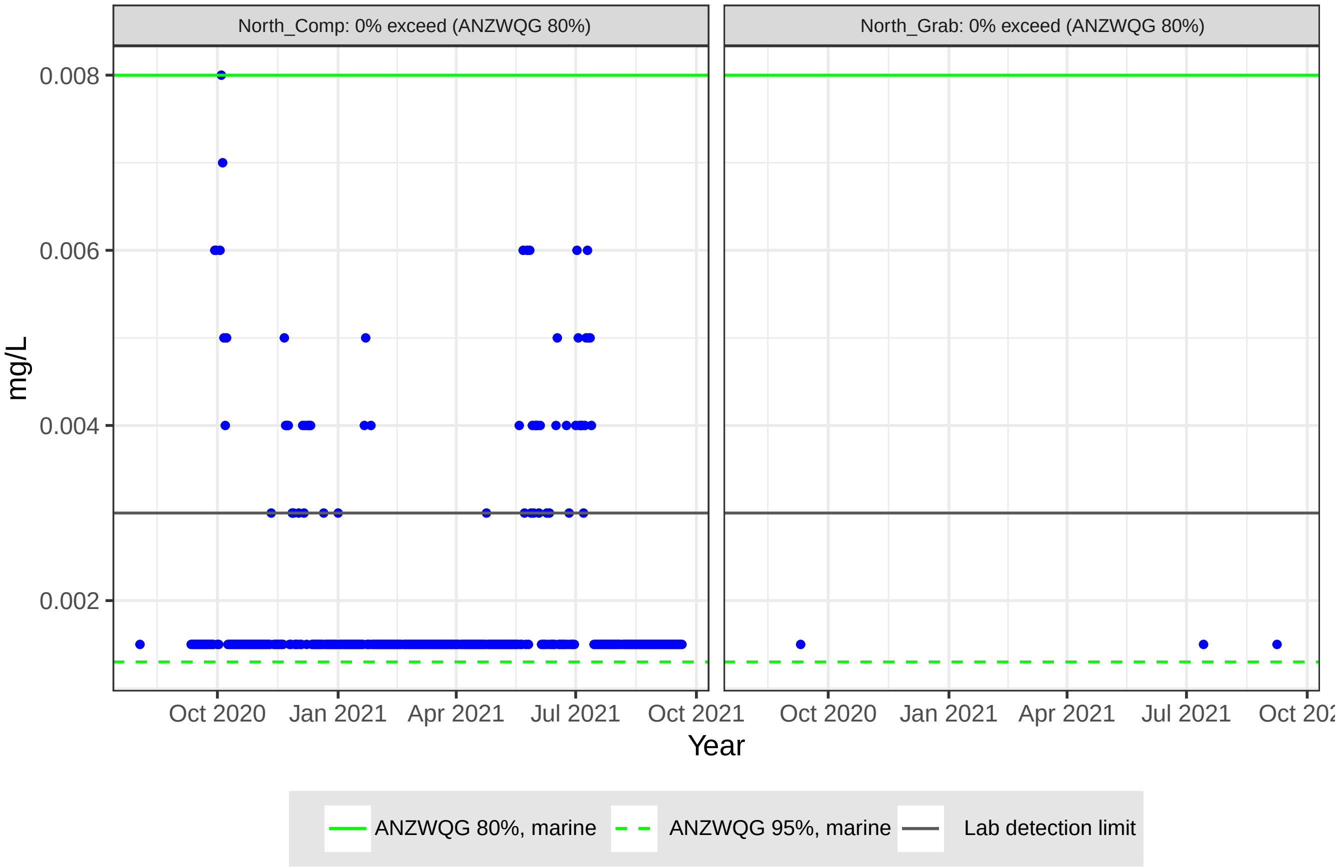
Dissolved Oxygen
Daily

Copper − Total
Daily



Copper − Dissolved

Daily



Chromium − Total

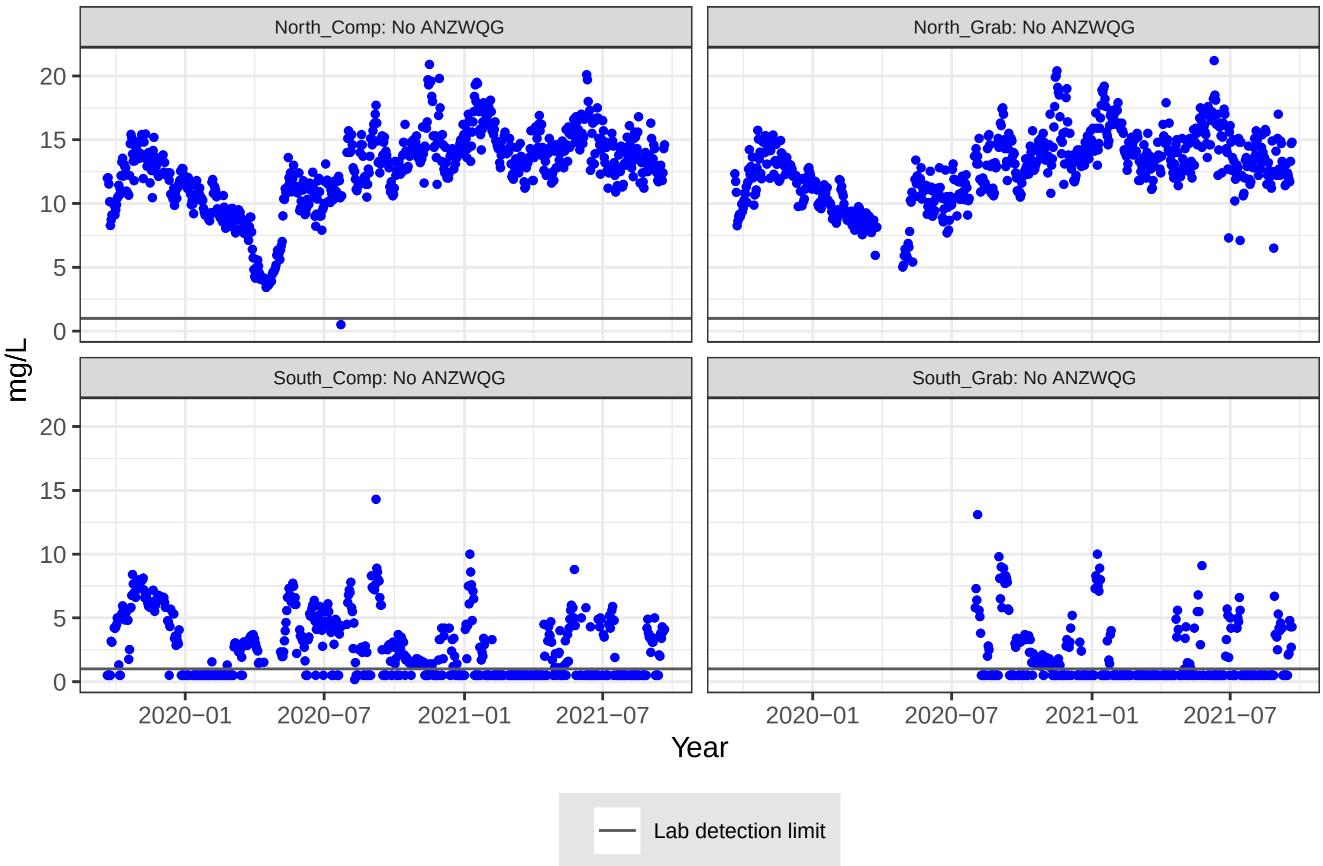
Daily

Cadmium − Total

Daily

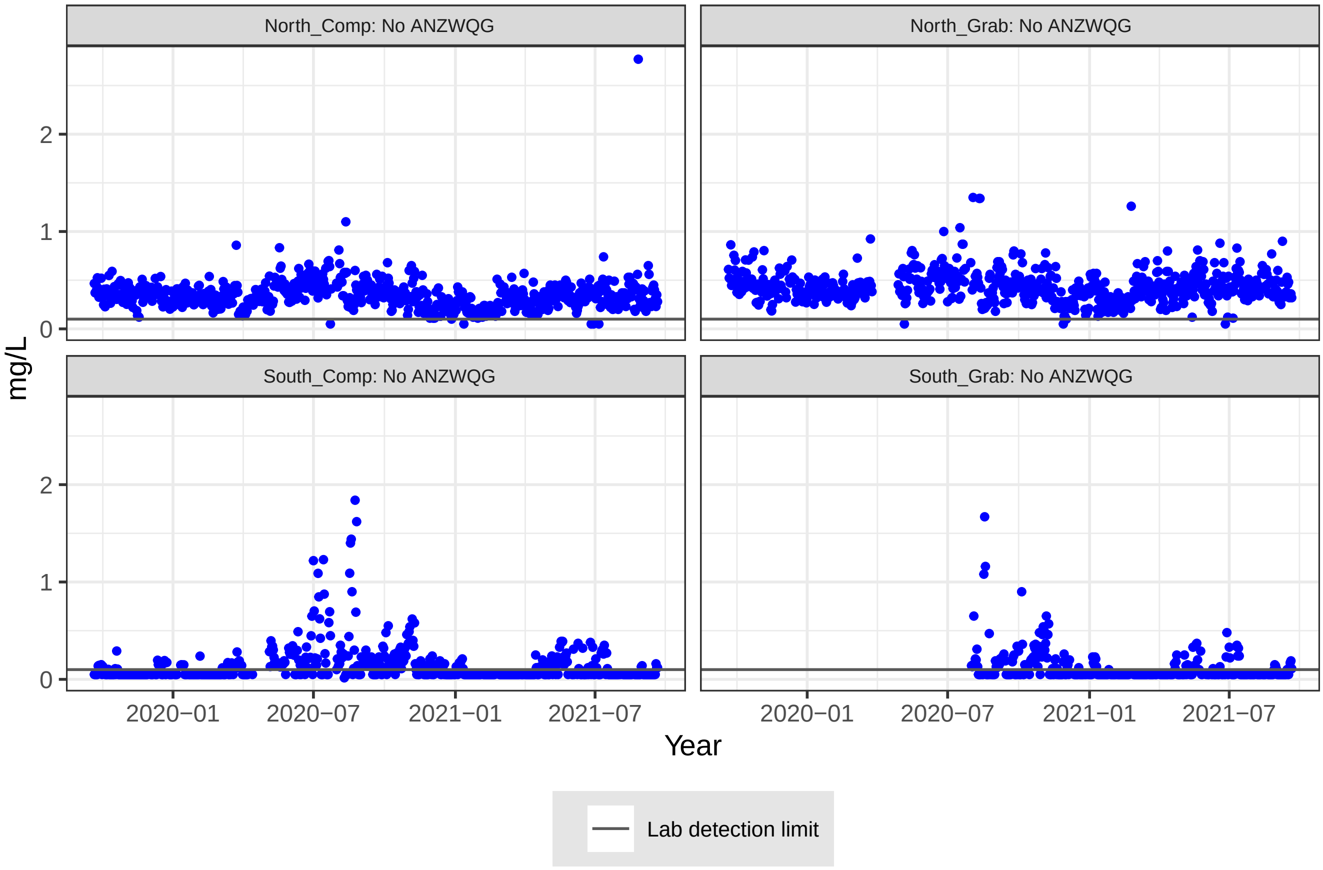
Boron − Total

Daily



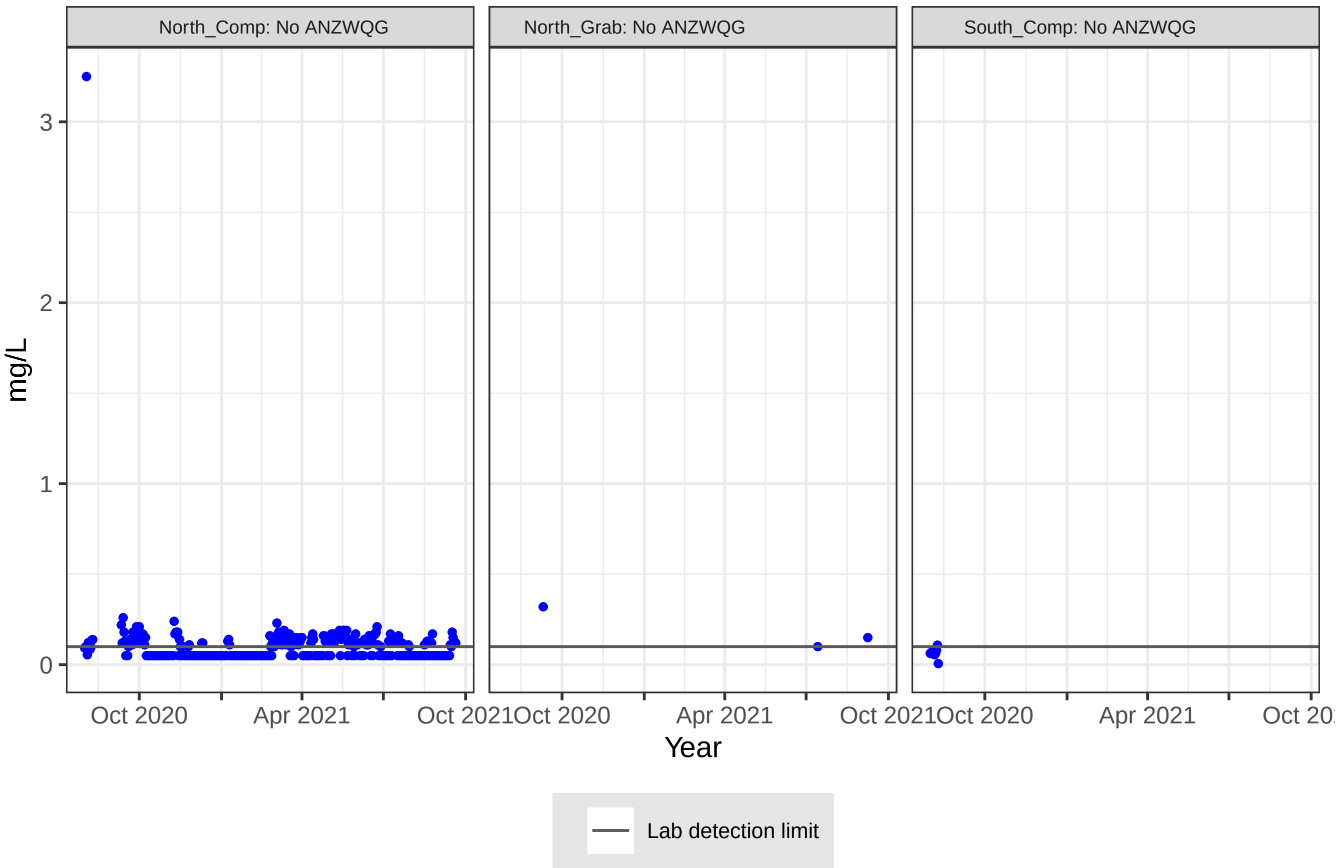
Aluminium − Total

Daily



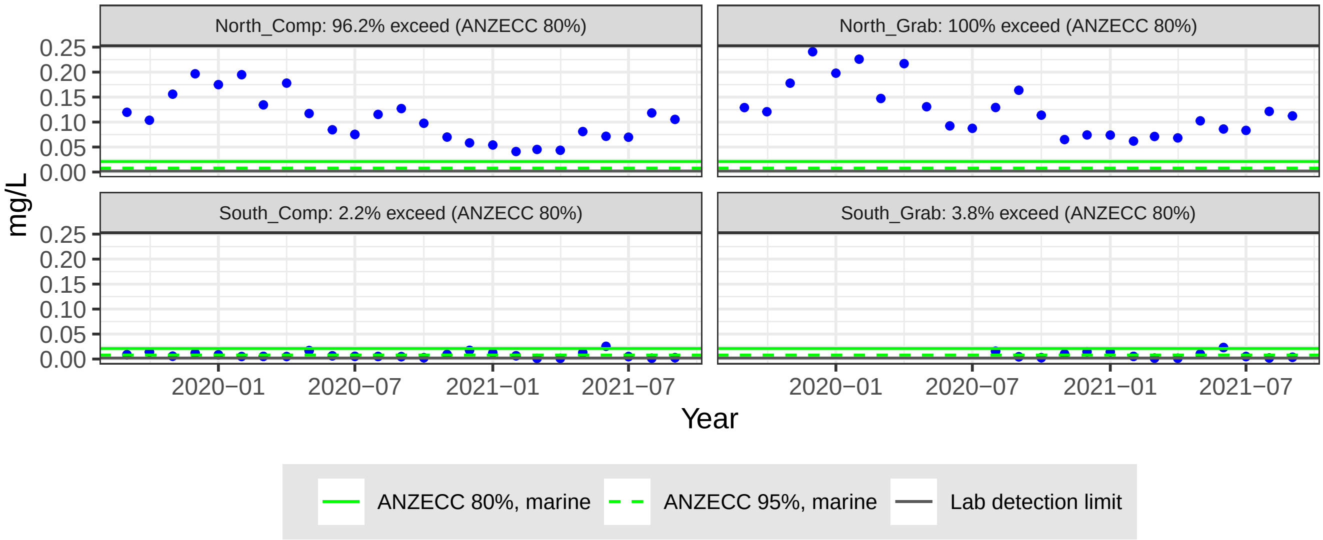
Aluminium − Dissolved

Daily



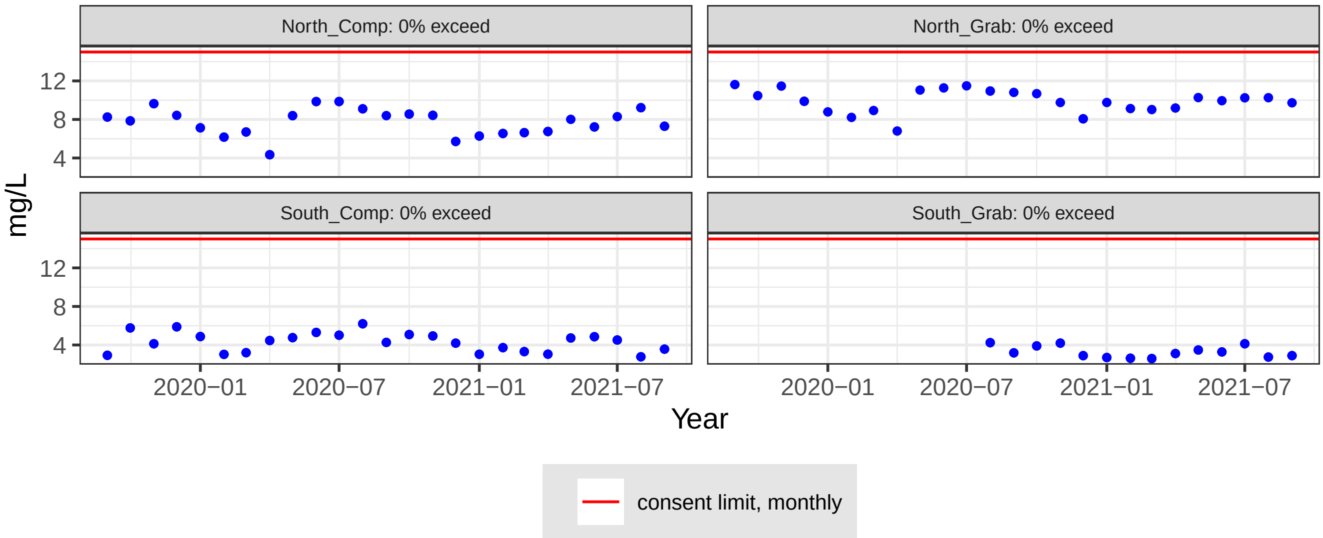
Zinc − Total

Monthly avg



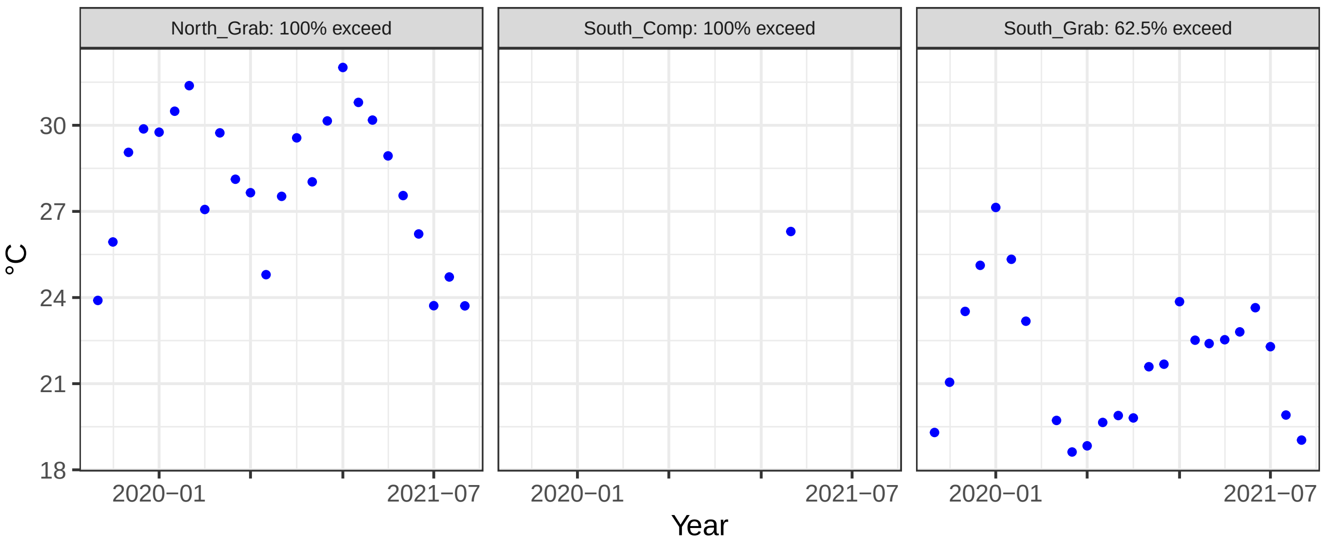
Total Suspended Solids

Monthly avg



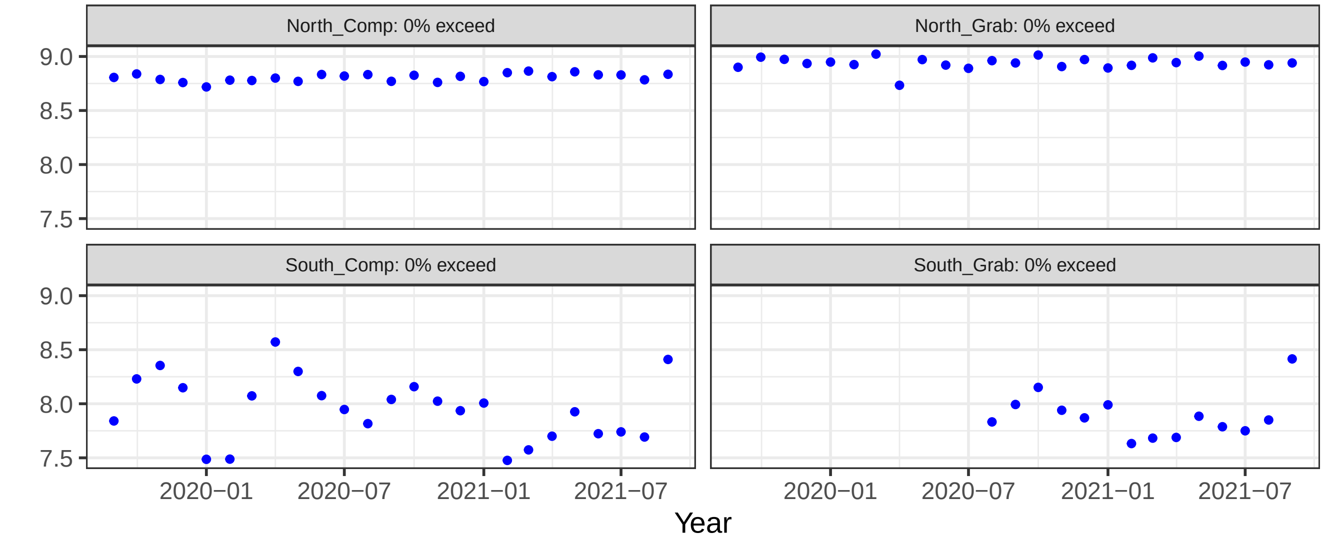
Temperature

Monthly avg



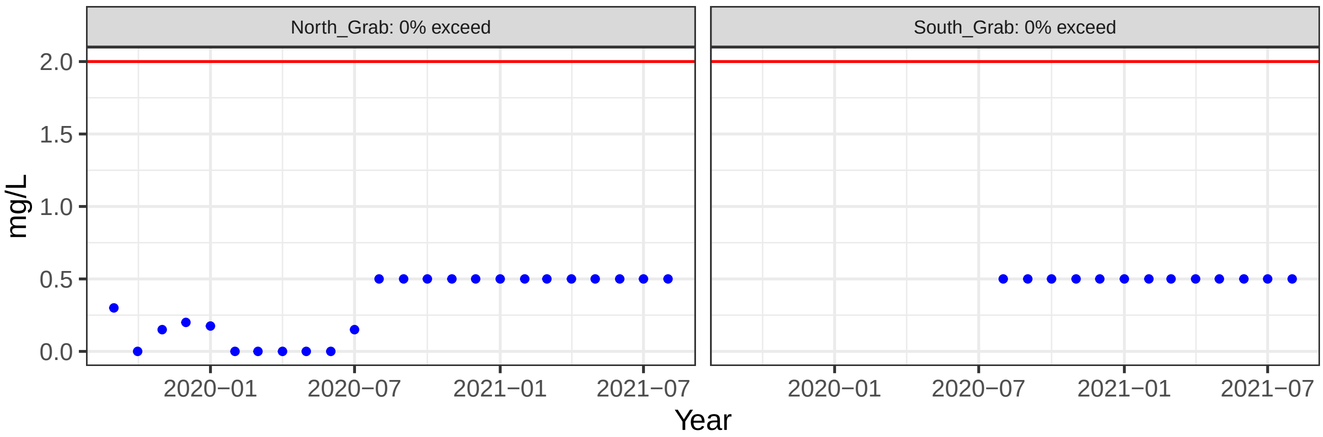
pH

Monthly avg



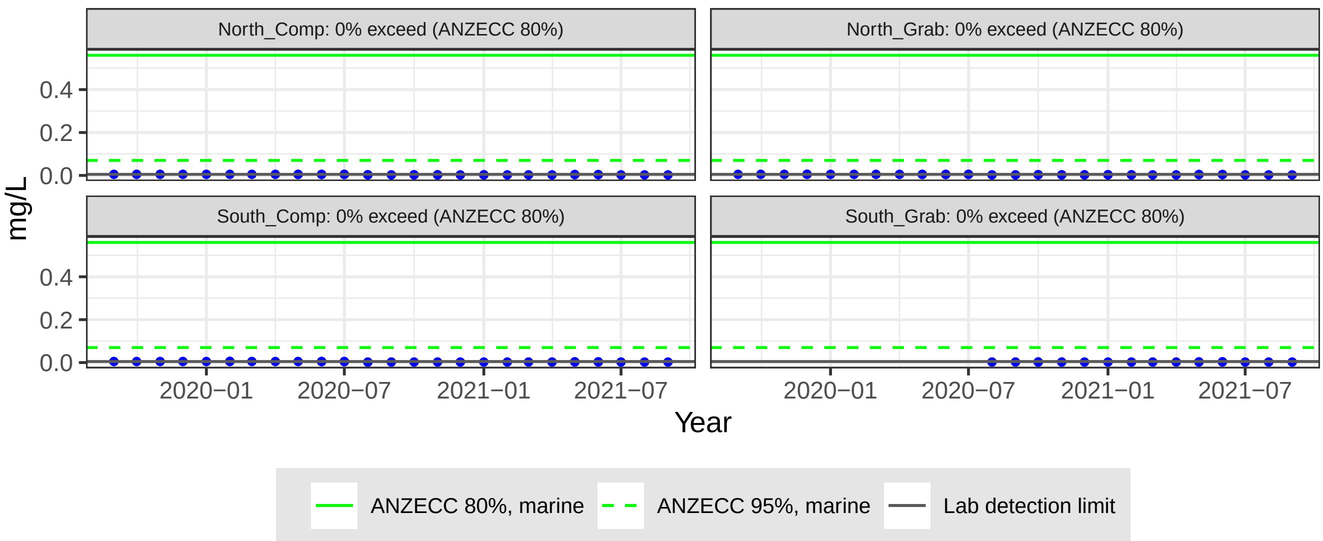
Oil and Grease

Monthly avg



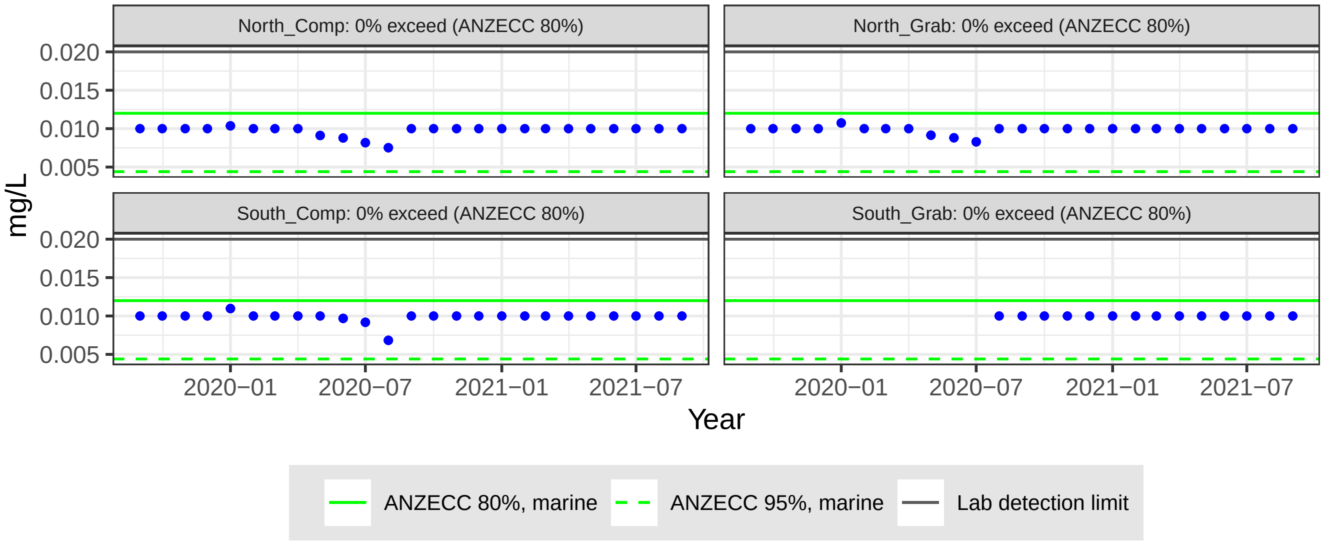
Nickel − Total

Monthly avg



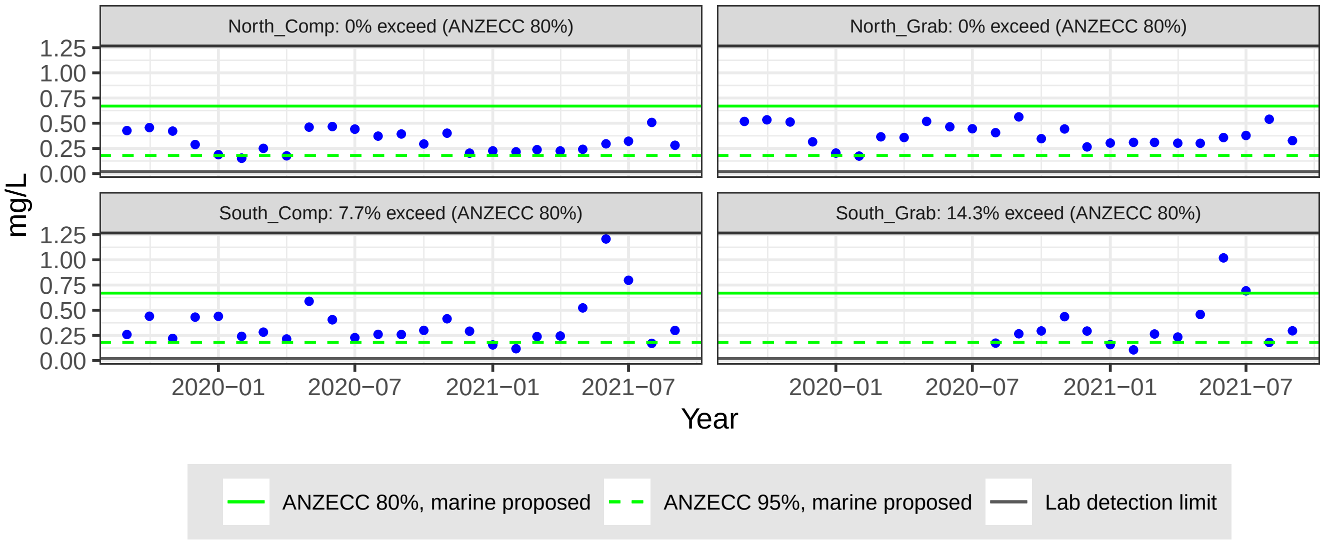
Lead − Total

Monthly avg



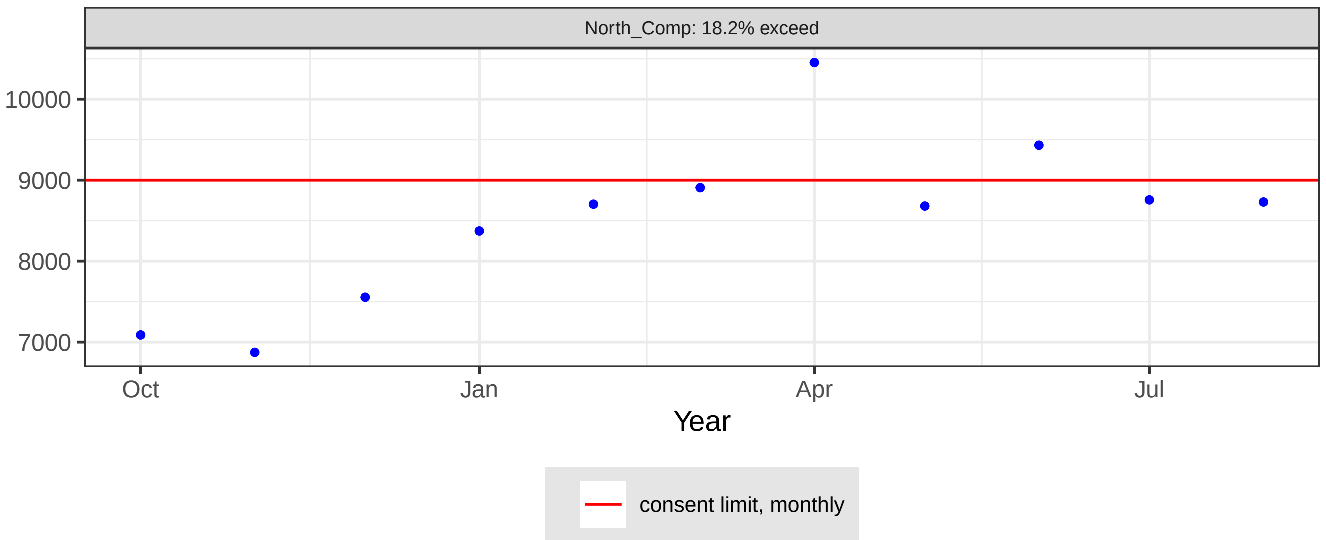
Iron − Total

Monthly avg



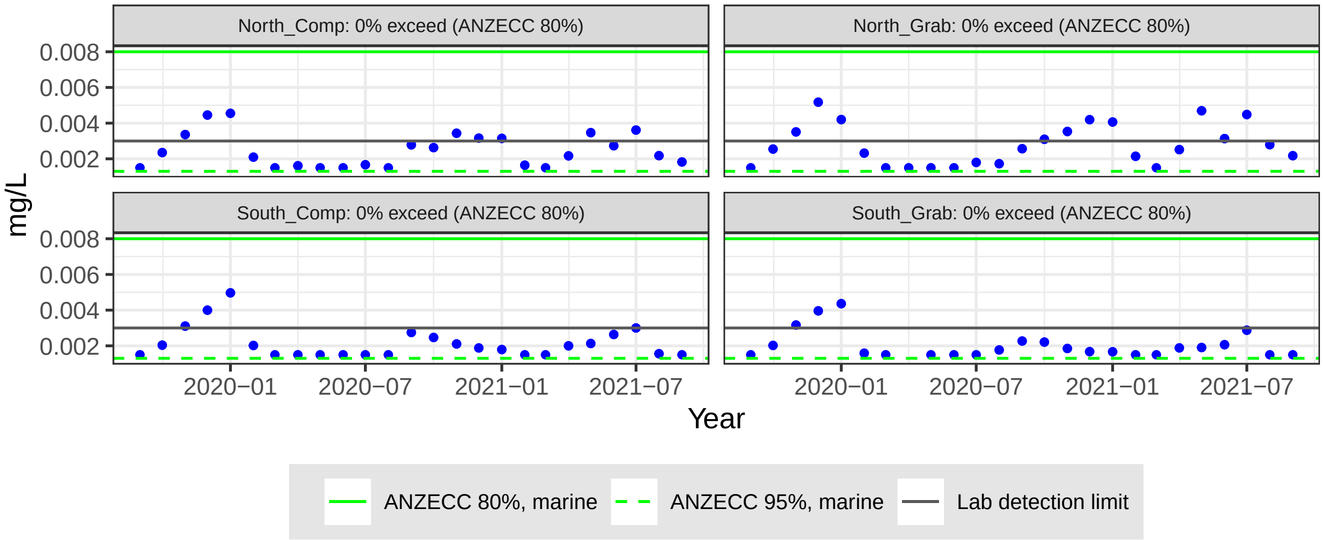
Flow (monthly)

Monthly avg



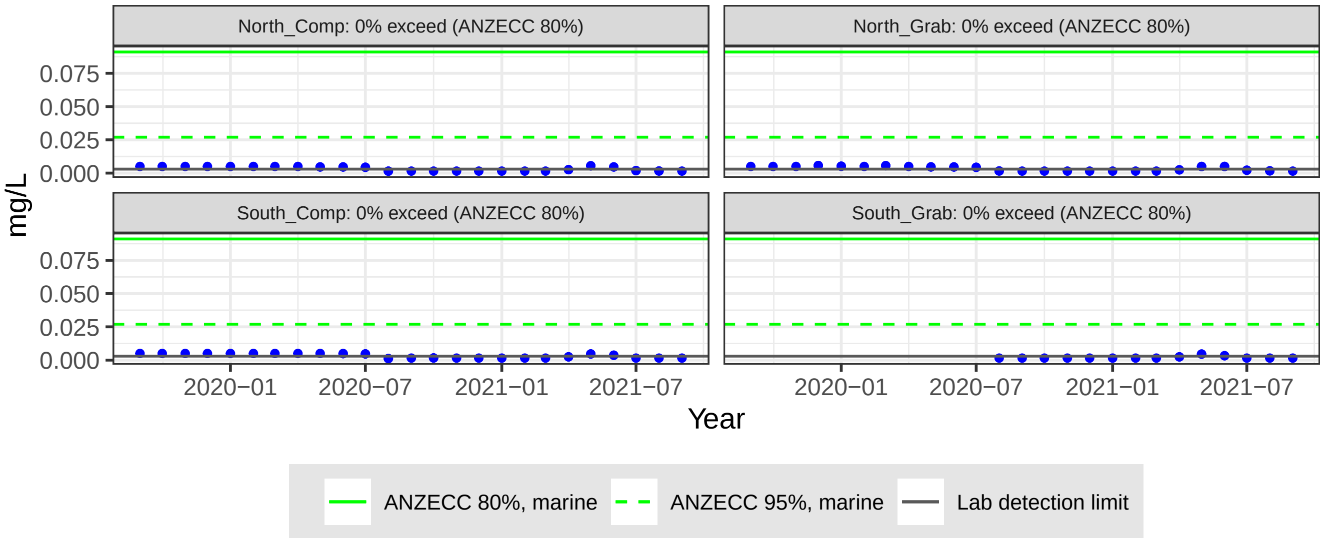
Copper − Total

Monthly avg



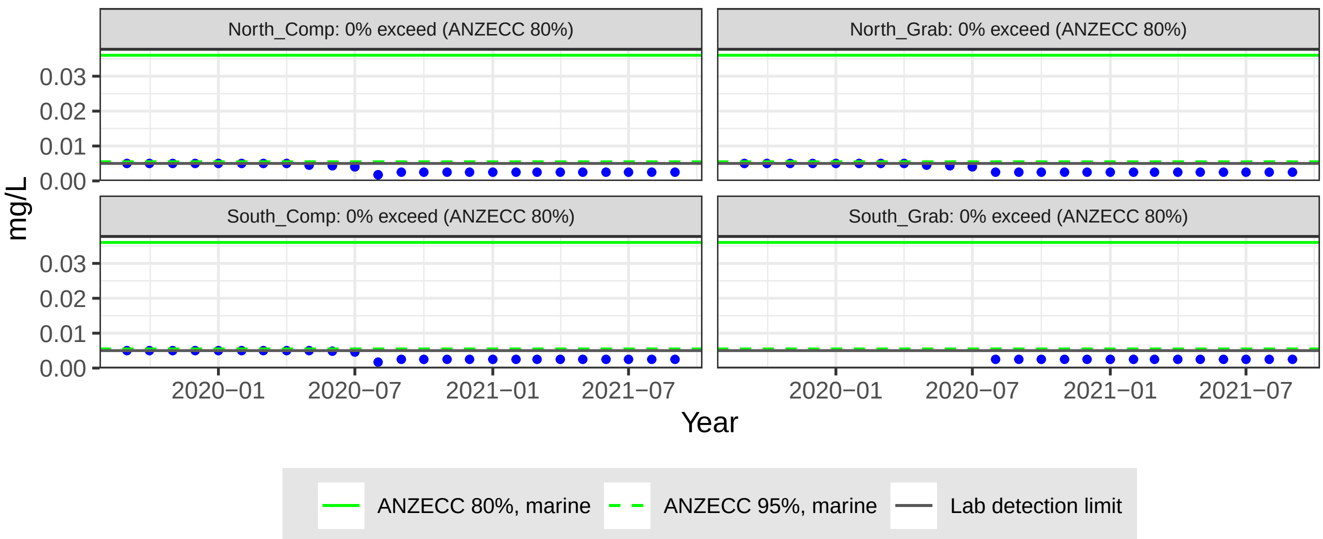
Chromium − Total

Monthly avg



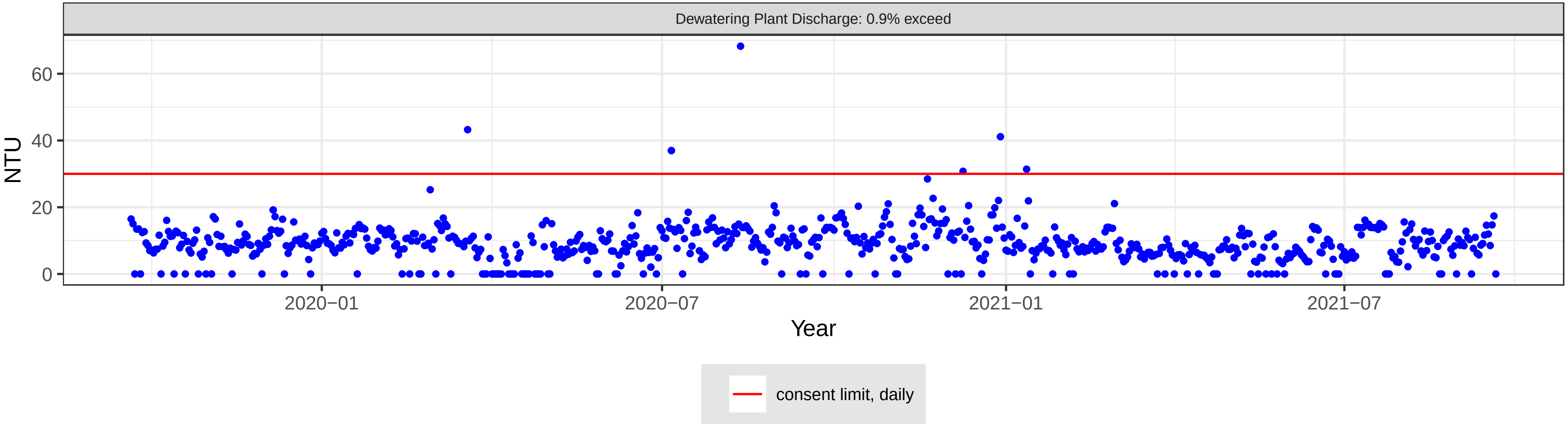
Cadmium − Total

Monthly avg



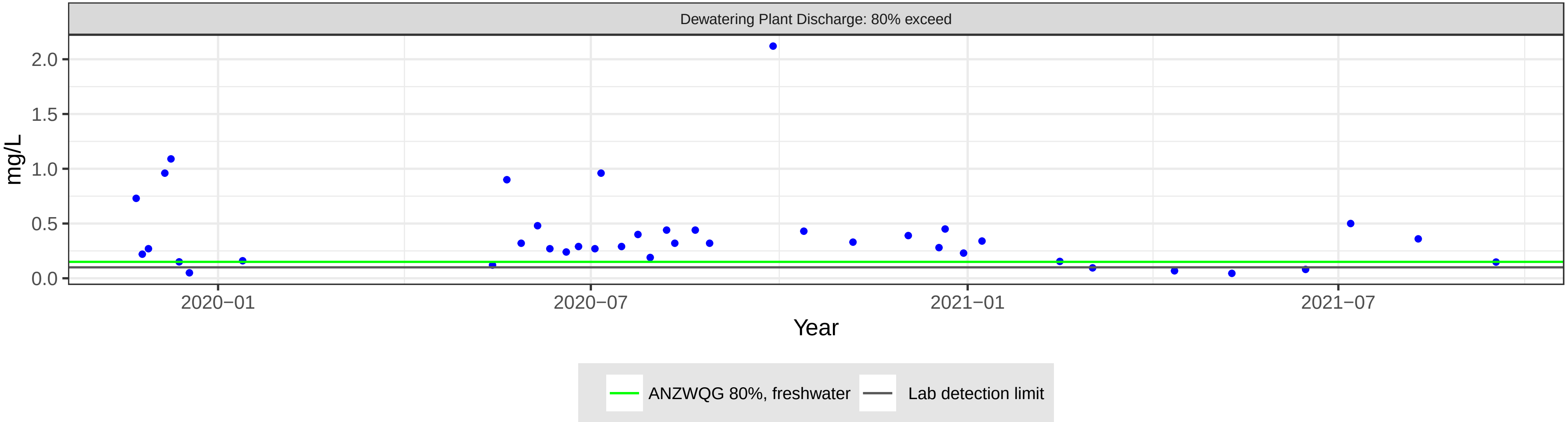
Daily Turbidity (flow−weighted)

Dewatering Plant



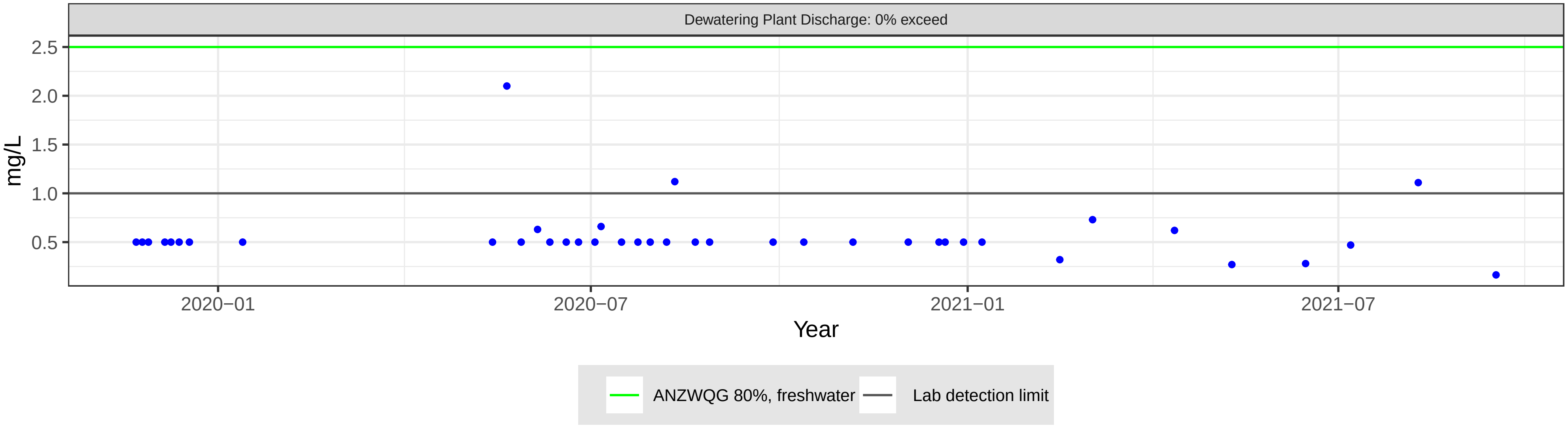
Aluminium − Total

Dewatering Plant



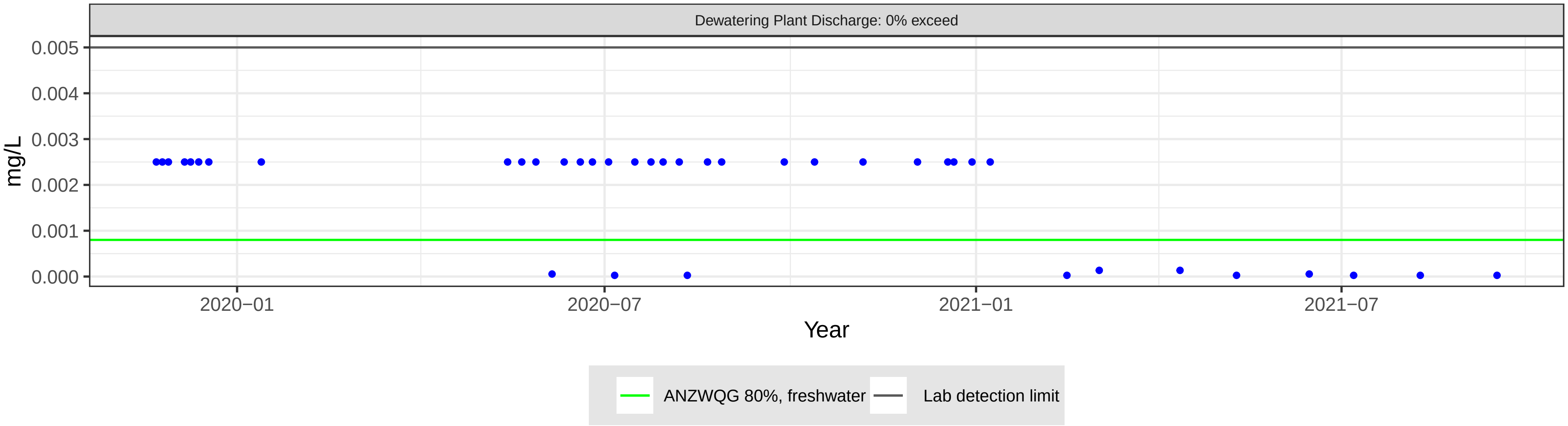
Boron − Total

Dewatering Plant



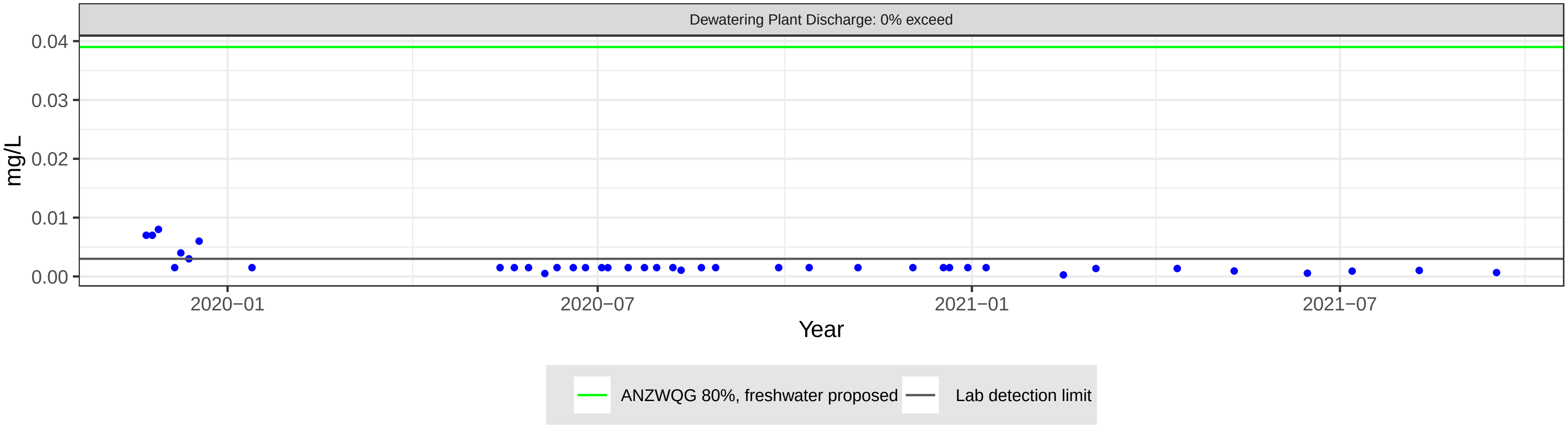
Cadmium − Total

Dewatering Plant



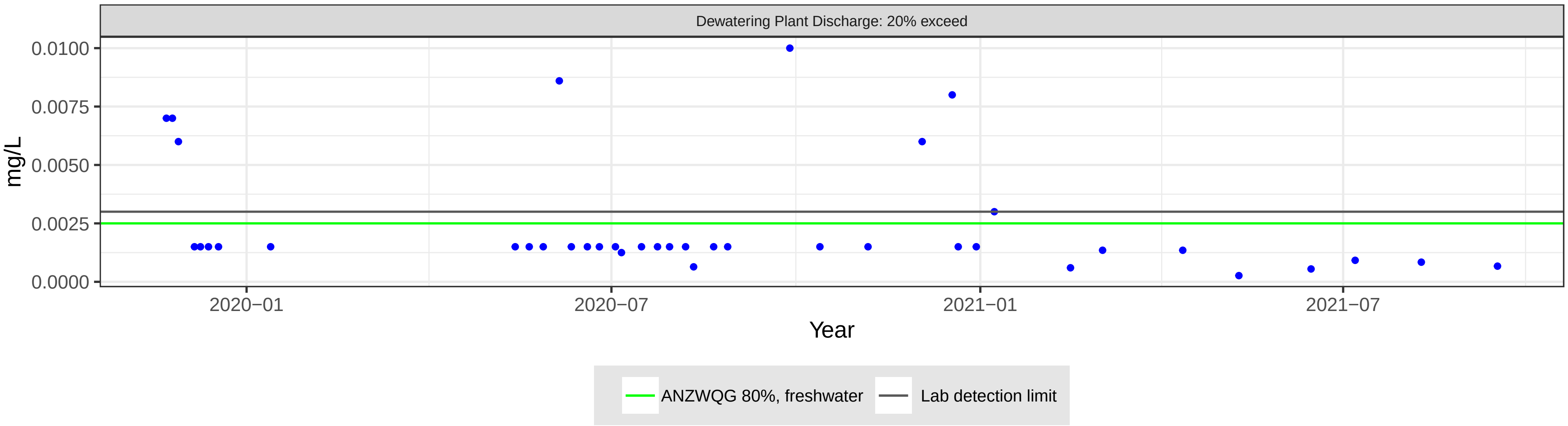
Chromium − Total

Dewatering Plant



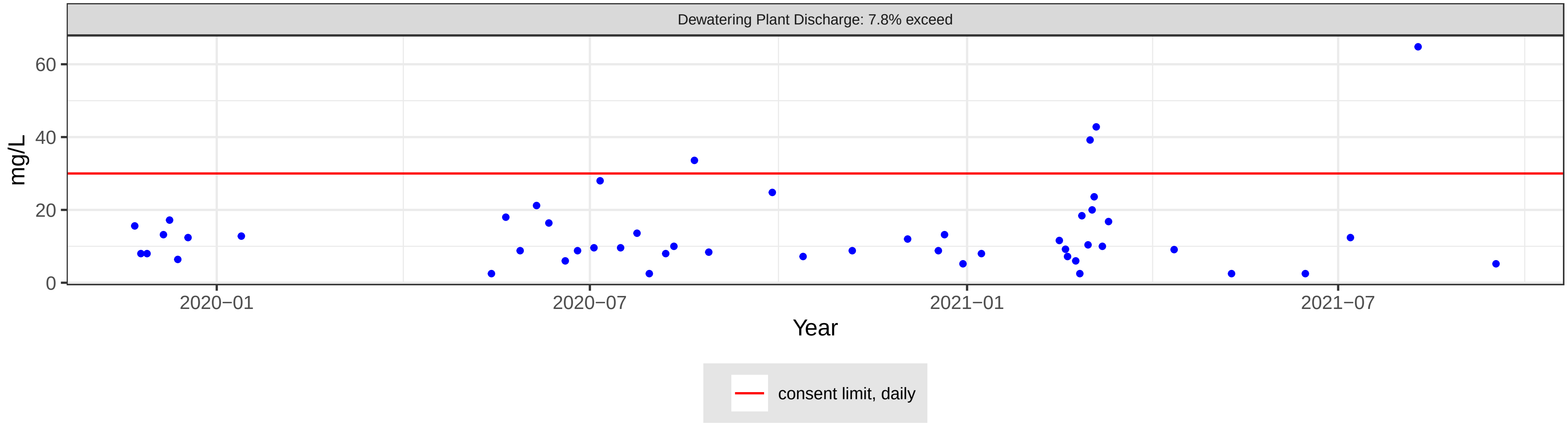
Copper − Total

Dewatering Plant



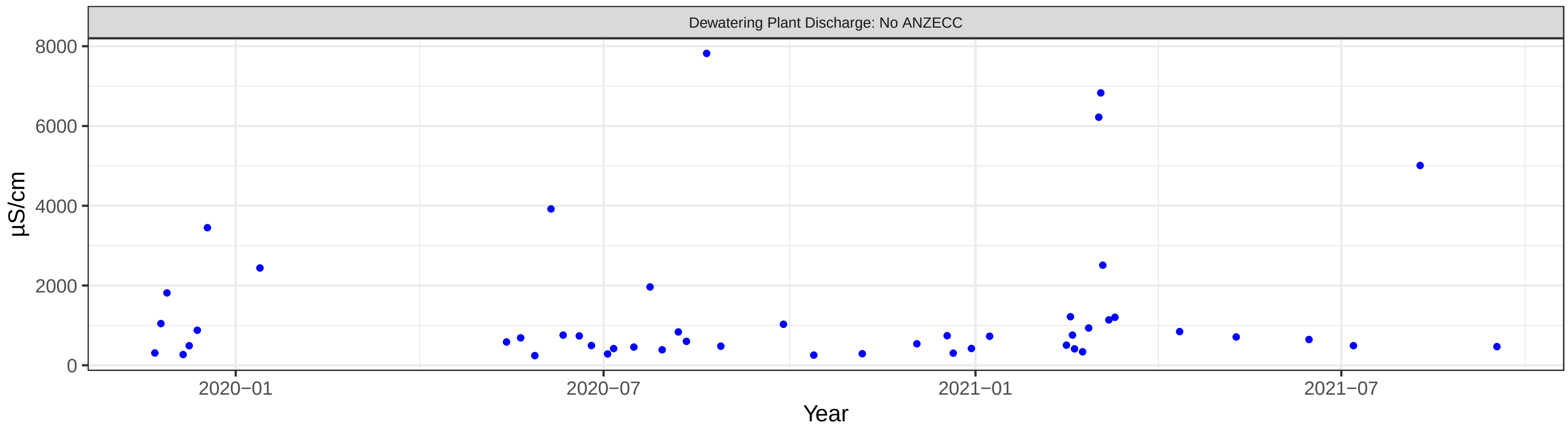
Daily Total Suspended Solids (flow−weighted)

Dewatering Plant



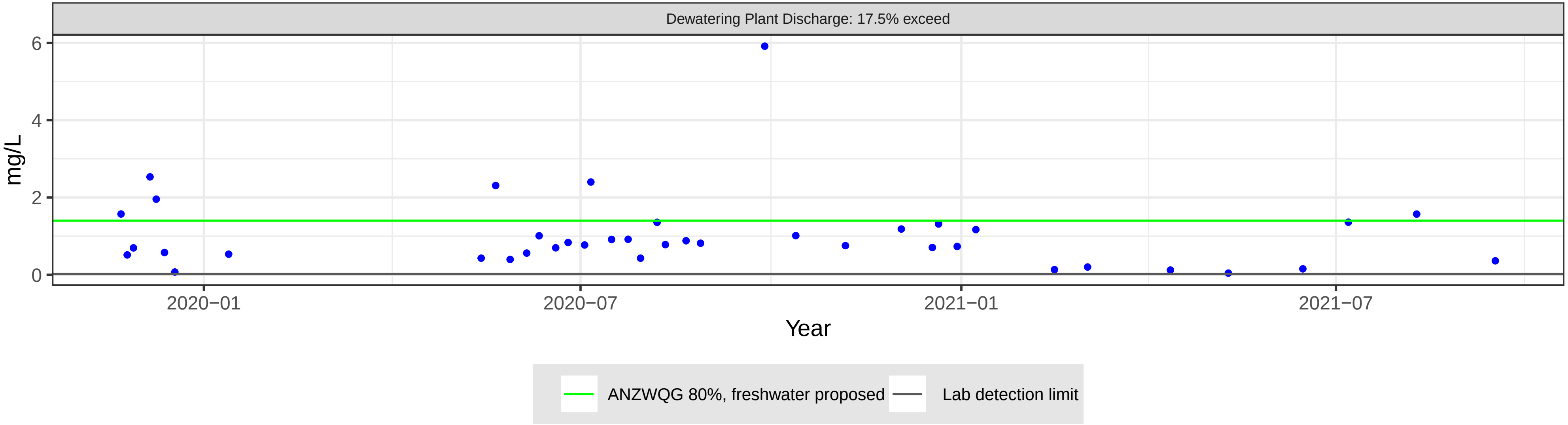
Electrical Conductivity

Dewatering Plant



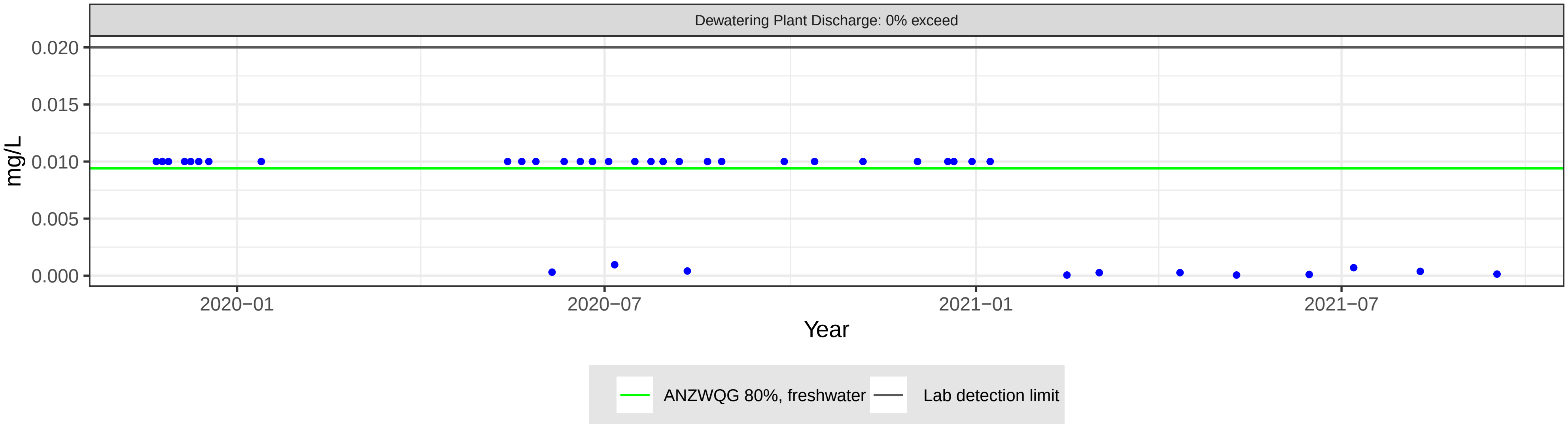
Iron − Total

Dewatering Plant



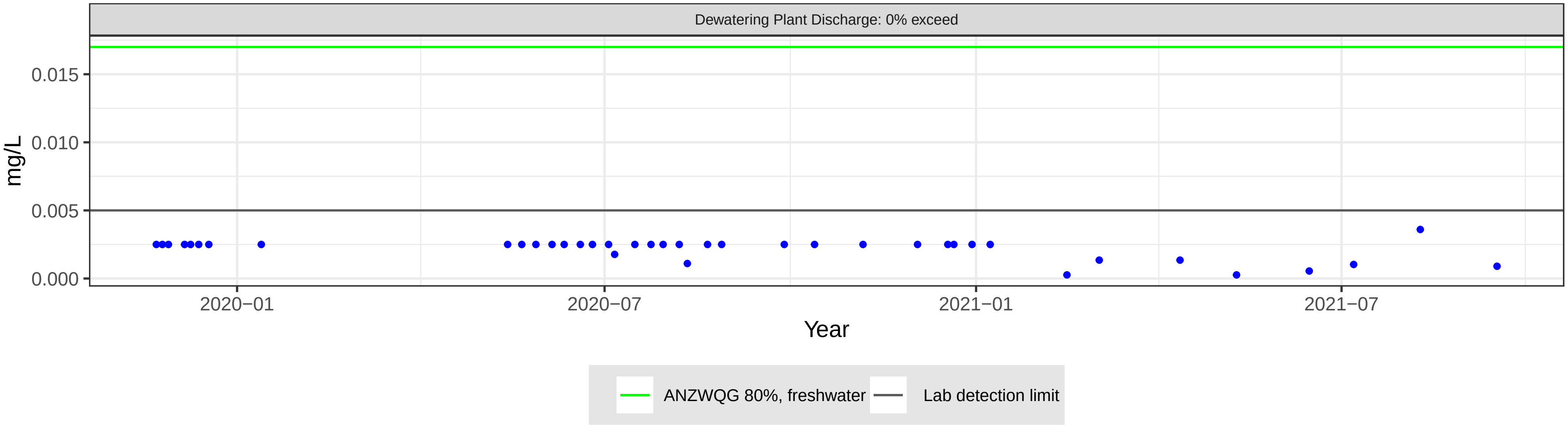
Lead − Total

Dewatering Plant



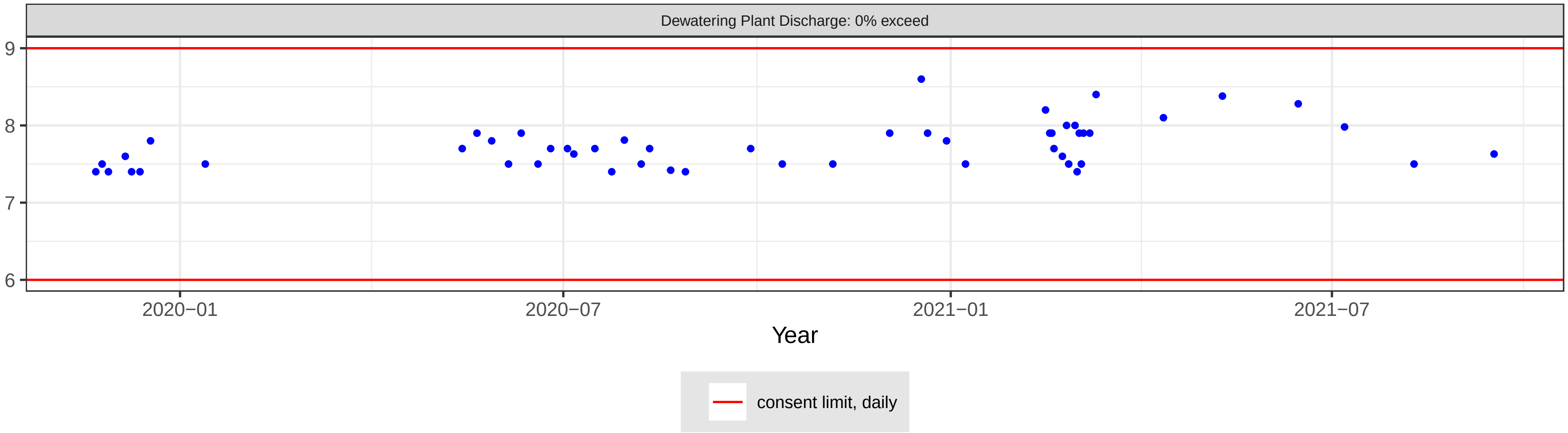
Nickel − Total

Dewatering Plant



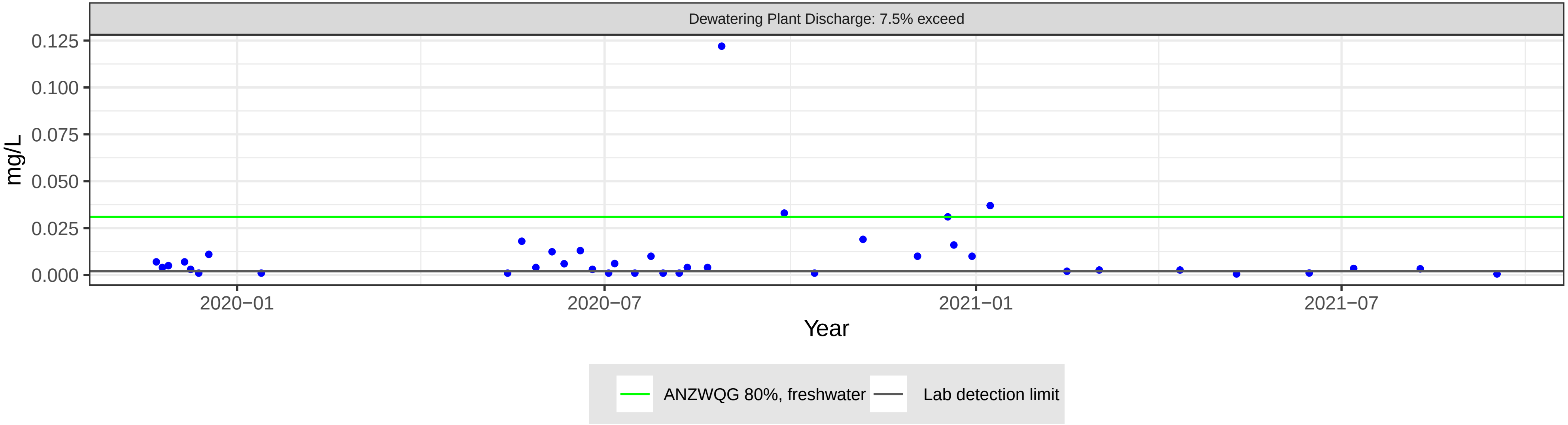
pH

Dewatering Plant



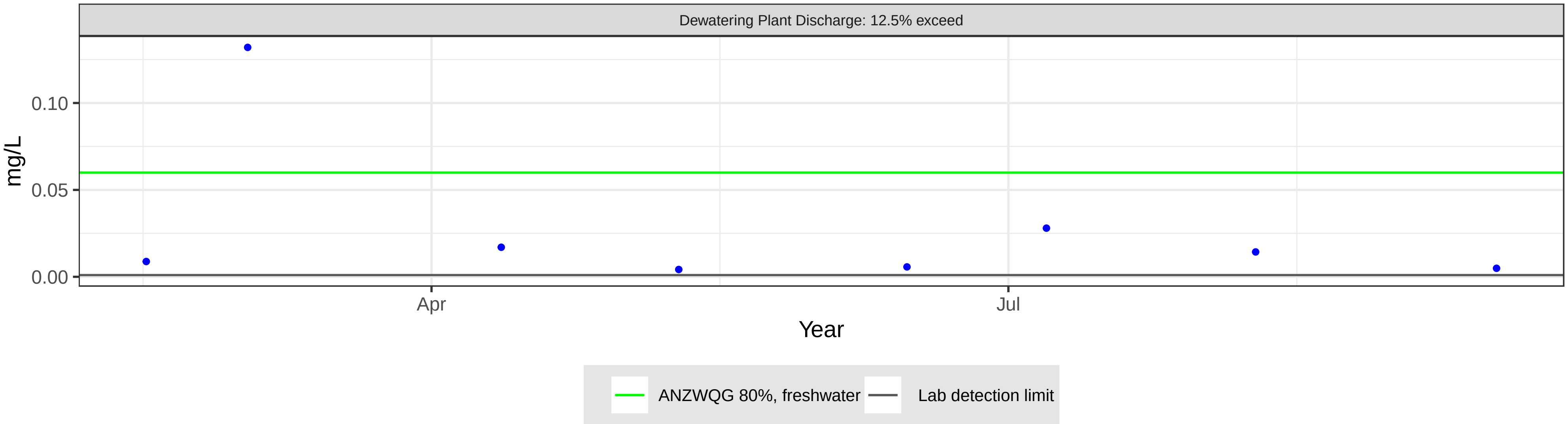
Zinc − Total

Dewatering Plant



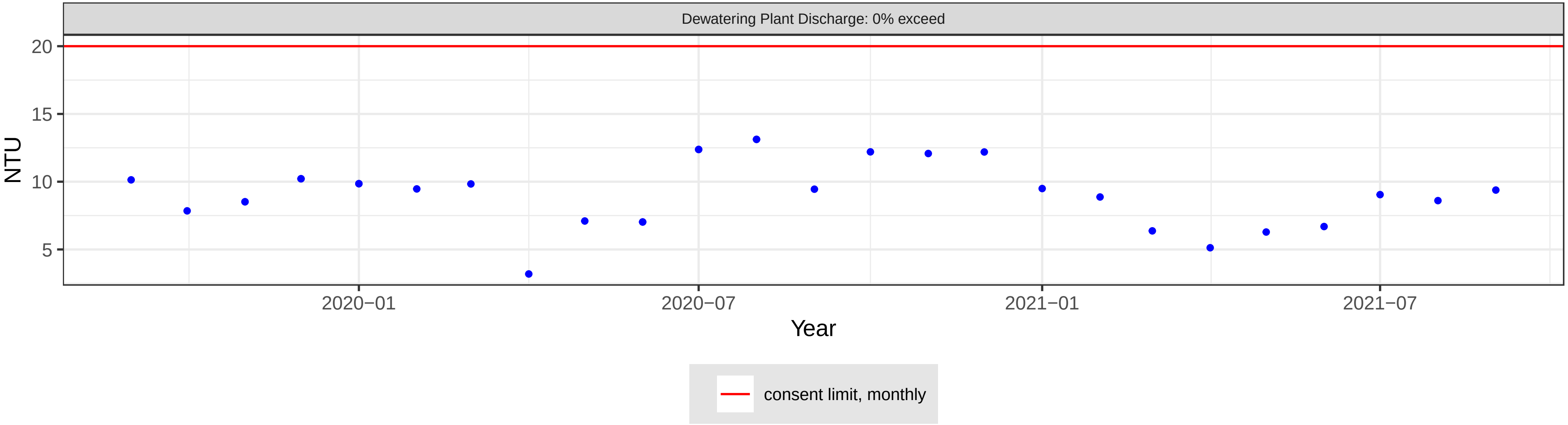
Vanadium − Total

Dewatering Plant



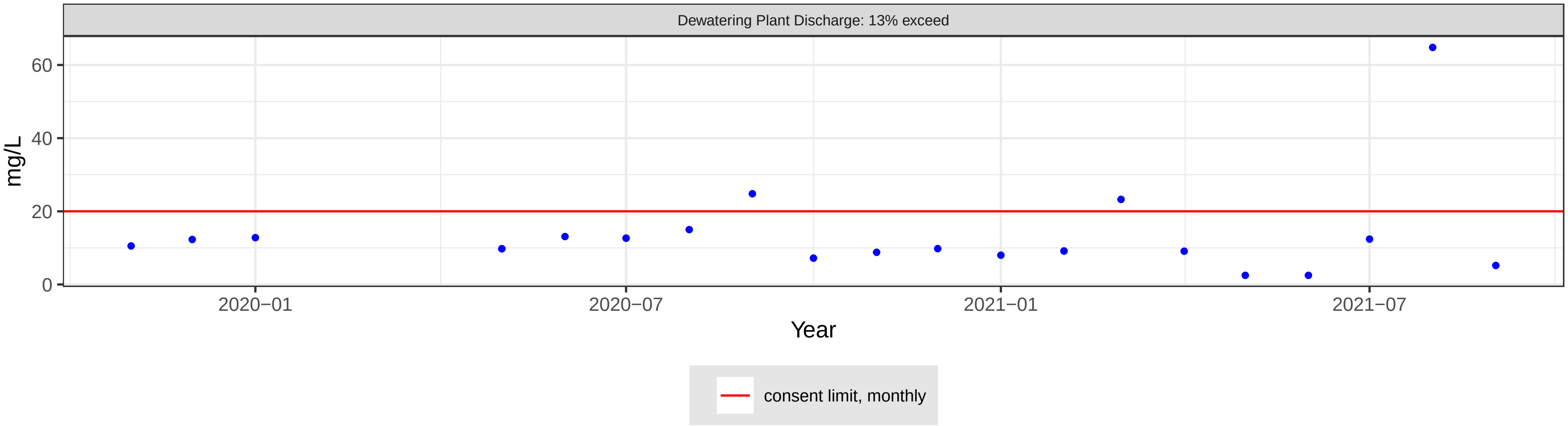
Daily Turbidity (flow−weighted) − averaged by month

Dewatering Plant



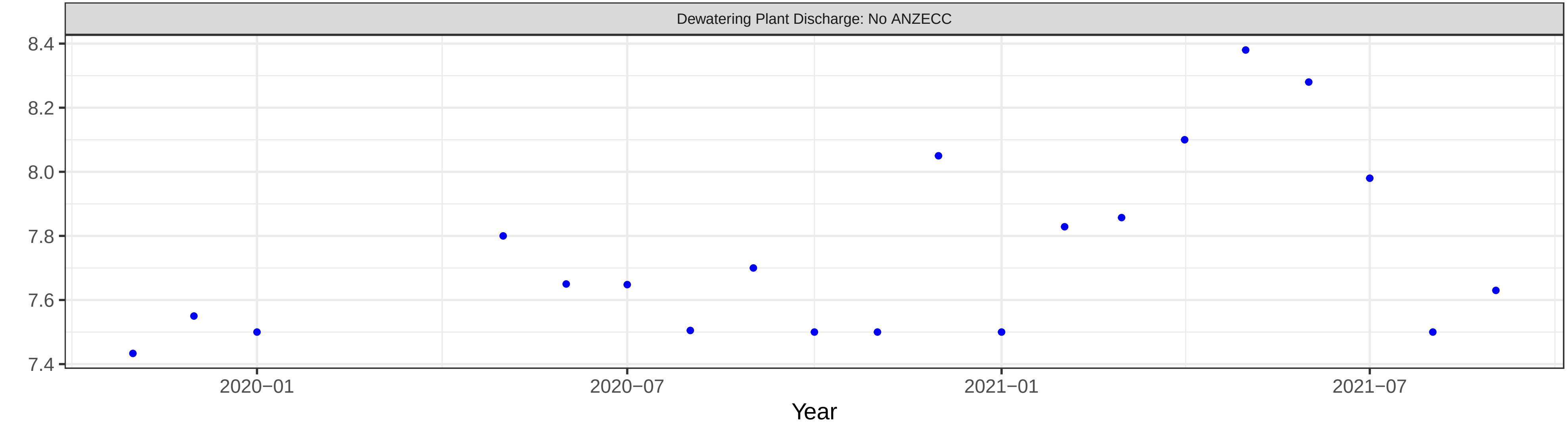
Daily Total Suspended Solids (flow−weighted) − averaged by month

Dewatering Plant



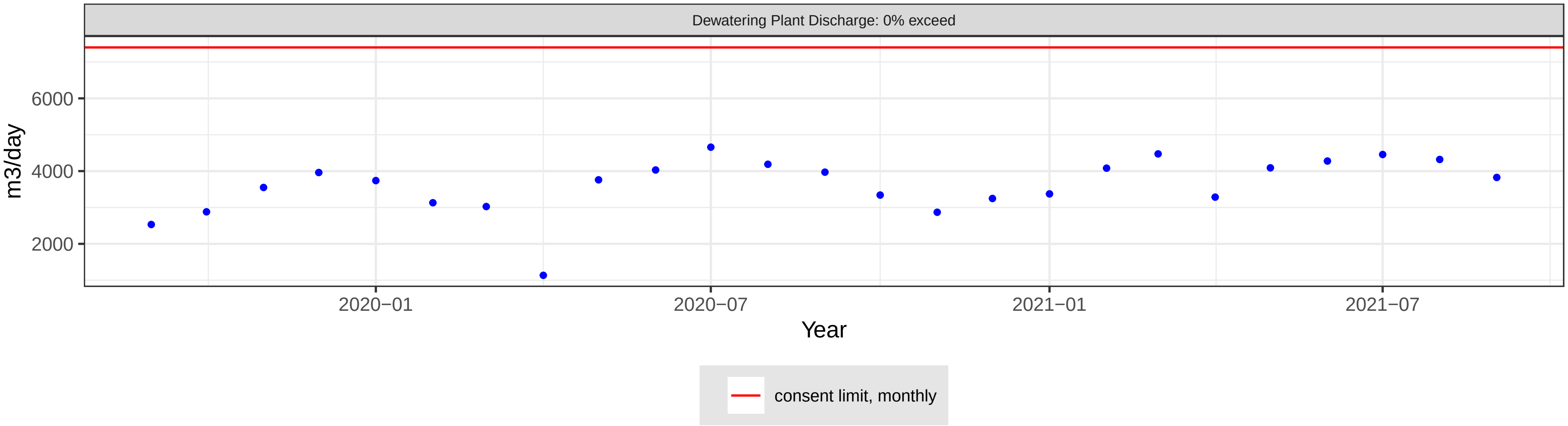
pH − averaged by month

Dewatering Plant



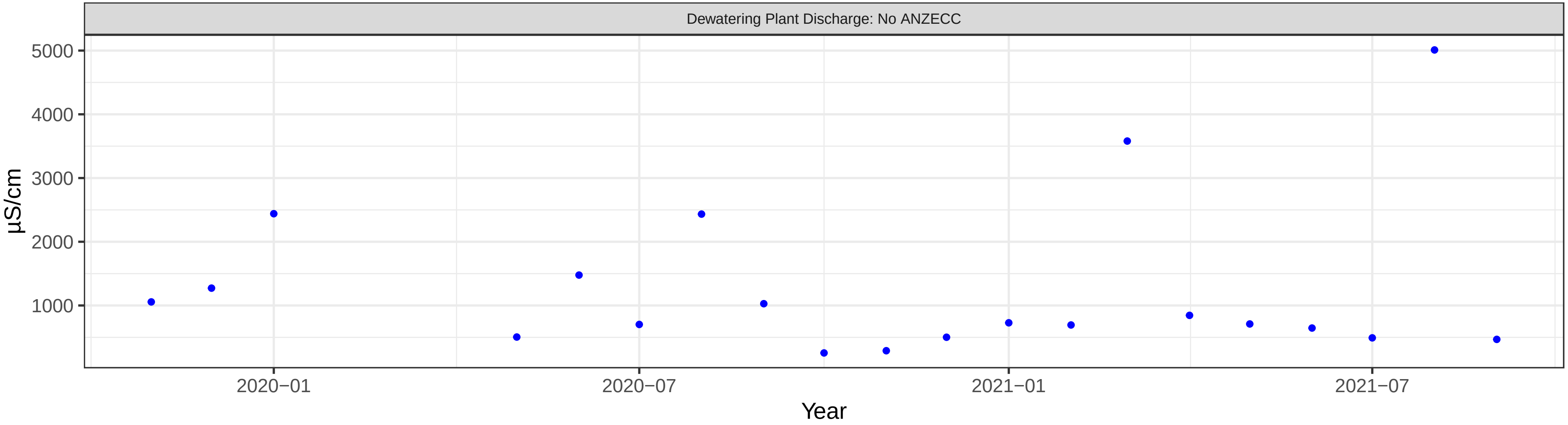
Daily Flow Volume (flow−weighted) − averaged by month

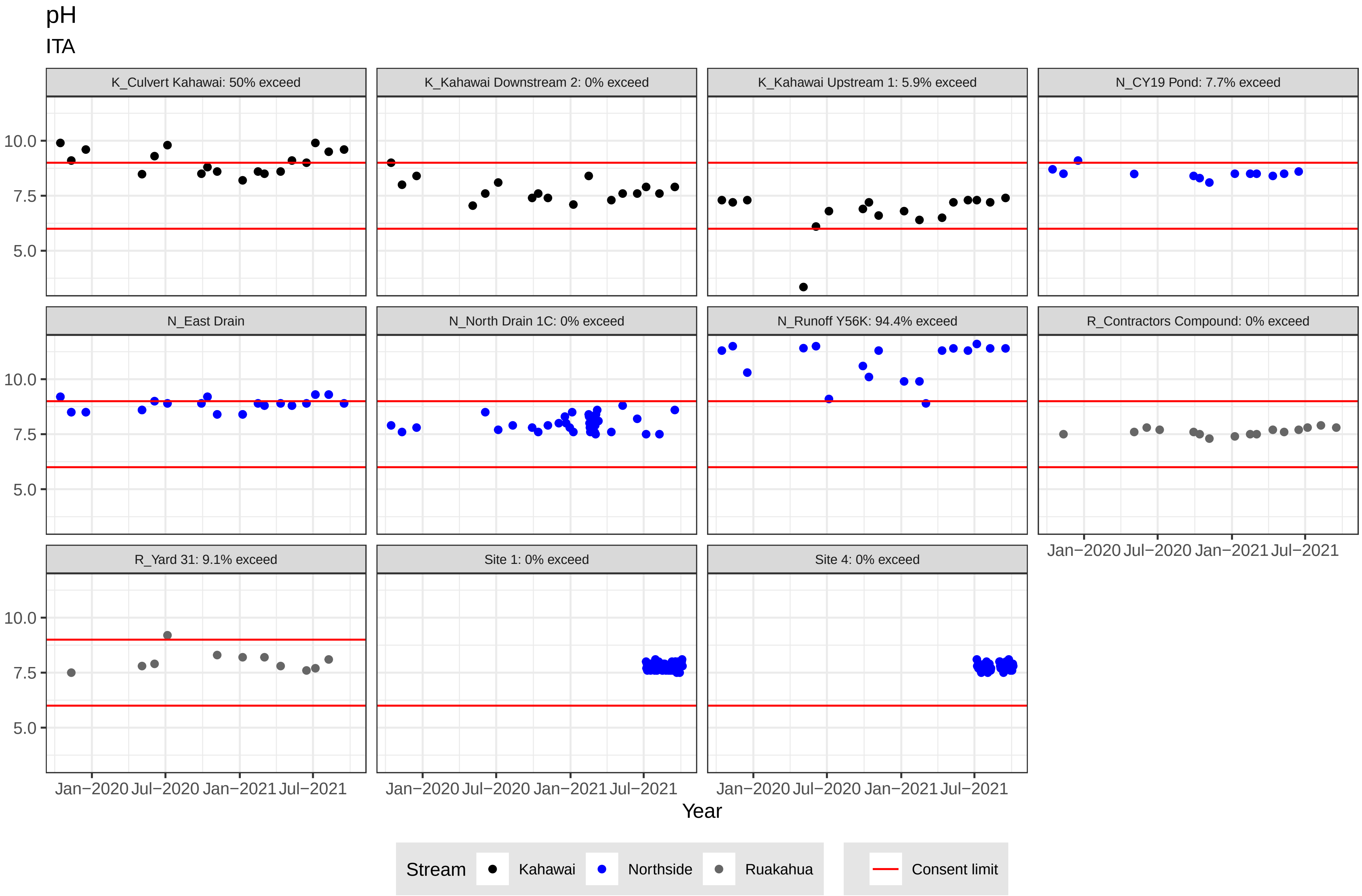
Dewatering Plant



Electrical Conductivity − averaged by month

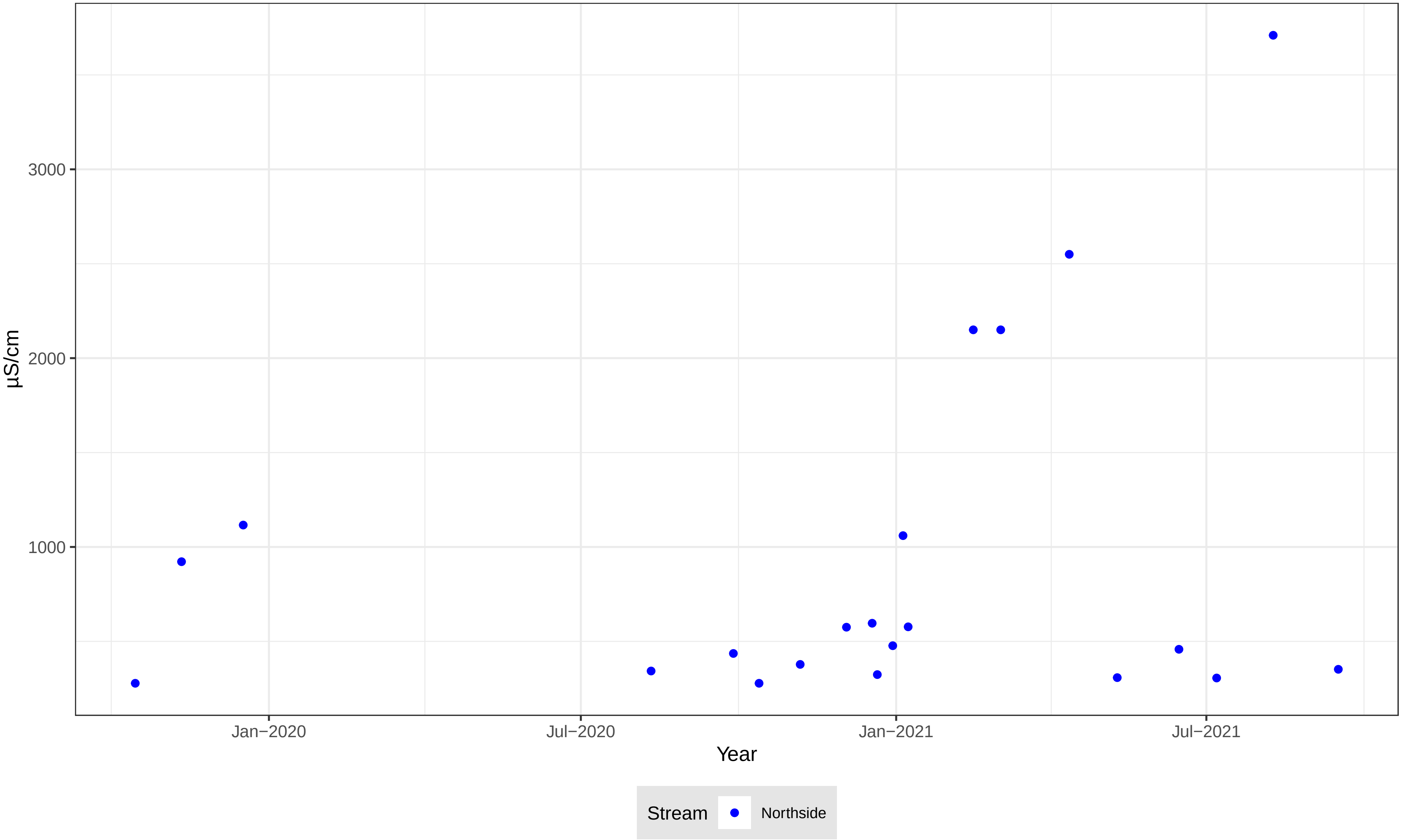
Dewatering Plant




pH
ITA
K_Culvert Kahawai: 50% exceed
K_Kahawai Downstream 2: 0% exceed
K_Kahawai Upstream 1: 5.9% exceed
N_CY19 Pond: 7.7% exceed
N_East Drain
N_North Drain 1C: 0% exceed
N_Runoff Y56K: 94.4% exceed
R_Contractors Compound: 0% exceed
R_Yard 31: 9.1% exceed
Site 1: 0% exceed
Site 4: 0% exceed
10.0
7.5
5.0
Jan−2020 Jul−2020 Jan−2021 Jul−2021
Year
Stream
Kahawai
Northside
Ruakahua
Consent limit

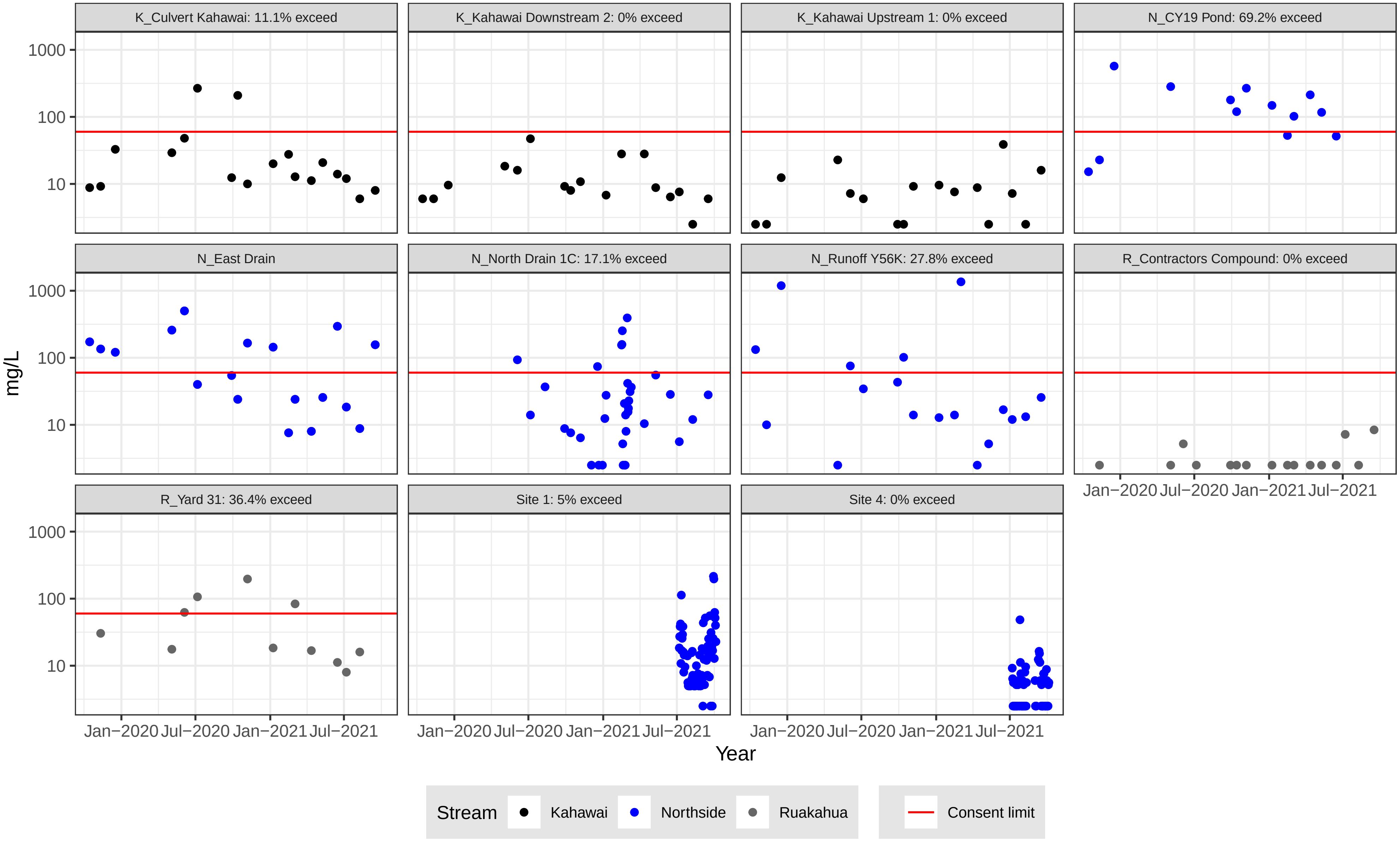
Electrical Conductivity

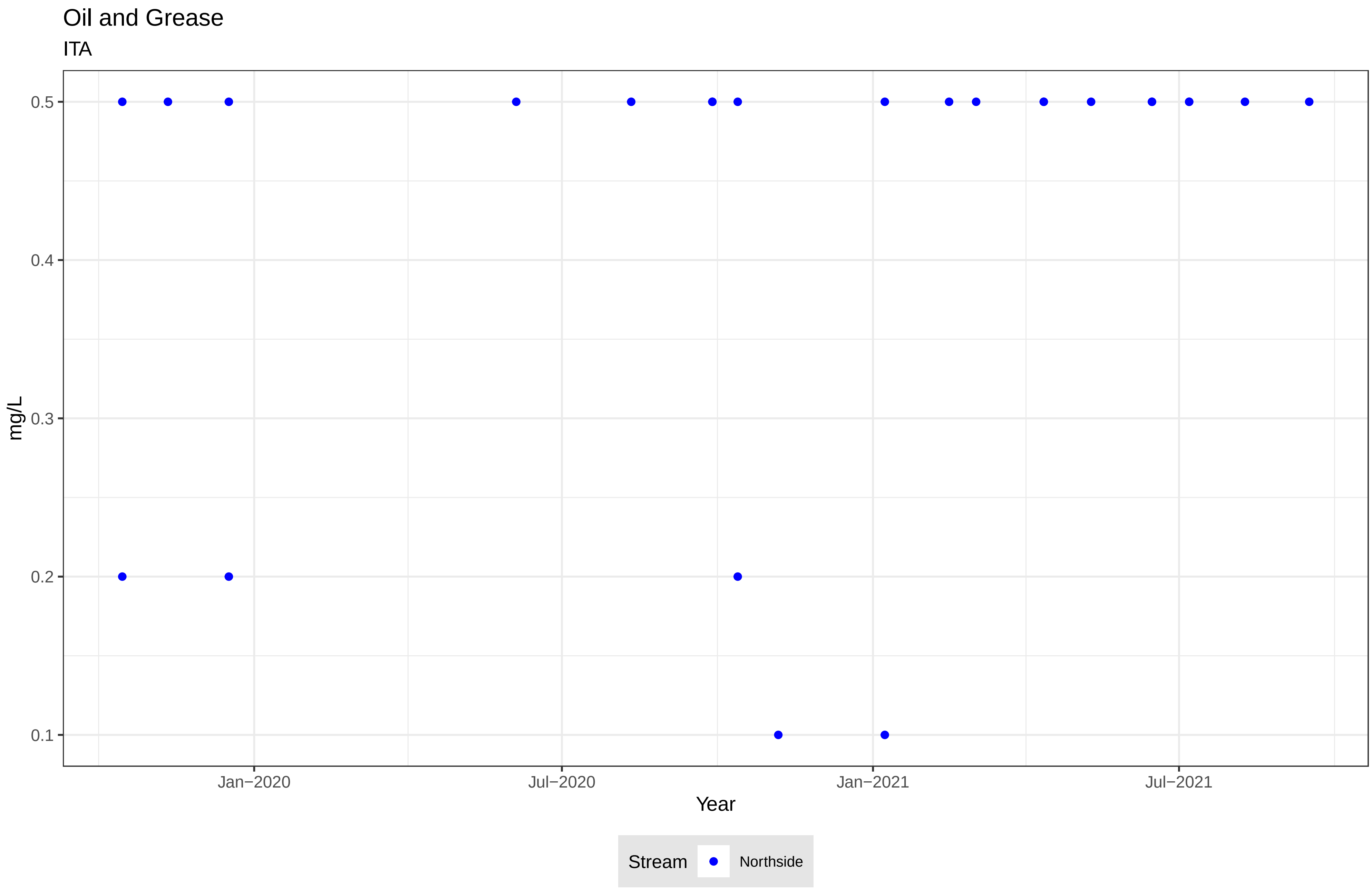
ITA



Total Suspended Solids

ITA

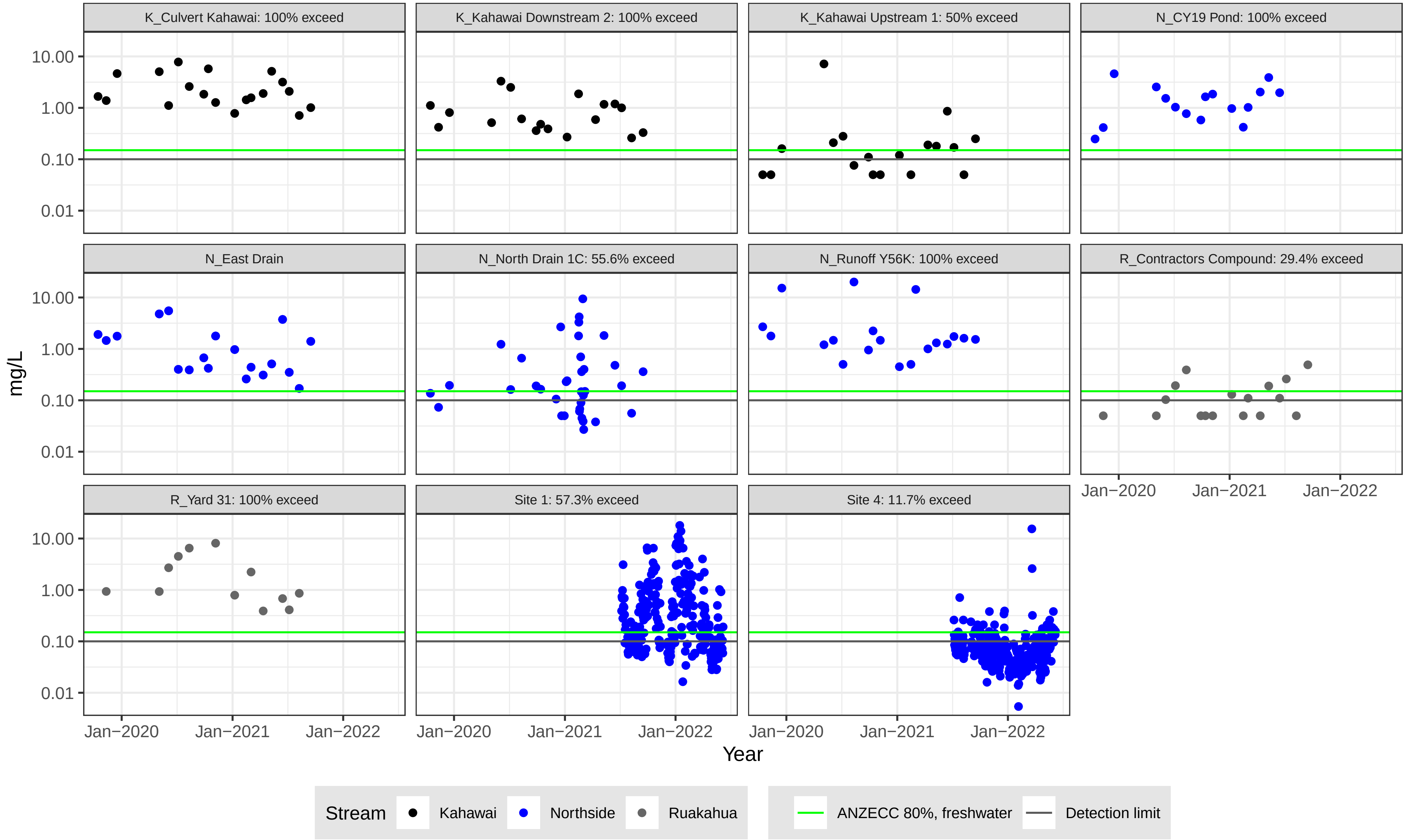


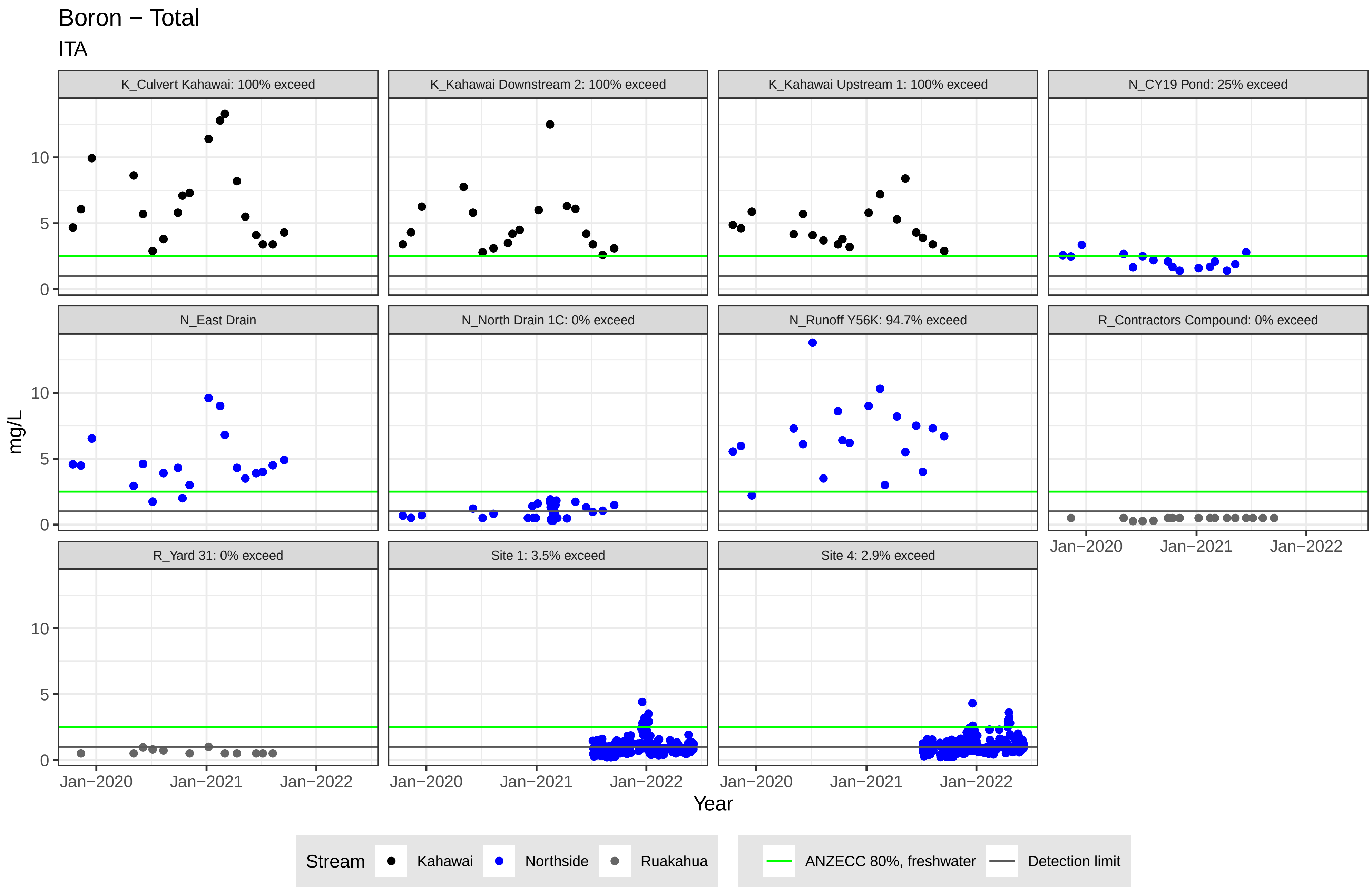


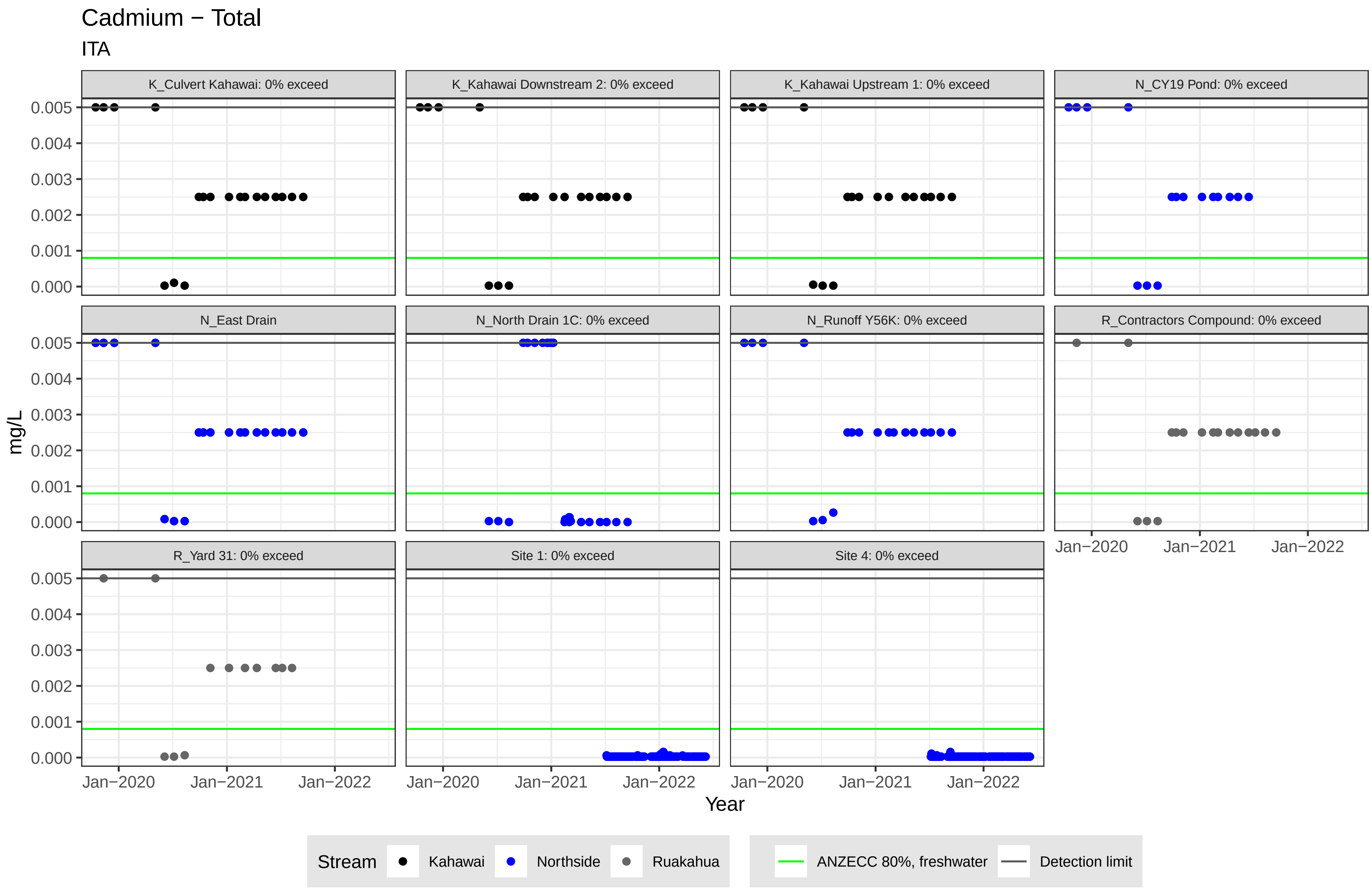
Oil and Grease
ITA
mg/L
0.5
0.4
0.3
0.2
0.1
Jan−2020
Jul−2020
Jan−2021
Jul−2021
Year
Stream
Northside

Aluminium − Total

ITA

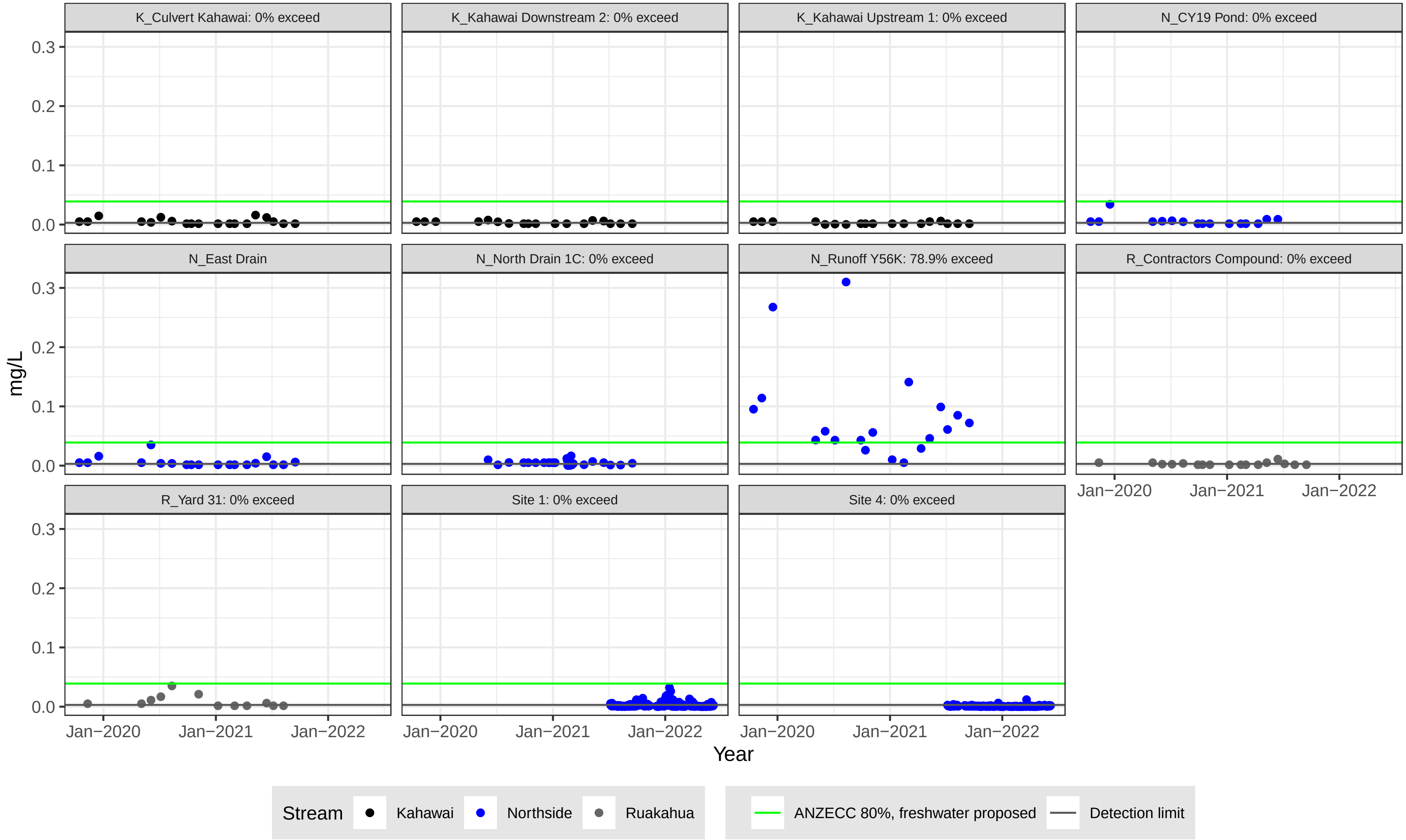


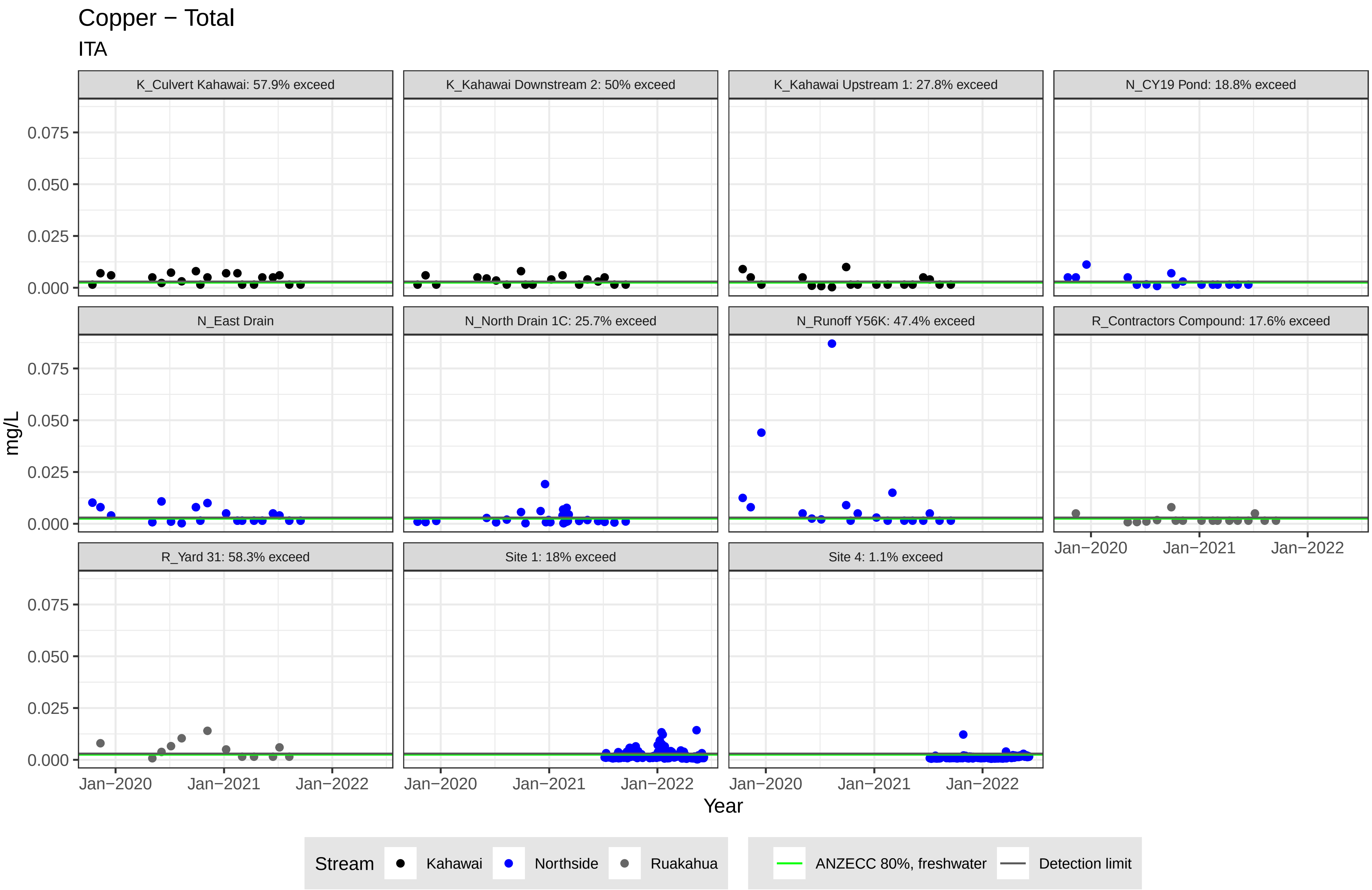

Boron − Total
ITA
K_Culvert Kahawai: 100% exceed
K_Kahawai Downstream 2: 100% exceed
K_Kahawai Upstream 1: 100% exceed
N_CY19 Pond: 25% exceed
N_East Drain
N_North Drain 1C: 0% exceed
N_Runoff Y56K: 94.7% exceed
R_Contractors Compound: 0% exceed
R_Yard 31: 0% exceed
Site 1: 3.5% exceed
Site 4: 2.9% exceed
mg/L
0
5
10
Jan−2020
Jan−2021
Jan−2022
Year
Stream
Kahawai
Northside
Ruakahua
ANZECC 80%, freshwater
Detection limit


Cadmium − Total
ITA
K_Culvert Kahawai: 0% exceed
K_Kahawai Downstream 2: 0% exceed
K_Kahawai Upstream 1: 0% exceed
N_CY19 Pond: 0% exceed
N_East Drain
N_North Drain 1C: 0% exceed
N_Runoff Y56K: 0% exceed
R_Contractors Compound: 0% exceed
R_Yard 31: 0% exceed
Site 1: 0% exceed
Site 4: 0% exceed
mg/L
0.005
0.004
0.003
0.002
0.001
0.000
Jan−2020
Jan−2021
Jan−2022
Year
Stream
Kahawai
Northside
Ruakahua
ANZECC 80%, freshwater
Detection limit

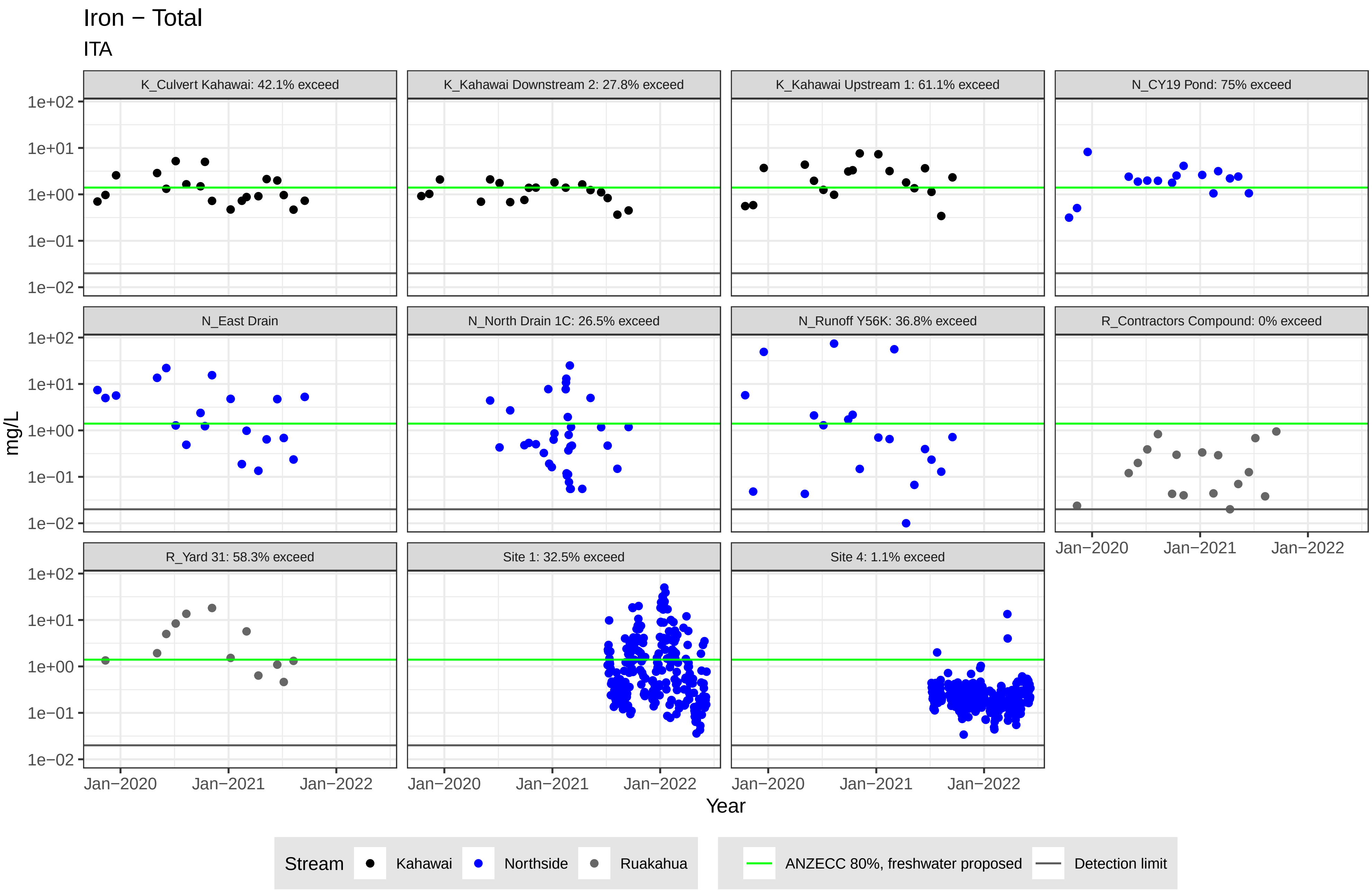
Chromium − Total

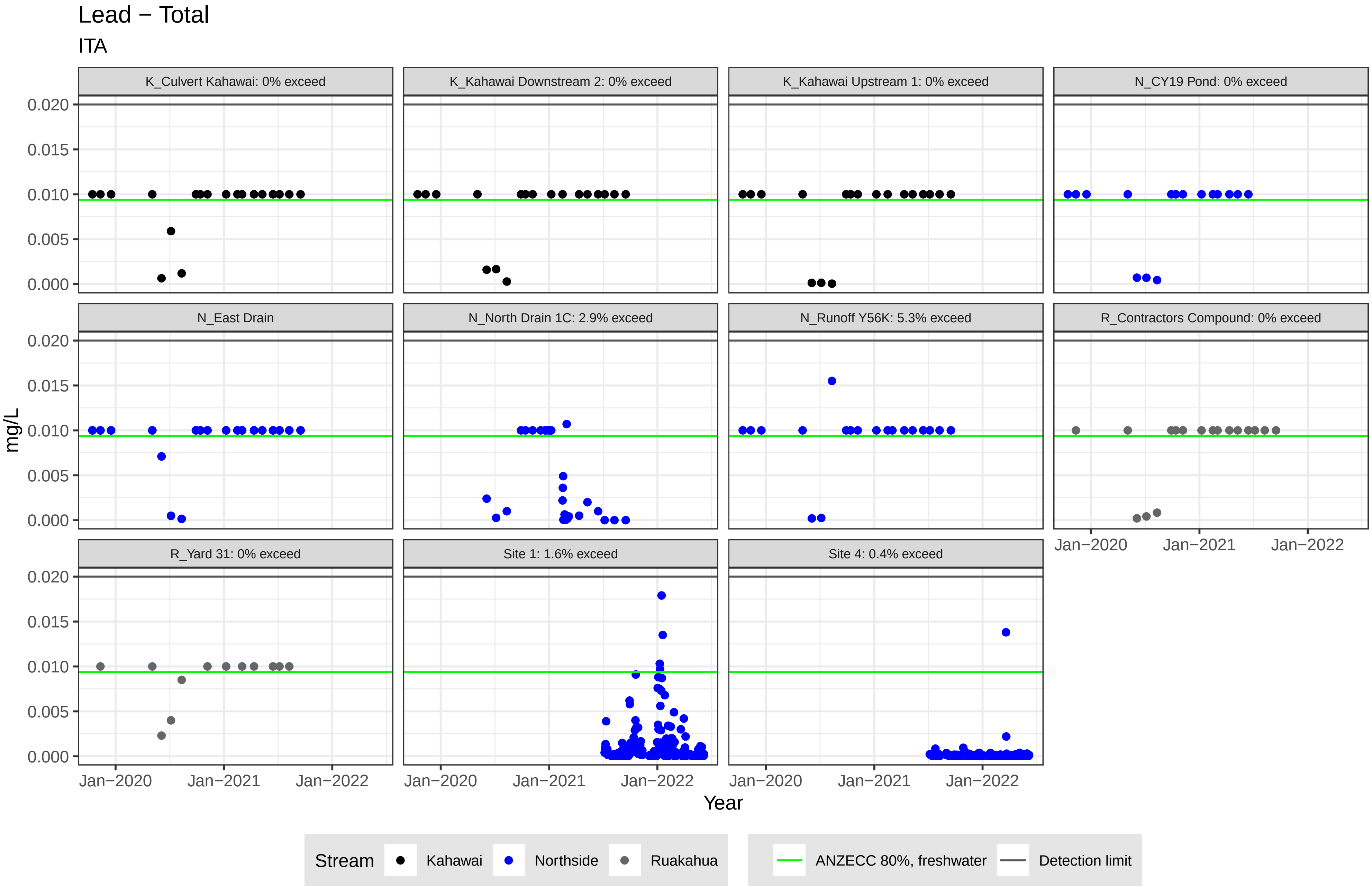
ITA





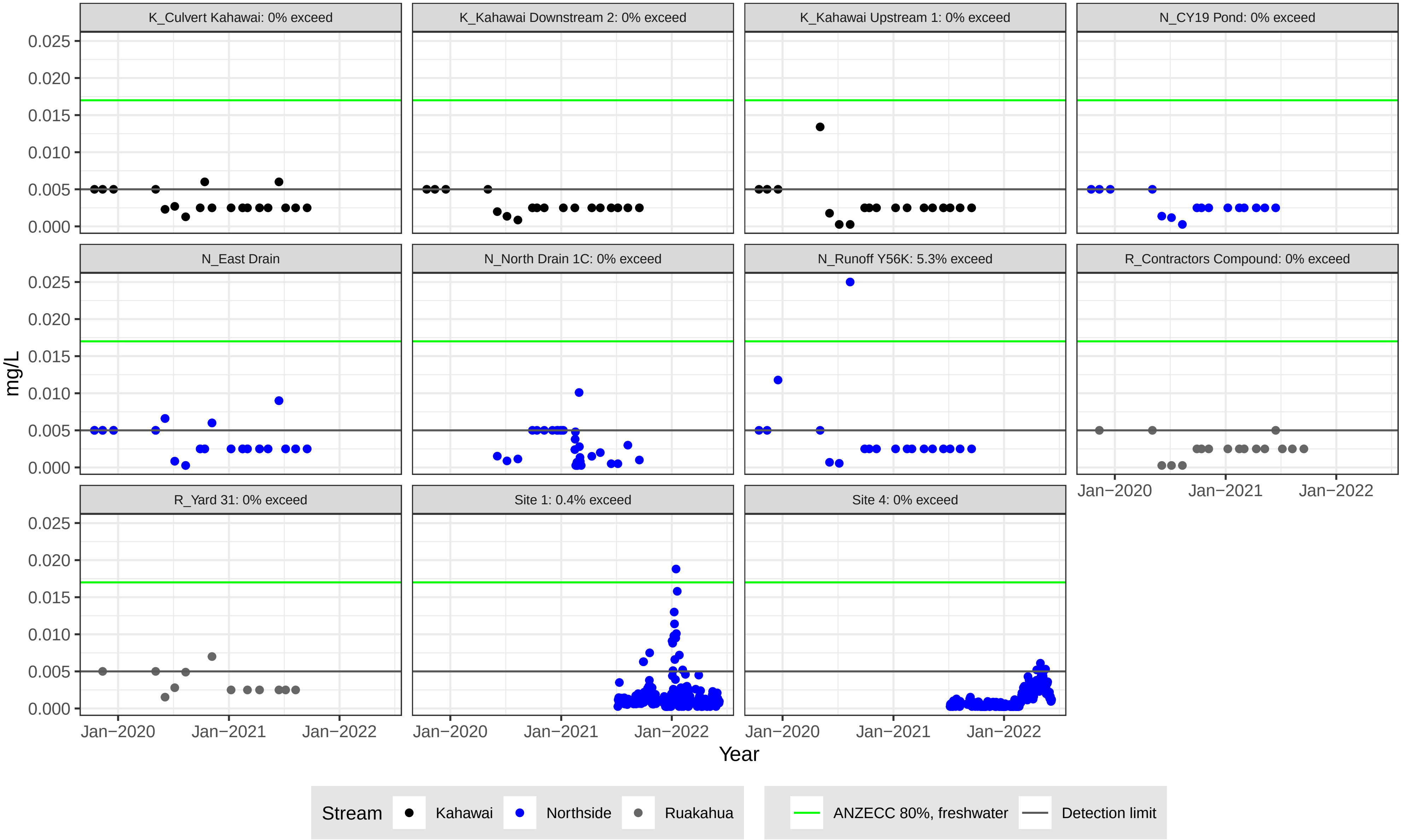
Copper − Total
ITA
K_Culvert Kahawai: 57.9% exceed
K_Kahawai Downstream 2: 50% exceed
K_Kahawai Upstream 1: 27.8% exceed
N_CY19 Pond: 18.8% exceed
N_East Drain
N_North Drain 1C: 25.7% exceed
N_Runoff Y56K: 47.4% exceed
R_Contractors Compound: 17.6% exceed
R_Yard 31: 58.3% exceed
Site 1: 18% exceed
Site 4: 1.1% exceed
mg/L
0.000
0.025
0.050
0.075
Jan−2020
Jan−2021
Jan−2022
Year
Stream
Kahawai
Northside
Ruakahua
ANZECC 80%, freshwater
Detection limit


Iron − Total
ITA
K_Culvert Kahawai: 42.1% exceed
K_Kahawai Downstream 2: 27.8% exceed
K_Kahawai Upstream 1: 61.1% exceed
N_CY19 Pond: 75% exceed
N_East Drain
N_North Drain 1C: 26.5% exceed
N_Runoff Y56K: 36.8% exceed
R_Contractors Compound: 0% exceed
R_Yard 31: 58.3% exceed
Site 1: 32.5% exceed
Site 4: 1.1% exceed
mg/L
1e+02
1e+01
1e+00
1e−01
1e−02
Jan−2020
Jan−2021
Jan−2022
Year
Stream
Kahawai
Northside
Ruakahua
ANZECC 80%, freshwater proposed
Detection limit


Lead − Total
ITA
K_Culvert Kahawai: 0% exceed
K_Kahawai Downstream 2: 0% exceed
K_Kahawai Upstream 1: 0% exceed
N_CY19 Pond: 0% exceed
N_East Drain
N_North Drain 1C: 2.9% exceed
N_Runoff Y56K: 5.3% exceed
R_Contractors Compound: 0% exceed
R_Yard 31: 0% exceed
Site 1: 1.6% exceed
Site 4: 0.4% exceed
mg/L
0.020
0.015
0.010
0.005
0.000
Jan−2020
Jan−2021
Jan−2022
Year
Stream
Kahawai
Northside
Ruakahua
ANZECC 80%, freshwater
Detection limit

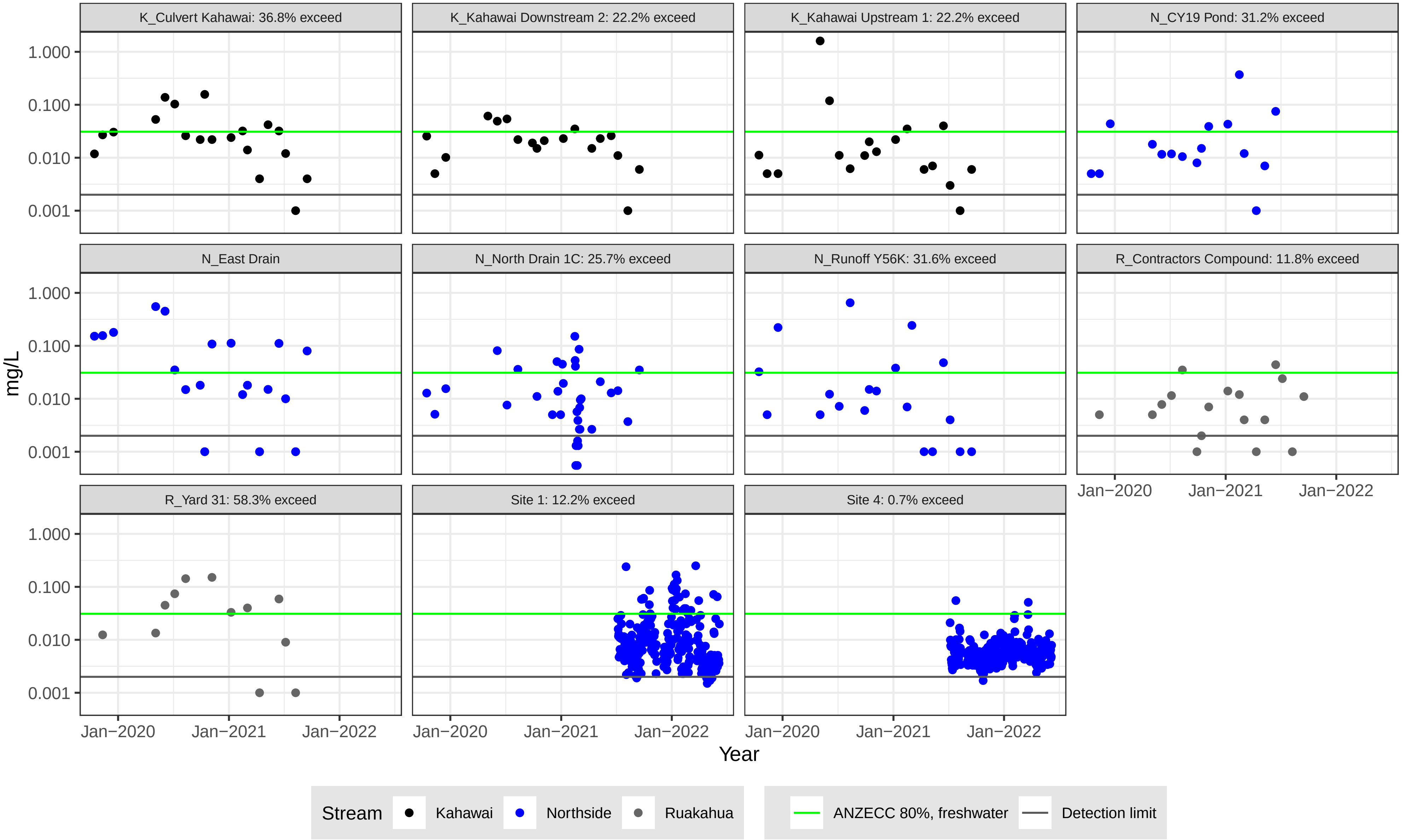
Nickel − Total

ITA



Zinc − Total

ITA



Attachment 2: Monitoring Results – Tabular

- Northside discharges
- Southside discharges
- Dewatering Plant discharges
- ITA Stormwater discharges

Attachment 2 Table 1: Northside discharge water quality and quantity, daily, September 2019- 2021

Sample type	Contaminant (mg/L)	Northside Daily				Consent limit	ANZ Marine Guideline[1]			
		Min	Max	Mean	Median		95%	% above guideline[2]	80%	% above guideline[2]
Composite	Aluminium	0.0500	2.8	0.3397	0.3300	-	NA	-	NA	-
	Boron	0.5	20.9	12.5	12.9	-	NA	-	NA	-
	Cadmium	0.0001	0.005	0.0035	0.0025	0.1	0.0055	0%	0.036	0%
	Chromium (CrIV)	0.0006	0.012	0.0033	0.0019	0.1	0.0044	0%	0.085	0%
	Copper (Dissolved)	0.0015	0.008	0.0019	0.0015	0.03	0.0013	16.2%	0.008	0%
	Copper (Total)	0.0015	0.013	0.0025	0.0015	0.03	0.0013	28.4%	0.008	1.9%
	Flow volume daily m^3	3461	18599	8213	7928	9000	NA	-	NA	-
	Iron	0.01	2.95	0.3146	0.2475	12.5	*0.18*	73.5%	*0.67*	6.1%
	Lead	0.0005	0.0214	0.0098	0.01	0.1	0.0044	0.4%	0.012	0.1%
	Nickel	0.0014	0.009	0.0037	0.0025	1.7	0.07	0%	0.56	0%
	pH	8.3	9.2	8.8	8.8	6.0- 9.5	NA	-	NA	-
	TSS	2.5	51.3	7.72	7.6	30	NA	-	NA	-
	Zinc (Dissolved)	0.0010	0.267	0.0147	0.009	1.5	0.008	55.3%	0.021	22.1%
	Zinc (Total)	0.0050	0.816	0.1051	0.0785	1.5	0.008	99.9%	0.021	98.8%
Grab	Aluminium	0.050	1.35	0.4292	0.41	-	NA	-	NA	-
	Boron	5.01	21.2	12.8	12.9	-	NA	-	NA	-
	Cadmium	0.0001	0.005	0.0034	0.0025	0.1	0.0055	0%	0.036	0%
	Chromium (CrIV)	0.0011	0.0256	0.0033	0.0015	0.1	0.0044	0%	0.085	0%
	Copper (Dissolved)	0.0015	0.0015	0.0015	0.0015	0.03	0.0013	0%	0.008	0%
	Copper (Total)	0.0015	0.015	0.0029	0.0015	0.03	0.0013	37.9%	0.008	3.3%
	Iron	0.0465	5.1	0.3805	0.2949	12.5	*0.18*	82.9%	*0.67*	9.3%

Sample type	Contaminant (mg/L)	Northside Daily				Consent limit	ANZ Marine Guideline[1]			
		Min	Max	Mean	Median		95%	% above guideline[2]	80%	% above guideline[2]
	Lead	0.0004	0.0228	0.0099	0.01	0.1	0.0044	0.3%	0.012	0.3%
	Nickel	0.0014	0.013	0.0037	0.0025	1.7	0.07	0%	0.056	0%
	Oil and Grease	0	0.5	0.3228	0.5	6	NA	-	NA	-
	pH	8	9.4	8.9	9	6.0-9.5	NA	-	NA	-
	Temperature (degrees C)	19	35.8	28.2	28.6	Increase of 20C	NA	-	NA	-
	TSS	2.5	27.6	10	9.6	30	NA	-	NA	-
	Zinc (Dissolved)	0.009	0.058	0.0333	0.033	1.5	0.008	100%	0.021	66.7%
	Zinc (Total)	0.017	0.859	0.1199	0.087	1.5	0.008	100%	0.021	99.3%

1. Proposed ANZWQG are in italics. The exceedance percentages are calculated for the proposed guideline values.

2. % of samples where mean is above the ANZWQG. Non-detects are counted as non-exceedances even if the detection limit is above the guideline value.

Attachment 2 Table 2: Northside discharge comparison of historical (2015- 2020) and current (2019- 2021) monitoring data, daily composite

Contaminants (mg/L)	Mean			Median	
	Historic	Current	% change	Historic	Current
Aluminium	NA	0.3397	-	NA	0.33
Cadmium	0.0049	0.0035	-29.8%	2	0.0025
Chromium (CrIV)	0.005	0.0033	-33.9%	0.005	0.0019
Copper	0.0038	0.0025	-33.8%	0.004	0.0015
Boron	NA	12.5	-	NA	12.9
Iron	0.498	0.3146	-36.8%	0.399	0.2475
Lead	0.0099	0.0098	-1.4%	0.01	0.01
Nickel	0.005	0.0037	-26%	0.005	0.0025
pH	8.8	8.8	0%	8.8	8.8
TSS	9.13	7.72	-15.4%	8.6	7.6
Zinc	0.125	0.1051	-15.9%	0.109	0.0785
Temperature (degrees C)	28.7	28.2	-1.7%	28.8	28.6

Attachment 2 Table 3: Southside discharge water quality and quantity, daily, September 2019- 2021

Sample type	Contaminant (mg/L)	Southside Daily				Consent limit	ANZ Marine Guideline[1]			
		Min	Max	Mean	Median		95%	% above guideline[2]	80%	% above guideline[2]
Composite	Aluminium	0.0154	1.8	0.1373	0.05	-	NA	-	NA	-
	Boron	0.166	14.3	2.562	1.6	-	NA	-	NA	-
	Cadmium	0.0001	0.005	0.0035	0.0025	0.1	0.0055	0%	0.036	0%
	Chromium (CrIV)	0.0003	0.011	0.0032	0.0015	0.1	0.0044	0%	0.085	0%
	Copper (Total)	0.0015	0.016	0.0022	0.0015	0.03	0.0013	17%	0.008	1.8%
	Flow volume daily m^3	0	3266	1086	674	2000	NA	-	NA	-
	Iron	0.01	2.0	0.367	0.252	12.5	*0.18*	68.1%	*0.67*	14.3%
	Lead	0.0001	0.0217	0.0098	0.01	0.1	0.0044	0.3%	0.012	0.3%
	Nickel	0.0006	0.0151	0.0036	0.0025	1.7	0.07	0%	0.56	0%
	pH	7.2	9	7.9	8	6.0-9.5	NA	-	NA	-
	Temperature (degrees C)	26.3	26.3	26.3	26.3	Increase of 20	NA	-	NA	-
	TSS	2.5	17.4	4.361	2.5	30	NA	-	NA	-
	Zinc (Dissolved)	0.0020	0.0066	0.0047	0.0046	1.5	0.008	0%	0.021	0.0%
	Zinc (Total)	0.0010	0.0840	0.0080	0.0050	1.5	0.008	29.9%	0.021	7.2%
Grab	Aluminium	0.05	1.67	0.12	0.05	-	NA	-	NA	-
	Boron	0.5	13.1	1.77	0.5	-	NA	-	NA	-
	Cadmium	0.0025	0.0025	0.0025	0.0025	0.1	0.006	0%	0.036	0%
	Chromium (CrIV)	0.0015	0.009	0.0019	0.0015	0.1	0.0044	0%	0.085	0%
	Copper (Total)	0.0015	0.0099	0.0021	0.0015	0.03	0.0013	15%	0.008	1.4%
	Iron	0.025	1.5	0.3461	0.231	12.5	*0.18*	61.5%	*0.67*	14.6%
	Lead	0.01	0.01	0.01	0.01	0.1	0.0044	0%	0.012	0%

Sample type	Contaminant (mg/L)	Southside Daily				Consent limit	ANZ Marine Guideline[1]			
		Min	Max	Mean	Median		95%	% above guideline[2]	80%	% above guideline[2]
	Nickel	0.0025	0.006	0.0026	0.0025	1.7	0.007	0%	0.56	0%
	Oil and Grease	0.5	0.5	0.5	0.5	-	NA	-	NA	-
	pH	7.2	9.4	7.89	7.8	6.0-9.5	NA	-	NA	-
	Temperature	13.9	31.6	21.85	21.6	Increase of 20C	NA	-	NA	-
	TSS	2.5	17.2	3.3	2.5	30	NA	-	NA	-
	Zinc (total)	0.001	0.3660	0.0081	0.003	1.5	0.008	30.5%	0.021	7.5%

1. Proposed ANZWQG are in *italics*. The exceedance percentages are calculated for the proposed guideline values.

2. % of samples where mean is above the ANZWQG. Non-detects are counted as non-exceedances even if the detection limit is above the guideline value.

Attachment 2 Table 4: Southside discharge comparison of historical (2015- 2020) and current (2019- 2021) monitoring data, daily composite

Contaminants (mg/L)	Mean			Median	
	Historic	Current	% change[1]	Historic	Current
Aluminium	NA	0.3397	-	NA	0.33
Cadmium	0.0050	0.0035	-29.9%	0.005	0.0025
Chromium (CrIV)	0.005	0.0032	-36.6%	0.005	0.0015
Copper	0.0027	0.0022	-19.4%	0.0015	0.0015
Boron	NA	12.5	-	NA	12.9
Iron	0.26	0.3673	41.3%	0.18	0.2524
Lead	0.0099	0.0098	-0.6%	0.01	0.01
Nickel	0.005	0.0036	-28.8%	0.005	0.0025
pH	8.1	7.9	-2%	8.1	8
TSS	3.8	4.4	14.8%	2.5	2.5
Zinc	0.0087	0.0080	-8.3%	0.005	0.005
Temperature (degrees C)	21.2	26.3	24.1%	20.9	26.3

1. Highlighted cells indicate where there was a % increase from historical mean data

Attachment 2 Table 5: Dewatering plant heavy metals monitoring results, (additional monitoring collected to support consent application) September 2019- September 2021, grab samples

Contaminant (mg/L)	Dew Plant Monitoring Result				Consent limit	ANZ Guideline Value[1]	
	Min	Max	Mean	Median		80%	% above guideline[2]
Aluminium	0.045	2.1	0.40	0.305	-	0.15	80%
Boron	0.164	2.1	0.5619	0.5	-	2.5	0%
Cadmium	0.00003	0.0025	0.0018	0.0025	-	0.0008	0%
Chromium (CrIV)	0.0003	0.008	0.002	0.0015	-	*0.039*	0%
Copper	0.0003	0.01	0.0024	0.0015	-	0.0025	20%
Conductivity uS/cm	242	7820	1345	710	-	175[4]	100%
Iron	0.042	5.9	1.0	0.775	-	*1.4*	17.5%
Lead	0.0001	0.01	0.0073	0.01	-	0.0094	0%
Nickel	0.0003	0.0036	0.0022	0.0025	-	0.17	0%
pH	7.4	8.6	7.7	7.7	-	NA	
Temperature (degrees C)	13.7	25.3	20.3	21.3	-	NA	-
Daily flow (m^3)	0	8557	3638	3741	7400	NA	-
TSS	2.5	64.8	13.7	10	-	NA	-
Turbidity	2	54.1	10.8	7.8	30	NA	-
Vanadium[3]	0.0042	0.132	0.0269	0.0116	-	0.006	12.5%
Zinc	0.0006	0.122	0.0105	0.004	-	0.031	7.5%

1. Proposed ANZWQG are in *italics*. The exceedance percentages are calculated for the proposed guideline values.

2. % of samples where mean is above the ANZWQG. Non-detects are counted as non-exceedances even if the detection limit is above the guideline value.

3. Vanadium has low reliability as a ANZWQG DGV.

4. Guideline value based on Biggs (1988) reference.

Attachment 2 Table 6: ITA monitoring results, September 2019- September 2021

Contaminant (mg/L)	Catchment	Location	ITA Monitoring Result				Consent Trigger level	ANZ Guideline Freshwater[1]	
			Min	Max	Mean	Median		80%	% above guideline[2]
Aluminium	Kahawai	Culvert Kahawai	0.71	7.8	2.7	1.8	1.5	0.15	100%
		Kahawai Downstream	0.26	3.3	0.95	0.60			100%
		Kahawai Upstream	0.05	7.1	0.56	0.14			50%
		Kahawai ITA (aka Metal Cutting Yard)	0.52	10.3	4.3	4.1			100%
	North Drain	CY19 Pond	0.25	4.6	1.6	1.3			100%
		North Drain 1C	0.03	9.4	0.83	0.18			55.6%
		East Pond	0.17	5.5	1.4	0.67			100%
		Y56K Pond	0.45	20	3.7	1.47			100%
	Ruakohua	Contractors Compound	0.05	0.49	0.14	0.10			29.4%
		Yard 31	0.39	8.1	2.4	0.93			100%
Boron	Kahawai	Culvert Kahawai	2.9	13.3	6.8	5.8	13	2.5	100%
		Kahawai Downstream	2.6	12.5	5.0	4.3			100%
		Kahawai Upstream	2.9	8.4	4.7	4.2			100%
		Kahawai ITA (aka Metal Cutting Yard)	2.8	13.6	6.9	6.5			100%
	North Drain	CY19 Pond	1.4	3.4	2.1	2.1			25%
		North Drain 1C	0.3	1.9	1.0	1.0			0%
		East Pond	1.7	9.6	4.7	4.3			89.5%
		Y56K Pond	2.2	13.8	6.7	6.4			94.7%
	Ruakohua	Contractors Compound	0.3	0.5	0.5	0.5			0%
		Yard 31	0.5	1.0	0.6	0.5			0%
Cadmium	Kahawai	Culvert Kahawai	0.0003	0.0050	0.0026	0.0025	NA	0.0008	0%
		Kahawai Downstream	0.0003	0.0050	0.0026	0.0025			0%
		Kahawai Upstream	0.0003	0.0050	0.0026	0.0025			0%

Contaminant (mg/L)	Catchment	Location	ITA Monitoring Result				Consent Trigger level	ANZ Guideline Freshwater[1]	
			Min	Max	Mean	Median		80%	% above guideline[2]
		Kahawai ITA (aka Metal Cutting Yard)	0.0003	0.0050	0.0026	0.0025			0%
	North Drain	CY19 Pond	0.0003	0.0050	0.0027	0.0025			0%
		North Drain 1C	0.0003	0.0050	0.0013	0.00003			0%
		East Pond	0.0003	0.0050	0.0026	0.0025			0%
		Y56K Pond	0.0003	0.0050	0.0026	0.0025			0%
	Ruakohua	Contractors Compound	0.0003	0.0050	0.0024	0.0025			0%
		Yard 31	0.0003	0.0050	0.0023	0.0025			0%
Chromium (CrIV)	Kahawai	Culvert Kahawai	0.0015	0.0160	0.0052	0.0037	0.4	*0.039*	0%
		Kahawai Downstream	0.0015	0.0076	0.0034	0.0017			0%
		Kahawai Upstream	0.0003	0.0060	0.0025	0.0015			0%
		Kahawai ITA (aka Metal Cutting Yard)	0.0015	0.0318	0.0091	0.0050			0%
	North Drain	CY19 Pond	0.0015	0.0342	0.0059	0.0049			0%
		North Drain 1C	0.0003	0.0165	0.0043	0.0045			0%
		East Pond	0.0015	0.0350	0.0059	0.0037			0%
		Y56K Pond	0.0050	0.3100	0.0844	0.0580			78.9%
	Ruakohua	Contractors Compound	0.0015	0.0110	0.0030	0.0015			0%
		Yard 31	0.0015	0.0350	0.0089	0.0050			0%
Copper	Kahawai	Culvert Kahawai	0.0015	0.0080	0.0044	0.0050	0.025	0.0025	57.9%
		Kahawai Downstream	0.0015	0.0080	0.0034	0.0033			50%
		Kahawai Upstream	0.0003	0.0100	0.0030	0.0015			27.8%
		Kahawai ITA (aka Metal Cutting Yard)	0.0015	0.0130	0.0049	0.0050			57.9%
	North Drain	CY19 Pond	0.0008	0.0112	0.0032	0.0015			18.8%
		North Drain 1C	0.0003	0.0192	0.0025	0.0013			25.7%
		East Pond	0.0003	0.0108	0.0041	0.0015			47.4%
		Y56K Pond	0.0015	0.0870	0.0110	0.0030			47.4%

Contaminant (mg/L)	Catchment	Location	ITA Monitoring Result				Consent Trigger level	ANZ Guideline Freshwater[1]	
			Min	Max	Mean	Median		80%	% above guideline[2]
	Ruakohua	Contractors Compound	0.0008	0.008	0.0022	0.0015			17.6%
		Yard 31	0.0008	0.014	0.0050	0.0044			58.3%
Iron	Kahawai	Culvert Kahawai	0.468	5.2	1.7	0.97	3.0	*1.4*	42.1%
		Kahawai Downstream	0.365	2.1	1.2	1.2			27.8%
		Kahawai Upstream	0.342	7.6	2.7	2.1			61.1%
		Kahawai ITA (aka Metal Cutting Yard)	0.155	9.8	3.0	2.2			57.9%
	North Drain	CY19 Pond	0.315	8.2	2.4	2.1			75%
		North Drain 1C	0.055	25	2.6	0.49			26.5%
		East Pond	0.135	22	4.8	2.4			52.6%
		Y56K Pond	0.01	74	10.3	0.7			36.8%
	Ruakohua	Contractors Compound	0.02	0.95	0.26	0.13			0%
		Yard 31	0.462	18.1	4.9	1.7			58.3%
Lead	Kahawai	Culvert Kahawai	0.0007	0.01	0.0088	0.01	0.094	0.0094	0%
		Kahawai Downstream	0.0003	0.01	0.0085	0.01			0%
		Kahawai Upstream	0.0001	0.01	0.0084	0.01			0%
		Kahawai ITA (aka Metal Cutting Yard)	0.0004	0.01	0.0086	0.01			0%
	North Drain	CY19 Pond	0.0005	0.01	0.0082	0.01			0%
		North Drain 1C	0.0002	0.0107	0.0036	0.0008			2.9%
		East Pond	0.0002	0.01	0.0088	0.01			0%
		Y56K Pond	0.0002	0.0155	0.0093	0.01			5.3%
	Ruakohua	Contractors Compound	0.0002	0.01	0.0083	0.01			0%
		Yard 31	0.0023	0.01	0.0087	0.01			0%
Nickel	Kahawai	Culvert Kahawai	0.0013	0.0060	0.0033	0.0025	0.17	0.017	0%
		Kahawai Downstream	0.0009	0.0050	0.0029	0.0025			0%
		Kahawai Upstream	0.0003	0.0134	0.0032	0.0025			0%

Contaminant (mg/L)	Catchment	Location	ITA Monitoring Result				Consent Trigger level	ANZ Guideline Freshwater[1]	
			Min	Max	Mean	Median		80%	% above guideline[2]
		Kahawai ITA (aka Metal Cutting Yard)	0.0018	0.0101	0.0034	0.0025			0%
	North Drain	CY19 Pond	0.0003	0.0050	0.0028	0.0025			0%
		North Drain 1C	0.0003	0.0101	0.0026	0.0015			0%
		East Pond	0.0003	0.0090	0.0036	0.0025			0%
		Y56K Pond	0.0006	0.0250	0.0044	0.0025			5.3%
	Ruakohua	Contractors Compound	0.0003	0.0050	0.0025	0.0025			0%
		Yard 31	0.0015	0.0070	0.0034	0.0025			0%
Zinc	Kahawai	Culvert Kahawai	0.001	0.1570	0.0397	0.0260	0.31	0.031	36.8%
		Kahawai Downstream	0.001	0.0612	0.0234	0.0215			22.2%
		Kahawai Upstream	0.001	1.6035	0.1069	0.0111			22.2%
		Kahawai ITA (aka Metal Cutting Yard)	0.001	0.2183	0.0585	0.0310			47.4%
	North Drain	CY19 Pond	0.001	0.3700	0.0422	0.0119			31.2%
		North Drain 1C	0.001	0.1510	0.0221	0.0100			25.7%
		East Pond	0.001	0.5502	0.1065	0.0350			52.6%
		Y56K Pond	0.001	0.6500	0.0691	0.0072			31.6%
	Ruakohua	Contractors Compound	0.001	0.0440	0.0111	0.0070			11.8%
		Yard 31	0.001	0.1510	0.0485	0.0365			58.3%
pH	Kahawai	Culvert Kahawai	8.2	9.9	9.1	9.1	6.0- 9.0	NA	NA
		Kahawai Downstream	7.1	9	7.8	7.6			
		Kahawai Upstream	3.4	7.4	6.8	7.2			
		Kahawai ITA (aka Metal Cutting Yard)	10.2	11.8	10.9	11.0			
	North Drain	CY19 Pond	8.1	9.1	8.5	8.5			
		North Drain 1C	7.5	8.8	8.0	7.9			
		East Pond	8.4	9.3	8.9	8.9			
		Y56K Pond	8.9	11.6	10.8	11.3			

Contaminant (mg/L)	Catchment	Location	ITA Monitoring Result				Consent Trigger level	ANZ Guideline Freshwater[1]	
			Min	Max	Mean	Median		80%	% above guideline[2]
	Ruakohua	Contractors Compound	7.3	7.9	7.6	7.6			
		Yard 31	7.5	9.2	8.0	7.9			
TSS	Kahawai	Culvert Kahawai	6	267	42	13	60	NA	NA
		Kahawai Downstream	3	47	13	9			
		Kahawai Upstream	3	39	9	7			
		Kahawai ITA (aka Metal Cutting Yard)	16	142	64	60			
	North Drain	CY19 Pond	15	572	165	120			
		North Drain 1C	3	393	46	16			
		East Pond	8	500	120	88			
		Y56K Pond	3	1358	170	15			
	Ruakohua	Contractors Compound	3	8	3	3			
		Yard 31	8	196	52	18			
Conductivity uS/cm	North Drain	*North Drain 1C*	278	3710	921	477	NA	175[4]	NA
	North Stream	*North Stream 4c*	273	5920	1473	492			

1. Proposed ANZWQG are in *italics*. The exceedance percentages are calculated for the proposed guideline values.

2. % of samples where mean is above the ANZWQG. Non-detects are counted as non-exceedances even if the detection limit is above the guideline value. All cadmium and the majority of chromium, lead and nickel results were below detection limits.

3. Bolded sampling points are points of discharge to the streams. *Italicised* sampling points are in the streams themselves. Plain text are point source locations.

4. Guideline value based on Biggs (1988).

Attachment 2 Table 7: ITA comparison of historical (2015- 2020) and current (2019- 2021) monitoring data, daily composite

Contaminant (mg/L)	Catchment	Location	Mean			Median	
			Historical	Current	% change	Historical	Current
Aluminium	Kahawai	Culvert Kahawai	4.48	2.68	-40%	2.41	1.84
		Kahawai Downstream	2.02	0.95	-53%	0.9	0.6
		Kahawai Upstream	0.28	0.56	99%	0.05	0.140
		Kahawai ITA (aka Metal Cutting Yard)	2.84	4.30	52%	2.07	4.1
	North Drain	CY19 Pond	2.1	1.59	-24%	1.01	1.28
		North Drain 1C	0.19	0.83	339%	0.12	0.178
		East Pond	3.69	1.43	-61%	1.92	0.67
		Y56K Pond	2.24	3.75	67%	1.06	1.47
	Ruakohua	Contractors Compound	0.17	0.14	-18%	0.1	0.103
		Yard 31	1.78	2.42	36%	0.86	0.933
Boron	Kahawai	Culvert Kahawai	16.5	6.754	-59%	13.8	5.8
		Kahawai Downstream	11.6	4.991	-57%	8.6	4.255
		Kahawai Upstream	4.9	4.703	-4%	4.9	4.240
		Kahawai ITA (aka Metal Cutting Yard)	17.3	6.897	-60%	16.4	6.481
	North Drain	CY19 Pond	3.4	2.136	-37%	2.5	2.1
		North Drain 1C	0.6	0.963	61%	0.5	0.96
		East Pond	9.1	4.661	-49%	9.1	4.3
		Y56K Pond	8.4	6.689	-20%	8.1	6.4
	Ruakohua	Contractors Compound	-	0.459	-	-	0.5
		Yard 31	-	0.623	-	-	0.5
Chromium (CrIV)	Kahawai	Culvert Kahawai	0.007	0.0052	-26%	0.005	0.0037

Contaminant (mg/L)	Catchment	Location	Mean			Median	
			Historical	Current	% change	Historical	Current
		Kahawai Downstream	0.006	0.0034	-44%	0.005	0.0017
		Kahawai Upstream	0.005	0.0025	-49%	0.005	0.0015
		Kahawai ITA (aka Metal Cutting Yard)	0.012	0.0091	-24%	0.005	0.0050
	North Drain	CY19 Pond	0.006	0.0059	-1%	0.005	0.0049
		North Drain 1C	0.003	0.0043	43%	0.002	0.0045
		East Pond	0.011	0.0059	-46%	0.005	0.0037
		Y56K Pond	0.104	0.0844	-19%	0.085	0.0580
	Ruakohua	Contractors Compound	0.005	0.0030	-40%	0.005	0.0015
		Yard 31	0.009	0.0089	-1%	0.005	0.0050
Copper	Kahawai	Culvert Kahawai	0.0044	0.00435	-1%	0.004	0.0050
		Kahawai Downstream	0.0034	0.00339	0%	0.0033	0.0033
		Kahawai Upstream	0.003	0.00297	-1%	0.0015	0.0015
		Kahawai ITA (aka Metal Cutting Yard)	0.0049	0.00488	0%	0.0043	0.0050
	North Drain	CY19 Pond	0.0041	0.00316	-23%	0.004	0.0015
		North Drain 1C	0.0009	0.00252	180%	0.0007	0.0013
		East Pond	0.0062	0.00408	-34%	0.004	0.0015
		Y56K Pond	0.0095	0.01098	16%	0.003	0.0030
	Ruakohua	Contractors Compound	0.0029	0.00220	-24%	0.0018	0.0015
		Yard 31	0.0036	0.00505	40%	0.0027	0.0044
Iron	Kahawai	Culvert Kahawai	1.3	1.7	29%	0.6	0.9699
		Kahawai Downstream	1.9	1.2	-37%	1	1.2
		Kahawai Upstream	3.8	2.7	-29%	1.9	2.1
		Kahawai ITA (aka Metal Cutting Yard)	2.9	3.0	2%	0.2	2.2

Contaminant (mg/L)	Catchment	Location	Mean			Median	
			Historical	Current	% change	Historical	Current
	North Drain	CY19 Pond	1.6	2.4	49%	0.8	2.1
		North Drain 1C	0.6	2.6	337%	0.3	0.49
		East Pond	6.6	4.8	-27%	1.9	2.4
		Y56K Pond	4.3	10.3	139%	0.1	0.7
	Ruakohua	Contractors Compound	0.3	0.3	-12%	0.2	0.126
		Yard 31	3.3	4.9	49%	1.3	1.7
Lead	Kahawai	Culvert Kahawai	0.0101	0.0088	-13%	0.01	0.01
		Kahawai Downstream	0.0096	0.0085	-11%	0.01	0.01
		Kahawai Upstream	0.0097	0.0084	-14%	0.01	0.01
		Kahawai ITA (aka Metal Cutting Yard)	0.0111	0.0086	-22%	0.01	0.01
	North Drain	CY19 Pond	0.0091	0.0082	-9%	0.01	0.01
		North Drain 1C	0.0037	0.0036	-3%	0.0004	0.0008
		East Pond	0.0097	0.0088	-9%	0.01	0.01
		Y56K Pond	0.0097	0.0093	-5%	0.01	0.01
	Ruakohua	Contractors Compound	0.0082	0.0083	1%	0.01	0.01
		Yard 31	0.0091	0.0087	-4%	0.01	0.01
Nickel	Kahawai	Culvert Kahawai	0.005	0.0033	-33%	0.005	0.0025
		Kahawai Downstream	0.005	0.0029	-43%	0.005	0.0025
		Kahawai Upstream	0.005	0.0032	-35%	0.005	0.0025
		Kahawai ITA (aka Metal Cutting Yard)	0.005	0.0034	-31%	0.005	0.0025
	North Drain	CY19 Pond	0.005	0.0028	-43%	0.005	0.0025
		North Drain 1C	0.002	0.0026	28%	0.001	0.0015
		East Pond	0.005	0.0036	-29%	0.005	0.0025

Contaminant (mg/L)	Catchment	Location	Mean			Median	
			Historical	Current	% change	Historical	Current
		Y56K Pond	0.006	0.0044	-27%	0.005	0.0025
	Ruakohua	Contractors Compound	0.004	0.0025	-36%	0.005	0.0025
		Yard 31	0.004	0.0034	-14%	0.005	0.0025
Zinc	Kahawai	Culvert Kahawai	0.025	0.0397	59%	0.012	0.0260
		Kahawai Downstream	0.022	0.0234	7%	0.005	0.0215
		Kahawai Upstream	0.098	0.1069	9%	0.005	0.0111
		Kahawai ITA (aka Metal Cutting Yard)	0.125	0.0585	-53%	0.013	0.0310
	North Drain	CY19 Pond	0.019	0.0422	122%	0.012	0.0119
		North Drain 1C	0.009	0.2210	2356%	0.003	0.0100
		East Pond	0.167	0.1065	-36%	0.0382	0.0350
		Y56K Pond	0.038	0.0691	82%	0.005	0.0072
	Ruakohua	Contractors Compound	0.014	0.0111	-20%	0.005	0.0070
		Yard 31	0.035	0.0485	39%	0.0179	0.0365
pH	Kahawai	Culvert Kahawai	10.9	9.1	-16%	11.1	9.1
		Kahawai Downstream	9.6	7.8	-19%	9.8	7.6
		Kahawai Upstream	7	6.8	-3%	7.1	7.2
		Kahawai ITA (aka Metal Cutting Yard)	11.9	10.9	-8%	12.1	11.0
	North Drain	CY19 Pond	8.3	8.5	2%	8.4	8.5
		North Drain 1C	8.0	8.0	0%	7.9	7.9
		East Pond	9.7	8.9	-8%	9.5	8.9
		Y56K Pond	10.7	10.8	1%	11.3	11.3
	Ruakohua	Contractors Compound	7.8	7.6	-3%	7.8	7.6
		Yard 31	7.9	8.0	2%	7.8	7.9

Contaminant (mg/L)	Catchment	Location	Mean			Median	
			Historical	Current	% change	Historical	Current
TSS	Kahawai	Culvert Kahawai	69	42	-39%	23	13
		Kahawai Downstream	20	13	-33%	9	9
		Kahawai Upstream	11	9	-16%	6	7
		Kahawai ITA (aka Metal Cutting Yard)	91	64	-30%	39	60
	North Drain	CY19 Pond	76	165	118%	21	120
		North Drain 1C	179	46	-74%	5	16
		East Pond	54	120	122%	54	88
		Y56K Pond	76	170	124%	12	15
	Ruakohua	Contractors Compound	4	3	-10%	3	3
		Yard 31	35	52	46%	18	18
Oil & Grease	Ruakohua	*North Drain 1C*	0.065	0.4313	563%	0	0.5
		East Pond	0.065	0.4333	567%	0	0.5

1. Highlighted cells indicate where there was a % increase from historical mean data
2. Bolded sampling points are points of discharge to the streams. *Italicised* sampling points are in the streams themselves. Plain text are point source locations.

Attachment 2 Table 8: Comparison between Site 1C grab and Site 1 composite samples

Contaminant (mg/L)	Site 1C[1]	Site 1[1]	% change between Site 1 & Site 1C[2]	ANZ Guideline Freshwater	
				95%	80%
Aluminium	0.8336	0.9843	18.1%	0.055	0.15
Boron	0.9633	0.9248	-4.0%	0.94	2.5
Cadmium	0.0013	0.000030	-97.8%	0.0002	0.0008
Chromium (CrIV)	0.0043	0.0027	-37.3%	0.001	0.04
Copper	0.0025	0.0019	-22.6%	0.0014	0.0025
Iron	2.6	2.7868	6.3%	-	-
Lead	0.0036	0.0010	-70.8%	0.0034	0.0094
Nickel	0.0026	0.00167	-34.9%	0.011	0.017
pH	8.0	7.8	-2.6%	-	-
Temperature (degrees C)	19.2	-	-	-	-
TSS	45.9	21.3	-53.6%	-	-
Vanadium	0.1930	0.0795	-58.8%	0.006	0.006
Zinc	0.0221	0.0175	-20.8%	0.008	0.031

1. Highlighted cells exceed the 80% SPL.
2. Highlighted cells indicate where there is a % increase between sites 1C and 1 samples.

Attachment 2 Table 9: Comparison of Sites 1 North Stream and Site 4 Lower North Stream, average daily composite (July 2021 – July 2022)

Contaminant (mg/L)	Site 1 mean (upstream)[1]	Site 4 mean (downstream)[2]	% change between Sites 1 and 4[3]	ANZWQG Freshwater		
				95%	90%	80%
Aluminium	0.9843	0.1499	-84.8%	0.055	0.08	0.15
Boron	0.9248	1.0081	9%	0.94	1.5	2.5
Cadmium	0.000030	0.000027	-7.6%	0.0002	0.0004	0.0008
Chromium (CrIV)	0.0027	0.0009	-66%	0.001	0.006	0.04
Copper	0.0019	0.0012	-38.5%	0.0014	0.0018	0.0025
Iron[4]	2.7868	0.3030	-89.1%	*1.4*		
Lead	0.0010	0.0002	-84.4%	0.0034	0.0056	0.0094
Nickel	0.00167	0.0012	-26.6%	0.011	0.013	0.017
Vanadium[4]	0.0795	0.0570	-28.4%	0.006		
Zinc	0.0175	0.0064	-63.5%	0.008	0.015	0.031
pH	7.8	7.8	0%	-	-	-
TSS	21.3189	5.5522	-74%	-	-	-

1. Highlighted cells in Site 1 column indicate those that exceed the 80% SPL.
2. Highlighted cells in Site 4 column indicate those that exceed the 95% SPL.
3. Highlighted cells indicate where there was a % increase between sites 1 and 4- however are still below the 95% SPL.
4. There is only one default guideline value for Vanadium, which has a low reliability, similarly for the proposed Iron value.

Attachment 3: Data logging methodology

The contaminants which are affected by the recording methodology reporting values as a ‘<’, are shown in Attachment 3 Table 1 below. We have provided the reported detection limit for each parameter, the value that has been reported for analysis (as half the detection limit) and compared this with the ANZWQG value for comparison.

Some detection limits (discussed hereafter as non-detects) are above the ANZWQG DGV, and these have been highlighted in Attachment 3 Table 1 below.

For some parameters, there was a step change in the laboratory detection limit during the monitoring period. Even with these changes of the non- detect limit, these are still above the ANZWQG. This occurred for chromium and cadmium.

Attachment 3 Table 1: Laboratory detection limits for metals at NZ Steel

Contaminant	Detection limit	Reported value[1]	ANZWQG Marine		ANZWQG Freshwater
			80%	95%	80%[2]
Aluminium	< 0.1	0.05	-	-	0.15
Boron	< 1.0	0.5	-	-	2.5
Cadmium	< 0.005[3]	0.0025	0.036	0.0055	0.0008
Chromium (CrIV)	< 0.003	0.0015	0.085	0.0044	*0.039*
Copper	< 0.003	0.0015	0.008	0.013	0.0025
Iron	< 0.02	0.01	-	-	*1.4*
Lead	< 0.02	0.01	0.012	0.0044	0.0094
Nickel	< 0.005	0.0025	0.56	0.07	0.017
Zinc	< 0.002	0.001	0.008	0.021	0.031

1. Highlighted cells indicate where the reported value is above the ANZWQG 95% SPL for freshwater.
2. Values in *italics* are proposed guideline values.
3. Detection limit changed throughout monitoring period- lowest detection limit reported here.

Attachment 4: Monitoring locations

Attachment 5: Draft Trigger Investigation Levels

Attachment 5 Table 1: Draft Trigger Investigation Levels for Northside and Southside Outfalls

Contaminant (mg/L)	Northside	Southside
Aluminium – Total	0.6492	0.5109
Boron – Total	18.7	7.4
Cadmium – Total	0.0061	0.0061
Chromium (CrIV) – Total	0.0072	0.0070
Copper – Dissolved	0.0042	-
Copper – Total	0.0063	0.0056
Iron – Total	0.7739	1.0158
Lead – Total	0.0128	0.0129
Nickel – Total	0.07[1]	0.07[1]
Zinc – Dissolved	0.0550	0.008[1]
Zinc – Total	0.2792	0.0262
Temperature (degrees)	34.2	27.8
TSS	14.3	9.6
Naphthalene	0.7[2]	n/a
pH	6.0 - 9.5	

Notes:

1. Cells marked with a [1] – have applied the ANZWQG 95 % SPL as this was greater than the mean result plus two standard deviations.
2. As monitoring for PAHs including naphthalene has not historically been monitored, an initial Trigger Investigation Level has been set based the ANZWGV 95% with an allowance of mixing of 10 times the guideline.

Attachment 5 Table 2: Draft Trigger Investigation Levels for ITA monitoring sites and Dewatering Plant

	Kahawai Stream				Ruakohua Stream		North Drain discharges				North Stream
Contaminant (mg/L)	Culvert Kahawai	Kahawai Upstream	Kahawai Downstream	Kahawai ITA	Contractors Compound	Yard 31	CY19 Pond	East Pond	Y56K Pond	Dewatering Plant	Site 1
Aluminium - Total	6.7	3.9	2.6	9.8	0.4	7.6	4.1	4.6	15.3	1.2	5.4
Boron - Total	13.2	7.6	9.8	13.5	-	-	3.3	8.8	12.1	-	2.1
Cadmium - Total	-	-	-	-	-	-	0.0060	0.0057	0.0057	-	0.0002[1]
Chromium (CrIV) - Total	-	-	-	-	-	-	0.0219	0.0223	0.2450	-	0.0110
Copper - Total	0.0090	0.0075	0.0075	0.0114	0.006	0.013	0.0088	0.011	0.0527	0.0074	0.0057
Iron - Total	4.5	2.3	2.3	8.3	0.9	16.4	6.0	16.9	55.1	3.0	15.3
Lead - Total	-	-	-	-	-	-	0.0158	0.0150	0.0161	0.0161	0.0055
Nickel - Total	-	-	-	-	-	-	0.011[1]	0.011[1]	0.0154	-	0.011[1]
Zinc - Total	0.1280	0.0571	0.8559	0.19172	0.036	0.151	0.2215	0.410	0.3838	0.0509	0.0786
Temperature (degrees)	25.5	22.4	23.0	27.8	23.0	26.2	23.5	23.1	21.0	27.6	
TSS	188	36.2	28.2	143.7	7	168	464.5	380	979.3	36.6	90.4
Turbidity[2]	-	-	-	-	-	-	-	-	-	-	-

	Kahawai Stream				Ruakohua Stream		North Drain discharges				North Stream
Contaminant (mg/L)	Culvert Kahawai	Kahawai Upstream	Kahawai Downstream	Kahawai ITA	Contractors Compound	Yard 31	CY19 Pond	East Pond	Y56K Pond	Dewatering Plant	Site 1
pH	6.0 - 9.5										

Notes:

1. Cells marked with a [1] - have applied the ANZWQG 95 % SPL as this was greater than the mean result plus two standard deviations.
2. Historically monitoring of sediment in water has focused on TSS. It is proposed to monitor both TSS and turbidity going forward to enable a TSS and turbidity relationship to be established monitoring of turbidity will be undertaken and trigger levels will be developed once sufficient data is obtained. In the interim, results will be compared to the TSS trigger levels.

Appendix D Stormwater quality treatment calculations

The existing treatment system volumes have been compared with Auckland Council stormwater guidance to check whether equivalent volumes have been provided. In some cases, due to the nature of the site, the pond size is not the controlling factor over settlement of fines and improvements in water quality.

The site is unique, due to the activities on site and the stockpiling of materials. The stormwater treatment ponds and devices were designed, and have been upgraded, to achieve water quality objectives and improve the quality of discharge to the receiving environment. The programme of water quality monitoring has been used to inform pond upgrades, changes to the stormwater treatment cycle, and improvements to the stormwater treatment operation (i.e. the addition of water treatment chemicals).

The following guidance has been considered:

- Stormwater Management Devices in the Auckland Region (GD01) (2017) – This guidance is the latest Auckland Council guidance related to stormwater management devices. The document provides guidance for the design of permanent stormwater treatment devices in the Auckland Region. The guidance does not include the use of ponds as primary treatment for stormwater, and as such has not been used for the assessment of the stormwater treatment systems;
- Stormwater Management Devices: Design Guidelines Manual (TP10) (2nd edition, May 2003) – This guidance is the predecessor document of current Auckland Council Guidance Document 01 (Stormwater Management) as outlined above outlining stormwater management devices in the Auckland Region and includes specific design guidelines for ponds as treatment devices. This document was active during the design of the majority of the stormwater ponds within the Site. Therefore, this document has been used to assess the treatment capacity of the devices as permanent stormwater devices; and
- Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05) (2017) – This guidance provides technical guidance for the design of erosion and sediment control (ESC) practices for land disturbing activities, including the design of settlement ponds. Given that the North yard and storage areas of the Site involve the movement and temporary storage of materials, including aggregate and coal, this guidance is considered relevant to assess the function of the stormwater treatment ponds.

This section includes an assessment of the design stormwater flows from the various sub-catchments across the Site and compares that to the capacity and function of the existing stormwater treatment devices.

Treatment guidance

TP10 guidance

The TP10 guidance on pond design, construction and maintenance is contained in Chapter 5 of the document.

The sizing of ponds is based on the storage of the water quality volume (WQV) within the pond. The water quality volume is the volume chosen that enables 75% removal of total suspended solids on a long-term average basis. The water quality rainfall in TP10 is classified as 1/3 of the 2-year ARI 24-hour rainfall, which is approximately 25 mm. The WQV rainfall under GD01 is classified as the 90thpercentile of 24=hour storm event (approximately 25 mm).

TP10 also recommends the use of extended detention (EDV) to increase the water quality treatment efficiency and prevent downstream erosion effects in streams. The extended detention rainfall in TP10 is classified as 34.5 mm. The detention requirement for erosion under GD01 is the 95thpercentile rainfall, which is given as 34 mm.

TP108 analysis is recommended to be carried out for up to five rainfall events, including 1/3 of the 2 year rainfall, 34.5 mm rainfall, the 2 year and the 10 year ARI rainfall. The TP108 methodology is recommended to calculate the WQV and EDV.

The key shape, depth and component recommendations for ponds under TP10 are as follows:

- The length should be a minimum of three times the width, and the flow pathway at least twice the width;
- Maximum 2 m in depth (due to safety);
- Must include a forebay (wet ponds) which is 15% of the WQV;
- Provide at least 50% of the WQV as permanent pond storage (50% as live storage);
- Spillway to convey the 10 year ARI flows; and
- The outlet structure should incorporate measures to separate oil and gross pollutants.

The stormwater treatment pond capacity (of all stormwater ponds on Site) has been assessed against both the WQV and the EDV to identify the volume of storage available. Although many of the sub-catchments are discharging to streams, there is no requirement to provide EDV, however this shows a greater efficiency of contaminant removal.

GD05 guidance

The GD05 sediment ponds provide the following guidance regarding the design of sediment retention ponds (SRP). The sizing of SRP is based on the contributing catchment area and slope length:

- Earthwork sites with slopes < 18% and < 200 m in length, SRPs should have a minimum volume of 2% of the contributing catchment area (200 m^3 for each ha of contributing catchment).
- Earthwork sites with slopes > 10% or > 200 m in length, the minimum volume should be greater than 3% of the contributing catchment area.

The sub-catchments are all flat, and there are no slopes longer than 200 m (although some maximum flow pathways are longer than 200 m). The 2% value is the required treatment volume for most sub-catchments, however for the Northside and Southside ITA catchments 3% has been applied, due to the large area of the catchment.

The shape requirements under the GD05 are similar to those under GD01 and TP10 and have a maximum pond depth of 2 m for safety. The guidance requires the use of dead storage, a forebay, and also a floating decant arm for the outflow.

Sub-catchment design storm event volumes

The potential stormwater volumes for each of the sub-catchments has been analysed using the TP108 manual methodology for a variety of 24-hour storm events, including the WQV (90th percentile), the 95thpercentile storm, the 2-year ARI, the 5-year ARI, 10-year ARI.

HIRDS v4 rainfall depths were used for the 2-year, 5-year and 10-year ARI 24-hour rainfall events[26]. The 2-, 5- and 10-year ARI events with climate change were also analysed. The maximum consent duration is 35 years, therefore the end of consent could be 2055, although may be sooner. Conservatively the 2050-2080 climate change horizon has been assumed, assuming RCP6.0. The applied rainfall depths are shown in Appendix D Table 1.

[26] Only considered up to the 10 year ARI event, as assessment is of the water quality treatment of the ponds, not the flood risk.

Appendix D Table 1: TP108 analysis rainfall depths

Design storm	Rainfall depth (mm)	
	Present day	2055 RCP6.0
90th%ile 24-hour storm (WQV)	23.5	-
95th%ile 24-hour storm (EDV)	32.5	-
2 yr ARI	63.2	70.6
5 yr ARI	82.1	92.5
10 yr ARI	96.4	109

The landuse within the catchments was classified into the following categories, with the corresponding SCS Curve numbers (CN) and the initial abstractions (Appendix D Table 2).

Appendix D Table 2: Applied TP108 landuse and rainfall loss

Landuse	CN (mm)	I_a (mm)
Roof	98	0
Sealed roads and sealed car parks	98	0
Yard areas (compacted gravels)	92	0
Grass	74	5

The underlying soil group is soil Group B; however, the Steel Mill is constructed on an area of artificial fill to produce the flat area, therefore soil Group C was assumed. The CN values were taken from TP108 Part B Table 2-2a for the land uses shown in Appendix D Table 2. The initial abstractions are based on the TP10 methodology, in that pervious areas have I_a=5 mm, and impervious areas have I_a=0 mm. The landuse across each catchment was delineated manually based on aerial imagery.

The yard areas on the site, including the stockpiling operations area, the aggregate and coal stockpiles, and the other yards, are not standard landuse categories. These areas generally comprise a compacted gravel, sometimes with stockpiles of materials overlying this which may provide stormwater storage. It has been conservatively assumed that these areas are impervious, and the landuse of “paved; open ditches (including right-of-way) has been applied.

The TP108 manual methodologies have been applied to calculate the WQV and other storm intensity volumes for the sub-catchments:

- For sub-catchments with significant areas of buildings and paved surfaces (heterogenous catchments), the pervious and impervious volumes were calculated separately, and a soil storage contaminant of 0.0 mm was applied for the impervious areas. This includes the Southside ITA Catchment, part of the Northside ITA Catchment, and the Contractors' Compound; and
- The sub-catchments that contain a majority yard, with little to fully impermeable surfaces, have been applied as homogenous catchments, with a combined soil storage parameter.

The peak flow rates have not been calculated for the sub-catchments, as some of the catchments incorporate pumping to the final treatment device, and inverts are not available for all stormwater features.

The resulting stormwater volumes for the design storm events for each catchment is contained in Appendix D Table 3.

Appendix D Table 3: Site-sub-catchment stormwater volumes for 24-hour duration design storms

Sub-catchment	Runoff volume (m^3) – 24 hour storm duration							
	90th%ile (WQV)	95th%ile (EDV)	2yr ARI	5yr ARI	10yr ARI	2yr ARI + CC	5yr ARI + CC	10yr ARI + CC
Northside ITA catchment	10,360	14,893	33,119	44,838	53,827	37,679	51,368	61,807
Southside ITA catchment	8,505	11,882	23,696	31,119	36,783	26,592	35,235	41,800
East Pond sub-catchment	649	1,036	2,508	3,464	4,200	2,879	3,998	4,853
Y56K Pond sub-catchment	104	176	471	671	826	548	784	966
Northern contractors compound sub-catchment	170	302	866	1,261	1,573	1,018	1,487	1,854
CY19 Pond sub-catchment	262	454	1,250	1,795	2,223	1,460	2,105	2,607
Rail siding sub-catchment	500	798	1,932	2,669	3,236	2,219	3,081	3,739
Contractors' Compound sub-catchment	441	611	1,192	1,551	1,824	1,333	1,749	2,064
Yard 31 sub-catchment	955	1,638	4,444	6,356	7,852	5,182	7,441	9,193
Kahawai Stream ITA catchment	238	380	920	1,271	1,541	1,057	1,467	1,781

The calculated runoff volumes provide an indication of how the peak flows compare to the current volume limits at the Northside Outfall with the Northside Outfall limit of 9,000 m^3/ day likely to be exceeded during all storm events from the 90th Percentile up.

Stormwater treatment system compliance

The existing stormwater treatment system devices are compared to the TP10 and GD05 treatment volume requirements below in Appendix D Table 4.

Appendix D Table 4: Stormwater treatment volumes compliances with TP10 and GD05

Catchment / Sub-catchment	Primary treatment device(s)	Required treatment volume (m^3)	Compliance

	Name	Volume (m^3)	TP10 WQV	TP10 EDV	GD05	
Northside ITA Catchment	Northside pond (north)	15,000	10,360	14,893	20,708	Exceeds TP10 WQV and EDV volume in each pond. GD05 is provided with combination
	Northside pond (south)	15,000				
Southside ITA Catchment	Southside surge pond	5,000	8,505	11,882	12,336	Exceeds TP10 WQV and EDV, and GD05 volumes with combination of both ponds
	Southside duty pond	8,000				
East Pond sub-catchment	East Pond	1,310	649	1,036	1,071	Exceeds TP10 WQV and EDV, and GD05 volumes
Y56K Pond sub-catchment	Y56K Pond	230	104	176	236	Exceeds TP10 WQV and EDV, similar to GD05 volume, complies with both
Coal Yard 19 sub-catchment	CY19 Pond	743	262	454	661	Exceeds TP10 WQV and EDV, and GD05 volumes
Kahawai Stream ITA sub-catchment	Metal cutting yard pond	220	238	380	393	Does not achieve TP10 or GD05 volumes
Contractors' Compound sub-catchment	Slag bed filters (x3)	N/a	441	611	383	Unable to assess – device is a filter not a pond. Monitoring indicates good function
Yard 31 sub-catchment	Yard 31 Pond 1	871	955	1,638	2,293	Exceeds TP10 WQV and EDV, and GD05 volumes
	Yard 31 Pond 2	2,810				

Note: green indicates single device in catchment complies with guidance, yellow indicates that combined treatment devices comply with the guidance, red indicates that compliance with the guidance is not achieved. Grey indicates that the treatment device cannot be assessed as the type if not contained in the AC guidance.

Appendix E Existing ITA Activities and Controls

ITA catchment	Activity		Key control	Contingency measure (existing)
Southside ITA catchment	Southside Ponds	Outlet	Continuous turbidity monitoring, with telemetry to Utilities control room	High NTU - diversion of ARP water to southside pond
			Continuous flow monitoring, with telemetry to Utilities control room	Flow reaching SS limit - stop pumping from NS to SS ponds
			Continuous pH monitoring, with telemetry to Utilities control room	High pH - diversion of ARP water to Southside Ponds
		Southside Ponds	Surge pond	Continuing increased volume will overflow to SS outfall
			Duty Pond - Southern catchment stormwater collection (and ARP as contingency)	Excess volume in "duty pond" results in overflow to SS surge pond
			Recycle lines diverting "normal" flow to Ruakohua Dam	High water inflow - surge pond and Outfall (as above)
			Oil skimmer and boom	Excess oil (surface) - vacuum truck to remove oil and floating oil booms
	ARP WWTP	Cold Mill	Treatment plant - chemical dosing	Stop operation until issues resolved and/or diversion to Duty southside pond
			Treatment plant - pH monitoring	
	Stormwater runoff	Sealed Roads	Road sweeping of main accessways/ sealed areas	Additional road washing or sweeping. Removal of any loose material adjacent to road. Check sumps are clean to allow full runoff
			Treatment via Southside Ponds	
		Unsealed roads	Road maintenance	Repair potholes on unsealed roads and yards Check sumps are clean to allow full runoff
			Road watering	

ITA catchment	Activity		Key control	Contingency measure (existing)
Southside ITA Catchment				Remove top aggregate layer, regrade and resurface
			Treatment via Southside Ponds	
		Unsealed yards	Yard surface maintenance	Improvement activity to stabilise yards
	Hazardous substance storage areas	Rolling Mills; Paint Line; Central Workshops; Metal Coating Line; Utilities	Secondary containment	Hyrdocarbon booms and skimmers in ponds Containment and treatment in Southside Ponds
			Regular third-party certification of tanks (Health and Safety at Work Act)	Major chemical spill to Southside Ponds would require close-off of pond to avoid contamination of Ruakohua Dam. Then appropriate treatment within pond.
	Hazardous substance (liquid) bulk delivery	Rolling Mills; Paint Line; Metal Coating Line; Utilities	Procedural controls; Secondary containment; Regular third-party certification of tanks Healthy and Safety at Work (Hazardous Substances) regulations	
	Hot Strip Mill cooling water blowdown	Hot Mill	Treatment via Southside Ponds	
	Oily waste treatment plant	Rolling Mill Utilities	Chemical treatment	Discharge to the Southside Ponds
			Dissolved Air Flotation tanks (DAF)	
			#1 buffer basin	
	Metal Coating Plant	Coating processes	pH neutralisation and chemical treatment	
			Effluent treatment plant discharges to Northside Ponds	
Northside ITA Catchment	Northside Ponds	Outfall	Continuous flow monitoring, with telemetry to Utilities control room	High flows may be diversion to Southside Outfall or Ponds with pre-treatment through Melter Aggregate filters. Investigate elevated water usage (check sheets); Bring surge pond on-line;

ITA catchment	Activity		Key control	Contingency measure (existing)
Northside ITA Catchment				Recycle pumps and pipeline checked
			Continuous pH monitoring, with telemetry to Utilities control room	Sulphuric acid dosing at outfall, dripped into the stilling basin
			Continuous turbidity monitoring, with telemetry to Utilities control room	During high rainfall water divert up to 150 m^3/hr to Melter Aggregate filter beds
				Additional chemical or adjustment of dosing at chute and IPWTP (before discharge into Northside Ponds
			Continuous temperature monitoring, with telemetry to Utilities control room	Divert up to 150 m^3/hr to Melter Aggregate filter beds
		Northside Ponds	Ponds	One pond off-line as surge with baffles
			Oil skimmers (both ponds)	
			Chemical dosing - chute	
			Chemical dosing - stilling basin	
		Melter Aggregate filter beds	Pumping from Northside Ponds with increased NTU or rainfall	
	SRNZ Ponds	SRNZ Ponds	Ponds (2)	
			Oil Booms	
			Melter Aggregate filter beds (1 pond)	Check condition of top layer of Melter Aggregate filter
	Tip Spray Leachate Pond	Forebay in Tip Spray Pond	Secondary sediment retention; Pumped to Northside Ponds	
		North (Closed) Landfill Pond	Pond, pumped to Tip Spray Pond	
		Truck wash down	Pond - initial sediment catch; drains to North Landfill Pond	

ITA catchment	Activity		Key control	Contingency measure (existing)
Northside ITA catchment		Slag wash plant	Sediment catch pit; drains to North Landfill pond	Check condition of sediment trap. Stop plant if bulk of sediment not retained at source Check condition of North Landfill Pond to initiate maintenance if required
	Product Tipping and waste processing (Middle-level)	Iron (plating) tipping banks	Cooling and dust suppression water runoff (recycle water) Drains to NS Ponds, via chute	Should heavy sediment load occur, turn off cooling water sprays to inspect and resolve
		RPCC/accretions tipping banks		
		Slag tipping banks		
		Metal Recovery Plant		
	Landfill leachate (west and east)	Landfills	Pumped to Northside Ponds	
	Stormwater runoff	Sealed Roads	Road sweeping	Additional road washing or sweeping. Removal of any loose material adjacent to road Check sumps are clean to allow full runoff
		Unsealed roads	Road maintenance	Repair potholes on unsealed roads and yards Check sumps are clean to allow full runoff Remove top aggregate layer, regrade and resurface
			Road watering	
		Unsealed yards	Yard surface maintenance and watering	
	Hazardous substance storage areas	Iron Plant; Steel Plant; SteelServ; Stores; Central Workshops; Metal Coating Line; Utilities	Secondary containment	Hydrocarbon booms and skimmers in Ponds Fill surge pond to provide for additional settling and/or chemical treatment
			Regular third-party certification of tanks (HSNO Act)	
	Hazardous substance (liquid) bulk delivery	Metal Coating Line; Utilities	Procedural controls; Secondary containment; Regular third-party	

ITA catchment	Activity		Key control	Contingency measure (existing)
Northside ITA catchment			certification of tanks (HSNO Act)	
	Iron plant	Iron plant WTP	Clarifiers	
			Chemical adjustment in clarifiers	
		Devansco Scrubbers	Sumps/ wedge pits	
		Melter de-dust scrubber	SRNZ Ponds	
		MHF Seal water	Regular maintenance to minimise leaks	
		MHF scrubber	Kilns process control	
		Fugitive losses from baghouses, debris handling	Minimise leakage from skips, maintenance of transfer systems, air pollution control equipment Inspections, ensuring bins are sealed, prompt repairs	Review containment and handling procedures
	Steel plant	Steel plant WWTP	Clarifiers	
			Chemical adjustment in clarifiers	
		Steel plant baghouse	Minimise leakage from skips, maintenance of transfer systems, air pollution control equipment	
			Sealed surface under baghouse for cleaning	
		Scrap yards		
		Steel Plant Raw materials handling	Curtain on reception hopper Maintenance of transfer systems; regular housekeeping through conveyor system and bin house	Check conveyors for misalignment Initiate additional cleaning

ITA catchment	Activity		Key control	Contingency measure (existing)
Northside ITA catchment			Housekeeping around train delivery of limestone	Vacuum truck for clean up of any spills
	Metal coating line	Metal coating line WWTP	pH control	
	Co-gen	Co-gen cooling tower	Diverted to firewater reservoir	
	BOC	Cooling tower	Blow down pumped, via pipe bridge, to Northside Ponds	
	Utilities sludge dewatering	Sludge ponds (ponds 1-5)	Valves on outlet drains closed during filling Slag weir for sludge retention and filtration	Divert clarifier underflow pumping to alternative pond
		Centrifuge	Wet pad containment and regular removal of material	Stop discharge to wet pad
	Iron Plant Raw Materials Handling	Working coal stockpile	French drains beneath stockpile drain to Northside Ponds	Clean blocked sumps or drains to avoid flooding
		PC stockpile	Drains to Northside Ponds	
		CY1/2 Southern Pond	Sediment fence to contain gross solids around stockpile Regular removal of fines between concrete barriers and sediment fence Cleaning of v-drain	
	Aggregates	Aggregates Wash Plant	Sediment pond flows to Northside Ponds	Stop aggregate washing to allow for pond cleaning
		Surface runoff at boundary of Operational Area	Planted swale drain and pipe diversion to North Landfill Pond	
		Wheel wash	Containment of solids in facility and regular cleaning. Flows to North Landfill Pond	Stop use washing to allow for pond cleaning
North Drain	Ironsand Dewatering Plant	Outfall	Continuous flow Monitoring	
			Continuous turbidity monitoring, at outfall	If NTU above 30, automatic diversion to

ITA catchment	Activity		Key control	Contingency measure (existing)
				settling pond or ironsand pumping shut down
		High-rate thickener	Chemical treatment	During start-up, until NTU at outfall spec water passes through diversion ponds with slag weirs
			Continuous turbidity monitoring, at clarifier	Diversion through ponds (first); Slurry pumping stop if continues > 30 minutes at NTU greater than consent limit
		Settling ponds	For use in start-up or high turbidity Sump to collect ironsand from Wet Pad Forebay for initial settlement and some water pumped to clarifier for treatment	
			Maintenance schedule - pond and pipe cleaning	Stop slurry pumping until high-rate thickener in control and/or pond able to settle solids to meet consent limit
		Pipeline diversion to Wet Pad PC stockpile via cyclones	Cyclones at discharge point, return most of the water to the D/W plant for treatment Surface runoff flow into sump to enable ironsand to be removed and returned to stockpile Overflow from sump to Pond Forebay and settling in pond	Arrange for cleaning of sump at next stoppage
		Centrifuge centrate pond	Settled water discharges Dewatering Plant Pond	If flooding of Settling Pond were to occur, request Pond 3 valve be closed (to divert water to Northside Ponds)
North Drain	CY19 Coal Stockpile	Forebay and Settling Pond	Sediment barriers to collect gross solids with regular removal Cleaning of yard between shipments	Additional clean-up of yard to reduce fines

ITA catchment	Activity		Key control	Contingency measure (existing)
			Automated chemical dosing, v-notch flow monitoring	
			Continuous NTU monitoring; Telemetry to Iron Plant control room, for appropriate response	If NTU above 60, automatic diversion to Northside Ponds
			Scheduled inspections: Operator/Engineer inspection of pond, chemicals, etc	
	CY1/2 Coal Stockpiles CY5/6 Coal Stockpiles	Yard runoff	Sediment fence to contain gross solids around stockpile Regular removal of fines between concrete barriers and sediment fence Cleaning of periphery v-drain	
		Yard runoff	Temporary surge capacity in PC1 and periphery drain	
		Yard periphery v-drains	Slag check dams for catching gross solids and slowing flow	
		East Pond	Automated chemical dosing, v-notch flow monitoring	
			Continuous NTU monitoring: Telemetry to Iron Plant control room, for appropriate response	East Pond cleaning, chemical dosing, continuous turbidity monitoring When NTU alert received from downstream continuous turbidity monitoring (Site 1), response protocol initiated (refer to Water Quality Management Plan)
North Drain	Tarping Bay	Y56K Pond (part) East Pond (part)	Sediment settlement	
	Hazardous substances	Water treatment chemicals at East and CY19 ponds;	Secondary containment	

ITA catchment	Activity		Key control	Contingency measure (existing)
	Road trucks and large operational vehicles	Spill response for hydrocarbon releases	Containment within East Pond, CY19 Pond, Y56K Pond	Deployment of downstream boom for containment of hydrocarbons. Stop slurry pumping to reduce flow
	Rail siding	Seepage drain and surface runoff	Nil to low contaminants	
Kahawai Stream	Kahawai ITA area (formerly Metal Cutting Yard)	Yard runoff Note: by early 2023 the fill in this yard will be removed, pond infilled and the area topsoiled/grassed	Runoff via v-drain to sediment pond, drains via planted (natural unnamed stream) to culvert discharging to Kahawai Stream	
			Sediment pond	Additional clean out of sediment pond
			Riparian planting (unnamed stream) and stock exclusion	
Ruakohua Stream	Contractors' Yard	Stormwater runoff	Aggregate filter beds	
		Hazardous substance storage areas	Secondary containment	Localised spill response
			Regular third-party certification of tanks (HSNO Act)	
	Road trucks and large operational vehicles	Spill response for hydrocarbon releases	Localised spill response	If flows to Settling Ponds containment Pond until clean up initiated
	Yard 31	Yard 31 Settling Ponds	V-drain collection, drain to two Settling Ponds (2)	
Ruakohua Dam	Raw Water Treatment Plant	Treatment plant alum sludge pond	Regular inspection and emptying to landfill	
		Hazardous substance storage areas	Secondary containment	Localised spill response
			Regular third-party certification of tanks (HSNO Act)	Localised spill response
		Slab yard	Majority of flow to recycle-water inlet of dam	
Coastal margin		Western access road	Road berm to direct flow to catch-pit,	

ITA catchment	Activity		Key control	Contingency measure (existing)
	Surface runoff at site boundary (near road 29A)		before drain through vegetation and pond	
			Road berm to direct flow to catch-pit, before drain through vegetation	
			Road berm to direct flow to SRNZ pond inflow channel	

Appendix F Summary of continuous improvement

Improvement activities summary, 2003-2021

The changes outlined in the table are minor changes to existing facilities in order to improve water quality. No changes to the nature or scale of the activity have occurred.

Year	Project	Description	Aim of Improvement	Discharge area
2003	Automated Dewatering Plant diversion	Full automation of Dewatering Plant diversion to settling ponds triggered by high turbidity. Turbidity meters installed at the thickener and discharge point to control outlet valve (direct discharge line or settling ponds), and to automatically shut down plant in event of high outlet turbidity.	Reduced sediment loads	North Drain
2003 - 2005	Dewatering Plant settlement pond improvements	Reconfiguring of settlement ponds, including weir & sluiceway installation, pumping regime changes, and automating drain valves.	Solid's removal in settling ponds	North Drain
1999-2004	Hardstand conversion to grass and gardens	Converting hardstand areas to grass and gardens to reduce traffic and laydown areas.	Lower sediment runoff	Northside/ Southside
2004-2005	Road sealing and repaving	Sealing unsealed roads and repaving existing sealed roads to allow for road sweeping.	Lower sediment runoff	Northside/ Southside
2004	Stormwater contaminant external audit	Identifying potential stormwater contaminants at source and options to improve stormwater pond efficiency. Many higher-impact projects progressed in subsequent years.	Improve treatment efficiency and water quality	Whole site
2004	Clarifier operation improvements	Improved operational control in Steel Plant and Iron Plant clarifiers to reduce manual dumping.	Reduce discharge volume	Northside
2004	Filtration beds	Installation of filtration beds at Northside Outfall and SRNZ Ponds using melter aggregate.	Improve discharge water quality	Northside
2005	Cooling tower water recycling	Blowdown from major cooling towers recycled to firewater reservoir.	Reduce discharge volume	Northside
2005	Water meters	Water meters installed on major secondary (fresh) water lines to improve monitoring of plant consumption.	Improve water use efficiency and reduce discharge volumes	Northside/ Southside
2005	Acid Plant Control system	Control system upgrades in Acid WWTP.	Improve water quality on direct discharge	Southside
2007	Southside Pond	Change from 2 ponds operating in parallel to taking smaller pond offline for use as surge capacity, to	Reduced sediment load at Southside	Southside

Year	Project	Description	Aim of Improvement	Discharge area
	reconfiguration	avoid overflow to Southside Outfall during high-rain events. Necessary as recycle lines to Dam not sufficient capacity for high rain.	Outfall during high rain events	
2009	Recycle line to Southside Ponds and dam	Installation of an above ground pipeline to the Southside Ponds, in order to recycle additional water to the Ruakohua Dam. (Periodically constrained by Conductivity, due to impact on cogeneration boilers).	Reduce volume at Northside Outfall, particularly during prolonged rainfall periods.	Northside
2013	Y56K Pond installation	Installation of settlement pond at Slag Yard for runoff from the stockpiles.	To collect sediment laden water and settle out sediment before discharging	North Drain
2013	Perimeter cut-off drain extension and use of sediment fences/barriers	Extension of existing drains to capture more runoff from Coal Yards 1 & 2 (CY1/2) and direct to settlement East Pond. Installation of sediment fences and barriers to protect fences, to collect gross sediment entering drains.	Improved treatment coverage and solids removal	North Drain
2015	ITA consent monitoring programme implemented	Regular monitoring programme under newly issued ITA Consent, approved by Council in February 2015 and commenced implementation.	Improved monitoring programme to allow for better understanding of issues in catchment	North Drain
2014	Rain activated flocculant dosing system	Rain activated flocculant dosing system installed in at the East Pond (relating to CY1/2 yards).	Enhance sediment removal	North Drain
2015	Decant arm install	Decant arm installed in February 2015 on upstream East Pond.	To better control sediment through increased retention and flowrate	North Drain
2015	Turbidity meter install	Installation of in-line turbidity monitoring on CY19 pond and automated diversion valves, in event pond treatment insufficient during high rainfall.	To automate diversion from, in response to potential contaminant increase	North Drain
2014	Sediment fences and barriers	Sediment fences and barriers installed around coal stockpiles, to reduce gross-loads to drain and East Pond.	For better erosion and sediment control	North Drain
2015	Housekeeping programme	Housekeeping procedures developed around coal yards (during and between shipments) and regular inspections implemented.	Improved programme to allow for better understanding and management of issues in catchment	North Drain
2015	Maintenance programme	Maintenance programme reviewed and reinforced for CY1/2 and CY19 treatment devices developed and implemented.	Improve discharge water quality	North Drain

Year	Project	Description	Aim of Improvement	Discharge area
2015	Metal Cutting Yard Sediment pond	Sediment pond (with decant arm) completed in April 2015. Upstream swale and downstream tributary planted to assist with treatment.	To collect sediment laden water and settle out sediment before discharging	Kahawai Stream
2017	ITA catchment of Kahawai Stream	Diversion pipe and bund installed to direct surface flow from Melter Slag stockpile area to Northside Ponds, via Tip Pond (reducing boron to stream).	Remove boron from surface water flow to Kahawai Stream	Kahawai Stream
2017	Melter slag filtration walls in one SRNZ ponds	By installing four Melter Slag filter walls in one of the SRNZ ponds, additional treatment occurs to ensure SRNZS inflow through to meet Southside Outfall consent limits. and pond configuration modified to consecutive operation.	Diverting water from SRNZ Pond (Northside catchment) to the Southside Outfall reduces volume at Northside Outfall and reduces contaminant load on Northside Ponds.	Northside/ Southside
2018	Direct discharge from SRNZ ponds to Southside Outfall	Installed branch in existing recycle line to Southside Ponds (existing installation from ~2009) to allow for water from the SRNZ Ponds (passing through Melter Slag filters) to be discharged to the Southside Outfall or Southside Ponds.	Reduce discharge volume at the Northside Outfall	Northside/ Southside
2017	Baffles installed in Northside Ponds	Dye testing in the Northside Ponds to determine the residence time in the ponds and possible effectiveness of baffle installation. Baffles then installed. Configuration of ponds changed to operate one pond at a time, to provide surge capacity.	To increase residence time and improve water quality at the discharge point. Empty pond can be used as a surge buffer	Northside
2017-2019	Flocculant dosing improvements	Trialled alternative flocculants (Superfloc, a.k.a. PAC) for dosing in Iron Plant WWTP, in Chute and in Northside Ponds.	Improve solids removal and water quality at discharge point	Northside
2018	Southside Ponds drain lines	Installation of additional drain lines from Southside Ponds to increase recycling to Ruakohua Dam and avoid overflow to Southside Outfall during high intensity rain events.	Improve water efficiency and reduce discharge volumes during storm events	Southside
2018-2019	East Pond upgrades	Increase pond size, add a level spreader, change to automated (flow activated) chemical dosing, continuous turbidity metering with info to control room for response.	Enhance treatment and improve discharge water quality	North Drain
2018-2019	CY19 pond upgrades	Modify forebay to provide for automated (flow activated) chemical dosing, continuous	Enhance treatment and improve	North Drain

Year	Project	Description	Aim of Improvement	Discharge area
		turbidity metering with info to control room for response.	discharge water quality	
2019	Coal Yards 5 & 6 diversion	Installation of new drains to divert greater proportion of runoff from Coal Yards 5 & 6 to catchpits and settlement ponds.	Improved treatment coverage and solids removal	North Drain
2019	Sealing North Gate entry	Sealing the road at the North Gate entrance to allow for road sweeping.	Reduce deposited sediment that can be mobilised during rain events	North Drain
2019	SRNZ Pond conversion	Reconfiguration of ponds with Pond 1 piped to Pond 2, after initial settling. Addition of slag walls to Pond 2 to allow it to act as a filtration bed. Provides for water to be pumped to this bed to Southside Outfall, in event of high volumes at Northside Outfall.	Manage Northside high volume (rain related) discharges	Northside/ Southside
2020	Truck wheel bath	Installation of truck wheel bath, to collect debris from coal trucks leaving unsealed yards.	Capturing potential sediment load washing to drain and ponds	Northside Ponds
2021	Road sealing	Sealing a high-traffic roads (Road 56) and resealing Road 50	Capturing potential sediment load washing to drain and ponds	Northside Ponds
2021	New high-capacity road sweeper	Reduce sediment load on drains by capturing fine sediments	Remove sediment from entering stormwater systems	Across site
2021	Realignment of roads adjacent to CY5/6 to eliminate L-Drain catchpit	When road to east of Cy5/6 was lifted and a new pipe to divert CY5/6 drains to head of East Pond, overflows from the L-Drain Catchpit ceased. L-Drain catchpit filled as part of project.	Improved treatment efficiency	North Drain
2021	Northside Pond baffle adjustment	Modification to installation of floating baffles to improve effectiveness and provide for easier removal during cleaning	Improved treatment efficiency	Northside
2021-2022	Northside process wastewater treatment systems (Primary Plants)	Optimisation of clarifier treatment to reduce zinc load, in anticipation of a lower consent limit.	Reduce zinc load from Site	Northside