REPORT

Tonkin+Taylor

Glenbrook Steel Mill Discharge to Water.

INDICATIVE DRAFT: Wetlands Management Plan

Prepared for
NZ Steel
Prepared by
Tonkin & Taylor Ltd
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Glossary

Term	Meaning / description
Benthic	Of, relating to, or occurring at the bottom of a body of water or the depths of the ocean.
Best Practicable Option (BPO)	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 or option for preventing or minimising the adverse effects on the environment having regard, among others 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."*
Coastal Marine Area (CMA)	Defined in section 2(1) of the RMA, as: *"the foreshore, seabed, and coastal water, and the air space above the water—* *(a) of which the seaward boundary is the outer limits of the territorial sea:* *(b) of which the landward boundary is the line of mean high water springs, except that where that line crosses a river, the landward boundary at that point shall be whichever is the lesser of—* *(i) 1 kilometre upstream from the mouth of the river; or* *(ii) the point upstream that is calculated by multiplying the width of the river mouth by 5".*
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.
Consented mixing zone	The mixing zone defined in the existing Northside and Southside Outfall discharge permits (Permits 21575 and 21576)
Council	Auckland Council
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.
Electric Arc Furnace (EAF)	NZ Steel has secured co-funding from the New Zealand Government to enable the installation of an EAF at the Site. The installation of the EAF, which if progressed is likely to be early 2027, is part of the decarbonisation of the Steel Mill. NZ Steel is currently in the feasibility stage of plans to construct and operate an EAF within the existing Steel Plant facility.
ITA Area	The ITA Area is the area of the Site 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 and to the east by Mission Bush Road, and the west by the Waiuku Estuary.

Term	Meaning / description
ITA Stormwater discharges	Rainfall runoff from ITA activity areas
Kahawai Stream	The Kahawai Stream is a small tributary of the Waiuku River that lies to the north of the Steel Mill. 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 as the MFS Stream.
Lower North Stream	The Lower North Stream is located to the north of the Steel Mill, 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.
Mean High Water Springs	The average of each pair of successive high waters during that period of about 24 hours in each semi-lunation (approximately every 14 days), when the range of the tide is greatest.
Modelled mixing zone	The area as modelled in the DHI (2022) report (included as Appendix E to this report) beyond which metals, temperature, and changes in salinity meet relevant guidelines.
North Drain	The North Drain is a constructed drain that was constructed in the 1980s to convey Steel Mill discharges and is an artificial watercourse in accordance with the AUP definition. The North Drain flows entirely within the ITA Area and discharges into the Lower North Stream north of Brookside Road.
North Stream Catchment	The North Stream Catchment is the modified catchment area that includes the artificial North Drain catchment and the Lower North Stream catchment.
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 East and West Landfills. Treated water from the Northside Ponds discharges to the coastal marine area via the Northside Outfall.
Northside Outfall Structure	The outfall structure from the Northside Ponds to the Waiuku Estuary.
NZ Steel	New Zealand Steel Limited
Outer Zone	An Outer Zone (OZ) is an estuarine area beyond the Settling Zone (SZ) (i.e. beyond where the majority of the sediment and associated contaminants settle onto the seabed.)
Process water	Process water is water that is used for a variety of manufacturing processes at the Steel Mill. For the purposes of this application, discharged process water includes both waste process water and landfill leachate.
Proposal	Resource consent application to authorise activities associated with the discharge of stormwater and process water at the Glenbrook Steel Mill (the Steel Mill) in accordance with sections 9, 12, 14 and 15 of the RMA
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 2.2 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

Term	Meaning / description
	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).
Residual effect	Effects on biodiversity or ecological values that cannot be avoided, remedied or mitigated.
Riparian margin	An area of land immediately adjacent to a permanent or intermittent river or stream.
Ruakohua Stream	The Ruakohua Stream (sometimes referred to as Ruakahua Stream) is located to the south of the main operational areas of NZ Steel's site. It is approximately 4km 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.
Settling Zone	The area where the majority of sediment and associated contaminants discharged from a catchment settles out in the coastal marine area.
Site	Includes all NZ Steel landholdings in relation to the Steel Mill at Glenbrook, which includes the Steel Mill, industrial landfills and farming activities as well as the adjoining coastal esplanade strip owned by Auckland Council.
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 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.
Southside Outfall Structure	The outfall structure from the Southside Ponds to the Waiuku Estuary.
Steel Mill/Glenbrook Steel Mill	The integrated steel making facility in Glenbrook and ancillary activities on the Site.
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.
Substrate	The material that rests at the bottom of a body of water.
Taihiki Estuary	An estuarine side arm adjoining the lower Waiuku Estuary.
Total suspended solids (TSS)	The total amount of particulate matter that is suspended in the water column, that are not dissolved, that can be trapped by a filter.
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.
Water column	Column of water from the surface of a sea, river or lake to the bottom sediment.
West Landfill	NZ Steel's closed landfill located on the northern side of Brookside Road within the Site. This is subject to separate resource consents that are not within the scope of this replacement consents application.
Zone of Influence (ZOI)	The areas/resources that may be affected by the biophysical changes caused by the Proposal and associated activities.
Zone of reasonable mixing	The area within which 'reasonable mixing' of contaminants from discharges occurs in receiving waters and within which the relevant water quality standards do not apply. Refer also to "modelled mixing zone".

1 Introduction

1.1 Background

[Drafting note: This document is an indicative draft only and is provided as part of the consent application as an indication of the approach to be taken with respect to wetland management in the final wetland management plan, which will be prepared in accordance with the consent conditions of the consent for which application is sought**.]**

This draft Wetlands Management Plan (WMP) describes the voluntary management and monitoring practices and procedures to be implemented to provide for enhancement of stream-wetland complexes associated with the operations of New Zealand Steel's (NZ Steel) Steel Mill, located at Glenbrook, Auckland (Site).

NZ Steel holds resource consents [insert new consent reference following grant] (Consents) that authorise the discharge of stormwater and process water from the Steel Mill to three sub catchments of the Waiuku Estuary. The sub catchments include the North Stream Catchment (comprising the North Drain and Lower North Stream), the Ruakohua Stream and Kahawai Stream. All three sub catchments contain freshwater wetlands[1] which primarily comprise riparian wetlands that border defined stream channels and together form stream-wetland complexes.

In June 2021, NZ Steel applied for Resource Consents to replace the discharge permits that authorise the stormwater and process water discharges from the Steel Mill to freshwater and the Coastal Marine Area (CMA). In [insert date] those consents were granted subject to the following conditions with respect to wetlands: [Insert appropriate cross reference to the final granted consent conditions as they relate to wetlands.].

1.2 Purpose and scope

[**Drafting Note:** While NZ Steel's consent application is being processed, this WMP is a working draft which is intended to set out the practices and procedures that will be implemented by NZ Steel as required by anticipated consent conditions, in particular [proposed condition 21]. It is expected to be updated following consultation with Auckland Council and other relevant stakeholders and finalised following the grant of permits in the future and the finalisation of consent conditions.]

The Resource Consent contains conditions [x] that set out the requirements in relation to this management plan as follows:

[text of final resource consent conditions to be inserted]

The purpose of the WMP is therefore to describe the management and monitoring practices and procedures to be implemented by NZ Steel to provide for additional enhancement of wetlands.

The scope of this WMP is to outline:

- The importance and ecological significance of the stream-wetland complexes impacted by NZ Steel's discharges to water that are authorised by the Consents (Section 2).
- The context of the NZ Steel's discharges to water that are authorised by the Consent (Section 3).
- The freshwater wetland biodiversity enhancement proposed by NZ Steel (Section 4).
- The implementation, maintenance and monitoring programs that are proposed voluntarily to enhance stream-wetland complexes (Section 5).

[1] Any reference to wetlands with in this WMP is solely in regard to freshwater wetlands.

- The roles and responsibilities in relation to the management, monitoring and reporting requirements set out in the WMP (Section 6).

2 Importance of stream-wetland complexes

As part of NZ Steel's consent application, Tonkin & Taylor Ltd (T+T) ecologists identified several natural inland wetland habitat types within the North Stream, the Ruakohua Stream and Kahawai Stream catchments (T+T, 2024; **Appendix A**). The majority of these wetlands are considered to be riparian wetlands that border defined stream channels and together form stream-wetland complexes totalling approximately 2.36 ha (**Appendix A**). The ecological values of individual wetlands within the Lower North Stream, the Ruakohua Stream and Kahawai Stream catchments were assessed by T+T ecologists as '**Moderate'** or '**High'**. An overview of the observed wetland plants and avian habitat is provided below and a summary of ecological value for each of the identified wetlands is available in **Appendix B**.

2.1 Existing wetland plants

The wetlands identified in the three sub-catchments are generally comprised of exotic species, dominated by reed grass (*Phalaris arundinacea*), water celery (*Apium nodiflorum*), mercer grass (*Paspalum distichum*) and willow weed (*Persicaria sp*.). However, five smaller and higher value native-dominated wetland types were also present, and these were dominated by flax (*Phormium tenax*), raupō (*Typha orientalis*), rautahi (*Carex geminata*), or giant rush (e.g. *Juncus pallidus*). Of these native dominated wetlands raupō reedland and the giant rushland wetland are classified as regionally 'endangered' (i.e., WL 19 and WL 10 in Singers et al. 2017, respectively).

2.2 Avian habitat

The wetlands that are dominated by native vegetation, are also likely to support habitat for pūweto/spotless crake (*Zapornia tabuensis tabuensis*) due to the higher habitat complexity of these wetlands and the corresponding provision of foraging and nesting habitat. Pūweto are classified as 'At Risk – Declining' (Robertson *et al*., 2021). In addition, wetlands adjacent to the Coastal Marine Area (CMA)[2] are expected to provide suitable foraging and nesting habitat for the nationally 'At Risk – Declining' mioweka /banded rail (*Gallirallus philippensis assimilis*) (Robertson *et al*. 2021)). Both species are listed as specified highly mobile fauna under the National Policy Statement for Indigenous Biodiversity (NPSIB; Ministry for the Environment, 2023).

The following section outlines why voluntary wetland enhancement was proposed in the NZ Steel 2021 Resource Consent Application.

3 Context: NZ Steel's effects on stream – wetland complexes

All wetlands in the North Stream Catchment receive the Dewatering Plant and ITA stormwater discharges. The Ruakohua Stream catchment will be subject to ITA stormwater discharges and the Ruakohua Stream lower catchment also receives discharges from NZ Steel's Waikato River water supply pipeline (separately consented) for use at the Site. Wetlands in the Kahawai Stream catchment may be subject to future ITA discharges.

3.1 Discharge contaminants

In relation to the North Stream Catchment wetlands, the Dewatering Plant discharges contain aluminium, copper and total suspended solids concentrations and conductivity levels that could

[2] Note: Management of coastal birds is addressed in the Coastal Bird Management Plan (T+T, 2024)

have direct effects on wetland plants and invertebrates and potential indirect effects on wetland birds (through bioaccumulation).

Elevated conductivity is primarily due to brackish (saline) water present in the Dewatering Plant discharge, due to the point at which Waikato River water is abstracted at the Waikato North Head mine. The concentrations are likely to prevent the establishment of salinity-sensitive wetland plants and macroinvertebrates in the North Stream Catchment wetlands.

ITA stormwater discharges contain aluminium, copper, cadmium, and lead concentrations, and in several instances exceed relevant Australia and New Zealand Guidelines for Fresh and Marine Water Quality (ANZWQG, 2018) for freshwater species. Correspondingly, ITA stormwater discharges have the potential to adversely affect wetland biodiversity within the Receiving Environment wetlands (in the North Stream, Kahawai Stream and Ruakohua Stream catchments).

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. It is currently in the feasibility stage of plans to construct and operate an EAF within the existing Steel Plant facility, but the Consents authorise its future operation. Under the EAF-operating scenario, with proposed controls and treatment, the ITA discharges related to the operation of the EAF are not expected to increase the contaminant loads to the North Drain or impact on existing water quality in the North Stream Catchment Receiving Environment. However, the EAF will result in the Dewatering Plant discharge decreasing by approximately 50 % (both in operational time and discharge volume)[3].

The freshwater Ecological Impact Assessment (EcIA; T+T (2024); Appendix H of the AEE) concluded that the EAF would not affect the above magnitude of effect assessments.

3.2 Assessment of effects

Overall, the freshwater EcIA (T+T (2024); Appendix H of the AEE) concluded that there was a **'Low'** overall level of effects on wetlands associated with Dewatering Plant and ITA stormwater discharges into the North Stream. Similarly, the ITA stormwater discharges into the Ruakohua Stream Catchments and any future ITA stormwater discharges into the Kahawai Stream were also assessed as **'Low'**.

Although the overall level of effects is assessed as **'Low'**, NZ Steel has elected to undertake voluntary enhancement measures to provide positive ecological outcomes for wetlands and associated indigenous biodiversity. It is considered that the implementation of the methods outlined within this WMP will ensure that additional enhancement measures will be successful in achieving overall positive outcomes for freshwater wetlands.

4 Proposed freshwater wetland biodiversity enhancement

This section provides an overview of the type of measures proposed to provide for voluntary enhancement of freshwater wetland values at the Site.

The key focus of the WMP is to outline the implementation, methods and monitoring proposed to enhance wetlands within NZ steel landholdings.

The proposed management and monitoring practices and procedures to be implemented by NZ Steel to enhance wetland biodiversity outcomes are outlined below. The proposed type and

[3] The Dewatering Plant is the primary source of flow to the North Drain and Lower North Stream. The discharge volume when the EAF is operating may result in the Dewatering Plant contributing approximately 40 % of total stream flow to the Lower North Stream at the stream mouth, -compared to about a current rate of 80% without an operative EAF.

area/quantum of each measure has been determined through an assessment of potential wetland areas available for enhancement.

4.1 Proposed wetland enhancement

[**Drafting note:** The below are indicative enhancement actions that may each individually or collectively be proposed and outlined in the final management plan. They are included in this draft management plan as a guide to illustrate the nature and type of enhancement measures that NZ Steel is likely to propose in the final management plan but alternative proposals may be included.

To enhance freshwater wetland ecological values within the NZ Steel landholdings, selective native wetland plantings and wetland margin buffer plantings will be undertaken in locations where ecological enhancement is expected to be most effective.

Native wetland plantings consist of planting into wetland soils to improve wetland biodiversity. Native wetland margin buffer plantings incorporate terrestrial plantings along wetland margins to buffer wetlands from surrounding land use activities.

The following outcomes are expected from the proposed enhancement measures:

- Improved water quality through shading and a reduced runoff from surrounding horticultural and farming land use practices through wetland margin plantings.
- Increased diversity and abundance of indigenous wetland and terrestrial plants and associated wetland and terrestrial biodiversity through native wetland and wetland margin plantings.

Figure 4.1: Placeholder location for representative photos that show native wetlands plantings and native wetland margin buffer plantings

5 Enhancement management

Enhancement actions described above require varying degrees of maintenance and monitoring to be completed to ensure that these actions are implemented successfully. Implementation, maintenance, and monitoring methods for these actions are described in Sections 5.1 to 5.3 below.

5.1 Implementation

5.1.1 Site selection

[Drafting note: As this is a Draft WMP, confirmation on the exact size and location of plantings will be established by NZ Steel, confirmed in accordance with consent conditions. (with additional engagement with other relevant stakeholders)].

This Draft WMP has identified the high value stream – wetland complexes associated with the Lower North Stream as the target area for enhancement plantings. This includes the native flax wetland and the native raupō wetland (**Appendix A1**). Both the native enhancement plantings and wetland margin plantings will be targeted to improve the health of indigenous wetland biodiversity values.

5.1.2 Selection and supervision of planting team

[Placeholder: This section of the management plan is to be completed when procurement/tender documents are being finalised for a contractor. Any contractors that are to undertake site preparation works (including pest plant and animal control and fencing) or planting implementation must have the appropriate certifications and operates in accordance with best practice methods. Any weed control within and adjacent to waterways will be completed by a person who holds the required professional contractors licence to undertake the work**]**

5.1.3 Site preparation

5.1.3.1 Initial plant-pest control

Woody pest plant species will need to be removed at least four months prior to any restoration planting being undertaken. The removal of pest plants will reduce pressure on the restoration planting ensuring plants do not need to compete for light, water, and nutrients.

Within the wider enhancement planting area (e.g., **Appendix A, Figure A1**) all woody and herbaceous pest plants identified are to be manually controlled, removed from site, and disposed of responsibly. Where practicable and if necessary, pasture grasses along the wetland margins are to be mown prior to planting and the grass left for mulching.

On the drier areas, woody pest plant species are to be controlled by cutting the plant as close to the ground and treating the cut with herbicide gel or paste. Stumps are not to be removed from site to prevent soil disturbance and associated bank destabilisation. If gorse is identified on site, it will be controlled using the above cut and paste methodology to provide space for the restoration planting.

Pest plants within the wetlands and surrounding areas may potentially provide bird breeding habitat during peak bird breeding season (September to January). Native birds are protected under the Wildlife Act 1953 and vegetation clearance within the wetland of woody vegetation will be avoided during peak bird breeding season.

5.1.3.2 Initial animal-pest control

Pest animal control will be conducted in line with NZ Steel's existing and ongoing work programme and contractors. This is likely to be reviewed and modified to ensure appropriate animal pest control for the new plantings for up to 5 years.

5.1.3.3 Fencing

Where fencing doesn't already exist, a stock proof fence will be installed around the perimeter of the native wetland margin buffer plantings to exclude any current or future stock access. A gap of at least 1 m will be left between the plantings and the fence to prevent browsing by stock, or an electric wire installed to prevent animal browsing of the plantings. The fence shall be inspected every six months for the first three years and repaired or replaced as required. To maintain the outcomes of the enhancement measures any planting areas will remain fenced off from stock (and maintained) with a 1 m buffer.

5.1.4 Planting implementation specifications

5.1.4.1 Plant stock and schedule

[Drafting note: A detailed planting schedule is to be developed for the enhancement plantings by a suitably qualified wetland specialist. This will include details on plant name (common and scientific name), plant spacing, plant grade, and plant density (as a proportion of native wetland and wetland margin buffer plantings)**]**.

Where practicable, species planted are to be eco-sourced from the Manukau Ecological District (Manukau ED), preferably from a nearby source. Native plants grown from seeds collected within the region are likely adapted to the climate and will generally do better. Depending on stock availability, some species changes may be required during planting. Any changes should be recorded to enable successful monitoring of the planting.

Optimal planting stock will be planted which has the following characteristics:

- Healthy, vigorous, and free from obvious signs of disease and pests.
- Of at least average size for the specified pot, planter bag size (i.e. PB).
- Well-developed root system with a high amount of new root growth.
- Not root bound.
- Well-branched and symmetrically shaped.

5.1.4.2 Planting hygiene to minimise risk of myrtle rust

Myrtle rust (*Austropuccinia psidii*) is a fungal disease that attacks plants of the Myrtaceae family. Mānuka (*Leptospermum scoparium*) and kānuka (*Kunzea ericoides*) derive from the Myrtaceae family and are proposed in the planting mix.

To reduce the risk of spreading myrtle rust, contractors must follow standard procedures set out by the New Zealand Plant Producers Incorporated (NZPPI) Biosecurity Declaration – Myrtle Rust Registration Process when sourcing plants from nurseries. A copy of this signed declaration certifying that the plant producer has implemented the Myrtle Rust Management Protocol must be provided by NZ Steel to Auckland Council, within three days of being obtained. Written confirmation and approval (letter or email) from Auckland Council must be obtained before the plants are delivered to the enhancement site.

Further, the following hygiene protocol is recommended to prevent the spread of the disease:

a Clean and sterilize earthwork machinery before entering and on leaving the site with Virkon S (or equivalent).

b Disinfect all items, such as spades, that can be surfaced wiped or dipped in disinfectant solutions using Virkon S (or equivalent) before starting work and after.

c Allow access to the planting area(s) only to staff.

d Make sure staff wash hands before starting to plant and after breaks using a recognized hand sanitation product.

e Raise staff awareness about myrtle rust and compliance with the above procedures.

5.1.4.3 Post-planting inspection

Records of how planting was undertaken are to be collected and measured against the specifications outlined in the above sections and Section 5.1.4. The project wetland ecologist is to observe planting and assess against these specifications and assess the health of plant stock during the planting period at each area.

5.1.5 Installing photo-monitoring locations

[Drafting note: The exact photo-monitoring location will be confirmed by a suitably qualified wetland ecologist and NZ Steel prior to installation occurring.**]**

Photo monitoring location(s) are to be established to monitor the enhancement plantings over time. Section 5.3.1.1 provides details on the intent of monitoring and the following section outlines how the photo monitoring location(s) are to be installed.

Photo location(s) consist of a wooden or metal rod installed in one point from where consistent photos can be taken and changes in vegetation are recorded. Each photo point will be recorded with GPS coordinates and visibly marked in the field (i.e. coloured rod). The number and directions (given in degrees (°) with due north being 0°/360°) of photographs to be taken from each location over multiple years is yet to be formalised.

5.1.6 Timeframe for implementation

A timeframe for undertaking the implementation programme is provided in **Table 5.2**.

5.2 Methodology

5.2.1 Planting specifications

The following sections outline the planting specifications that are to be followed when undertaking the required enhancement plantings.

5.2.2 Timing of planting

Timing of the planting will occur during the following periods:

a Native enrichment planting into wetland soils will be undertaken in late summer/early autumn (March-April inclusive) so all plants can establish before wet weather may cause flooding and damage.

b Native wetland margin buffer planting will be undertaken between April to June to allow the plants to establish before the drier summer months.

5.2.3 Planting methodology

Plants will be laid out as per the spacing requirements provided in the plant schedule prepared in Section 5.1.4.1.

For each plant, a hole will be dug deep enough so the plant collar is approximately 1 cm below ground level, and wide enough so the roots can be appropriately covered by soil. The soil on the bottom of the hole will be loosened to allow easy root penetration. Prior to planting, any grass or other remaining vegetation will be cleared away (to approximately 50 cm from circumference of hole), from each planting hole reducing competition for nutrients and light.

The plant will be planted, along with a fertiliser tablet, in the ground by filling the space surrounding the root ball with soil and lightly press the soil to fill any voids which may otherwise become waterlogged. For maintenance and monitoring purposes each plant is to be marked with a bamboo stake.

Enhancement plantings in rural settings are likely to be impacted by hares, rabbits and pukeko. Browsing damage will be prevented by full implementation of an animal pest control program prior to planting (as outlined above) and for at least 5 years post planting. However, in the first instance, utilising planting biodegradable sleeves/shields around the stems of each woody plant will aide in

reducing any browser damage from pest species. The sleeves are to be used as recommended by the manufacturer and will be removed manually if they do not decompose over time to avoid collaring effects.

5.2.4 Planting maintenance

5.2.4.1 Infill planting

Plants that do not survive are to be replaced with the same species from the planting schedule in the following planting seasons (March - April inclusive for native enrichment planting and April to June inclusive for the wetland margin buffer plants). In some instances, a consulting ecologist, who may be engaged by NZ Steel, may determine that a change in species is acceptable, and any change to the planting schedule is to be recorded.

5.2.4.2 Ongoing pest plant control and inspection monitoring

To ensure the native enhancement planting establishes well, long-term pest plant control and inspection monitoring is required. It is proposed to continue post planting maintenance and inspections in spring (September/October) and autumn (February/March) every six months within the first five years of planting to ensure the planting is establishing successfully.

NZ Steel is to schedule for replacement of any dead plants in the following planting season (following the methods Section 5.2.4)

Where native enrichment planting into wetland soils occurs pest plants can be controlled manually, including the release of native plants from surrounding pest plants using hand pulling techniques. Pest plants other than pasture grasses are to be securely bagged and disposed of at an appropriate location. Cut or pulled pasture grasses can be used to mulch around the plantings reducing plant growth around the plants leaving at least a 10 cm distance around the plant base free.

Within the native wetland margin buffer plantings, pest plants can be controlled with herbicides. However, in the first instance native plants will be manually released from surrounding pest plants prior to applying herbicide to reduce the risk of spray damage to the enhancement planting.

5.2.5 Timeframe for planting and maintenance programme

A timeframe for undertaking the planting and maintenance programme is provided in **Table 5.2**.

5.3 Monitoring

Monitoring may be undertaken to confirm whether the wetland enhancement actions have been successful. Any monitoring of the wetland enhancement area will be undertaken under the supervision of a suitably qualified wetland ecologist.

A timeframe for undertaking the monitoring programme is provided in **Table 5.2**

5.3.1 Wetland biodiversity condition monitoring

5.3.1.1 Photo monitoring

A photographic record is to be undertaken of:

1 The existing wetland quality and extent prior to the commencement of any enhancement works.

2 Following completion of wetland enhancement planting for the specified monitoring period.

To this end, any photo points will be established at multiple locations throughout the stream wetland complexes per the implementation methodology described in Section 5.1.5.

Photo monitoring will be undertaken by NZ Steel prior to planting (to obtain a baseline) and may continue after the restoration planting is completed.

5.3.1.2 Wetland bird survey methodology

NZ Steel may undertake voluntary wetland bird survey(s). If undertaken, the details will be confirmed, however; they may be based on the following methodology.

NZ Steel would engage a suitably qualified ornithologist to undertake bird surveys:

1 Before enhancement plantings (to determine a baseline); and

2 Post enhancement survey (possibly at years 3, 5 and/or 10 after planting completion).

The purpose of these surveys is to determine if wetland birds have returned to the area.

Cryptic wetland birds (i.e. pūweto and mioweka) would be surveyed using Automatic Recording Devices (ARD's), playback surveys and listening stations as described below. This work will build on the extensive bird survey work undertaken for the Assessment of Effects on the Environment (AEE) and the Coastal Bird Management Plan (CBMP) - currently in draft.

Wetland bird surveys would include targeting wetlands within or near to the proposed enhancement wetland areas. Targeted dawn and dusk field surveys would be undertaken in conjunction with the deployment of ARD's across the identified wetland areas in the Lower North Stream.

Wetlands selected for targeted wetland bird surveys are those that provide potential habitat for pūweto and mioweka. Wetland habitats to be targeted include those dominated by flax, raupō, rautahi, giant rush, and those adjacent to the CMA (**Appendix A, Figure A1**). These habitats are expected to provide suitable foraging and nesting habitat for pūweto and mioweka.

5.3.1.3 Automatic recording devices (ARDs)

ARDs could be deployed at each wetland identified as an enhancement site during the wetland bird breeding season (**Table 5.1**). ARDs would be programmed to record at dawn and dusk - one hour before sunrise to two hours after sunrise, and 1 hour before sunset to two hours after sunset.

Table 5.1: Pūweto and mioweka breeding season (grey shaded boxes)

Species name	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
pūweto												
mioweka												

5.3.1.3.1 Playback surveys and listening stations

Playback surveys targeting pūweto and mioweka may be undertaken during fine weather in early November and commence 30 minutes before sunrise to an hour after sunrise, and 2 hours before sunset to 30 minutes after sunset. Enhancement sites which have appropriate habitat for wetland birds may have two dawn surveys completed to determine bird presence.

During deployment and retrieval of ARDs additional opportunistic playback surveys may be undertaken targeting pūweto and mioweka.

Where multiple bird call responses are received from the same approximate location, it will be assumed that one individual is present.

5.4 Summary and timeline of actions

This WMP sets out the voluntary enhancement measures NZ Steel propose to undertake and the associated monitoring that may be undertaken.

Table 5.2 provides an indicative draft schedule of works including site preparation, pest animal control, fencing, restoration planting and any monitoring which may be completed.

Table 5.2: Indicative draft schedule of works

Year 1 Actions	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Installation of photo points												
Photo monitoring pre-enhancement												
Site preparation: Plant pest control												
Site preparation: Animal pest control												
Year 2 Actions	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Photo monitoring pre-enhancement												
Site preparation: Plant pest control												
Site preparation: Animal pest control												
Fencing: including inspections and maintenance												
Plantings: Native enhancement												
Plantings: Native wetland buffer												
Maintenance: ongoing pest plant control												
Maintenance – pest animals												
Potential monitoring - post enhancement photo and avian monitoring												
Year 3 + Actions	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Maintenance: ongoing pest plant control												
Maintenance – pest animals												
Planting maintenance: Infill planting												
Potential monitoring - post enhancement photo and avian monitoring												

Note: Light green coloured fields mark a potential earlier start or extension in works.

5.5 Reporting

A report shall be prepared by NZ Steel, with input from a suitable qualified specialist as required. The report shall summarise the enhancement measures undertaken, and any monitoring completed at 5 and 10 years since the completion of planting. The report may include the following:

- A description of the type of enhancement planting activities undertaken, this may include maps confirming aerial extent and location of enhancement.
- Overview of the maintenance completed to control pest plant species and whether infill planting was undertaken (this shall include a description of the extent, type, and location of infill planting completed).
- A summary of the monitoring results undertaken in accordance with Section 5.3.1.
- Recommendations for future improvements or changes to the maintenance and monitoring program.

5.6 Implementing changes to the WMP

Prior to implementing any changes to this WMP, NZ Steel will advise Auckland Council in writing. The rationale behind any changes made must be consistent with the conditions of the Consents, best practice management techniques, and enhancement outcomes identified in this plan.

6 Roles and responsibilities

NZ Steel is responsible for the implementation of all required management, monitoring and reporting requirements set out in the WMP.

It is anticipated that NZ Steel will engage a suitably qualified wetland ecologist to oversee the implementation works associated with enhancement measures.

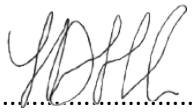
7 Applicability

This report has been prepared for the exclusive use of our client New Zealand Steel, with respect to the particular brief given to us and 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 this report will be used by Auckland Council in undertaking its regulatory functions in connection with the operation of the Steel Mill.

Tonkin & Taylor Ltd
Environmental and Engineering Consultants

Report prepared by:



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Sam Heggie-Gracie
Ecology Consultant

Authorised for Tonkin & Taylor Ltd by:

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Jenny Simpson
Project Director

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Patrick Lees

Freshwater Ecologist

Technical review by Dr Matt Baber, Consultant Ecologist

PALE
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Appendix A Wetland location

A1 Lower North Stream wetland complexes

LEGEND

- Site
- Watercourse
- Tributary
- Exotic Dominated Wetland
- Giant Rush Wetland
- Flax Wetland
- Raupō Wetland

Lower North Stream Giant Rush

Lower North Stream Native Raupō Wetland

Lower North Stream Native Flax Wetland

Lower North Stream Exotic Wetland 1

Lower North Stream Exotic Wetland 2

Lower North Stream Exotic Wetland 3

Lower North Stream Exotic Wetland 4

North Stream Trib

Lower North Stream

A3 SCALE 1:2,500

0 20 40 60 80 100 m

LOCATION PLAN

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Exceptional thinking together

NOTES:

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

REV	DESCRIPTION	GIS	CHK	DATE
0	First Version	ANTH	JORB	28/06/21

PROJECT No.	1010577	
DESIGNED	ANTH	JUN. 21
DRAWN	ANTH	JUN. 21
CHECKED	JORB	JUN. 21

APPROVED DATE

CLIENT **NZ STEEL**

PROJECT **RECONSENTING GLENBROOK STEEL MILL**

TITLE WETLAND COMPLEXES 1

SCALE (A3) 1:2,500 FIG No. FIGURE W-FWE3 REV 0

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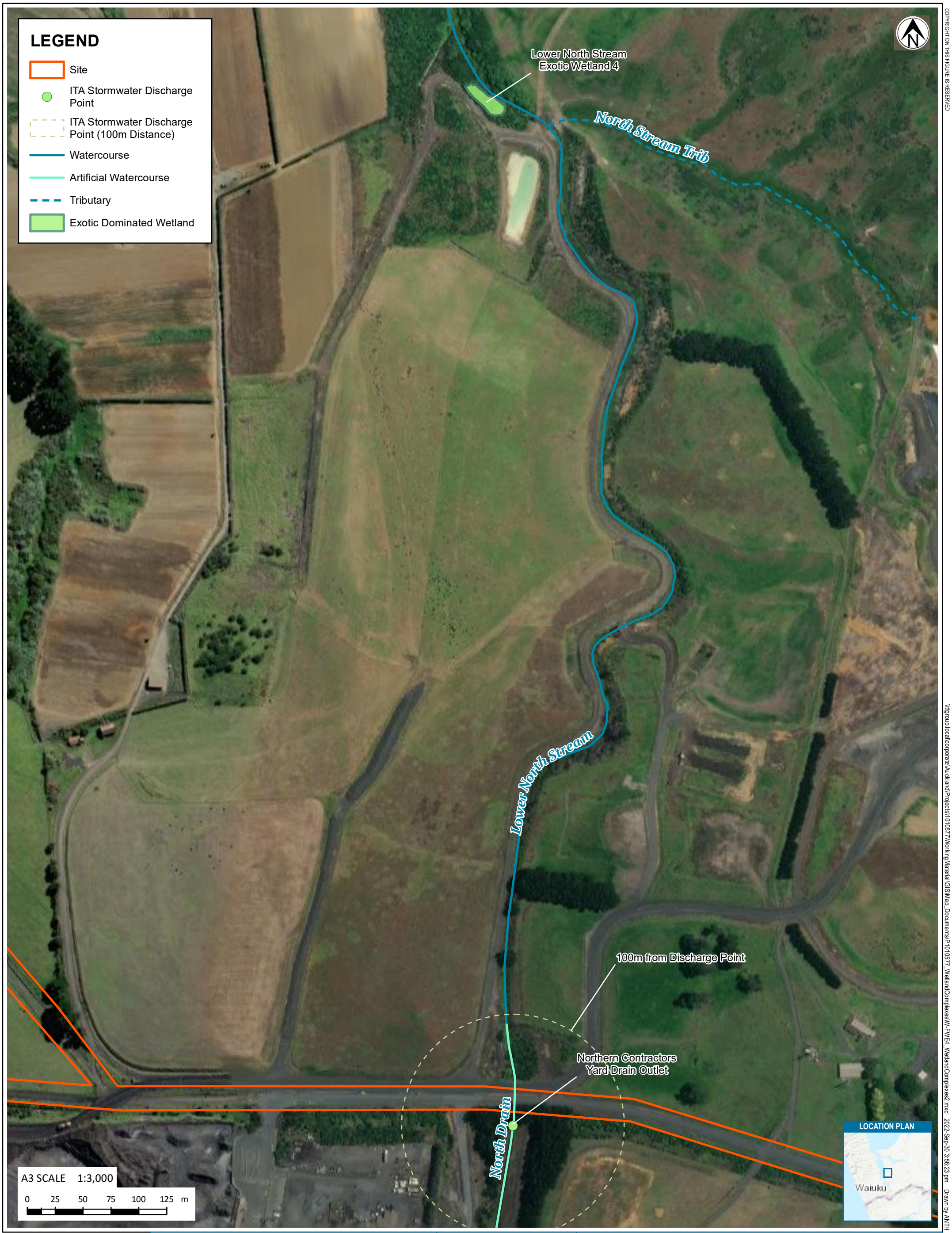

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World Imagery: Maxar

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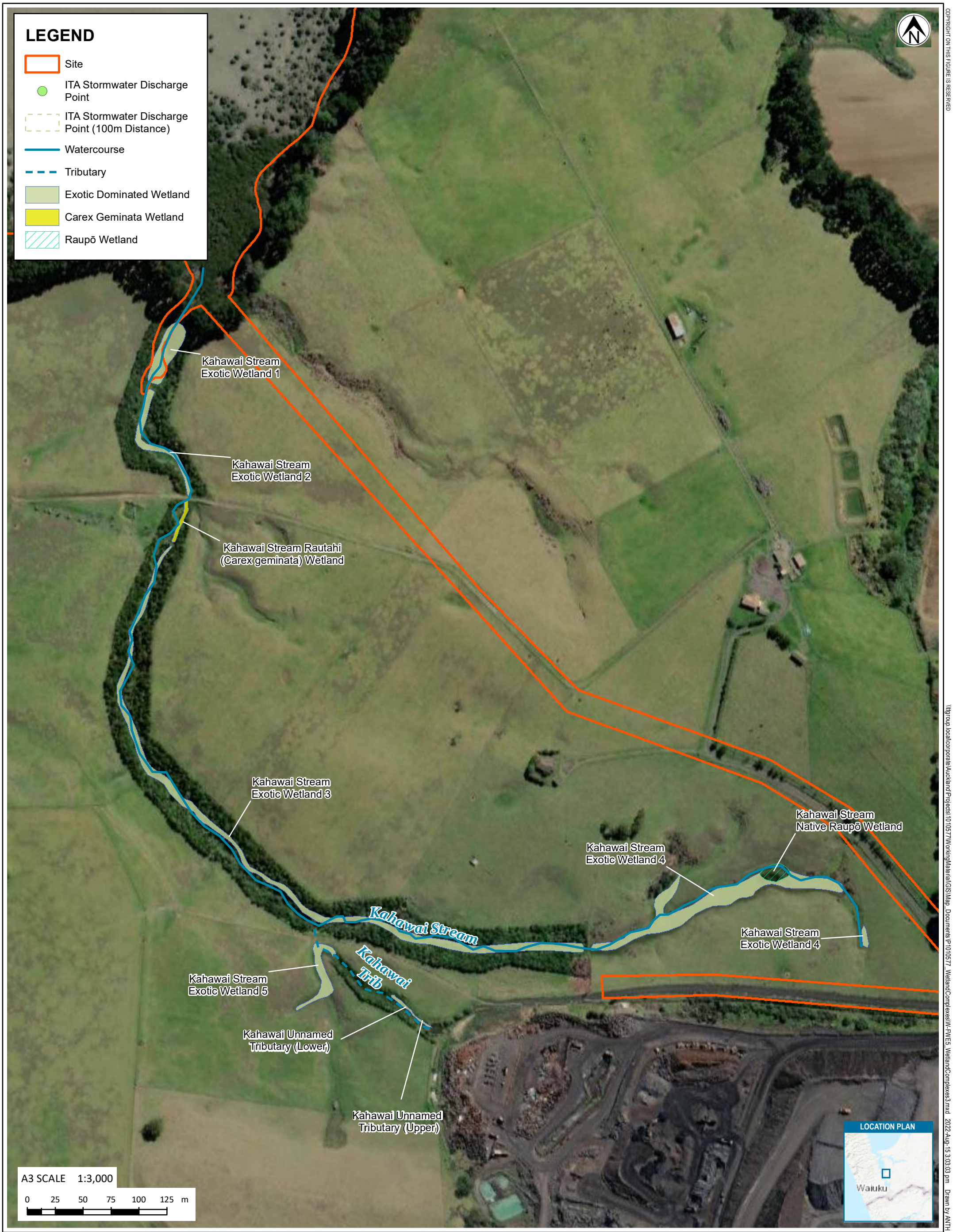
CLIENT **NZ STEEL**
PROJECT **RECONSENTING GLENBROOK STEEL MILL**
TITLE WETLAND COMPLEXES 2
SCALE (A3) 1:3,000 FIG No. FIGURE W-FWE4 REV 0

A2 Kahawai Stream wetland complexes



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CLIENT **NZ STEEL**
PROJECT **RECONSENTING GLENBROOK STEEL MILL**
TITLE WETLAND COMPLEXES 3
SCALE (A3) 1:3,000 FIG No. FIGURE W-FWE5 REV 0

A3 Ruakohua Stream wetland complexes

LEGEND

- Site
- ITA Stormwater Discharge Point
- ITA Stormwater Discharge Point (100m Distance)
- Watercourse
- Tributary
- Exotic Dominated Wetland

N

Ruakohua Stream

Contractors Compound Outlet

Ruakohua Stream Exotic Wetland 1

100m from Discharge Point

Ruakohua Stream Exotic Wetland 2

Ruakohua Stream Exotic Wetland 3

Yard 31 Outlet

Ruakohua Trib

100m from Discharge Point

A3 SCALE 1:2,500

0 20 40 60 80 100 m

LOCATION PLAN

Waiuku

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World Imagery: Maxar

REV	DESCRIPTION	GIS	CHK	DATE
0	First Version	ANTH	JORB	28/06/21

PROJECT No.	1010577	
DESIGNED	ANTH	JUN. 21
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CHECKED	JORB	JUN. 21

APPROVED DATE

CLIENT **NZ STEEL**

PROJECT **RECONSENTING GLENBROOK STEEL MILL**

TITLE WETLAND COMPLEXES 4

SCALE (A3) 1:2,500 FIG No. FIGURE W-FWE6 REV 0

Appendix B Summary of ecological values of wetlands

Wetland name	Ecological value description	EcIAG value
Lower North stream: Exotic Wetland 1	Low for representativeness, high for rarity and distinctiveness due to likely presence of At-Risk fauna, moderate for diversity and pattern because 4 native species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. One high, two moderate and one low equates to high overall value.	High
Lower North Stream Giant rush Wetland	Moderate for representativeness, high for rarity and distinctiveness due to likely presence of At-Risk fauna, moderate for diversity and pattern because native species are dominant and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. One high, and three moderate scores equates to a high overall value.	High
Lower North Stream Native Raupō Wetland	High for representativeness, high for rarity and distinctiveness due to likely presence of At-Risk fauna and regional threat status of raupō wetlands, moderate for diversity and pattern because native species are dominant and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Two high, and two moderate scores equates to a High overall value.	High
Lower North Stream: Exotic Wetland 2	Low for representativeness, high for rarity and distinctiveness due to likely presence of At-Risk fauna, Low for diversity and pattern because non-native species are dominant and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. One high, one moderate and two low sub-criteria scores equates to a moderate overall value.	Moderate
Lower North Stream Native Flax Wetland	Moderate for representativeness, high for rarity and distinctiveness due to likely presence of At-Risk fauna, moderate for diversity and pattern because native species are dominant and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. One high, and three moderate scores equates to a high overall value.	High
Lower North Stream: Exotic Wetland 3	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, Moderate for diversity and pattern because native species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Three moderate and one Low sub-criteria scores equates to a moderate overall value.	Moderate

Wetland name	Ecological value description	EcIAG value
Lower North Stream: Exotic Wetland 4	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, Low for diversity and pattern because no native plant species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Two moderate and two Low sub-criteria scores equates to a moderate overall value.	Moderate
Kahawai Stream: Exotic Wetland 1	Moderate for representativeness, high for rarity and distinctiveness due to likely presence of At-Risk species, moderate for diversity and pattern because five native species are present and moderate for ecological context due to buffering, ecological connectivity and ecological function values. One high and three moderates equate to a high overall value.	High
Kahawai Stream: Exotic Wetland 2	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, moderate for diversity and pattern because four native species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Three moderate and one Low sub criteria score equates to a moderate overall value.	Moderate
Kahawai Stream: Rautahi (*Carex geminata*) Wetland	Moderate for representativeness, high for rarity and distinctiveness due to likely presence of At-Risk fauna, moderate for diversity and pattern because native species are dominant and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. One high, and three moderate scores equates to a high overall value.	High
Kahawai Stream: Exotic Wetland 3	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, moderate for diversity and pattern because native species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Three moderate and one Low sub criteria score equates to a moderate overall value.	Moderate
Kahawai Stream: Exotic Wetland 4	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, moderate for diversity and pattern because native species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Three moderate and one Low sub criteria score equates to a moderate overall value.	Moderate
Kahawai Stream: Exotic Wetland 5	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, moderate for diversity and pattern because native species are present and moderate for ecological context due to buffering,	Moderate

Wetland name	Ecological value description	EcIAG value
	ecological connectivity, and ecological function values. Three moderate and one Low sub criteria score equates to a moderate overall value.	
Kahawai Stream: Native Raupō Wetland	Moderate for representativeness, high for rarity and distinctiveness due to likely presence of At-Risk species and regional threat status of raupō wetlands, moderate for diversity and pattern because native species are dominant and moderate for ecological context due to buffering, ecological connectivity and ecological function values. One high, and three moderate scores equates to a high overall value.	High
Kahawai Unnamed Tributary (Upper)	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, moderate for diversity and pattern because native species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Three moderate and one Low sub criteria score equates to a moderate overall value.	Moderate
Kahawai Unnamed Tributary (Lower)	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, moderate for diversity and pattern because native species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Three moderate and one Low sub criteria score equates to a moderate overall value.	Moderate
Ruakohua Stream: Exotic Wetland 1	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, moderate for diversity and pattern because native species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Three moderate and one Low sub criteria score equates to a moderate overall value.	Moderate
Ruakohua Stream: Exotic Wetland 2	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, moderate for diversity and pattern because native species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Three moderate and one Low sub criteria score equates to a moderate overall value.	Moderate
Ruakohua Stream: Exotic Wetland 3	Low for representativeness, moderate for rarity and distinctiveness due to the overall threat status of wetlands, moderate for diversity and pattern because native species are present and moderate for ecological context due to buffering, ecological connectivity, and ecological function values. Three moderate and one Low sub criteria score equates to a moderate overall value.	Moderate

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