MITCHELL DAYSH

ravensdown

RAVENSDOWN LIMITED

NAPIER WORKS SUSTAINABLE SITE PROJECT

Resource Consent Applications and Assessment of Environmental Effects

29 November 2021

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REPORT INFORMATION

Report Status	Final
Our Reference	MDL001040
File Location	Napier
Authors	Anita Anderson
Review By	Stephen Daysh

PREAMBLE

INTRODUCTION

This application is about setting up the Ravensdown Napier Works for sustainable operations over the next 35 years, based on future-focused environmental outcomes.

The Napier Works is the largest superphosphate manufacturing facility in New Zealand. As such it is a major physical resource for the New Zealand agricultural sector which must be sustainably managed for the future.

Fertiliser has been manufactured by the Napier Works since 1953 and the building, plant and equipment have an assessed replacement value of approximately $242 million. The Napier Works is a prominent and major industry in the Hawke's Bay area, making important employment and economic contributions.

Ravensdown Limited ("**Ravensdown**") has a strong commitment to ensuring that all aspects of its business are undertaken in a sustainable way. In line with that commitment, this application will ensure that Ravensdown's industrial manufacturing processes are undertaken in a way that minimise adverse effects on the receiving environment.

In addition, in consultation with mana whenua and other stakeholders, Ravensdown is proposing with this application to undertake a major wetland restoration project in an area adjacent to the Napier Works that will greatly enhance the ecological and cultural values of the wetland. This Habitat Abundance Restoration Project ("**HARP**") is an important positive effect of the overall proposal and its establishment and ongoing care, and maintenance will be made possible by the granting of 35-year consents.

Fertilisers are an important input into New Zealand's agricultural sector. Used wisely they greatly assist New Zealand's ability to produce primary products, which underpin our economy. This application focusses on consideration of the effects of the manufacturing of superphosphate at the Napier Works.

The application specifically does not address the end use of fertiliser and the management of adverse effects from the application of fertiliser to land. That activity is managed and controlled under other RMA processes. No resource consents are being sought by Ravensdown to authorise that activity as part of this proposal.

Air Discharges

Discharges of contaminants to air are a consequence of the industrial processes undertaken at Napier Works associated with the manufacture of sulphuric acid and superphosphate.

Over the last two decades Ravensdown has invested in process efficiencies and improvements resulting in large reductions in the volume of contaminants that enter the

receiving air environment. There has been a corresponding reduction in potential adverse effects to the point where adverse effects of discharges to air (assessed by reference to amenity, human health, and vegetation effects) are minor.

A recently consented variation to the existing air discharge permit (granted by Hawke's Bay Regional Council ("**HBRC**") in July 2021) will enable a further reduction in the volume of contaminants released by combining multiple stacks in the manufacturing operation into one combined higher stack with a new scrubber system. In addition, Ravensdown proposes to replace the existing Acid Plant Converter Tower which is approaching the end of its life cycle. Both pieces of work have been budgeted by Ravensdown as capital items at an approximate cost of $30 million and are scheduled to be completed in 2023.

As set out in the Air Discharge Strategy – *Ravensdown (November 2021a),* Ravensdown will further minimise the discharge of contaminants to air from the Napier Works over the life of a new air discharge permit to the greatest extent practicable. This will involve:

- The use of appropriate technology and best practice management to minimize discharges of contaminants from the acid and fertiliser manufacturing processes; and
- Good Enhanced site management practices to further reduce fugitive emissions to air.

External independent review of the Napier Works' performance confirms that with the planned upgrades the plant will be operating in line with best international practice.

As a further sustainability measure and to ensure the plant continues to utilise best international practice, Ravensdown is proffering strong and effective review conditions that will ensure the discharges to air from the Napier Works are maintained in line with that high standard over the 35-year life of the new resource consents.

Stormwater/Process Water Discharges

Ravensdown currently discharges treated stormwater collected from the Napier Works and process water to the blind arm of the Tūtaekurī River via the Ravensdown Drain, and from there to the Waitangi Estuary, and eventually to the ocean.

Understanding the contribution that the discharge by Ravensdown makes to the overall quality of the Blind Arm is complex because of the confounding influence of other stormwater and industrial discharges in the area. Detailed independent assessment has nevertheless concluded the adverse ecological effects of the current Ravensdown discharge are minor.

While the assessed effects of the existing discharge are minor, Ravensdown accepts that there is a strong cultural and community preference for discharges to be directed to land rather than water wherever possible. Ravensdown also appreciates the increasing drive to improve the quality of the water in our rivers and estuaries that is being driven at both national (via the National Policy Statement for Freshwater Management ("**NPS-FW**") and

regional levels (via the proposed Plan Change 9 - TANK (Tūtaekurī, Ahuriri, Ngaruroro, Karamu) Catchment Plan ("**TANK**").

Ravensdown has actively sought early stakeholder input and advice on a "blank sheet" basis in assessing alternative water treatment and discharge alternatives for the Site. This open and inclusive process was undertaken for a number of reasons - to satisfy the provisions of section 105 of the Resource Management Act 1991 ("**RMA**"), to build community relationships, and to respond to the community's long-term expectations.

The development of alternatives was undertaken by a specially constituted stakeholder forum, supported by Ravensdown's planning, engineering and science team called the Technical Focus Group ("**TFG**"). The multi-criteria decision analysis ("**MCDA**") undertaken by the TFG has recommended a preferential land-based treated water discharge proposal, which Ravensdown has agreed to advance in these replacement resource consent applications.

The outcome of these investigations and consultation is that discharge of treated water will primarily be to land owned by Ravensdown via irrigation with an associated crop cut and carry operation. It is proposed that the animal feed generated from this process is planned to be supplied as free drought relief feed for "at need" regions, as and when necessary.

When soil and weather conditions do not allow irrigation to land, discharge of the treated water will be into the HARP wetland area which will be created as part of an Adaptive Management Plan – *Ravensdown (November 2021d)*. Prior to the full establishment of the HARP Wetland in Years 1 and 2, any discharge needed to the Waitangi Estuary area will be via the existing system to the Blind Arm of the Tūtaekurī River, with a condition requiring that this takes place within three hours either side of high tide to take advantage of times of higher and more rapid dilution.

To ensure that the treated water which is either discharged to land via irrigation, or which reaches the Waitangi Estuary area has low levels of contaminants consistent with the expectations of the NPS-FW and TANK Plan Change, Ravensdown is committing in this application to a staged and adaptive approach to achieve the TANK Plan Change standards within 6 years of commencement of the new consent.

Within 18 months of consent commencement Ravensdown proposes to install and commission a clarifier (and associated holding pond) and bioretention device. These Stage 1 works are expected to significantly improve the pre-discharge quality of water from the Site. The effectiveness of the Stage 1 works on the discharge water quality will be closely monitored to inform the detailed design of Stage 2 works which are likely to include a new settling and discharge pond, as well as a constructed wetland.

The Stage 2 works will be implemented within 5 years of consent commencement. It is expected that following commissioning of Stage 2 the discharge water quality will meet the TANK standards after reasonable mixing, In the unlikely event that the Stage 1 and 2 treatment works does not address all water discharge conditions volunteered by Ravensdown after a monitoring check in Year 6 of the adaptive management process, the company has written into the review conditions in Part D a specific requirement that HBRC may review the conditions of consent under section 128 of the RMA at that stage.

Ravensdown anticipates that this timeframe to improve the quality of its discharge to meet the anticipated TANK standards will put it well ahead of many other dischargers of water in the area.

Ravensdown is happy to make this commitment because of its desire to achieve long term security for its Napier Works operation via 35-year consents. The capital cost of the proposed improvement works, including the HARP, is estimated to be in the order of $10 million over 6 years and can only be supported on the basis of a gaining a long-term and future-proofed resource consent package for the Napier Works.

In addition to the major works described above Ravensdown will continue to investigate and implement practices on-site to minimise the volume of contaminants at source within the site before they enter the stormwater system.

Water Takes

Ravensdown holds a current water take permit from two existing on-site bores located within the Coastal Environment for use in the manufacture of sulphuric acid and fertilisers. This supplies drinking water, fire service supply, steam generation, dilution, cooling tower make-up and acid make-up. This water permit expires in 2027, but given the additional water needed for environmental purposes (i.e. to sustain the constructed treatment wetland, the HARP wetland and cropping plants associated with the land discharge area during the summer months) a new water permit is being sought, with a term which aligns with the new discharge permits.

Habitat Abundance Restoration Project

In recognition of the opportunity Ravensdown has to assist mana whenua and the wider community to create a better and more sustainable future, and in anticipation of the granting of 35-year consents for the ongoing operation of the Napier Works, Ravensdown is proposing a new wetland restoration project referred to as the HARP.

The HARP is not proffered as mitigation for an adverse effect or as a biodiversity offset or compensation under section 104 (1) (ab) of the RMA, as no effects that are more than minor have been identified for the chosen Water Discharge Strategy – *Ravensdown (November 2021b)*. Rather the HARP is a separate beneficial project which Ravensdown is excited to

put forward on the basis that the security afforded by the granting of 35-year consents justifies the investment the company will make in the HARP.

The HARP will improve the natural character values of a presently degraded natural wetland area, improve indigenous biodiversity, and provide mahinga kai opportunities. It will be developed in accordance with the HARP Plan – *Ravensdown (November 2021e)* which has been developed with input from local wetland experts, mana whenua, HBRC and other key stakeholders.

Once the HARP wetland has been developed, treated stormwater and process water from the Napier Works will be discharged to the HARP wetland, which will be open to the rising and falling ocean tide.

Summary Points

Over the term of the existing consents major improvements in environmental performance of the Napier Works have been made, such that adverse effects on the environment from ongoing operations are now assessed as no more than minor.

The Napier Works is the largest plant of its type in New Zealand and is a nationally important physical resource.

Ravensdown seeks resource consents to enable the ongoing operation of the Napier Works for 35 years, as provided for in the RMA.

In consideration of the granting of 35-year consents Ravensdown is proffering an extensive programme of new works and conditions. This will enable the preferential discharge of treated stormwater and process water to land via irrigation, and will require that after reasonable mixing all discharges of water that need to be made to the Waitangi Estuary comply with the discharge standard expectations of the TANK plan change within six years of consents commencing.

Ravensdown will continue to invest in the management of its operations to ensure discharges to air comply with applicable standards and are minimised by the adoption of best practicable option technology, with a proposed condition requiring a 10-yearly best practice technology review.

The HARP is an important beneficial project that Ravensdown offers to construct and maintain for the requested 35-year consents period.

All the activities that are covered by the resource consents being sought have been assessed by appropriately qualified and experienced independent experts. Where appropriate, Ravensdown has received expert advice on appropriate ways the address potential adverse effects and has adopted and incorporated this advice into its proposal.

A strong engagement process with the TFG of interested and knowledgeable stakeholders has directed the development of the proposals presented in the application, including the preferential discharge of water to land via irrigation, and the inclusion of the HARP as an associated beneficial project. Ravensdown is sincerely grateful for the input and advice from all members of the TFG.

The company has pro-actively included the HBRC technical review consultants in all the TFG meetings held throughout 2021 and has forwarded them all the relevant "Final Draft" expert reports prepared as part of this application package for peer review input.

The Ravensdown experts have addressed their feedback on these inputs in peer review in tables showing their responses and have updated their final reports to address the Council experts' input, where this is agreed with. This inclusive peer review process has greatly assisted the Ravensdown team, and accordingly the application is being put forward as a fully complete package of information, so it can be promptly notified, as requested.

The activities have been assessed against the relevant objectives, policies and methods in the relevant planning instruments, and are supported by the expert planning analysis incorporated in this Assessment of Environmental Effects ("**AEE**").

Ravensdown looks forward to an open and engaging process through the submissions process and to presenting at any hearing that may be required.

PART A

Resource Consent Applications

FORM 9

RESOURCE CONSENT APPLICATION FOR ACTIVITIES WITHIN THE ADMINISTRATIVE JURISDICTION OF THE HAWKE'S BAY REGIONAL COUNCIL

Under Section 88 and 145, Resource Management Act 1991:

To: Hawke's Bay Regional Council
Private Bag 6006
Napier 4142

1. **Ravensdown Limited applies for the following type of resource consents:**

Core Activity	Specific Activity	Rule	Activity Status and Consent Type
Discharges to air	To discharge contaminants into the air from the operation and maintenance of a sulphuric acid and fertiliser manufacturing plant at Awatoto including all ancillary activities.	Rule 28 of the RRMP	Discretionary – Discharge Permit
Discharges to land and water	To discharge treated stormwater and process water and associated contaminants from a sulphuric acid and fertiliser manufacturing plant at Awatoto onto or into land and into water (Waitangi Estuary) in the Coastal Margin.	Rule 9 of the RCEP Reg 54(c) of the NESFW	Discretionary - Coastal Permit Non-complying activity consent
	To temporarily discharge dewatering water associated with the construction of new stormwater and process water treatment facilities onto or into land and into water (Waitangi Estuary) in the Coastal Margin.	Rule 9 of the RCEP	Discretionary - Coastal Permit
	To discharge treated stormwater and process water and associated contaminants from a sulphuric acid and fertiliser manufacturing plant at Awatoto to land in circumstances where contaminants will be absorbed by crops and soils and/or may enter shallow groundwater.	Rule 52 of the RRMP	Discretionary - Discharge permit

Core Activity	Specific Activity	Rule	Activity Status and Consent Type
	To discharge treated stormwater from a sulphuric acid and fertiliser manufacturing plant at Awatoto to land in circumstances where contaminants will be absorbed by crops and soils and/or may enter shallow groundwater.	Rule TANK 22	Restricted Discretionary - Discharge Permit
Water Take	To take up to 13,477 m^3 of groundwater per week from well numbers 15986 and 15989 for the following industrial uses: • The manufacture of sulphuric acid and fertilisers; • The treatment of stormwater and process water including sustaining constructed treatment wetlands and the maintenance of crop cover on the discharge to land area (shown on Plan B); and. • Sustain an artificial wetland within the Waitangi Regional Park.	Rule 35 of the RCEP	Discretionary – Coastal Permit
	To temporarily take groundwater by dewatering associated with the construction of new stormwater and process water treatment facilities.	Rule 55 of the RRMP	Discretionary – Water Permit
Land use	Vegetation clearance and soil disturbance activities in the Coastal Margin associated with: • Erection, reconstruction, placement, alteration, extension, removal, or demolition of stormwater and process water treatment and discharge structures; and • Wetland restoration activities.	Rule 8 of the RCEP Reg 54(b) of the NESFW Reg 42 of the NESFW Reg 39 of the NESFW	Restricted Discretionary – Coastal Permit Non-complying activity consent Restricted Discretionary Activity Restricted Discretionary Activity

2. **The activity to which the application relates (the proposed activity) is as follows:**

- The operation, upgrading and maintenance of the Ravensdown Napier Works Fertiliser Plant.
- The establishment and maintenance of a Wetland Restoration Project.

3. **The site at which the proposed activity is to occur is as follows:**

Address: 200 Waitangi Road, Awatoto, Napier 4110 (NCC UPI: 117526).

Legal Description: Ravensdown Napier Works: SECS 26 44 50 56 60 PT SECS 32 43 LOT 4 DP 8546 LOTS 1 2 DP 16060 BLK I CLIVE SD, LOTS 6 & 7 DP 25683

Wetland Restoration: Lot 1 DP 6287, Section 57 Block I Clive SD, Part Section 52 Block I Clive SD

4. **The following additional resource consents are required from the Napier City Council for the proposal to which this application relates and have been applied for:**

- A restricted discretionary land use consent and controlled NES consent for Earthworks; and
- A discretionary land use consent for wetland restoration activities.

5. **An assessment of the proposed activity's effect on the environment is attached that:**

(a) Includes the information required by clause 6 of the Schedule 4 of the Resource Management Act 1991; and

(b) Addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and

(c) Includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

6. **An assessment of the proposed activity against the matters set out in Part 2 of the Resource Management Act 1991 is attached.**

7. **An assessment of the proposed activity against any relevant provisions of a document referred to in section 104(1)(b) of the resource Management Act 1991, including the information required by clause 2(2) of Schedule 4 of the Act is attached.**

8. **The replacement asset value of the Ravensdown operations at Awatoto is approximately $242 million[1].**

[1] Replacement value of the existing building, plant and equipment on site.

9. **The following further information required to be included in this application by the district plan, the regional plan, the Resource Management Act 1991, or any regulations made under that Act:**

- Assessment of Environmental Effects and accompanying technical documents.
- Proposed consent conditions.
- Management Plans.

10. **Ravensdown Limited seek an expiry date of 35 years from the grant of all consents.**

Date: 29 November 2021

Signature:

Andrew Torrens
Napier Works Manager
Ravensdown Limited

Address for Service: Ravensdown Limited
c/- Mitchell Daysh Limited
PO Box 149
Napier 4140

Contact: Anita Anderson

Telephone: 021 924 460

Email: anita.anderson@mitchelldaysh.co.nz

FORM 9

LANDUSE CONSENT APPLICATION FOR ACTIVITIES WITHIN THE ADMINISTRATIVE JURISDICTION OF THE NAPIER CITY COUNCIL

Under Section 88 and 145, Resource Management Act 1991:

To: Napier City Council
Private Bag 6010
Napier 4142

1. **Ravensdown Limited applies for the following type of resource consents:**

Core Activity	Specific Activity	Rule	Activity Status and Consent Type
Earthworks	Earthworks in the Main Industrial Zone.	Rule 52A.9 of the NCDP	Restricted Discretionary - Land Use Consent
	The disturbance of soils in HAIL areas.	Regulation 9 (1) of the NESCS	Controlled – NES Consent
Wetland Restoration Activities	Undertake wetland restoration activities, including associated earthworks and structures, within a Natural Hazard Area (River Hazard).	Rule 62.13(c)	Discretionary - Land Use Consent

2. **The activity to which the application relates (the proposed activity) is as follows:**

To undertake earthworks associated with new water treatment facilities and the construction of a wetland enhancement project.

3. **The site at which the proposed activity is to occur is as follows:**

Address: 200 Waitangi Road, Awatoto, Napier 4110.

Legal Description: Ravensdown Napier Works: SECS 26 44 50 56 60 PT SECS 32 43 LOT 4 DP 8546 LOTS 1 2 DP 16060 BLK I CLIVE SD, LOTS 6 & 7 DP 25683

Wetland Restoration: Lot 1 DP 6287, Section 57 Block I Clive SD, Part Section 52 Block I Clive SD

4. **The following additional resource consents are required from the Hawke's Bay Regional Council for the proposal to which this application relates and have been applied for:**

- A discretionary consent for discharges to air.

- A restricted discretionary discretionary and non-complying consent for discharges to land and water.
- Discretionary consents for ground water takes.
- A restricted discretionary and non-complying land use consent for vegetation clearance and soil disturbance activities.

5. **An assessment of the proposed activity's effect on the environment is attached that:**

   (a) Includes the information required by clause 6 of the Schedule 4 of the Resource Management Act 1991; and

   (b) Addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and

   (c) Includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

6. **An assessment of the proposed activity against the matters set out in Part 2 of the Resource Management Act 1991 is attached.**

7. **An assessment of the proposed activity against any relevant provisions of a document referred to in section 104(1)(b) of the resource Management Act 1991, including the information required by clause 2(2) of Schedule 4 of the Act is attached.**

8. **The replacement asset value of the Ravensdown operations at Awatoto is approximately $242 million[2].**

9. **The following further information required to be included in this application by the district plan, the regional plan, the Resource Management Act 1991, or any regulations made under that Act:**

   - Assessment of environmental effects and accompanying technical documents.
   - Proposed consent conditions.
   - Management Plans.

[2]Replacement value of the existing building, plant and equipment on site.

Date: 29 November 2021

Signature: 

Andrew Torrens
Napier Works Manager
Ravensdown Limited

Address for Service: Ravensdown Limited
c/- Mitchell Daysh Limited
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B

PART B

Assessment of Environmental Effects

1. INTRODUCTION

1.1 BACKGROUND

Ravensdown Limited ("**Ravensdown**") undertakes the manufacture, storage and sale of sulphuric acid and phosphate fertilisers which requires the import of bulk materials and the production of sulphuric acid. The Ravensdown Napier Works ("**Napier Works**" or "**Site**") is the company's largest manufacturing site, located at 200 Waitangi Road, Awatoto, Napier. As New Zealand's largest superphosphate Manufacturing Plant, production of superphosphate typically ranges between 250,000 and 300,000 tonnes per annum, although the Site has the capacity to produce up to 440,000 tonnes per annum in its current configuration.

Ravensdown currently holds a water discharge permit (AUTH-114016-02), an air discharge permit (AUTH-115256-04) and a water take consent (AUTH-116104-03) issued by Hawke's Bay Regional Council ("**HBRC**")[3] associated with the manufacturing activities at the Site. The water and air discharge permits are due to expire on 31 May 2022 and 21 Oct 2022 respectively. In order to continue to operate under these two discharge permits, under section 124 of the Resource Management Act 1991 ("**RMA**") an application to renew the permits must be lodged with the Hawke's Bay Regional Council on or before 30 November 2021 and 21 April 2022.

In addition to the above discharge permits, Ravensdown is also seeking to replace the water take consent AUTH-116104-03 through this application. While this consent does not expire until 31 May 2027, it is tied to the water treatment and discharge proposal outlined in this application. Therefore, by replacing this consent, the duration of rights will be aligned with the relevant discharge permits required as part of the proposed water treatment and discharge solution for the Site.

1.2 NAPIER WORKS SUSTAINABLE SITE PROJECT

With the above renewal dates in mind, Ravensdown has been reviewing the activities and processes associated with the water and air discharges at the Site since mid-2019 with the intention of making improvements that will minimise any effects from the operations on the local receiving environment while recognising that the Napier Works is a major physical resource in the Hawkes Bay region where discharges must be sustainable under any anticipated regulation over the next 35 years.

The result of this review process is captured in Ravensdown's documented water and air discharge strategies – *Ravensdown (November 2021a&b)* and has resulted in the

[3] Consent Reference: AUTH-114016-02, AUTH-115256-04, AUTH-116104-03.

requirement for a suite of resource consents from the HBRC and Napier City Council ("**NCC**") to provide for the following:

- Water take and use
- Discharges to air
- Water discharges to land and water
- Treatment plant construction
- Wetland restoration activities

This application is therefore based on the following:

- A water discharge strategy that sets out Ravensdown's commitment to sustainable water discharges from the Napier Works with no significant adverse effects in the receiving environment.
- Air and water discharge strategies that adopt strict contaminant discharge limits based on detailed effects assessments and having regard to current and future expectations set in national and regional planning instruments.
- Water discharge limits that align the discharges with long term council and community expectations requiring Ravensdown to undertake a major improvement projects to control and treat water discharges from its Site to a very high standard.
- A collaborative process that Ravensdown initiated and participated in with local community stakeholders, including the establishment and facilitation of a TFG that has selected a preferred discharge strategy based on a preferential pathway for the discharge of stormwater to land whenever possible.
- Ravensdown wish to lead in the long-term sustainable management of the Napier Works and the community's' desire to enhance the adjacent Waitangi Estuary to create an abundant freshwater wetland habitat has led to the idea of the Habitat Abundance Restoration Project ("**HARP**") being volunteered as a significant "benefit" project.
- The HARP is not being put forward for consideration under S104(1)(ab) as a volunteered project to mitigate, offset or compensate for any identified adverse effects but as a significant long term habitat enhancement project in its own right.
- The significant additional capital and ongoing maintenance costs for the HARP and the committed treatment upgrades are able to be supported by the Company if a long-term consent is granted as this will secure the company's operating future at Napier.

1.3 COMPANY OVERVIEW

Ravensdown is a farmer owned co-operative which has the sustainable objective of "Enabling Smarter Farming for a Better New Zealand". It does this by providing products, expertise and technology to farmers throughout New Zealand through[4]:

- *Practical insights, trusted guidance and lab-based testing on soil, plant and tissue samples.*
- *Environmental consultancy to mitigate impacts and move beyond compliance.*
- *Quality agri products including agrichemicals, seeds …*
- *Manufacturing superphosphate[5] at dedicated plants in Christchurch, Dunedin and Napier. Lime quarries producing agricultural lime products.*
- *Logistics and storage so bulk fertiliser and other products are available when needed. Global sourcing from top tier suppliers.*
- *Precision fertiliser application by ground and by air.*
- *Map-and-measure technology for better on-farm decision making.*
- *Innovation and research to ensure advice and solutions are based on sound science.*

Fertiliser has been manufactured at the Napier Works since 1953, and the operation was purchased by Ravensdown in 1987. Ravensdown is proud of its contribution to the economic and social wellbeing of Napier and Hawke's Bay during this time. Ravensdown's commitment is highlighted in its Environmental Policy as follows:

> *The environment is an integral part of our business and we acknowledge the relationship between the environment and our products and activities. Our commitment to the environment will be a guiding principle in our business planning and development.*
>
> *To accomplish this we commit to:*
>
> - *Comply with the requirements of our discharge permits, codes of practice and other relevant environmental obligations*
> - *Work to reduce emissions and discharges as far as possible, consistent with sound operation and the economics of production*
> - *Set environmental and social objectives and targets during the planning process and monitor progress at regular intervals*
> - *Put in place programmes to continuously improve environmental performance across all our sites*
> - *Improve our manufacturing and supply footprint through science, technology and innovation*

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[4] /www.sbc.org.nz/about/our-members/sbc-members/Ravensdown

[5] and its derivatives

- *Develop awareness and understanding among the company's employees of the interactions between the environment and the company's activities*
- *Influence all employees to prevent pollution, and to seek to enhance the environment in the course of their activities*
- *Work with farmers and growers through the provision of science, technology, products and people to help them manage their environmental footprint*
- *Contribute to carbon reduction targets in all commercial decision-making including procurement and investment decisions*
- *Be a good neighbour, caring for the communities and environment that we live, work and operate in.*

1.4 EXISTING RESOURCE CONSENTS

Ravensdown currently operates under a suite of existing resource consents granted by the HBRC and NCC as summarised in the following table.

Table 1: Existing resource consents held by Ravensdown

Consent No.	Consent Type	Activity Description	Expiry	Issuing Authority
AUTH-114016-02 (DP040143Wa)	Discharge to Water	To discharge contaminants into water for the purpose of disposing of stormwater, cooling water from air compressors and a hydraulic drive, water from drinking fountains and a truck wash, water from cooling towers and high pressure boilers, and rinse water from a boiler water treatment plant into the Tūtaekurī River (Waitangi Estuary).	31 May 2022	HBRC
AUTH-115256-04 (DP050561Ab)	Discharge to Air	To discharge contaminants into the air from the operation of the company's fertiliser manufacturing plant at Awatoto, including the following processes: • The manufacture of sulphuric acid, • The manufacture of superphosphate fertiliser, • The storage, blending and dispatch of bulk and bagged fertilisers and sulphuric acid, • The receipt and storage (inside and outside) of raw materials and imported fertiliser, • General site operations.	21 Oct 2022	HBRC

Consent No.	Consent Type	Activity Description	Expiry	Issuing Authority
AUTH-116104-03 (WP060639Tb)	Water take	To take water from well no's. 15986 and 15989 (150 mm diameters) for use in the manufacture of sulphuric acid and fertilisers.	31 May 2027	HBRC
AUTH-126648-01	Discharge to Water	To discharge, for a short-term and temporary duration, Fluorescent Red Rhodamine WT dye into water at the Awatoto Drain from the settling pond at Ravensdown Limited's superphosphate manufacturing plant.	31 May 2023	HBRC
970172	Land use	To erect 38m high Chimney / Stack	NA	NCC
030228	Land use	6 metre stack extension	NA	NCC
060271	Land use	To establish transport depot within area of significance to iwi	NA	NCC
200123	Land use	Construction of a new 50m high air discharge stack to replace two existing 38m high 'den stacks' and the single 36m high hygiene stack within the superphosphate manufacturing facility. NESCS consent for earthworks on land containing contaminated soil.	Needs to be implemented by 31 March 2026	NCC

1.5 ASSESSMENT OF ENVIRONMENTAL EFFECTS REPORT STRUCTURE

All matters required to be addressed in accordance with Schedule 4 of the RMA are contained within this Assessment of Environmental Effects ("**AEE**"), which is set out as follows:

Section 1 Is this introduction.

Section 2 Describes the existing environment.

Section 3 Introduces the air and water discharges strategies

Section 4, 5 & 6 Provides an overview of the proposal.

Section 7 Summarises the proposal in terms of the relevant statutory documents under the RMA.

Sections 8 to 18 Assesses any actual or potential environmental effects associated with the proposal and details mitigation measures where appropriate.

Section 19 Outlines the consultation undertaken and notification requirements.

Section 20 Details the proposed notification.

Section 21 Is a concluding comment.

1.6 KEY REPORTS

A number of reports have been commissioned to provide background and baseline technical information, develop and set the consenting strategy, describe the proposal chosen and to investigate and report on the associated environmental, cultural, and economic effects. The investigations undertaken have provided a comprehensive analysis of the environmental issues associated with the existing and proposed activities at the Napier Works that are required to be assessed under the RMA. The reports are summarised in this document and form part of the AEE for the purposes of the resource consent applications detailed in Part A of this application.

Links to the key reports can be found in Parts C and D as set out in Table 2 below:

Table 2: Key Reports

Short Title	Author(s)	Organisation	AEE Reference
Part C - Reference Reports			
R1 - Ecology Baseline Report	Ngaire Phillips (lead) Mike Stewart Sharon DeLuca	Streamlined Environmental Boffa Miskell	*Streamlined (August 2021)*
R2 – Manufacture Plant Process Report	David Ivell	JESA	*JESA (November 2021)*
R3 – Acid Plant Process Report	Jesse Heubsch	Chemetics	*Chemetics (November 2021)*
R4 – Air Discharge Strategy	Andrew Torrens	Ravensdown	*Ravensdown (November 2021a)*
R5 – Water Discharges High Level Options Review	Anna Lindgren David Delegarza Helen Caley	Aurecon	*Aurecon (November 2021)*
R6 – Water Discharge Strategy	Andrew Torrens	Ravensdown	*Ravensdown (November 2021b)*
R7 – Site Contamination Investigation (PSI) Report	Nikki Mather Emma Lewis	Beca	*Beca (August 2021)*

Short Title	Author(s)	Organisation	AEE Reference
Part D – Assessment Reports			
A1 - Air Discharge Dispersion Modelling and Air Quality Effects Report	Richard Chilton	Tonkin+Taylor	*Tonkin+Taylor (November 2021)*
A2 - Vegetation Effects	Stephen Trolove	Plant & Food Research	*Plant & Food Research (November 2021)*
A3 - Estuarine Ecology Assessment	Ngaire Phillips (lead) Mike Stewart Sharon DeLuca	Streamlined Environmental Boffa Miskell	*Streamlined (November 2021)*
A4 - Land Discharge Effects and Management	Ian Millner (lead) Alexandra Johansen Ants Roberts Mike Wright David Delegarza	Land Vision HB Bay Geological Services Ravensdown Ravensdown` Aurecon	*Land Vision HB (November 2021)*
A5 - Water Take Effects Assessment	Alexandra Johansen	Bay Geological Services	*Bay Geological Services (November 2021)*
A6 - Human Health Effects	Francesca Kelly	Environmental Medicine	*Environmental Medicine (November 2021)*
A7 - Detailed Site Investigation (DSI) Report	Nikki Mather Mia Uys	Beca	*Beca (November 2021)*
A8 - Economic Assessment	Sean Bevin	Economic Solutions	*Economic Solutions (November 2021)*
A9 - Planning Assessment	Philip McKay Mason Jackson	Mitchell Daysh	*Mitchell Daysh (November 2021)*
A10 - Cultural Impact Assessment	Chad Tareha	Ngāti Pārau Hapu	*Ngāti Pārau Hapu (November 2021)*
A11 - Cultural Impact Assessment	Aramanu Ropiha	Kohupatiki Marae	*Kohupatiki Marae (November 2021)*

1.7 PROPOSED CONDITIONS

This AEE and the supporting reports outlined in the tables above needs to be read together with the proposed conditions set out in Part E – Proposed Conditions. The set of proposed consent conditions is based on the detail in this application and include a separate conditions set for the HBRC and NCC applications and a set of general conditions that apply across the whole suite of resource consents sought.

1.8 MANAGEMENT PLAN APPROACH

A feature of the proposed conditions in Part E is the provision of three Site Management Plans to govern the site operations associated with the air and water discharges as set out in Table 3.

The three Management Plans included in the Table 3 below have all been prepared as final documents ready to be approved through the decision-making process. This has the advantage of decision makers being able to fully consider the management processes which are tied into the proposed resource consent conditions in Part E, thereby not needing future Council officer certification processes.

Table 3: Site Management Plans

Short Title	Author	Organisation	AEE Reference
Part F – Management Plans			
M1 – Source Control Management Plan	Helen Caley Richard Chilton Andrew Torrens	Aurecon Tonkin+Taylor Ravensdown	*Ravensdown (November 2021c)*
M2 - Adaptive Management Plan	Helen Caley Andrew Torrens	Aurecon Ravensdown	*Ravensdown (November 2021d)*
M3- Habitat Abundance Restoration Project (HARP) Plan	Helen McCarthy Andrew Torrens TFG Working Group Members Hans Rook	Ravensdown	*Ravensdown (November 2021e)*

In addition to these three Management Plans above, the proposed conditions in Part E include reference to a Construction Environmental Management Plan (CEMP) and a Contaminated Site Management Plan (CSMP) to be prepared and lodged for certification by the appropriate consent authorities along with the design plans for the new water treatment facilities described in section 5 of this AEE.

1.9 HBRC PRE-APPLICATION REVIEW

Ravensdown provided the HBRC with final draft versions of a number of the technical assessments and reference reports in order for their team of experts to undertake a pre-application review and provide any feedback prior to the final applications being lodged. These reviews and associated communications, and the Ravensdown responses are attached in Part G.

This allowed the Ravensdown technical team to update their assessments where necessary with the intention of and avoid technical questions and further information requirements following lodgement.

2. THE EXISTING ENVIRONMENT

2.1 SITE AND SURROUNDS

The Napier Works is within the Main Industrial Zone as defined in the Napier District Plan at 200 Waitangi Road, Awatoto, Napier. This area is flat in topography and is a long-established industrial area. The Site is located approximately 6.5 km south of Napier City centre and 11.5 km northeast of the Hastings central business area.

The Awatoto Industrial area is one of Napier's five main industrial zones and has traditionally been the preferred location for large scale industry in Napier[6]. The Napier Works occupies an elongated 16 ha area comprising the southern extent of the Main Industrial Zone at Awatoto. A number of other industrial activities are located immediately to the north of the Site.

The City of Napier District Plan ('District Plan') provides the following description of the Awatoto Industrial area:

> *The Awatoto industrial area is located on the southern fringe of the City, adjacent to the foreshore. It is the setting for a number of industries that require relatively large sites. Awatoto's manufacturing specialisation includes fertiliser manufacturing, chemicals, textiles, aggregate and food processing. This zone is also known for its number of existing industrial operations that may, from time to time, produce objectionable visual and/or odour effects. Industrial activities that require large sites and/or which may generate objectionable effects may benefit from Awatoto's relative isolation from sensitive activities where there is less potential for reverse sensitivity issues to arise.*
>
> *It should be noted that the area of land to the east of State Highway 2 is not serviced. Meanwhile, only a sewerage service is provided to the land westward of State Highway 2 extending from 827 Waitangi Road (Lot 1 DP 22549) in the north, to 890 Waitangi Road (Sec 62, Blk 1 Clive Survey District) to the south.*

The land to the west of the Napier Works and the Main Industrial Zone comprises of Rural zoned land with various pastoral farming and horticulture / viticulture activities. The BioRich composting operation is located to the southwest of the Site and the Napier wastewater treatment plant to the northwest. The 17.5 ha of land directly opposite the Napier Works is owned by Ravensdown and is the area of the irrigation based land discharge component of the applications.

The railway line and State Highway 51 lie between the subject site and the coast to the east.

The closest residential zone is located to the north, approximately 1.2 km from the northern boundary of the Site. Residential zones are also present to the south and west of the Site,

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[6] City of Napier District Plan, Chapter 22 Industrial Environments.

located approximately 2.75 km and 5.5 km away. There are also five houses to the east of the site on State Highway 51 opposite the Napier Works.

Figure 1 and Figure 2 below provides an overview of the surrounding area and the Napier Works.

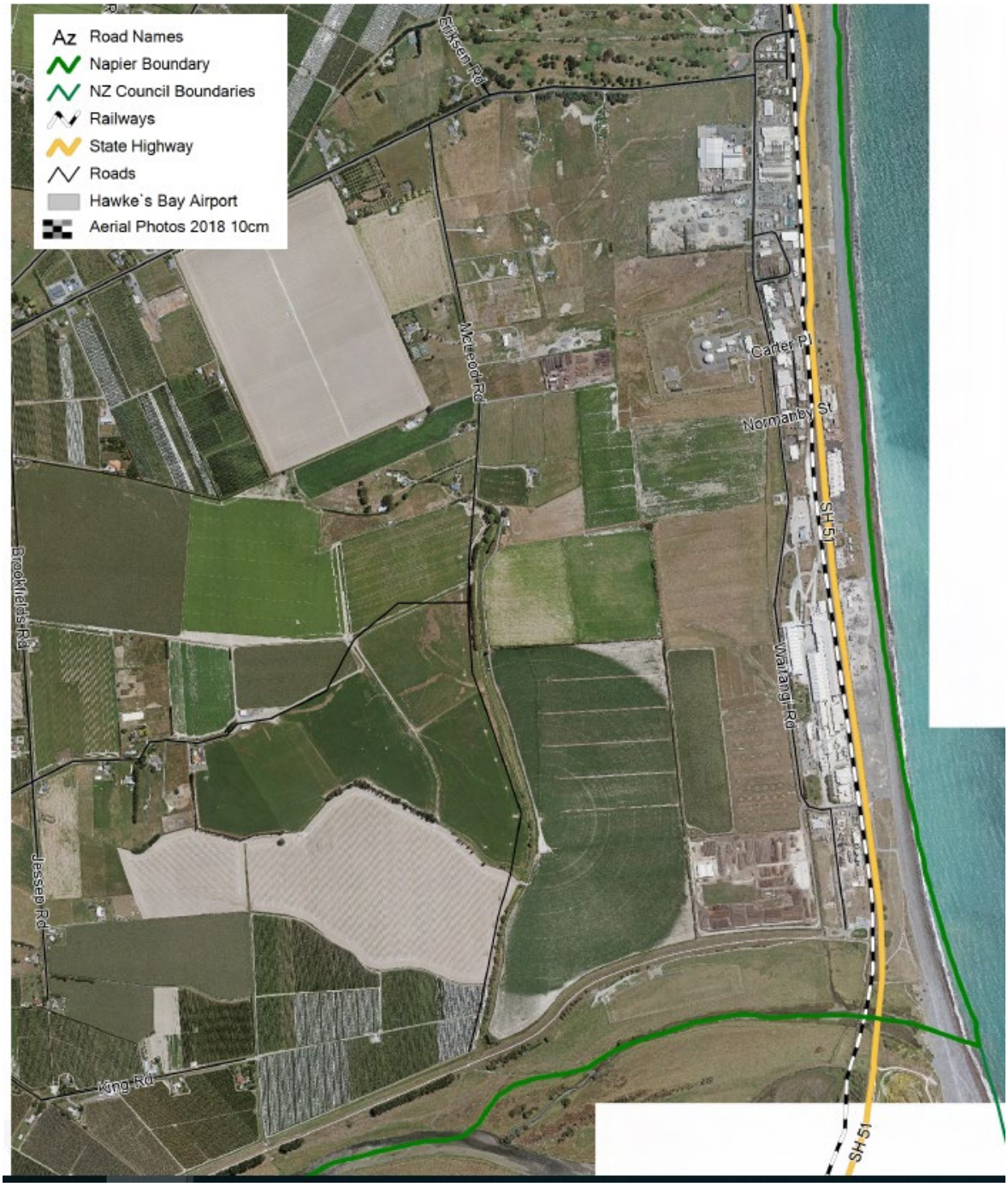


Figure 1: Location overview

Figure 2: Aerial photograph of the Napier Works.[7]

[7] From Beca 2021, Detailed Site Investigation.

2.2 MANA WHENUA CULTURAL VALUES

The area holds significant values for local mana whenua and these values are described in the two CIA reports commissioned by Ravensdown and lodged with the applications - Ngāti Pārau Hapu (November 2021) and Kohupatiki Marae (November 2021).

An archaeological site V21/299 is located adjacent to the western boundary of the site on Waitangi Road. It is understood the site is associated with the historic Te Awapuni pa.

2.3 WAITANGI REGIONAL PARK AND ESTUARY

The Waitangi Regional Park and the Waitangi Estuary, encompassing the common mouth of the Ngaruroro, Tūtaekurī and Karamu/Clive rivers, sits on the southern side of the Napier Works boundary. The Waitangi Estuary is listed as a Significant Conservation Area ("**SCA**") in the Regional Coastal Environment Plan (Figure 3).

Figure 3: Coastal Environment (orange line) and Waitangi Estuary Significant Conservation Area 11.

The Waitangi Regional Park and Estuary is described on the HBRC website as follows:

> *Waitangi ranks within the top 10 wetlands in the region that require protection and enhancement as determined by Hawke's Bay Regional Council. This area provides a variety of wetland and coastal habitats that support a significant population of bird species. It connects with the nearby Tukituki Estuary. The restoration of some of the*

wetland areas now is helping to provide habitats for seabirds, waterfowl, fish, insects and plants along this coastline.

The estuary initially linked the Ngaruroro and Tukituki River mouths and in the late 1800's a small ferry boat transported people and goods across the rivers. Significant changes have occurred since then as a result of storms and coastal erosion. The construction of the Heretaunga Plains Flood Control Scheme in the 1960 and 70s further altered the wetlands. Numerous stopbanks and pump stations were constructed along these rivers and Muddy Creek south to the Tukituki River to provide flood protection and drainage to extensive areas of land between Napier and Hastings. While this was important for the economic development of Hawke's Bay, it did help to destroy an extensive wetland system over this area which is now being restored.

The Waitangi Regional Park has been developed by the HBRC in conjunction with mana whenua in recognition of the significant cultural, historical, biodiversity and recreational values in the area. The development and enhancement projects undertaken include:

- Installation of the Ātea a Rangi Star Compass.
- Enhancement of the existing wetland and construction of a new wetland.
- Extensive native planting
- Development of carparks and pathways.
- Installation of educational signage.

Water discharges from the Napier Works settling pond currently enter a drain to the south of the pond (Ravensdown Drain) which discharges into the Awatoto Drain approximately 80m to the west. This reach of the Awatoto Drain also receives pumped flows from the HBRC's Awatoto pump station which pumps stormwater and other collected water from drains running through the nearby rural land and the Awatoto industrial area. The Awatoto drain then flows south into the blind arm of the Tūtaekurī River and then west into the Tūtaekurī River main stem. The Tūtaekurī River then flows eastward to the Pacific Ocean via the Waitangi Estuary. These features and waterways are shown on Figure 4 below.

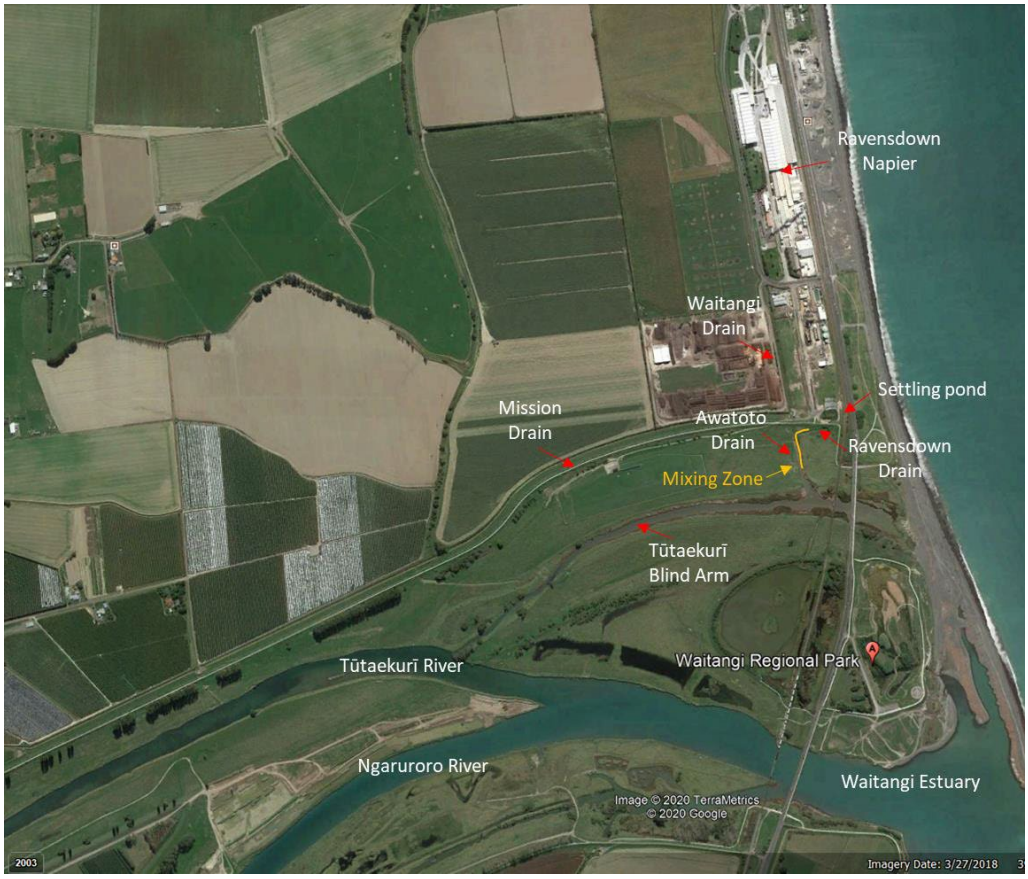


Figure 4: Current Napier Works stormwater and process water discharge receiving environment and associated waterways. [8]

The Site is classified as a Recommended Area for Protection and Significant Amenity Landscape in the Hastings District Plan.

2.4 RURAL LAND USE IN THE SURROUNDING AREA

Land to the west of the Napier Works is predominantly used for pastoral and to a lesser extent horticultural activity (mostly apple orchards but also some vineyards). Fluoride gas and acidic aerosol discharges can impact vegetation considered to be sensitive and the analysis and modelling has considered the effects on the vegetation growing in the area (see section 10).

The majority of the pastoral land use comprises short rotation cropping, grassland, and fluoride-tolerant perennial crops. The short rotation crops grown in the area include maize, sweetcorn, beetroot, squash, onion and tomato, and less commonly pea, bean, pumpkin, spinach and small areas of market gardening (which includes lettuce, cauliflower, leek,

[8] Streamlined Environmental Limited (2021) Ravensdown Napier Baseline Technical Investigations.

cabbage, broccoli and silver beet) . The distribution of these various land-cover types around the Napier Works is shown in Figure 5.

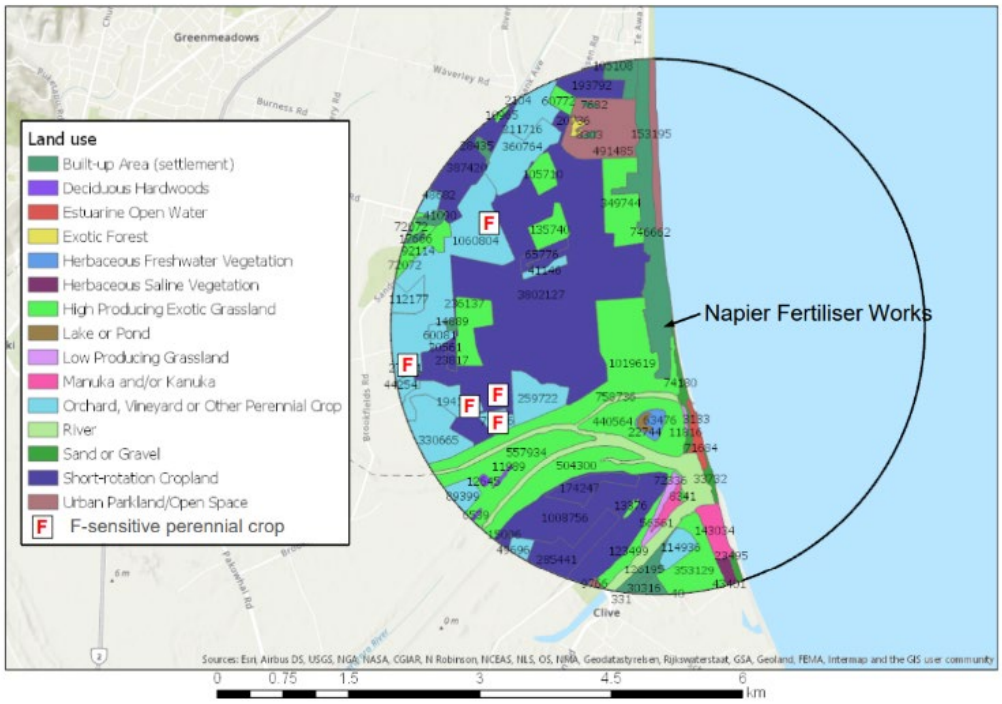


Figure 5: Land use within a 3km radius of the Ravensdown Napier Works. [9]

2.5 METEOROLOGY AND TOPOGRAPHY

The dispersion of emissions to the air from the Napier Works and therefore the concentrations of contaminants experienced by sensitive receptors, is influenced by wind flows. A wind rose plot for the Napier Works is shown in Figure 6 below showing that:[10]

- *The prevailing winds come from the west-southwest.*
- *Winds also prevail from the northeast.*
- *Strong winds (>7 m/s) prevail from the northeast.*
- *There are a low percentage of calm conditions.*

[9] Plant & Food Research, November 2021. Effects of emissions-to-air from the Ravensdown Napier Fertiliser Works on vegetation.

[10] Tonkin + Taylor, 2021. Reconsenting of Ravensdown Napier Works: Air Quality Assessment.

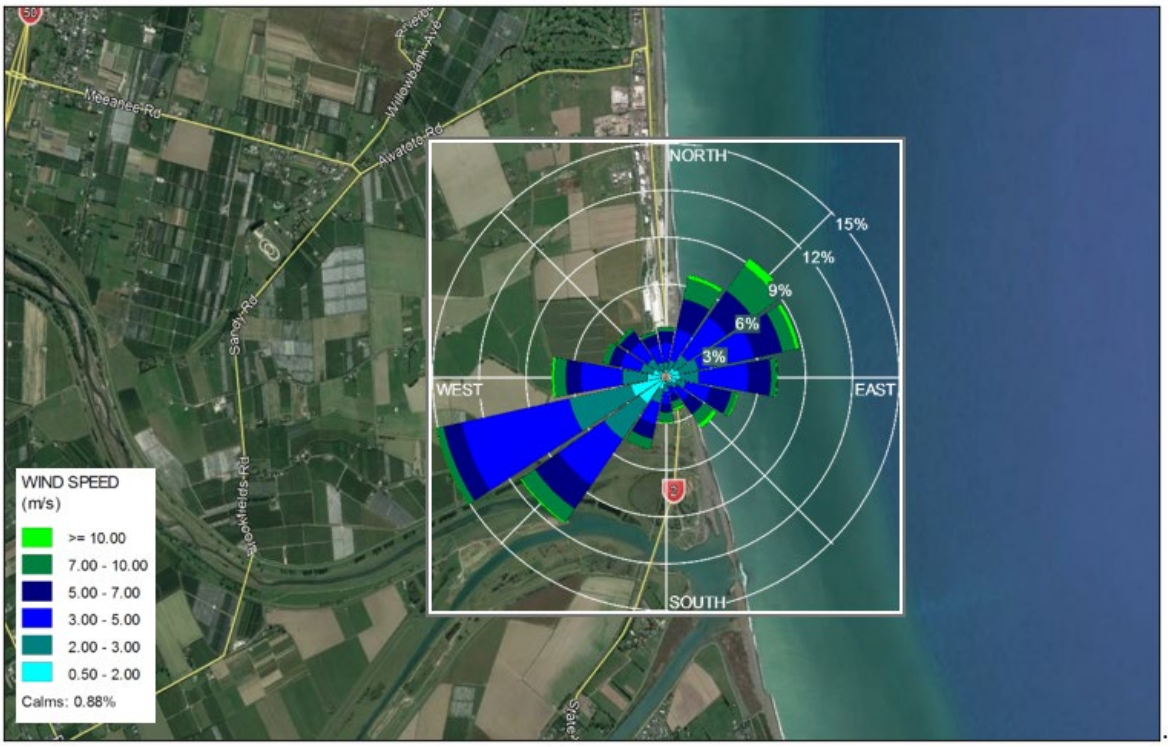


Figure 6: Wind rose for the Napier Works.

2.6 CLIMATE CHANGE

In terms of the effects of Climate Change in relation to activities on the Site HBRC and Gisborne District Council commissioned NIWA to prepare a report on climate change projections – *"Climate Change Projections and Impacts for Tairāwhiti and Hawke's Bay, NIWA Report No. 2020298AK, November 2020.*

The following points summarise ongoing and potential future impacts of a changing climate on different sectors and environments in Tairāwhiti and Hawke's Bay.

- *Increasing temperatures due to human-induced climate change will likely impact primary sector activities through increasing the incidence of pests and diseases. Cattle become more stressed during heatwaves (which are projected to increase under a warming climate), which may affect milk production in the dairy sector to a greater degree than at present. Increasing temperatures affect the rate of plant growth, which may affect the quality and quantity of harvested fruit and vegetable crops, as well as the productivity of forestry and pasture. Human health will also be affected by a changing climate due to the increasing prevalence of hot conditions and heatwaves. Warmer temperatures in the future may increase the length of the tourism season and provide opportunities for new crops to be grown.*
- *A warmer atmosphere in the future is expected to result in increases to rainfall intensity. Increased rainfall intensity is associated with more slips, floods, and erosion, and hence damage to infrastructure (e.g. roads, water supply), the forestry sector, and agricultural land productivity. Loss of infrastructure connectivity is a risk for the tourism sector.*

Increased rainfall intensity increases the risk of reduced quality of fruit and vegetables, as well as causing soil saturation issues for horticulture and agriculture.

- *Future reductions in rainfall and increases in drought severity may cause fire risk to increase in the Tairāwhiti and Hawke's Bay regions, affecting forestry, the natural environment, and the tourism sector. Future reductions to water availability from decreasing rainfall as well as lower river flows may affect the available water take for irrigation and urban supply, and also affect freshwater ecosystems.*
- *Ongoing sea-level rise caused by climate change is likely to increase exposure of infrastructure and primary sector activities to extreme coastal flooding, as well as cause habitat loss at the coastal margins where ecosystems are not able to move further inland (coastal squeeze). Exposure is likely to increase over time in response to higher sea levels.*
- *Warming oceans will induce pressures on the distribution and abundance of marine species, and ocean acidification will affect species with carbonate shells (e.g. paua, oysters).*
- *Increased concentrations of carbon dioxide should increase forest, pasture, crop, and horticulture productivity, if not limited by water availability.*

In terms of sea-level rise the site is outside both the Year 2065 and Year 2120 Coastal Hazard layers on the Hawke's Bay Hazard Portal. The site east of Waitangi Road is identified as being subject to potential coastal inundation over the next 100 year period.

The activities at the site have a small footprint in relation to effects on climate change. The only substantive contribution of greenhouse gases from the site is associated with the diesel fired acid plant pre-heating and start-up processes which are described in section 4.4 of this AEE. Table 4 itemises the Site's reported CO_2 emissions for the past four completed calendar years.

Ravensdown is investigating the use of alternative fuels to minimise their carbon emissions. Primarily this is the use of biodiesels for both reheating of Acid Plants and mobile plant (loaders), however solar electricity generation is also being investigated. Ravensdown is moving its forklift fleet to electric units.

Napier Works already runs a 7MW steam turbine on site, utilising excess heat from the acid manufacturing process to generate electricity. This electricity is either used on site or returned to the national grid in times when fertiliser manufacturing is not occurring.

Ravensdown is a member of the Climate Leaders Coalition, and therefore has specific climate change commitments to meet. The company reports emissions annually and has set reduction targets in line with well below two degrees of warming. There is a carbon reduction plan in place to meet these goals.

Table 4: Napier Works reported carbon dioxide emissions

Activities	2017	2018	2019	2020
Electricity Exported to the Grid	-167	-187	-200	-97
Electricity Purchased from the Grid	835	487	635	739
Landfilled waste - with LFGR			19	18
Stationary Diesel	804	661	258	371
Transport Diesel	318	349	265	276
Transport Petrol	15	8	10	12
Total GHG inventory (TCo2e)	**1,805**	**1,318**	**988**	**1,318**

3. DISCHARGE STRATEGY DEVELOPMENT PROCESS

3.1 INTRODUCTION

This section provides a description of the process that has been followed in the development of the air and water discharge strategies for the Napier Works culminating in the finalisation of a proposed Process Description for the air discharges and Project Description for the water discharges from the Site.

3.2 CONSULTATION

The consultation undertaken by Ravensdown in the development of the Site discharge strategies is described in Section 19 of this document and has involved constructive and positive engagement with a wide range of stakeholders, including Councils, mana whenua and other interested parties. Much of this consultation has been through the TFG as detailed in the following section.

3.3 TECHNICAL FOCUS GROUP

Ravensdown formed a TFG made up of representatives from key stakeholder groups to engage with Ravensdown during the consent project. The purpose of the TFG was to provide advice and input to Ravensdown as part of a two-way information sharing process for the preparation of the resource consent application package, including in the development of the discharge strategies for the Site. Further detail of the TFG process can be found in Section 19.

3.4 INDUSTRIAL PROCESS REVIEW

Ravensdown engaged Jesa Technologies and Chemetics Inc (via Worley) to undertake reviews of the site's emission control technology (current and proposed) associated with the Manufacturing Plant and Acid Plant. The reviews concluded the controls were consistent with international best practice for other similar plants around the world. The resulting reports – Jesa (November 2021) and Chemetics (November 2021) are provided in Part C of this application and have been used to inform the Air Discharge Strategy summarised below.

3.5 ASSESSMENT OF ALTERNATIVE TREATMENT AND DISPOSAL OPTIONS

In the assessment of an application for a discharge permit or coastal permit, section 105(1)(c) of the RMA requires that:

- *the consent authority must … have regard to … any possible alternative methods of discharge, including discharge into any other receiving environment.*

s105 of the RMA requires that there be a consideration of alternative methods to any discharge, including as to whether the discharge could be into any other receiving environment.

As detailed in section 3.3.1 above, the air discharges from the Napier Works have been reviewed and are considered consistent with industry best practice.

Ravensdown engaged Aurecon New Zealand Ltd ("**Aurecon"**) to complete a high-level stormwater and process water options review for the site – *Aurecon (November 2021)*. This review considered various treatment options for the stormwater and process water from the site, and three receiving environments for the discharge of this treated water (the current receiving environment of the drains flowing into the Tūtaekurī River/Waitangi Estuary, a direct coastal discharge to Hawke Bay, and a discharge to land).

The Ravensdown project team, assisted by the TFG, assessed each of these options using a multi-criteria decision analysis process ("**MCDA**") with the following objective:

> *To establish the most sustainable long-term solution for the treatment and discharge of stormwater and process water from the Ravensdown Napier Works to enable the continued operation of the site".*

Through the MCDA process, each option was scored against ten (weighted) assessment criteria under the headings "Technical", "Consenting and environmental", "Financial" and "Stakeholder". The TFG provided their views and scores for the two stakeholder criteria – "Mana Whenua values" and "Other stakeholder considerations / concerns".

Ravensdown was cognisant that the existing current consented treatment of the site stormwater and process water and the discharge via the Ravensdown Drain to the Tūtaekurī River/Waitangi Estuary would not be favoured by stakeholders and the community or tenable in the current regulatory environment in the longer term. This was reinforced through early meetings with mana whenua and further supported at the first meeting of the TFG. This "Status Quo" option was included in the MCDA scoring and was the least favourable of all options.

The options assessment report concludes that

> *Based on the scoring, the preferred option was for a "combination of treatment options", with the opportunity to discharge both to land and the Tūtaekurī River/Waitangi Estuary, and with the possibility of a future discharge to the marine environment (e.g. via the NCC outfall) if necessary to manage any stormwater and process water wastewater with elevated levels of particular contaminants and meet water quality expectations.*

This options assessment and MCDA process provided a robust assessment of alternatives for the treatment and discharge of the Ravensdown stormwater and process water that meets the requirements of s105(1)(c) and provided Ravensdown the basis to develop the Water Discharge Strategy.

3.6 AIR DISCHARGE STRATEGY

The Air Discharge Strategy has been developed following the process review described above and the assessment the air discharge effects using baseline monitoring information from the Napier Works. The Air Discharge Strategy is attached in Part C.

Ravensdown has commenced implementation of this strategy by committing to major expenditure for the replacement in 2023 of the existing Den Scrubber System (including a variation to the existing air discharge permit that was granted by the HBRC on 5 July 2021) and the Acid Plant Converter Tower. The replacement of these assets and increased on-site source control measures will result in improvements to both stack discharges and fugitive emissions from the site which are reflected in the proposed consent conditions attached in Part E.

3.7 WATER DISCHARGE STRATEGY

The Water Discharge Strategy is attached in Part C and details the key aspects of an adaptive management process for the treatment and discharge of stormwater and process water from the site to both land and under certain conditions to the estuarine environment. The strategy is underpinned by a comprehensive sampling and monitoring programme, robust source control measures, the reuse of process water where practicable, and a significant reduction in contaminants in discharges to the receiving environment through the implementation of a staged treatment improvement process. The discharge quality targets set out in the discharge strategy are based on the most conservative regulatory standards, with 4.9 times dilution applied. These targets have been reflected in the proposed consent conditions attached in Part E.

3.8 HABITAT ABUNDANCE RESTORATION PROJECT

Ravensdown has been cognisant of the significance of the Waitangi Regional Park and Estuary, and this was further highlighted through the engagement with stakeholders during the TFG process. The discussions with TFG members identified that the diminishing levels of mahinga kai within the immediate and outlying areas of the Waitangi Estuary was a significant cultural concern to mana whenua.

A HARP team was subsequently established with several representatives from the TFG to consider the opportunity to develop an area of the Waitangi Regional Park and undertake a habitat abundance restoration project. The HARP Plan – *Ravensdown (November 2021e)* provides further detail of the proposal.

4. AIR DISCHARGE PROCESS DESCRIPTIONS

4.1 INTRODUCTION

Following the development of the air discharge strategy, Ravensdown worked with Tonkin + Taylor ("**T+T**") to develop the process descriptions described in the following section.

The air discharge process description details the site activities undertaken at the Napier Works that has been used to inform the assessment of air discharges. It reflects much of the existing infrastructure, along with planned projects to:

- Replace the Den Scrubber system and combine the discharge with that from the existing Hygiene scrubber via a new 50m stack; and
- Replace the Acid Plant converter as part of Ravensdown's asset replacement programme. This will enable Ravensdown to align with international best practice and consequently further reduce sulphur dioxide (SO_2) emissions.

4.2 OVERVIEW

Ravensdown produces superphosphate fertiliser, which requires the import of bulk materials and the production of sulphuric acid. As New Zealand's largest superphosphate Manufacturing Plant, production of superphosphate typically ranges between 250,000 and 300,000 tonnes per annum, although the Site has the capacity to produce up to 440,000 tonnes per annum in its current configuration.

Superphosphate is produced by reacting ground phosphate rock with concentrated sulphuric acid, which results in the phosphate being soluble and available for plant uptake as a fertiliser. The manufacturing process initially requires the production of sulphuric acid. The site layout is shown in Figure **7** and the various steps involved in superphosphate manufacture are summarised in the flow diagram given in Figure 8 and are described in more detail in the following sections.

Figure 7: Site layout [11]

[11] Tonkin + Taylor, 2021. Reconsenting of Ravensdown Napier Works: Air Quality Assessment.

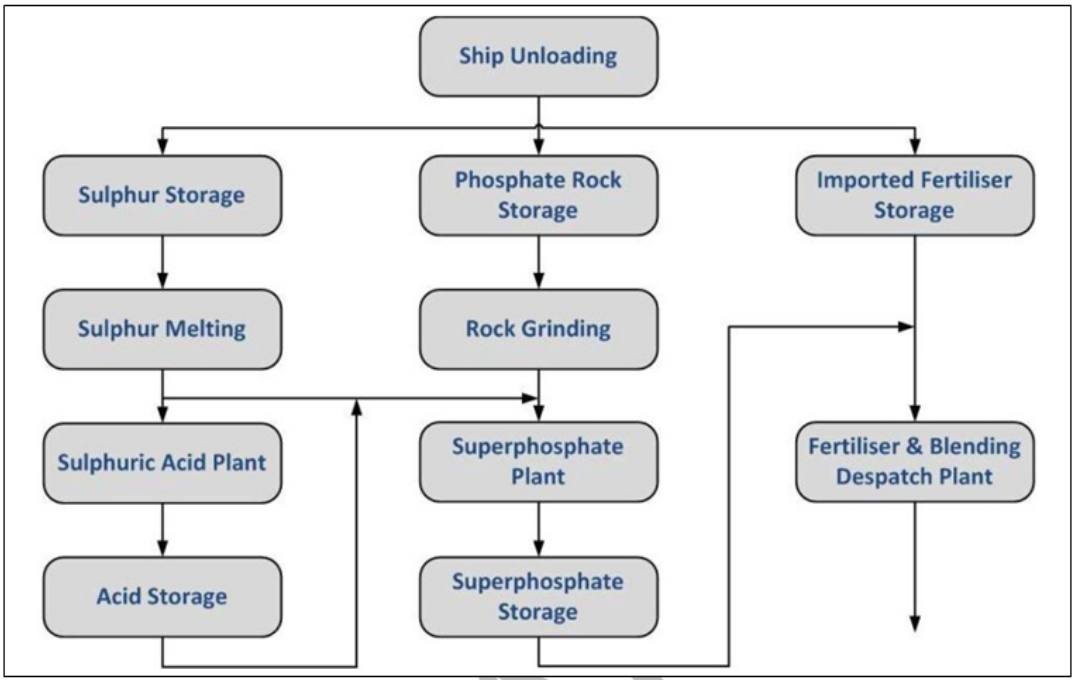


Figure 8: Summary of the Site activities that occur at the Ravensdown Napier Works.

4.3 BULK MATERIALS

Ravensdown receives approximately 200,000 tonnes of bulk materials for manufacture at Napier Works via the Port of Napier each year, mostly in the form of sulphur and phosphate rock. These are transferred from the port in covered trucks to the Site.

Up to 27,000 tonnes of prilled[12] sulphur is stored within the sulphur stores, while the phosphate rock is stored within several covered/enclosed 'rock stores' with capacity of approximately 80,000 tonnes. The locations of the sulphur and rock stores are indicated in Figure **7**.

4.4 SULPHURIC ACID PRODUCTION

4.4.1 Sulphur receipt and storage

Elemental sulphur is currently imported primarily from Canada. It is a by-product of the petrochemical industry. The sulphur is received by ship at the Napier Port and is transported by truck to the Site. The sulphur is in a granular form (prill) with a specification[13] of less than 5% fines to reduce dust emission during the handling and

[12] Prilled refers to the sulphur being in a granulated state that minimises the potential for dust generation from its handling.

[13] The as received fines content is typically less than 3%.

conveying process. Prior to shipping the elemental sulphur will have SLS (Sodium Lauryl Sulphate) applied to minimise formation of hydrogen sulphide (H_2S).

The prilled sulphur is received at the Site into an intake hopper and then conveyed into one of two bulk sulphur storage sheds. The location of the storage sheds is shown in Figure **7**.

4.4.2 Sulphur melter

Sulphur prills are loaded from the stores into a melting plant to be melted indirectly via steam, which causes any water contained within the sulphur to be released as well as some H_2S gas. Both the steam and hydrogen sulphide are discharged through vents. The molten sulphur is pumped to the Acid Plant or Manufacture Plant. A schematic of the sulphur melting process is given in Figure 9.

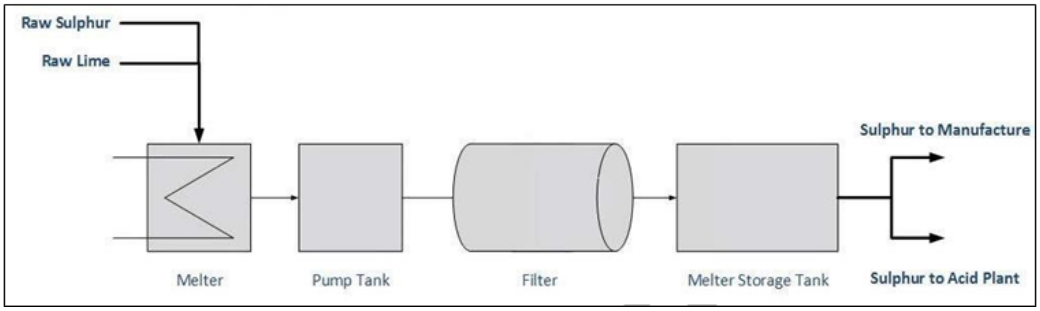


Figure 9: Sulphur melter flow diagram (source: Ravensdown)

Figure 10: View of the sulphur melter and sulphur stores from Waitangi Road, outside of the Site.

4.4.3 Acid Plant

Sulphuric acid is produced through a Sim-Chem (Monsanto) designed plant that uses the 'Contact Process', which is a widely known and understood means of sulphuric acid manufacture. This process initially involves burning molten sulphur with dried air to form sulphur dioxide (SO_2). SO_2 is then passed over a catalyst (vanadium pentoxide), which converts it into sulphur trioxide (SO_3) – this is done in the 'converter'. SO_3 is then scrubbed from the gas stream using strong sulphuric acid (H_2SO_4), further concentrating the acid. Water is added to dilute the concentration and the resulting sulphuric acid is pumped to storage tanks for use in the fertiliser Manufacturing Plant or commercial sales. Figure 11 provides a simplified schematic of the acid production process and Figure 12 provides a view of the Acid Plant from State Highway 51.

The Napier Works operates a double absorption process. This two-step conversion and adsorption process reduces the amount of SO_2 released to atmosphere for a given production rate when compared to single absorption plants. This is because of the greater rate of removal of SO_3, which allows the reaction equilibrium to move further.

Approximately 100,000 tonnes of sulphuric acid are produced each year, depending on sales, the majority of which is used in the manufacturing process and the remainder sold directly to consumers.

Many of the reaction steps involved in the production of sulphuric acid result in the generation of excess heat. The excess heat is used to generate steam. Low-pressure steam is used in the Acid Plant, while high-pressure steam is used to create electricity through a steam turbine.

In times when the Acid Plant is not operating, a diesel-powered boiler is required to continue the supply of low-pressure steam. Further information on the Acid Plant start-up is given in the following section.

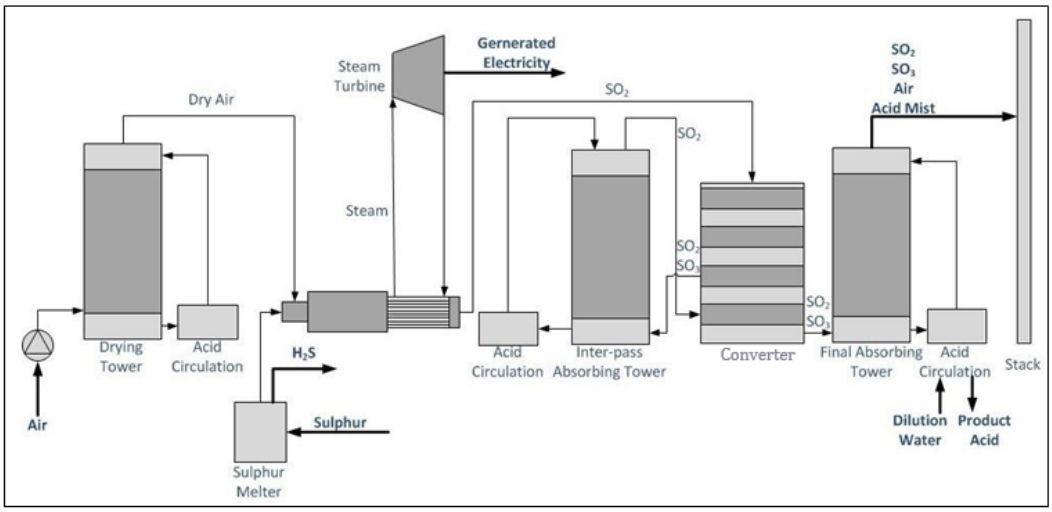


Figure 11: Double absorption sulphuric Acid Plant flow diagram (source: Ravensdown)

Figure 12: View of Acid Plant from State Highway 51.

4.4.3.1 Acid Plant pre-heating and shut down

The diesel-powered auxiliary boiler is used to generate low pressure steam for short periods when the Acid Plant process is not operating but intended to restart. This boiler discharges products of combustion.

Diesel combustion emissions and SO_2 are also discharged from heating the process vessels during restart of the Acid Plant.

Heating of the furnace refractory, catalyst and other process equipment also occurs before firing the Acid Plant on sulphur and this results in discharge of diesel combustion products.

Since November 2016, the start-up procedure has been refined to minimise SO_2 emissions. A 'start- up stack' was also installed extending the height of the previous temporary stack that was used for pre-heating the furnace. These measures help minimise the ambient concentrations of SO_2 during start-up. Ravensdown is continuing to investigate measures to further reduce the impact of SO_2 emissions during startup, including the configuration of the start-up stack.

The technique for cooling the Acid Plant down prior to an annual maintenance shutdown has also been refined. The plant is now allowed to cool more gradually, ensuring any residual sulphur is burnt off and converted to acid prior to completely shutting down. The consequence of this is it also helps to minimise SO_2 emissions during plant start-up.

As discussed in the Air Discharge Strategy, Ravensdown will continue to investigate and implement measures to reduce SO_2 emissions during start-up.

4.4.4 Converter replacement

As described in the Air Discharge Strategy, a planned replacement of the existing converter tower is programmed for 2023, which will increase the volume of catalyst inside the tower and enable a greater conversion of SO_2 to SO_3. It is expected that this new converter technology will enable Ravensdown to meet a lower SO_2 emission rate limit.

4.5 MANUFACTURING PLANT

4.5.1 Phosphate rock receipt and grinding

The primary ingredient of superphosphate is phosphate rock. This raw material is purchased internationally and shipped to the Napier Port. From the port the rock is trucked to the Site and received over an intake system which conveys it into rock storage sheds. The location of the rock stores is shown in Figure **7**.

In its raw state, the phosphate rock has a range of consistencies, from sand-like to coarse chip. In this state the rock is too coarse to react sufficiently with acid and make superphosphate. Prior to processing, the rocks are blended through a weighed silo system to create a mix, which satisfies the chemical characteristics required by the plant. It is then fed to four grinding mills where it is ground to the consistency of talcum powder (more than 80% passing a 75 µm sieve) and conveyed to a storage tank. Figure 13 provides a schematic of the rock grinding process.

Dust is generated from the grinding of raw phosphate rock and the manufacturing of superphosphate. This dust is collected through bag house systems, which are associated with each mill (collectively referred to as Bradley Mills). The baghouse system uses a fan to draw in air and pass it over a set of filter bags capturing any dust before it is discharged. Dust collected on the filter bags is reused in the feed for the powder plant.

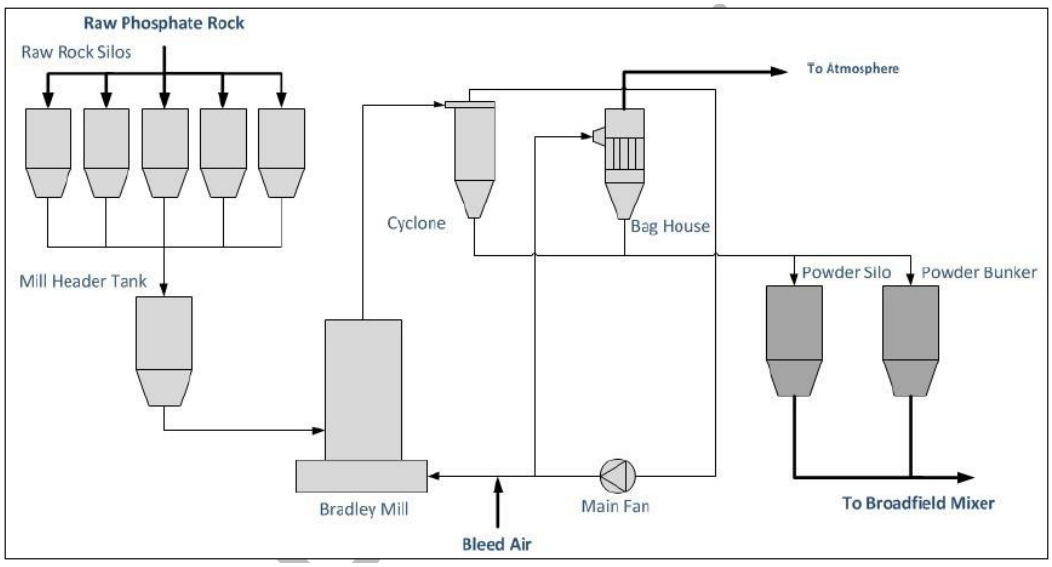


Figure 13: Rock grinding plant flow diagram (source: Ravensdown)

4.5.2 Rock acidulation

From the storage tank, the finely ground phosphate rock powder is fed into the Broadfield Mixer and Den. In the mixer sulphuric acid (H_2SO_4) and phosphate rock are reacted, alongside hydrofluorosilicic acid (FSA)[14] and fresh water to form a product with the consistency of wet concrete. Elemental sulphur may also be added from the sulphur melter on occasions to provide a product containing sulphur.

Two reactions occur. The first occurs quickly between sulphuric acid and phosphate rock to create phosphoric acid and gypsum. The second reaction uses the phosphoric acid and more phosphate rock to produce monocalcium phosphate, which occurs over a couple of weeks depending on rock source and grind consistency.

The initial manufacturing process occurs for over approximately 20 minutes inside a reaction chamber called the 'Den', which allows completion of the first reaction and significant progress through the second. Once cured, the material is crushed and passed through the granulation system to form the final granulated product. This product is conveyed into the storage sheds and allowed to mature until the granules fully harden and the reaction completes.

The process of adding H_2SO_4 to the mixer causes the phosphate to convert to a soluble state. Fluoride is mostly bound within the same mineral (usually fluorapatite) as phosphate, causing fluoride to be released during the mixing process, as well as carbon dioxide, heat,

[14] The FSA is sourced from the Den and Hygiene scrubbers described below.

and steam. A wet scrubbing system referred to as the ‘Den Scrubber’ is used to absorb fluoride gases from the process. The Den Scrubber system is comprised of a series of large towers that contain sprays that wash the steam and absorb the fluoride before it is discharged through the Manufacturing Stack(s).

There are also some fluoride gases that are released during the granulation and conveying systems. These are collected through a second scrubber system known as the ‘Hygiene Scrubber’, allowing fluoride levels to be minimised within the building. Emissions associated with the Hygiene Scrubber are also discharged through the Manufacturing Stack.

Figure 14: View of the Manufacturing Plant looking from SH51. The stacks in the background are the existingDen Scrubber stacks and the stack in foreground is the existing Hygiene scrubber stack.

The Hygiene and Den Scrubber systems currently discharge via separate stacks (two for the Den Scrubbers and a single stack for the Hygiene scrubber). Ravensdown has recently been granted (5 July 2021) a variation to its existing air discharge permit to replace the Den Scrubber system and combine all three stacks into a new, taller 50 m stack. As described in the Air Discharge Strategy, this new scrubber system will enable Ravensdown to operate in a lower fluoride discharge limit and lower ambient fluoride levels.

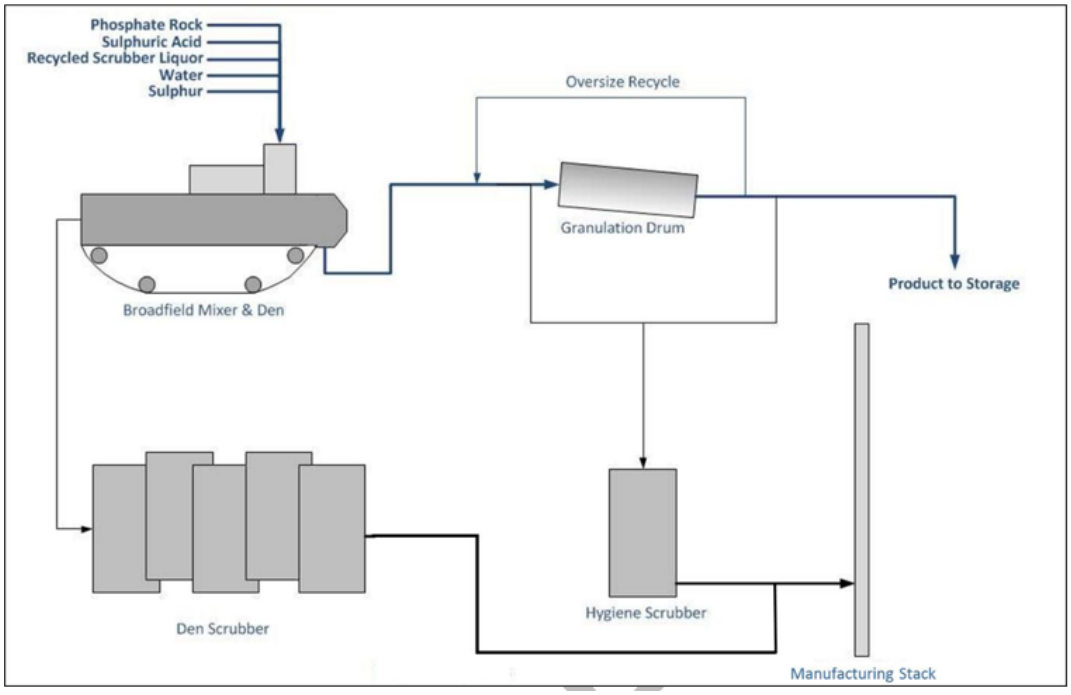


Figure 15: Superphosphate plant flow diagram with a combined Manufacturing Stack.

4.6 COOLING TOWERS

The Acid Plant operates two cooling towers that are used for cooling the freshly made sulphuric acid and for cooling the turbine/alternator system. The bulk of the heat generated in the acid manufacture process is reclaimed and used to generate steam. Manufacturing steps such as acid dilution release low grade heat which is not hot enough to be used to create steam. This heat must be removed from the plant and is dissipated through cooling towers. The cooling towers consume fresh water and remove heat from the plant through evaporation. The evaporated water may be seen as a vapour plume above the cooling tower fans on occasions and contains no contaminants.

4.7 DISPATCH PROCESS

A loader is used to collect the cured superphosphate from the storage sheds and feed it into a dressing plant. This dressing plant breaks up any lumps in the product before it is loaded into trucks to be dispatched from the Site. A portion of the superphosphate is also fed into a blending plant which allows other products which are not manufactured on the Site to be blended with it to achieve the nutrient characteristics required by a customer. This is loaded into trucks using conveyors or front-end loaders to be dispatched from Site.

The processes of conveying, dressing, and loading of the fertiliser can result in some dust becoming airborne.

5. WATER DISCHARGE PROJECT DESCRIPTION

5.1 INTRODUCTION

Following the development of the air and water discharge strategies, Ravensdown worked with Aurecon to develop the water project description described in the following section.

The water discharge project description provides the details of the proposed solution for future stormwater and process water management at the Napier Works including the time horizons for the proposed Stage 1 and Stage 2 upgrades, and the proposed treatment devices to be installed during each stage. In addition, it details the expected system performance and the water balance modelling undertaken for the site to determine the volume and percentage of rainfall events captured and treated for the site. Ongoing monitoring will be undertaken to confirm if additional treatment devices, source control strategies, or discharge schemes are required over and above the elements identified below.

5.2 STORMWATER AND PROCESS WATER DISCHARGE REQUIREMENTS

5.2.1 Quality Requirements

The water quality targets and standards for the receiving environment set in the following regulatory documents have been summarised in Table 5 and Table 6 to guide the development of the stormwater and process water management system.

- National Policy Statement for Freshwater Management ("**NPS-FW**")
- Proposed Plan Change 9-TANK (Tūtaekurī, Ahuriri, Ngaruroro, Karamu) Catchment Plan ("**TANK**"), including updates recommended by council officers in their s42A report to the hearing panel[15];
- Hawke's Bay Regional Coastal Environment Plan ("**RCEP**")

There were water quality targets and standards in the above-mentioned regulatory documents that were not in a form that was conducive to the design process. In particular, the regulatory documents included some water quality targets referring to a percentage increase of the particular contaminant in the receiving environment, and some had targets for visual clarity in the waterbody. While these are appropriate to consider in the assessment of effects, they are by nature variable and are not included in the table below.

[15] While these standards are not yet operative and may change, they are considered conservative and have been adopted for the purposes of this application as representing an expression of the community's expectation for longer term water quality in the TANK area.

Table 5: Summary of target and existing contaminant concentrations

Contaminants		Receiving Environment Guideline / standard value (mg/L)		Concentration in existing discharge (mg/L)
		Tūtaekurī River / WaitangiEstuary	Land	
Soluble reactive phosphorus	Annual median of nofewer than 8 samplesin a 12-month period	0.015 (1)	-	7.8 (5)
Ammoniacal nitrogen (10)	Receiving environment concentration	0.1 (1)	-	0.403 (5)
Nitrate nitrogen	Receiving environment concentration	0.05 (1) (Improving trend by 2040)	<1 (3)	4.98 (5)
Nitrate	Maximum	0.195 (2)	50 (3,4)	8.46 (8)
Total nitrogen	Receiving environment concentration	0.11 (1) (Improving trend by 2040)	-	5.39 (5)
Total suspended solids		25 (2)	-	5 (5)
pH		7.0-8.5 (1)	7.0 - 8.5 (3,4)	21% of records since 2018 less than 7.0, and 0% greater than 8
Fluoride		-	1.5 (3,4)	39.79 (7)
Al		0.055 (1,2)	0.1 (3,4)	3.04 (7)
Cu		0.0013 (1,2)	1 (3,4)	0.21 (7)
Cd		0.0055 (1,2)	0.004 (3,4)	0.05 (7)
Cr		0.027 (1,2)	0.05 (3,4)	0.043 (7)
Ni		0.07 (1,2)	0.08 (3,4)	- (9)
Zn		0.015 (1,2)	1.5 (3,4)	0.478 (7)

(1) TANK Plan Change, s42A Addendum report, Waitangi Estuary water quality
(2) RCEP – surface water quality
(3) TANK Plan Change, s42A Addendum report, groundwater quality
(4) RRMP – environmental guidelines, groundwater quality
(5) Median of measurements collected since 2007
(6) 95th percentile of measurements collected since 2007
(7) Maximum value of measurements collected since 2007
(8) 80th percentile of measurements collected since 2007
(9) Nickel is measured in the receiving environment but not in the discharge, so there is no direct comparison to the discharge standards
(10) unionised ammonia based on pH8 at 20 deg C, all flows

For several of the contaminants in Table 5 the regulatory documents add a qualifier (for example, that the measurement is a maximum concentration, or an annual median). For the

purposes of designing the stormwater system the guideline / standard value has been used as a target for the discharge, regardless of how the regulatory document directs that this is measured in the receiving environment.

It is important to note that these water quality standards for the Tūtaekurī River /Waitangi Estuary need to be met following reasonable mixing. Streamlined Environmental have undertaken a dye study to assess the dilution of stormwater and process water that is likely to occur in the Awatoto Drain. Streamlined Environmental[16] have recommended that a dilution of 2.8 should be used if the discharge is occurring at low tide (or if the discharge is constant regardless of tide state), and 4.9 if the discharge was undertaken to take advantage of the greater dilution occurring at high tide. To demonstrate indicatively how this dilution will assist with achieving the guideline values, Table 6 applies these dilution factors to the existing discharge quality.

Table 6: Tūtaekurī River / Waitangi Estuary water quality standards with dilution applied, in comparison to existing discharge quality

Contaminants		Guideline / standard value (mg/L)	Concentration in existing discharge with dilution applied - discharge at any tide state (mg/L)	Concentration in existing discharge with dilution applied – discharge at high tide (mg/L)
Soluble reactive phosphorus	Annual median of nofewer than 8 samplesin a 12-month period	0.015	2.79	1.59
Ammoniacal nitrogen (10)	Receiving environment concentration	0.1	0.014	0.08
Nitrate nitrogen	Receiving environment concentration	0.05	1.78	1.02
Nitrate	Maximum	0.195	3.02	1.73
Total nitrogen	Receiving environment concentration	0.11	1.93	1.10
Total suspended solids		25	1.79	1.02
pH		6.5-9	N/A	N/A
Fluoride		5-	14.21	8.12

[16] Streamlined Environmental, 2021. Ravensdown Napier discharge consent - Assessment of Estuarine Ecological Effects.

Contaminants	Guideline / standard value (mg/L)	Concentration in existing discharge with dilution applied - discharge at any tide state (mg/L)	Concentration in existing discharge with dilution applied – discharge at high tide (mg/L)
Al	0.055	1.09	0.62
Cu	0.0013	0.08	0.04
Cd	0.0055	0.02	0.01
Cr	0.027	0.02	0.01
Ni	0.07	No data available	No data available
Zn	0.015	0.17	0.10

5.2.2 Design Guidelines

The design of this project is based on the following standards and criteria:

- Hawkes Bay Waterway Guidelines - Stormwater Management.
- Napier Code of Practice for Subdivision and Land Development.
- HIRDS rain data.
- Stormwater Management Devices in the Auckland Region GD01 (referred to for design of water quality devices where local applicable standards were not available).

5.3 EXISTING STORMWATER AND PROCESS WATER SYSTEM

The Ravensdown Awatoto site is split into four major stormwater catchments (Figure 16):

- Catchment 1: Truck wash and despatch north
- Catchment 2: Despatch south and manufacturing
- Catchment 3: Site office, intake store, melting and acid plant north
- Catchment 4: Acid plant south

The site intercepts stormwater from the adjacent public road (Waitangi Road) which is to the west of the site and runs through the centre of the site. As the roadway is elevated above the site, there are no discharges from the site onto the roadway.

Stormwater runoff from the southern end of the site (between Catchment 4 and the site's existing settling pond) does not have any ongoing contaminant-generating industrial activities and is therefore not shown in this description. Stormwater from this area flows to several roadside swales that do not directly connect to the settling pond and primarily

infiltrate to ground. However, in large events, these roadside swales may overtop and flow to the settling pond.

Process water enters the stormwater system from acid plant operations and from blowdown water from the cooling towers, south of the acid plant.

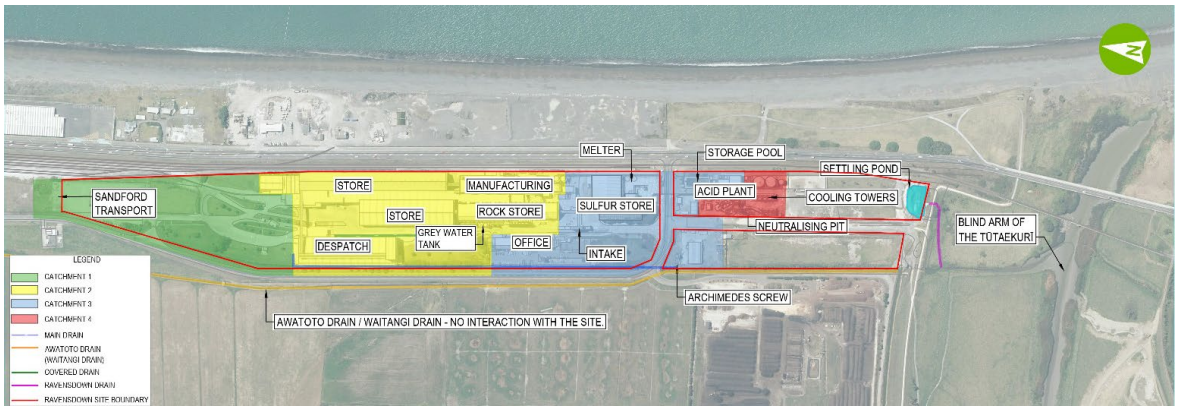


Figure 16: Stormwater catchments

Stormwater is captured at several locations on site from where it may be consumptively used by being injected directly into the manufacturing process or used in the scrubbers. Stormwater and process water that is not reused, ultimately discharges to the settling pond located at the southern end of the site.

Water is added to the setting pond from the site bores as required to provide dilution prior to discharge (see section 6 for further details).

Outflows from the settling pond[17] make their way to the Ravensdown Drain which discharges to the Tūtaekurī Blind Arm, then west into the main stem of the Tūtaekurī River. The Tūtaekurī River then flows east to the Waitangi Estuary which discharges into the Pacific Ocean.

A more detailed description of the existing stormwater system, including a detailed schematic flow diagram is included in section 3 of the High Level Options Report – *Aurecon (November 2021*).

5.4 PROPOSED STORMWATER MANAGEMENT SYSTEM

The adaptive management strategy outlined in the Water Discharge Strategy in Part C proposes to implement site improvements over two stages. Stage 1, targets improvements in those catchments that contribute most of the contaminants to the overall stormwater

[17] Maximum rate of Discharge = 265 L/s

load. These improvements should have an immediate impact, significantly reducing the overall load of the contaminants of highest concern.

Stage 2 is intended to provide a site-wide stormwater management solution through implementing a wetland-based treatment system. Following Stage 2, ongoing monitoring will be undertaken to confirm if additional treatment devices, source control strategies, or discharge schemes are required over and above the elements identified below. A water balance model has been developed for Stage 2 in order to estimate the mean annual volumes of water captured through the proposed adaptive management strategy.

5.4.1 Stage 1

The primary improvements proposed with Stage 1 are the installation of a bioretention basin and a clarifier treatment device adjacent to the manufacture and despatch facilities (Catchment 2). These devices target nitrogen and phosphate-based nutrients as well as heavy metals resulting from the manufacture of superphosphate. Figure 17 shows the improvements associated with this stage. Refer to drawing 1001 in Appendix 1 for additional details.

Figure 17: Stage 1 improvements

5.4.1.1 Bioretention basin

A bioretention treatment device with a saturated zone is proposed for the catchment that services the urea store and despatch area. This device, which is intended to remove the dissolved forms of nitrogen (i.e., ammoniacals and nitrates), is specifically targeted at this

location, being the only location on site where nitrogen-based fertilisers (e.g., urea) are present. Bulk sediment removal will be undertaken prior to discharge to the device, either in a manhole-based proprietary treatment device, or within a forebay to the device itself. This device consists of a vegetated surface area that infiltrates through an engineered media to an underlying submerged zone, discharging through an underdrain (refer Appendix 1). Enhanced removal of the target contaminants can be provided through the presence of carbon amendments within the saturated zone. The basin has been sized to provide retention for the rainfall depth of 25mm from all impervious areas within the catchment boundary and provide treatment for the captured volume of stormwater.

The existing stormwater system for the despatch south and manufacturing catchment flows to a large sump (the grey water sump), from where it is pumped to the grey water tank. It is proposed that this system be diverted north of its connection with the grey water sump to flow into the bioretention basin.

The bioretention basin will include planted areas that store, filter and release stormwater through a vegetated soil media layer. The basin will be lined with a polyethylene (PE), geosynthetic clay liner (GCL) or other similar impervious linings which will prevent the interception of ground water or the discharge of contaminated water to ground. Subsoil drainage positioned within the submerged layer will enable treated water to be directed to a chamber and pumped into the clarifier for additional treatment.

The basin will consist of a ponding zone to provide retention above the infiltration zone. Plant species included in this zone will be selected to enhance the nitrogen and phosphorus uptake while also withstanding the elevated fluoride concentrations anticipated in the runoff from this catchment. When the bioretention storage overtops (i.e., when the catchment receives more than 25mm of rain), additional inflow will flow over a weir and into the Ravensdown Main Drain which flows to the Discharge Pond.

Table 7: Bioretention basin parameters

Sub-catchment area	Rainfall capture depth	Estimated ponding depth	Minimum storage volume
3.1 Ha	25mm from all external impervious areas including roof areas	0.5 m	615 m^3

5.4.1.2 Clarifier System

A clarifier is proposed to treat the wastewater originating from the manufacture, intake and despatch catchments (Catchments 1, 2 and 3). A clarifier is a settling tank that provides for continuous removal of solids from chemically treated water. Clarifiers also allow for continuous removal of solids / sludge from the base of the settling tank.

A holding pond is proposed to capture stormwater to be treated by the clarifier. The holding pond is necessary to attenuate peak flows during storm events, allowing the clarifier to treat the water at a rate that may be slower than is generated by the storm event.

The proposed holding pond is designed to capture all storm events up to a 75mm event (at a 10-year ARI intensity) for the manufacture and intake catchments. This volume significantly exceeds the typical water quality capture volume of about 25mm of rainfall and was selected based on the nature of the catchment, which includes significant manufacturing operations. This catchment is expected to be the main contributor to contaminants that are entrained within phosphate rock, including SRP, fluoride, and heavy metals.

The holding pond has been sized based on operating at a constant flow rate of 10 L/s, which reduces the bulk storage requirement necessary to achieve the desired 75mm capture volume. As the specific clarifier operational parameters are subject to ongoing design, the exact design flow rate may vary and the proposed volume in the holding pond will be determined based on the final device selected.

Common flocculants used by clarifiers include alum and polyferric sulphate (PFS). These flocculants cause suspended solids to clump together which greatly reduces the settling time. The flocculants also react with several key dissolved contaminants in the water to form a solid precipitate that is settled out with the solids. Through precipitation, clarifiers can remove soluble reactive phosphorus (SRP) down to very low levels of below 0.05 mg/L. Clarifiers can also treat fluoride to 3mg/L and other heavy metals (especially aluminium, copper and zinc) that are associated with the raw materials from superphosphate manufacturing operations.

Table 8 below indicates which events would be fully captured by the proposed system.

Table 8: Clarifier Holding Basin Performance Range

Rainfall intensity (mm/hr)												
	Duration (hours)											
ARI*	0.167	0.333	0.5	1	2	6	12	24	48	72	96	120
1.58	43.20	30.60	25.00	17.90	12.55	6.92	4.61	3.02	1.90	1.43	1.16	0.98
2	48.96	34.50	28.20	20.10	14.15	7.73	5.15	3.34	2.10	1.58	1.28	1.08
5	70.20	49.20	40.00	28.20	19.60	10.58	6.98	4.46	2.79	2.10	1.69	1.42
10	87.60	60.90	49.20	34.50	23.90	12.77	8.33	5.33	3.31	2.47	1.98	1.67
20	106.80	73.50	59.40	41.40	28.45	15.12	9.83	6.21	3.83	2.85	2.28	1.91
30	118.80	81.60	65.80	45.70	31.30	16.53	10.75	6.75	4.17	3.07	2.47	2.06
40	127.80	87.60	70.60	48.80	33.35	17.50	11.33	7.13	4.38	3.25	2.59	2.17
50	135.00	92.40	74.40	51.40	35.05	18.33	11.83	7.42	4.56	3.38	2.70	2.25
60	141.00	96.30	77.60	53.50	36.40	19.00	12.33	7.71	4.71	3.47	2.77	2.32
80	151.20	103.20	82.80	56.90	38.70	20.17	12.92	8.08	4.94	3.64	2.90	2.43
100	159.00	108.30	86.80	59.60	40.40	21.00	13.50	8.42	5.13	3.76	3.00	2.50
250	193.20	130.50	104.20	71.00	47.75	24.50	15.67	9.67	5.83	4.28	3.40	2.83

*ARI – Annual Return Interval

The green cells in Table 8 represent the range of design storms that will be successfully attenuated, treated and discharged through the holding pond and clarifier system. The dark green cells are those that would be captured by a traditional 25mm water quality capture volume. Therefore, the light green cells represent events that the proposed system would capture and treat above and beyond traditional design. The orange cells indicate the threshold storms that are on the edge of the pond's storage limit. These are design storms that have been used to assess the pond performance range and will be attenuated. The design storms corelating to the red cells will exceed the pond's storage in its current configuration. Refinement of the clarifier outflow system may change the final treatment envelope.

In addition to inflows from the holding pond, the proposed clarifier will also receive the discharge from the bioretention basin discussed above. This effluent originated from the south portion of the despatch areas.

Prior to entering the settling tank, water will be dosed with flocculant in a dosing tank. Along with dosage with a flocculant, it is likely that pH dosing will be required in the dosing tank to optimise the clarifier's efficiency.

Based on the initial flow rate of 10 L/s, the required settling tank would have a volume of approximately 100,000 litres. It is envisioned the clarifier system would consist of three to four settling tanks that would be utilised in parallel as needed.

There are two discharge streams generated by the clarifier – the clarified (clean) water from the top of the clarifier, which will be discharged to the Ravensdown Main Drain and the effluent from the bottom of the clarifier, which is intended to be captured and reinjected to the industrial process. Effluent from the clarifier can be utilised in the

industrial process either as a dewatered solid or bulk liquid. It is possible that the existing grey water tank, or additional holding tanks may be used to hold this captured water as needed. Dewatering of the clarifier effluent may be conducted using a decanting centrifuge or other dewatering device, depending on the nature of the sludge produced. The dewatered solids will either be mixed into the superphospate manufacture process, or should the solid prove unsuitable for manufacture, landfilled in an appropriate facility. The resulting liquid could then either be returned to the clarifier influent or consumptively used in the manufacture process.

Table 9: Clarifier basin parameters

Sub-catchment area	Clarifier treatment rate	Capture depth	Estimated max ponding depth	Minimum storage volume
2.4 Ha	10 L/s	75mm from all external impervious areas including roof areas	1.5 m	1205 m^3

The existing stormwater system for the manufacture catchment flows through a stormwater reticulation and enters the grey water tank sump from the south. It is proposed that this stormwater system be reconfigured to intercept this flow at the location of the existing sump and direct it to the proposed holding pond, as shown in drawing 1001 in Appendix 1.

A portion of the proposed catchment currently flows to a second sump, located south of the office buildings. Although this sump was historically connected to the grey water sump, this connection has since been blocked or removed. To allow for this portion of the catchment to flow to the clarifier system, it is proposed that this connection be reinstated to allow for discharge to the holding pond.

A further portion of the existing inflow to this catchment consists of flow from the sulphur stores, melter, and acid plant areas. As this water should not contain significant concentrations of superphosphate-based contaminants (i.e., SRP, fluoride and heavy metals), this area is not proposed to discharge to the clarifier. The stormwater system will require modification to allow this catchment to flow to the Ravensdown Main Drain instead of the clarifier holding pond.

As discussed above, the holding pond / clarifier system is intended to capture up to a 75mm rain event. Once the holding pond is full, additional inflow will flow over a weir and be discharged to the Ravensdown Main Drain which flows to the Discharge Pond.

5.4.1.3 pH dosing and neutralisation

Under the current arrangement, the pH is managed at several locations across the Site. These locations include the neutralisation pit within the acid plant and at the Archimedes screw. As this system is working well, no significant modifications are proposed, except for the addition of a pH dosing point at the clarifier as needed to optimise the clarifier operations.

5.4.1.4 Discharge Pond discharge improvements

Under the current arrangement, stormwater and process water is discharged from Ravensdown via a settling pond located at the southern boundary of the site. The pond discharges via two pumps through a stopbank to a drain that flows to the Tūtaekurī River / Waitangi Estuary.

The combined capacity of the two outlet pumps is 240 L/s, separated into individual pump capacities as per below,

- Daily flow management – 20 L/s
- High flow relief – 220 L/s

The capacity of the existing discharge system has been assessed to determine its suitability for future use by comparing the detention storage and the pumps' capacity to the HIRDS V4 rainfall data for the site.

The total proposed storage of the developed site, approximately 4300 m^3, has been incorporated into the pump capacity assessment. Storm events producing total runoff volumes less than this volume are able be fully attenuated on site and released to the discharge pond at a rate well below the pump system's capacity. The analysis indicates that long duration (6+ hours) storm events can produce flood volumes that exceed the system's capacity for storage. These events will bypass the treatment and flow directly to the discharge pond. However, longer duration events have lower rainfall intensities with corresponding lower peak flows. The results indicate that the discharge pumps can manage the computed peak flow rates for all events exceeding 24 hours in duration.

There are several events that exceed the storage capacity of the system and the peak discharge capacity of the discharge pumps. These events are 6-hour events that exceed a 50-year ARI, and 12-hour events that exceed a 20-year ARI. In these infrequent events, it is likely that ponding would occur within the site, such as within the office carpark as has been noted in previous large events (such as the extreme rainfall event on 9 November 2020).

Further development of the treatment devices may alter the range stated due to changes in the residence times and the available storage volumes. The flow capacity of the Archimedes Screw has been estimated to be within a range of 80 – 110 L/s. At this flow, it

is anticipated that the screw will be the limiting factor that regulates the peak flow rate of the overall system.

Based on the overall system performance, upgrade of the existing discharge pumps is not currently considered necessary, however upgrades to the Archimedes screw could be considered to reduce flood potential within the site in the future.

Based on feedback received from project stakeholders including Mana Whenua and the Technical Focus Group, it is proposed that the preferred discharge will be to land adjacent to the site using a spray irrigation system. This discharge to land is described in greater detail below. While the discharge to land is intended to be the primary means of discharge for this system, a secondary discharge to the Tūtaekurī River /Waitangi Estuary will be maintained for times when conditions are not appropriate for a discharge to land.

During Stage 1, it is proposed to maintain the settling pond in its current physical configuration, however modifications will be made to the discharge pump arrangement to provide for land discharge and to limit discharge to the estuary. A programmable logic controller (PLC) is proposed to manage the discharge for the system. The discharge will be prioritised as follows:

- Discharge to land via spray irrigation.
- Discharge to estuary at high tide (three hours before and three hours after).
- Discharge to estuary at any time.

When possible, all discharge to land will be as described in the section below.

When discharge to the land is not possible, it is proposed to preferentially discharge to the estuary three hours before and three hours after high tide to provide for enhanced dilution and flushing of contaminants. Although it is believed that most daily flows can be discharged through these means, in order to manage high flows on site, high flow discharges will be required from the pond outside of high tide during significant rainfall events. It is noted that significant dilution will occur during these periods, limiting the impact of these discharges.

Although reshaping and lining this pond is part of the long-term plan, this work is not recommended during Stage 1, as contaminant-laden sediment inflows to the pond may be expected to continue until the Stage 2 work is complete. As these sediments are likely to leach contaminants into the effluent water, they would need to be fully removed in order to achieve the desired discharge water quality at that time. Therefore, reshaping and lining the pond should be completed following the installation of all upstream water quality devices proposed under Stage 2.

5.4.1.5 Discharge to land

It is proposed to establish a spray irrigation discharge as the preferential discharge from the stormwater system when soil conditions allow (i.e. during dry periods). This discharge would pump water from the existing settling pond to the Ravensdown-owned paddocks on the west side of Waitangi Road. Ravensdown owns approximately 17.5ha in this area that is available for spray irrigation.

A range of potential pasture and crop systems are suitable for the site. Decisions about which crop (or range of crops) can be made seasonally but for simplicity it is assumed that a semi-permanent pasture will be established and maintained.

It is intended that pasture (or other crops) will be cut on a regular basis and made into baleage (a portable and common form of silage). Other options are to make it into hay or cut and transport off site fresh. It is proposed that the animal feed generated from this process could be supplied as free drought relief feed for "at need" regions as and when necessary. The advantage of exporting dry matter from the site is the associated removal of plant available nutrients thereby reducing the accumulation and associated risk of nutrient accumulation on site. In addition to the potential removal of nutrients from the site, other benefits of cut and carry include:

- The absence of livestock on site which in turn reduces potential internal transfers and accumulation of nutrients which can result in site specific loadings being more than monitored levels.
- Excellent control over residual pasture height which in turn reduces potential losses via overland flow.
- The ability to specifically maintain grass buffer strips within and surrounding any identified overland flow path.

An assessment of land-based discharge following treatment to ground discharge is detailed in section 12 of this AEE.

The stormwater would be conveyed from the existing settling pond, the end point of the upgraded treatment train system, to the land irrigation system via a pump system and pressurised pipeline. The pump system would be installed as an addition to the existing discharge pump house adjacent to the settling pond. The modifications to the pump chambers and pump house will be determined once a final pump is selected and the geometry of the new system is clear. The key design parameters of the pump system are:

- Approximately 950 metres of pipe from the settling pond to irrigation system.
- Feed rate of 20 litres/second, the baseline discharge of the proposed wetland system.
- A working requirement of 2-2.5 bar at the connection to the spray irrigator.

Based on the stated parameters the following options are appropriate for the proposed servicing of the irrigation system.

- 950 metres of 250OD SDR17 PE pipe; and
- 20kW submersible pump, single-stage, centrifugal pump; or.
- 10kW non-self-priming, single-stage, centrifugal pump.

Full detailed design is required to determine the exact specification of the final system.

5.4.1.1 Water take to supplement crop irrigation

In order to maintain the crop cover in the irrigation area during dry periods and when the water within the stormwater system is limited, the crops will be irrigated via the water take from the existing onsite bores. (see section 6 for further details).

5.4.2 Stage 2

The second stage of site improvements is intended to build upon the treatment facilities implemented in Stage 1 and provide a site-wide treatment solution. This stage introduces a large settling pond that discharges to a constructed treatment wetland and improvements to the Discharge Pond to limit potential interactions with groundwater. Figure 18 shows the improvements associated with this stage, refer to drawing 1002 in Appendix 1 for additional details.

Figure 18: Stage 2 improvements

5.4.2.1 Settling Pond

A new Settling Pond is proposed directly south of the Archimedes screw. This location allows for the system to make use of the significant boost in hydraulic gradient (head) provided by the Archimedes screw.

The proposed Settling Pond is intended as a first-line treatment to remove the suspended solids in the water and the associated contaminants that are entrained in or adhere to them. A forebay is proposed at the inlet of the Settling Pond to localise the sediment capture to an area where it may be more easily removed. The proposed Settling Pond will be lined with an impervious liner, either plastic or bentonite (clay) based to eliminate infiltration of partially treated water to the ground or the inflow of groundwater to the pond. The Settling Pond is initially intended to capture 25mm of water from the overall site and retain the water for a 24-hour period prior to discharge to a constructed wetland.

This pond would represent a significant upgrade to the existing pond, providing significantly longer retention times, capturing larger events, and providing significant attenuation to downstream components.

Table 10: Settling Pond parameters

Sub-catchment area	Design rainfall depth	Estimated ponding depth	Minimum storage volume
12.4 Ha	25mm rainfall events from all external impervious areas including roof areas	1.5 m	2090 m^3

5.4.2.2 Wetland

Water from the proposed Settling Pond will be discharged through an orifice to an adjacent constructed wetland system. The wetland system is a system made up of aquatic plants and microbes that provides for removal of contaminants, especially nutrients (both nitrogen and phosphate-based), with some removal of heavy metals.

Wetlands can perform a variety of treatment processes which include those driven by filtration, sedimentation, adsorption, biological uptake, chemical deposition, volatilisation, and microbial activity. On top of the treatment advantages, stormwater wetlands can contribute positivity to the environmental and cultural values of an area through habitat enhancement for multiple species.

The sizing of a wetland is influenced by the size of the contributing catchment and the quality of the influent water. The residence time (the length of time required for water to pass from one end of the wetland to the other) is a primary design parameter to achieve the required outcome – longer residence times and associated slower flows enhance the efficacy of the wetland treatment system.

The unique benefit of a constructed wetland compared to other standard treatment systems, e.g. first flush interception and soakage systems, is the ability for wetland systems to denitrify contaminated surface runoff. The denitrification process is driven by the presence of specific aquatic plants that can consume and breakdown suspended nitrogen compounds that would otherwise potentially discharge into the receiving environment.

Wetlands can also provide for treatment through phytoremediation. Phytoremediation processes treat contaminants through uptake and metabolization by plants which can both convert contaminants into neutral compounds and entrain them in vegetation, which is later removed and disposed of appropriately.

The plants also help slow the flows through the wetland basin, allowing suspended particles in the water to settle to the bottom of the wetland. Plant life also promotes microorganisms to grow on the surface of aquatic vegetation, helping to trap suspended contaminants.

Like the Settling Pond, the wetland will be lined to eliminate discharge to groundwater of untreated water and the inflow of groundwater. The proposed wetland will be sized to contain 25 mm of rainfall from the overall site (including both the permanent water level and the "live" water level) with a 48-hour retention time.

Table 11: Wetland parameters

Sub-catchment area	Design rainfall depth	Estimated ponding depth	Minimum storage volume
12.4 Ha	25mm rainfall events from all external impervious areas including roof areas	0.8 m (average)	2120 m^3

The minimum storage volume has been assessed based on a 48-hour residence time for the treatment volume. This may be refined as part of further design iterations changing the storage requirements.

The wetland design will be based on best practices and will include different zones of varying depths with plant selections appropriate to each zone. These zones include deep and shallow marsh zones, deep pools and tree islands. The final design may include floating wetland components in open water areas for enhanced treatment, if species can be sourced that would be appropriate for the site.

Flows within the wetland will be supplemented by water from the onsite bores as necessary to maintain the health of the ecosystem as detailed in section 6 below.

5.4.2.3 Discharge Pond

Following treatment in the wetland, the proposed system will discharge treated water to the outlet pond consisting of the repurposed existing settling pond. Following the discharge improvements completed under Stage 1, the operations of the Discharge Pond will be modified to allow for the proposed high tide discharge and to facilitate the discharge to land. As part of Stage 2, it is proposed to update this facility to better accommodate the wider discharge and treatment scheme.

In order to minimise potential interaction with groundwater and to improve safety at the site, the existing settling pond will be lined with an impervious clay or plastic liner and regraded. At the outlet pond, discharge pumps will be programmed to discharge to land via the spray irrigation scheme.

When irrigation is not appropriate, the discharge may be directed to the Tūtaekurī River/Waitangi Estuary at times coinciding with the high tide. This timing is intended to take advantage of enhanced dilution provided by discharge within this timeframe and minimise the potential build-up of contaminants within the estuary. Although it is expected that minor event flows will be discharged either to ground or at high tide, it is noted that during periods of higher flows, high volume discharge to the Tūtaekurī/Waitangi Estuary will be required regardless of tidal levels to prevent flooding on site.

5.5 MUSIC MODELLING

Continuous simulation water quantity modelling has been undertaken using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) model. MUSIC was developed from research undertaken at Monash University in Melbourne, the Cooperative Research Centre (CRC) for Catchment Hydrology and eWater. MUSIC establishes a water balance for the site using a continuous rainfall record and evapotranspiration input data to model runoff from catchments by converting rainfall into runoff, and in doing so accounting for losses due to soil storage and evapotranspiration.

Initially a MUSIC model was established and run to reflect the existing operations and discharge conditions. The results from the model were then reviewed against sample flow data taken from the existing pond discharge point and stormwater runoff flow rates for the site estimated through the rational method. An additional daily flow was included in the existing model scenario to account for dilution water which is added as part of the operational processes.

The stormwater quantity model was developed using the variables summarised below:

- Meteorological data: The modelling has been undertaken using the most suitable record of continuous rainfall data that is available for the site. Continuous rainfall data sets were provided by the Hawke's Bay Regional Council at various gauges across the Napier region. Rainfall data from the Napier, Farndon Road and Awatoto gauges were combined

and reformatted to produce a continuous rainfall data set in 30-minute intervals from 2006-2021. Potential evapotranspiration data was sourced from NIWA Cliflo online data base for the Napier station (15876) for the period October 1997-July 2021.

- Catchments: The various sub-catchments within the site were defined using the existing network information provided by Ravensdown and the pollutant and operational areas identified within the site. The catchments were categorised into pervious and impervious areas which consisted of roof, hardstand (impervious external stores, plant, and sealed roads), semi-impervious hardstand (unsealed roads) and pervious grassed areas.

Two different scenarios were modelled in MUSIC to reflect the staged approach discussed above. Stage 1 includes the modifications to the stormwater piped network, a holding pond and bioretention device adjacent to the manufacture and despatch facilities. Stage 2 includes theSettling Pond and wetland. In both scenarios, the dilution water which is currently included in the operational processes has been excluded as, even if it is continued, it will be applied to the end of the system instead of being diverted through the treatment devices.

An outflow of approximately 10L/s was included in the design and modelling of the holding pond to reflect the estimated discharge which will be pumped to the clarifier. The model considered that any attenuation provided by the clarifier would be minimal and the main purpose for this stormwater device would be treatment only. The water quality model therefore included the clarifier as a flow through node only.

5.5.1 Water balance model results

The water balance model results are summarised in Table 12 below. The results show that 93% of the total volumetric inflows from the overall site are treated through the system (i.e., flow through the wetland) with the clarifier system treating 97% of inflows) from the manufacture catchment.

Table 12: Water balance modelling results

Stormwater device	Mean volume captured [m^3/ year]	Mean volume weir bypass [m^3/ year]	Volumetric percentage of inflow treated [%]	Percentage of rainfall events captured [%]
Holding Pond / clarifier (Stage 1)*	14560	370	95	98
Bioretention Basin (Stage 1)*	13920	810	97	99
Detention Basin (Stage 2)**	53330	3590	94	99
Wetland (Stage 2)***	52390	3850	93	99

* Bypass flows go to Detention Basin
** Bypass flows go to Wetland
***Bypasses to Waitangi Estuary via Discharge Pond

The holding pond, bioretention basin, detention basin and wetland have all been modelled with high level weir bypass facilities. The modelling results indicate that while there are bypass flows expected, these would occur during larger storm events when the wider area is also experiencing significant rain. It is anticipated that these types of storm events would provide significant dilution and flushing flows to the receiving marine environment which is located downstream of the final discharge pond.

5.5.2 Model limitations and future development

The water quantity model developed for this investigation uses several default parameters, such as soil storage capacity, due to the lack of local data available. The discharge results to the receiving environment from the existing model have therefore not been fully calibrated to the recorded discharge flow data provided by Ravensdown. A dilution flow has been added to the existing model scenario to account for operational processes where additional clean water is added prior to discharge to the existing settling pond. However, as the long-term plan for the site is to minimise the use of dilution water to the greatest extent practical, this flow was removed from the proposed Stage 1 and 2 models. Additional uncontrolled flows to the existing system, such as ground water infiltration into the unlined settling pond, are unknown and therefore have been excluded from the results. The reuse of stormwater within the site for operational use including water stored within the existing grey water tank and storage pool has also been excluded from the model as the proposed site arrangement would modify this use.

The rainfall data included in the model is not site-specific due to the lack of continuous data available for this exact location. A combination of data from several different stations within the Napier, Farndon Road and Awatoto areas were used to form a continuous rainfall data set.

It is proposed that future investigations include the optimisation of the current MUSIC model to estimate the efficiency of the various stormwater treatment devices in the removal of target pollutants for the site including TSS, TP and TN. The model results will then be compared against consented water quality discharge targets and removal efficiencies to assess the suitability of different proposed stormwater treatment devices for both Stage 1 and Stage 2 scenarios. Any future contaminant model will exclude fluoride and sulphate as these contaminants cannot be modelled with MUSIC.

5.6 PROPOSED STORMWATER AND PROCESS WATER SYSTEM PERFORMANCE

An assessment of the operations of the proposed stormwater system has been undertaken to quantify the potential discharge quality of the system, once it has been fully commissioned. Table 13 below summarises the assumed removal efficacies that were used for the analysis and provides selected references.

Table 13: Device removal efficacies applied to the analysis

Contaminant	Device			
	Clarifier	Bioretention device /w/ carbon	Settling Pond	Constructed Wetland
Soluble Reactive P	0.03 mg/L [1]	25% [2]	10%	15%
Fluoride	3 mg/L [3]	0%	0%	0%
Ammoniacal Nitrogen (NH_4^+)	0%	60% [4]	5%	20%
Nitrate-Nitrogen (NO_3^-)	20% [4]	40% [5]	10%	75% [6]
Nitrite-Nitrogen (NO_2^-)	15%	60% [5]	10%	60%
Al	0.23 mg/L [1]	0%	10%	50%
Cu	0.01 mg/L [1]	90% [7]	10%	48%[8]
Cd	0%	90% [9]	10%	90% [7]
Cr	0%	0%	10%	89% [7]
Zn	0.5 mg/L[1]	90% [6]	10%	75%[10]
TSS	99%	90%	80%	90%

Note - Orange highlighted cells are those where the clarifier is expected to remove down to a given level as indicated. All other cells are the removal efficacies as a percentage of influent concentration.

[1] Cameron, Keith & Di, Hong. (2019). A new method to treat farm dairy effluent to produce clarified water for recycling and to reduce environmental risks from the land application of effluent. Journal of Soils and Sediments. 19. 10.1007/s11368-018-02227-w.
[2] Søberg, L.C., Al-Rubaei, A.M., Viklander, Metal. Phosphorus and TSS Removal by Stormwater Bioretention: Effects of Temperature, Salt, and a Submerged Zone and Their Interactions. Water Air Soil Pollut 231, 270 (2020). https://doi.org/10.1007/s11270-020-04646-3
[3] Hiroshi NAKAZAWA, Kazuhito NISHIKAWA2 and Wataru HAREYAMA, Removal of Fluoride Ions from Aqueous Solution Using Ferric Hydroxide,2012, Graduate School of Engineering, Iwate University, Morioka 020-8551
[4] Aghapour AA, Nemati S, Mohammadi A, Nourmoradi H, Karimzadeh S. Nitrate removal from water using alum and ferric chloride: a comparative study of alum and ferric chloride efficiency. Environmental Health Engineering and Management Journal 2016; 3(x): x–x.
[5] Osman, M.; Wan Yusof, K.; Takaijudin, H.; Goh, H.W.; Abdul Malek, M.; Azizan, N.A.; Ab. Ghani, A.; Sa'id Abdurrasheed, A. A Review of Nitrogen Removal for Urban Stormwater Runoff in Bioretention System. Sustainability 2019, 11, 5415.
[6] Uuemaa, E.; Palliser, C.C.; Hughes, A.O.; Tanner, C.C. Effectiveness of a Natural Headwater Wetland for Reducing Agricultural Nitrogen Loads. Water 2018, 10, 287.
[7] Wang, J.; Zhao, Y.; Yang, L.; Tu, N.; Xi, G.; Fang, X. Removal of Heavy Metals from Urban Stormwater Runoff Using Bioretention Media Mix. Water 2017, 9, 854
[8] Sardar Khan, Irshad Ahmad, M. Tahir Shah, Shafiqur Rehman, Abdul Khaliq, Use of constructed wetland for the removal of heavy metals from industrial wastewater, Journal of Environmental Management, Volume 90, Issue 11,2009, Pages 3451-3457,ISSN 0301-4797
[9] Jianlong Wang, Pingping Zhang, Liqiong Yang, Tao Huang (2016). Cadmium removal from urban stormwater runoff via bioretention technology and effluent risk assessment for discharge to surface water, Journal of Contaminant Hydrology, Volumes 185–186,2016, Pages 42-50, ISSN 0169-7722,
[10] T.Y. Yeh, C.C. Chou, C.T. Pan, Heavy metal removal within pilot-scale constructed wetlands receiving river water contaminated by confined swine operations, Desalination, Volume 249, Issue 1, 2009, Pages 368-373, ISSN 0011-9164

Table 14 summarises the expected efficacy of the overall system.

Table 14: Treatment system performance

Contaminant	Existing discharge				Proposed discharge				% Mass Reduction
	Average (mg/L)	Median (mg/L)	90% (mg/L)	Annual Mass (kg)	Average (mg/L)	Median (mg/L)	90% (mg/L)	Annual Mass (kg)	
Soluble reactive phosphorus	9.32	7.81	17.42	1205.00	0.72	0.60	1.34	92.76	92%
Ammoniacal nitrogen	3.39	0.40	9.98	62.18	1.18	0.14	3.49	21.74	65%
Nitrate nitrogen	5.22	4.98	9.98	768.36	0.62	0.60	1.19	91.97	88%
Nitrite	1.21	0.20	4.02	30.86	0.18	0.03	0.59	4.51	85%
Total nitrogen	10.41	5.39	23.06	831.62	1.99	0.77	5.27	118.22	86%
Total suspended solids	9.25	5	19.80	771.45	0.19	0.10	0.41	16.16	97.9%
Fluoride	5.02	4.07	9.05	627.96	0.99	0.89	1.39	137.69	78%
Al	0.50	0.26	1.11	40.15	0.039	0.028	0.067	4.39	89%
Cu	0.029	0.010	0.052	1.54	0.002	0.001	0.003	0.19	88%
Cd	0.002	0.001	0.002	0.12	0.00004	0.00001	0.00003	0.002	98%
Cr	0.009	0.010	0.019	1.54	0.001	0.001	0.002	0.15	90%
Zn	0.078	0.050	0.178	7.71	0.02	0.01	0.02	1.50	81%

It is noted that this analysis is based on broad assumptions around the source of contaminants and the overall removal efficacy of the proposed devices (as discussed above) and is not based on modelling. The actual performance of Stage 1 may vary depending on a range of factors. However the proposed adaptive management approach will enable Stage 2 to address this.

The reductions outlined in this table are those that are expected to occur as a result of the treatment processes only. A parallel effort to address the source of contaminants and implement source control measures will be undertaken and will result in further reductions in both mass load and concentrations that are not quantified by this analysis.

shows a breakdown of the approximate contaminant sources by catchment and the approximate source control efficacy necessary to achieve the proposed water quality limits for median to 90th percentile discharges.

Table 15: Source Control Requirements

Contaminant	Source Control Efficacy Required by Catchment			
	Site Exit and Truck Wash	Despatch Centre	Manufacture and Intake	Sulphur Store, Melter, and Acid Plant
Soluble Reactive Phosphorus	98%-99% - this area should be managed through source control to minimise spillage and tracking. This area can be included in the clarifier catchment if required.	OK - Clarifier removes to an appropriate level	OK - Clarifier removes to an appropriate level	98%-99% - There is no ongoing activity in this area that should contribute to contaminant. Cleaning the site from historic uses should eliminate any ongoing source.
Ammoniacal Nitrogen	0%-86 - this area should be managed through source control to minimise spillage and tracking	0%-86% - this area should be managed through source control to minimise contract with stored nitrogen-based product and to minimise spillage and tracking	OK - No expected contribution	OK - No expected contribution
Nitrate Nitrogen	58%-79% - this area should be managed through source control to minimise spillage and tracking	58%-79% - this area should be managed through source control to minimise contact with stored nitrogen-based product and to minimise spillage and tracking	OK - No expected contribution	OK - No expected contribution
Nitrite	OK - Treatment expected to achieve required outcome			
Total Nitrogen	28%-90% - this area should be managed through source control to minimise spillage and tracking	28%-90% - this area should be managed through source control to minimise contact with stored nitrogen-based product and to minimise spillage and tracking	OK - No expected contribution	OK - No expected contribution
Total Suspended Solids (TSS)	OK - Treatment expected to achieve required outcome			

Contaminant	Source Control Efficacy Required by Catchment			
	Site Exit and Truck Wash	Despatch Centre	Manufacture and Intake	Sulphur Store, Melter, and Acid Plant
Fluoride	OK - Treatment expected to achieve required outcome			
Al	OK - Treatment expected to achieve required outcome			
Cu	OK - Treatment expected to achieve required outcome			
Cr	OK - Treatment expected to achieve required outcome			
Zn	OK - Treatment expected to achieve required outcome			

It is noted that a significant level of source control may be required to fully manage nitrate-based contaminants, which is primarily driven by ammoniacal nitrogen. Nitrate based fertilisers are not manufactured on site and are imported in only limited quantities. As the overall scope of these operations is relatively small, it is possible to fully contain operations to a limited area with robust source control measures.

5.7 POTENTIAL FUTURE ADAPTIVE MANAGEMENT PATHWAYS (STAGE 3)

After the treatment devices outlined above have been installed and fully commissioned, the system will be monitored for performance against the discharge water quality conditions identified in the consent and applicable national and regional planning documents. Where deficiencies are noted, there are a number of potential options available to provide either additional treatment or management of the water. These options are briefly summarised below:

5.7.1 Potential additional treatment devices

5.7.1.1 Filter media

Following the implementation of Stages 1 and 2, if specific contaminants remain above the level set in the consent conditions, media filters may be installed to target individual contaminants. Ideally these devices will be installed where they receive inflow from high contaminant generating catchments, however placing a larger media filter at the end of the treatment line may be considered as needed. Some of the filter media that may be considered is briefly summarised in Table 16 below.

Table 16: Filter media options

Media type	Target pollutants
Perlite	TSS, Oil, Grease
ZPG	Soluble metals, TSS, Oils, Grease, Organics, Ammonium
Zeolite	Soluble metals, Ammonium, Some organics
GAC (Granular Activated Carbon)	Oil, Grease, Organics
Mussel shells[18]	TSS, Copper, Zinc
Iron slag[19]	TSS, Nitrates, Ammonium, Phosphorus

5.7.1.2 Secondary clarifier

The proposed clarifier for this system is located adjacent to the manufacture facility. This location has been proposed due to the expected high concentrations of contaminants originating from this catchment as well as for the management of the effluent sludge in the nearby manufacture process. Adding an additional end of line clarifier to remove any residual contaminants may be considered if needed.

5.7.1.3 Adding wetland cells

The proposed wetland will consist of a series of cells with different hydraulic and biologic functions. These cells include shallow and deep marshes, tree islands, deep pools and, potentially, floating wetland components. If additional treatment is required, the adaptive management strategy may consider adding additional cells to the wetland that target specific biotreatment processes.

5.7.1.4 Trade waste discharge

If contaminant concentrations remain elevated and there remains no practical method for treatment of the contaminant of concern, a final option is to divert a portion of the site to trade waste, to be treated at the NCC wastewater treatment plant. This may also be an option for the clarifier effluent water should it prove unsuitable for use in the manufacturing process, or when the process is unable to accept inflows (e.g., during shutdown).

[18] https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=830

[19] http://tur-www1.massey.ac.nz/~rhaverka/ShiltonWR2006.pdf

6. WATER TAKE AND USE

6.1 INTRODUCTION

Ravensdown currently holds a water take permit to take water from two bores for use across the Site. As set out in section 1 of this AEE, this consent does not expire until 31 May 2027, however because the proposed water treatment process and discharge strategy relies on this water for the operation of the treatment solution, the proposed use of the water has been reviewed as detailed below.

6.2 SITE WATER USE

Water is currently utilised across the site for a variety of purposes under the general consented use of the "Manufacture of Sulphuric Acid and Fertilisers". The requirement for water used in the site processes would continue with some efficiencies provided as a result of the proposed treatment and discharge solution. In addition to this, water is required to maintain the constructed treatment wetland, the maintenance of crop cover within the discharge to land area and the HARP wetland during dry periods as set out in Table 17 and Figure 19 below.

Table 17: Site water requirements

Site Water Use	Existing Volume (Consented)		Proposed Volume	
	Weekly (m^3)	Annual (m^3)	Weekly (m^3)	Annual (m^3)
Manufacture of sulphuric acid and fertilisers	21,000[1]	1,092,000	7,945	
Site base load[2]			2,820	
Sustaining treatment wetland			175	
Maintaining crop cover on irrigation area			1,900	
Subtotal for Operations			**12,840**	**633,240[2]**
Sustaining HARP wetland			637[3]	33,215
Total			**13,477**	**666,455**

[1] Actual historical maximum weekly take of 11,833m^3.
[2] Site base load is domestic usage and site wash water.
[3] Assuming 48 weeks per year of manufacturing
[4] Using an evapotranspiration rate of 0.7 L/s/Ha and a water surface area of 1.5Ha

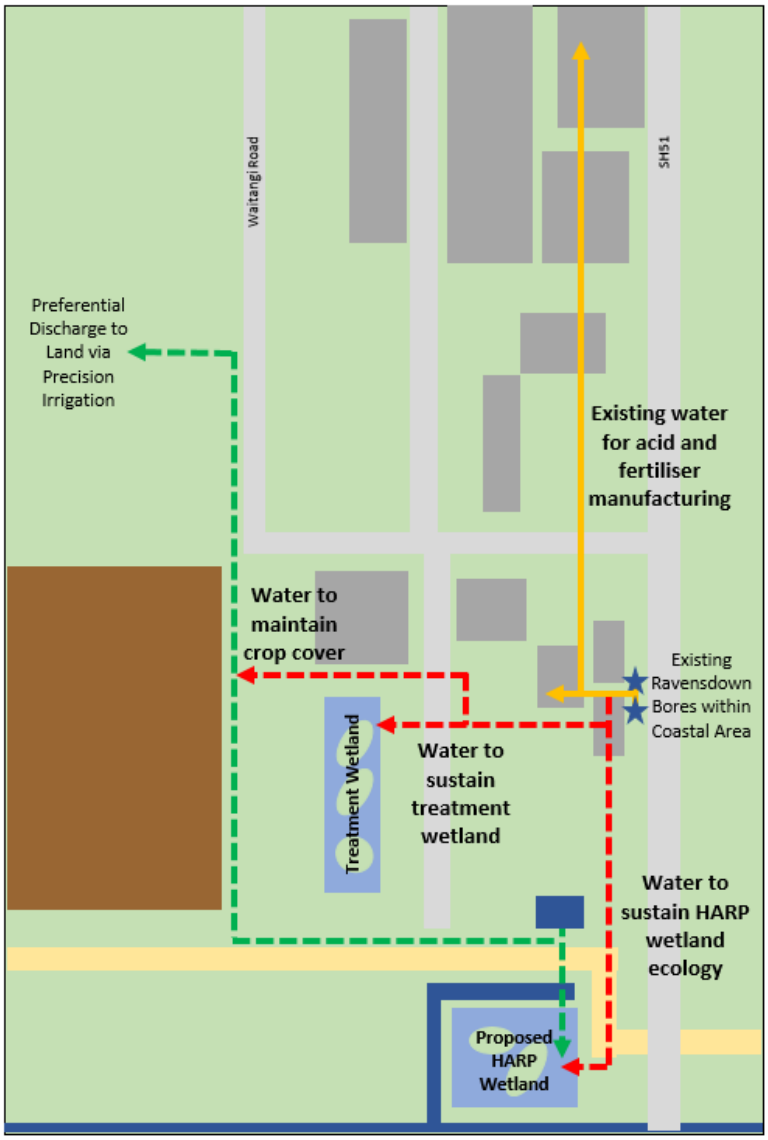


Figure 19: Site water use schematic

This proposed water take volume is significantly less than the current consented volume for the site. While not directly relevant (as the water take application is assessed as being within the coastal environment and subject to the RCEP provisions), it is noted that in terms of the TANK proposed plan change provisions the past actual and reasonable use information records a maximum historical weekly take of 11,833m^3. The new proposed maximum weekly volume for the same base manufacturing process is 10,765m^3. The additional 2,712m^3 maximum weekly take being sought is all associated with environmental outcomes to benefit the coastal environment and is therefore consistent with the relevant objectives and policies in the RCEP.

7. STATUTORY CONSIDERATIONS AND ASSESSMENT

7.1 INTRODUCTION

This section identifies the relevant framework under the RMA for assessing the activities associated with the air and water discharges from the Napier Works.

The Mitchell Daysh Ltd report[20] (*Mitchell Daysh, November 2021*) ("**Planning Assessment**") identifies the discharge permits and other resource consents that are required under the RMA for the activities associated with the air and water discharges. It also presents an analysis of the proposal in relation to the relevant policy framework within which the resource consent applications will be assessed and determined. The following sets out the key aspects of the Planning Assessment.

7.2 STATUS OF PROPOSED ACTIVITIES

The site sits within the jurisdictions of the Hawke's Bay Regional and Napier City Councils. The relevant planning instruments for these councils that determine the status of the activities comprising the proposal are:

- Hawke's Bay Regional Coastal Environment Plan ("**RCEP**");
- Hawke's Bay Regional Resource Management Plan ("**RRMP**");
- Proposed Plan Change 9 ("**TANK**"); and
- City of Napier District Plan ("**District Plan**").

In this instance, it is also appropriate to consider relevant National Environmental Standards ("**NES**") that might require additional consents.

The status of the proposed activities with respect to these instruments is presented below.

7.2.1 National Environmental Standards

There are seven operative NES that have come into effect as regulations to date. Of relevance in this case are;

- NES for Freshwater ("**NESFW**");
- NES for Air Quality ("**NESAQ**");
- NES for Sources of Drinking Water ("**NESDW**"); and
- NES for Assessing and Managing Contaminants in Soil to Protect Human Health 2011 ("**NESCS**").

[20] Ravensdown Limited - Napier Works Sustainable Site Project, Planning Assessment, November 2021

The NESAQ and NESDW do not prescribe any consenting requirements relevant to the discharges from the Napier Works, therefore, the assessment to determine whether any NES consents are required is limited to the NESFW and the NESCS.

7.3 SUMMARY OF CONSENT REQUIREMENTS

Table 18 and Table 19 provide a summary of the consents required in relation to the proposed air and water discharges

Table 18: Summary of Regional Consent Requirements

Core Activity	Specific Activity	Rule	Activity Status and Consent Type
Discharges to air	To discharge contaminants into the air from the operation and maintenance of a sulphuric acid and fertiliser manufacturing plant at Awatoto including all ancillary activities.	Rule 28 of the RRMP	Discretionary – Discharge Permit
Discharges to land and water	To discharge treated stormwater and process water and associated contaminants from a sulphuric acid and fertiliser manufacturing plant at Awatoto onto or into land and into water (Waitangi Estuary) in the Coastal Margin.	Rule 9 of the RCEP Reg 54(c) of the NESFW	Discretionary - Coastal Permit Non-complying activity consent
	To temporarily discharge dewatering water associated with the construction of new stormwater and process water treatment facilities onto or into land and into water (Waitangi Estuary) in the Coastal Margin.	Rule 9 of the RCEP	Discretionary - Coastal Permit
	To discharge treated stormwater and process water and associated contaminants from a sulphuric acid and fertiliser manufacturing plant at Awatoto to land in circumstances where contaminants will be absorbed by crops and soils and/or may enter shallow groundwater.	Rule 52 of the RRMP	Discretionary - Discharge permit
	To discharge treated stormwater from a sulphuric acid and fertiliser manufacturing plant at Awatoto to land in circumstances where contaminants will be absorbed by	Rule TANK 22	Restricted Discretionary - Discharge Permit

Core Activity	Specific Activity	Rule	Activity Status and Consent Type
	crops and soils and/or may enter shallow groundwater.		
Water Take	To take up to 13,477 m^3 of groundwater per week from well numbers 15986 and 15989 for the following industrial uses: • The manufacture of sulphuric acid and fertilisers; • The treatment of stormwater and process water including sustaining constructed treatment wetlands and the maintenance of crop cover on the discharge to land area (shown on Plan B); and • Sustain an artificial wetland within the Waitangi Regional Park.	Rule 35 of the RCEP	Discretionary – Coastal Permit
	To temporarily take groundwater by dewatering associated with the construction of new stormwater and process water treatment facilities.	Rule 55 of the RRMP	Discretionary – Water Permit
Land use	Vegetation clearance and soil disturbance activities in the Coastal Margin associated with: • Erection, reconstruction, placement, alteration, extension, removal, or demolition of stormwater and process water treatment and discharge structures; and • Wetland restoration activities.	Rule 8 of the RCEP Reg 54(b) of the NESFW Reg 42 of the NESFW Reg 39 of the NESFW	Restricted Discretionary – Coastal Permit Non-complying activity consent Restricted Discretionary Activity Restricted Discretionary Activity

Table 19: Summary of District Consent Requirements

Core Activity	Specific Activity	Rule	Activity Status and Consent Type
Earthworks	Earthworks in the Main Industrial Zone.	Rule 52A.9 of the NCDP	Restricted Discretionary - Land Use Consent
	The disturbance of soils in HAIL areas.	Regulation 9 (1) of the NESCS	Controlled – NES Consent
Wetland Restoration Activities	Undertake wetland restoration activities, including associated earthworks and structures, within a Natural Hazard Area (River Hazard).	Rule 62.13(c)	Discretionary - Land Use Consent

7.4 BUNDLING

The "bundling" approach derives from case law rather than being explicitly set out under the RMA. Good resource management practice generally requires all the resource consents for a project to be identified at the outset and all applications should be made together to enable them to be considered jointly or concurrently. The guiding principle for bundling is that where there are activities on one site that are closely associated with each other or are directed towards one dominant use or purpose, they should be assessed holistically as a single bundle and in accordance with the most restrictive activity status contained within the bundle of activities being considered. This is done separately for each relevant jurisdiction. In addition, recognising that, from a practical perspective, the proposed water and land use related activities are fundamentally different to the proposed air discharges, bundling in this instance has also been done separately for these grouped types of activity.

7.4.1 Overall Status of Activities - Regional Council Jurisdiction

7.4.1.1 Water and Land Use Activities

Regional Plans -

Overall, under the RCEP, RRMP and TANK documents, the project will require a range of resource consents for **Controlled, Restricted Discretionary** and **Discretionary Activities**.

NESFW

In addition to any district and regional consenting requirements for activities affecting wetlands and freshwater, resource consents will be required under the NESFW for:

- **Non-complying Activities**, including:

- Earthworks occurring within and within the 10m setback of a wetland associated with upgrades to the settling pond;
- Discharges from the settling pond occurring within a natural wetland (Waitangi Estuary); and

- **Restricted Discretionary Activities**, including:
  - The construction of wetland utility structures; and
  - Restoration activities in a natural wetland including; vegetation clearance, earthworks and all associated water takes, diversions and discharges including the discharge of environmental flows of groundwater and treated stormwater for the purpose of sustaining a new/restored wetland.

Overall Activity Status Water and Land Use Activities

When applying the 'bundled' approach to the water and land use related activities requiring resource consent from the Regional Council, the project is considered a **Non-complying Activity**.

7.4.1.2 Air Discharge Activities

Regional Plans

Under the RRMP, the proposed air discharge activities are a **Discretionary Activity**.

Overall Activity Status Air Discharge Activities

The overall activity status of the applicant's proposed discharges to air is **Discretionary**.

7.4.2 Overall Status of Activities - District Council Jurisdiction

NESCS

Controlled Activity land use consent under Regulation 9(1) is required for disturbance of soil.

District Plan

The proposal's inclusion of wetland restoration activities, including associated earthworks, within a Natural Hazard Area (River Hazard) is a **Discretionary Activity** under the District Plan.

Overall Activity Status

When applying the 'bundled' approach to the land use related activities requiring resource consent from the District Council, the project falls to be considered a **Discretionary Activity**.

7.5 PLANNING ASSESSMENT CONCLUSION

The Planning Assessment concludes that due to the locations of proposed activities being spread across coastal and non-coastal environments, there are a number of relevant statutory documents comprising a substantial body of relevant policy guidance requiring consideration for the Napier Works Improvement Project. This leads to a reasonably complex framework of considerations where care is needed to ensure correct rules and policies are applied to individual activities included in the proposal.

Overall, a number of different resource consents will be required for the proposal under the RCEP, RRMP, TANK proposed plan, Napier District Plan, NESFW and NESCS.

When applying the 'bundled' approach, the water and land use aspects of the proposal are to be processed as a Non-complying Activity, noting that the gateway test requirement of section 104D of the RMA is met in regard to this matter.

The overall activity status of the applicant's proposed discharges to air is Discretionary.

When applying the 'bundled' approach to the land use related activities requiring resource consent from the District Council, the project falls to be considered a Discretionary Activity.

After canvassing the suite of statutory documents pertaining to the site, and having regard to relevant provisions contained within these documents, it is concluded that the applicant's proposal aligns closely with, and overall, achieves these.

8. ASSESSMENT OF EFFECTS METHODOLOGY

The effects assessment section below follows a structured assessment methodology, which addresses the following matters:

- Potential environmental effects.
- Assessments undertaken.
- Results of assessments.
- Suggested approach for effects identified.

The results outlined in each of the assessment sections that follow are the executive summaries of the Assessment Reports prepared for this AEE.

It is important to note that for consistency and accuracy the key findings of each of the Assessment Reports are set out in the words of the respective authors, and have not been adapted or paraphrased in the AEE, except where minor tense, referencing and wording changes have been needed to assist readability, or where recommendations from the study authors have been converted to firm commitments by the applicant.

The Assessment Reports are included in full in Part D of this AEE as set out in Table 20 below.

Table 20: Assessment Reports

Short Title	Author	Organisation
A1 - Air Discharge Dispersion Modelling and Air Quality Effects Report	Richard Chilton	Tonkin+Taylor
A2 - Vegetation Effects	Stephen Trolove	Plant & Food Research
A3 - Estuarine Ecology Assessment	Ngaire Phillips (lead) Mike Stewart Sharon DeLuca	Streamlined Environmental Boffa Miskell
A4 - Land Discharge Effects and Management	Ian Millner (lead) Alexandra Johansen Ants Roberts Mike Wright David Delegarza	Land Vision HB Bay Geology Ravensdown Ravensdown Aurecon
A5 - Watertake Effects Assessment	Alexandra Johansen	Bay Geology
A6 - Human Health Effects	Francesca Kelly	Environmental Medicine Ltd

Short Title	Author	Organisation
A7 - Detailed Site Investigation (DSI)l Report	Nikki Mather Mia Uys	Beca
A8 - Economic Assessment	Sean Bevin	Economic Solutions
A9 - Planning Assessment	Philip McKay Mason Jackson	Mitchell Daysh
A10 - Cultural Impact Assessment	Chad Tareha	Ngāti Pārau
A11 - Cultural Impact Assessment	Aramanu Ropiha	Kohupatiki Marae

9. AIR DISCHARGE DISPERSION MODELLING AND AIR QUALITY EFFECTS

An assessment of air quality effects was undertaken and is discussed in a report prepared by T+T (*Tonkin + Taylor, 2021. Reconsenting of Ravensdown Napier Works: Air Quality Assessment*).

9.1 POTENTIAL ENVIRONMENTAL EFFECTS

The main discharges to air from the site are:

- Fluoride and acid mist from the Manufacturing Plant,
- Sulphur dioxide (SO_2) and acid mist from the Acid Plant,
- PM_{10} and $PM_{2.5}$ from the Bradley Mills,
- Emissions associated with diesel combustion from on-site vehicles, machinery and the diesel burners used during a cold start-up of the Acid Plant;
- Odour (including hydrogen sulphide from the sulphur melter), and
- Dust from raw material and product handling.

The potential air quality effects of the discharges include those on human health (SO_2, PM_{10} and $PM_{2.5}$), impacts on vegetation (fluoride, SO_2 and acid mist), and amenity impacts (odour and dust). Fluoride emissions also have the potential to result in window etching on properties close to the site.

9.2 ASSESSMENT UNDERTAKEN

Discharges of fluoride, SO_2, PM_{10} and $PM_{2.5}$ have been assessed using air dispersion modelling to predict contaminant ground level concentrations enabling an assessment against relevant air quality assessment criteria for human health and sensitive ecological ecosystems[21]. This has been combined with a review of available ambient monitoring data.

The assessment evaluates the existing site configuration as well as proposed changes to the plant in line with Ravensdown's Air Discharge Strategy, most notably associated with the new Den Scrubber and combined Manufacturing Plant stack, as well as the new Acid Plant converter.

The potential effects of diesel combustion emissions associated with the infrequent cold start-up of the Acid Plant have been assessed qualitatively.

[21] Based on the New Zealand ambient air quality guidelines for plants showing the maximum allowable concentration (critical level) of fluoride for selected averaging times (Ministry for the Environment 2002).

Odour and dust effects have been assessed qualitatively, taking into account the frequency, intensity, duration, offensiveness and location of impacts (the FIDOL factors). This has been informed by a review of separation distances to sensitive locations, meteorology and historic complaint records.

9.3 RESULTS OF ASSESSMENTS

Regarding effects on vegetation, this assessment provides an evaluation of predicted fluoride and SO_2 concentration against ambient air quality guidelines for sensitive ecosystems and the results are used to further inform a separate assessment by The New Zealand Institute for Plant & Food Research Limited and a Public Health assessment by Environmental Medicine Limited. Notwithstanding this, the predicted concentrations are well within the relevant MfE guidelines for the protection of sensitive ecosystems except for land to the immediate east of the site (former Winstone site and foreshore). Further consideration of vegetation effects is provided by The New Zealand Institute for Plant and Food Research Limited.

Dispersion modelling has shown that the planned new Manufacturing Plant stack and proposed reduction in maximum fluoride emission will lead to a reduction in fluoride ground level concentrations compared with the previous plant configuration (i.e., the Den Scrubber system discharging via two separate stacks and the Hygiene Scrubber via its own stack).

Predicted SO_2 concentrations from the normal operation of the site are well within the relevant assessment criteria for human health and vegetation impacts and the potential effects are considered to be low. Concentrations are expected to reduce further as a result the replacement of the Acid Plant converter.

Isolated events have occurred where high concentrations of SO_2 have been measured off-site at the Winstone monitoring site. These events have historically been associated with start-up of the Acid Plant, although more recently fires associated with the sulphur melter also resulted in high concentrations. Ravensdown has implemented changes to the Acid Plant start-up procedures to reduce SO_2 emissions and has increased the height of the start-up stack from 3m to 18m to improve dispersion of those emissions – no monitoring exceedances at the Winstone site have been attributed to start-up conditions since this time. Notwithstanding this, Ravensdown continues to investigate measures to minimise emissions associated with start-up conditions and has implemented measures to minimise the likelihood of a melter fire occurring in future. Regarding the melter, Ravensdown has engaged an independent review of the melter fire suppression system and is progressing plans for its replacement, working with international suppliers regarding industry best practice.

Emissions of oxides of nitrogen, carbon monoxide, PM_{10}/$PM_{2.5}$ and SO_2 from diesel-fired external combustion appliances used during the infrequent cold start-up of the Acid Plant

are not expected to give rise to off-site ground level concentrations that approach relevant assessment criteria. The risk of any such exceedance actually occurring is further minimised by the very infrequent nature of cold start-up of the Acid Plant.

Given the above, T+T considers the adverse effects associated with the discharge of SO_2 from the site is low, and effects will reduce further with the proposed convertor replacement. On this basis we consider the potential SO_2 effects to be less than minor.

For PM_{10} and $PM_{2.5}$, relatively high concentrations are predicted for the location immediately east of the Bradley mills (i.e., the Winstone site). The model predictions are broadly consistent with the measured PM_{10} concentrations at the Winstone monitoring site. However, exposure over a 24-hour period is not reasonably expected to occur at this location given the industrial nature of the site. At the most impacted location where human exposure is relevant, predicted cumulative concentrations are low relative to the assessment criteria. On this basis the effects of PM_{10} and $PM_{2.5}$ emissions are considered to be less than minor.

A qualitative FIDOL assessment has been made regarding the potential odour and dust nuisance effects. The findings of these assessments concluded that there is low potential for offensive or objectionable odour effects to occur as a result of discharges from the Ravensdown site, which is consistent with the record of dust and odour complaints (few complaints). Accordingly, it is considered the odour and dust effects are less than minor.

The ongoing potential for fluoride emissions to give rise to window etching has been assessed as less than minor.

9.4 SUGGESTED APPROACH FOR EFFECTS IDENTIFIED

Overall, the ongoing potential for adverse air quality effects described above is assessed as being less then minor. Notwithstanding this, several improvements to the site are proposed that will reduce air discharges in line with Ravensdown's Air Discharge Strategy (Ravensdown 2021). The most notable upgrades include the Den Scrubber system (which has recently been authorised through a consent variation) and a proposed upgrade to the Acid Plant converter. The Ravensdown Board has approved the funding for the capital expense of the new plant with a committed timeframe the installation of the plant (2022 for the Manufacturing Plant scrubbers and 2023 for the Acid Plant converter).

10. VEGETATION EFFECTS

An assessment of the effects of air emissions on vegetation was undertaken and is discussed in a report prepared by the New Zealand Institute for Plant and Food Research ("**Plant & Food Research**") (*Trolove S: Reviewed by Searle B, Clothier B, Doley D. November 2021. Effects of emissions-to-air from the Ravensdown Napier Fertiliser Works on vegetation*).

10.1 POTENTIAL ENVIRONMENTAL EFFECTS

The main contaminants discharged to air from the Napier Works that have the potential to harm plants are fluoride (F), sulphur dioxide (SO_2), acidic aerosols and dust. The potential effects of these at high concentrations are:

- Fluoride: leaf deformities, yellow or dead patches on leaves, reduced fruit-set and reduced plant growth.
- Sulphur dioxide: leaf damage.
- Acidic aerosols: leaf deformities, burn-like symptoms and impaired stomatal behaviour.
- Dust: reduced photosynthesis, blocked stomata, increased leaf temperature and water loss.

10.2 ASSESSMENTS UNDERTAKEN

The assessments undertaken to investigate the risk of harm included:

- Investigating any complaints made to Ravensdown over the current resource consent period (2007–2021).
- Conducting field walks of the Waitangi Regional Park, and leaf testing to investigate the cause of possible damage from emissions.
- Examining the leaf F monitoring data collected by Plant & Food Research from 2007–2021.
- Comparing modelled F and SO_2 concentrations with guideline concentrations for vegetation published by the Ministry for the Environment (MfE).
- Reviewing the scientific literature for recommended concentrations in the case of acidic aerosols, where MfE guidelines did not exist.

10.3 RESULTS OF ASSESSMENTS

The results of these assessments were:

- No cases of damage to vegetation during the current resource consent period that could be attributed to the Napier Works.
- Dust was considered to have negligible effect on vegetation outside of the Napier Works' boundary.
- There were no high leaf F concentrations that may indicate loss of marketable yield (i.e. loss of yield or quality that may affect grower returns).
- Modelled concentrations of F and SO_2 were below concentrations likely to cause economic damage to crops in the Awatoto–Meeanee area, given the current distribution of crop species.
- The F emissions may be a cause for concern if F-sensitive species are planted closer than 1.0 km to the Napier Works Manufacturing Stack, and Ravensdown emit F at the maximum rate of 1.0 kg/h for approximately 12 h or more.
- The literature review indicated that a pH of >2.7 for Manufacturing Stack emissions should be generally appropriate to avoid damage to vegetation and fruit from acidic aerosols. However, there might be a very low risk of some damage arising from regular, intermittent exposure to acidic emissions of pH ≤4.0 (depending on the crop species and growth stage) under misty or highly humid conditions without significant rainfall (≤0.2 mm), where the wind is fluctuating back and forth across orchards for several hours. This risk may be greater during flowering in spring. There have been no reports of damage under such conditions during the current resource consent period.

10.4 SUGGESTED APPROACH FOR EFFECTS IDENTIFIED

The low risk of potential damage if a F-sensitive crop was planted closer than 1.0 km to the Manufacturing Stack would be mitigated by:

- Management of fugitive emissions will be reduced via the proposed Source Control Plan.
- Normal factory operations release F at much lower rates (an average of 0.07 kg/h) than the 1.0 kg/h rate for 12 h used in the model.

The very low risk of damage from acidic aerosols at pH <4.0 with repeated exposure could be mitigated by:

- Adjusting the Manufacturing Stack emissions to pH >4.0 under misty or very humid conditions where the wind was blowing towards an orchard for a period greater than 30 minutes. These weather conditions are described in condition 39 of the current consent: i.e., the pH should be adjusted to >4.0 when the wind speed is <3m/s and the wind direction is between 030°-155° (i.e., on-shore) and the temperature is >22°C, it is

dark and the relative humidity is >70%. This condition would only hold during the growing season for pip and stonefruit (late August to end of April). For the growing season outside of the flowering period (i.e., for the months of November to April) the risk is only for multiple exposures, so emission pHs of <4.0 on up to three different days should not be considered a breach of resource consent.

- No other significant risks were identified.

11. ESTUARINE ECOLOGY EFFECTS

An assessment of the effects of the proposed discharge of treated stormwater and process water to the Tūtaekurī River / Waitangi Estuary is discussed in a report prepared by Streamlined Environmental Limited (*Phillips, N., De Luca, S., Stewart, M. 2021. Ravensdown Napier discharge consent - Assessment of Estuarine Ecological Effects*).

11.1 POTENTIAL ENVIRONMENTAL EFFECTS

The potential effects of the current Ravensdown Napier discharge on the receiving environment have been summarised. Consideration was given to effects on a range of water quality parameters (including nutrients, metals and various physico-chemical properties), as well as process chemicals associated with the operations of the facility. Effects on marine ecology were also considered and included assessment of benthic macroinvertebrates, fish and macrophytes (past and present studies), as well as ecotoxicology of the whole effluent (WETT or Whole Effluent Toxicity Testing) following rainfall events.

Ravensdown has prepared a Water Discharge Strategy which underpins management of stormwater and process water on site. Effects of predicted discharge quality following staged installation of treatment devices proposed as part of this strategy are assessed and considered for different tidal stages. Any indirect effects on the estuary receiving environment associated with application of stormwater to land are not included in the Streamlined Environmental assessment.

11.2 ASSESSMENTS UNDERTAKEN

Potential effects on current and future water quality were assessed by comparison with relevant guidelines and standards, as well as consideration of upstream water quality and its influence on water quality downstream of the discharge (such as the HBRC-controlled pump and upstream industries such as BioRich). Trends over time in current discharge quality were also considered. Where available, predicted discharge quality following proposed treatment was used to derive receiving environment concentrations under high and low tide scenarios, taking into account dilutions determined from a dye study undertaken in 2020. Predicted receiving environment concentrations were then compared with a) receiving environment concentrations derived from discharge quality targets proposed by Ravensdown Napier and b) other relevant guidelines (including those defined by the National Policy Statement on Freshwater Management (2020), the Hawkes Bay Regional Council Coastal Plan and Plan Change 9 TANK (Tūtaekurī, Ahuriri, Ngaruroro, Karamu) Catchment Plan. Where predicted concentrations, or other values of water quality parameters needing to be assessed against guidelines and standards were not available, we used monitoring data from the previous 5 years to assess compliance.

Potential effects associated specifically with process chemical formulations in the current discharge were assessed by undertaking an ecological risk assessment. This approach was necessary as most of these chemicals are not generally able to be directly measured. Taking into account dilutions achieved in the mixing zone and consideration of tidal influence, measures of risk (risk quotients) were derived based on potential ecotoxicological effects, propensity to persist and/or bioaccumulate for each component chemical within a process chemical formulation.

Potential effects on marine ecology of the current discharge were assessed using the EIANZ guidelines for undertaking ecological impact assessments (Roper-Lindsay et al., 2018), which have been adapted for marine ecosystems. This method involved assigning ecological values based on threat classification and marine ecology value characteristics, and then identifying the magnitude of any effects in order to determine the overall level of effect of the proposal. The assessment considered the ecological value defined from past and current ecological assessments, along with receiving environment quality and ecotoxicological studies to determine overall effects. An assessment of the effects of the proposed discharge quality on marine ecology considered the potential response to improvements in water quality.

11.3 RESULTS OF ASSESSMENTS

Water quality monitoring indicates that the current Ravensdown Napier discharge is likely to be contributing concentrations of nickel, copper and aluminium to the receiving environment at levels above effects guidelines, with localised increases in concentrations during wet weather events. The results of the dye study indicated limited mixing within the Awatoto Channel, even under an outgoing tide. Significant improvement in water quality is predicted following the introduction of treatment devices in conjunction with the overall discharge management strategy. While this treatment is predicted to reduce both loads and concentrations of most contaminants, concentrations of some contaminants in the receiving environment, in particular aluminium and ammoniacal nitrogen, are predicted to continue to exceed guidelines. Higher upstream concentrations of some contaminants (when compared with downstream of the discharge) means Ravensdown Napier has no ability to meet these guidelines in isolation from other contributions. Despite these exceedances, there is no evidence to indicate that the discharge is having more than a minor effect on ecological values beyond the mixing zone. The improvement in water quality is likely to have a positive effect on the existing low ecological values.

11.4 SUGGESTED APPROACH FOR EFFECTS IDENTIFIED

Continued monitoring of the discharge at the frequency defined in the current consent conditions is recommended, with an extended set of parameters to allow for monitoring against compliance with the discharge targets.

Ravensdown Napier has an established monitoring programme which is designed to characterise ambient and rainfall-affected receiving environment quality. In addition, 5-yearly ecological assessments are undertaken to determine potential changes in benthic communities, sediment composition and quality, as well as ecotoxicity associated with the Ravensdown Napier discharge. A robust data set has been compiled since this monitoring was initiated, providing a valuable resource for assessing trends. It is recommended that this monitoring continue for the duration of the consent. Based on our assessment of the relevant regulatory standards, the following changes to the monitoring programme are recommended:

- Chlorophyll a determination – use an appropriate analytical method with a reduced detection limit to 0.001 mg/L to allow comparison with the relevant guideline.
- Add clarity measurements to the monitoring programme.
- If it is considered necessary to calculate Fish IBI, then fish monitoring would need to be added to the 5 yearly monitoring programme.

It is also recommended that the timing of the receiving environment monitoring be linked to the staging of the implementation of the treatment devices and the overall water discharge strategy.

While the proposed treatment will substantially reduce the loads and concentrations of a range of water quality parameters in the discharge and receiving environment, it is evident that tidal state is a significant factor in minimising adverse ecological effects. It is therefore recommended that, when discharge to water is necessary, it be undertaken preferentially on the ebbing tide. This recommendation is consistent with the proposed discharge strategy.

There may be potential to restore the ecological values to some extent through improved discharge water quality. As part of its discharge strategy, Ravensdown has proposed a Habitat Abundance Restoration Project ("**HARP**") within an identified area of the Waitangi Estuary. All contributing activities (including other point and diffuse source discharges upstream of Ravensdown Napier's facility) would need to be considered to address the cumulative effects to be able to restore ecological values across the whole receiving environment. Streamlined Environmental will also provide advice to Ravensdown on the proposal for the HARP.

12. LAND DISCHARGE EFFECTS AND MANAGEMENT

An assessment of the effects of the proposed discharge of treated stormwater and process water to land is discussed in a report prepared by Landvision Limited (*Landvision Limited, November 2021. Ravensdown Stormwater and Process Water Discharge - Land Discharge Effects and Management*). Input into this assessment report was also provided by Ravensdown Soil Chemists, Bay Geological Services Limited and Aurecon.

12.1 POTENTIAL ENVIRONMENTAL EFFECTS

The potential effects covered within this assessment are.

- The loss or potential loss of applied contaminants to the confined aquifer.
- The capacity within the site to effectively manage stormwater applications in a manner that accommodates the volumes expected from the treatment process.
- Whether the site has any inherent characteristics that would deem it unsuitable for the proposed activity.

12.2 ASSESSMENTS UNDERTAKEN

This report assesses several aspects of the proposed process against the TFG objective. Specifically, these include:

- An assessment of soils for suitability for irrigation and potential contaminant loading. This assessment included the digging of test pits to confirm on site soil conditions to depth, analysis of the soil profile to various rooting depths to ascertain available water capacity and electromagnetic mapping of the site to determine soil heterogeneity.
- Baseline monitoring to account for current soil loadings through the establishment of monitor soil test transects that represent historical use and potential soil fertility status.
- Investigations relating to sub regional geology (as relates to ground water) and on-site investigation to ascertain on site conditions. Bore logs from a range of neighbouring bores used for agricultural and drinking water were reviewed and two test pits were dug on site to confirm local conditions.
- Analysis of the projected load of contaminants reviewed against baseline soil loadings and properties.
- A review of monitoring protocols to guide adaptive management of site going forward.

12.3 RESULTS OF ASSESSMENTS

- An assessment of soils for suitability for irrigation and potential contaminant loading.

  Key aspects of the soil on the proposed discharge site were examined. Test pits were dug and soil textural assessment was completed. The soils on the site have high

Available Water Capacity (AWC) and no limitation to rooting depth in the top 1.2 meters. The soils are predominately silt based and largely consistent across the site. The capacity of the soils to absorb and retain the proposed contaminant loading is adequate for the foreseeable future (decades).

The soils on site are of reasonably uniform parent material and function.

- Baseline monitoring to account for current soil loadings.

  A comprehensive soil testing regime was initiated across the site based on historical use. The results have shown that pH, Olsen P, extractable cations (e.g., QTK = Quicktest K) and soil sulphur all exceed the optimum ranges by a considerable amount. Therefore, there are no soil fertility limitations for the use of this site for the purpose of a cut and carry system. Indeed, there are opportunities to reduce soil fertility status in the short term before following a maintenance fertiliser program to keep fertility status within agronomic optimums.

  The current levels of heavy metals were also measured. It was concluded from those samples that there are no limitations to a cut and carry operation. This is because the key risk pathway is via direct ingestion by animals. There will be no animals on site.

- Investigations relating to sub regional geology (as relates to ground water) and on-site investigation to ascertain on site conditions.

  On site investigation of test pits and review of bore logs and literature relating to the local area found there are thick layers of impermeable substrate beneath the site. An independent analysis found ‘’The thickness of the low permeability clay and silts, along with artesian pressure and vertically upwards groundwater gradient would help restrict the downwards movement of contaminants into the deeper strata and is regarded as one of the barriers to prevent microbial contamination” (Tonkin + Taylor, 2019; PDP, 2021). There is no evidence of springs or discharging groundwater within the vicinity of the project area or Waitangi Estuary, inferring that the confining layer is likely intact.

  Onsite investigations confirmed the existence of non-permeable layers identified in bore logs from neighbouring sites beneath the discharge area.

- Analysis of the projected load of contaminants reviewed against baseline soil loadings and properties.

  The effect of adding to the baseline loads was analysed. It was found that the low annual loadings (as proposed) will have a marginal effect on accumulation rates assuming there are no losses from the site. The addition of 7.9 kg F/ha will only increase the soil F concentration by 8.25 mg/kg annually, assuming there are no losses. Given that the other five elements (Al, Cu, Cd, Cr, Zn) are orders of magnitude lower than the estimated F addition, there is extremely low accumulation of these elements at the site over the 35 year consent period assuming no losses.

- A review of monitoring protocols to guide adaptive management of site going forward.

  A set of recommendations for further baseline and ongoing monitoring have been made. These relate to two key areas, firstly on-site effective management in a manner that allows for long-term understanding and adaption. Secondly, environmental monitoring of ground and surface water to assess the effectiveness of on-site management.

  It is recommended that monitoring protocols are established to address trends in soil fertility status, soil heavy metal loads, foliar analysis, surface water and both shallow and the confined aquifer. This information should form the core of an annual irrigation and site management report.

  All the recommendations relating to monitoring are based upon commonly used and accepted methods of analysis. Accurate monitoring of parameters relating to mass balance of contaminants on site and review of management settings and integration of any future recommendations are critical.

12.4 SUGGESTED APPROACH FOR EFFECTS IDENTIFIED

It was concluded that the discharge of treated process water and stormwater to land, based on analysis of soil chemistry, geology, and agricultural systems, will have no effect on the current condition of the source protection zone. This is because the annual additions of contaminants in the treated irrigation water are quantitatively small and will either be utilised and removed in the harvested forage or bound tightly to soil colloids on site and sits over a thick layer of low permeability sediments.

To support this conclusion going forward a set of monitoring outcomes have been suggested. In addition to monitoring, it is recommended to proceed with the design of an irrigation design concept that accommodates the final design of the treatment process, and is cognizant of the site, soil, and climate. The dual focus of both stormwater discharge and maximization of dry matter exported off site are compatible and desirable outcomes.

In the interim a continued focus on establishing and collecting baseline data from ground and surface water is recommended. This data should be used to guide the final design of tactical operational management. Baseline data is a key requirement for effective adaptive management going forward.

13. WATER TAKE EFFECTS

An assessment of the effects of the proposed water take are discussed in a report prepared by Bay Geological Services Limited (*Hydrogeological Assessment of Production Well Nos. 15986 And 15989 for Resource Consent No. Auth-116104-03 Replacement Application, November 2021).*

13.1 POTENTIAL ENVIRONMENTAL EFFECTS

The plant operates on a 24-7 basis, with an operational methodology based on the most efficient use of groundwater resources, which is critical to the operation and must be available to underpin year-round production. A water discharge strategy for the site resulted after a review of the method of treatment and the receiving environment. It is proposed to manage water discharges from the site through improved source control and specific treatment processes for various contaminants. Part of the process will involve discharging the treated water to land via spray irrigation and growing drought relief crops. Alternatively, the treated water will be discharged to the Waitangi Estuary at high tide through a constructed wetland when irrigation application is unavailable due to ground conditions.

It is proposed that the water take is maintained for use on site at a weekly volume of 12,840 m^3. An additional water take of 637 m^3/week will be required to maintain the ecosystem and water level at the constructed wetland proposed within the Waitangi Regional Park. The proposed combined take totals 13,477 m^3/week with an annual volume of 666,455 m^3.

A review of historical water use indicates that groundwater is pumped year-round with a mean annual volume of 240,716.40 m^3 over the years January 2007 to December 2011, which is 21.96% of the consented annual volume of 1,092,000 m^3. The records from January 2014 to January 2021 reveal a mean annual volume of 343,778 m^3 calculated using pumping records, which is 31.5 % of the consented annual volume.

13.2 ASSESSMENTS UNDERTAKEN

Deep groundwater bores near the coast and the Awatoto area typically exhibit flowing artesian conditions. About 85 bores are recorded within approximately 2 km of the Production Wells, used for industrial, irrigation, domestic and stockwater, exploratory and environmental purposes, which range in depth from 2.40 to 64.90 m below ground level (bgl), with the majority screened across the confined gravel aquifer greater than 40 m depth. The closest municipal water supply wells are located approximately 2.4 and 2.5 km NNW from the Production Wells and are screened across the confined gravel aquifer.

The Production Well Nos. 15986 and 15989 are screened across a confined brown gravel aquifer from 55.90 to 63.90 m and 48.21 to 57.43 m bgl, respectively with a static water level (SWL) of + 6 to 7 m above ground level (agl). HBRC data indicates that the confined

aquifer displays high to very high transmissivity values. The test results for the nearby pump tested Well No.1722 determined a very high transmissivity value of 25,000 m^2/day, which is considered appropriate for the confined aquifer conditions and setting. Predicted long-term well interference at an average flow rate of 34.63 l/s over 365 days in surrounding bores screened over the confined gravel aquifer is considered negligible due to the very high adopted transmissivity value.

13.3 RESULTS OF ASSESSMENTS

In reviewing the available information, it is considered that the Applicant's proposed groundwater take is not likely to adversely affect the ability of nearby users and consent holders to take groundwater from the confined aquifer, due to the flowing artesian conditions and very highly transmissive aquifer. Furthermore, it is understood that the current Water AUTH-116104-03 is utilised efficiently within the plant. Therefore, the proposed water take is considered to have negligible impact on neighbouring takes, and a less than minor effect on the surrounding environment.

13.4 SUGGESTED APPROACH FOR EFFECTS IDENTIFIED

It is recommended that Ravensdown continue to maintain a record of the water take and use at the site.

14. HUMAN HEALTH EFFECTS

An assessment of the human health effects related to the discharges from the site are discussed in a report prepared by Environmental Medicine Limited (*Environmental Medicine Limited. 2021. Reconsenting of Ravensdown Napier Works, Assessment of Environmental Health Effects*).

14.1 POTENTIAL HUMAN HEALTH EFFECTS

The potential human health effects of the proposed Ravensdown Napier air discharges on the receiving environment have been summarised. This has included a review of recent past exposures using ambient monitoring information. Additionally, consideration was given to effects of water discharges for human contact recreation and mahinga kai harvesting.

Effects arise through community interaction with potential hazards among the air emissions from the site activities, or water discharges. Potential routes of exposure were considered, to identify potential effects, and these included:

- Community inhalation of pollutants present in ambient air;
- Coastal water contact recreation, including the Waitangi Estuary;
- Gathering local food sources/mahinga kai.

14.2 ASSESSMENTS UNDERTAKEN

Five components were used for the assessment of human health effects:

- Community characterisation

  Identification of the location of residential and other sensitive community use and consideration of community health characteristics.

- Identification of hazards

  Information sources for hazards included assessments by Tonkin + Taylor (Air Discharge Effects Assessment), Plant and Food Research (Vegetation Effects Assessment) and Streamlined Environmental (Estuarine Ecological Effects Assessment). To determine whether contaminants have hazardous potential for humans, both epidemiological and toxicological information were used, tailored to the hazard and potential for exposure.

  Additionally, information was sourced about land and groundwater discharges from the following assessments: Ravensdown Stormwater and Process Water Discharge – Land Discharge Effects and Management, Aurecon (Ravensdown Napier stormwater and process water management) and the Ravensdown Napier Works Resource Renewal Project Water Discharge Strategy 2021.

- Health effects from contaminants (exposure-response)

  Review and guideline documents from authoritative sources were identified for the hazards under assessment. Ministry for the Environment (MfE) and World Health Organisation (WHO) exposure-response and guideline exposure criteria were included to assess respirable particulate, fluorides, sulphur dioxide, sulphur trioxide, acid aerosols and hydrogen sulphide. Mahinga kai was assessed using dietary intake guidance from WHO.

- Exposure assessment

  Information about exposure to contaminants included assessments by Tonkin + Taylor (Air Discharge Effects Assessment), Plant and Food Research (Vegetation Effects Assessment) and Streamlined Environmental (Estuarine Ecological Effects Assessment). The methods used to determine exposure included ambient air monitoring records, air dispersion modelling, plant sampling and water discharge quality assessment.

- Characterisation of potential for health effects (public health risk)

  This component of the assessment interpreted exposure patterns among the community using exposure-response guidelines. Conclusions were made about the likelihood of health effects. The National Environmental Standard (NES), and ambient air exposure guidelines (WHO, MfE) are conservative and include protection of those who may be vulnerable to health effects because of age or personal health. Similarly the Drinking Water Standards (WHO, NZMOH) and Nutrient Reference Values and other food quality guidance provided by Food Standards Australia and New Zealand (FSANZ) are protective for people of all ages and personal health, including pregnancy and infancy.

14.3 RESULTS OF ASSESSMENTS

- Community characterisation

  Residential and other sensitive communities are mostly located in areas where modelled and measured air emissions show very low exposure. Exceptions include a cluster of residences to the north-east, proximate housing to the north/north-west and impacts in a non-residential area to the east accessed for coastal recreation.

- Identification of hazards

  The main inhalation health hazards identified for humans were: particulates, fluorides, sulphur dioxide and sulphur trioxide. Hydrogen sulphide was identified as an odour hazard. Potential for drift off-site from irrigation discharges was also considered.

  Water discharge contaminants were identified as not hazardous to humans through contact recreation. These are primarily an ecological hazard.

- Health effects from contaminants (exposure-response)

The exposure-response for health effects from particulates is determined in relation to overall mortality and cardio-respiratory morbidity. Health-based guidelines include both daily and annual exposure periods and PM_{10} and the finer $PM_{2.5}$. The exposure-response for fluoride indicates that the main health effect is long-term exposure (months/years) through dietary intake and relates to bone health.

The exposure-response for sulphur dioxide indicates that the main health effects are both acute (ten minute exposures, irritancy and asthma) and ongoing (daily exposures, respiratory and cardiovascular).

The exposure-response for sulphur trioxide and acid aerosols indicates acute irritancy and a contribution to longer-term health effects.

The exposure-response for hydrogen sulphide indicates odour effects at ambient exposures.

The relevant effects assessments for water contaminants are based on ecological effects in the estuarine and marine environments.

Drinking water guidelines for human health are relevant where water is consumed. Household rainfall supply was not identified. The assessment of stormwater and process water land discharges on surface water and other groundwater effects have been included through the assessment of estuarine water.

- Exposure assessment

The Discharge Effects Assessment concludes that inhalation exposure to particulate and fluorides is maximal to the east of the plant in a non-residential area. The most impacted locations where community residential assessment is relevant are among a cluster of residences to the north-east and, for acid plant discharges, an area to the west of the site. The residential locations with most impacted exposures for fluorides, particulate, sulphur dioxide and sulphur trioxide are below relevant assessment criteria/guidelines. Human residential exposure to these contaminants from Ravensdown Napier is below accepted toxicological thresholds for adverse health effects.

Exposure to the irrigation water was not considered a public health risk.

Contaminants in estuarine and coastal waters represent an ecological exposure and are not an issue for contact recreation.

Samples of watercress from Awatoto indicate fluoride content that will not produce health effects in the context of normal dietary exposure to fluorides.

- Characterisation of potential for health effects (public health risk)

Assessment of inhalation contaminant exposure patterns among the community at residential locations indicates less than minor health effects. Maximal particulate

concentrations are located in a coastal carpark with short recreational exposures and correspondingly minor health effects.

The watercress samples indicate that mahinga kai is not a source of elevated health risk.

14.4 SUGGESTED APPROACH FOR EFFECTS IDENTIFIED

Particulate

- Recommend a review of the ongoing suitability of the ambient monitoring sites.
- Recommend that the monitoring site selection includes representative community residential exposure.
- Recommend that $PM_{2.5}$ monitoring is included, together with PM_{10}.
- Recommend the further development and use of management plan(s) to reduce fugitives from the Napier Works.

Sulphur dioxide

- Recommend that incident event investigation and mitigation continues, in any future unexpected events.
- Note that the planned replacement of the Acid Plant converter will reduce SO_2 emissions and this will further reduce and minimise effects.
- Recommend continued ambient monitoring, with a site representative of community exposure as well as an impacted site.

Fluorides

- Recommend continued ambient monitoring at a site representative of community exposure.

15. DETAILED SITE INVESTIGATION

The extent of potential contamination of soils that could be disturbed in the development of the proposed stormwater and process water management system is discussed in a report prepared by Beca (*Beca, 2021 Detailed Site Investigation Stormwater and Process Water Management Project at Ravensdown, Napier*).

15.1 POTENTIAL ENVIRONMENTAL EFFECTS

A Detailed Site Investigation (DSI) was prepared by Beca Limited for Ravensdown Limited (Ravensdown) to investigate the presence and extent of potential contamination of soils to be disturbed during the proposed stormwater and process water management system upgrades. In this report, reference to “the wider Ravensdown Site” constitutes the wider Ravensdown facility situated at 200 Waitangi Road, Awatoto, Napier. Reference to “the Site” constitutes areas within the wider Ravensdown Site proposed for soil disturbance as part of the Stormwater and Process Water Management Project development.

15.2 ASSESSMENTS UNDERTAKEN

A Preliminary Site Investigation (PSI) (desktop study) was undertaken as the first stage of the investigation for the wider Ravensdown Site, and the findings of this assessment were used to generate a soil sampling methodology specific to the stormwater and process water system management system upgrades.

The following Hazardous Activities and Industries List (HAIL) activities were identified during the PSI on or within the vicinity of the site:

- A6: Fertiliser manufacture or bulk storage
- B2: Electrical transformers
- E1: Sites with buildings containing asbestos products known to be in a deteriorated condition
- G5: Waste disposal to land

Identified contaminants of concern on-site therefore included heavy metals, polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbon (TPH), fluoride, polychlorinated biphenyls (PCBs), asbestos and pH (screening for fertiliser by-products) in soils.

The DSI undertook systematic sample locations targeted areas likely to undergo soil disturbance as part of the proposed development. Soil samples were collected at varying depths from test pit excavations and submitted for laboratory analysis targeting identified contaminants of concern.

15.3 RESULTS OF ASSESSMENTS

- Encountered ground conditions generally comprised grass cover and topsoil (to approximately 0.2m bgl) underlain by sands and gravels (to between approximately 0.7m and 1.75m bgl), which in turn was underlain by clays to at least the final depths targeted in this investigation (3.2 m bgl).
- Fill containing man-made materials was observed in the north-east of the proposed holding pond, near the pipeline south of the small car wash, and in all test pits undertaken within the southern portion of the site to a maximum depth of 1.75m bgl.
- The fill was generally described as sands and gravels containing traces of concrete, painted concrete, clay red pipe, timber, glass, fabric, rope, cloth, fertiliser bags, metal, plastic, bitumen, assumed fertiliser, rubber pipes and metal cylinders.
- No buried asbestos containing materials (ACM) were visually identified at the time of undertaking the fieldwork, even though buried plastic wrapping was encountered within 7 test pits on the southern portion of the site.
- Yellow powdered deposits (likely buried elemental sulphur) were encountered within the top 1m of test pits undertaken in the southern portion of the site. White deposits (likely buried fertiliser) were also noted in this area (between approximately 0.1m and 1.6m bgl).
- Although likely to be tidally influenced, groundwater was generally encountered at between 0.9m and 1.6m bgl in the north of the site and between 2m and 2.6m in the south of the site.
- 60 samples (including 4 quality samples) were collected from 28 test pits across the site and screened for heavy metals, TPH, PAH and pH. 43 soil samples were also analysed for asbestos, 5 were analysed for fluoride and 2 for PCBs.
- 3 soil samples collected from between 0.5m and 0.85m bgl within the fill material on-site exceeded environmental risk threshold values for heavy metals but did not exceed the adopted guideline values for human health risk.
- 3 soil samples collected from between 0.5m and 1.5m bgl within the fill material on-site contained asbestos; however, these levels were below the adopted human health guideline levels.
- 4 of the 5 soil samples analysed for fluoride exceeded environmental risk threshold values but did not exceed the adopted guideline values for human health risk.
- The 2 soil samples analysed for PCBs returned results below the laboratory levels of detection.
- All TPH and PAH results were below the adopted environmental and human health guideline values.

- 22 of the 56 samples analysed had pH levels below 6 which may be indicative of acid generation or fertiliser leachate.

The following exposure pathways are considered to be potentially complete:

- Construction Workers: Although concentrations of contaminants of concern were all found to be below the criteria for the protection of outdoor workers, a Contaminated Soils Management Plan (CSMP) is recommended with adequate procedures to control potential exposure during development works.
- Groundwater Resources: Various Water Permits for groundwater use for drinking water purposes are recorded within the surrounding area. Potential impacts on groundwater were not assessed in this investigation and cannot be ruled out. The proposed works will be carried out in shallower soils and perched groundwater. Impacts on groundwater should be considered and managed through implementation of controls set out in a management plan.
- Surface Water: Surface water features are present within the area. The exposure pathway can be managed through implementation of suitable design and management controls.

15.4 SUGGESTED APPROACH FOR EFFECTS IDENTIFIED

Shallow groundwater and evidence of impacted soil that poses a risk to the environment was noted, mainly in the southern portion of the site however, the impacts on the northern portion cannot be ruled out without further testing. A groundwater assessment to determine the effects of the fertiliser-related buried waste to the groundwater is recommended (outside of the scope for this report).

A CSMP is recommended to control identified exposure pathways during development works. The CSMP shall align with the proposed design where materials are kept in situ or reused.

It is possible for buried wrapped asbestos to be present within the south of the site. If encountered, further work will be required and may cause delays. The removal of any discovered asbestos may require the engagement of a licenced removalist. This can be managed through incorporating contingency procedures in the CSMP to anticipate the management of such material.

Management controls and design considerations should be in place where any impacted material is planned to be reused on site. These can be set out in a CSMP. The proposed water holding infrastructure should be designed to avoid the water interacting with potentially impacted groundwater.

In the event where off-site soil removal is required, this should be agreed with the acceptor of the material since the level of contamination may restrict the disposal at local

landfills. Additional soil analysis, and quantities of soil to be disposed, may be required to determine its acceptance.

15.4.1 Consent Requirements

Areas on-site where HAIL activities are more likely than not to have occurred are considered to be a “piece of land” under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS). It is more likely than not that HAIL activities occurred on-site. Based on the extent of the proposed works, is not likely to meet the Permitted Activity criteria under Section 8 in the NESCS. As the identified contaminants of concern analysed in this investigation did not exceed any of the adopted human health risk criteria, the proposed works will require a Controlled Activity consent under Section 9 in the NESCS.

15.4.2 Soil Disposal

- Site soil with the presence of hydrocarbons and metal concentrations above the regional background concentrations does not meet the definition of cleanfill but is suitable for reuse.
- The reuse of any contaminated material (where contaminants of concern exceeds the environmental risk criteria) within the site should be adequately managed and considered in the design to minimise the potential environmental effects at the site and groundwater.
- In the event buried suspected asbestos is encountered during earthworks, further assessment may be required. The handling / removal of the material will likely be considered as licensed asbestos removal work.
- Where the materials are not considered suitable for reuse, spoil materials may be disposed of off-site to an appropriate facility authorised to accept such materials.

16. ECONOMIC ASSESSMENT

An economic assessment of the Ravensdown Napier operations is discussed in a report prepared by Economic Solutions Ltd (*Economic Solutions Ltd, 2021, Napier and Hawke's Bay Economic Impacts of Ravensdown Manufacturing Operation*).

16.1 POTENTIAL ENVIRONMENTAL EFFECTS

This report provides a Hawke's Bay region- based economic assessment of the major Napier-based Ravensdown operation. This includes its Awatoto manufacturing plant and co-located ARL research and analysis subsidiary business; Port of Napier related raw material/final product importing, storage and distribution activities; and Severn St, Pandora product distribution store.

16.2 ASSESSMENTS UNDERTAKEN

Specifically, the economic assessment covers the following aspects:

- The direct economic impacts of the Ravensdown operation in Napier.
- The results of a formal economic impact modelling assessment of the business operation for the Napier and Hawkes Bay areas, for the 2019/20 financial year.
- An assessment of other important local and regional economic gains of the Ravensdown operation.

The main information sources used for the assessment have included relevant base production, financial, employment and other statistics provided by the Company; Statistics New Zealand data; Napier City Council District Plan and other information; the results of a formal economic impact modelling analysis (of the Napier Ravensdown operation) undertaken by Hughes Consulting, Auckland; and ESL's own review of the potential local/regional economic gains stemming from the operation.

16.3 RESULTS OF ASSESSMENTS

16.3.1 Direct Economic Effects

These include as follows:

- The Company's major manufacturing operation is located in the Awatoto Industrial Zone of Napier. The Company's associated ARL research and analysis subsidiary business service is co-located in this Zone. The other parts of the local Ravensdown business are also located within main industrial zones of the City (Port of Napier and Pandora).
- The Awatoto operation contains a range of established and specialised manufacturing facilities and plant/equipment with a combined insurance value of approximately $250 million.

- Annual production from the plant is currently in the order of 300,000 tonnes.
- The total site area of the Ravensdown manufacturing plant accounts for approximately 11% of the Awatoto main industrial zone area.
- The Awatoto operation is an important part of Napier's overall wealth-creating manufacturing and processing sector.
- The operation is Ravensdown's largest and only North Island manufacturing enterprise, and accounts for in excess of half of the Company's national production.
- Total direct employment of 94 staff with a diverse range of skill sets.
- Some 170 contractors are used during the year for required plant maintenance and development work.
- The Company makes a significant contribution to the Port of Napier's overall business performance (and import infrastructure and capability), accounting for 40% of total Port import tonnages and 5% of the total value of imports.

16.3.2 Economic Impacts

The key results from the formal economic impact modelling assessment (for the 2019/20 financial year) undertaken for the collective group of Ravensdown business activities based in Napier, are as follows:

- Direct economic impacts for the Hawke's Bay region of: total operating Revenue $100.86 million, total full/part-time Employment 94 persons, total Net (or disposable) Household Income generated of $5.87 million and total Value Added or contribution to the regional economy/Gross Regional Product GRP of $21.71 million.
- Indirect and induced ('backward or supplier' industry linkage) economic impacts for the Hawke's Bay region of: Revenue $128.71 million, Employment 407 persons, Net Household Income $15.10 million and Value Added/GRP $52.25 million. These impacts represent the multiplied or flow-on economic impacts within the region.
- Total economic impacts for the Hawke's Bay region of: Revenue $229.57 million, Employment 501 persons, Net Household Income $20.97 million and total Value Added/GRP $73.96 million. On average, these economic impacts represent 1% of the regional totals for these economic impact measures. This is considered to be a significant result for a single manufacturing enterprise in the region.
- Total economic impacts for the Napier City area are estimated at Revenue $144.62 million, Employment 232 persons, Net Household Income $11.0 million and Value Added/GRP $39.48 million. On average, these values represent approximately 54% of the total Hawke's Bay economic impacts.

16.3.3 Other Economic Gains

Other economic gains generated for the Napier/Hawke's Bay area region by the Ravensdown operation in Napier, include:

- Contributing significantly to maintaining the underlying economic strength, capacity and efficiency of the overall Awatoto Industrial Zone of Napier.
- The different parts of the Ravensdown operation are all located in relatively close proximity to each other in the City. This significantly assists the Company's operational efficiency and overall business performance in terms of servicing its various markets.
- These factors are also assisted by the relatively close proximity of the overall Napier operation to the local and external roading / transport network.
- The Company provides an ongoing significant business opportunity for Hawke's Bay trucking businesses and for a wide range of specialist plant maintenance and development contractors.
- Provision of employment opportunities within the overall operation covering a wide range of specialist occupations.

16.4 SUGGESTED APPROACH FOR EFFECTS IDENTIFIED.

It is recommended that the overall importance of the Ravensdown operation in Napier to the City and regional economies, as indicated by the detailed economic assessment results provided in this report, be taken into consideration by the HBRC in the course of its deliberations on the Company's application for renewal of its long-term water and air discharge consents.

17. CULTURAL IMPACT ASSESSMENTS

Two Cultural Impact / Values Assessments ("**CIA**" or "**CVA**") have been prepared by mana whenua to assess the Ravensdown resource consent project. As detailed in section 19 below, Ravensdown approached a number of mana whenua groups throughout the resource consent project. Representatives of Ngāti Pārau hapū and Kohupātiki Marae have engaged in the project resulting in the establishment of valuable relationships with Ravensdown and the two CIA's provided in Part D of this application.

These two reports differ from all other assessment reports in format, therefore the executive summaries have not been directly replicated into this section below and instead the conclusion and / or recommendations sections of both reports are provided below.

17.1 NGĀTI PĀRAU HAPŪ TRUST

The CIA on behalf of the mana whenua hapū, Ngāti Pārau was prepared by Chad Tareha who is the Chairman of the Ngāti Pārau Hapū Trust (*Ravensdown Napier, Resource Consents Renewal, Cultural Impact Assessment, November 2021*). The CIA states that "*Ngāti Pārau holds principal mana whenua interests in the lower reaches of the Tūtaekurī River and the river is also an area of great cultural significance*". The conclusion section of this assessment is replicated below.

17.1.1 Report Conclusions

This CIA has documented the Ngāti Pārau hapū cultural values, views, interests and historical connections Ngāti Pārau hapū holds within the Awatoto, Waitangi Estuary and surrounding areas. This CIA has identified various sites of cultural significance in the context of Ravensdown's resource consent renewal project, and that Ngāti Pārau hapū hold principal mana whenua interest in the lower reaches of the Tūtaekurī River.

This CIA has summarised, and was guided by, various technical assessments commissioned by Ravensdown to assess the effects of the air and process water and stormwater discharges. Although these technical assessments do not identify any major concerns that may have a direct impact to sites of significance to Ngāti Pārau, Ngāti Pārau believe that any impacts on the cultural values identified in this CIA will be further averted, minimised and/or mitigated through the implementation of the newly proposed systems, processes and regular monitoring in partnership with mana whenua.

Regular and ongoing active-engagement has been established and will continue between Ravensdown and Ngāti Pārau, who are active kaitiaki of the Tūtaekurī River and Waitangi Estuary. Because of the cultural and historical connection Ngāti Pārau has with the lower reaches of the Tūtaekurī River, Waitangi Estuary and surrounding wetlands, Ngāti Pārau proposes that we build a closer partnership with Ravensdown. The purpose of these partnerships will be to build a closer connection between our entities, provide advice and

guidance as mana whenua, to support the Habitat Abundance Restoration Programme and associated monitoring and to support a positive community kaupapa.

Recommendation 1: Ngāti Pārau hapū supports the proposed site for disposal of stormwater and process water through irrigation across 17.5 ha of farmland.

Recommendation 2: Ngāti Pārau hapū are committed to working with Ravensdown to ensure a healthy estuarine environment for the Waitangi Estuary and wetlands area. Ngāti Pārau insists that they be kept appraised of, and included in the Habitat Abundance Restoration and ongoing monitoring.

Recommendation 3: That Ravensdown invest in future Mana Whenua Kaitiaki (environmentalists), through an on-going and active partnership with Mana Whenua to achieve the environmental and cultural aspirations of Mana Whenua, Ravensdown and that of the community.

17.2 MANA WHENUA AFFILIATED TO KOHUPĀTIKI MARAE

The mana whenua group affiliated to Kohupātiki Marae and of Ngāti Hinemoa, Ngāti Hori, Ngāti Hawea hapū engaged Aramanu Ropiha to compile a cultural values, names and associations report (*Whataangaanga and Surrounds, Cultural Values, Names and Associations, November 2021).* This report states that there are a number of tangata whenua with interests in this area including these three mana whenua groups. The recommendation section of this assessment is replicated below.

17.2.1 Report Recommendations

1. That Ravensdown invest in Rangatiratanga - Leadership through a long-term relationship with mana whenua to achieve all cultural outcomes over the long term[22]. This relationship includes:
   - 1.1 The proposed habitat abundance restoration project as stage one:- is just stage one of a bigger project; and
   - 1.2 That the partnership brings in other industry operating at Whataangaanga for ongoing enhancement staged projects: Mana, Mauri Tu; Taiao.
   - 1.3 A second concurrent project runs in conjunction with the restoration project; Names and associations is project two that researches the names and associations used through time, for the area of the estuary, and interprets the findings consistent with the cultural outcomes of Whakapapa; Ahi kaa; Mahi Toi; Tohu.

and

[22] Long-term in this context begins with the duration of the resource consent i.e. 35 years

2. That Ravensdown, in acknowledgement of the waka culture of the early inhabitants of the area; and of the positive social impact associated with waka today, invests in restoring the culture of waka on the rivers. Manaakitanga - fostering potential.

and

3. That Ravensdown, in partnership with Mana whenua; establish a Whakatipu Kaitiaki policy to provide scholarships and internships specifically targeting rangatahi Māori, actively investing in mana whenua capacity and capability to engage with the environmental and other issues related to the Ravensdown operations.

18. SUMMARY OF ASSESSMENT OF EFFECTS

The assessments authors presented a number of recommendations in their reports as summarised in sections 9 to 17 above. Ravensdown have addressed these recommendations through the proposed resource consent conditions, monitoring and the site management plans that have been attached in Section F of this AEE.

19. COMMUNITY ENGAGEMENT

19.1 INTRODUCTION

Ravensdown committed to an open and transparent stakeholder engagement process at the outset of the resource consent project for the Napier Works with the objectives of:

- Providing opportunities for stakeholders and the community to ask questions, provide feedback and ideas, and participate in decision making.
- Maintaining an open and honest dialogue with all stakeholders and the community.
- Building strong connections with all stakeholders and the community.
- Providing timely responses and feedback, with the intention of using this feedback to positively influence the Project where possible.
- Enhancing stakeholder and community acceptance and trust.

Early and meaningful engagement with councils, mana whenua and other relevant stakeholders was seen as a key to the project's success and is outlined below.

19.2 CONSULTATION WITH MANA WHENUA

Ravensdown sought early advice from the HBRC as to the appropriate mana whenua parties to engage with in relation to the Site's activities and the resource consent project. The HBRC Pataka mapping tool provided the location and extent of iwi and hapū resources in Hawke's Bay which was the basis for the early engagement and contact with mana whenua. It was noted that:

- The Napier Works lies within the Ngati Kahungunu iwi boundary and Te Taiwhenua O Heretaunga.
- Te Taiwhenua o Te Whanganui-a-Orutū maintains an interest in activities within the Napier area.
- Both Mana Ahuriri and Heretaunga Tamatea are listed as treaty partners for the area.
- There are several hapū affiliated with local marae on the Heretaunga Plains who all have a relationship with the rivers and coastline in the area of the Napier Works. These hapū include Ngāti Hori, Ngāti Hawea and Ngāti Pārau.

Ravensdown initiated engagement these parties in 2020 to both establish contacts for this resource consent process and for consultation on the two earlier resource consent applications to vary the air discharge permit and for the short-term discharge of dye into the Ravensdown Drain (associated with ecological effects assessment). These same parties were invited to participate in the TFG.

Te Taiwhenua O Heretaunga declined to be directly involved in the project noting that engagement with Ngati Pārau, Te Taiwhenua O Te Whanganui A Orotū and Kohupātiki Marae was appropriate.

Ravensdown also undertook to establish a relationship with Te Taiwhenua o Te Whanganui-a-Orutū, hosting a visit at the Site to discuss the resource consent project on 12 March 2021 and inviting them to be involved in the TFG process. Representatives of Te Taiwhenua o Te Whanganui-a-Orutū have been unable to attend any TFG meetings, however the project team has maintained contact with the intention of keeping them up to date with the project as it developed. Te Taiwhenua o Te Whanganui-a-Orutū also indicated that they would provide a CIA however this has not progressed at the time of finalising the application and AEE documentation. Ravensdown is committed to maintaining a relationship with Te Taiwhenua o Te Whanganui-a-Orutū and welcomes further discussions at a time that suits representatives.

Ravensdown have continued to developed strong relationship with representatives of Ngāti Pārau hapū and Kohupātiki Marae. Representatives of both groups have participated in the TFG process and are involved in the HARP working group. Ravensdown is continuing to grow these partnerships, gaining an understanding of the cultural values and effects on mana whenua associated with the Site. The two Cultural Impact / Values Assessments provided with this application and summarised in section 18 provide Ravensdown with valuable information in relation to the views and history of Ngāti Pārau hapū and the mana whenua group affiliated to Kohupātiki Marae.

19.3 COUNCILS

Ravensdown has maintained ongoing dialogue with both the HBRC and NCC throughout the resource consent project at staff, management and leadership levels of both organisations. Representatives of both Councils have also participated in the TFG as noted in Table 21 below.

Ravensdown has attempted to work collaboratively with the Councils, meeting with NCC in the development of the water discharge strategy where options involving NCC infrastructure were raised, and through the opportunity of technical peer review by both councils of a number of key documents.

As noted in section 1.9, Ravensdown provided the HBRC with final draft versions of a number of the technical assessments and reference reports in order for their team of experts to undertake a pre-application review and provide any feedback prior to the final applications being lodged.

19.4 TECHNICAL FOCUS GROUP

As noted in section 3.3, Ravensdown formed a TFG made up of representatives from a diverse range of key stakeholder groups to engage with Ravensdown during the consent

project (Table 21 below). The purpose of the TFG was to provide advice and input to Ravensdown as part of a two-way information sharing process for the preparation of the resource consent application package.

Table 21: TFG Membership

TFG Members *	Consent Authorities - Observers	Support Roles
Hawke's Bay Regional Council - Operations Focus	Hawke's Bay Regional Council - Consents Planner	Ravensdown Works Manager Andrew Torrens
Iwi / Hapū / Marae Representatives - Te Taiwhenua o Te Whanganui-a-Orutū - Ngāti Pārau Hapū - Waiohiki Marae - Ngāti Toaharapaki, Ngāti Hōri - Kohupātiki Marae	Department of Conservation - Regulatory Function	Ravensdown Consents Manager Helen Hurring
Napier City Council - Environmental Team		Facilitator Stephen Daysh
Hawke's Bay District Health Board		Assistant Facilitator Anita Anderson
Department of Conservation - Operations Focus		
Forest and Bird[1]		
Fish and Game New Zealand		
Neighbouring Industry		
Ravensdown Client – Horticultural Sector		
Ravensdown Client – Agricultural Sector		
Ravensdown Staff Members		
Taradale High School Representatives		

[1] Representative from Forest and Bird withdrew after TFG Meeting 3 due to a change in role.

The TFG met five times between April 2021 and October 2021. Minutes of each meeting and presentations and information shared with the group can be found on the Ravensdown website at www.ravensdown.co.nz/ravensdown/napier-21-consent

A summary of these meetings is presented in Table 22 below.

Table 22: Summary of TFG meetings and key topics discussed

Meeting Number and Date	Summary of Meeting
TFG 1, 15 April 2021	• Introductions and background to TFG • Feedback from members for involvement in the TFG. • Review and agreement of TFG Terms of Reference
TFG 2, 18 May 2021	• Presentation from Ravensdown technical assessment authors on scope of studies at Kohupātiki Marae.
TFG 3, 16 July 2021	• MCDA for the site water discharges. • Presentation of MCDA assessment by technical team. • Assessment of Stakeholder and Mana Whenua[1] criteria by TFG members. • Ranking of water discharge options
TFG 4, 27 August 2021	• Presentation of Air and Water discharge Strategies • Presentation of draft scopes for Assessment Studies and Management Plans
TFG 5, 1 October 2021	• Presentation of Effects Assessment Reports

[1] Mana whenua members of the TFG undertook scoring of this criteria separately from the full TFG on 9 July 2021.

The TFG process has helped Ravensdown develop a number of enduring relationships with stakeholders. Ravensdown has gained some valuable insight into the community's views in relation to the Napier Works and intend to work alongside stakeholders to strengthen and maintain these relationships. The HARP is one such outcome of the TFG process. Of particular note is the input provided by the three Taradale High School students whose voice throughout the TFG process has been invaluable.

Figure 20: TFG Meeting 3 at Kohupātiki Marae

Figure 21: TFG Members

19.5 OTHER INTERESTED PARTIES

Ravensdown developed a webpage dedicated to communication on the project in early 2021 which is publicly available. The webpage includes information on the Site as well as documents from TFG meetings, recent HBRC monitoring reports and baseline technical reports. This webpage will continue to be updated with relevant project information and the resource consent application and AEE documentation.

Other recent engagement has included:

- Meeting with local MP's Anna Lorck and Stewart Nash in November 2021 to discuss the plans for the site discharges and the general site matters.
- Communications with members of the community regarding the upcoming consent process.

19.6 SITE OPEN DAY

Ravensdown is planning to hold an Open Day at the Napier Works on 10 February 2022 to provide members of the public with an opportunity to discuss the project and resource consent application with Ravensdown, their independent experts and members of the TFG. The open day will be well-advertised and held during the submission period to enable potential submitters to become familiar with the step change proposed to site operations before preparing a submission.

20. NOTIFICATION

Ravensdown has discussed notification with both NCC and HBRC Consenting staff at pre-application meetings held on 25 November 2021 noting their intention to request the public notification of the applications from both Councils.

NCC staff have expressed that public notification of the application in relation to the NCC consents was not necessary or recommended on the basis that in their view the effects are no more than minor. Therefore, Ravensdown requests that the application for the land use consents associated with activities within the administrative jurisdiction of NCC and set out in this document are processed on a non-notified basis.

In terms of the various HBRC applications, and pursuant to section 95A(2)(b) of the Resource Management Act 1991, Ravensdown formally requests that the application for the resource consents within the administrative jurisdiction of the HBRC be publicly notified to ensure that all potentially interested parties can comment on the application through a public process.

In addition to this Ravensdown requests that the notification period for the HBRC applications commences on 20 January 2022 and closes on 17 February 2022 to recognise the Christmas holiday period. In doing so Ravensdown waives the associated resource consent processing timeline.

21. CONCLUSION

Ravensdown is applying to the HBRC and NCC for a suite of resource consents to provide for the long-term operations at the Napier Works while minimising any adverse effects from the operations on the local receiving environment, and providing for a significant wetland restoration/enhancement project. These consents relate to site activities associated with:

- Water take and use
- Discharges to air
- Water discharges to land and water
- Treatment plant construction
- Wetland restoration activities

This AEE and the accompanying documents sets out a fulsome assessment of the actual and potential effects associated with these activities and provides an overall conclusion that any adverse effects will be minor or less than minor and can be managed through the proposed consent conditions and management plans.

Finally, the analysis provided in the accompanying Planning Assessment concludes that overall this proposal achieves the purpose of the RMA as expressed in the objectives and policies of the relevant planning instruments, that adverse effects of the activity will be avoided, remedied or mitigated in accordance with the expectations of the relevant planning documents and sections 5, 6, 7 and 8 of the RMA, and therefore consideration of Part 2 confirms it is appropriate to grant the consents applied for subject to the conditions proffered by the applicant.

1

APPENDIX 1

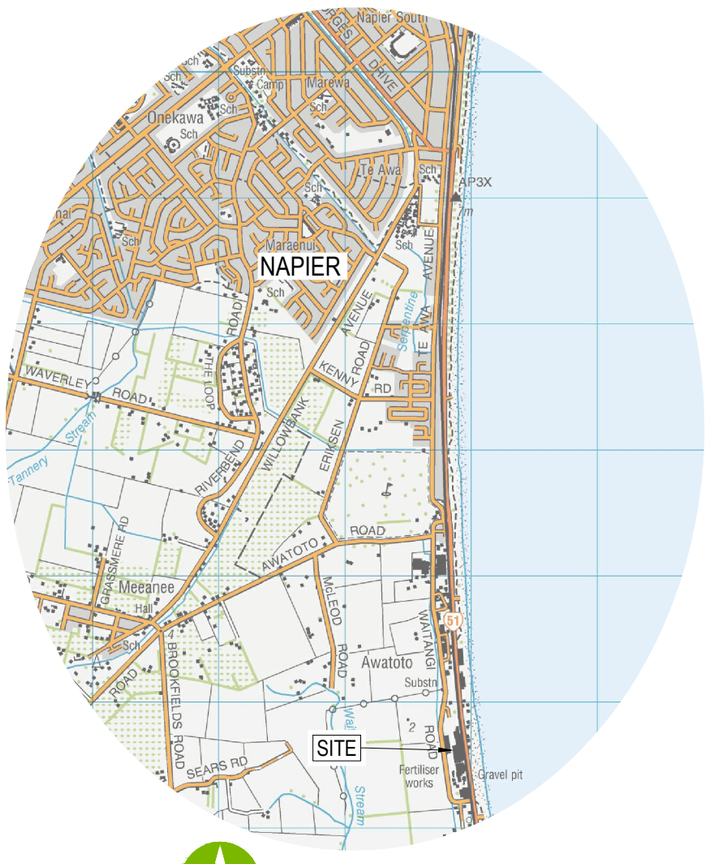
Drawing Set

Appendix A - Drawings

- 509619-0000-DRG-CC-0000 – Cover Sheet – Location Plan and Drawing Index
- 509619-0000-DRG-CC-1001 – Stormwater Management Plan – Stage 1
- 509619-0000-DRG-CC-1002 – Stormwater Management Plan – Stage 2
- 509619-0000-DRG-CC-1003 – Detail 1 & Schematic Long Section
- 509619-0000-DRG-CC-1004 – Irrigation Alignment & Details
- 509619-0000-DRG-CC-1101 – Bioretention Basin and Typical Section
- 509619-0000-DRG-CC-1102 – Holding Pond and Typical Section
- 509619-0000-DRG-CC-1103 – Settling Pond and Typical Section
- 509619-0000-DRG-CC-1104 – Wetland and Typical Section
- 509619-0000-DRG-CC-1105 – Clarifier Schematic

NAPIER
STORMWATER RECONSENTING

DRAWING INDEX	
DRAWING NUMBER	DRAWING TITLE
509619-0000-DRG-CC-0000	COVER SHEET - LOCATION PLAN AND DRAWING INDEX
509619-0000-DRG-CC-1001	STORMWATER MANAGEMENT PLAN - STAGE 1
509619-0000-DRG-CC-1002	STORMWATER MANAGEMENT PLAN - STAGE 2
509619-0000-DRG-CC-1003	DETAIL 1 & SCHEMATIC LONG SECTION
509619-0000-DRG-CC-1004	IRRIGATION ALIGNMENT & DETAILS
509619-0000-DRG-CC-1101	BIORETENTION BASIN & TYPICAL SECTION
509619-0000-DRG-CC-1102	HOLDING POND & TYPICAL SECTION
509619-0000-DRG-CC-1103	SETTLING POND & TYPICAL SECTION
509619-0000-DRG-CC-1104	WETLAND &TYPICAL SECTION
509619-0000-DRG-CC-1105	CLARIFIER PROCESS DIAGRAM



LOCALITY PLAN
NTS

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ABN: 54 005 139 873

PRELIMINARY
NOT FOR CONSTRUCTION

SIZE	DATE	DRAWING No.	PROJECT No.		WBS		TYPE		DISC		NUMBER		REV
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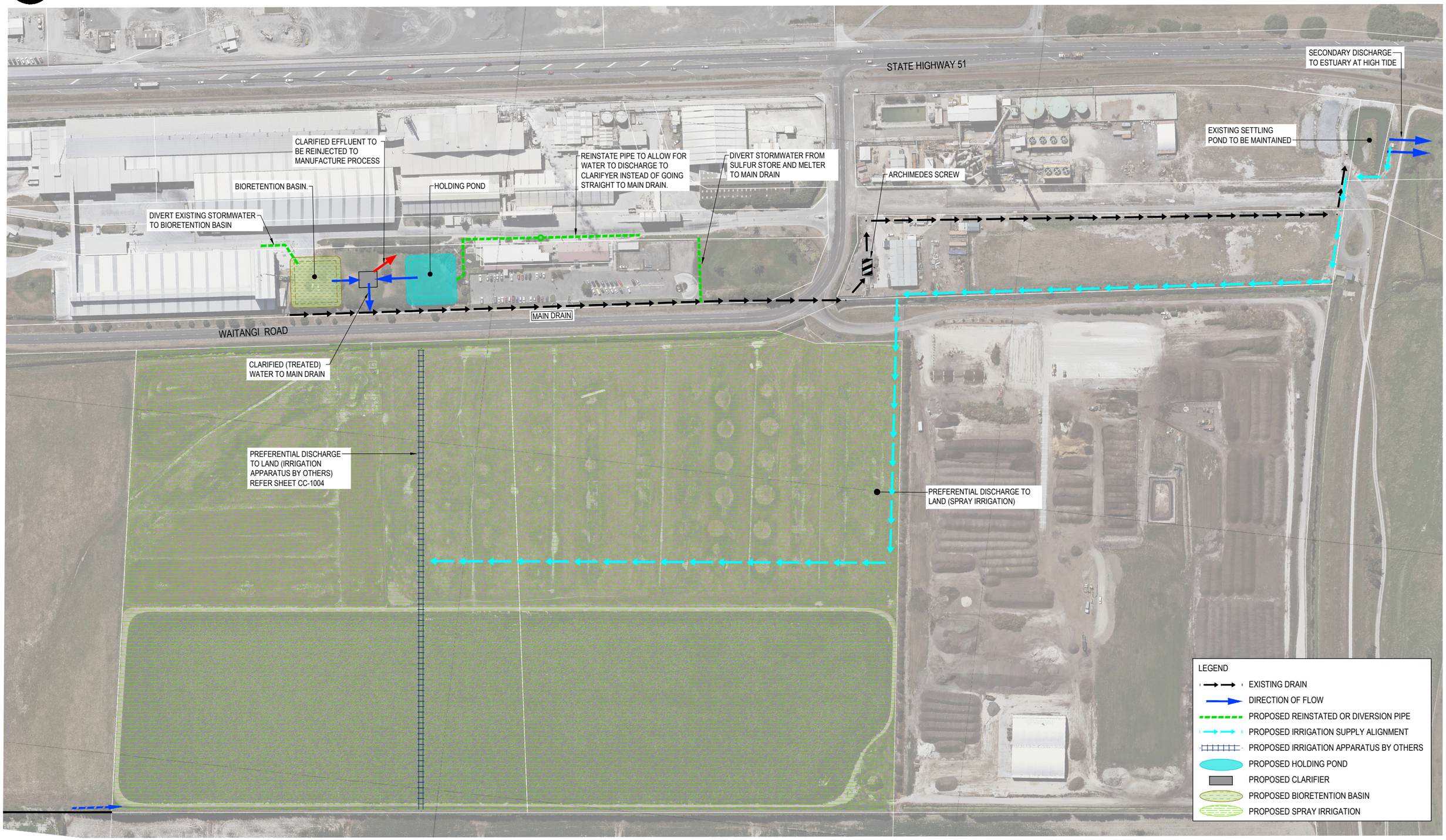

10 0 20 40m 60m

SCALE 1:1250

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CLIENT
ravensdown

REV	DATE	REVISION DETAILS	APPROVED
B	2021-10-29	IRRIGATION AND TREATMENT DEVICE UPDATES	A LINDGREN
A	2021-08-24	PRELIMINARY ISSUE	A LINDGREN

SCALE	1:1250
SIZE	A1
DRAWN	R DAWSON
DESIGNED	I FOWLER
REVIEWED	D DELAGARZA

PRELIMINARY
NOT FOR CONSTRUCTION
APPROVED
DATE

PROJECT	NAPIER STORMWATER RECONSENTING
TITLE	STORMWATER MANAGEMENT PLAN STAGE 1

DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
	509619	0000	DRG	CC	1001	B

Plot Date: 2021-10-19 09:25:00 Office: Christchurch Filename: p:\all\designshare.au.aurecon.info\Prv_AU\DO1_01\Documents\Projects\509\ex\509619 - Napier Stormwater Reconsenting\5 Deliver\design\003 Drawings\509619-0000-DRG-CC-1002.dwg

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CLIENT
ravensdown

REV	DATE	REVISION DETAILS	APPROVED
C	2021-10-22	IRRIGATION AND TREATMENT DEVICE UPDATES	A LINDGREN
B	2021-09-06	CLIENT COMMENTS INCLUDED	A LINDGREN
A	2021-08-24	PRELIMINARY ISSUE	A LINDGREN

SCALE	1:1250
SIZE	A1
DRAWN	R DAWSON
DESIGNED	I FOWLER
REVIEWED	D DELAGARZA

PRELIMINARY
NOT FOR CONSTRUCTION
APPROVED
DATE

PROJECT	NAPIER STORMWATER RECONSENTING
TITLE	STORMWATER MANAGEMENT PLAN STAGE 2

DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
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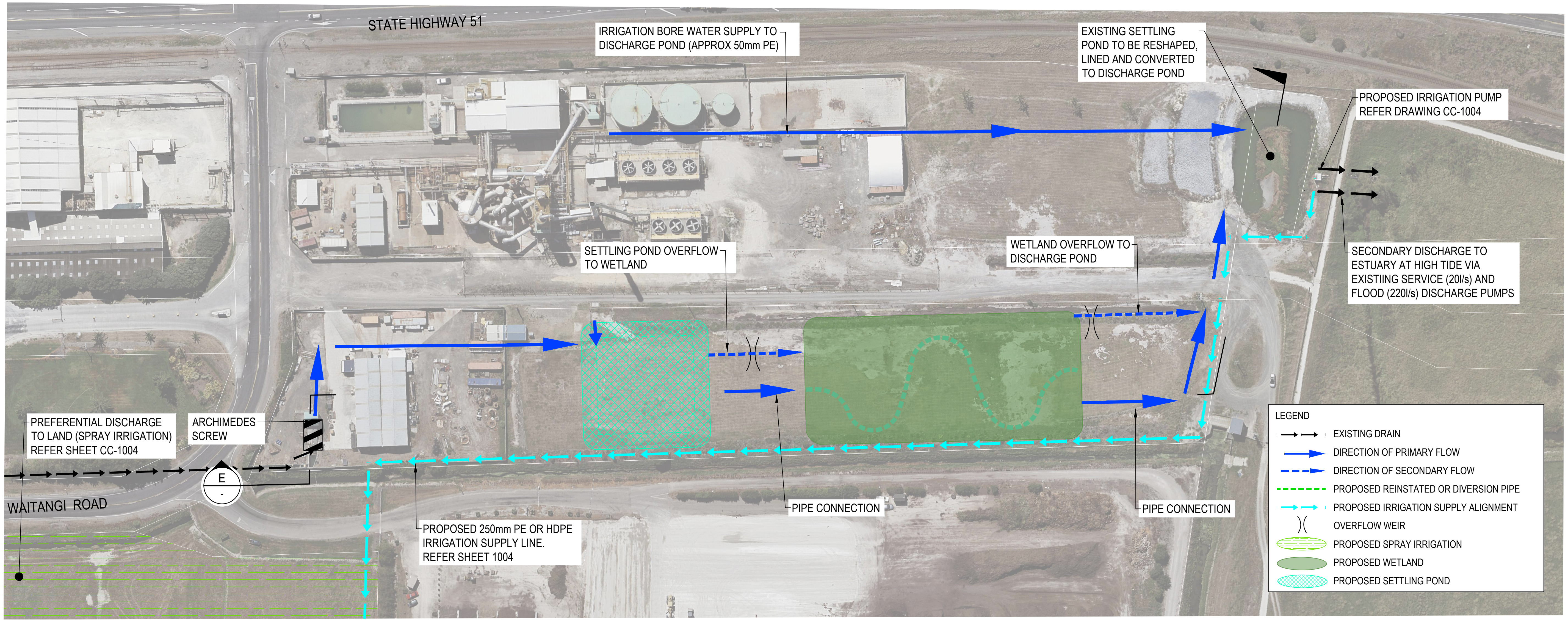
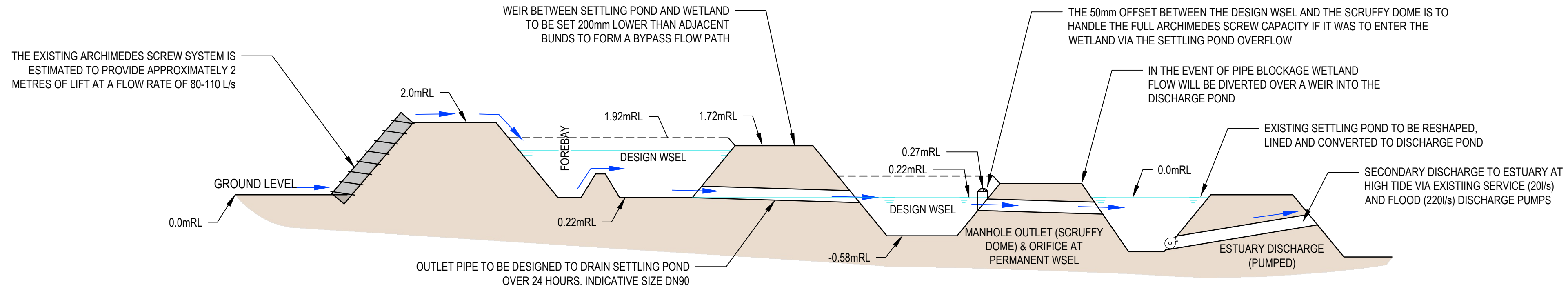


VIEW 1
1:750 CC-1002



SCHEMATIC SECTION E
NOT TO SCALE

7.5 0 15 30m
SCALE 1:750

NOTES:

1. THE LEVELS STATED ON THE SCHEMATIC ARE RELATIVE TO THE HEAD LIFT PROVIDED BY THE ARCHIMEDES SCREW. THIS WAS ESTIMATED DURING AN AURECON SITE VISIT.
2. A DETAILED TOPOGRAPHIC SURVEY WILL BE REQUIRED TO FINALIZE THE SIZING AND ARRANGEMENT OF THE VARIOUS TREATMENT DEVICES.
3. TREATMENT DEVICES ARE BEING ASSESSED AGAINST A LARGER INFLOW IN THE EVENT OF AN UPGRADE TO THE ARCHIMEDES SCREW.

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REV	DATE	REVISION DETAILS	APPROVED
A	2021-10-29	IRRIGATION AND TREATMENT DEVICE UPDATES	A LINDGREN

SCALE	SIZE
1:750	A1

DRAWN: R DAWSON
DESIGNED: I FOWLER
REVIEWED: D DELAGARZA

PRELIMINARY
NOT FOR CONSTRUCTION
APPROVED
DATE

PROJECT: NAPIER STORMWATER RECONSENTING
TITLE: STORMWATER MANAGEMENT PLAN STAGE 2 - VIEW 1 & SCHEMATIC LONG SECTION

DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
	509619	0000	DRG	CC	1003	A

STATE HIGHWAY 51

WAITANGI ROAD

WAITANGI ROAD CORRIDOR

PROPOSED IRRIGATION PUMP
Q=20L/sec
H=30m
P=10 kw (SURFACE) / 20 kw (SUBMERSIBLE)

250mm PE OR HDPE IRRIGATION SUPPLY LINE

PROPOSED IRRIGATION APPARATUS
(BY OTHERS)

LEGEND

- EXISTING DRAIN
- DIRECTION OF PRIMARY FLOW
- DIRECTION OF SECONDARY FLOW
- PROPOSED IRRIGATION APPARATUS BY OTHERS
- PROPOSED IRRIGATION SUPPLY ALIGNMENT
- PROPERTIES OWNED BY EXTERNAL PARTIES
- PROPOSED SPRAY IRRIGATION

7.5 0 15 30m
SCALE 1:750

Plot Date: 2021-10-29 09:33:00 Office: Christchurch\Drawings - pw1:\design\share.au.aurecon.info\PW_AUDC1_01\Documents\Projects\509xxx\509619 - Napier Stormwater Reconsenting\05 Deliver\ design\501 Drawing\509619-0000-DRG-CC-1004.dwg

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CLIENT
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REV	DATE	REVISION DETAILS	APPROVED
A	2021-10-29	IRRIGATION AND TREATMENT DEVICE UPDATES	A LINDGREN

SCALE	SIZE
	A1

DRAWN: M KORAKO
DESIGNED: I FOWLER
REVIEWED: D DELAGARZA

PRELIMINARY
NOT FOR CONSTRUCTION

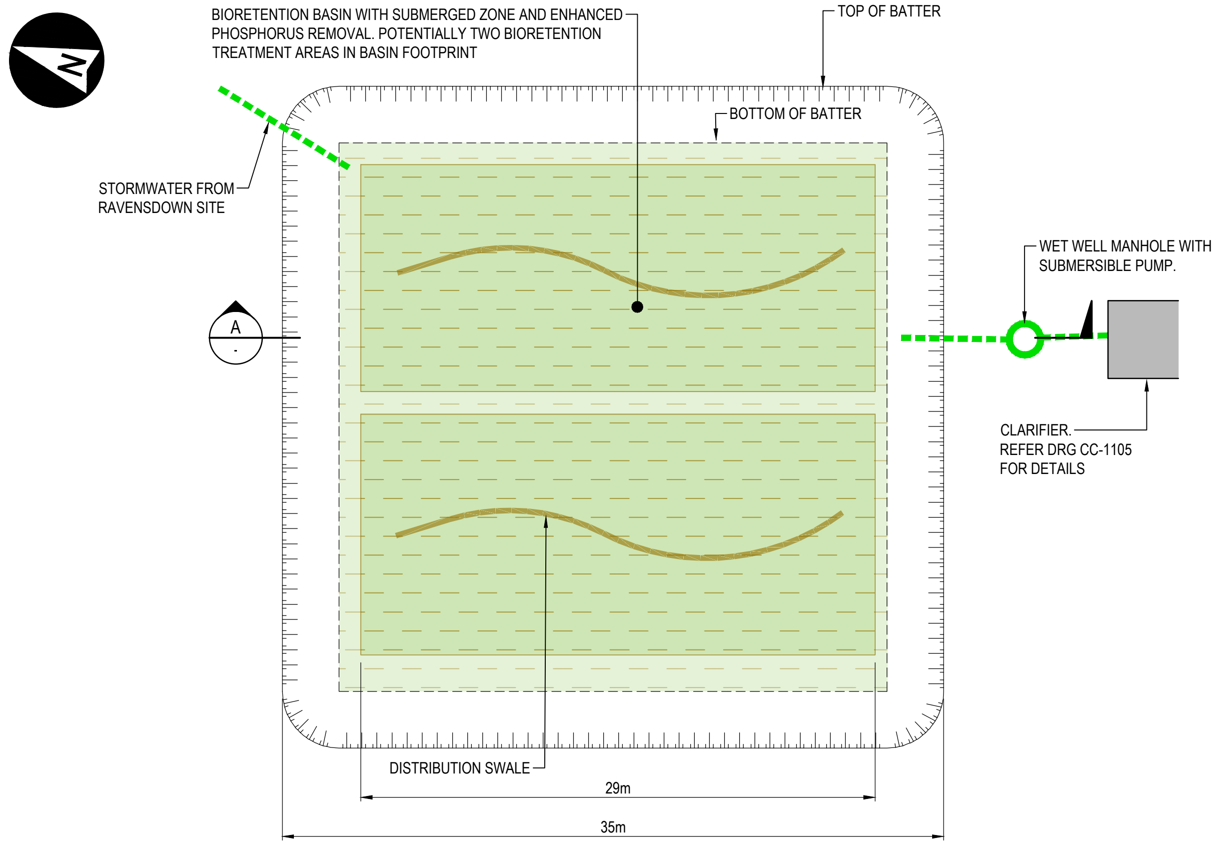
APPROVED
DATE

PROJECT: NAPIER STORMWATER RECONSENTING

TITLE: STORMWATER MANAGEMENT PLAN
IRRIGATION ALIGNMENT AND DETAILS

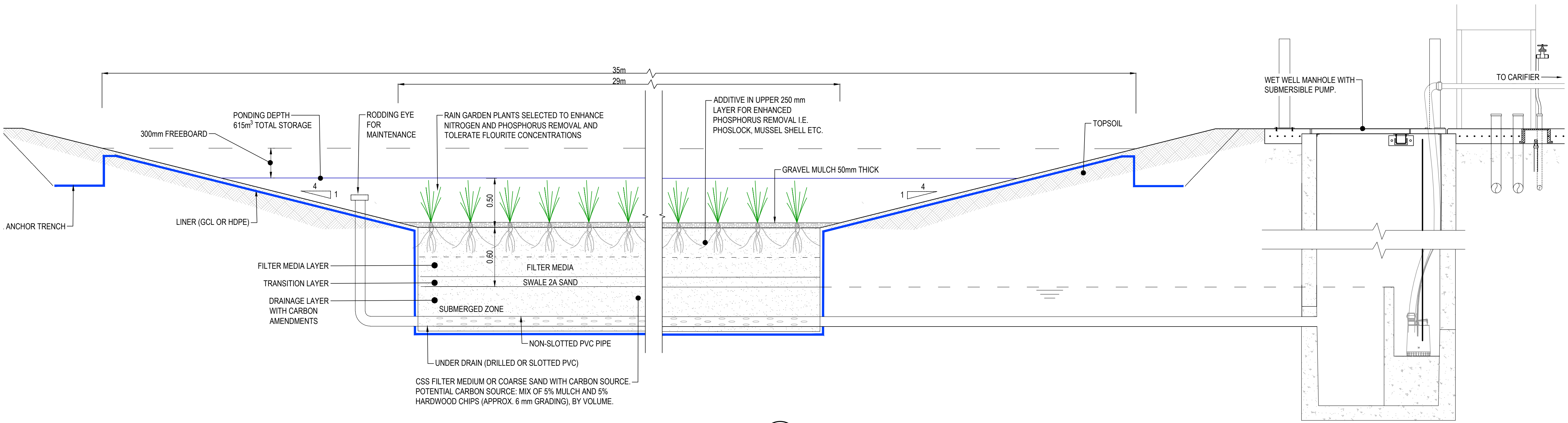
DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
	509619	0000	DRG	CC	1004	A

NOTES:
1. REFER STORMWATER MANAGMENT PLAN ON DRG-CC-1001
2. REFER TO DRG-CC-1105 FOR CLARIFIER SCHEMATIC.
3. A SAMPLING POINT WILL BE INCLUDED ON THE INLET AND OUTLET OF ALL TREATMENT DEVICES.



BIORETENTION BASIN DETAIL

1:200



SECTION A

1:20

200 0 400 800mm
SCALE 1:20

2 0 4 8m
SCALE 1:200

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REV	DATE	REVISION DETAILS	APPROVED
B	2021-09-06	CLIENT COMMENTS INCLUDED	A LINDGREN
A	2021-08-24	PRELIMINARY ISSUE	A.LINDGREN

SCALE	SIZE
NTS	A1

DRAWN: R DAWSON
DESIGNED: I FOWLER
REVIEWED: D.DELAGARZA

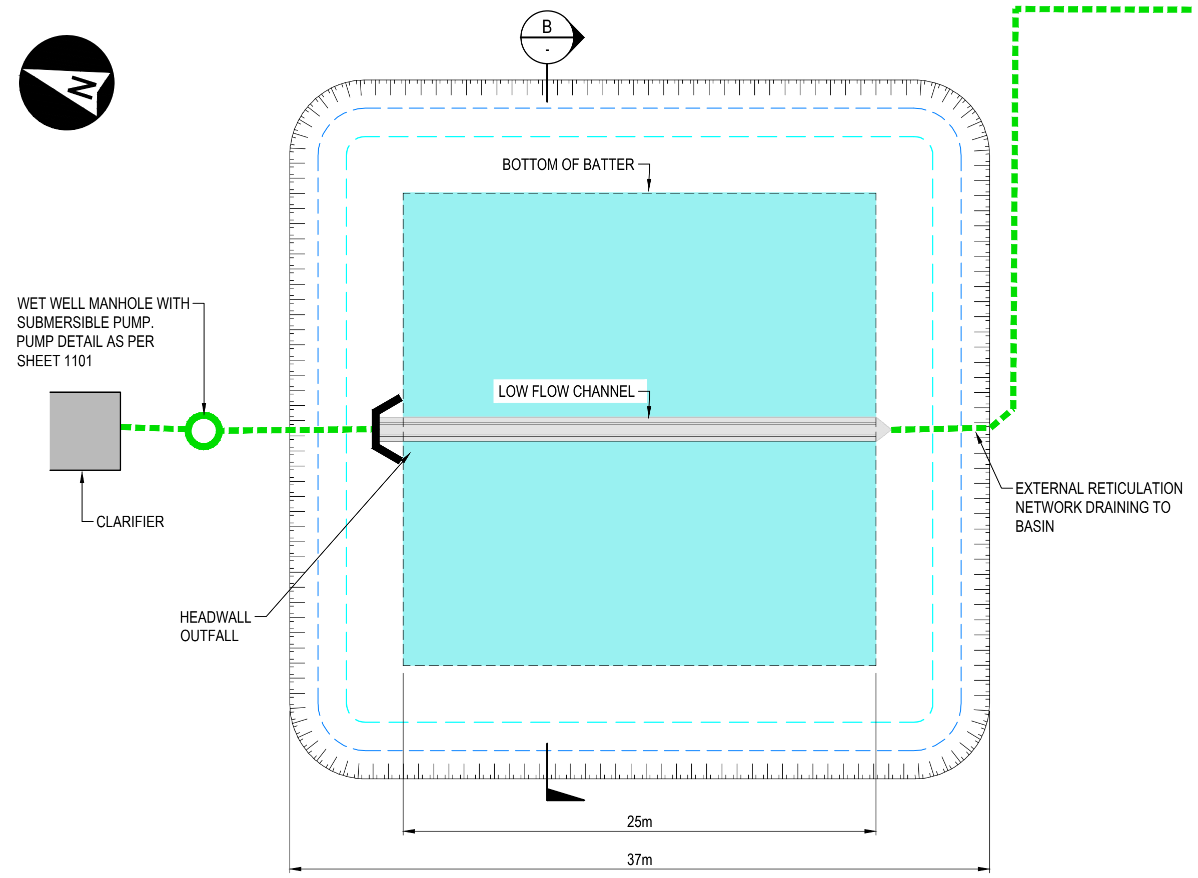
PRELIMINARY
NOT FOR CONSTRUCTION

APPROVED
DATE

PROJECT: NAPIER STORMWATER RECONSENTING

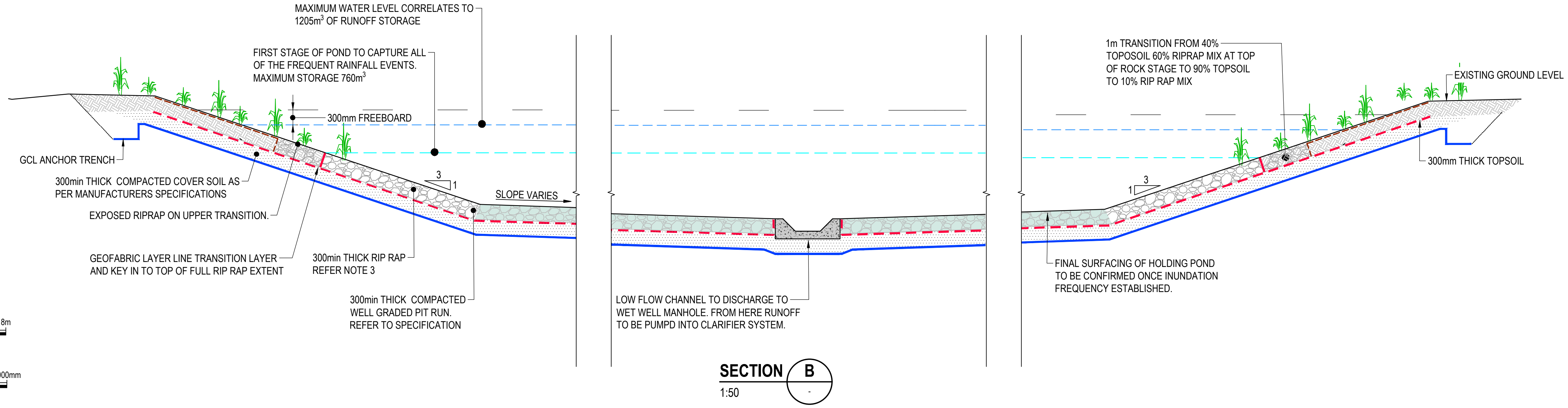
TITLE: BIORETENTION BASIN TYPICAL CROSS SECTION

DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
	509619	0000	DRG	CC	1101	B



HOLDING POND DETAIL
1:200

NOTES:
1. REFER STAGE 1 STORMWATER MANAGMENT PLAN ON DRG-CC-1001
2. REFER TO DRG-CC-1105 FOR CLARIFIER SCHEMATIC.
3. ROCK SPECIFICATIONS
   Dmin = 100mm
   D50 = 150mm
   Dmax = 200mm
   300 min THICK.
4. GEOSYNTHETIC CLAY LINER (GCL) COVER SOIL TO BE APPROVED BY ENGINEER. SILTY MATERIAL EXCAVATED ONSITE IS LIKELY TO BE PERMISSIBLE. COVER SOIL TO BE SMOOTH ROLLED AND COMPACTED TO 92% MDD. COVER SOIL TO BE PLACED FROM BASE UPHILL BY SMALL DOZER. DOWNHILL PLACEMENT NOT PERMISSIBLE.
5. GCL TO BE PLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS WITH MINIMUM OVERLAP OF 300mm, GCL ON GCL. LENGTHWISE JOINTS ON SLOPE NOT PERMISSIBLE WITHOUT GEOTECHNICAL ADVICE. MANUFACTURER'S RECOMMENDATIONS FOR SLOPE INSTALLATION TO BE FOLLOWED.
6. GCL TO BE PLACED ON SMOOTH ROLLED BASE . WHERE SMOOTH SURFACE FINISH CANNOT BE ACHIEVED A 50mm BLINDING LAYER WILL BE REQUIRED MADE OF LIGHTLY COMPACTED SILTY SANDS.
7. HOLDING POND SIZED FOR ALL 75mm RAINFALL EVENTS UP TO THE 10-YEAR ARI 6-HOUR DESIGN STORM.
8. FIRST STAGE OF POND HAS BEEN SIZED TO CAPTURE ALL FREQUENT RAINFALL EVENTS.
9. POND HAS BEEN SIZED BASED OFF ESTIMATED PEAK FLOWS AND WITH AN CONSTANT CLARIFIER OUTFLOW OF 10L/s. FURTHER DESIGN ITERATIONS WILL OPTIMIZE THE HOLDING POND TO CLARIFIER DISCHARGE ARRANGEMENT. TOTAL POND VOLUME 1205m^3
10. A SAMPLING POINT WILL BE INCLUDED ON THE INLET AND OUTLET OF ALL TREATMENT DEVICES.



SECTION B
1:50

Plot Date: 6/9/2021 11:39:35 AM Office: Christchurch Filename: C:\PW_WORKING\DAWSONR\...\509619-0000-DRG-CC-1102.DWG

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REV	DATE	REVISION DETAILS	APPROVED
B	2021-09-06	CLIENT COMMENTS INCLUDED	A LINDGREN
A	2021-08-24	PRELIMINARY ISSUE	A.LINDGREN

SCALE	SIZE
AS SHOWN	A1

DRAWN: R DAWSON
DESIGNED: I FOWLER
REVIEWED: D DELAGARZA

PRELIMINARY
NOT FOR CONSTRUCTION

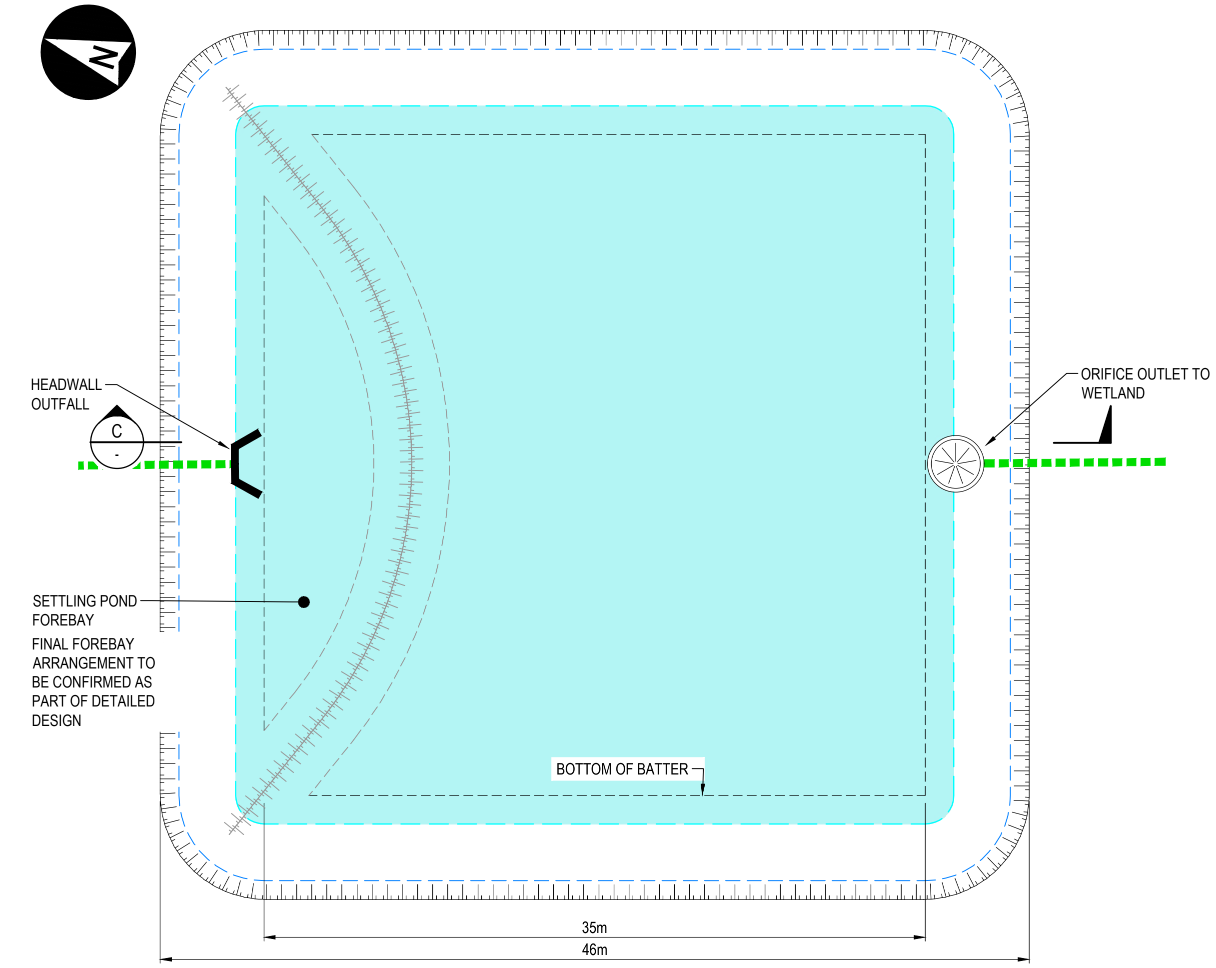
APPROVED
DATE

PROJECT: NAPIER STORMWATER RECONSENTING

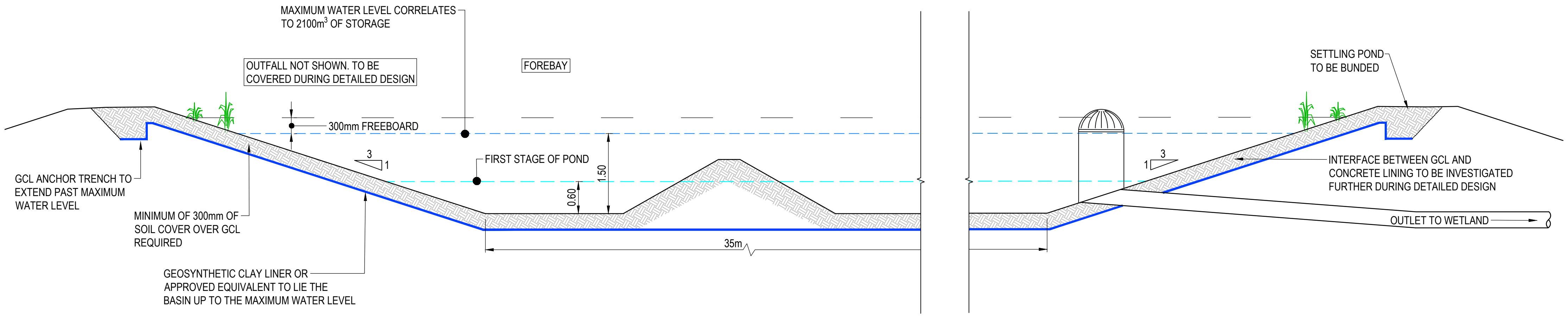
TITLE: HOLDING POND TYPICAL SECTIONS

DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
	509619	0000	DRG	CC	1102	B

NOTES:
1. REFER STAGE 2 STORMWATER MANAGMENT PLAN ON DRG-CC-1002
2. GEOSYNTHETIC CLAY LINER (GCL) COVER SOIL TO BE APPROVED BY ENGINEER. SILTY MATERIAL EXCAVATED ONSITE IS LIKELY TO BE PERMISSIBLE. COVER SOIL TO BE SMOOTH ROLLED AND COMPACTED TO 92% MDD. COVER SOIL TO BE PLACED FROM BASE UPHILL BY SMALL DOZER. DOWNHILL PLACEMENT NOT PERMISSIBLE.
3. GCL TO BE PLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS WITH MINIMUM OVERLAP OF 300mm, GCL ON GCL. LENGTHWISE JOINTS ON SLOPE NOT PERMISSIBLE WITHOUT GEOTECHNICAL ADVICE. MANUFACTURER'S RECOMMENDATIONS FOR SLOPE INSTALLATION TO BE FOLLOWED.
4. GCL TO BE PLACED ON SMOOTH ROLLED BASE . WHERE SMOOTH SURFACE FINISH CANNOT BE ACHIEVED A 50mm BLINDING LAYER WILL BE REQUIRED MADE OF LIGHTLY COMPACTED SILTY SANDS.
5. SETTLING POND HAS BEEN SIZED TO DETAIN 25mm OF RAINFALL FROM THE TOTAL SITE.
6. OUTFALL FROM SETTLING POND TO TREATMENT WETLAND TO BE CONFIRMED IN DETAILED DESIGN.
7. POND STORAGE 2100m^3
8. A SAMPLING POINT WILL BE INCLUDED ON THE INLET AND OUTLET OF ALL TREATMENT DEVICES.



SETTLING POND DETAIL
1:200



SECTION C
1:50

2 0 4 8m
SCALE 1:200

500 0 1000 2000mm
SCALE 1:50

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REV	DATE	REVISION DETAILS	APPROVED
B	2021-09-06	CLIENT COMMENTS INCLUDED	A LINDGREN
A	2021-08-24	PRELIMINARY ISSUE	A.LINDGREN

SCALE	SIZE
AS SHOWN	A1

DRAWN: R DAWSON
DESIGNED: I FOWLER
REVIEWED: D DELAGARZA

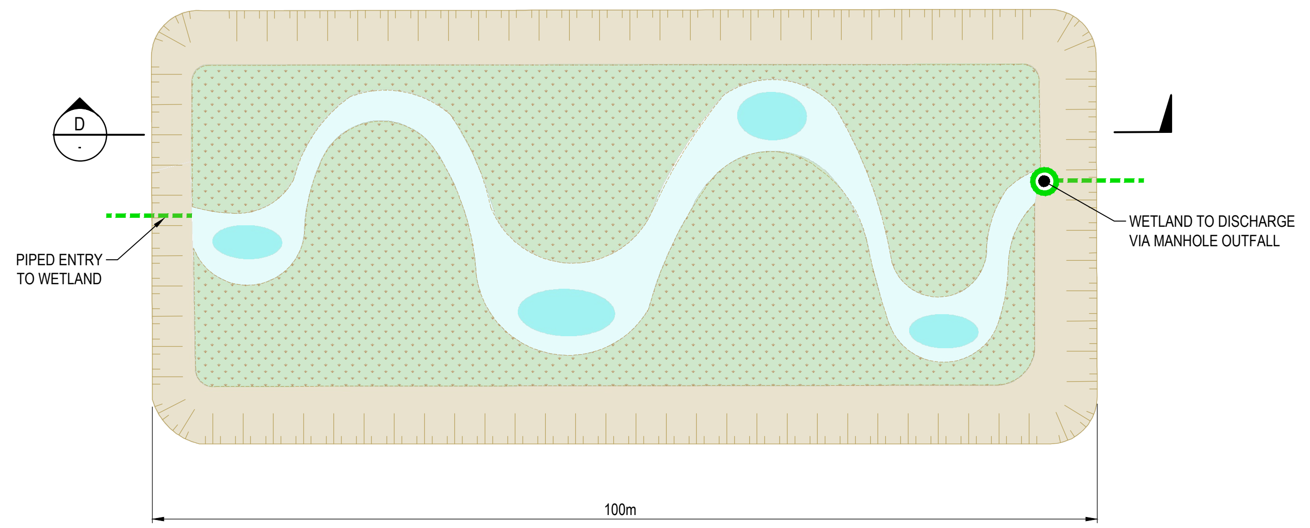
PRELIMINARY
NOT FOR CONSTRUCTION

APPROVED
DATE

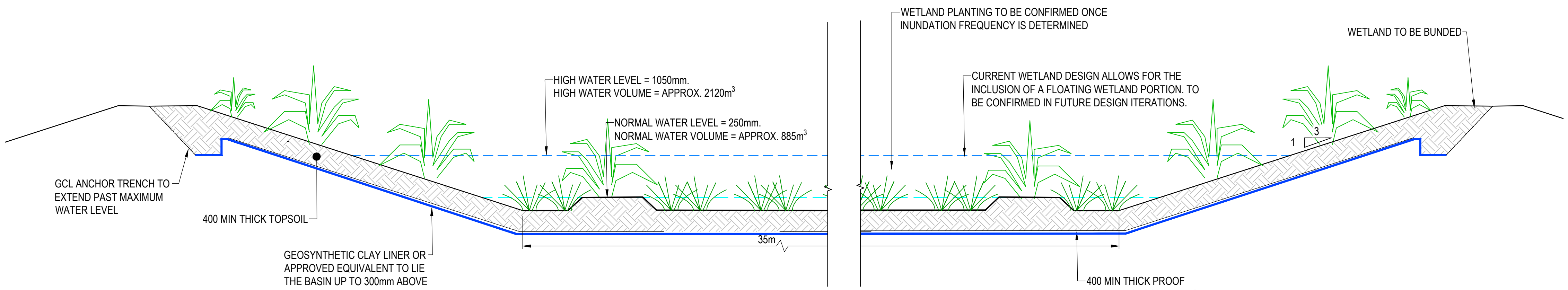
PROJECT: NAPIER STORMWATER RECONSENTING

TITLE: SETTLING POND & TYPICAL SECTION

DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
	509619	0000	DRG	CC	1103	B



WETLAND DETAIL
1:400



SECTION D
1:20

500 0 1000 2000mm
SCALE 1:50

NOTES:

1. GEOSYNTHETIC CLAY LINER (GCL) COVER SOIL TO BE APPROVED BY ENGINEER. SILTY MATERIAL EXCAVATED ONSITE IS LIKELY TO BE PERMISSIBLE. COVER SOIL TO BE SMOOTH ROLLED AND COMPACTED TO 92% MDD. COVER SOIL TO BE PLACED FROM BASE UPHILL BY SMALL DOZER. DOWNHILL PLACEMENT NOT PERMISSIBLE.
2. GCL TO BE PLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS WITH MINIMUM OVERLAP OF 300mm, GCL ON GCL. LENGTHWISE JOINTS ON SLOPE NOT PERMISSIBLE WITHOUT GEOTECHNICAL ADVICE. MANUFACTURER'S RECOMMENDATIONS FOR SLOPE INSTALLATION TO BE FOLLOWED.
3. GCL TO BE PLACED ON SMOOTH ROLLED BASE . WHERE SMOOTH SURFACE FINISH CANNOT BE ACHIEVED A 50mm BLINDING LAYER WILL BE REQUIRED MADE OF LIGHTLY COMPACTED SILTY SANDS.
4. A SAMPLING POINT WILL BE INCLUDED ON THE INLET AND OUTLET OF ALL TREATMENT DEVICES.

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CLIENT: ravensdown

REV	DATE	REVISION DETAILS	APPROVED
B	2021-09-06	CLIENT COMMENTS INCLUDED	A LINDGREN
A	2021-08-24	PRELIMINARY ISSUE	A.LINDGREN

SCALE	SIZE
AS SHOWN	A1

DRAWN: R DAWSON
DESIGNED: I FOWLER
REVIEWED: D DELAGARZA

PRELIMINARY
NOT FOR CONSTRUCTION

APPROVED
DATE

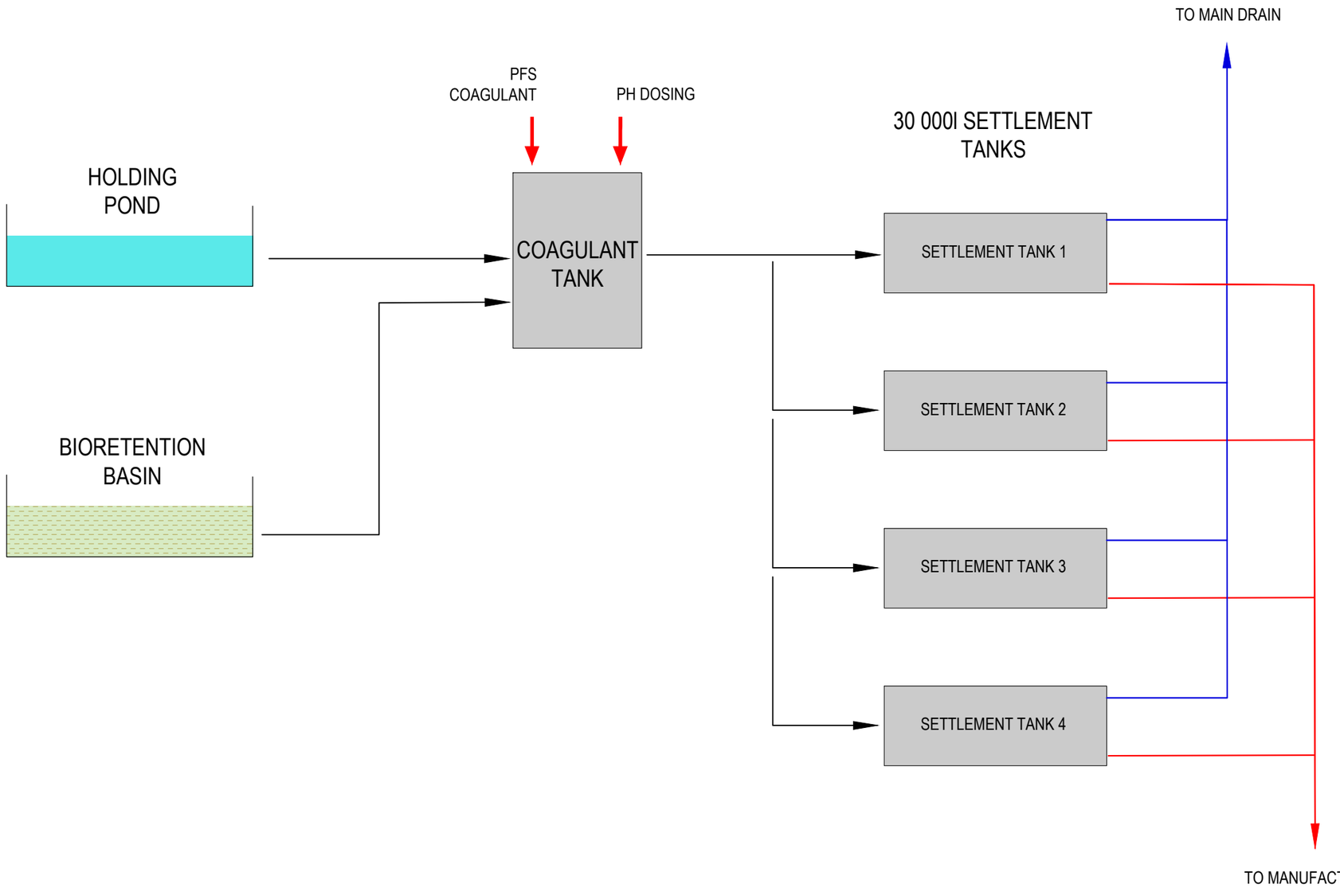
PROJECT: NAPIER STORMWATER RECONSENTING

TITLE: WETLAND TYPICAL SECTION

DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
	509619	0000	DRG	CC	1104	B

NOTES:

1. A SAMPLING POINT WILL BE INCLUDED ON THE INLET AND OUTLET OF ALL TREATMENT DEVICES.



Plot Date: 6/9/2021 4:15:54 PM Office: ChristchurchFilename: C:\PW_WORK\ROS.DAWSON\AUDC1_01\D0467\d0467d09619\d09619d000.DRGCC1105.DWG

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CLIENT: ravensdown

REV	DATE	REVISION DETAILS	APPROVED
B	2021-09-06	CLIENT COMMENTS INCLUDED	A LINDGREN
A	2021-08-24	PRELIMINARY ISSUE	A.LINDGREN

SCALE	SIZE
AS SHOWN	A1

DRAWN: R DAWSON
DESIGNED: I FOWLER
REVIEWED: D DELAGARZA

PRELIMINARY
NOT FOR CONSTRUCTION

APPROVED
DATE

PROJECT: NAPIER STORMWATER RECONSENTING

TITLE: CLARIFIER PROCESS DIAGRAM

DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
	509619	0000	DRG	CC	1105	B