

IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF applications for resource consents and notices of requirement in relation to the Ōtaki to North of Levin Project

BY **WAKA KOTAHI NZ TRANSPORT AGENCY**

Applicant

ŌTAKI TO NORTH OF LEVIN HIGHWAY PROJECT

TECHNICAL ASSESSMENT I: CONTAMINATED LAND

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EXECUTIVE SUMMARY

1. The Ōtaki to north of Levin highway Project ("**Ō2NL Project**" or "**Project**") involves the construction, operation, use, maintenance and improvement of approximately 24 kilometres of new four-lane median divided state highway (two lanes in each direction) and a shared use path ("**SUP**") between Taylors Road, Ōtaki and the Peka Peka to Ōtaki expressway ("**PP2Ō**") and State Highway 1 ("**SH1**") north of Levin.
2. A Preliminary Site Investigation ("**PSI**") has been undertaken over the full extent of the Ō2NL Project, focussing on historic and current land uses on properties along the proposed designations and, in particular, the indicative footprint of the new road where disturbance of soil will occur.
3. As required under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Regulations (the "**NESCS**"), the PSI identifies potential Hazardous Substances and Industries List¹ ("**HAIL**") sites where use or deposition of hazardous substances has or may have occurred historically. It then assesses the actual and potential impacts on human health and the environment from the Ō2NL Project due to soil disturbance that has the potential to cause migration of contaminants.
4. Resource consent for activities managed under the NESCS and any relevant Regional Plan rules is not being sought at this stage of the process. Instead, consents will be sought, as required, in accordance with the outcomes of the recommendations in this report.
5. Based on the current and inferred historic land use and activities within the 'Project corridor' (by which I mean the land area encompassed by the proposed designations for the Project), I consider that potential for contaminated land exists within the corridor.
6. The disturbance of contaminated land during the construction of this Project may, without effective management, result in the discharge of contaminants to air, groundwater, and surface water. Such discharges may have adverse effects on human health and the environment.
7. The Ō2NL Project passes through typically gently undulating pastoral farmland located along the Horowhenua plains, with the Tararua Range / foothills to the east, and the Tasman Sea sand-dune country to the west.

¹ the Hazardous Substances and Industries List is promulgated by the Ministry for the Environment.

The soils are free-draining and groundwater flow is generally in a westerly direction towards the coast or Punahau / Lake Horowhenua.

8. The current land use can be characterised as agricultural landscape, comprising dairy farming, extensive areas of market gardening, pockets of orchards, glasshouses, poultry farms, and a vineyard. The existing State Highway 1, and the North Island Main Trunk Railway, between Wellington and Palmerston North are generally located to the west of the Ō2NL Project. Some of these land uses are identified as HAIL activities.
9. The PSI identified 35 potential HAIL sites which might be affected by the Ō2NL Project (30 of which are located within the area subject to the proposed designations and the remaining 5 are within the vicinity). 26 of these HAIL sites are identified as market gardens and orchards. 'Market Gardens' and 'Orchards' are listed as HAIL (A10) activities as there may have been historically bulk storage and use of persistent pesticides and herbicides such as Dichlorodiphenyltrichloroethane ("**DDT**") (which was banned in New Zealand in 1989) and residual contaminants may remain in soils.
10. There are also several dwellings and associated outbuildings (including sheds) that will be removed as part of the proposed construction work and there is potential for lead and asbestos to have been used in these buildings, especially for asbestos if they were built or renovated between 1940 and 1990. Sheep dips and offal pits may possibly be present on some farm properties.
11. A historical landfill (G3) has also been identified within the general location of the south bank approach to the proposed Ohau River bridge that will be part of the Ō2NL Project works. An active quarry is also located next to this site.
12. An investigation of Manawatū-Whanganui Regional Council's ("**Horizons**") list of HAIL sites identified three sites adjacent to the proposed designations and a further two in close proximity to two of the material supply sites next to the Waikawa Stream. These sites are outside the proposed designations and hydraulically downgradient in terms of groundwater flow direction and therefore possible contamination migration from any of these sites is likely to be away from the proposed works. No HAIL sites were identified on the Greater Wellington Regional Council ("**GWRC**") Selected Land Use Register ("**SLUR**") list within or close to the proposed designations.

13. The inclusion of a property on the HAIL does not, of itself, demonstrate the presence of land contamination at that property. However, it does provide an alert that land in and around that property may be contaminated and, on that basis, and with the support of associated supplementary evidence (if available), allows a conclusion as to whether further site investigation of the levels of possible land contamination should be undertaken.
14. The 35 HAIL sites identified within, or adjacent to, the proposed designations or material supply sites were assessed in terms of potential risk to human and/or environmental health. An initial qualitative risk screening, based on the likelihood and the nature of contamination existing at the site from a particular activity and potential for exposure has been assigned to each HAIL site.
15. A high-risk rating indicates a high potential for contamination that would require additional management and validation testing as part of the proposed works. A low-risk rating indicates a low potential for contamination or exposure as the site will not be disturbed as part of the work. A medium-risk rating indicates an uncertainty in whether an activity will have resulted in site contamination and further investigation is required to quantify these risks and determine the potential for reuse within the construction footprint. Land that was observed to be used for market gardens and orchards prior to 1989, when DDT was in use in New Zealand are considered a higher risk than more recent horticultural land.
16. Eight properties were identified as medium risk, though some activities crossed multiple property boundaries. I recommend that a detailed site investigation ("**DSI**") be undertaken once access to the land designated for the Project becomes more readily available and once the construction methodology is finalised, to determine the likely concentrations of residual pesticides and metals within the soil that may be disturbed as part of the Ō2NL Project. The DSI will assess if the soil to be disturbed as part of the works are within background levels and can be reused within the Project, are within NESCS guideline values, and can be encapsulated as part of the road embankments within the HAIL site, or whether the material should be appropriately disposed of offsite. The DSI will, as and if required, inform the development of a contaminated soils management plan ("**CSMP**") prior to construction works.

17. One site (an historical landfill / waste disposal site) was identified as high-risk and needing further investigation and management as part of the proposed works. A review of previous site investigations was undertaken as part of the PSI. A contamination investigation undertaken by Stantec in 2021 involved systematic soil sampling and analysis within the southern Ohau River bridge approach.² Geophysical assessment of the site was also undertaken. These confirmed the presence of fill material at this location although the soil analysis showed concentrations only slightly above the background concentration range (soil type 1) for chromium, copper and zinc.
18. The geophysical assessment also noted the potential for leachate to be present. This is water that has percolated through the landfill material and leached out some of the contaminants. The quality of this water depends on the type of material it has moved through and how well those contaminants are bound to the soil. There is potential for this to migrate to the Ohau River or groundwater if not adequately contained and have a negative impact on the water quality.
19. The presence of historical landfill material within the road alignment has a potential to impact on the structure of the new bridge and roadway at Ohau River. Consideration should be given within the design to either:
 - (a) leaving the material undisturbed in situ, ensuring it is adequately contained and capped, and constructing the road over the top.
 - (b) removal and disposal of all unsuitable material offsite.
20. If the Ō2NL Project is able to avoid disturbing the material within the landfill site and ensure that it is adequately contained and protected from erosion from the Ohau river, this would be preferable to the Project. If it is not practicable to avoid disturbance, any unsuitable material should be disposed of at a facility authorised to take the material. In such a case, and depending on the extent of the disturbance, it may be that remediation works will be appropriate to remove all historical landfill material and dispose of it properly. Any leachate should be collected and treated appropriately. This will reduce the potential for future discharge of contaminants to the Ohau River from this site. Once a designation is place, I recommend a DSI be undertaken at this site and, if contaminants are found above background levels, a remedial action plan developed.

² Section 3.2, page 20, of the PSI (**Appendix I.1**).

21. The presence of asbestos – cement sheet roofing material has been identified at one site and the removal of this material will need to be managed by a licensed operator. I recommend that all buildings built prior to 1990 that are to be removed as part of the works be inspected for the presence of asbestos by a suitably qualified person prior to being demolished.
22. There is always the possibility that currently unknown / unrecorded areas of historical contamination might be encountered during the Ō2NL Project works or discovered by other disciplines carrying out investigative activities, most particularly the geotechnical experts or within historical building inspections.
23. If unexpected potentially contaminated material is disturbed during Ō2NL Project works, an unexpected discovery protocols should be implemented; the consequences of this may be that the nature and extent of suspected contamination needs to be promptly investigated, including by sampling and analysis of potentially contaminated material. This should be undertaken under the guidance of a Suitably Qualified and Experienced Practitioner ("**SQEP**") and based on the results, appropriated management measures put in place to manage the contaminants onsite or to remove and dispose of the contaminated material to an authorised facility.

INTRODUCTION

24. My name is Kathryn Anne Halder.
25. I am Principal Environmental Scientist, of Stantec New Zealand.
26. My specialist areas are the investigation and assessment of land contamination, solid waste management, landfill acceptance of special waste and waste assessments, monitoring environmental discharges from contaminated land, and the preparation of site management plans with respect to soil contamination.
27. This assessment is based on a PSI of the Ō2NL Project that I have undertaken in accordance with the NESCS and in general accordance with the Ministry for the Environment's ("**MfE**") Contaminated Land Management Guideline ("**CLMG**") No 1: Reporting on Contaminated Sites in New Zealand (2021). The PSI is attached as **Appendix I.1**.
28. The PSI relies on the records of known HAIL sites held by Horizons, Kāpiti Coast District Council ("**KCDC**") and Horowhenua District Council ("**HDC**")

and identified on the GWRC online maps, historical and current aerial photography publicly available through Retrolens, LINZ and google earth, drone footage, previous site investigations and geotechnical, hydrogeology and geophysical assessments undertaken by Stantec and Cook Costello and a site visit of the proposed Ō2NL Project corridor.

29. The PSI has been reviewed by Kevin Tearney, Technical Director – Land Quality & Remediation, SLR Consulting NZ Limited and a certified environmental practitioner site contamination specialist (CEnvP SC).
30. Resource consent for activities managed under the NESCS and any relevant Regional Plan rules is not being sought at this stage of the process, however, as above, a PSI has been undertaken, as well as a subsequent site visit and analyses as described in this report. This report provides an overview of the information gathered and assessments undertaken so far. It also includes recommendations on next steps, including a DSI at several sites. I understand consents will be sought, as required, in accordance with the outcomes of the DSI and the other steps I have recommended in this report.

Qualifications and experience

31. I have the following qualifications relevant to this assessment:
 - (a) Bachelor of Science Honours (in Environmental Science), Aberdeen University;
 - (b) Masters of Science (in Environmental Engineering), Queens University Belfast;
 - (c) Charter member of the Chartered Institution of Waste Management (CIWM) and Certified Environmental Practitioner while working in the UK;
 - (d) Member, WasteMINZ; and
 - (e) SQEP, as referenced in the NESCS and defined in the User's Guide, National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.
32. My experience in contaminated land spans some 20 years of consulting experience, with most of this having been carried out in New Zealand. I have also worked on contaminated sites in Northern Ireland, Scotland and Fiji.

33. Since being in New Zealand, I have undertaken over 100 projects with respect to risk assessment of contaminated soil, contaminated land investigations, and contaminated soil management. I have been involved as a contaminated land advisor as part of the State Highway 58 ("**SH58**") road improvements works since 2019. I have managed contaminated land at wastewater treatment plants, historical landfills, gas works, orchards and within a variety of utility pipework renewals and road upgrades throughout the country. I have also spent seven years assessing special and contaminated soil waste acceptance applications for the Tasman District landfill in terms of the environmental effect, safe handling, and disposal protocols, where appropriate.
34. As part of both my BSc and master's thesis I undertook research work on contaminated land risk assessments based on historical land uses, source, pathway, receptor modelling and in-field testing to support the models.

Code of conduct

35. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014. This assessment has been prepared in compliance with that Code, as if it were evidence being given in Environment Court proceedings. In particular, unless I state otherwise, this assessment is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Purpose and scope of assessment

36. Waka Kotahi has lodged Notices of Requirement ("**NoRs**") for designations to HDC and KDCDC, and is applying for the necessary resource consents from Horizons and GWRC, for the Ō2NL Project. The Ō2NL Project is part of the New Zealand Upgrade Programme ("**NZUP**") and has the purpose to *"improve safety and access, support economic growth, provide greater route resilience, and better access to walking and cycling facilities"*.
37. The new State Highway route was selected following a staged multi-criteria analysis ("**MCA**") of route, interchange and local road options. The process involved a consideration of the investment and project objectives, environmental, archaeological, built heritage and social impacts amongst other factors.

38. This report is one of a suite of technical reports prepared for the Ō2NL Project and identifies contaminated or potentially contaminated land that could be affected by the Ō2NL Project and the potential impacts on human health and the environment from soil disturbance. It has been prepared to inform the Assessment of Environmental Effects ("AEE") provided in Volume II and to support the NoRs and application for resource consents required for the Ō2NL Project.
39. The objective of this assessment has been, to identify any past or present HAIL activities, or other activities that may result in contaminants being present within or adjacent to the indicative alignment and to assess the potential risk to human health and the environment from contaminants within site soils that may be disturbed by the Ō2NL Project.
40. My assessment has been reviewed against the NESCS and regional plans to determine if resource consents is required and to provide recommendations for further investigations (if applicable) and for the appropriate management, reuse or disposal of contaminated soils encountered as part of the works.

Assumptions and exclusions in this assessment

41. The only assumption made in this report is that the historical records of land uses held by HDC, KCDC, Horizons and GWRC along the proposed designations are complete and accurate and that the locations of HAIL sites have been correctly recorded and provided to Stantec during requests associated with the preparation of the PSI. This is a standard assumption made in the course of preparing PSIs.
42. The detailed assessment of buildings that may be removed as part of the works is outside the scope of this contaminated land assessment. All buildings built prior to 1990 that are to be removed as part of the works should be inspected for the presence of asbestos by a suitably qualified person prior to being demolished.

PROJECT DESCRIPTION

43. Waka Kotahi is giving notices of requirement for designations to the HDC and the KCDC and is applying for the necessary resource consents from Horizons and GWRC for the Ō2NL Project.
44. The Ō2NL Project involves the construction, operation, use, maintenance, and improvement of approximately 24 kilometres of new four-lane median

divided state highway (two lanes in each direction) and a SUP between Taylors Road, Ōtaki (and PP2Ō) and SH1 north of Levin. The Ō2NL Project includes the following key features:

- (a) a grade separated diamond interchange at Tararua Road, providing access into Levin;
- (b) two dual lane roundabouts located where Ō2NL crosses SH57 and where it connects with the current SH1 at Heatherlea East Road, north of Levin;
- (c) four lane bridges over the Waiauti, Waikawa and Kuku Streams, the Ohau River and the North Island Main Trunk ("**NIMT**") rail line north of Levin;
- (d) a half interchange with southbound ramps near Taylors Road and the new Peka to Ōtaki expressway to provide access from the current SH1 for traffic heading south from Manakau or heading north from Wellington, as well as providing an alternate access to Ōtaki.
- (e) local road underpasses at South Manakau Road and Sorensens Road to retain local connections;
- (f) local road overpasses to provide continued local road connectivity at Honi Taipua Road, North Manakau Road, Kuku East Road, Muhunoa East Road, Tararua Road (as part of the interchange), and Queen Street East;
- (g) new local roads at Kuku East Road and Manakau Heights Road to provide access to properties located to the east of the Ō2NL Project;
- (h) local road reconnections connecting:
 - (i) McLeavey Road to Arapaepae South Road on the west side of the Ō2NL Project;
 - (ii) Arapaepae South Road, Kimberley Road and Tararua Road on the east side of the Ō2NL Project;
 - (iii) Waihou Road to McDonald Road to Arapaepae Road / SH57;
 - (iv) Koputaroa Road to Heatherlea East Road and providing access to the new northern roundabout;

- (i) the relocation of, and improvement of, the Tararua Road and current SH1 intersection, including the introduction of traffic signals and a crossing of the NIMT;
 - (j) road lighting at conflict points, that is, where traffic can enter or exit the highway;
 - (k) median and edge barriers that are typically wire rope safety barriers with alternative barrier types used in some locations, such as bridges that require rigid barriers or for the reduction of road traffic noise;
 - (l) stormwater treatment wetlands and ponds, stormwater swales, drains and sediment traps;
 - (m) culverts to reconnect streams crossed by the Ō2NL Project and stream diversions to recreate and reconnect streams;
 - (n) a separated (typically) three metre wide SUP, for walking and cycling along the entire length of the new highway (but deviating away from being alongside the Ō2NL Project around Pukehou (near Ōtaki)) that will link into shared path facilities that are part of the PP2Ō expressway (and further afield to the Mackays to Peka expressway SUP);
 - (o) spoil sites at various locations along the length of the Project; and
 - (p) five sites for the supply of bulk fill /earth material located near Waikawa Stream, the Ohau River and south of Heatherlea East Road.
45. The Ō2NL Project provides the final northern link of the Wellington Northern Corridor that extends from Wellington International Airport to north of Levin.
46. The main feature of relevance to this contaminated land assessment is the bridge over the Ohau River, specifically the southern approach to this bridge where a possible historical landfill has been identified and road alignment that crosses historical market garden and orchard land.
47. Other features of relevance to this contaminated land assessment are the preferred material supply locations near the Waikawa Stream and the general alignment through historical market gardens and pastoral land.

METHODOLOGY

Identification of Potential Source of Contaminated Land

48. An understanding of potential areas of contaminated soil that may be present along the proposed designations is an essential element of construction planning. It also influences consenting requirements, reuse or disposal location(s) selection for surplus soil, the health and safety risks that may be posed to project construction workers who carry out activities in any areas of contaminated soil along the alignment, and the risk to the Project and surrounding environment through contaminant migration caused by dewatering activities or exposed soil, erosion and stormwater runoff.
49. Sources of historical and current land use information were scrutinised and included:
 - (a) A review of GWRC, KCDC, HDC and Horizons contaminated sites databases and historical records of known HAIL / SLUR sites.
 - (b) A review of drone footage from March 2021 undertaken along the entire route of the Ō2NL Project to identify current land use. This was supported with imagery from Google Earth and streetview.
 - (c) A review of aerial photography including scrutiny of historical images (Retrolens (<https://retrolens.co.nz/>) for the pre 1990 imagery and LINZ (<https://data.linz.govt.nz/>) for 1991-current imagery, indicating historical land uses at properties within the proposed designation boundary.
 - (d) Obtaining a general understanding of the surrounding environment, hydrology and hydrogeology and the nature of the geology to support contaminant migration, sourced from other technical studies being undertaken for the Project.
 - (e) Identification of known and potential HAIL sites that will be disturbed by the work, or within the proposed designation boundary that are relevant to the project.
 - (f) Identification of any potential contamination risks from the extraction of aggregate from 'material supply sites' situated along the Ō2NL project because of historical activities.

- (g) A review of site investigation work previously undertaken on an area identified as historically being used as a landfill, to assess the potential level of risk to human health and the environment if disturbed.
 - (h) A site visit, undertaken on 16 September 2022 ("**September site visit**") to verify ground features or current site uses and note any variations from what is visible on the photographic evidence.
50. Based on the information collected, a conceptual site model was developed that considered the following:
- (a) **Source** - a substance that is capable of causing an unacceptable risk to human and/or environmental health.
 - (b) **Pathway** - a mode or route by which the substance / source can migrate to a receptor.
 - (c) **Receptor** - someone and/or something that could be adversely affected by the substance / source.
51. Where one or more of these elements are absent, it is highly unlikely that there will be a risk to human and/or environmental health. Where all of these elements are present, a complete or potentially complete pathway for contamination exists and there is a potential risk to human and/or environmental health that requires further investigation and possible remediation and/or management. The magnitude of the risk is primarily a function of the concentration, mobility and physico-chemical properties of the source, the sensitivity of the receptor and the nature of the migration pathway.
52. A risk screening methodology was applied to all identified HAIL sites within the proposed designation of the Ō2NL Project to reflect the hazards that presents the greatest risk and assess the likelihood of exposure to contaminants as part of the Ō2NL project. This risk rating then informs the conceptual site model ("**CSM**") and the requirement for DSIs to be undertaken and resource consents.

ASSESSMENT CRITERIA

National and Best Practice Criteria

53. The disturbance of contaminated land is governed by the NESCS, supported by several CLMG produced by the MfE.
54. The "*minimum requirements*"³ for the conduct of a PSI, in order to ensure it aligns with NESCS, are set out in Appendix A of the CLMG. The steps required for a PSI include site identification and proposed site use, site description, historical site use, risk assessment, conclusions, recommendations, limitations and SQEP certification, among others.
55. For the Project's PSI, all required criteria were assessed and a checklist was provided within the PSI, in accordance with Appendix A of the CLMG.

Applicable National Standards

56. The NESCS has the objective of ensuring that land affected by contaminants in soil is appropriately identified and assessed when soil disturbance and/or land development activities will take place.
57. The NESCS enables the safe use of affected land by:
 - (a) establishing regulations for five specific land use activities⁴ that ensure district planning controls relevant to assessing and managing public health risks from contaminants in soil are appropriate and nationally consistent;
 - (b) establishing soil contaminant standards protective of human health and requiring their use when decisions are made under the NESCS; and
 - (c) ensuring best practice and consistent reporting on land affected or potentially affected by contaminants is applied and enables efficient information gathering and consistent decision-making.
58. As is standard procedure for such major infrastructure projects, and consistent with Regulation 6 of the NESCS, a site wide PSI has been undertaken, in addition to the interrogation of both Horizons' and GWRC's

³ Appendix A of the CLMG, page 31.

⁴ Rural residential / lifestyle block 25% production; Residential 10% production; High-density residential, Recreation; commercial / industrial outdoor worker (unpaved) as included in the Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011).

historical land use records, in order to identify possible HAIL sites along the Project's indicative designation corridor.

59. The Ō2NL Project includes land that hosts or has previously hosted activities or industries which are described in the HAIL and, therefore, meets the definition of "land covered" under Regulation 7 of the NESCS. Specifically, as noted below, the Project passes through activities A10 (Market Gardens), A10 (Glass houses), and G3/G5 (historic landfill). There is also potential for the storage of fuel (A17), fertilisers (A6) and agri chemicals (A2) to have occurred and outbuildings to have been constructed using products that contain lead or asbestos (E1).
60. As discussed below, it cannot yet be said with certainty that disturbing soils at these sites would pose no risk to human health or the environment. A DSI is required at a number of sites before it can be determined with certainty if, under Regulations 9, 10 and 11, resource consent is required to disturb soils at the HAIL sites.

EXISTING ENVIRONMENT

61. The following is summarised from Dr Jack McConchie's Technical Assessment G (Hydrogeology and Groundwater).
62. The existing environment is characterised by improved rural farmland in grass pasture or crops for animal feed, orchards, and market garden / horticultural land parcels with farm residences and associated out-buildings, including implement sheds and similar facilities. There are no industrial premises along the proposed designations or in close proximity (<100m from the proposed designation boundary).
63. The topography is typically gently rolling, with various streams running in a general east to west direction across the area of the proposed designations. The proposed designation crosses the Ohau River some 5km south of Levin and there are other minor streams which the proposed designation will cross in the stretch between the Ohau River and the northern outskirts of Ōtaki, where the Ō2NL Project works commence. These rivers and streams have meandered back and forth over time.
64. The geology along the Ō2NL indicative alignment is described as comprising glacial and interglacial sands and gravel deposits interspersed with riverine sediments. The soils are free-draining and, in certain circumstances, there is

potential in such soils for the migration of contaminants to impact soils some distance from any contamination source.

65. Groundwater flow is generally in a westerly direction towards the coast or Punahau / Lake Horowhenua. In general, the water table mimics the topographic surface and ranges. Springs and some wetlands occur where the water table intersects the ground surface, especially towards the northern and southern ends of the Ō2NL Project.
66. Consented takes in the area are mainly for agriculture irrigation / water supply, horticultural irrigation / water supply and recreational irrigation / industrial use. Other shallow groundwater bores, with abstraction, are used for domestic and stock water supply.
67. The Ō2NL Project is designed to not alter the existing water balance of the area, avoid any direct interaction with the groundwater system; and maintain the existing hydraulic connections between surface water and groundwater.

ACTIVITIES OF CONCERN

68. The nature of pastoral farming and the presence of several orchards and market gardens implies the use of fertilisers for soil improvements. This activity is likely to have been widespread within the proposed designations. Market gardens and orchards are listed as HAIL A10. There may have been bulk storage and use of persistent pesticides such as DDT and resulting residues that remain in soils of the area.



Figure I.1 Typical land use within the project designation

69. Fuel supplies in limited volumes (typically diesel) are present on most farms and there is the potential for lead and asbestos to have been used in some of the old farm buildings.

70. There is a poultry farm located at the northern end of the proposed designation. Poultry farms (especially older ones) have been historically constructed from asbestos containing material. Other contaminants such as pathogens, nutrients, emerging organic contaminants and viruses may also be present on surrounding land depending on historical use of poultry waste as fertiliser.
71. Sheep dips may possibly be present on some farm properties through which the Ō2NL Project passes, although there is no record of these in either Horizons or GWRC records.
72. A gravel quarry is located adjacent to the alignment next to the Ohau River. This site is not identified on the Horizons HAIL records. Fuel is often stored at such locations.
73. The eastern urban area of Levin is immediately adjacent to the proposed designation. This area of Levin is entirely residential in nature and there are no known facilities such as service stations present which border the alignment and which could have an impact on the soils within the Project area.
74. The existing State Highway and the NIMT Railway between Wellington and Palmerston North are generally located to the west of the Ō2NL Project. Works to the existing SH1 would be very limited and only occur at the tie-ins to the Ō2NL Project indicative alignment.

POTENTIAL CONTAMINATION SOURCES

75. Horizons provided details from their database of known or potentially contaminated sites (HAIL sites) within the proposed designation boundaries and surrounds. Three HAIL sites were identified along Arapaepae South Road adjacent to the proposed designated boundary.
76. HDC provided the following records (Table I.1) for each of the three HAIL sites identified on the Horizons database.

Table I.1 HAIL sites as identified next to the designation boundary by Horizons

Title	Site HAIL ID 33	Site HAIL ID 10	Site HAIL ID 11
Horizon File No	ERM 0501AC	ERM 0501AV	ERM 0501AU
Address	26 Arapaepae South Road Levin 5510	380-386 Arapaepae Road Levin Rural 5571	378 Arapaepae Road Levin Rural 5571
Property Title	Lot: 1 DP: 322349	Lot: 4 DP: 25093	Lot: 2 DP: 427531
Status	Current	Current	Current
Contaminants	Landfill sites - General waste	Fuel Storage Tanks - Hydrocarbon	Fuel Storage Tanks - Hydrocarbon
Horizons SAHS	700518	700653	700652
Activity - HAIL	G3	A17	A17
Description	Arapaepae Road small dump - Landfill site	Storage Tanks and drum storage - underground fuel tank in shed - back entrance to house	Storage tanks and drum storage - above ground fuel storage tanks
Current Status	Unverified history hazardous industry / act	Verified history hazardous industry / act	Verified history hazardous industry / act
Tank Removed?	No	No	No

77. The HAIL sites at 378 and 380-386 Arapaepae Road, Levin (Figure I.2) were noted as having fuel storage tanks present and therefore the potential losses of petroleum hydrocarbon-based fuels associated with refuelling of farm vehicles to be present within soils. These sites are outside the proposed designation and hydraulically downgradient in terms of groundwater flow direction. Therefore, possible contamination migration from any of these known sites is likely to be away from the proposed works and not influenced by any dewatering that could be required. The likelihood of encountering petroleum hydrocarbon contaminants from these HAIL sites as part of the works is therefore considered to be low.



Figure I.2 HAIL sites at 378 and 380-386 Arapaepae Road

78. During the September site visit the storage tanks were located at 378 Arapaepae Road. These were in the ground at the northern corner of the site behind the residential building and well away from the designation boundary.
79. The tanks at 380-386 Arapaepae Road were no longer present. The tenant was present at the site at the time of the inspection and confirmed that the fuel storage was associated with a machinery building that used to be located in the northwest corner of the property. The tenant located an old sump (Figure I.3) and soak away area which he believed drained the machinery area. This flowed in a northern direction and away from the Ō2NL Project designation area.



Figure I.3 Sump and soak away area at 380-386 Arapaepae Road (HAIL ID 10)

80. 26 Arapaepae South Road Levin (HAIL ID 33) was recorded to be the location of a historical landfill site. There are no HDC records of the age of the landfill, the quantity of material that may have been deposited here or its composition. There is an area of low ground observed in 1940 (Figure I.4) which is subsequently filled, and a dwelling located on the site. The HAIL site is outside the proposed designation boundary and hydraulically downgradient of the works and will not be disturbed as part of the works.

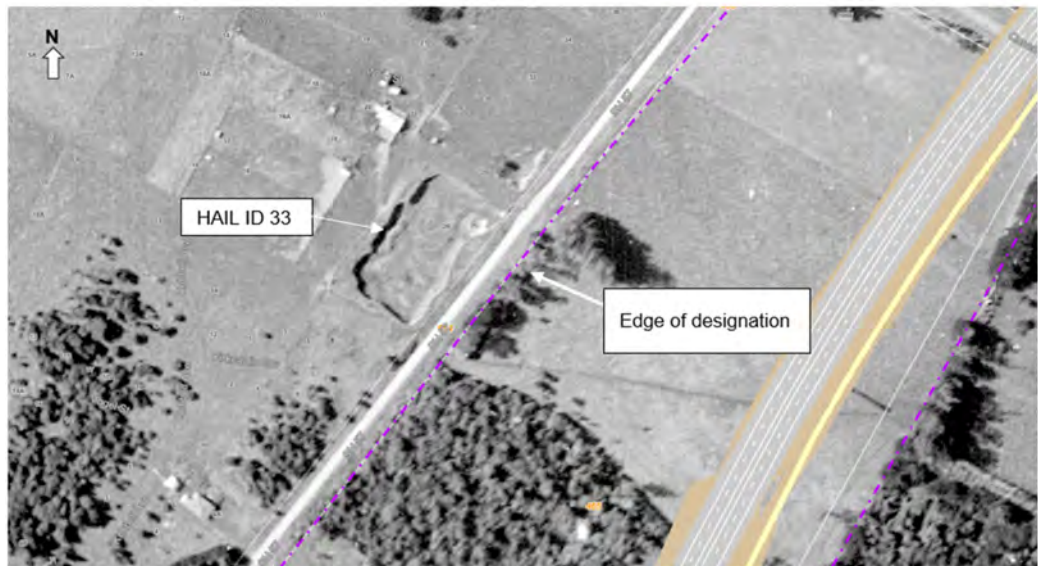


Figure I.4 HAIL Site 26 Arapaepae South Road (source Retrolens imagery 1940)

81. Horizons also provided details from their database of known or potentially contaminated sites near the material supply sites for the works. Two historical landfill sites were identified next to the Waikawa Stream near material supply sites (#15 and #19) HDC records note the following details

(Table I.2) for each site. No HAIL sites were identified next to material supply sites #34a and 36.

Table I.2 HAIL sites identified near material supply sites

Title	Site HAIL ID 35	Site HAIL ID 34
Address	887 State Highway 1 Levin Rural 5570	861 State Highway 1 Levin Rural 5570
Property Title	WN826/26	WN7D/255
Status	Current	Current
Contaminants	Landfill sites - General waste	Landfill sites - General waste
Horizons SAHS	700692	700060
Horizon File No	ERM 0501CL	ERM 0501P
Activity - HAIL	G3	G3
Description	The Properties of Ransfield - 891 State Highway 1 Levin South - Old refuse landfill site - Manakau - near Waikawa Stream	Waikawa Stream Manakau - Landfill site
Current Status	Verified history hazardous industry/act. The land has been subdivided and the landfill extents is now located within 13 North Manakau Road next to Waikawa Stream and within part of 883 Sate Highway 1	No identified Contamination The land has been subdivided and Council no longer consider this property to be a HAIL site
Near material supply site	#15	#19

82. Historical imagery publicly available from Retrolens imagery (Figure I.5) shows disturbed land at various locations along the eastern side of the Waikawa stream.

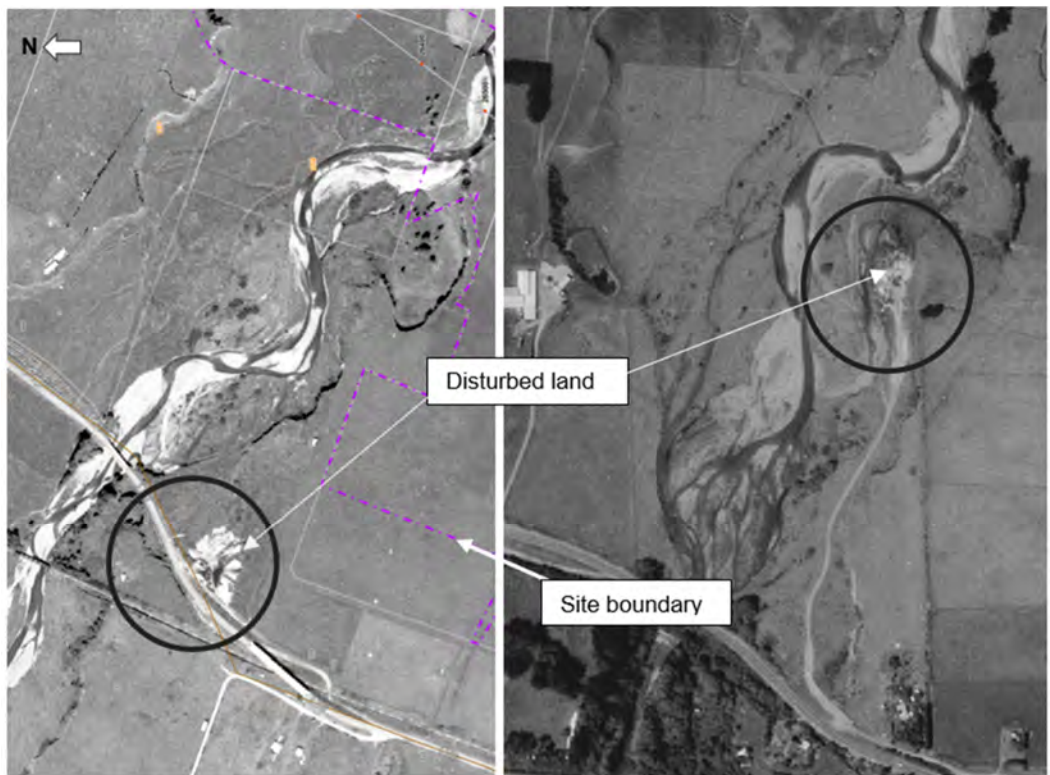


Figure I.5 Potential Landfills Waikawa Stream (source Retrolens imagery 1940 & 1983)

83. The full scale and location of landfill material is unclear from the imagery. Council records note that the site is located within the Waikawa flood plain, the materials dumped here have not been identified but some capping of the site has been undertaken.
84. During the September site visit and discussions with the landowner the extent of the landfill was located within 13 North Manakau Road next to Waikawa Stream and within part of 883 State Highway 1. The landfill is approximately 500m west of SH1.



Figure I.6 Approximate location of the historic next to Waikawa Stream

85. This HAIL site is located downgradient in terms of groundwater flow direction from the material supply site and no excavations are proposed within HAIL site #35.
86. Investigation of the HDC property file for HAIL site ID #34 noted that the HAIL classification was attached to the land and had remained on the property when it was subdivided. It refers to the Manakau Landfill which is located across the stream. HDC no longer consider this property to be a HAIL site.
87. GWRC's SLUR is freely available to use on the GWRC website and holds similar information about contaminated sites as the Horizons database. Accordingly, the GWRC SLUR was accessed and interrogated, given that the southern part of the proposed designations (the first 6km or so) lies within the GWRC boundary. The southern part of the Ō2NL Project lying within the GWRC's jurisdiction has no HAIL sites identified on the SLUR.
88. Land covered by the NESCS includes any piece of land where an activity or industry described in the HAIL is, or has been, undertaken, whether it is included in Council records or not.
89. A review of aerial photography including scrutiny of historical images (Retrolens (<https://retrolens.co.nz/>) for the pre-1990 imagery and LINZ (<https://data.linz.govt.nz/>) for 1991-current imagery was undertaken for the entire Ō2NL route. This review looked for evidence of other historical HAIL

land uses at properties within the designation boundary not included on the Council's databases.

90. This review identified 30 potential HAIL sites within the indicative Project alignment where use or deposition of hazardous substances has or may have occurred historically.⁵ 26 of these are identified as either 'Market Garden' or 'Orchard'. 'Market Gardens' and 'Orchards' are listed as HAIL (A10) activities as there may have been historically bulk storage and use of persistent pesticides such as DDT which was banned in New Zealand in 1989 but may remain as a residual contaminant in soils. A single market garden may expand over multiple properties.
91. Two of the 30 sites were identified to have poultry or other animal husbandry and the potential for outbuildings to contain asbestos.
92. One was identified as a quarry and one a potential landfill site. Discussions with the owner of the quarry site next to the Ohau River as part of geotechnical investigations noted that landfilling activities (HAIL ID 7) had historically occurred near the quarry. The site is located (Figure I.7) within the southern approach to the Ohau River bridge and will be disturbed as part of the Project construction works. This site is not on the Council HAIL records. The quarry is identified as a HAIL site due to the potential for fuel storage at the site.

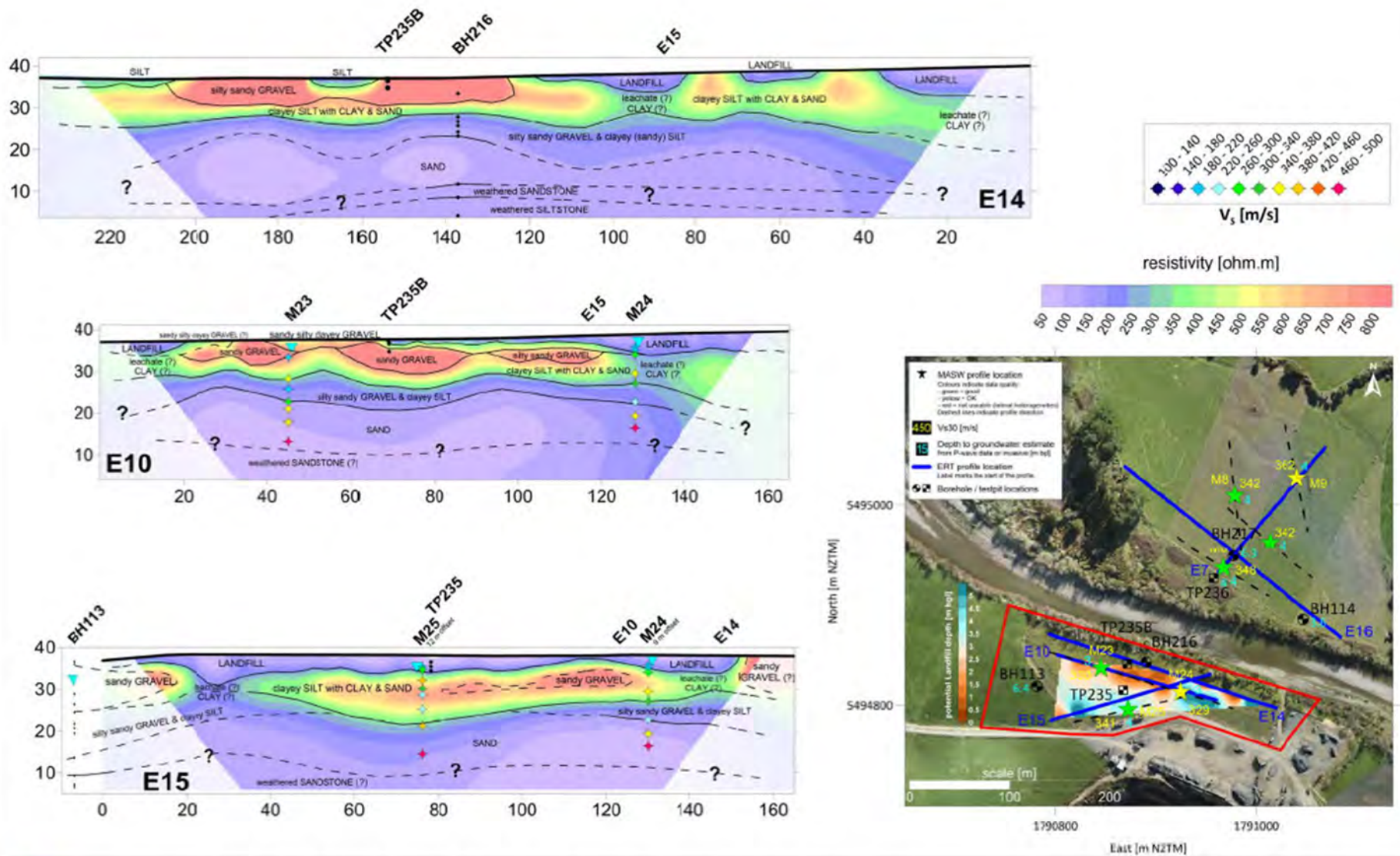


Figure I.7 Location of historical landfill within the southern approach to the Ohau River bridge

⁵ See Table 7, at page 18, of the PSI (**Appendix I.1**). As set out at Table 4 (page 12) of the PSI, three sites were identified as "Historical HAIL Activities" adjacent to the indicative alignment. These were Site ID 33 (26 Arapaepae Road), Site ID 10 (380-386 Arapaepae Road) and Site ID 11 (378 Arapaepae Road). These sites are identified as "Low Risk Sites" at Table 9 (page 23) of the PSI. Two other sites (Site ID 34 – 861 SH1 and Site ID 35 (13 North Manakau Road, within part of 883 SH1) were also identified as either 'No Risk' or 'Low Risk'.

93. There is no evidence within the historical photos available for HAIL ID 7 of ground disturbance at this location other than the riverbed that was located across part of the site in 1940.
94. A review of previous site investigation reports was carried out to assess the nature and extent of possible landfill material and the potential effects of the Ō2NL Project.
95. Preliminary sampling and further investigations carried out by Stantec in 2021 (in respect of HAIL ID 7) found:⁶
- (a) evidence of landfill material including fence posts, a metal pipe, potentially a mattress, plastic, and bits of wire;
 - (b) all contaminants other than heavy metals were below detection limits and no asbestos was identified within the samples;
 - (c) the presence of historic landfill in the site's general vicinity has not resulted in widespread contamination of the soil, and no contaminant concentrations exceeded the NESCS soil contaminant standards for commercial / industrial land use;
 - (d) given the low levels of contaminants encountered, there was no evidence of widespread landfilling having occurred in the area;
 - (e) further consideration should be given to whether a consent (supported by a CSMP) is required under the NESCS for disturbance of soil and the off-site disposal of any surplus soil;
 - (f) landfill material had historically been disposed of at this site; and
 - (g) there is the potential for leachate (water that has percolated through the landfill material and leached out some of the contaminants) to be present.
96. These findings are supported by a geotechnical assessment and ERT modelling (Figure I.8) of the site undertaken on 13 August 2012 which looked to define the extent of the potential landfill.

⁶ Pages 20-21 of the PSI (**Appendix I.1**).



Ohau River Bridge (Southern Side) - Geophysical Model Interpretation

Blue triangles mark groundwater depths (estimated from MASW P-wave data or boreholes/test pits). Geological interpretation is based on all available data, but might differ from reality where discrepancies between data were encountered and/or in absence of any conclusive data.

CCL Project No. 15058-006
 O2NL - Surface Geophysics
 Version 2.2
 Updated groundwater information.
 13.06.2021

Figure I.8 Geophysical Assessment (Source: Cook and Costello)

ASSESSMENT OF EFFECTS

97. Possible construction effects of the Ō2NL Project on contaminated land include:⁷
- (a) disturbance of contaminants in soil and groundwater and consequential discharges of contaminants to air, land and water (surface and groundwater) where there may be an effect on the environment; and
 - (b) discharge of such contaminants where there may be an effect on human health – including site workers and the public.
98. Sites 33 (Horizons File No ERM 0501AC), 10 (ERM 0501AV) and 11 (ERM 0501AU) are outside the proposed designation, as defined by F4 Design Package released 20 April 2022. No soil will be disturbed at any of these sites as part of the Project construction works and they are considered 'Low Risk Sites', including in terms of risk to human health.⁸
99. Sites 35 (ERM 0501CL) and 34 (ERM 0501P) are located along the Waikawa Stream and downgradient of potential material supply site #15 and #19. No soil shall be disturbed within these sites as part of the Ō2NL Project construction works and they are considered either 'No Risk' (HAIL site ID 34) or 'Low Risk' (35).
100. Orchardng practices prior to the 1970s entailed the use of various pesticides and agrichemicals that persist in the environment. Metals are often a co-contaminant for fertilisers and pesticides/herbicides. Residual concentrations of contaminants may remain within the soils and disturbed as part of the Ō2NL Project. The total concentrations of potential contaminants are currently unknown.
101. The findings of the PSI and review of previous investigation reports identified a historical landfill (HAIL ID 7) next to the Ohau River within the Ō2NL Project indicative alignment. Soil analysis as part of the site investigations has shown expected contaminants are present with the soils in concentrations that are slightly above background levels, as shown in Table I.3. The individual sample results showed chromium and nickel concentrations were above the background range across all samples, with copper slightly elevated in 50% of samples and zinc in 25% of samples.

⁷ Page 29 of the PSI (**Appendix I.1**).

⁸ Page 23 of the PSI (**Appendix I.1**).

Table I.3: Analytical results for soil samples at southern approach to Ohau River bridge

	Wellington background concentration (Soil type 1) ⁹	Landfill acceptance criteria (Class B)	Average of Results for 12 Soil Samples
Total Recoverable Arsenic (mg/kg)	<2 - 7	10	6
Total Recoverable Cadmium (mg/kg)	<0.1 - 0.1	2	0.04
Total Recoverable Chromium* (mg/kg)	7 - 12	10	16
Total Recoverable Copper (mg/kg)	4 - 10	10	12
Total Recoverable Lead (mg/kg)	4.5 - 180	10	24
Total Recoverable Nickel (mg/kg)	4 - 9	20	14
Total Recoverable Zinc (mg/kg)	28 - 79	20	68
Benzo[a]pyrene (BAP) (mg/kg)	<0.002 - 0.08		0.005

102. None of the concentrations of analysed contaminants exceeded the NESCS criteria for a commercial / industrial land use and thus it is unlikely that there will be a risk to human health if proposed works are undertaken at the Ohau River historical landfill location.

103. Several heavy metal contaminant concentrations exceeded the MfE acceptance criteria for a Class B landfill, meaning that any soil to be disposed of off-site should be disposed of to a Class A landfill. MfE guidelines for landfill acceptance criteria provide only a guideline disposal at various landfill types, the results should be compared to the specific landfill's acceptance criteria.

104. The presence of fill material within the road alignment has a potential to impact on the structure of the new bridge at Ohau River and needs to be considered further as part of the final design.

Risk assessment

105. A preliminary CSM was used in the determination of the potential risk to human health and/or the environment as a result of soil being disturbed as part of the Ō2NL Project and/or groundwater conditions.

⁹ Determination of Common Pollutant Background Soil Concentrations for the Wellington Region (GWRC, August 2003).

106. The following locations were considered medium – high risk and likely to be disturbed as part of the proposed works.

Table I.4: Preliminary CSM Risk Assessment

HAIL ID	Site ID	Address	HAIL Activity	Contamination Status	Possible Contaminants	Risk
5	169	703 State Highway 1, Manakau	A10 Market Garden	Unverified Land use noted on project property information as current	Pesticides and Heavy Metals	Medium Risk - Market Garden present in the 1970s
6	173	695-703 State Highway 1	A10 Market Garden	Unverified Land use noted on project property information as current	Pesticides and Heavy Metals	Medium Risk - Market Garden present in the 1970s
7	209	559 State Highway 1, Manakau	G3 or G5	Verified field sampling has been undertaken	TPH, PAH, heavy metals and asbestos.	High Risk as waste material observed by geologist during site investigation. Soil contaminants tested low
9	298	416 Arapaepae South Road, Levin	A10 Market Garden	Unverified Land use noted on project property information as current	Pesticides and Heavy Metals	Medium Risk - no imagery available to determine if present in the 1970s
12	367	232 Kimberley Road, Levin	A10 Market Garden	Unverified Land use noted on project property information as current	Pesticides and Heavy Metals	Medium Risk - no imagery available to determine if present in the 1970s
20	499	34 Arapaepae Road, SH57 Levin	A10 Market Garden	Unverified Land use noted on project property information as current	Pesticides and Heavy Metals	Medium Risk - Imagery shows multiple fields and crops present in the 1970s
21	506	50 Arapaepae Road, Levin	A10 Orchard	Unverified Land use noted on project property information as current	Pesticides and Heavy Metals	Medium Risk - Imagery shows multiple fields and crops present in the 1970s
22	511	1051 Queen Street East, Levin	A10 Market Garden	Unverified Land use noted on project property information as current	Pesticides and Heavy Metals	Medium Risk - Imagery shows multiple fields and crops present in the 1970s
28	586	101 Waihou Road, Levin	A10 Glass houses	Unverified	Asbestos, Pesticides and Heavy Metals. ¹⁰	Medium-High Risk – Site observations and testing indicate that asbestos cement

¹⁰ Other contaminants Pathogens, nutrients, EOCs, viruses may be present depending on historical use of poultry waste on the site from neighbouring property.

HAIL ID	Site ID	Address	HAIL Activity	Contamination Status	Possible Contaminants	Risk
						corrugated roofing material is present on this site.

107. Land parcels where horticultural and/or orchard activities have historically been undertaken were considered of low risk of being affected by the Project if the activity was established later than 1980 and/or the activity was outside the footprint of the area of soil disturbance and/or downgradient of the works.
108. The main migration pathways (that is, a means by which a receptor can be exposed to or affected by a contaminant) identified for the Ō2NL Project are dermal contact and sediment runoff during construction works and migration of exposed soils or contaminated water. Soils which have residual pesticide concentration are likely to inhibit the success of any planting if used within the stormwater channel. Once the road is established the new road pavement will act as a barrier to the migration pathway.
109. The main receptors identified for the Project are the site contractors / workers involved in the construction works and surface water ecosystems if contaminated soil is discharged from the site through runoff or reused within planted recreational areas.

Measures to Remedy or Mitigate Actual or Potential Adverse Contamination Effects

110. This assessment has identified potential sources of contamination within the proposed designation area of the Ō2NL Project. In order to mitigate the potential adverse effects of disturbing contaminated soil as part of the construction of the Ō2NL Project a DSI needs to be undertaken on those sites identified as medium-high risk. Based on the results, the following mitigation measures should be considered within the CSMP (to be provided in support of NESCS consents, if these are determined to be required):
- (a) Leaving the material undisturbed in situ and design the road over it allowing for any settlement;
 - (b) Encapsulating any disturbed soils that are within the NESCS guidelines but higher than background values with the proposed works;
 - (c) Reusing any disturbed soils from the HAIL sites deemed to be similar to background values within the project works;

- (d) Removing and disposing of all unsuitable material offsite.
111. Once the properties are purchased, it is recommended that a DSI is undertaken for the A10 HAIL sites identified and located within the area to be disturbed, to inform if a CSMP needs to be developed as part of the overall site management systems and processes. If DDT or other pesticides are found, then the CSMP should include a methodology to encapsulate this soil within the embankments and Project works rather than reuse as topsoil. If no contaminants are found, then it can be reused on site within the Project as topsoil.
112. A DSI should also be undertaken at HAIL site ID 7 to further investigate the findings of the geophysical model and develop a remedial action plan where appropriate. If the Ō2NL Project is able to avoid disturbing the material within the landfill site, this would be preferable. If it is not practicable to avoid disturbance, any unsuitable material should be disposed of at a facility authorised to take the material. In such a case, and depending on the extent of the disturbance, it may be that remediation works will be appropriate to remove all historical landfill material and dispose of it properly. This will reduce the potential for future discharge of contaminants to the Ohau River from this site. Validation testing of the remaining soils should be undertaken following any remedial works.
113. Dewatering and sediment control within the proposed Ō2NL Project works is proposed within the Construction and Environmental Management Plan and specifically the Erosion and Sediment Control Plan (refer to the DCR and its appendices, Appendix Four of Volume II). This will reduce the potential for any contaminant migration.
114. While extensive investigations have been taken to try and locate all HAIL sites within the proposed Ō2NL Project designation, there is always the possibility that unknown/unrecorded areas of historical contamination could be encountered during the Ō2NL Project and will need to be managed via an unexpected discovery protocol.

CONCLUSION

115. The land within the proposed designations is predominantly agricultural or horticultural.
116. The thorough assessment of current and historical land use (via a PSI) determined that a historical landfill, markets gardens and orchard land exist

within the project designation and therefore the NESCS regulations shall apply.

117. Given that the PSI cannot at this stage state that it is "*highly unlikely that there will be a risk to human health if the activity is done to the piece of land*" the NESCS regulations shall apply.
118. Prior to construction works a DSI should be carried out for the following medium – high risk sites to determine the level of residual pesticides, associated metals or other contaminants that remain in the soils and inform the management of the soil as part of the CSMP, if and as required.
 - (a) HAIL ID 5;
 - (b) HAIL ID 6;
 - (c) HAIL ID 9;
 - (d) HAIL ID 12;
 - (e) HAIL ID 20;
 - (f) HAIL ID 21;
 - (g) HAIL ID 22; and
 - (h) HAIL ID 28.
119. Soil testing should be undertaken in accordance with Contaminated Land Management Guidelines No. 5: Site investigation and analysis of soils (Revised 2021).
120. Once the DSI work has been completed then the requirement for consents under the NESCS and relevant Regional Plan rules can be reviewed, and any necessary applications made.
121. It is also recommended that once final disturbance volumes and contaminant concentrations are known, further consideration be given to either reusing the soil within the Ō2NL Project or encapsulating soil within the Project works, or off-site disposal of any surplus soil (if required).
122. If a NESCS consent is required then it is also recommended that a CSMP is prepared in support of that application to ensure the safe handling of the disturbed soil within HAIL sites and appropriate reuse or disposal.

123. The presence of historic landfill material within the road alignment has a potential to impact on the structure of the new bridge and roadway at Ohau River. Consideration should be given within the design to either:
- (a) leaving the material undisturbed in situ and construct the road over the top; or
 - (b) removal and disposal of all unsuitable material offsite. This will reduce the potential for future discharge of contaminants to the Ohau river from this site.
124. Once a designation is place, I recommend a DSI be undertaken at this site (HAIL ID 7) and, if waste material or soil contaminants are found above background levels, a remedial action plan and CSMP is developed for this site. Any unsuitable material should be disposed of at a facility authorised to take the material.
125. The presence of asbestos – cement sheet roofing material has been identified at one site and the removal of this material will need to be managed by a licensed operator. I recommend that all buildings, built prior to 1990, that are to be removed as part of the works should be inspected for the presence of asbestos by a suitably qualified person prior to being demolished.
126. An unexpected discovery protocol is recommended to be provided by conditions of consent. This will ensure that, should such discoveries be made, they will be thoroughly assessed and, if necessary, remediated and/or mitigated to reduce risks from contaminated soil to negligible levels.



Kathryn Halder
14 October 2022

APPENDIX I.1: PRELIMINARY SITE INVESTIGATION

ŌTAKI TO NORTH OF LEVIN

Preliminary Site Investigation

PREPARED FOR Waka Kotahi | September 2022

We design with community in mind

Revision schedule

Rev No	Date	Description	Signature of Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
00	11/06/2020	Initial PSI	P Heveldt	K Halder	K Halder	J England
01	15/07/2022	Updated PSI	K Halder	K Tearney	K Tearney	P Peet
02	14/09/2022	Updated PSI following Council comments	K Halder	S Stewart		
03	20/09/2022	Updated PSI following site visit	K Halder	K Tearney	K Tearney	J England



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Quality statement

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Executive summary

A Preliminary Site Investigation (“PSI”) has been carried out for the proposed Ōtaki to North of Levin Highway Project (“Ō2NL Project” or “the Project”). The Ō2NL Project provides the final northern link of the Wellington Northern Corridor that extends from Wellington International Airport to north of Levin and has the purpose to “improve safety and access, support economic growth, provide greater route resilience, and better access to walking and cycling facilities”.

This PSI is one of a suite of technical reports prepared for the Ō2NL Project and identifies contaminated or potentially contaminated land that could be affected by the Project and the potential impacts on human health and the environment from soil disturbance.

The objective of this PSI is to identify any past or present Hazardous Activities and Industries List (“HAIL”) activities, or other activities that may result in contaminants being present on or near the Project alignment and to assess the risk that any such identified activities may pose to the Project. This PSI focuses on the footprint of works and the proposed designation boundary.

The Ō2NL Project passes through typically gently undulating pastoral farmland located along the Horowhenua plains, with the Tararua Range/foothills to the east, and the Tasman Sea sand-dune country to the west. The soils are free-draining and groundwater flow is generally in a westerly direction towards the coast or Lake Horowhenua. The current land use is characterised as largely agricultural; comprising dairy farming, extensive areas of market gardening, pockets of orchards, glasshouses, poultry farms, and a vineyard. The existing State Highway and the North Island Main Trunk Railway between Wellington and Palmerston North are generally located to the west of the Project. Some of these land uses are identified as HAIL activities.

The inclusion of a property on the HAIL does not, of itself, demonstrate the presence of land contamination at that property. However, it does provide an alert that land in and around that property may be contaminated and, on that basis and with the support of associated supplementary evidence (if available), allows a conclusion as to whether further investigation of the levels of possible land contamination should be undertaken.

An investigation of Manawatū-Whanganui Regional Council’s (“Horizons”) list of HAIL sites identified three sites next to the proposed designation. The investigation also found two further HAIL sites in close proximity to two of the material supply sites. These HAIL sites are outside the proposed designation and hydraulically downgradient in terms of groundwater flow direction and therefore possible contamination migration from any of these sites is likely to be away from the proposed works. No HAIL sites were identified on the GWRC Selected Land Use Register (SLUR) list within, or close to, the proposed Ō2NL Project alignment.

A review of aerial photography including scrutiny of historic images, drone footage and site walkover identified 30 potential HAIL sites within the designation. These were mainly market gardens or orchards, HAIL (A10) activities and a potential source of contaminations as there may have been historically bulk storage and use of persistent pesticides such as Dichlorodiphenyltrichloroethane, DDT in the 1950s and 1960s. A landfill / disposal site was also identified next to the Ohau River within the footprint of the new road. There are also several dwellings and associated outbuildings (including sheds) that will be removed as part of the proposed construction work and potential for lead and asbestos to have been used in these buildings.

The sites were screened in terms of potential risk to human and/or environmental health. Eight properties were identified as medium risk although some activities crossed multiple property boundaries. Asbestos was also detected at one of these sites bound within asbestos cement corrugated roofing material. One historical disposal site was identified as potential High risk and needing some further investigation and management as part of the proposed works.

For activities under R8(3) of the NESCS the preliminary site investigation concludes it is possible that there will be a risk to human health if activity is done to a piece of land identified as HAIL.

The PSI has recommended that a detailed site investigation (DSI) is undertaken at the sites identified as medium or high risk once the properties are purchased. Once the findings of the DSI are known, where contaminants above background levels are identified, a contaminated soil management plan (“CSMP”) shall be prepared prior to works to ensure the safe handling of the disturbed soil within HAIL sites and appropriate reuse or remediation within the overall Ō2NL Project, management on site via encapsulation / mixing and treatment / disposal in spoil sites or disposed of at an appropriate landfill or facility authorised to take the material.

The requirement for a global resource consent under the NESCS for the Project works will be reviewed following the DSI work and appropriate land use consents applied for prior to construction.



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Abbreviations

Enter Abbreviation	Enter Full Name
CLMG	Contaminated Land Management Guidelines
DSI	Detailed Site Investigation
GWRC	Greater Wellington Regional Council
HAIL	Hazardous Activities and Industries List
HDC	Horowhenua District Council
Horizons	Manawatū-Whanganui Regional Council
KCDC	Kāpiti Coast District Council
MCA	Multi-criteria analysis
MfE	Ministry for the Environment
NESCS	National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health
NoR	Notices of Requirement
NZUP	New Zealand Upgrade Programme
Ō2NL	Ōtaki to North of Levin
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance and Quality Control
SH	State Highway
SLUR	Selected Land Use Register
SQEP	Suitably Qualified and Experienced Practitioner
Waka Kotahi	Waka Kotahi NZ Transport Agency



1 Introduction

Waka Kotahi NZ Transport Agency (“Waka Kotahi”) is giving notices of requirement (“NoRs”) for designations to the Horowhenua District Council (“HDC”) and the Kāpiti Coast District Council (“KCDC”) and is applying for the necessary resource consents from Manawatū-Whanganui Regional Council (“Horizons”) and Greater Wellington Regional Council (“GWRC”) for the Ōtaki to North of Levin Project (“the Ō2NL Project” or “the Project”).

The Ō2NL Project is part of the New Zealand Upgrade Programme (“NZUP”) and has the purpose to “improve safety and access, support economic growth, provide greater route resilience, and better access to walking and cycling facilities”. The new State Highway route was selected following a staged multi-criteria analysis (“MCA”) of route, interchange and local road options. The process involved a consideration of the investment and Project objectives, environmental, archaeological, built heritage and social impacts amongst other factors.

The Ō2NL Project provides the final northern link of the Wellington Northern Corridor that extends from Wellington International Airport to north of Levin.

As part of this process Waka Kotahi has engaged Stantec New Zealand (Stantec) to undertake a Preliminary Site Investigation (PSI) of the Project. This PSI is one of a suite of technical reports prepared for the Ō2NL Project and identifies contaminated or potentially contaminated land that could be affected by the Project and the potential impacts on human health and the environment from soil disturbance. It has been prepared to inform the AEE and to support the NoRs and application for resource consents.

This PSI has been undertaken in accordance with the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (“NESCS”) and has been developed in general accordance with the Ministry for the Environment’s (“MfE”) Contaminated Land Management Guideline (“CLMG”) No 1: *Reporting on Contaminated Sites in New Zealand (2021)*. Please refer to CLMG table of contents checklist in Appendix A.

This document has been prepared by Kathryn Halder a Suitably Qualified and Experienced Practitioner (“SQEP”) as referenced in the NESCS and defined in the *User’s Guide, National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health* (MfE (2012)). Evidence of Kathryn Halder’s SQEP qualification and experience is presented in Appendix B. This PSI has also been reviewed by Kevin Tearney, Technical Director – Land Quality & Remediation, SLR Consulting NZ limited and certified environmental practitioner site contamination specialist (CEnvP SC).

1.1 Investigation Objectives

The objective of this PSI is to identify contaminated land, including:

- any past or present Hazardous Activities and Industries List (HAIL) sites or
- land that might not be HAIL but contain contaminants eg, lead paint and asbestos in soil from buildings

on or near the Project alignment and to assess the risk that any such identified contaminated land may pose to the Project. This PSI focuses on the footprint of works and the proposed designation boundary.

1.2 Scope of Work

In order to identify the likelihood of encountering contaminated soil within the proposed designation, a systematic desktop assessment of historical and current land uses has been carried out. This assessment includes:

- A review of GWRC, KCDC, HDC and Horizons contaminated sites databases and historical records of known HAIL sites.
- A review of drone footage from March 2021 undertaken along the entire route of the Ō2NL Project to identify current land use. This was supported with imagery from Google Earth.
- A review of aerial photography including scrutiny of historic images (Retrolens (<https://retrolens.co.nz/>) for the pre 1990 imagery and LINZ (<https://data.linz.govt.nz>) for 1991-current imagery, indicating historical land uses at properties within the proposed designation boundary.
- Obtaining a general understanding of the surrounding environment, hydrology and hydrogeology and the nature of the geology to support contaminant migration, sourced from other technical studies being undertaken for the Project.
- Identification of known and potential HAIL sites that will be disturbed by the work, or within the proposed designation boundary that are relevant to the Project.
- Identification of potential contamination risks from the extraction of aggregate from ‘material supply sites’ situated along the Ō2NL Project because of historical activities.



- A review site investigation work previously undertaken on an area identified as historically being used as a landfill to assess the potential level of risk to human health and the environment, if disturbed.
- Site visit to verify ground features or current site uses and note any variations from what is visible on the photographic evidence.

1.2.1 Legislative setting

This PSI has been conducted in accordance with the Contaminated Land Management Guidelines, within the framework of the Resource Management Act 1991. Relevant specific guidelines include the following:

- MfE, 2021, Contaminated Land Management Guidelines No. 1, Reporting on Contaminated Sites in New Zealand;
- MfE, 2021, Contaminated Land Management Guidelines No. 5, Site Investigation and Analysis of Soils;
- Order in Council, 2011, Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011;
- MfE, 2012, Users' Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health;
- Horizons Regional Council One Plan, The consolidated Regional Policy Statement, Regional Plan and Regional Coastal Plan for the Manawatu-Wanganui Region, 2014; and
- Greater Wellington Regional Council Proposed Natural Resources Plan (PNRP), 2022.

1.3 Site Identification

The Ō2NL Project involves the construction, operation, use, and maintenance of approximately 24km of new four-lane, median divided state highway between Taylors Road (to the north of Ōtaki) and State Highway 1 (“SH1”) north of Levin. The proposed Ō2NL Project alignment is shown in Figure 1 and a site plan provided in Appendix C.

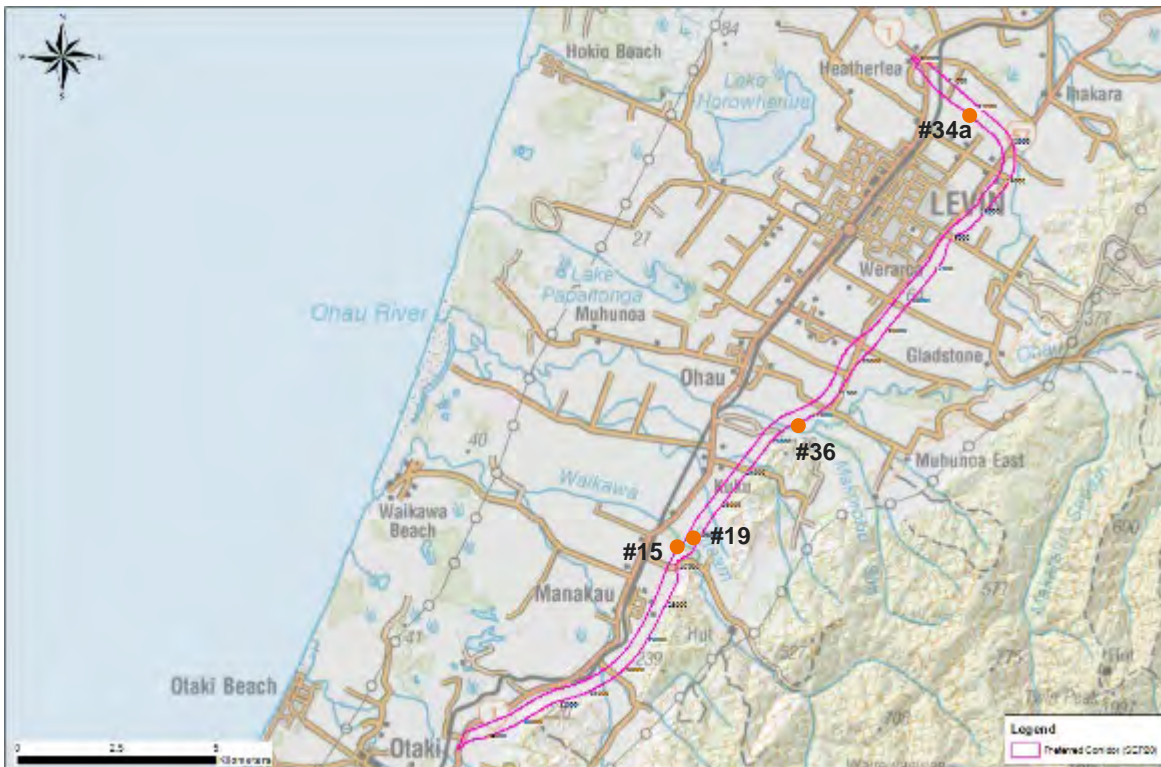


Figure 1: Ō2NL preferred alignment and material supply sites in relation to existing SH1.

Key: Ō2NL preferred alignment ● Material supply sites

Construction of the new highway will take place within the proposed designation and therefore this delineates the area where soil disturbance will be carried out. Typically, the road width will consist of 60m for the four-lane highway and up to 100m where slip lanes are required. While there may be certain works, such as interchanges and roundabouts, that require relatively extensive lateral excavation, these will be within the designation footprint. Further details of the proposed



site works are provided in Section 1.4. It follows that the investigation of potentially contaminating activities that might impact the road construction works should focus on land within the proposed designation boundary.

1.4 Proposed Site Use

The Ō2NL Project involves the construction, operation, use, maintenance, and improvement of approximately 24 kilometres of new four-lane median divided state highway (two lanes in each direction) and a shared use path (“SUP”) between Taylors Road, Ōtaki (and the PP2Ō) and SH1 north of Taitoko/Levin. The Ō2NL highway will extend predominantly over farmland and will remain a road once construction is complete. As a summary, the Project comprises the following key features.

- a) a grade separated diamond interchange at Tararua Road, providing access into Taitoko/Levin;
- b) two dual lane roundabouts located where Ō2NL crosses SH57 and where it connects with the current SH1 at Heatherlea East Road, north of Taitoko/Levin;
- c) four lane bridges over the Waiauti, Waikawa and Kuku Streams, the Ohau River and the North Island Main Trunk (“NIMT”) rail line north of Taitoko/Levin;
- d) a half interchange with southbound ramps near Taylors Road and the new Peka to Ōtaki expressway to provide access from the current SH1 for traffic heading south from Manakau or heading north from Wellington, as well as providing an alternate access to Ōtaki.
- e) local road underpasses at South Manakau Road and Sorenson Road to retain local connections;
- f) local road overpasses to provide continued local road connectivity at Honi Taipua Road, North Manakau Road, Kuku East Road, Muhunoa East Road, Tararua Road (as part of the interchange), and Queen Street East;
- g) new local roads at Kuku East Road and Manakau Heights Road to provide access to properties located to the east of the Ō2NL Project;
- h) local road reconnections connecting:
 - i) McLeavey Road to Arapaepae South Road on the west side of the Ō2NL Project;
 - ii) Arapaepae South Road, Kimberley Road and Tararua Road on the east side of the Ō2NL Project;
 - iii) Waihou Road to McDonald Road to Arapaepae Road/SH57;
 - iv) Koputaroa Road to Heatherlea East Road and providing access to the new northern roundabout;
- i) the relocation of, and improvement of, the Tararua Road and current SH1 intersection, including the introduction of traffic signals and a crossing of the NIMT;
- j) road lighting at conflict points, that is, where traffic can enter or exit the highway;
- k) median and edge barriers that are typically wire rope safety barriers with alternative barrier types used in some locations, such as bridges that require rigid barriers or for the reduction of road traffic noise;
- l) stormwater treatment wetlands and ponds, stormwater swales, drains and sediment traps;
- m) culverts to reconnect streams crossed by the Ō2NL Project and stream diversions to recreate and reconnect streams;
- n) a separated (typically) three metre wide SUP, for walking and cycling along the entire length of the new highway (but deviating away from being alongside the Ō2NL Project around Pukehou (near Ōtaki)) that will link into shared path facilities that are part of the PP2Ō expressway (and further afield to the Mackays to Peka expressway SUP);
- o) spoil sites at various locations along the length of the Project; and
- p) five sites for the supply of bulk fill /earth material located near Waikawa Stream, the Ohau River and south of Heatherlea East Road.



Material supply sites have also been identified and selected along the route (Figure 1) through a MCA of all options. The selected sites lie outside the proposed designation and are shown in Figure 2 below. This PSI also assesses the current and historical land use of these sites in terms of potential contamination.

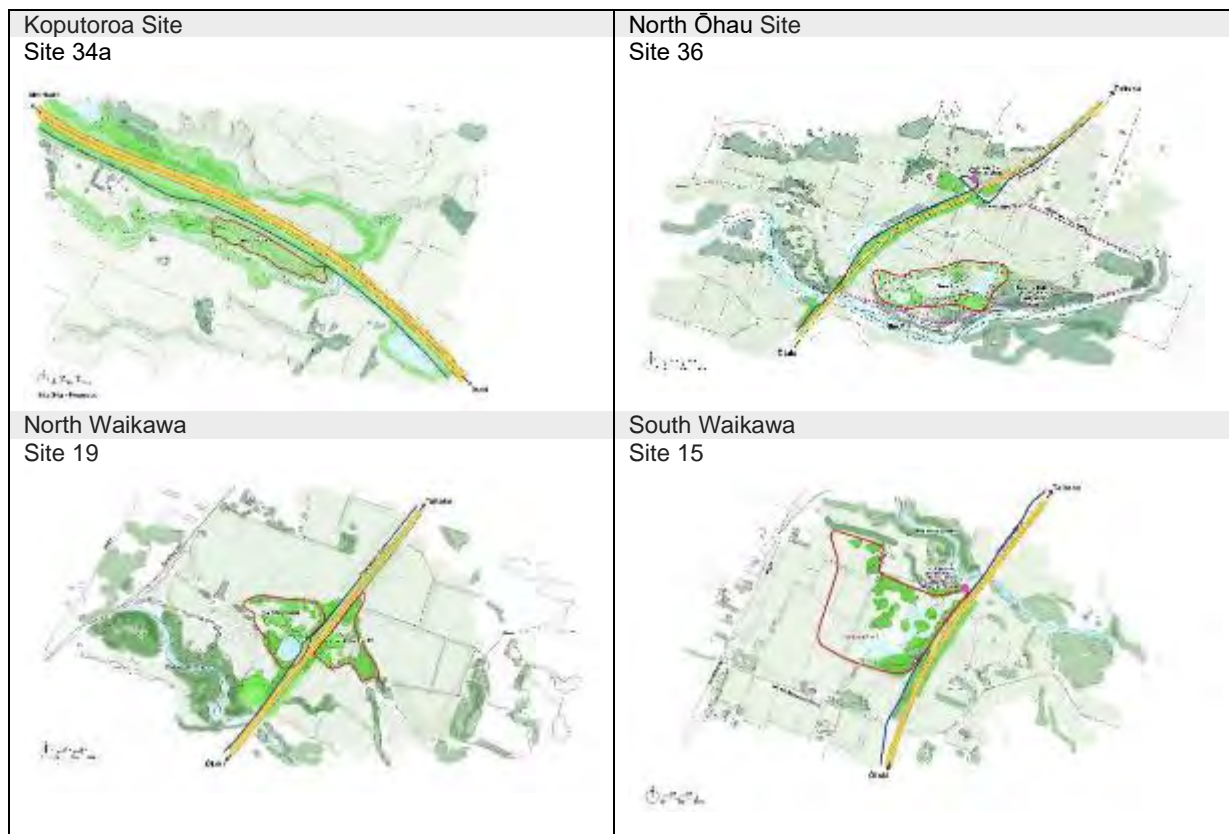


Figure 2: Ō2NL Material Supply Site ID

2 Site Description

2.1 Environmental setting

The following sections have been based on the suite of technical assessments being undertaken for the Project. For further details refer to the individual assessments.

2.1.1 Landscape

The following is summarised from Mr Gavin Lister's Landscape, Visual and Natural Character assessment provided as Technical Assessment D in Volume IV as part of the Assessment of Environmental Effects (AEE) for the Project.

The Ō2NL Project passes through typically gently undulating pastoral farmland located along the Horowhenua plains, with the Tararua Range/foothills to the east, and the Tasman Sea sand-dune country to the west. The plains are a combination of outwash terraces from the Tararua Range and former seabed and marine sands raised by tectonic activity. The plains originally supported lowland rainforest dominated by species such as tōtara, rimu, and tawa. The wetter soils, such as around the toe of Pukehou and on the upper tributaries of the Koputaroa Stream, would have been characterised by kahikatea pukatea forest.

Streams and small rivers originating in the Tararua Range flow directly across the plains to the coast. The most notable are the Ohau River, and the Kuku, Waikawa, Manakau, Waiauti, and Waitohu Streams. They typically have meandering channels in stony beds that reflect their origins in the greywacke foothills of the Tararua Range.

The Project extends from the Manawatū River in the north to the Waitohu Stream and Ōtaki in the south. The alignment also includes a limited number of major road intersections.



2.1.2 Geology

The following is summarised from Dr Jack McConchie's Hydrogeology and Groundwater assessment provided as Technical Assessment G in Volume IV as part of the Assessment of Environmental Effects (AEE) for the Project.

The geology along the Ō2NL Project is described as comprising glacial and interglacial sands and gravel deposits interspersed with riverine sediments.

The Project area is predominately characterised by alluvial deposits transported from the Tararua ranges during the late Pleistocene and Holocene interglacial periods. A large alluvial basin has been formed, which extends along the middle part of the Project area from the eastern plains and towards the coast and has overlain or incised older shoreline and dune sand deposits. The alluvial deposits forming localised fans and terraces around the existing and historical waterways, such as the Ohau River and Waikawa River, are also encountered.

Figure 3 shows the QMap (Heron, 2014), simplified 1:250,000 geological map for the overall area and Table 1 provides a description of each stratum.

Table 1: Geology Description

Regional map Unit Code	Strata Name	Description	Period	Approximate Age (ma)
Q1a	Holocene river deposits	Alluvial gravel, sand, silt, mud, and clay with local peat, includes modern riverbeds.	Quaternary	0 - 0.12
Q2a	Late Pleistocene river deposits	Poorly to moderately sorted gravel with minor sand or silt underlying terraces; minor fan gravels are included	Quaternary	0.12 - 0.24
Q3a	Late Pleistocene river deposits	Weathered; poorly sorted to moderately sorted gravel underlying loess-covered; commonly eroded aggregational surfaces.	Quaternary	0.24 - 0.59
Q5b	Late Pleistocene shoreline deposits	Beach deposits consisting of marine gravel with sand; commonly underlying loess and fan deposits.	Quaternary	0.71 - 0.128
Q6a	Middle Pleistocene river deposits	Weathered; poorly sorted to moderately sorted gravel underlying loess-covered; commonly eroded aggregational surfaces.	Quaternary	0.128 - 0.186
Tt	Basement rock (Wellington Greywacke)	Alternating sandstone and mudstone, poorly bedded sandstone with minor coloured mudstone, conglomerate, basalt, chert.	Triassic	142 - 248



Figure 3: Simplified 1:250,000 geological map and road corridor.



The soils are free-draining and there is potential in such soils for the migration of contaminants to an extent that may impact soils some distance from any contamination source. The potential for migration will be dependent on the leachability characteristics of any contaminant encountered.

2.1.3 Hydrogeology and Hydrology

The following is summarised from Dr Jack McConchie's Hydrogeology and Groundwater assessment provided as Technical Assessment G in Volume IV as part of the Assessment of Environmental Effects (AEE) for the Project.

Near the Tararua Range, groundwater flows downwards into deeper semi-confined sand and gravel aquifers because of the positive hydraulic gradient. However, near the coast and Punahau / Lake Horowhenua, the vertical hydraulic gradient reverses and groundwater flow is upwards from the semi-confined aquifers into the shallow overlying unconfined aquifers and hydraulically connected surface water bodies.

The main surface water bodies are the Ohau River and Lakes Horowhenua and Papaitonga. Smaller streams include the Waiauti, Waikawa, Kuku and Koputaroa. All these surface water features interact with the groundwater system, either receiving or contributing water depending on the hydrogeology and hydraulic gradient.

The Ō2NL Project crosses the Ohau River approximately 5km south of Levin and there are other minor streams which the new highway alignment will cross in the stretch between the Ohau River and the northern outskirts of Ōtaki where the Project works commence.

Groundwater flow is generally in a westerly direction towards the coast or Lake Horowhenua, as shown in Figure 4.

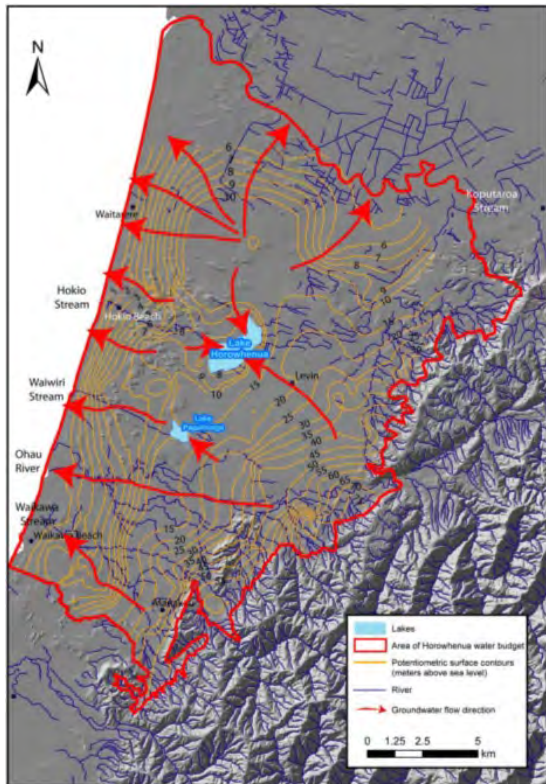


Figure 4: General Groundwater flow direction

In general, the water table mimics the topographic surface and ranges in depth from the ground surface to deeper than 20m. Springs and some wetlands occur where the water table intersects the ground surface, especially towards the northern and southern ends of the Project. The deepest groundwater levels generally occur at locations east of Levin (near Tararua Rd). The highest groundwater levels ranged from 0.5m to 2m below the ground surface in areas near Queen Street East (east of Levin), east of Manakau Township, and adjacent to Manakau Stream.

There are numerous bores in the area listed in Horizons' bore database,¹ and shown in Figure 5, however, most are down-gradient of the Project.

¹ Data obtained in 2022 from Horizons bore database that is accessible via their online data portal.



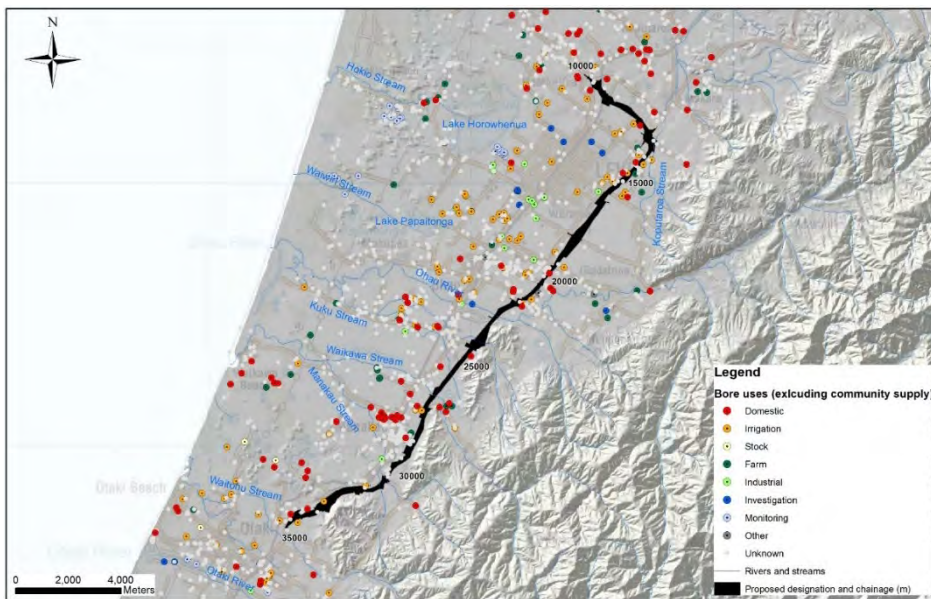


Figure 5 Consented groundwater abstractions and monitoring bores. (Source: Horizons & GWRC online databases, September 2021)

As of September 2021, one community water supply scheme was identified within the proposed designation (Glenmorgan Water Supply Scheme) as well as 34 bores, and a further 104 within 250 m. Only one bore within the designation (the Glenmorgan CS bore) has a permit to take water. Most bores with water permits are a sufficient distance from the Project that they are not adversely affected by the works. Consented takes were mainly for agriculture irrigation/water supply, horticultural irrigation/water supply and recreational irrigation/industrial use. Other shallow groundwater bores, with abstraction, are used for domestic and stock water supply.

The Ō2NL Project is designed to not alter the existing water balance of the area, avoid any direct interaction with the groundwater system; and maintain the existing hydraulic connections between surface water and groundwater.

2.2 Existing Land Use

2.2.1 Site inspection

An inspection of existing land use was undertaken in two stages. The first stage involved reviewing the drone footage and google earth street view images for the entire route. This provided an aerial view of the proposed designation and identification of existing use within the proposed designation boundary.

The second stage involved inspecting the proposed designation from public access points and inspecting several properties currently in ownership of the crown. Due to access arrangements, it was not possible to visit every site of interest. The site visit was undertaken by Kathryn Halder on 16 September 2022. The aim of the site visit was to verify ground features or current site uses and to note material variations from what was observed on the drone footage.

The following properties shown in Table 2 were accessed as part of this site visit. Not all sites inspected were considered to be HAIL but instead provided a good vantage point to view the proposed alignment and overall landuse.



Table 2: Properties accessed as part of site visit

Stantec Site ID	Address
132	55 Wi Tako Street
158	121A North Manakau Road
No ID	833 SH1, Manakau
337	379 Arapaepae Road Sth
311	380 Arapaepae Road Sth
326	378 Arapaepae Road Sth
506	50 Arapaepae Road
586	101 Waihou Road
604	32 McDonald Road
573	172 Fairfield Road
470	42 Sorensens Road
444	6 Heatherlea East Road

The proposed designation was also viewed at locations, considered safe to do so, along the following roads using a GIS map of the proposed alignment loaded into the Google Earth app for ground referencing on site.

- State Highway 1
- Manakau Heights Drive
- Mokena Kohere Street
- Kuku East Road
- Arapaepae Road South
- Kimberley Road
- Queen Street East
- Waihou Road
- Heatherlea East Road
- Koputaroa Road
- South Manakau Road
- Wi Tako Street
- North Manakau Road
- Muhunoa East Road
- McLeavey Road
- Tararua Road
- Arapaepae Road North
- McDonald Road
- Sorensens Road

This overview of the route confirmed its general land use as agricultural or horticultural land (Figure 6 and Figure 7). There are a number of rural properties and outbuildings within the Project designation boundary or close by (Figure 8) and the route crosses a number of local roads.



Figure 6 Farm and pastoral land



Figure 7 Market Gardens, orchards, berry farms and horticultural land



Figure 8 Various buildings located within the Ō2NL Project designation

Due to access constraints, it was not possible to view all horticultural or pastoral land, nor the quarry and historic landfill next to the Ohau river, nor parts of the route that are not intersect by the existing road network, as part of this site visit. These will be reviewed in more detail once access is granted.

Current and historical land use are discussed in more detail in the sections below.

2.2.2 Current site uses

The existing environment within the proposed designation boundary is characterised by agricultural land uses, comprising dairy and sheep farming, extensive areas of market gardening, pockets of orchards, glasshouses, poultry farms, and a vineyard. The topography is typically gently rolling, with various streams running in a general east to west direction across the area of the proposed designation.

There are small pine plantations within the sand dune country and on the backdrop hills. The agricultural land is interspersed with pockets of lifestyle or rural-residential development.

The proposed Ō2NL Project alignment also includes a limited number of major road intersections and river crossings.

Further discussion around land use and associated potential contamination is included in Section 3.1.

2.2.3 Surrounding land uses

The surrounding land use is similar to that observed within the proposed designation, which bypasses both Manakau and Ohau townships by significant margins. However, a small portion of the proposed designation is positioned adjacent to an eastern residential area of Levin township, from near the intersections of Queen St East and Arapaepae South Roads to slightly north of the intersections of Arapaepae South Road and Tararua Roads.

There are no industrial premises within the proposed designation or in close proximity (within 100m) of the proposed designation boundary.

The existing State Highway and the North Island Main Trunk Railway between Wellington and Palmerston North (Figure 9) are generally located to the west of the Project (Figure 1). Project works to the existing SH1 would be very limited and only occur at the tie-ins to the Ō2NL Project.



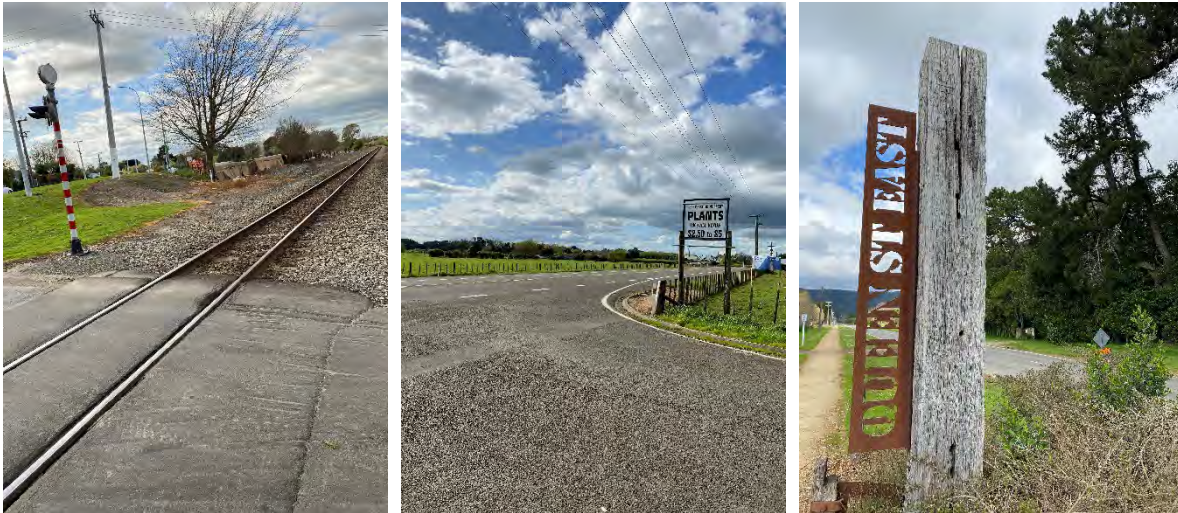


Figure 9 Roads and railway networks

The new road will connect to the current State Highway road improvements being completed south of Ōtaki and have similar features and stormwater management systems (Figure 10).



Figure 10 New State Highway being completed south of Ōtaki

3 Historical Site Use

3.1 Activities of Environmental Concern

The HAIL sets out a detailed list of both historic and current land use activities that, by their nature and the type of likely discharges, may have given rise to land contamination. The inclusion of a property on the HAIL does not, of itself, demonstrate the presence of land contamination at that property. However, it does provide an alert that land in and around that property may be contaminated and, on that basis and with the support of associated supplementary evidence (if available), allows a conclusion as to whether further investigation of the levels of possible land contamination should be undertaken. Similarly, land that is not HAIL, may be contaminated land owing to the presence of contaminants derived from building materials or similar, including asbestos.

Historic aerial photographs show that the major use of land along the proposed designation has been for pastoral and horticultural farming purposes, since the land was first developed in the early 1920s and 1930s. Common HAIL activities historically associated with such rural environments across New Zealand include:

- HAIL A2 (Chemical manufacture, formulation or bulk storage)
- HAIL A6 (Fertiliser manufacture or bulk storage)
- HAIL A8 (Livestock dip or spray race operations)
- HAIL A10 (Persistent pesticides bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds)
- HAIL A17 (Storage tanks or drums for fuel, chemicals or liquid waste)
 - HAIL G3 (Landfill sites - General waste)
- HAIL G5 (Waste disposal to land / Farm dumps (excluding where biosolids have been used as soil conditioners))
- HAIL E1 (Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition)
- HAIL H (Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment).

Key activities of Environmental Concern (AEC) for the proposed Ō2NL Project based on the major land uses, are outlined in Table 3 below.

Table 3 Key Activities of Environmental Concern within the Ō2NL Project

Activity	Potential contamination
Fertiliser use / pest control	<p>The nature of pastoral farming and the presence of several orchards and market gardens implies the use of fertilisers for soil improvements is likely to have been widespread within the proposed designation.</p> <p>The presence of fertiliser storage structures is an indication of the bulk storage of fertiliser (HAIL A6), potentially associated with metals contamination. Agrichemical storage would also generally be associated with farming.</p> <p>Market gardens, orchards, glasshouses and spray sheds are listed as HAIL (A10) which is associated with bulk storage and use of persistent 'pesticides' including organochlorine pesticides (OCP) such as Dichlorodiphenyltrichloroethane (DDT). There is potential that organic and metals residues from pesticides may remain in soils within the proposed Ō2NL designation and will be disturbed as part of the works.</p>
Fuel and chemical storage	<p>Fuel supplies in limited volumes (typically diesel) are present on most farms and there is potential for storage of various chemicals typically in sheds. Losses to the ground could result in the contamination of soil which may be disturbed by the works.</p> <p>The eastern urban area of Levin is immediately adjacent to the proposed designation. This area of Levin is entirely residential in nature and there are no known facilities such as service stations present which border the proposed Ō2NL Project.</p>
Animal husbandry	<p>There is a poultry farm located at the northern end of the proposed designation. Pathogens, nutrients, Emerging Organic Contaminants (EOC's), viruses may be present depending on historical use of poultry waste on the site.</p>



Activity	Potential contamination
	Sheep dips and offal pits may possibly be present on some farm properties which could be disturbed as part of the works, although there is no record of these in Horizons, HDC or GWRC records.
Mining / Quarry	A quarry is located adjacent to the proposed Ō2NL Project next to the Ōhau River. This site is not identified on the Horizons HAIL records. Gravel extraction is excluded from the HAIL list. Fuel is often stored at such locations (HAIL A17) and explosives may have been used.
Building demolition	<p>There will be several dwellings and associated outbuildings (including sheds) that will be removed as part of the proposed construction works. There is potential for lead and asbestos to have been used in some of the old farm buildings. Poultry farms (especially older ones) are often constructed from asbestos containing material.</p> <p>Asbestos from buildings has not been investigated as part of the PSI but it is recommended that asbestos surveys are undertaken for buildings that need to be demolished along the corridor prior to work commencing and licensed asbestos removalists appointed where appropriate. Contamination associated with buildings (as well as lead from flaked paint) will likely be within a couple of meters of the building exteriors.</p> <p>Septic tanks may be also present at some rural properties</p>
Farm dumps	Waste generated on a farm (including burial of dead animals) has historically been permitted to be disposed of or burnt onsite. This has resulted in multiple small 'farm dumps' being established over time. These sites are unlined and often free draining, allowing contaminants to migrate in groundwater. There is potential that several farm dumps are located within the potential designation and could be disturbed as part of the works.
Railway	Fuels, oils, greases, lubricants, solvents, and related organic constituents, wood preservatives and heavy metals can be associated with railway activities particularly around yards. While the railway line will not be disturbed as part of the works there are two interfaces with the proposed Ō2NL Project. A new level crossing at SH1 / Tararua Road (remote from new highway alignment) and a bridge connection over the railway near Sorenson Road.

The identification of HAIL sites and activities of concern has been undertaken through:

- review of publicly available information held by Council,
- review of historical aerial photographs and recent drone footage and
- site visit to verify ground features or current site uses and note any variations from what is visible on the photographic evidence.

The locations of the identified sites within and adjacent to the proposed designation are presented in Appendix C. All sites are also listed in Appendix D, identified by a HAIL Site Number (Hail ID) allocated by Stantec. This numbering is used throughout the DSI.

3.1.1 Review of Council information of known HAIL sites

Horizons and GWRC each maintain a list of HAIL sites in their regions; such lists however are only as comprehensive and reliable as the information that has been obtained or provided in developing the lists. Thus, while the Horizons HAIL list was scrutinised (by Horizons, on Stantec's behalf) and Stantec has interrogated the GWRC Selected Land Use Register (SLUR) database in this work, the output of results cannot be considered the final or only the arbiter of contaminated sites in the region. This limitation must always be kept in mind when interpreting the findings of HAIL searches.

A .kmz file of the preferred Ō2NL Project alignment was presented to Horizons, who then interrogated their database of known or potentially contaminated sites (HAIL sites). This data was then provided to Stantec and further information requested from Horizons and HDC on specific sites of interest. A copy of the information supplied by Council is contained in Appendix D and maps showing the location of the HAIL sites identified are provided in Appendix C.2. No HAIL sites were identified within the proposed designation by the Horizons database, however three HAIL sites (Table 4) were identified along Arapaepae South Road adjacent to the proposed designation boundary.

Greater Wellington Regional Council's SLUR is freely available to use on the GWRC website and holds similar information about contaminated sites as the Horizons database. Accordingly, the GWRC SLUR was accessed and interrogated, given that the southern part of the Ō2NL Project (the first 6km) lies within the GWRC boundary. No HAIL sites were identified on the SLUR within or close to the proposed Ō2NL Project alignment.



Table 4: Known Historical HAIL Activities Adjacent to Designation Boundary

Title	Site HAIL ID 33	Site HAIL ID 10	Site HAIL ID 11
Horizons File No	ERM 0501AC	ERM 0501AV	ERM 0501AU
Address	26 Arapaepae South Road Levin 5510	380-386 Arapaepae Road Levin Rural 5571	378 Arapaepae Road Levin Rural 5571
Property Title	Lot: 1 DP: 322349	Lot: 4 DP: 25093	Lot: 2 DP: 427531
Status	Current	Current	Current
Contaminants	Landfill sites - General waste	Fuel Storage Tanks - Hydrocarbon	Fuel Storage Tanks - Hydrocarbon
Horizons SAHS	700518	700653	700652
Activity - HAIL	G3	A17	A17
Description	Arapaepae Road small dump - Landfill site	- Storage Tanks and drum storage - underground fuel tank in shed - back entrance to house	Storage tanks and drum storage - above ground fuel storage tanks
Current Status	Unverified history hazardous industry/act	Verified history hazardous industry/act	Verified history hazardous industry/act
Tank Removed?	No	No	No

The HAIL sites at 378 and 380-386 Arapaepae Road, Levin (Figure 11) were noted as having fuel storage tanks present and therefore the potential for losses of petroleum hydrocarbon-based fuels associated with refuelling of farm vehicles to be present within soils. These sites are outside the proposed designation and hydraulically downgradient in terms of groundwater flow direction and therefore the direction of possible contamination migration from any of these known sites is likely to be away from the proposed works. The likelihood of encountering petroleum hydrocarbons contaminants from these two HAIL sites as part of the works is therefore considered to be low.



Figure 11: HAIL sites at 378 and 380-386 Arapaepae Road

During the September site visit, the location of the storage tanks at 378 Arapaepae Road was determined. These tanks were in the ground at the northern corner of the site behind the residential building (Figure 12), approximately 40m west of the designation boundary.



Figure 12 Storage tanks at 378 Arapaepae Road (HAIL ID 11)

The tanks at 380-386 Arapaepae Road were determined to be no longer present. The tenant was present at the site at the time of the inspection and confirmed that the fuel storage was associated with a machinery building that used to be located in the northwest corner of the property. The tenant located an old sump (Figure 13) and soak away area which he believed drained the machinery area. The sump outlet drained in a northern direction and away from the Ō2NL Project designation area.



Figure 13 Sump and soak away area at 380-386 Arapaepae Road (HAIL ID 10)

26 Arapaepae South Road Levin was recorded to be the location of a historic landfill site ((HAIL ID 33 on maps in Appendix C). There are no Council records of the age of the landfill, the quantity of material that may have been deposited here or its composition. There is an area of low ground observed in a 1940 aerial photograph (Figure 14) which is subsequently filled, and a dwelling is located on the site in the 1970s. The HAIL site is outside the proposed designation boundary and hydraulically downgradient of the works and will not be disturbed as part of the works.



Figure 14: HAIL Site 26 Arapaepae South Road (source Retrolens imagery 1940)

Horizons also provided details from their HAIL database of known or potentially contaminated sites near the material supply sites for the works.

No HAIL sites were identified next to material supply sites #34a and #36.

Two historic landfill sites (HAIL ID 34 and 35) were identified by Horizons next to the Waikawa Stream close to materials supply sites #15 (south Waikawa) and #19 (north Waikawa) (Figure 15). Council records note the following details (Table 5) for each site.

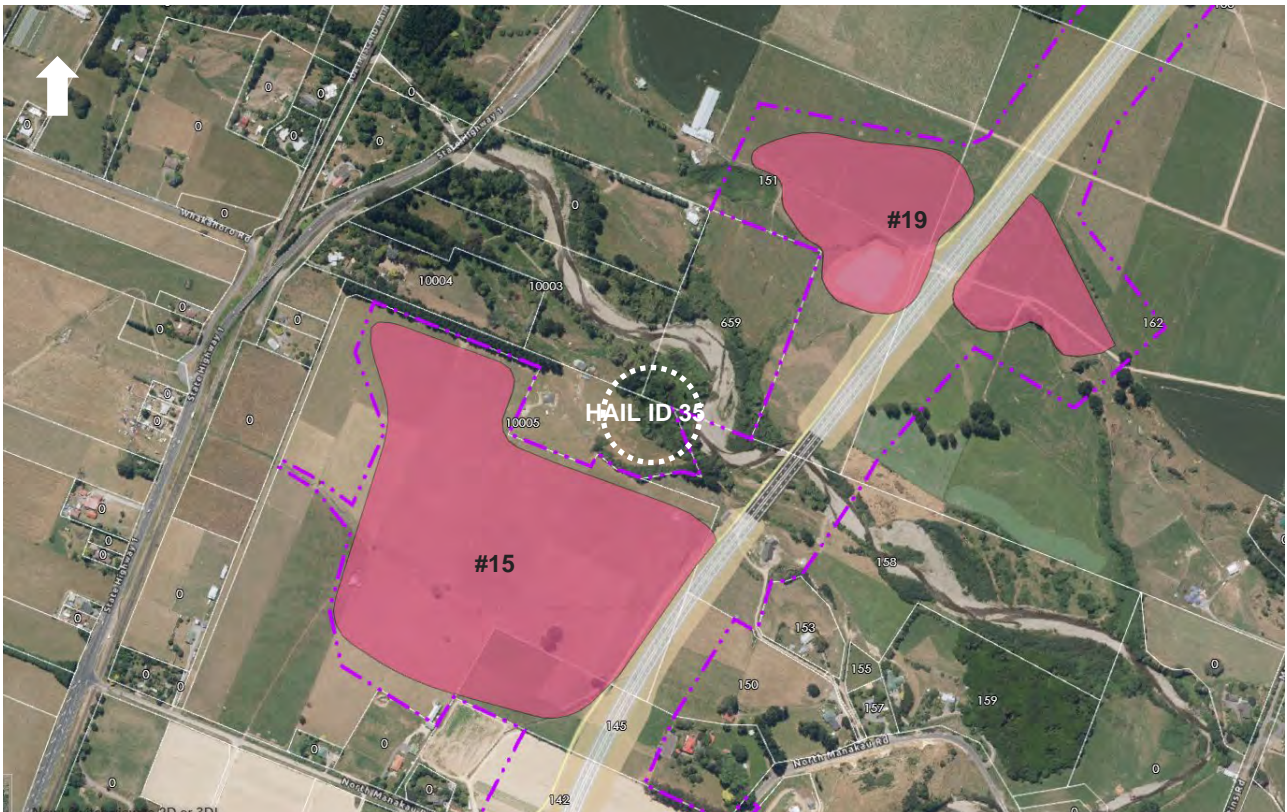


Figure 15 Material supply sites next to Waikawa Stream



Table 5 Known Historical HAIL Activities, from Council records, near Material Supply Sites

Title	Site HAIL ID 34	Site HAIL ID 35
Address	861 State Highway 1 Levin Rural 5570	887 State Highway 1 Levin Rural 5570
Property Title	WN7D/255	WN826/26
Status	Current	Current
Contaminants	Landfill sites – General waste	Landfill sites – General waste
Horizons SAHS	700060	700692
Horizon File No	ERM 0501P	ERM 0501CL
Activity – HAIL	G3	G3
Description	Waikawa Stream Manakau – Landfill site	The Properties of Ransfield – 891 State Highway 1 Levin South – Old refuse landfill site – Manakau – near Waikawa Stream
Current Status	No identified Contamination. The land has been subdivided and Council no longer consider this property to be a HAIL site	Verified history hazardous industry/act. The land has been subdivided and the landfill extents is now located within 13 North Manakau Road next to Waikawa Stream and within part of 883 State Highway 1
Near material supply site	#19	#15

Historical imagery publicly available from Retrolens imagery (Figure 16) shows disturbed land at two main locations on the southern side of the Waikawa Stream, in close proximity to site #15. The full scale and location of landfill material is unclear from the imagery. Council records note that the area is “located within the Waikawa flood plain, the materials deposited have not been identified but some capping has been undertaken”.

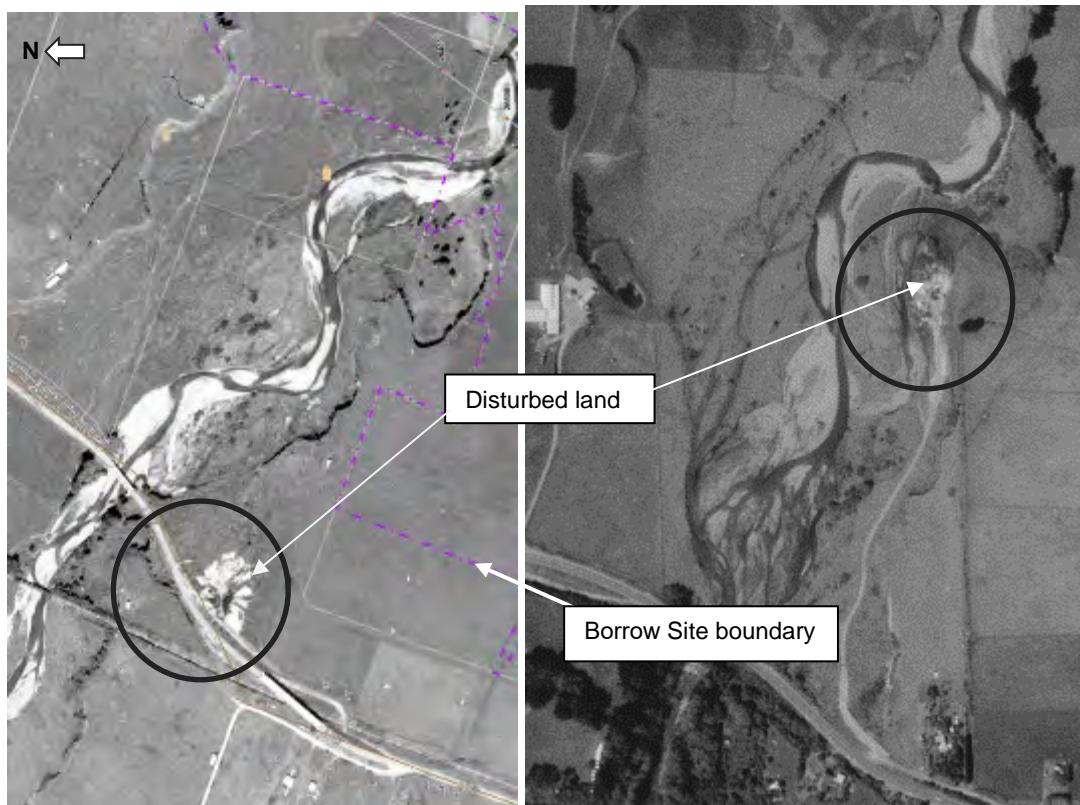


Figure 16: Potential Landfills Waikawa Stream (source Retrolens imagery 1940 & 1983)



The Council records additionally describe the location of the former (Manakau) landfill as “turn off east of SH1, 1.9km north of Manakau 200m south of the Waikawa stream. Take second left (going north), down a private road. The landfill is on the right in a garden, at the end of the private road”.

Discussions on site on 16 September 2022 during the site walkover with Mr N Bolton, one of the owners of 13 North Manakau Road, provided further information regarding the historic closed landfill. Mr Bolton understood that the landfill had been developed to service the local community and was closed in the 1960s and had accepted general domestic refuse, some of which was burnt onsite. Mr Bolton was also able to point out the extent of the landfill, which lies next to (south of) the Waikawa Stream within part of 13 North Manakau Road and part of 883 Sate Highway 1, as shown in Figure 17. This corresponds with the southern part site HAIL ID 35.



Figure 17 Approximate location of the historic Landfill next to Waikawa Stream.

Mr Bolton also noted that the cap was very thin in places and metal could be seen at the toe of the landfill. He currently has sheep grazing the site and has an air rifle shooting range set up on the lower area of the property. Current photographs taken on 16 September 2022 are presented in Figure 18 and Figure 19.



Landfill face



Top of landfill, view west

Figure 18 Closed Landfill located within 13 North Manakau Road





Toe of landfill, view north



Toe of landfill, view south

Figure 19 Closed Landfill toe, 13 North Manakau Road

On the basis of this information, it is concluded that:

- Material supply site #15 lies within 11 North Manakau Road immediately to the south of the former landfill
- Material supply site #19 lies approximately 400 m northeast of the former landfill, across the Waikawa Stream on pastoral land.

3.1.2 Review of historical land use along Ō2NL proposed designation

Land covered by the NESCS includes pieces of land where an activity or industry described in the HAIL is or has been undertaken, whether it is included in Council records or not. For any PSI it has to be assumed that Council records may be incomplete and therefore a wider search of historical photographs is important.

3.1.2.1 Aerial Photographs

A review of aerial photography including scrutiny of historic images (Retrolens (<https://retrolens.co.nz/>) for the pre 1990 imagery and LINZ (<https://data.linz.govt.nz/>) for 1991-current imagery, was undertaken for the entire Ō2NL route. Recent drone footage was also used. This review looked for evidence of historical and current HAIL land uses at properties within the designation boundary. Images from the following years were available for all or part of the route.

- 1939 – 1942
- 1961 – 1965
- 1970 – 1979
- 1999 – 2000
- 2010 – 2011
- 2015 – 2016
- Drone footage March 2021

Maps showing all the inferred HAIL sites based on the aerial photograph reviews are provided in Appendix C.3. Commentary is provided in Appendix D.

Table 6 provides summary details of the sites considered as potential HAIL sites within the potential designation. The relative risk associated with each based on its age and likelihood of being disturbed are considered in Section 4. Photos showing how the key sites of concern (market gardens or orchards in the 1960s and 70s) have developed overtime are provided in Appendix F.

Table 6: All Sites within the Potential Designation Identified as Potentially HAIL

HAIL SITE ID.	Location	Approx. Chainage (m)	Historical Land use of Concern	Possible Contaminants	Activity - HAIL
1	45 South Manakau Road	29,800	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
2	49 South Manakau Road	29,600	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
3	58 North Manakau Road, Manakau	27,300	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
4	51 North Manakau Road, Manakau	27,000	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
5	703 State Highway 1, Manakau	24,800	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
6	695-703 State Highway 1,	24,600	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
7	559 State Highway 1, Manakau	22,900	Landfilling	TPH, PAH, heavy metals and asbestos.	G5 waste disposal to land / G3 Landfill
8	559 State Highway 1, Manakau	22,900	Quarry / fuel storage	TPH/BTEX and PAH,	E7 mining industries (excl. gravel extraction)
9	416 Arapaepae South Road, Levin	20,400	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
12	232 Kimberley Road, Levin	19,500	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
13	273 Arapaepae South Road, Levin	19,000	Possible Orchard / Vines	Pesticides and Heavy Metals	A10 Orchard
14	237 Kimberley Road, Levin	19,500	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
15	259 Kimberley Road, Levin	19,500	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
16	1-7 Heatherlea East Road, Levin	10,000	Orchard / fruit trees	Pesticides and Heavy Metals	A10 Orchard
17	12-16 Heatherlea East Road, Levin	10,300	Possible small farm dump and small private orchard	Pesticides, Heavy Metals TPH, PAH, and asbestos.	A10 Orchard possible G5
18	148/138 SH1 Levin Foxton	10,800	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
19	32 Heatherlea East Road	10,500	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
20	34 Arapaepae Road, SH57 Levin	15,800	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
21	50 Arapaepae Road, Levin	15,600	Orchard / fruit trees	Pesticides and Heavy Metals	A10 Orchard
22	1051 Queen Street East, Levin	15,600	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
23	108 Arapaepae Road, Levin	15,100	Orchard / fruit trees	Pesticides and Heavy Metals	A10 Orchard
24	116 SH57 Arapaepae Rd, Levin	14,900	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
25	40 Waihou Road, Levin	15,100	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
26	116 SH57 Arapaepae Rd, LEVIN SHANNON	14,900	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
27	278 Heatherlea East Rd	12,600	Orchard / fruit trees	Pesticides and Heavy Metals	A10 Orchard
28	101 Waihou Road, Levin	14,200	Polly tunnels next to Valleyview Poultry Limited	Asbestos, Pesticides and Heavy Metals.*	A10 Glass houses



HAIL SITE ID.	Location	Approx. Chainage (m)	Historical Land use of Concern	Possible Contaminants	Activity - HAIL
29	1051 Queen Street East, Levin	15,200	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden
30	40 Waihou Road, Levin	14,900	Valleyview Poultry / Next to designation	Pathogens, Heavy Metals, nutrients, EOC's, viruses	
31	42 Waihou Road, Levin	14,800	Orchard / fruit trees	Pesticides and Heavy Metals	A10 Orchard
32	45 Waihou Road, Levin	14,700	Market Garden / horticultural	Pesticides and Heavy Metals	A10 Market Garden

* Note: Other contaminants, pathogens, nutrients, EOC's, viruses may be present depending on historical use of poultry waste as fertilizer from neighbouring property.

During the September site visit, several Polly Tunnels and outbuildings (Figure 20) were observed at 101 Waihou Road (Site 28, Table 6). The land is owned by the crown and is currently leased. The tenants had just recently moved in and were not aware of the history of the site and what the outbuildings had historically been used for.

Based on the observations on site there is potential for the roofing of some of these outbuildings to contain asbestos. A sample of the roofing material was taken during the site visit and sent to Hills Laboratories, an accredited lab, to confirm the presence or absence of asbestos. The analysis report identified the roofing material as fibre cement and detected the presence of Amosite (Brown Asbestos), Chrysotile (White Asbestos) and Crocidolite (Blue Asbestos). While left undisturbed the asbestos remains bound within the corrugated asbestos cement roofing material. A licensed asbestos removalist will be required to manage the removal and disposal of these buildings appropriately. This property will also require further DSI once the buildings are removed to confirm any residual levels of contaminants within the soils, including asbestos.



Figure 20 Out buildings located at 101 Waihou Road, Levin

3.1.2.2 Site HAIL ID 7

Discussions with the owner of the quarry site next to the Ohau River (Appendix G) as part of geotechnical investigations noted that landfilling activities had historically occurred near the quarry. The site (HAIL ID 7 in Table 6) is located within the southern approach to the Ohau River bridge as shown in Figure 21 and will be disturbed as part of the Project construction works.



This site is not on the Council HAIL records. There is no evidence within the historical photos available that show ground disturbance at this location other than for quarry operations. The riverbed can be observed across part of the site in 1940 as the river meandered naturally.



Figure 21: Location of historic landfill within the southern approach to the Ohau River bridge

Further investigations of this location were undertaken as part of a geotechnical and contamination assessment in 2021. A summary of the findings is provided in section 3.2 below. The investigation report is presented in Appendix H.

3.2 Preliminary Sampling and Investigation Reports

An assessment of the HAIL site identified on the South Bank of the Ohau River (HAIL ID 7) was undertaken by Stantec in 2021. This included a geophysical survey, geotechnical bore and test pits to try to confirm the presence or absence of a landfill at this location.

Visual assessments of the site investigation test pits and groundwater boreholes logs noted evidence of landfill material including fence posts, a metal pipe, potentially a mattress, plastic, and bits of wire.

As part of the site investigations soil samples were taken at varying depths at four locations across the part of the site considered to have been used as a landfill and one location upstream but within the proposed alignment. Sample analysis was conducted by R J Hill Laboratories which is accredited by International Accreditation New Zealand (IANZ).

Samples were analysed for:

- Heavy metals
 - Cadmium
 - Copper
 - Lead
 - Chromium (total)
 - Nickel
 - Zinc
- Polycyclic Aromatic Hydrocarbons (PAH)
- Semi volatile organic compound (SVOC)
- Organochlorine Pesticides (OCP)
- Asbestos (presence and absence)
- Total Petroleum Hydrocarbons (TPH)

All contaminants other than heavy metals were below detection limits and no asbestos was identified within the samples. Heavy metal contaminants were detected in the soils at concentrations that are generally comparable with background levels as recorded for category "Main Soil Type 1" in the Determination of Common Pollutant Background Soil Concentrations for the Wellington Region (GWRC, August 2003), as shown in Table 7. Wellington Region Type 1 soils were selected as it comprises of Q1a soil from west of Levin and is therefore representative of local background levels.



Table 7: Analytical Results for Soil Samples at Southern Approach to Ohau River Bridge

	Wellington Background Concentration (Soil Type 1) ²	Landfill Acceptance Criteria (Class B)	Average of Results for 12 Soil Samples
Total Recoverable Arsenic (mg/kg)	<2 - 7	10	6
Total Recoverable Cadmium (mg/kg)	<0.1 - 0.1	2	0.04
Total Recoverable Chromium* (mg/kg)	7 - 12	10	16
Total Recoverable Copper (mg/kg)	4 - 10	10	12
Total Recoverable Lead (mg/kg)	4.5 - 180	10	24
Total Recoverable Nickel (mg/kg)	4 - 9	20	14
Total Recoverable Zinc (mg/kg)	28 - 79	20	68
Benzo[a]pyrene (BAP) (mg/kg)	<0.002 - 0.08		0.005

The individual sample results are provided contamination assessment report is provided in Appendix H. Chromium and nickel total concentration were slightly above the background range across all samples, with copper slightly elevated in 50% of samples and zinc in 25% of samples.

The results indicate that the presence of historic landfill in this general vicinity has not resulted in widespread contamination of the soil. No contaminant concentrations exceeded the NESCS soil contaminant standards for commercial / industrial land use.

Several contaminant concentrations exceeded the MfE acceptance criteria for a Class B landfill, meaning that without further leachability testing, any soil to be disposed off-site should be disposed of to a Class A landfill. MfE guidelines for landfill acceptance criteria provide only a guideline disposal at various landfill types; the results should be compared to the specific landfill's acceptance criteria.

Given the low levels of contaminants encountered, the contamination assessment report concluded that there was no evidence of widespread landfilling having occurred in the area. However, the assessment report recommended that a CSMP is used to ensure the safe handling of the soil and that further considerations are made to determine if a consent is required under the NESCS for disturbance of soil and the off-site disposal of any surplus soil, to carry out the proposed Ō2NL Project works at this location.

A geophysical investigation was subsequently undertaken in August 2021. The geophysical data interpretation indicated that landfill material had historically been disposed of at this site. The model also provided an indication of the extent of the landfill material, Figure 22. The geophysical assessment also noted the potential for leachate to be present. Leachate is water that has percolated through the landfill material and leached out some of the contaminants. The quality of this leachate depends on how well the contaminants are bound to the soil.

3.3 Unknown Sites

While investigations have been taken to try and locate all HAIL sites within the proposed Ō2NL Project designation, there is always the possibility that unknown/unrecorded areas of historic contamination could be encountered during the Ō2NL Project works or discovered by other disciplines carrying out investigative activities, most particularly the geotechnical experts or within historical building inspections.

Such circumstances, if they occur, should be investigated by an expert in contaminated land assessments. The outcome may be that further investigation of soil contamination is, in the future and/or during construction, deemed necessary to understand the nature and extent of such contamination. This, in turn, may affect requirements for consent under the NESCS.

If unexpected, contaminated material is disturbed during Ō2NL Project works, the procedures of an unexpected discovery protocol should be implemented; the consequences of this may be that the nature and extent of suspected contamination need to be promptly investigated, including by sampling and analysis of potentially contaminated material. This may in turn invoke consenting requirements under the NESCS.

² Determination of Common Pollutant Background Soil Concentrations for the Wellington Region (GWRC, August 2003)



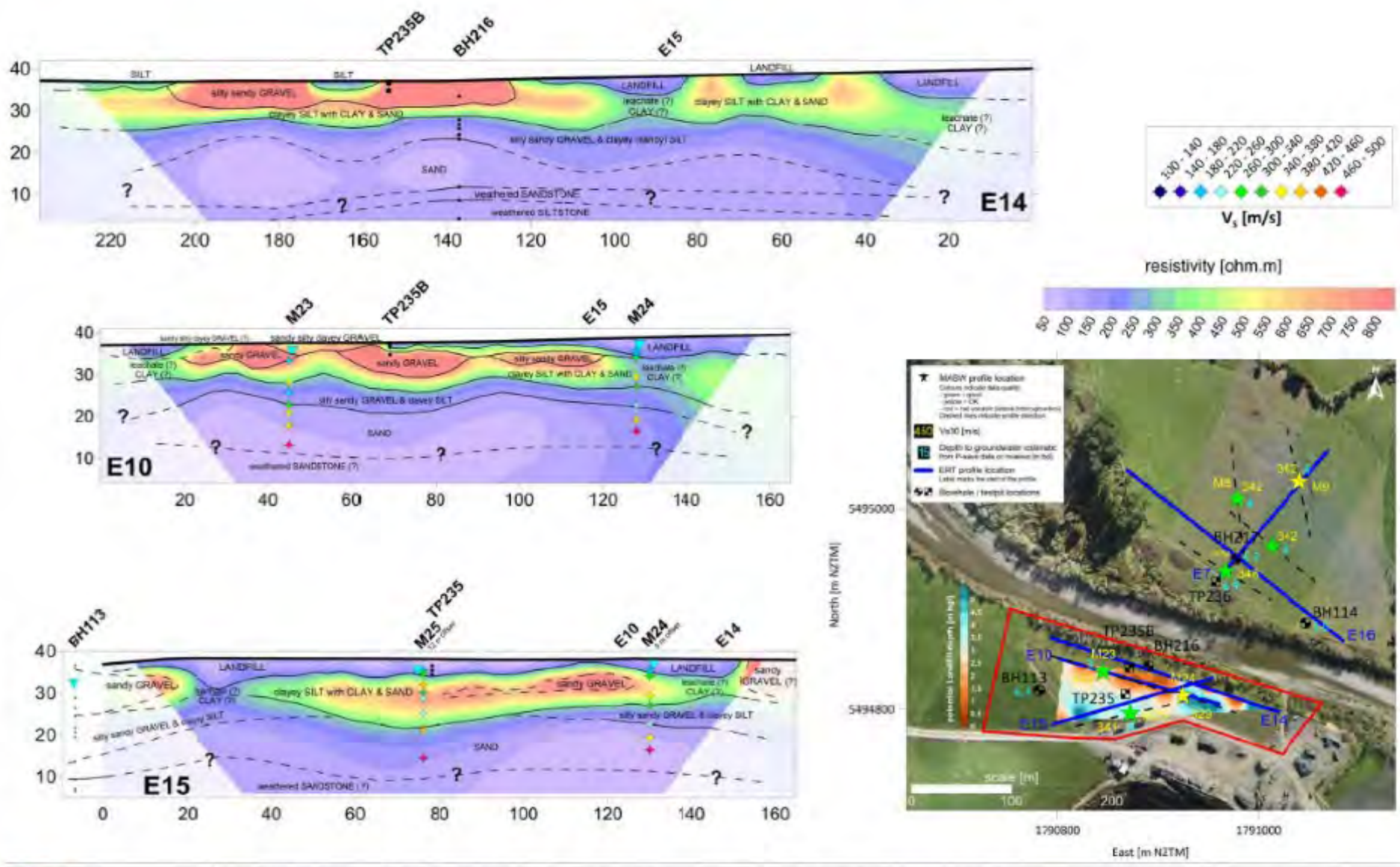


Figure 22: Geophysical model interpretation



4 Risk Assessment

4.1 Preliminary Conceptual Site Model

A preliminary Conceptual Site Model (“CSM”) is a tool used in the determination of the potential risk to human health and/or the environment as a result of soil and/or groundwater conditions. An assessment is undertaken to identify the likely presence or absence of the following elements:

- **Source** - a substance that is capable of causing an unacceptable risk to human and/or environmental health.
- **Pathway** - a mode or route by which the substance/source can migrate to a receptor.
- **Receptor** - someone and/or something that could be adversely affected by the substance/source.

For instances where one or more of these elements are absent, an unacceptable risk to human and/or environmental health cannot exist. Where all of these elements are present, a complete or potentially complete pathway for contamination exists and there is a potential risk to human and/or environmental health that will require further investigation and possible remediation and/or management. The magnitude of the risk is primarily a function of the concentration, mobility and physico-chemical properties of the source, the sensitivity of the receptor and the nature of the migration pathway.

A risk screening has been undertaken and overall site ranking applied to each site to reflect the hazards that present the greatest risk. This is a qualitative assessment based on the likelihood and the nature of contamination existing at the site from a particular activity and has been based on the MfE Contaminated land management guidelines No. 3: Risk screening system. The risk ranking is intended to be a prioritisation tool to direct future site investigations and soil management during soil disturbance. A high-risk rating indicates a high potential for contamination that would require investigation and a low-risk ranking indicates a low potential for contamination, which may not require direct investigation. A medium risk rating indicates an uncertainty in whether an activity will have resulted in site contamination and further investigation is likely required to quantify this risk.

4.2 Potential Contamination Sources

Based on the historical records held by Horizons and HDC and the activities of environmental concern identified in Section 3, the following locations next to the proposed Ō2NL Project designation or material supply sites have been identified as known HAIL sites and therefore a potential source of contamination. A copy of council records for each site are provided in Appendix E.

4.2.1 Low Risk Sites

Table 8 presents sites considered to be low risk. As noted in Table 8, the likelihood of these sites being disturbed as part of the works and contaminants being encountered that pose a risk to human health is considered to be low, given that they are outside the area of disturbance and hydraulically downgradient of the works.

Table 8: HAIL Activities Identified by Council Records in the Vicinity of the Proposed Works

HAIL ID (Horizons SAHS no.)	Site ID	Location of Activity	HAIL Activity Identified	Contamination Status	Possible Contaminants	Risk Screening - Likelihood of exposure to contaminants
700653	10	380-386 Arapaepae Road Levin Rural 5571	A17	Verified history hazardous industry/act	TPH/BTEX and PAH,	Low Risk - Outside designation and hydraulically downgradient of works. Therefore, mobilisation of contaminants to the Project unlikely.
700652	11	378 Arapaepae Road Levin Rural 5571	A17	Verified history hazardous industry/act	TPH/BTEX and PAH,	Low Risk - Outside designation and hydraulically downgradient of works. Therefore, mobilisation of contaminants to the Project unlikely.
700518	33	26 Arapaepae South Road Levin 5510	G3	Unverified history hazardous industry/act	TPH, PAH, heavy metals and asbestos.	Low Risk - Outside designation and hydraulically downgradient of works. Therefore,



HAIL ID (Horizons SAHS no.)	Site ID	Location of Activity	HAIL Activity Identified	Contamination Status	Possible Contaminants	Risk Screening - Likelihood of exposure to contaminants
						mobilisation of contaminants to the Project unlikely.
700060	34	861 State Highway 1 Levin Rural 557	G3	Council records note no identified Contamination	TPH, PAH, heavy metals and asbestos.	No Risk – Council records note that this site should be removed from the HAIL register as it has been incorrectly left on the title when the land was subdivided and the landfill is located across the Waikawa Stream.
700692	35	Observed on site to be located at 13 North Manakau Road and within part of 883 Sate Highway 1, next to Waikawa Stream	G3	Verified history hazardous industry/act	TPH, PAH, heavy metals and asbestos.	Low Risk - Outside material supply site boundary and hydraulically downgradient of works. This site is not to be disturbed as part of the works. The extents of the landfill is visible on site and known to the landowner.

4.2.2 Low-Medium, Medium and Medium-High Risk Sites

Orcharding practices prior to the 1970s entailed the use of various pesticides and agrichemicals that persist in the environment. Metals are often a co-contaminant for fertilisers and pesticides/herbicides and a survey undertaken by University of Waikato in 2003 found that “concentrations of arsenic in soils under orchard trees in the Tasman region and around the spray sheds and storage and handling areas at some historic orchards exceeded the Ministry for the Environment’s residential soil guidelines.”³

Table 9 provides a summary of the horticultural and orchard pieces of land that are considered to present a low- medium or medium risk of contaminants being encountered if the soil is disturbed. A full list of the agricultural sites investigated is provided in Appendix D. Land parcels where horticultural and/ or orchard activities have historically been undertaken were considered of low to medium risk to the Project if the activity was established later than 1980 or the activity was outside the footprint of the area of soil disturbance and/or downgradient of the works.

Table 9: Market Garden and Orchard HAIL Activities Identified by Aerial Photographs

HAIL ID	Site ID	Location of Activity	HAIL Activity Identified	Contamination Status	Possible Contaminants	Risk Screening - Likelihood of exposure to contaminants
5	169	703 State Highway 1, Manakau	A10 Market Garden	Unverified Land use noted on the Project property information as current	Pesticides and Heavy Metals	Medium Risk - Market Garden present in the 1970s and there is a likelihood that persistent pesticides and herbicides such as DTT could have been used at this time.
6	173	695-703 State Highway 1	A10 Market Garden	Unverified Land use noted on the Project property information as current	Pesticides and Heavy Metals	Medium Risk - Market Garden present in the 1970s and there is a likelihood that persistent pesticides and herbicides such as DTT could have been used at this time.

³ University of Waikato June 2003 - Historic Pesticide Residues in Horticultural and Grazing Soils in The Tasman District, SK Gaw



HAIL ID	Site ID	Location of Activity	HAIL Activity Identified	Contamination Status	Possible Contaminants	Risk Screening - Likelihood of exposure to contaminants
9	298	416 Arapaepae South Road, Levin	A10 Market Garden	Unverified Land use noted on the Project property information as current	Pesticides and Heavy Metals	Medium Risk - no imagery available to determine if present in the 1970s. Further testing required to confirm the presence of contaminants
12	367	232 Kimberley Road, Levin	A10 Market Garden	Unverified Land use noted on the Project property information as current	Pesticides and Heavy Metals	Medium Risk - no imagery available to determine if present in the 1970s. Further testing required to confirm the presence of contaminants
14	374	237 Kimberley Road, Levin	A10 Market Garden	Unverified Land use noted on the Project property information as current	Pesticides and Heavy Metals	Low - Medium Risk - only a small part of the site to be disturbed
15	381	259 Kimberley Road, Levin	A10 Market Garden	Unverified Land use noted on the Project property information as current	Pesticides and Heavy Metals	Low - Medium Risk - only a small part of the site to be disturbed
20	499	34 Arapaepae Road, SH57 Levin	A10 Market Garden	Unverified Land use noted on the Project property information as current	Pesticides and Heavy Metals	Medium Risk - Imagery shows multiple fields and crops present in the 1970s. There is a likelihood that persistent pesticides and herbicides such as DTT could have been used at this time.
21	506	50 Arapaepae Road, Levin	A10 Orchard	Unverified Land use noted on the Project property information as current	Pesticides and Heavy Metals	Medium Risk - Imagery shows multiple fields and crops present in the 1970s. There is a likelihood that persistent pesticides and herbicides such as DTT could have been used at this time.
22	511	1051 Queen Street East, Levin	A10 Market Garden	Unverified Land use noted on the Project property information as current	Pesticides and Heavy Metals	Medium Risk - Imagery shows multiple fields and crops present in the 1970s. There is a likelihood that persistent pesticides and herbicides such as DTT could have been used at this time.
28	586	101 Waihou Road, Levin	A10 Glass houses	Unverified	Asbestos, Pesticides and Heavy Metals. Other contaminants Pathogens, nutrients, EOC's, viruses may be present depending on historical use of poultry waste on the site.	Medium - High Risk - no clear imagery available to determine if present in the 1970s s. Further testing required to confirm the presence of persistent pesticides etc. Site observations indicate that the shed roofing may contain asbestos. This is to be confirmed through additional testing.

Further soil analysis is recommended within these sites to determine the level of residual pesticides or associated metals that remain in the soils, prior to the proposed works.



4.2.3 Other Risk Sites

Other HAIL activities identified within the Ō2NL Project designation are assessed in Table 10.

Table 10: Other HAIL Activities Identified within the O2NL Designation

HAIL ID	Site ID	Location of Activity	HAIL Activity	Contamination Status	Possible Contaminants	Risk Screening - Likelihood of exposure to contaminants
7	209	559 State Highway 1, Manakau next to the Ohau River	G3 or G5	Verified field sampling has been undertaken	TPH, PAH, heavy metals and asbestos.	High Risk as waste material observed by geologist during site investigation. Soil contaminants tested low
8	209	559 State Highway 1, Manakau	E7 mining industries (excluding gravel extraction)	Unverified	TPH/BTEX and PAH,	Low - Medium Risk - subject to confirming quantity of any fuel, or hazardous substance stored on site
17	453	12-16 Heatherlea East Road, Levin	Possible G5	Unverified	Pesticides and Heavy Metals, TPH, PAH, and asbestos.	Low - Medium Risk - Possible risk of farm dump being encountered

Several dwellings and associated outbuildings (including sheds) have been identified within the Ō2NL Project designation and will be removed as part of the proposed construction works. There is potential for lead and asbestos to have been used in some of the old farm buildings and the storage of fuel and agrichemicals. Contamination associated with buildings (as well as lead from lead-based flaked paint) will likely be within a couple of meters of the building exteriors. Asbestos was used as a building material widely in NZ until 1990 following the cease in production of asbestos building materials in 1987. Buildings inspections should be carried out on buildings built or renovated between 1940 and 1990 prior to demolition to identify the potential for asbestos to be present. Removal of any asbestos should be managed in accordance with the Health and Safety at Work (Asbestos) Regulations, 2016, the Code of Practice for the Management and Removal of Asbestos, 2016 and the BRANZ, New Zealand Guidelines for Assessing and Managing Asbestos in Soil, 2017.

While there are no records of farm dumps, sheep dips or ofal pits within the Ō2NL Project designation, there is a potential that some may be encountered during works. If encountered these will be investigated by a SQEP and appropriate management taken in accordance with the unexpected discovery protocols.

4.3 Migration Pathways

A migration pathway is a means by which a receptor can be exposed to, or potentially affected by, a contaminant. The exposure pathway can be direct (i.e. stays within the same exposure medium) or indirect, where transport from one medium to another takes place. The following potential migration pathways (Table 11) are possible for this site depending on the type of contaminants.

Table 11: Potential Migration Pathways

Potential Migration Pathways	Description
Ingestion	Eating or swallowing of contaminated dust/soils from contaminated soils, either by deliberate consumption, or indirectly by eating with dirty hands.
Inhalation	Breathing in dust from contaminated soil, particularly when land disturbance or vehicle movements are in operation. Inhalation of volatilised organic contaminants within the excavation and its surrounds.



Potential Migration Pathways	Description
Dermal Contact	Direct contact with contaminated residues on the ground surface, potentially causing skin conditions such as dermatitis, etc. Certain contaminants can be absorbed into the body through the skin or enter directly through open cuts or abrasions.
Leaching and Sediment Runoff	Infiltration of water through contaminated soils that are exposed to rainfall could potentially leach out soluble contaminants. Sediment erosion can also move contaminants bound to the soil structure. Both mechanisms can result in pollution of local waterways, with the former also potentially impacting on groundwater.
Migration of Contaminated Water	Contaminated water can migrate laterally or vertically depending on permeability and preferential pathways such as drains or man-made voids and channels. Such migration of contamination may impact on shallow groundwater quality and local waterways. Surface water runoff can carry sediment-bound contamination into local waterways.

While it is understood that the works will avoid any direct interaction with the groundwater system, dewatering and sediment control within the proposed Ō2NL Project works should also consider the potential for contaminant migration as a result of disturbing HAIL sites, identified within the designation, particularly where close to streams and wetlands. The design shall also consider the ongoing treatment of stormwater run-off from the new road which may contain sediments, heavy metals and hydrocarbons.

4.4 Receptors

A receptor is something (such as people, a water body, or an ecosystem) that could be adversely affected by the contaminant.

During construction and operation of the Ō2NL Project, the following people could be affected by the works:

- Construction workers building the road who may be exposed to contaminated soil, groundwater, and dust.
- Off-site public, including workers at nearby properties who may be exposed to contaminated dust.
- Maintenance workers, including those workers who maintain subsurface utilities may be exposed to contaminated soil, groundwater, and dust.

Potential ecological receptors for contaminants in land that may be disturbed by the works include:

- Terrestrial flora and fauna.
- Off-site biota in freshwater bodies.

4.5 Source-Pathway-Receptor Linkages

A preliminary conceptual site model (CSM) has been developed for the Ō2NL Project on the basis of this PSI. Figure 23 shows the potential source-pathway-receptor relationships that have been identified, bearing in mind the proposed end land use.

The essential elements of a CSM are:

- Known and potential sources of contamination.
- Potentially affected environmental receiving environments.
- Human and ecological receptors; and
- Potential and complete exposure pathways.

Based upon the findings of this investigation, it can be concluded that several HAIL activities are present or have historically been present along or adjacent to the Ō2NL Project alignment. Historical horticultural and pastoral practices have the potential to have caused localised contamination of soils and groundwater. Landfill material is likely to contain a variety of contaminants and water that has percolated through the landfill material may have leached out some of the contaminants. The quality of this leachate depends on the type of material it has moved through and the solubility of the contaminants. If not adequately contained, there is potential for this to migrate and effect surrounding waterbodies.



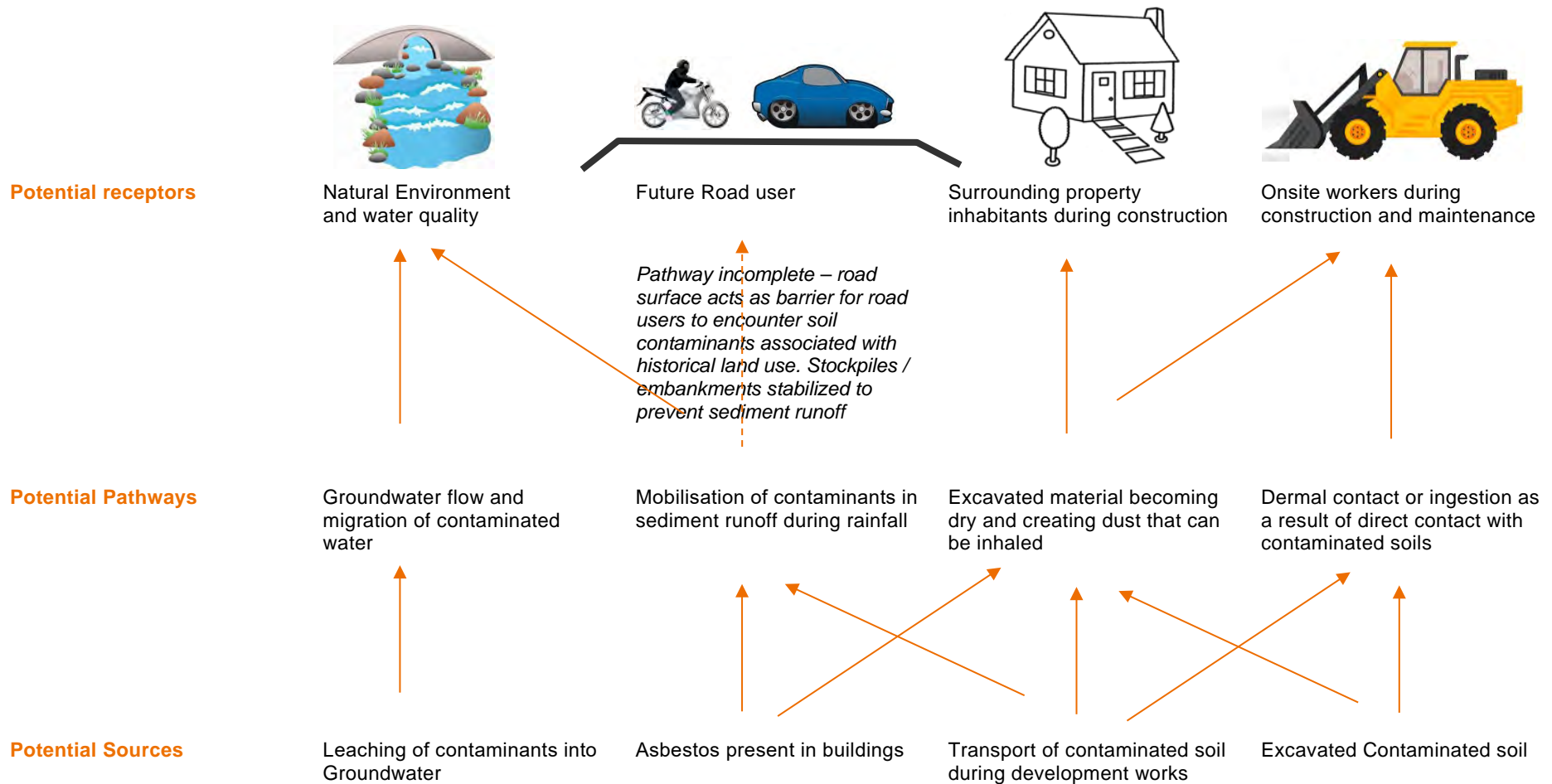


Figure 23 Preliminary Conceptual site model (CSM) for proposed works



The potential construction effects of the Ō2NL Project on contaminated land have been identified as:

- Disturbance of contaminants in soil and groundwater and consequential discharges of contaminants to air, land and water (surface and groundwater) where there may be an effect on the environment; and
- Discharge of such contaminants where there may be an effect on human health – including site workers and the public.

However, actual soil and groundwater quality data on the potentially affected sites is currently unknown which means that the scale of the risk to human and ecological receptors cannot be determined at this stage.

The main pathways identified for the Project are dermal contact, dust and sediment runoff during construction works and migration of contaminated water. Soils which have residual pesticide concentration could inhibit the success of any planting if used within the stormwater channel. Once the road is established the new road pavement will act as a barrier to direct migration pathways.

The main receptors identified for the Ō2NL Project are the site contractors / workers involved in the construction works and surface water ecosystems if contaminated soil is discharged from the site through runoff or reused within planted recreational areas.

The encapsulation of any contaminants where concentrations are above general background concentration within the embankments of the proposed work and disposal of refuse material offsite to a facility authorised to take the material will reduce to risk of exposure to potential receptors and break exposure pathways.

4.6 Additional Information

It is recommended that a DSI is undertaken within the A10 HAIL sites identified in Table 9 once the properties are purchased to allow the CSM to be reviewed and if concentrations are above background levels to inform a CSMP (to be developed as part of the overall site management systems and processes). If DDT or other pesticides are found in elevated concentrations at any site, then the CSMP should include a methodology to encapsulate this soil within the embankments and earthworks rather than reuse as topsoil. If no contaminants are found, then it can be reused on site within the Project as topsoil.

A DSI should also be undertaken at HAIL site ID 7 to further investigate the findings of the geophysical model and develop a remedial action plan where appropriate and at HAIL site ID 28 once the buildings and roofing containing asbestos has been removed to confirm any residual levels of contaminants within the soils.

The CSM would need to be reviewed and updated following the DSI's.



5 Evaluation of Relevant RMA and Regional Plan Rules

5.1 National Environmental Standard Requirements on the Project

The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (“NESCS”) provides a nationally consistent set of planning controls for the management of activities that disturb contaminated and potentially contaminated land. The following table (Table 12) provides an overview of the requirements under the NESCS and their impact on the Project.

Table 12: NES-CS Regulatory Requirements

Rules	Description								
<p>Regulation 5(9) of the NESCS notes that “<i>these regulations do not apply to a piece of land described in subclause (7) or (8) about which a detailed site investigation exists that demonstrates that any contaminants in or on the ‘piece of land’ are at, or below, background concentrations</i>”.</p>	<p>The proposed work currently falls under the requirements of the NESCS since, with the exception of site HAIL OD ID7, no DSIs currently exists for the HAIL sites within the proposed designation identified in this PSI. Soil testing would be required to determine if contaminant concentrations are below background and if Regulation 5(9) can be applied.</p>								
<p>Section 5(1)(a) of the NESCS <i>these regulations apply when a person wants to do an activity described in any of the subclauses (2) to (6) on a piece of land described in subclause (7) or (8)</i></p> <p>Regulation 7 of the NESCS specifies that a piece of land under the NESCS is an area that has, or has had, or is more than likely to have or have had a HAIL activity undertaken upon it.</p>	<p>The works are subject to the NESCS given that HAIL sites identified in this PSI will be disturbed.</p>								
<p>The method for determining if a piece of land is to be disturbed Regulation 6 (3) is to undertake a PSI that assesses <i>the likelihood that the soil is contaminated as a result of activity or industry occurring</i></p>	<p>From this PSI it is determined that HAIL sites shall be disturbed as part of the works and therefore the regulations shall apply.</p>								
<p>Regulation 8(3) of the NESCS outlines permitted activity criteria for disturbing of soil on a HAIL site. If the volume of soil to be disturbed or removed as a result of proposed activities at a site exceeds those ratios of volumes to site area set out below a resource consent is required under the NES-CS.</p> <table border="1" data-bbox="167 1496 903 1666"> <thead> <tr> <th></th> <th>Max Permitted Quantity</th> </tr> </thead> <tbody> <tr> <td>Permitted Activity volume for reuse on site</td> <td>25 m³ per 500 m² of site area</td> </tr> <tr> <td>Permitted Activity volume for removal off site</td> <td>5 m³ per 500 m² of site area</td> </tr> <tr> <td>Duration of earthworks</td> <td>Two months</td> </tr> </tbody> </table> <p>The proposed construction works could encounter soils potentially impacted by horticultural chemicals at 10 locations along the alignment covering at least 4 km (~16%) of the alignment. Typically, such contamination affects upper soils to depths of about 0.3- 0.5 m. For the designation width of 60 m, this indicates the potential presence of 72,000-120,000 m³ of impacted soils.</p>		Max Permitted Quantity	Permitted Activity volume for reuse on site	25 m ³ per 500 m ² of site area	Permitted Activity volume for removal off site	5 m ³ per 500 m ² of site area	Duration of earthworks	Two months	<p>Final design is required to determine if the permitted activity volumes can be met otherwise the work must be considered under the controlled activity, restricted discretionary or discretionary activity rules and a resource consent applied for.</p>
	Max Permitted Quantity								
Permitted Activity volume for reuse on site	25 m ³ per 500 m ² of site area								
Permitted Activity volume for removal off site	5 m ³ per 500 m ² of site area								
Duration of earthworks	Two months								
<p>Regulation 8(4) of the NESCS outlines permitted activity criteria for subdividing land or changing the use of the piece of land as:</p> <ul style="list-style-type: none"> (a) a preliminary site investigation of the land or piece of land must exist: (b) the report on the preliminary site investigation must state that it is highly unlikely that there will be a risk to human health if the activity is done to the piece of land: 	<p>The Project constitutes a change of use and the activity must therefore be assessed under this regulation.</p> <p>This document provides the PSI required by the regulations as there are HAIL sites located within the proposed works. Soil analysis would need to be undertaken for</p>								



Rules	Description
<p>(c) the report must be accompanied by a relevant site plan to which the report is referenced:</p> <p>(d) the consent authority must have the report and the plan.</p>	<p>the works to be considered under the permitted, controlled activity or restricted discretionary rules. If no DSIs are undertaken, the works would be subject to discretionary activity rules.</p>
<p>Under Regulation 7(4)(b) of the NESCS, guideline criteria for the protection of human health must be chosen in accordance with the current edition of the Contaminated Land Management Guidelines No. 2 "Hierarchy and Application in New Zealand of Environmental Guideline Values", Wellington, Ministry for the Environment.</p>	<p>The PSI considered that the HAIL sites to be disturbed by the proposed works require detailed site investigation (DSI) to determine the risk to human health and the environment if disturbed. Given that the land will be mainly used as part of the Ō2NL Project designation, and the area will be sealed by the new road and shared paths, guideline criteria compatible with that land use should be considered when assessing the risk to human health.</p> <p>Where appropriate other relevant receiving environment guidelines and soil contaminant standards (SCS) should also be considered as part of the DSI depending on the contaminants encountered and the proximity to sensitive environments.</p>

5.2 Regional Plan Rules

The Ō2NL Project is located within the Horizons and Greater Wellington Regions and therefore the following operative regional plans are relevant to the Project.

- Horizons One Plan
- Proposed Natural Resources Plan for the Wellington Region (Final Appeals Version 2022)

A statutory Rule Assessment (Volume II, Appendix One of this application) has been carried out for the Project and those rules relevant to the disturbance of HAIL material are summarised in the tables below. Once sufficient site access has been granted and DSIs have been carried out to determine the level of contaminants present within a site then a final planning assessment against permitted activity rules can be made and where appropriate resource consents applied for to allow for the disturbance of contaminated soil.

Table 13 Relevant regional rules with the Horizons One Plan

Rule Reference	Commentary
<p>14-24 Discharges of persistent and harmful contaminants</p>	<p>In this case the past use of sites in the Horizons Region for market gardening means that there is a potential for persistent organochlorines to exist in the soils. Waka Kotahi has to date been unable to gain sufficient access to the relevant sites traversed by the Project to undertake soil testing to determine presence or absence of contaminants, and if contaminants are present, to what level. Subsequent soil testing as part of a DSI will determine the need or otherwise for any consent under this Rule.</p> <p>If persistent organochlorines exist in the soils then consent will be sought under 14-24 as a non-complying activity</p>
<p>14-28 Discharges of contaminants onto or into land that may enter water.</p>	<p>As above, Waka Kotahi has to date been unable to gain sufficient access to the relevant sites traversed by the Project to undertake soil testing as part of a DSI to determine presence or absence of contaminants.</p>
<p>14-30 Discharges of water or contaminants to land or</p>	<p>If contaminants above background levels are present, then consent will be applied for under Rule 14-30, which allows for discharges of water or contaminants to land or water not covered by other rules in the One Plan or Chapter 14 as a discretionary activity.</p>



Rule Reference	Commentary
water not covered by other rules in this Plan or chapter	

Table 14 Relevant regional rules Proposed Natural Resources Plan for the Wellington Region

Rule Reference	Commentary
5.2.12 Contaminated Land and Hazardous Substances Rule R81 : Detailed Site Investigation	No sites traversed by the Project within the Greater Wellington Region are indicated as contaminated land on the GWRC SLUR database or have been identified as HAIL by this PSI. If contamination is encountered during the works, then a detailed site investigation will be undertaken in accordance with the requirements of this permitted activity rule.
5.2.12 Contaminated Land and Hazardous Substances Rule R82 : Discharges from contaminated land	See above. This rule will be relied upon if any contaminated land is encountered, and a detailed site investigation undertaken.

6 Conclusions

This PSI has determined that contaminated land and HAIL sites, including a historic landfill, markets gardens and orchard land, exist within the Project designation. Ten of these sites have been identified on the basis of desk study or site walk over inspection as medium or higher risk sites in relation to the presence of contaminants in soil and groundwater that could be disturbed during highway construction works:

- HAIL ID 5
- HAIL ID 7
- HAIL ID 9
- HAIL ID 20
- HAIL ID 22
- HAIL ID 6
- HAIL ID 8
- HAIL ID 12
- HAIL ID 21
- HAIL ID 28

Further investigation of these sites will be required to quantify the contamination, human health and environmental risk, resource consenting requirements and management.

Full access to the proposed designation was not available during the period of the PSI. Further sites could be identified in the future.

While application of the national and regional planning rules cannot be fully assessed at this stage with certainty. It appears likely that works within at least certain parts of the alignment will be subject to the NESCS for change of use and soil disturbance, and to One Plan rules on discharges to land and water.

7 Recommendations

Prior to construction works detailed site investigations are recommended within the medium risk sites to determine the level of residual pesticides or associated metals that remain in the soils and inform the appropriate management of the soil to be adopted as part of the proposed road construction methodology. Soil testing should be undertaken in accordance with Contaminated Land Management Guidelines No. 5: Site investigation and analysis of soils (Revised 2021).

It is also recommended that once final disturbance volumes and contaminant concentration are known, further considerations are made to either reuse the soil within the construct footprint of the Project, encapsulate soil within the earthworks, or, if off-site disposal of any surplus soil is required.

The presence of historic landfill material within the road alignment has a potential to impact on the structure of the new bridge and roadway at Ohau River. Consideration should be given within the design to either:

- leaving the material undisturbed in situ and design the road over the top or
- removal and disposal of all unsuitable material offsite.

There is also an opportunity to consider remediation of the site as part of the Ō2NL Project works and remove all historical landfill material and dispose of it properly. This will reduce the potential for future discharge of contaminants to



the Ohau river from any historical material disposed of here. It is recommended that a DSI is undertaken to confirm the exact quantity of contaminated material to be managed. Any unsuitable material should be disposed of at a facility authorised to take the material.

It is recommended that a CSMP is provided, for any sites requiring NESCS consent, to ensure the safe handling of the disturbed soil within HAIL sites and appropriate reuse or disposal. This should be based on the findings of the DSIs.

An unexpected discovery protocol is also recommended as part of the overall project; this will ensure that, should such discoveries be made, they will be thoroughly assessed and, if necessary, remediated and/or mitigated to reduce risks from contaminated soil to negligible levels.

8 Statement of Limitations

Stantec New Zealand (Stantec) has prepared this report for the use of Waka Kotahi in accordance with the usual care and thoroughness of the consulting profession. It has been prepared in accordance with the scope of work and for the purpose outlined in this report. It is based on accepted practices and standards at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report. Stantec makes no determination or recommendation regarding a decision to provide or not to provide financing with respect to the site.

There is no investigation that is thorough enough to preclude the presence of materials at the site which presently, or in the future, may be considered hazardous. As regulatory evaluation criteria are subject to change, concentrations of contaminants present and considered acceptable may, in the future, become subject to different regulatory standards which cause them to become unacceptable and require remediation for the site to be suitable for the existing or proposed land use activities.

The methodology adopted and sources of information used by Stantec are outlined in this report. Stantec has made no independent verification of the information beyond the agreed scope of works and Stantec assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to Stantec was false.

This report was finalized in September 2022 and is based on the conditions encountered and information reviewed at the time of preparation. Stantec disclaims any responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.



9 SQEP Certification of the Report

I Kathryn Halder of Stantec New Zealand certify that:

This preliminary site investigation meets the requirements of the Resource Management (National Environmental Standard for assessing and managing contaminants in soil to protect human health) Regulations 2011 because it has been:

- done by a suitably qualified and experienced practitioner, and
- reported on in accordance with the current edition of Contaminated land management guidelines No 1 – Reporting on contaminated sites in New Zealand, and
- the report is certified by a suitably qualified and experienced practitioner.

For activities under R8(3) of the NESCS this preliminary site investigation concludes it is possible (without further soil analysis) that there will be a risk to human health if the activity is done to the piece of land identified at HAIL and therefore a resource consent should be sought for the Project works.

The activity to be undertaken as defined in R 5(4) is described on page 3 of this preliminary site investigation and the areas of land addressed are described in section 3 of this preliminary site investigation.

Evidence of the qualifications and experience of the suitably qualified and experienced practitioner(s) who have done this investigation and have certified this report is appended to the preliminary site investigation report in Appendix A.

Signed:Kathryn Halder.....

Dated:20 September 2022.....



10 References

Heron, D.W. (custodian) (2014). Geological Map of New Zealand 1:250 000. GNS Science Geological Map 1. Lower Hutt, New Zealand. GNS Science.

Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

BRANZ, 2017, New Zealand Guidelines for Assessing and Managing Asbestos in Soil.

MfE, 2012, User's Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, Ministry for the Environment.

MfE, 2021a, Contaminated Land Management Guidelines No.1: Reporting on Contaminated Sites in New Zealand.

MfE, 2021b, Contaminated Land Management Guidelines No. 5: Site investigation and analysis of soils.

MfE, 2011c, Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand.

MfE, 2004, Module 2 – Hazardous waste guidelines: Landfill waste acceptance criteria and landfill classification, Ref: ME 510.

Ōtaki to North of Levin Project – Contamination Assessment at the South Bank of the Ōhau River. Prepared for Waka Kotahi NZ Transport Agency June 2021. Report prepared by Stantec, reference 310203848, Status Final (the 'South Bank contamination assessment').

University of Waikato June 2003 - Historic Pesticide Residues in Horticultural and Grazing Soils In The Tasman District, SK Gaw

Technical assessments provided as part of the Project

Mr Andrew Craig's Hydrology and Flooding assessment provided as Technical Assessment F in Volume IV;

Mr Gavin Craig Lister's Landscape, Visual and Natural Character assessment provided as Technical Assessment D in Volume IV;

Dr Jack McConchie's Hydrogeology and Groundwater assessment provided as Technical Assessment G in Volume IV



Appendices

We design with community in mind



Appendix A PSI requirements

A1: PSI Table of contents: s: 'subdivision' or 'change in use' as a permitted activity

Content	Required	Required if relied on ⁴	CLMG 5 section
1. Introduction investigation objectives site identification (site name, address, legal description; site boundaries; a map reference and geographic coordinates) proposed site use	Section 1.1 Section 1.3	 Section 1.4	2.1 3.3.1 3.3.2
2. Site description environmental setting site layout current site uses surrounding land uses geophysical surveys site inspection	 Appendix C Section 2.2.2 Section 2.2.3	Section 2.1 Figure 22 Section 2.2.1	3.3.3 3.3.4 3.3.5 3.3.6 5.1 3.3.8
3. Historical site use summary of site history gained from: <ul style="list-style-type: none"> review of existing investigation reports review of council information review of aerial photographs interviews review of other historical Information preliminary sampling (if carried out) <ul style="list-style-type: none"> description (including diagram) justification for sample location and analyte selection results comparison of results to guidelines 	Section 3	 <input type="checkbox"/> Section 3.1.1 Section 3.1.2 Appendix G <input type="checkbox"/> Section 3.2	3.3.7 3.3.9
4. Risk assessment conceptual site model evaluation of the probability that contamination exists on the site identification and characterisation of potential pathways and receptors for each exposure area across the site (e.g. assessment of geology, hydrogeology, building construction, site use) likelihood that contamination poses a risk to identified receptors including potential receptors	Section 4.1 Sections 4.2 – 4.5 Sections 4.2 – 4.5 Sections 4.2 – 4.5	 	3.3.11

⁴ Any evidence relied upon to form an opinion and/or conclusion must be included in the report including sampling. If sampling is relied upon, then headings 3, 4 and 5 of table A4 apply



Content	Required	Required if relied on ⁴	CLMG 5 section
<p>magnitude of the risk to receptors, pursuant to regulation 8(4)(b):</p> <p>is it highly unlikely that there will be a risk to human health if the activity is done to the piece of land?</p> <p>evaluate the magnitude of any identified risk to other receptors (eg, ecological)</p> <p>describe the limitations of the data collected and the assumptions and uncertainties inherent in the data and models used</p> <p>Note: If the regulation 8(4)(b) 'highly unlikely' test cannot be achieved, then the activity is not permitted.</p>	<p>Section 4</p> <p>Section 4</p>	<input type="checkbox"/>	<p>3.3.11</p> <p>7.3.2</p>
5. Conclusions	Section 6		
6. Recommendations (if relevant to report purpose)		Section 7	
7. Report limitations	Section 8		
8. SQEP certification of report (refer appendix C)	Section 9		1.2
9. References	Section 10		
Appendices: relevant supporting information			

Supporting information	Required	Required if relied on ⁵
Figures (including site plan – regulation 8(4)(c))	Appendix C	
Conceptual site model (if not included in report body)	In body of report	
Land titles		<input type="checkbox"/>
Site photographs (if site inspection carried out)		Drone footage available on GIS Maps Site photos contained within body of report
Laboratory reports and chain of custody documentation (if sampling carried out)		Appendix H
Calibration information for any field screening instruments used		<input type="checkbox"/>
Other supporting information		<input type="checkbox"/>
Statement of qualification of the author and, if not the author, the certifying SQEP	Appendix B	

⁵ Any evidence relied upon to form an opinion/conclusion must be included in the report.



Appendix B Evidence of SQEP Qualifications and Experience

KATHRYN HALDER

Kathryn is a Principal Environmental Scientist and has worked both in New Zealand and throughout the UK in contaminated land and waste management. Kathryn has over 20 years' experience working closely with Local Councils, Regulatory Authorities, Governmental bodies and businesses. She has also worked with the Ministry for the Environment in developing waste assessment guidance document and developing a NZ waste minimisation infrastructure database.

Kathryn's undergraduate and master studies were in contaminated land and site risk assessments based on historic land. She has also experience in applying the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health having carried out contaminated land investigations. She has also overseen the successful bioremediation of a number of these sites. Kathryn also has experience in working with developing 'source, pathway, receptor' models to assess risk to human health and reporting to the standard of the Ministry for the Environment's Contaminated Land Management Guidelines. Kathryn has been involved as Contaminated Land technical advisor on several Waka Kotahi projects including Woodend Corridor Alignment, Ō2NL and SH58.

While in NZ, Kathryn has undertaken over 100 projects with respect to risk assessment of contaminated soil, contaminated land investigations, and contaminated soil management. Kathryn has also been responsible for:

- Preparation of preliminary site investigations (PSI)
- On site test pitting, core sample investigations, hydrovac pothole investigations and sample collection
- Preparation of detailed site investigation reports (DSI)
- Development of Waste Assessments and Waste Management and Minimisation Plans (WMMPs)
- Site Management and sediment control plans
- Hazardous Waste Management
- Landfill waste acceptance
- Environmental Monitoring
- Coal tar assessment
- Consenting applications under the National Environmental Standard for Assessing and Managing Contaminants in Soil (NESCS)

She has also spent seven years assessing special and contaminated soil waste acceptance applications for the Tasman District landfill in terms of the environmental effect, safe handling, and disposal protocols, where appropriate.

EDUCATION

- MSc (Environmental Engineering), Queens University Belfast, 1999
- BSc (Environmental Science), Aberdeen University, 1998

MEMBERSHIPS

Chartered member of CIWM while in the UK
Environmental Practitioner - CIWM
Member, WasteMINZ



Appendix C Figures

Site Plans





LEGEND

	EXISTING PROPERTY BOUNDARY
	PROPOSED DESIGNATION BOUNDARY
	TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21
		DRN	CHK	APP	DATE

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED	PROF REGISTRATION
	Jamie Povall	Steve Sutton	Steve Sutton	Jamie Povall	Andy Wright	Jamie Povall	
	11.11.21	11.11.21	08.12.21	08.12.21	14.04.22	18.04.22	

Client:




WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 1

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scales	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1000
Rev.	B



LEGEND

	EXISTING PROPERTY BOUNDARY
	PROPOSED DESIGNATION BOUNDARY
	TEMPORARY WORKS AREA

NOTE

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	11.11.21	11.11.21	08.12.21	08.12.21	14.04.22	18.04.22

Client:

WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 2

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scales	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1001
Rev.	B

DRAFT



LEGEND

	EXISTING PROPERTY BOUNDARY
	PROPOSED DESIGNATION BOUNDARY
	TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21
		DRN	CHK	APP	DATE

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED
	Jamie Povall	Steve Sutton	Steve Sutton	Jamie Povall	Andy Wright	Jamie Povall
	11.11.21	11.11.21	08.12.21	08.12.21	14.04.22	18.04.22

Client:

WAKA KOTAHI
 OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
 SHEET 3

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scale	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1002
Rev.	B



LEGEND

	EXISTING PROPERTY BOUNDARY
	PROPOSED DESIGNATION BOUNDARY
	TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21

REVISIONS

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED	DATE
	Jamie Povall	Steve Sutton	Steve Sutton	Jamie Povall	Andy Wright	Jamie Povall	11.11.21 11.11.21 08.12.21 08.12.21 14.04.22 18.04.22

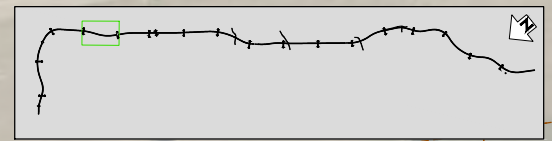
PROF REGISTRATION:

Client:

WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 4

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scales	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1003
Rev.	B



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.



REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21
		DRN	CHK	APP	DATE

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED
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	11.11.21	11.11.21	08.12.21	08.12.21	14.04.22	18.04.22

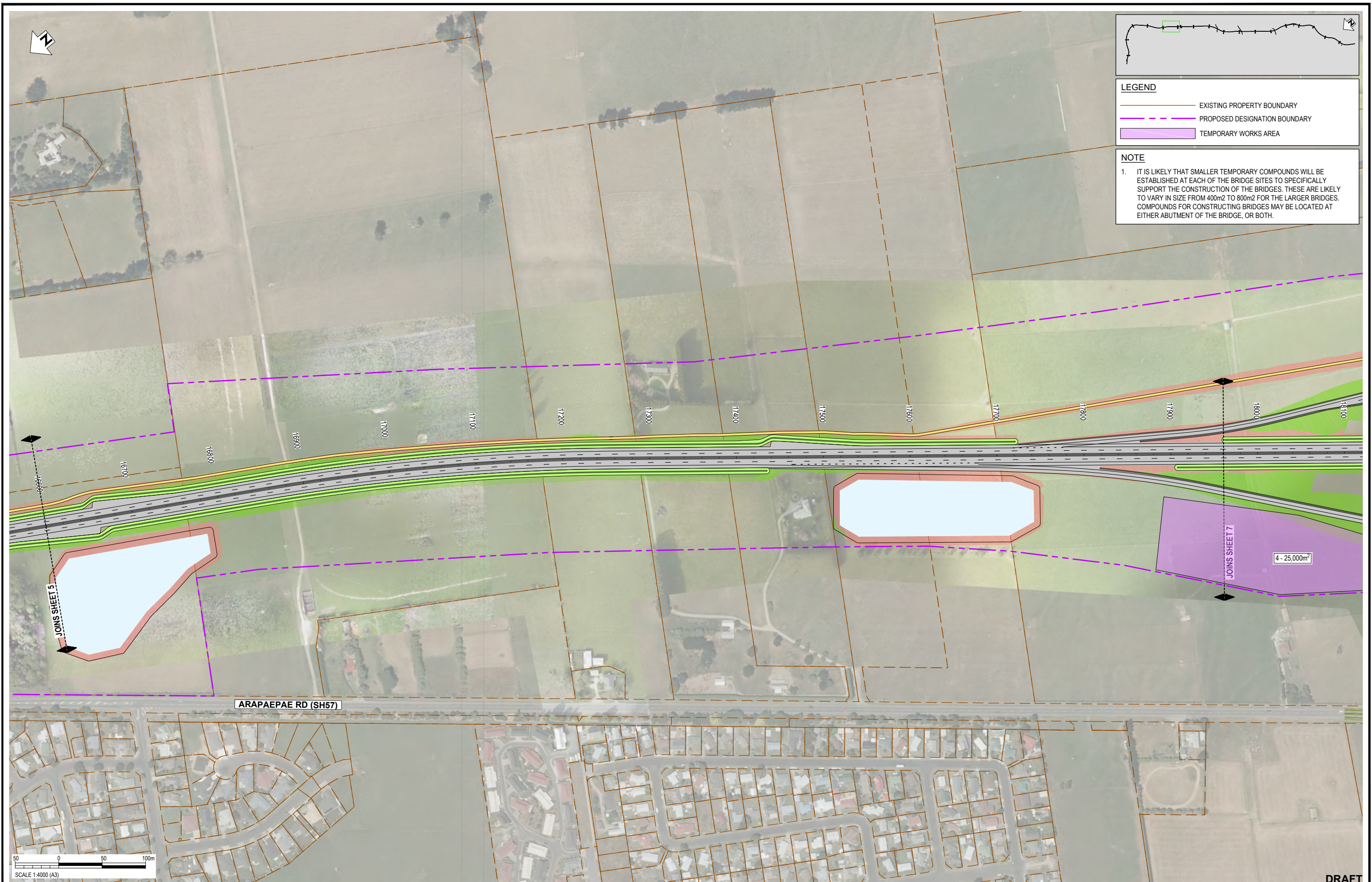
Client:




WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 5

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scales	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1004
Rev.	B



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	20.04.22
A	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	09.12.21

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED
	Jamie Povall	Steve Sutton	Steve Sutton	Jamie Povall	Andy Wright	Jamie Povall
	11.11.21	11.11.21	08.12.21	08.12.21	14.04.22	18.04.22

Client:

WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 6

Status Stamp: **FOR CONSENT**

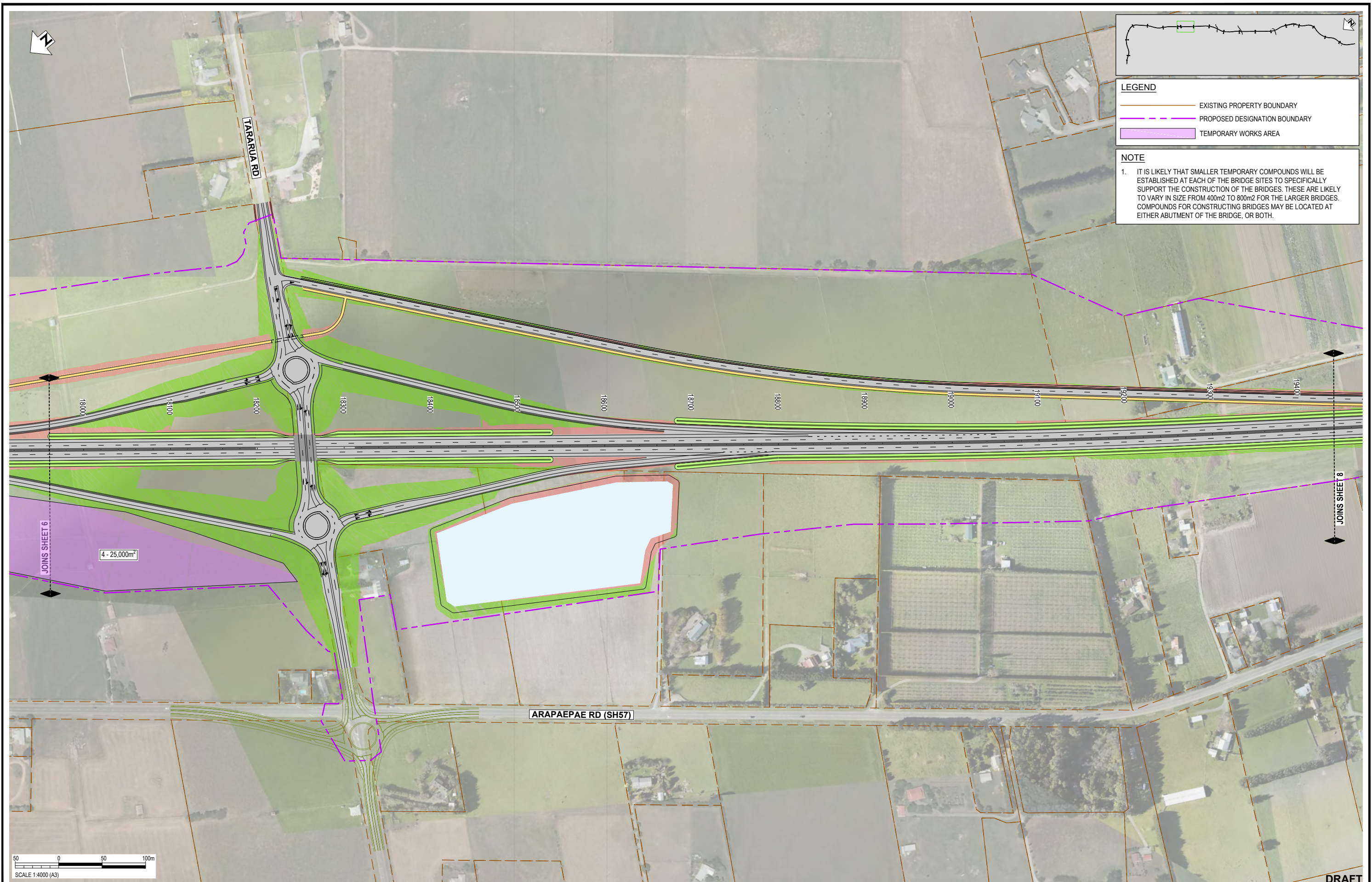
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Scales: 1 : 4000 (A3)

Drawing No: 310203848-01-500-C1005

Rev: **B**

DRAFT



LEGEND

	EXISTING PROPERTY BOUNDARY
	PROPOSED DESIGNATION BOUNDARY
	TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
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		DRN	CHK	APP	DATE

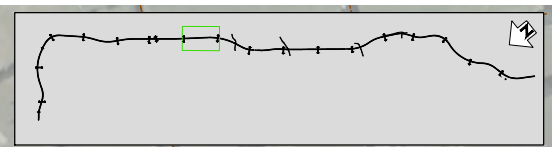
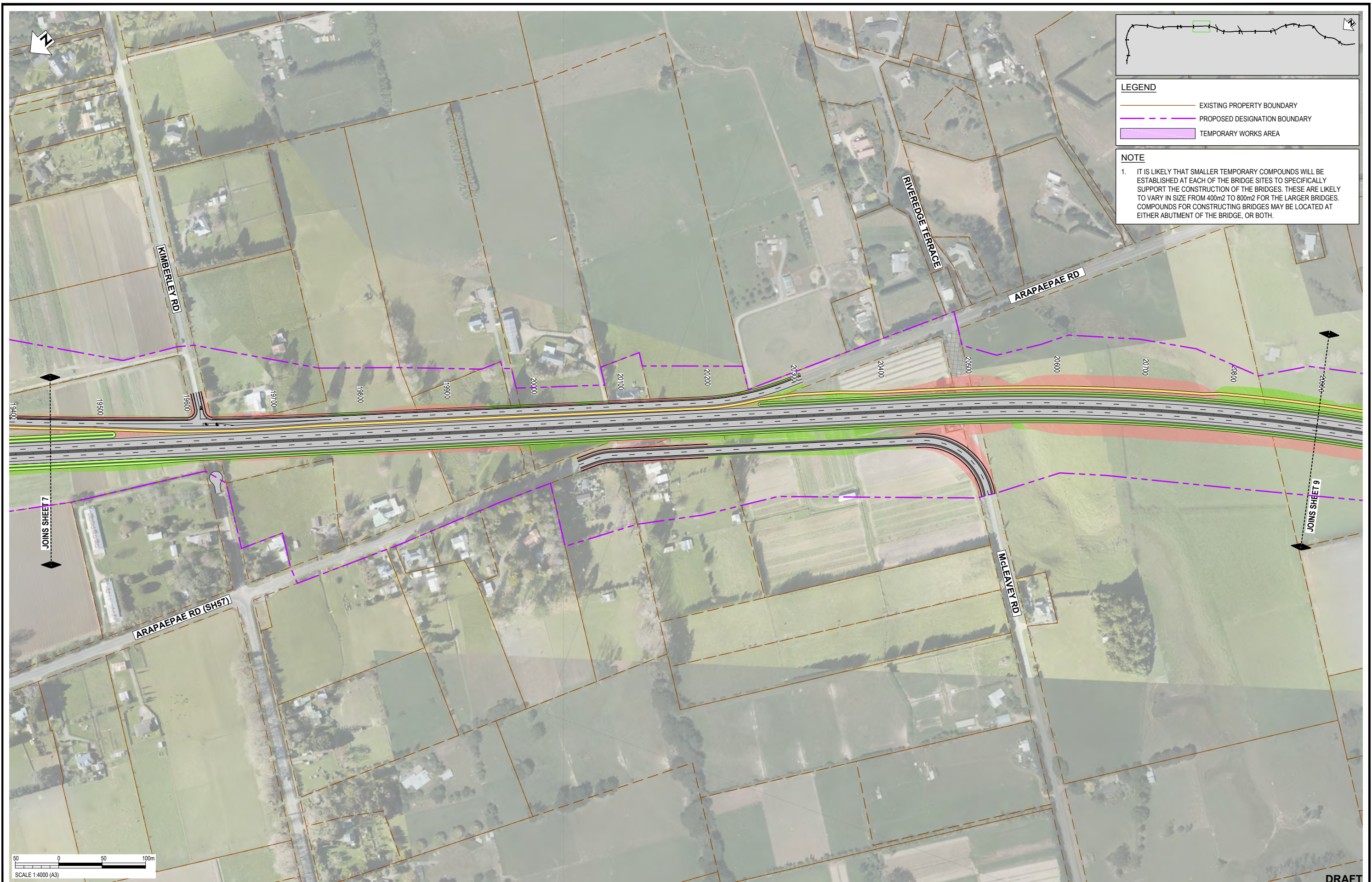
SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED	DATE
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Client:

WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 7

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scales	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1006
Rev.	B



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.



DRAFT

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21
		DRN	CHK	APP	DATE

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED	PROF REGISTRATION
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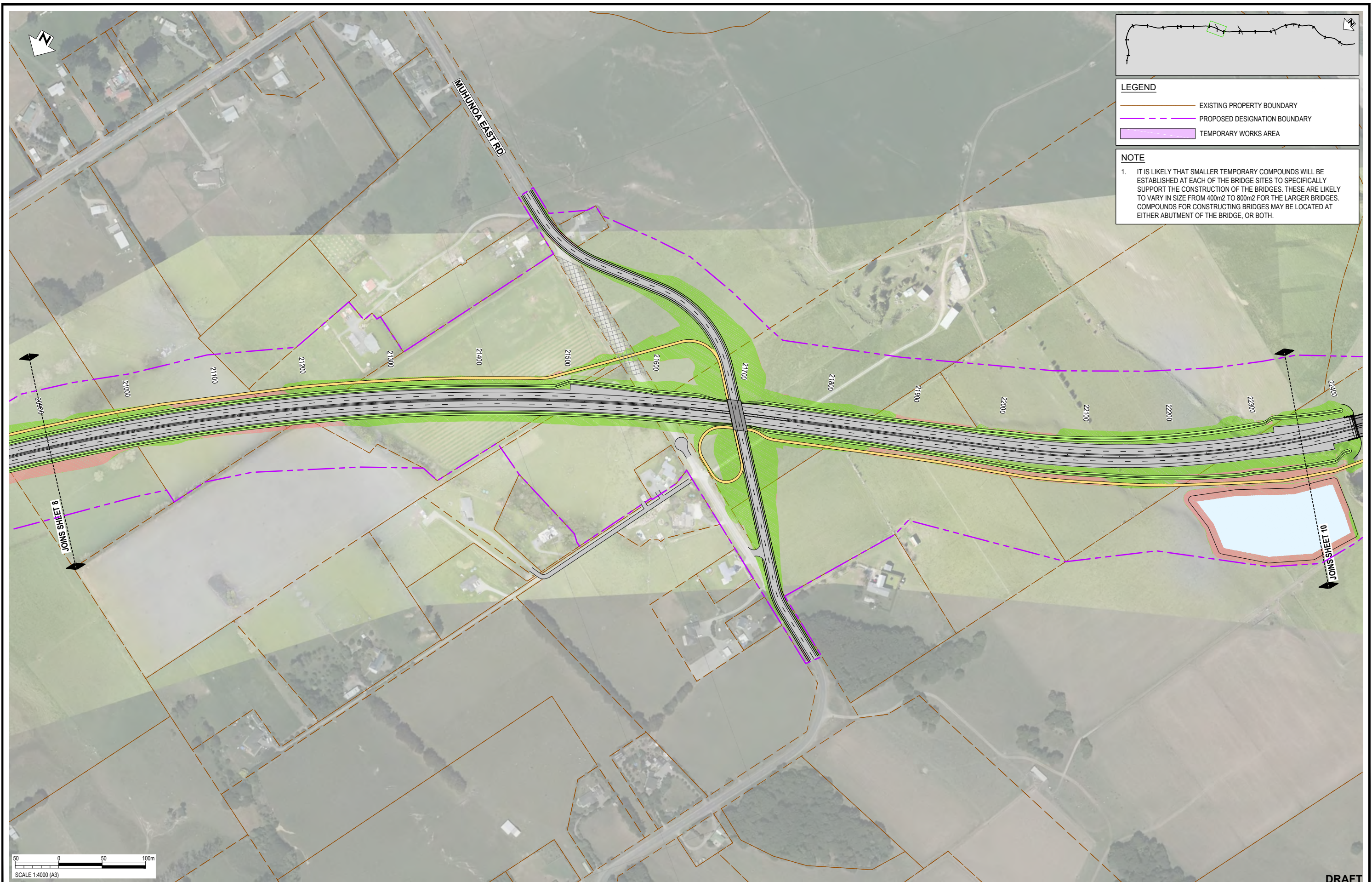
Client:




WAKA KOTAHI
 OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
 SHEET 8

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scales	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1007
Rev.	B



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21
		DRN	CHK	APP	DATE

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED
	Jamie Povall	Steve Sutton	Steve Sutton	Jamie Povall	Andy Wright	Jamie Povall
	11.11.21	11.11.21	08.12.21	08.12.21	14.04.22	18.04.22

Client:

WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 9

FOR CONSENT
Date Stamp 20.04.22
Scale: 1 : 4000 (A3)
Drawing No. 310203848-01-500-C1008
Rev. B



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED	DATE
	Jamie Povall	Steve Sutton	Steve Sutton	Jamie Povall	Andy Wright	Jamie Povall	11.11.21 11.11.21 08.12.21 08.12.21 14.04.22 18.04.22



Client: **WAKA KOTAHI**
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 10

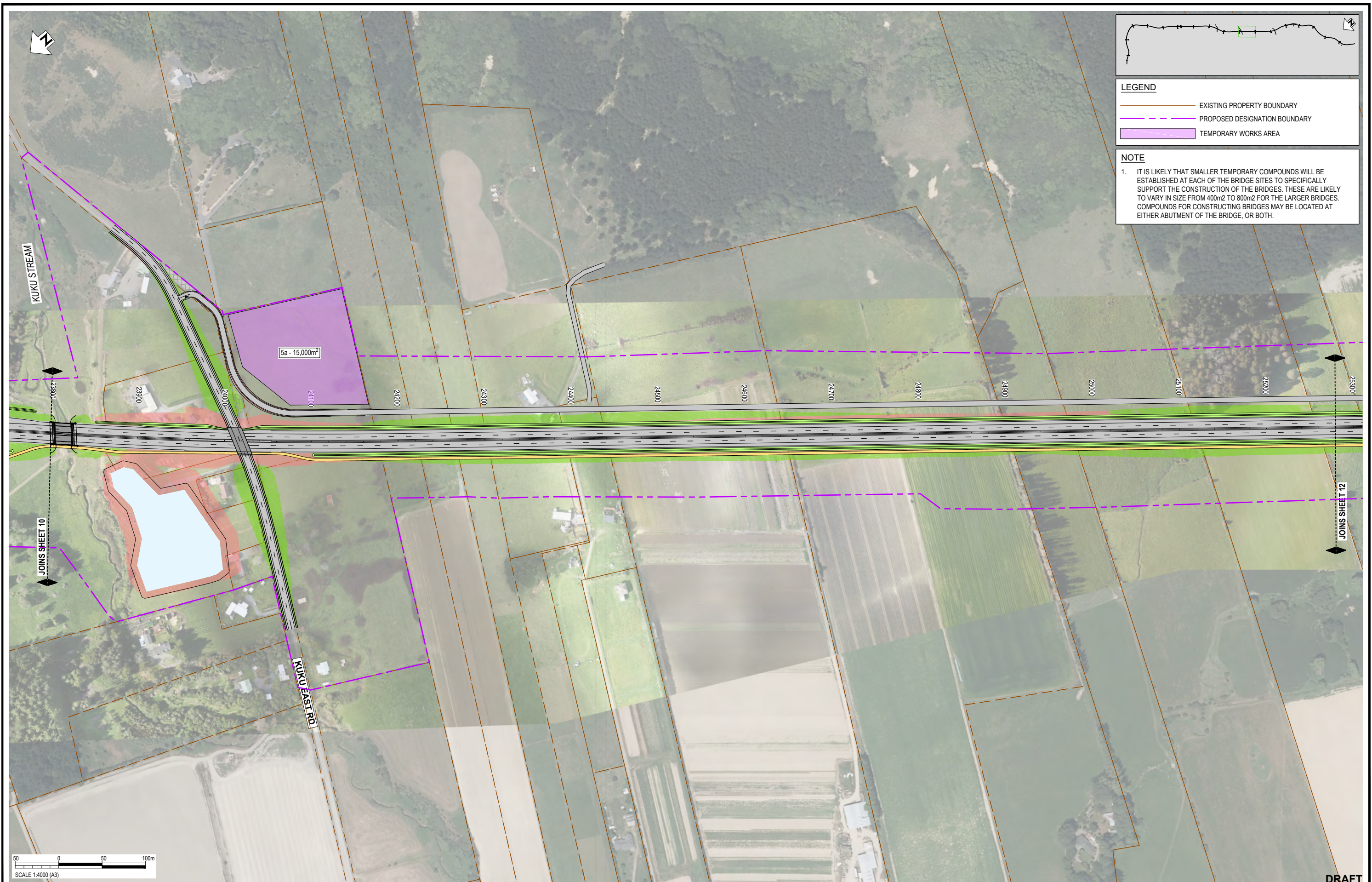
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Date Stamp: **20.04.22**

Scales: 1 : 4000 (A3)

Drawing No: **310203848-01-500-C1009**

Rev: **B**



LEGEND

	EXISTING PROPERTY BOUNDARY
	PROPOSED DESIGNATION BOUNDARY
	TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

REV	DESCRIPTION	DRN	CHK	APP	DATE
B	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	20.04.22
A	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	09.12.21

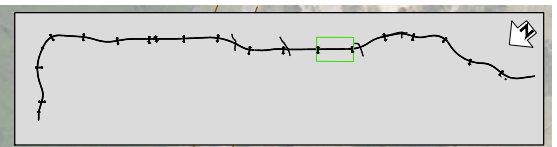
SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED
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					14.04.22	18.04.22

Client:

WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 11

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scale	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1010
Rev.	B



LEGEND

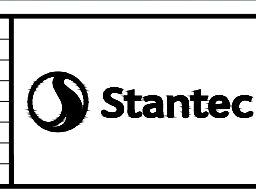
- EXISTING PROPERTY BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21

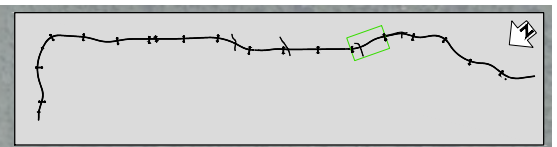
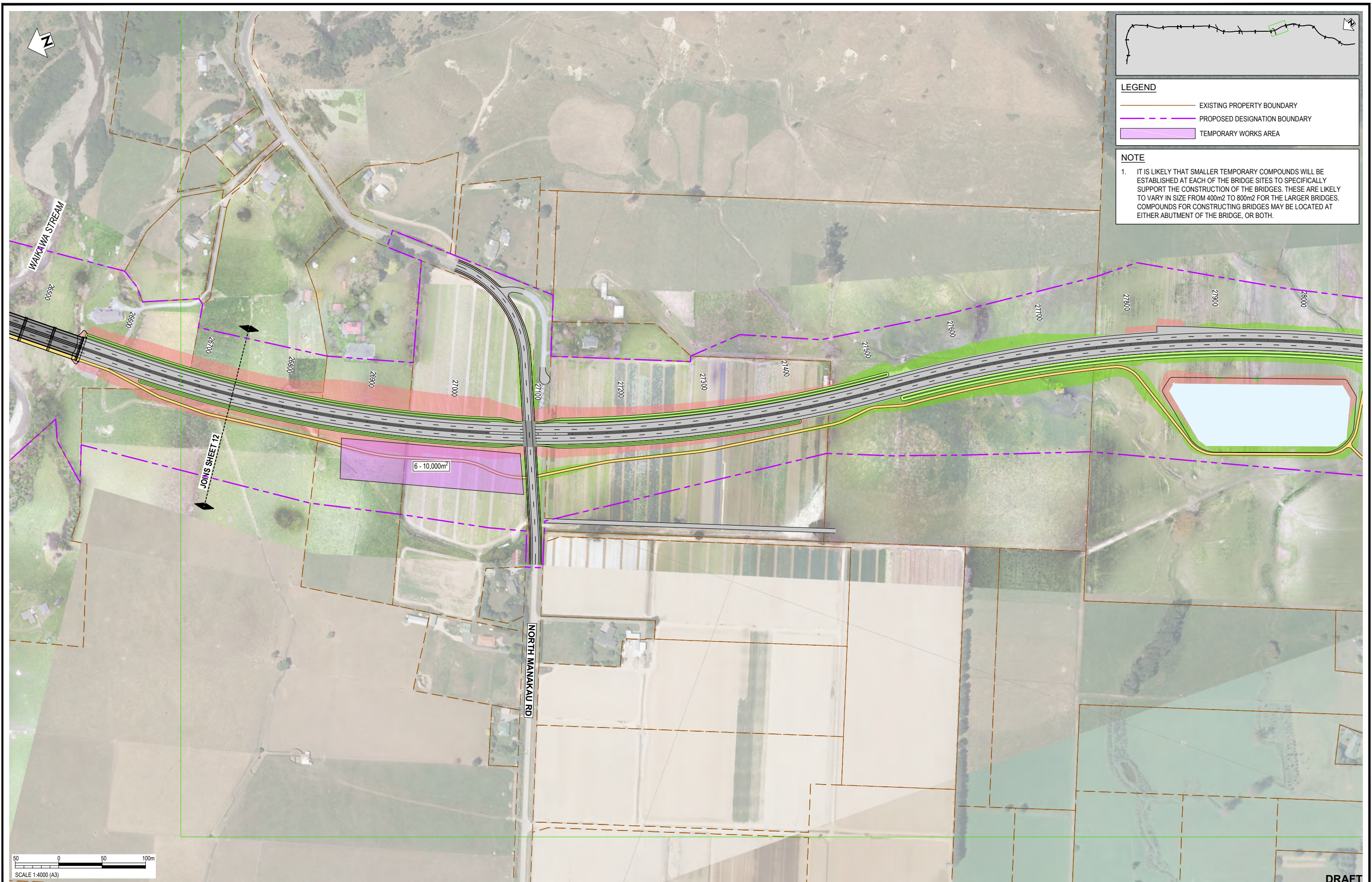
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	Jamie Povall	Steve Sutton	Steve Sutton	Jamie Povall	Andy Wright	Jamie Povall	11.11.21 11.11.21 08.12.21 08.12.21 14.04.22 18.04.22



Client: WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 12

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scale	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1011
Rev.	B



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.



DRAFT

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	20.04.22
A	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	09.12.21
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SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED	PROF REGISTRATION:
	Jamie Povall	Steve Sutton	Steve Sutton	Jamie Povall	Andy Wright	Jamie Povall	

Client:




WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
 SHEET 13

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scales	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1012
Rev.	B



LEGEND

	EXISTING PROPERTY BOUNDARY
	PROPOSED DESIGNATION BOUNDARY
	TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

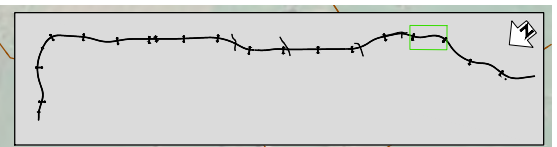
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B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21
REV		DRN	CHK	APP	DATE

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED	PROF REGISTRATION
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	11.11.21	11.11.21	08.12.21	08.12.21	14.04.22	18.04.22	

Client: **WAKA KOTAHI**
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 14

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scales	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1013
Rev.	B



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21
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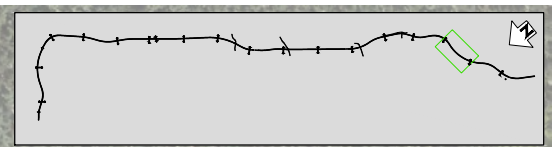
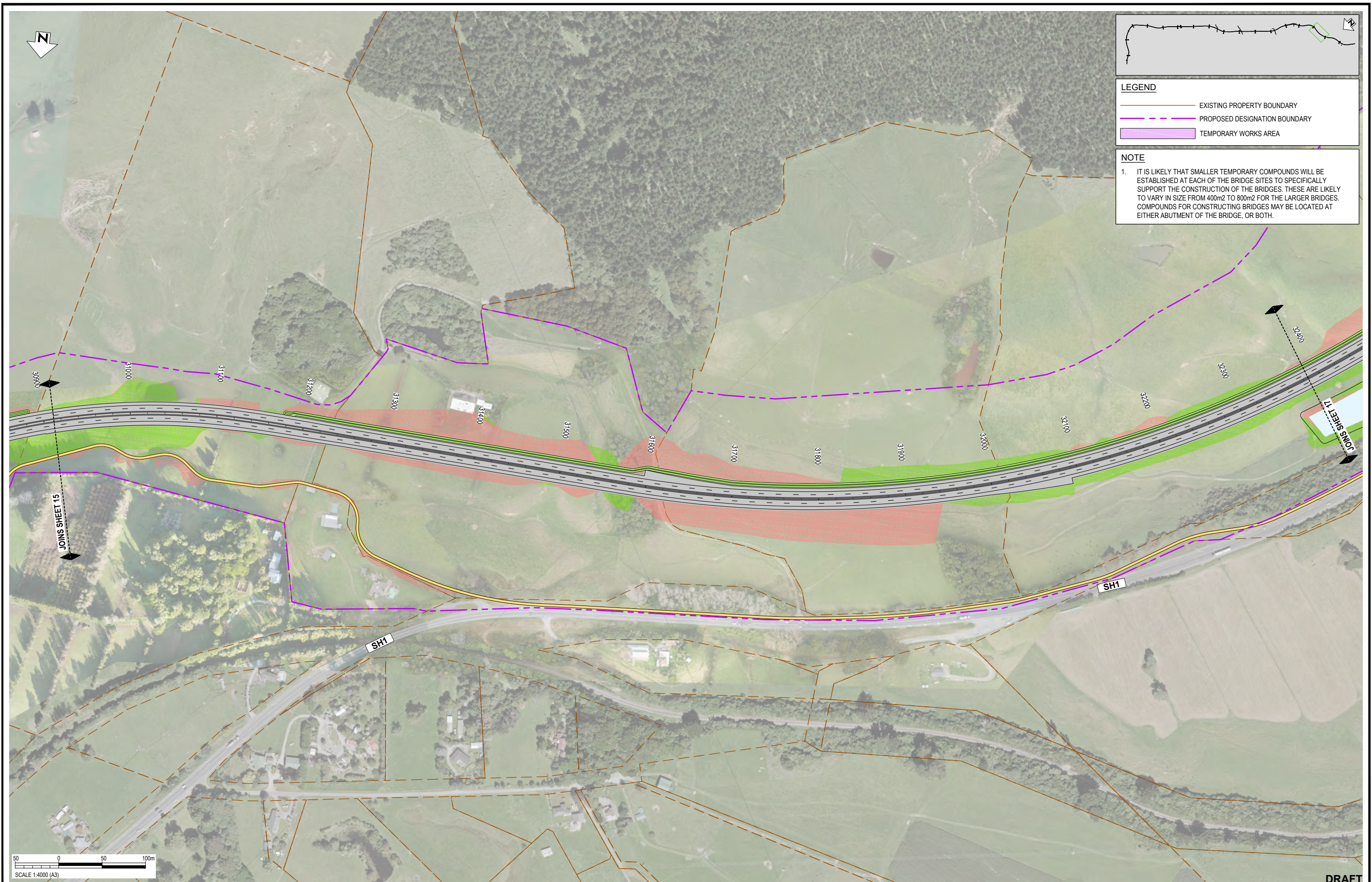
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	11.11.21	11.11.21	08.12.21	08.12.21	14.04.22	18.04.22	



Client: **WAKA KOTAHI**
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 15

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scales	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1014
Rev.	B



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

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SCALE 1:4000 (A3)

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REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21
		DRN	CHK	APP	DATE

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED	DATE
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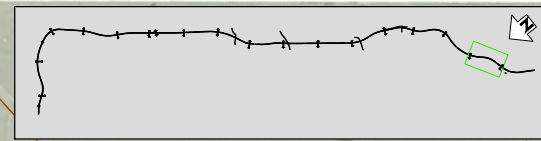
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WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 16

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scale	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1015
Rev.	B



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- TEMPORARY WORKS AREA

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

SCALE 1:4000 (A3)

DRAFT

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	DATE
B	ISSUED FOR CONSENT - DRAFT				20.04.22
A	ISSUED FOR CONSENT - DRAFT				09.12.21
		DRN	CHK	APP	DATE

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED	DATE
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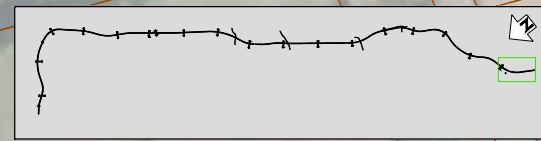
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WAKA KOTAHI
OTAKI TO NORTH OF LEVIN

ACCOMMODATION WORKS
SHEET 17

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scale	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1016
Rev.	B



LEGEND

- EXISTING PROPERTY BOUNDARY
- - - PROPOSED DESIGNATION BOUNDARY
- Temporary Works Area

NOTE

1. IT IS LIKELY THAT SMALLER TEMPORARY COMPOUNDS WILL BE ESTABLISHED AT EACH OF THE BRIDGE SITES TO SPECIFICALLY SUPPORT THE CONSTRUCTION OF THE BRIDGES. THESE ARE LIKELY TO VARY IN SIZE FROM 400m² TO 800m² FOR THE LARGER BRIDGES. COMPOUNDS FOR CONSTRUCTING BRIDGES MAY BE LOCATED AT EITHER ABUTMENT OF THE BRIDGE, OR BOTH.

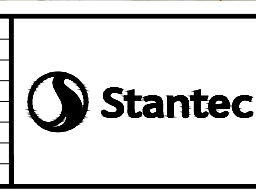
SCALE 1:4000 (A3)

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	20.04.22
A	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	09.12.21
		DRN	CHK	APP	DATE

REVISIONS

REV	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	20.04.22
A	ISSUED FOR CONSENT - DRAFT	SS	AW	JP	09.12.21
		DRN	CHK	APP	DATE

SURVEYED		
DESIGNED	Jamie Povall	11.11.21
DRAWN	Steve Sutton	11.11.21
CAD REVIEW	Steve Sutton	08.12.21
DESIGN CHECK	Jamie Povall	08.12.21
DESIGN REVIEW	Andy Wright	14.04.22
APPROVED	Jamie Povall	18.04.22
PROF REGISTRATION:		



Client: WAKA KOTAHI
 OTAKI TO NORTH OF LEVIN
 ACCOMMODATION WORKS
 SHEET 18

Status Stamp	FOR CONSENT
Date Stamp	20.04.22
Scale	1 : 4000 (A3)
Drawing No.	310203848-01-500-C1017
Rev.	B

DRAFT