15 July 2022

Job No: 64872#BEE2

eTrack No: 200041623

Attention: Matt Doughney

Highbrook Living Limited

HIGHBROOK PRIVATE PLAN CHANGE REQUEST – PRELIMINARY LAND CONTAMINATION REVIEW

Dear Matt

Background

Babbage Consultants Limited (Babbage) was engaged by Highbrook Living Limited to undertake a desktop study to support a private plan change request to re-zone a portion of land (herein referred to as the site) they hold, which forms part of a larger property at 8 Sparky Road (LOT 2 DP 209362), Otara, Auckland (herein referred to as the property). The land to be included in the proposed private plan change request has an area of approximately 4.4 ha, as shown in Map No. 1 (attached) and is currently zoned Business – Light Industry under the Auckland Unitary Plan Operative in Part (AUP OP). The private plan change request seeks to re-zone the site to high density residential land use.

The desktop study was limited to a review of historical aerial photographs covering the area and received Auckland Council property files to identify current or historical potential contamination sources at the site. The findings of this review are presented below.

The site

The site forms part of the larger former Ōtāhuhu power station property, which was closed in 2015.

According to Auckland Council (AC) GeoMaps website[1], the site is bounded by Highbrook Drive to the east, Tāmaki River (estuary) to the north and west, the Southern Motorway to the west, and Highbrook Drive off ramp to the south. The site slopes steeply to the north and west, with a fall of some 6 m. The Otara Creek flows into the Tamaki River to the east of the site.

[1] AC October 11 2021. Auckland Council GeoMaps. Retrieved from https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html

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Review of aerial photographs

Aerial photographs sourced from AC GeoMaps website, Google Earth Pro[2] and Retrolens website[3] were reviewed to identify past land uses at the site and the immediately surrounding area. In summary, the following was observed at the site:

- The site was used as pastoral land until the late 1960s.
- The eastern portion of site developed into a diesel fuel above ground storage tank (AST) farm and containment berm as part of Ōtāhuhu power station in the late 1960s.
- The south-western and north-eastern portions of the site were subject to land reclamation activities between 1967 and 1979.

The Ōtāhuhu power station was later decommissioned in 2013[4]. A summary of historical aerial photographs is provided in Attachment 1 and copies of selected historical aerial photographs are presented in Appendix A.

Review of Auckland Council property files

The key documents and findings related to the site and nearby areas are summarised in Table 1 below. The investigation works are attached in Attachment 2 and the results of the documents assessed are presented in Appendix B. Map No. 2 attached shows the location of the former investigation works areas.

Table 1. Summary of reviewed documents.

Document	Summary of findings
Ōtāhuhu Peaker Project Ground Contamination Assessment by Tonkin & Taylor Ltd (T&T) 2011[5]	Twenty-two test pits across the property, in particular Fill Area A, Fill Area C, west of Ōtāhuhu B Power Station, former inlet that existed south of the holding pond, the former AST farm that existed west of the holding pond, and a separate smaller AST farm located east of Ōtāhuhu A Power Station. Concentrations of metals, polycyclic aromatic hydrocarbons (PAH), total petroleum

[2] Google Earth 11 October 2021. Google Earth Pro 2021. Retrieved from https://earth.google.com/web/search/highbrrok+drive/

[3] Local Government Geospatial Alliance 11 October 2021. Retrolens Historic Image Resource. Retrieved from http://retrolens.nz/

[4] T&T October 2012. Ground Contamination Desk Study – Ōtāhuhu Power Station.

[5] Babbage was not provided with T&T 2011 report. Information summarised from Ground Contamination Desk Study by T&T 2015.

Document	Summary of findings
	hydrocarbons (TPH) were detected below NESCS[6] Soil Contaminant Standards (SCSs) for high density residential land use and Auckland Unitary Plan permitted activity (AUP PA) criteria[7] (both herein referred to as the applicable proposed land use criteria). Groundwater collected from one test pit was reported below Australian and New Zealand Environment and Conservation Council (ANZECC)[8] 95% freshwater species for PAH and TPH below 85 milligrams per litre (mg/l).
Ground Contamination Desk Study by T&T 2015	Discrete areas throughout the Ōtāhuhu Power Station property, of which the site forms part of, have been subject to past activities that have the potential to cause ground contamination. T&T further noted that concentrations present are unlikely to constrain re-use of the site for commercial/industrial activities and that contaminants appear predominantly restricted to near surface soils.
Detailed Site Assessment by Geosciences Ltd (GSL) 2018	Ten soil samples within a separate smaller AST tank farm area located east of Ōtāhuhu A Power Station, five soil samples from former underground storage tank area, and four soil samples from former transformer area (within Ōtāhuhu Power Station property but over 600 m south-east from proposed plan change site area). Concentrations of metals, PAH, TPH, BTEX (benzene, toluene, ethylbenzene, and xylene), and polychlorinated biphenyls (PCB) were detected below the applicable proposed land use criteria.
Contamination Assessment of Proposed Highbrook Drive Intersection Works by GSL 2019	Ten test pits across former AST tank farm on east side of the site (investigated portion east of Highbrook Drive only). Concentrations of metals, PAH, and TPH were detected below the applicable proposed land use criteria. Based on these results, GSL concluded that *"the soil in the area of proposed earthworks is highly unlikely to present a risk to human health, or the environment."*

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

[7] AC 2016. Auckland Unitary Plan Chapter E30.6.1.4 permitted activity soil acceptance criteria.

[8] ANZECC 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

A more detailed summary of the above reviewed documents is presented in Attachment 2. Map No. 2 attached shows the location of the former investigation works areas.

Discussion

Babbage notes that the site requested to be rezoned has not had an intrusive environmental investigation performed on it. Based on the records and historical aerial photographs reviewed, Babbage has identified five areas that have potentially impacted soil from previous site activities. The areas, potential constituents of concern within each area, commentary on soil impacts, and probability of impacts to soil are presented in Figure 1 and Table 2 below.

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CLIENT / PROJECT

Stonehill Trustees

Highbrook Private Plan Change

MAP TITLE

Map No 2. Former Investigations and Soil Disturbed Areas - Potential Contaminated Land

MAP REVISIONS

06/04/2022	Initial version by TT.

Legend

- 8 Sparky Road Site
- Highbrook Site Boundaries

Potential Contaminated Land Areas - Highbrook Site

- Area 1 - Reclamation (1969 - 1979)
- Area 2 - Reclamation (1967)
- Area 3 - Former Tank Farm (1967 - 2003)
- Area 4 - Former Construction Yard Area (2006)
- Area 5 - Soil/Fill Material Stockpiled (2006)

Former Intrusive Investigations

- Areas of T&T 2011 Investigation
- T&T 2011
- T&T 2011
- Not Investigated
- Area of GSL2018 DSI Investigation
- Area of GSL2019 Investigation

NOTES
Aerial Images - LINZ Basemap
Land Parcels - Auckland Council Geomaps

DISCLAIMER:
This map/plan is not an engineering draft.
This map/plan is illustrative only and all information should be independently verified on site before taking any action.

SCALE

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MAP NO.

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Table 2. Probability of contaminated areas with exceedances above the NESCS SCS for residential land use and AUP PA criteria.

Area	Potential contaminants of concern	Commentary on potential soil impacts	Probability of exceedances in soil
Area 1 – South-western portion (reclaimed land 1969-1979)	Unknown source and quality of reclamation fill material. Potential contaminants: Metals, PAH, TPH, polychlorinated biphenyls (PCB), and asbestos containing material (ACM).	Estimated reclaimed land area cover is approximately 8% of the total site area. T&T 2015 estimated the depth is likely to be between 0.5-5 m based on topography. Based on the constituents of concern, soil impacts can be managed or remediated if encountered.	High-medium likelihood considering the uncontrolled practices of waste disposal during that period.
Area 2 – North-eastern portion (reclaimed land 1967)	Unknown source and quality of reclamation fill material. Potential contaminants: Metals, PAH, TPH, PCB, and ACM.	Estimated reclaimed land area cover is approximately 6% of the total site area with depth estimated between 0.5-5 m (T&T 2015). Based on the constituents of concern, soil impacts can be managed or remediated if encountered.	High likelihood considering the uncontrolled practices of waste disposal during that period and visual observation of potential ACM.
Area 3 – Former tank farm within the site (1967-2003)	Unknown source and quality of fill material for containment berm and historical spills from ASTs. Potential contaminants: Metals, PAH, TPH and ACM.	Estimated area cover is approximately 9.5% of the site near the northern border of Highbrook Drive. T&T (2011) and GSL (2019) investigation at the southern border of the road showed concentrations were below the applicable proposed land use criteria and no groundwater have been affected by soil contamination. T&T (2015) mentioned that extensive earthworks (19,000 m^3 of imported cleanfill and 3,000 m^3 of cut) was undertaken for proposed reshaping the northern border of the road which falls within the site. Based on the constituents of concern. soil impacts can be managed or remediated if encountered.	Low likelihood based on the investigations on nearby areas and earthworks undertaken on site for Highbrook Drive construction.
Area 4 – Former construction yard area (2004-2008)	Surficial soil contamination from stored material and hazardous substances. Potential contaminants: Metals, PAH, and TPH.	Estimated area covers approximately 10% of the total site area. Estimated period of this activity comprised 4 years (2004-2008) based on T&T 2015 report. Based on the constituents of concern, soil impacts can be managed or remediated if encountered.	Low likelihood considering the short period of exposure and legislative requirements on storage and handling of hazardous materials.

Area	Potential contaminants of concern	Commentary on potential soil impacts	Probability of exceedances in soil
Area 5 – Southern area (Fill Area B placed 2006)	Burn off area for domestic waste and dump area of Ōtāhuhu site for general and industrial waste and hardfill (T&T 2015). Potential contaminants: Metals, PAH, TPH, PCB, organochlorine pesticides (OCP), volatile organic compounds (VOC), semi-volatile organic compounds (SVOC) and ACM.	Estimated area cover is approximately 19.5% of the total site area. Investigations carried out by T&T 2011 in dump sites A and C nearby showed concentrations of contaminants detected below the applicable proposed land use criteria. Due to the public access made available to this dump area, there may be other constituents of concern not tested for in previous environmental assessments. Based on the constituents of concern, soil impacts can be managed or remediated if encountered.	Medium-low likelihood based on the nearby investigations and relatively recent (2006) use as dump site.

This table above shows that the five areas that have potentially impacted soil from previous site activities cover approximately half of the site area, however approximately 33% of the site area has medium or high likelihood to present soil contamination which may exceed the applicable human health and environment guidelines. These areas comprise of reclaimed land areas (Areas 1 and 2) near the Tamaki River bank and the Fill Area B (Area 5). It is anticipated that the other two areas (Areas 3 and 4) will have a low likelihood of encountering soil impacts above the applicable proposed land use criteria

In the event that soil impacts are encountered above the applicable proposed land use criteria, implementation of remediation/management practices can be adopted to remove or isolate those impacts. Therefore, based on the information reviewed, there are no known soil contaminant impacts that would impede land change use or development of the site as high-density residential use. The potential land remediation works can be completed at the land development phase, in accordance with the requirements of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health 2011.

Yours sincerely

Tiago Teixeira
Chemical Engineer

Hiram Garcia
Principal Environmental Consultant

Babbage Consultants Limited

Attachments: Applicability and Limitations

Attachment 1 – Table A1 – Historical Aerial Photographs Review

Attachment 2 – Table A2 – Summary of Reviewed Investigation Reports

Appendix A – Historical Aerial Photographs

Appendix B – T&T 2011 and 2015 Records and Geoscience 2019 Records

APPLICABILITY AND LIMITATIONS

Restrictions of Intended Purpose

This report has been prepared solely for the benefit of Babbage Consultants Limited as our client with respect to the brief. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

Legal Interpretation

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

Maps and Images

All maps, plans, and figures included in this report are indicative only and are not to be used or interpreted as engineering drafts. Do not scale any of the maps, plans or figures in this report. Any information shown here on maps, plans and figures should be independently verified on site before taking any action. Sources for map and plan compositions include LINZ Data and Map Services and local council GIS services. For further details regarding any maps, plans or figures in this report, please contact Babbage Consultants Limited.

Reliability of Investigation

Babbage has performed the services for this project in accordance with the standard agreement for consulting services and current professional standards for environmental site assessment. No guarantees are either expressed or implied.

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

Table A1. Historical aerial photographs review.

Year	Site	Surrounds
1940	Pastoral land use.	Pastoral land use.
1958	Pastoral land use.	Pastoral land use. A road and bridge extending over Tamaki River is visible to the west. Electric pylons visible to the south-east.
1967	Construction of two ASTs and containment berm in progress on eastern portion. Reclamation activities on the north-eastern portion of the site, at the riverbank of Tamaki River.	Development of Ōtāhuhu power station to the east.
1969	Construction of ASTs and containment berm appear complete. Land reclamation observed in progress in the south-west portion of the site.	Continued development of Ōtāhuhu power station to the east. Large holding pond observed to the east of the ASTs.
1972	No significant changes observed.	Large holding pond appears to be dry.
1979	Reclamation in the south-western portion is complete and a barge dock appears to be present. A jetty appears to be constructed into the Tamaki River.	A second pond is visible to the south-east of the ASTs.
1980	Some stockpiled material is visible to the north-east of the rectangular feature in the southern area of the site.	No significant changes observed.
1988	North-eastern portion of the site appears to be used as a construction yard. The rectangular feature in the south-western corner of the site has been removed.	No significant changes observed.
1996	The construction yard in the north-eastern portion of the site appears to have been removed.	The second pond to the south-east of the ASTs is no longer visible.
2001	No significant changes at the site.	The Ōtāhuhu B power station has been constructed south-east of the site.

Year	Site	Surrounds
2003/2004	The ASTs have been removed although their footprints and containment berm are still visible. A roadway is visible from the ASTs leading south-west.	No significant changes observed.
2006	The eastern part of the site has been subject to earthworks associated with the construction of Highbrook Drive along the eastern site boundary. The north-eastern portion of the site appears to be being used as construction yard for the road works. The roadway though the centre of the site appears to have been widened and extended to the yard in the north and to a site access from the Southern Motorway in the south-west portion of the site. Soil/fill material appears to have been stockpiled in the south-western part of the site.	A stormwater pond has been constructed between the motorway and the site. Placement of fill appears to be ongoing to the east of the northern part of the site where the former AST containment area was. Construction works for the bridge over the Otara Creek are visible to the east of the site.
2008	Highbrook Drive has been completed and areas adjacent to the road converted to grass or plantings.	Electric pylon visible between motorway and the north-western corner of the site.
2010-2011	The construction yard in the northern part of the site appears to be gone. The south-western corner of the site appears to have been levelled and is grassed.	No significant changes observed.
2017	No significant changes on site.	A large area between Highbrook Drive and the power station has been cleared of vegetation, and hardfill placed for use as a vehicle parking area. Stockpiled material is visible between the Highbrook Drive and the pond.
2021	No significant changes on site.	The large pond to the east of the site has been partially drained and earthworks are occurring in this area. Hardstand area to the west of Ōtāhuhu B power station has increased.

Table A2. Summary of reviewed investigation reports.

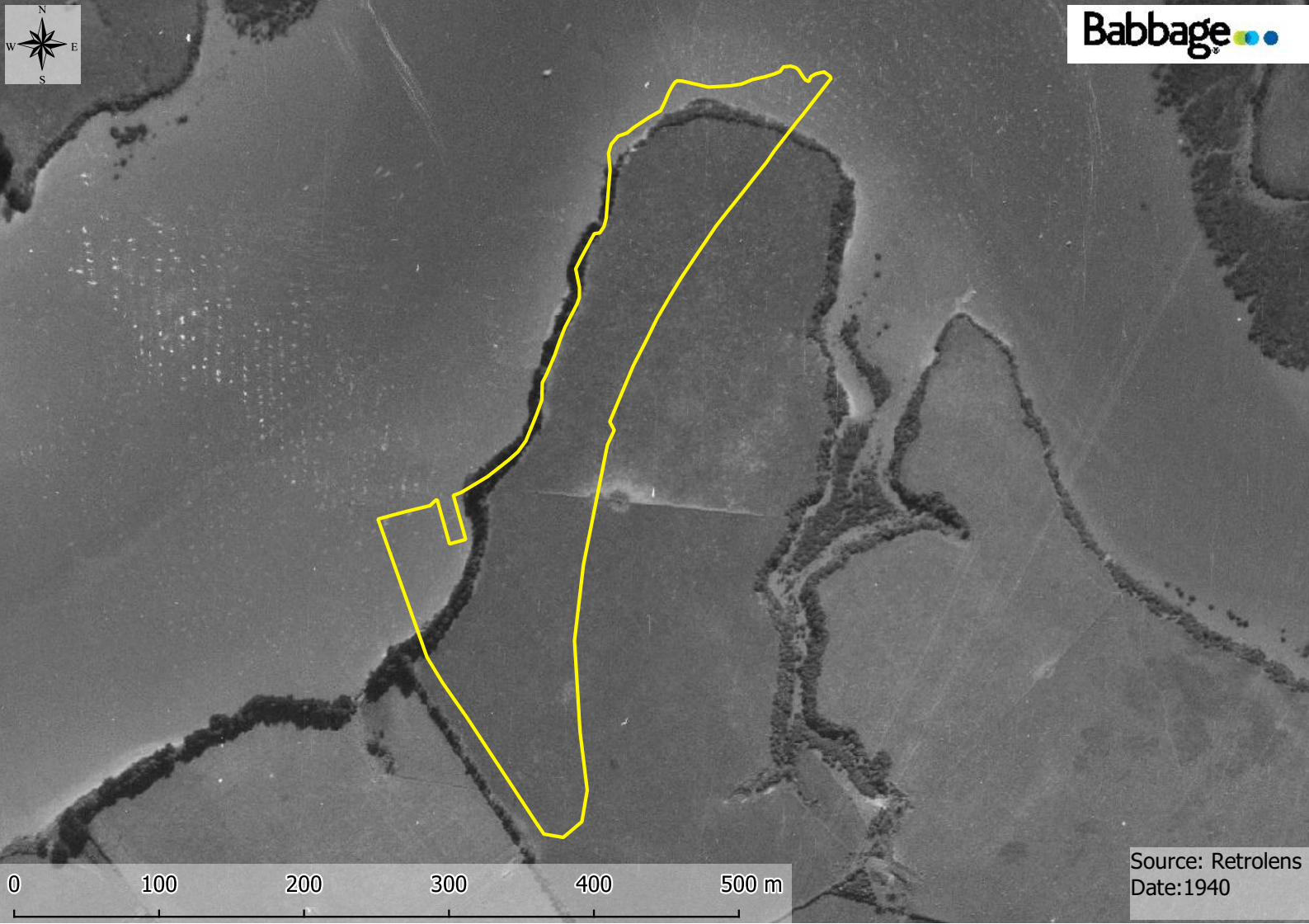
Tonkin & Taylor Ltd, 2015. Ground Contamination Desk Study, Ōtāhuhu Power Station. Job Number 31228.v2.2, Prepared for Contact Energy Ltd, October 2015.
T&T carried out this preliminary site investigation (PSI) for the whole 8-10 Sparky Road site. The investigation included a desktop study and a site visit. A summary of key findings is listed below. Site visit: • Potential asbestos material used in the reclamation area near the weir was observed during the site visit (north-eastern site corner, refer T&T Photograph A-61). • Ōtāhuhu Power station staff provided information relating to three historic fill areas located on the western portion of the site (Fill Area A, Fill Area B and Fill Area C), however just Area B is located at the southwestern portion of the site. This area was used as the burn-off area for the nearby village and the Ōtāhuhu site for general and industrial waste and hard fill. Refer Appendix B (Google Earth image of T&T Appendix B). Property file review in relation to site: • No consents prior to 1997. • Use of cleanfill material (19,000 m^3) over the former tank farm for road construction purposes (Highbrook Drive). Refer GHD earthworks drawing No. 51-19638-SK779 Rev B – 2005 Approval (Appendix B). • No recorded spill incidents for the site. T&T summarised soil investigation work carried out in August 2010 and reported in 2011 (T&T 2011). Refer to investigation area indicated on T&T Figures 3 and 4 in Appendix B. Selected soil samples were analysed for metals, TPH and PAH. Groundwater was collected from test pit TP2 and analysed for PAH and TPH. Excavations in the former tank farm area encountered fill comprising silt with minor sand and clay. A strong hydrocarbon odour was recorded in the fill material and groundwater at 2.5 m below ground level (m bgl) in the test pit TP2. Groundwater was encountered in the majority of the test pits approximately 0.5 to 1 mbgl. According to T&T, the majority of results are present below background values (non-volcanic) for metals, PAH and TPH. There are some concentrations of metals, pyrene and BAP equivalent that are present at levels above the published background, statistical analysis of these results indicates that following statistical analysis most elevated results fall below background for all contaminants except benzo(a)pyrene (BAP) equivalent. Laboratory results were below the NESCS SCS for residential land use 10% produce and for AUP PA criteria. Results of groundwater of TP2 show concentrations of PAH at or below both ANZECC 80% and 95% freshwater protection levels and total petroleum hydrocarbons were detected in all three ranges, but at relatively low levels (0.14 to 85 mg/l). According to T&T concentrations are low enough not to cause an ongoing

risk to either human health or the surrounding receiving environment. The 2011 investigation concluded that while fill across the site includes refuse in isolated areas, generally contaminant concentrations are relatively low and are below relevant human health and environmental criteria. Based on the data collected from the 2011 investigation contamination was not expected to present constraints on future commercial development of the investigated area of the site, with the exception of the cost of disposal of excavated materials to a managed or licenced landfill if they could not be reused on site. Table 6.1 of the T&T report indicated areas with potential for ground contamination the areas of reclamation and filling around the coastlines (former barge dock and weir); fuel and chemical storage area; and landfill sites.
Geosciences Ltd, 2018. Detailed Site Investigation (DSI), Former Ōtāhuhu Power Station, Investigation of Historic Tank Farm, Underground Storage Tank and Transformer Bay. Reference Number: Rep-1210a/DSI/Dec18/Rev1¸Prepared for Stonehill Property Trust, 31 December 2018, Revised 5 April 2019.
This DSI investigation scope areas were tank farm east of Ōtāhuhu A Power Station, underground storage tank and former transformer. The works carried out and key findings are described below: Tank farm: • Excavation of eight test pits followed by 10 analyses of soil for TPH, PAH and BTEX. Underground storage tank (UST): • Excavation of one test pit and collection of five soil samples for analysis of heavy metals, TPH, PAH and BTEX. Former transformer: • Collection of five surficial soil samples followed by analyses of four soil samples for heavy metals, TPH and PCB. The analytical results showed minor detection of PAH compounds (just one result of BAP in one sample for UST area). Remaining analytical results were within the expected naturally occurring background ranges for volcanic soils of the Auckland Region. GSL concludes that earthworks within the footprint of this area of former Ōtāhuhu Power Station are highly unlikely to present any risk to human health or the environment. Furthermore, no further specific remediation or management is required for within the piece of land covered under this investigation.

Geosciences Ltd, 2019. Contamination Assessment of Proposed Highbrook Drive Intersection Works. Reference Number: Ltr-1210c/Oct19, Prepared for NZ Storage Holdings Ltd, dated 18 October 2019.
GSL carried out an environmental assessment to investigate the soil quality of the area where has been proposed the construction of a new intersection on Highbrook Drive. The area of the proposed road intersection falls within the footprint of the former AST tank farm on the east side of the site. The first stage involved the excavation of 11 test pits with a total of 16 soil samples recovered (five of them composite samples) prior to the Highbrook Drive construction works. This investigation was reported as DSI addendum report (ref: Ltr-1210b-Jun19). The intrusive investigation works observed 1.0 m up to 2.5 m of mixed clay and hardfill highly compacted that likely, according to GSL, would extend the full extent of the earth bund. The analytical results showed that the concentrations were below the AUP PA criteria and NESCS SCS for residential land use 10% of produce (refer Appendix B). Some exceedances for volcanic background limits occurred for lead (three sample locations) and for petroleum hydrocarbons (traces of BAP was detected in eight sample locations and TPH C15-C36 in three sample locations). The second stage involved seven hand augers with seven soil samples recovered during the earthworks of the proposed development. Soil samples were recovered from depths of between 300 mm and 500 mm depth along the road verge. The soil was described as silty clay with abundant gravel inclusions and minor silty topsoil, refusal occurred in each hand auger hole due to gravel content. The analytical results returned with no exceedances of AUP PA criteria or NESCS SCS for residential land use 10% of produce (refer Appendix B). Exceedances of BAP were reported above the volcanic background limits. Based on these results, GSL concluded that *"the soil in the area of proposed earthworks is highly unlikely to present a risk to human health, or the environment."*

Appendix A

Historical Aerial Photographs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Source: Retrolens
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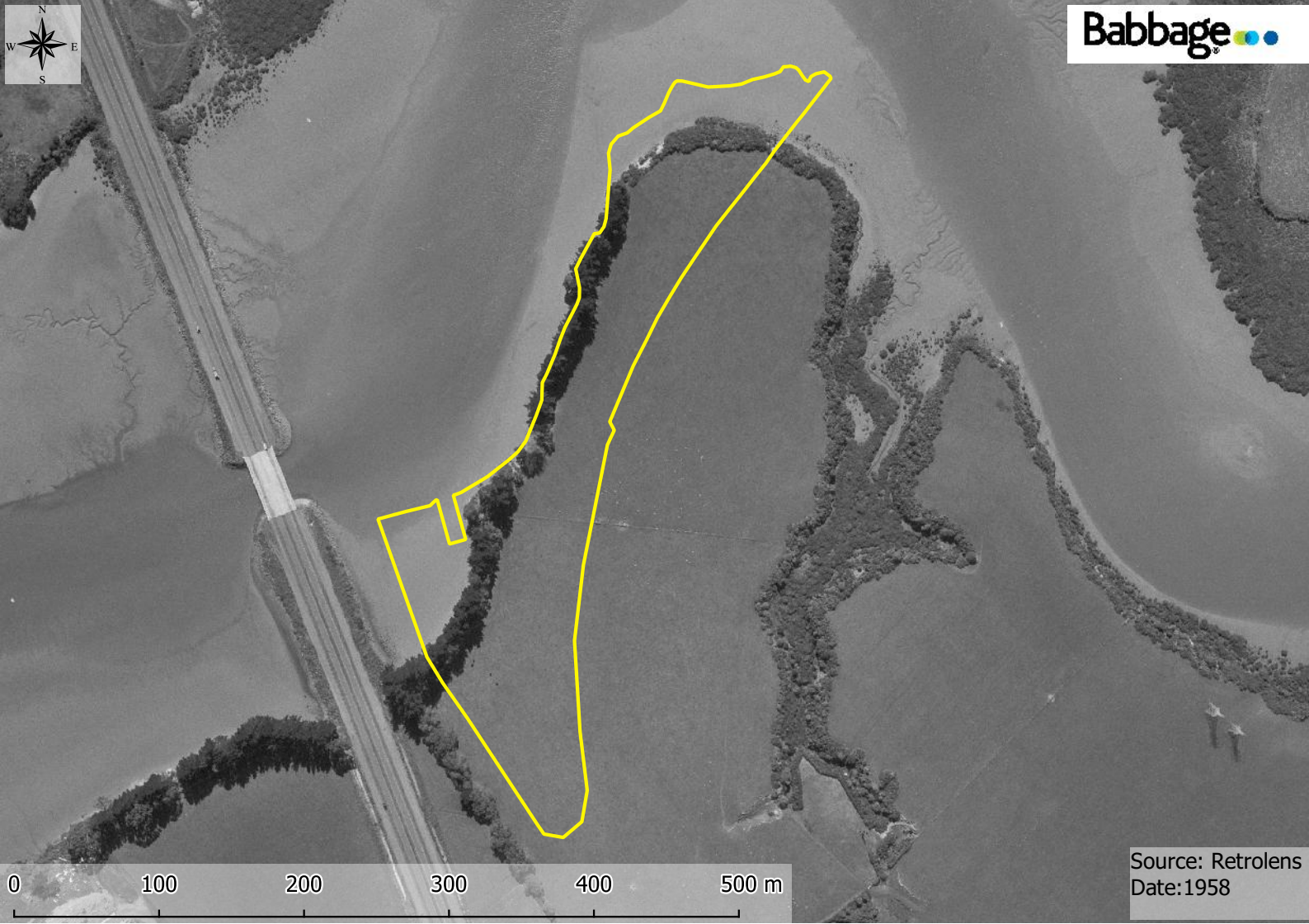
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Source: Geomaps
Date:2017


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Source: GoogleEarth
Date:2021

Appendix B

T&T 2011 and 2015 Records and Geoscience 2019 Records

Table C.1: Summary of 2010 soil results from the western portion of the site

Contaminants	Minimum	Maximum	Mean	95% UCL	NES Soil (Commercial/ Industrial)[1]	ALW/Unitary Plan Permitted Activity Criteria (Discharges)[2]
Metals						
Arsenic	3	19	5	6	70	100
Cadmium	<0.1	0.25	0.1	0.2	1,300	7.5
Chromium	11	67	34	39	6,300	400
Copper	3	43	22	25	240,000 [3]	325
Lead	12	70	25	30	3,300	250
Nickel	5	54	27	31	6,000 [3]	105
Zinc	21	125	59	70	400,000 [3]	400
PAH						
Naphthalene	<0.14	<0.17	-	-	210 [5]	16 (<1 m)[4] 270 (1-4 m)[4]
Pyrene	<0.03	0.25	-	-	-	NA[2]
B(a)P_{eq}.	<0.03	0.78	0.061	0.21	35	2.15
TPH						
C7-C9	<9	<12	-	-	500 [5]	500 (<1 m)[4] 500 (1-4 m)[4]
C10-C14	<20	<30	-	-	1,700 [5]	1,700 (<1 m)[4] 2,200 (1-4 m)[4]
C15-C36	<40	<50	-	-	NA [5]	NA[24]

Notes:

All values in mg/kg

NA indicates contaminant not limiting as estimated health based criterion is significantly higher than that likely to be encountered on site (i.e. 20,000 mg/kg for TPH, 10,000 mg/kg for other contaminants)

NC indicates 'Not Calculated' because all carcinogenic PAHs are below the laboratory limit of detection.

1 - MfE, April 2012. Users Guide: National Environmental Standard for assessing and managing contaminants in soil to protect Human Health (unless otherwise stated).

2 - ARP:ALW Permitted Activity Soil Criteria Schedule 10 - discharges (unless otherwise stated).

3 - National Environment Protection (Assessment of Site Contamination) Measure 1999 (Updated April 2013). Guideline on the Investigation Levels for Soil and Groundwater - Commercial/Industrial

4 - MfE 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Sandy silt, GW Protection 2 m depth.

5 - MfE 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Sandy silt, commercial/industrial use.

Table C.2: Summary of 2010 soil results from east of the tank farm

Contaminants	Minimum	Maximum	Mean	95% UCL	NES Soil (Commercial/ Industrial) [1]	ALW/Unitary Plan Permitted Activity Criteria (Discharges)[2]
PAH						
Naphthalene	<12	<17	-	-	210 [3]	16 (<1 m)[4] 270 (1-4 m)[4]
Pyrene	<0.03	0.04	-	-		NA[4]
$B(a)P_{eq}$.	NC	NC	-	-	35	2.15
TPH						
C7-C9	<8	<11	-	-	500 [3]	500 (<1 m)[4] 500 (1-4 m)[4]
C10-C14	<20	<30	-	-	1,700 [3]	1,700 (<1 m)[4] 2,200 (1-4 m)[4]
C15-C36	<40	<50	-	-	NA [3]	NA[4]

Notes:

All values in mg/kg

NA indicates contaminant not limiting as estimated health based criterion is significantly higher than that likely to be encountered on site (i.e. 20,000 mg/kg for TPH, 10,000 mg/kg for other contaminants)

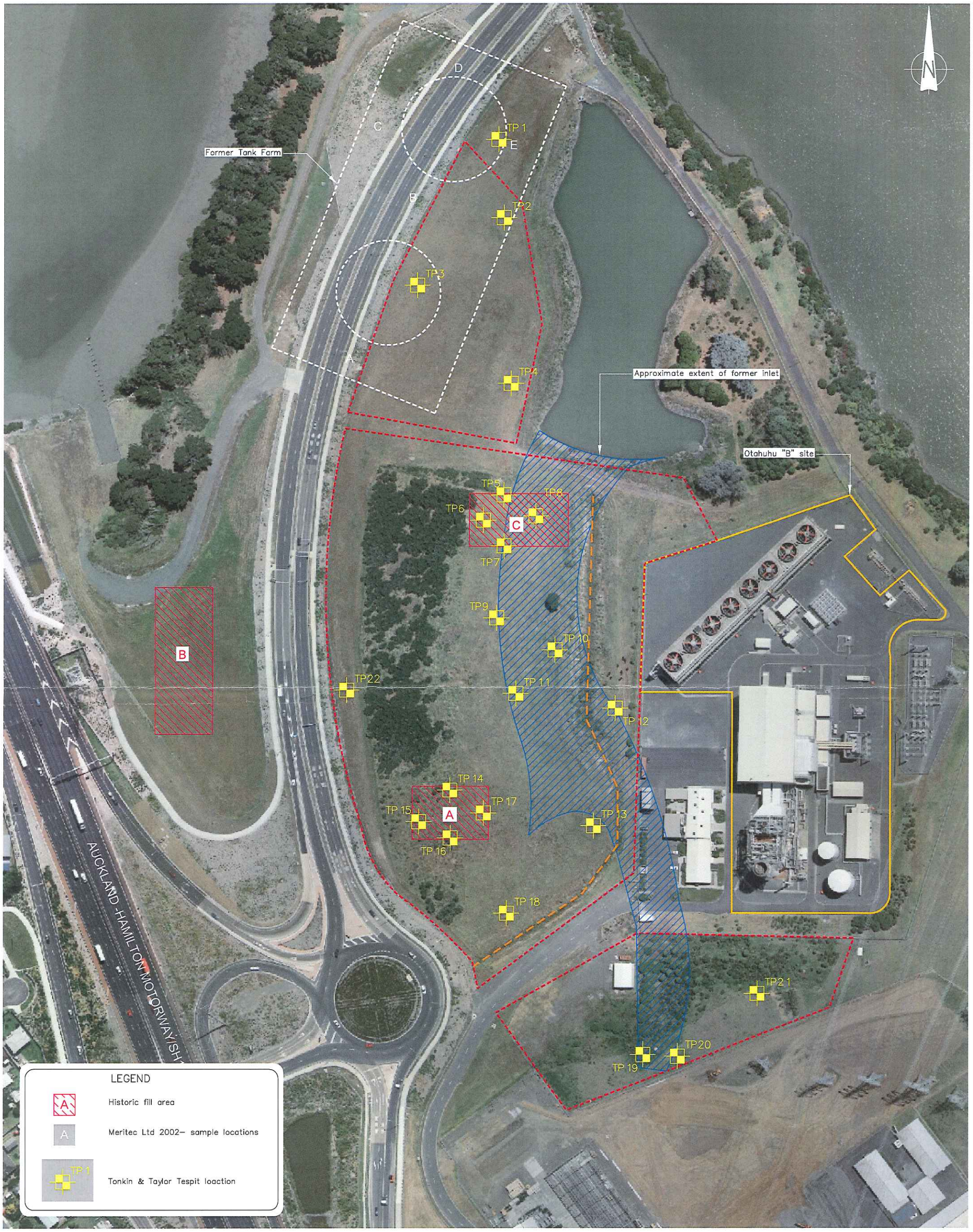
NC indicates 'Not Calculated' because all carcinogenic PAHs are below the laboratory limit of detection.

1 - MfE, April 2012. Users Guide: National Environmental Standard for assessing and managing contaminants in soil to protect Human Health (unless otherwise stated).

2 - ARP:ALW Permitted Activity Soil Criteria Schedule 10 - discharges (unless otherwise stated).

3 - MfE 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Sandy silt, commercial/industrial use.

4 - MfE 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Sandy silt, GW Protection 2 m depth.



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Aerial photo sourced from Terralink International
(Copyright 2002–2005 Terralink International Limited and its licensors)

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Tonkin & Taylor
Environmental and Engineering Consultants
105 Carlton Gore Road, Newmarket, Auckland
www.tonkin.co.nz

DRAWN	BNRB	Sep.10
DRAFTING CHECKED		9/10
APPROVED		9/10
CADFILE : 85220.001–F3.dwg		
SCALES (AT A3 SIZE) 1: 2000		
PROJECT No. 58220.001		

CONTACT ENERGY LTD
GROUND CONTAMINATION ASSESSMENT
PROPOSED TURBINE PLANT & TANK FARM
Site Investigation Plan

FIG. No. Figure 3

REV. 0

SCALE 1:500

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Aerial photo sourced from Terralink International (Copyright 2002–2005 Terralink International Limited and its licensors).

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Tonkin & Taylor Environmental and Engineering Consultants 105 Carlton Gore Road, Newmarket, Auckland www.tonkin.co.nz	DRAWN	BNRB Sep.10
	DRAFTING CHECKED	9/10
	APPROVED	9/10
	CADFILE : \\85220.001-F4.dwg	
	SCALES (AT A4 SIZE) 1:500	
	PROJECT No. 85220.001	

CONTACT ENERGY LIMITED

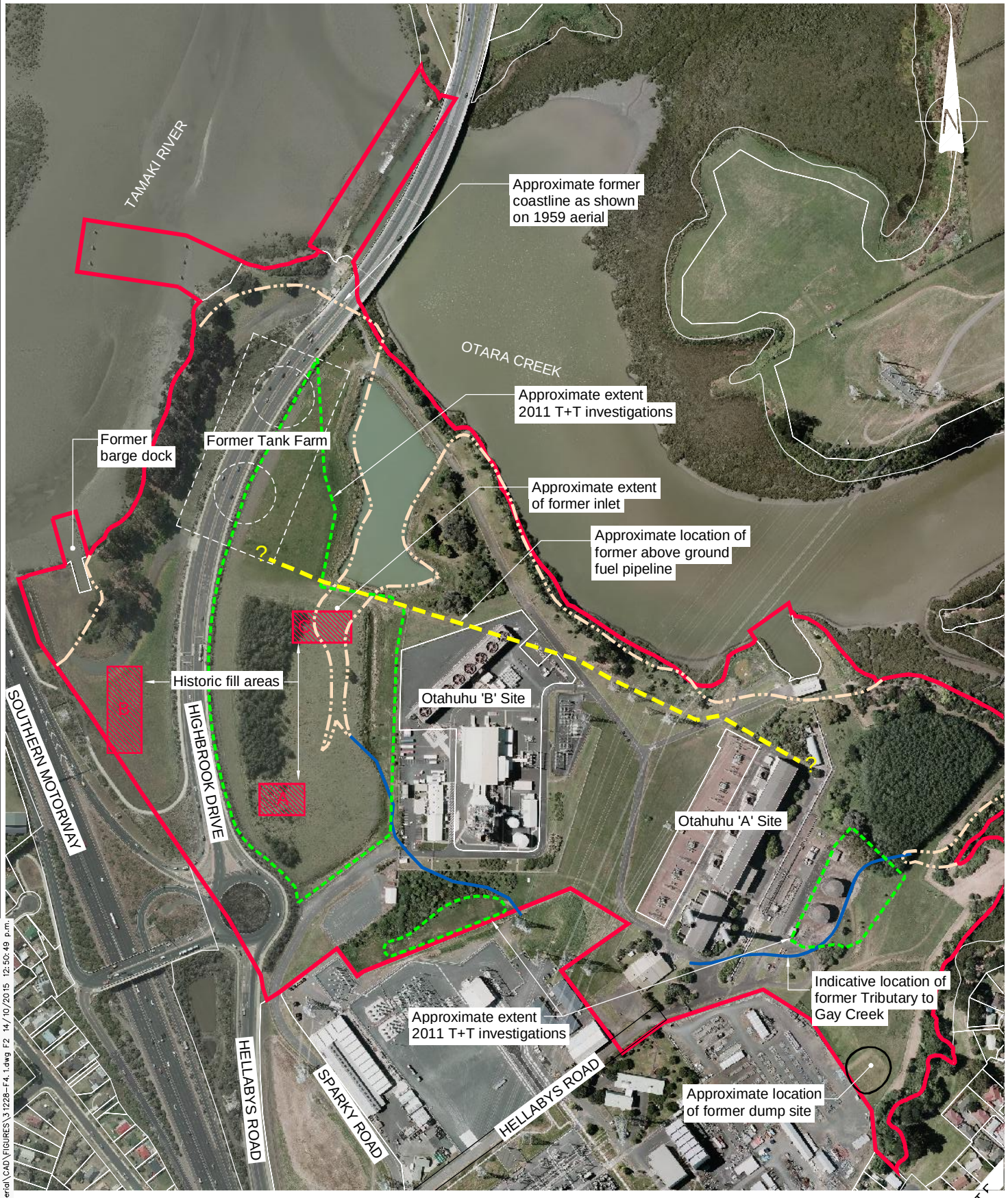
GROUND CONTAMINATION ASSESSMENT
PROPOSED TURBINE PLANT & NEW TANK FARM

Site Investigation plan

FIG. No. Figure 4

REV. 0


Otahuhu historic waste sites
Area A: Used as local rubbish dump for village and station general waste. Generally burnt off
Area B: Burn off area for Village and Otahuhu site general and industrial waste and hard fill.
Bulldozed off to right hand side
Area C: Excavation waste from A station erection earthworks
NOTE: Otahuhu site used to include what is now Transpower and Transfield areas
B
C
A
© 2008 MapData Sciences PtyLtd, PSMA
Image © 2008 DigitalGlobe
Google
Pointer 36°56'53.36" S 174°51'39.72" E elev 0 ft
Streaming 100%
Eye alt 2267 ft



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Aerial photo and property boundaries sourced from Auckland Council GIS Website

L:\31228\WorkingMaterial\CAD\FIGURES\31228-F4.1.dwg F2 14/10/2015 12:50:49 p.m.

Tonkin+Taylor

105 Carlton Gore Road, Newmarket, Auckland
www.tonkintaylor.co.nz

DRAWN	RBS	Oct. 15
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APPROVED	rcp	Oct 15
CADFILE : 31228-F4.1.dwg		
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PROJECT No. 31228		

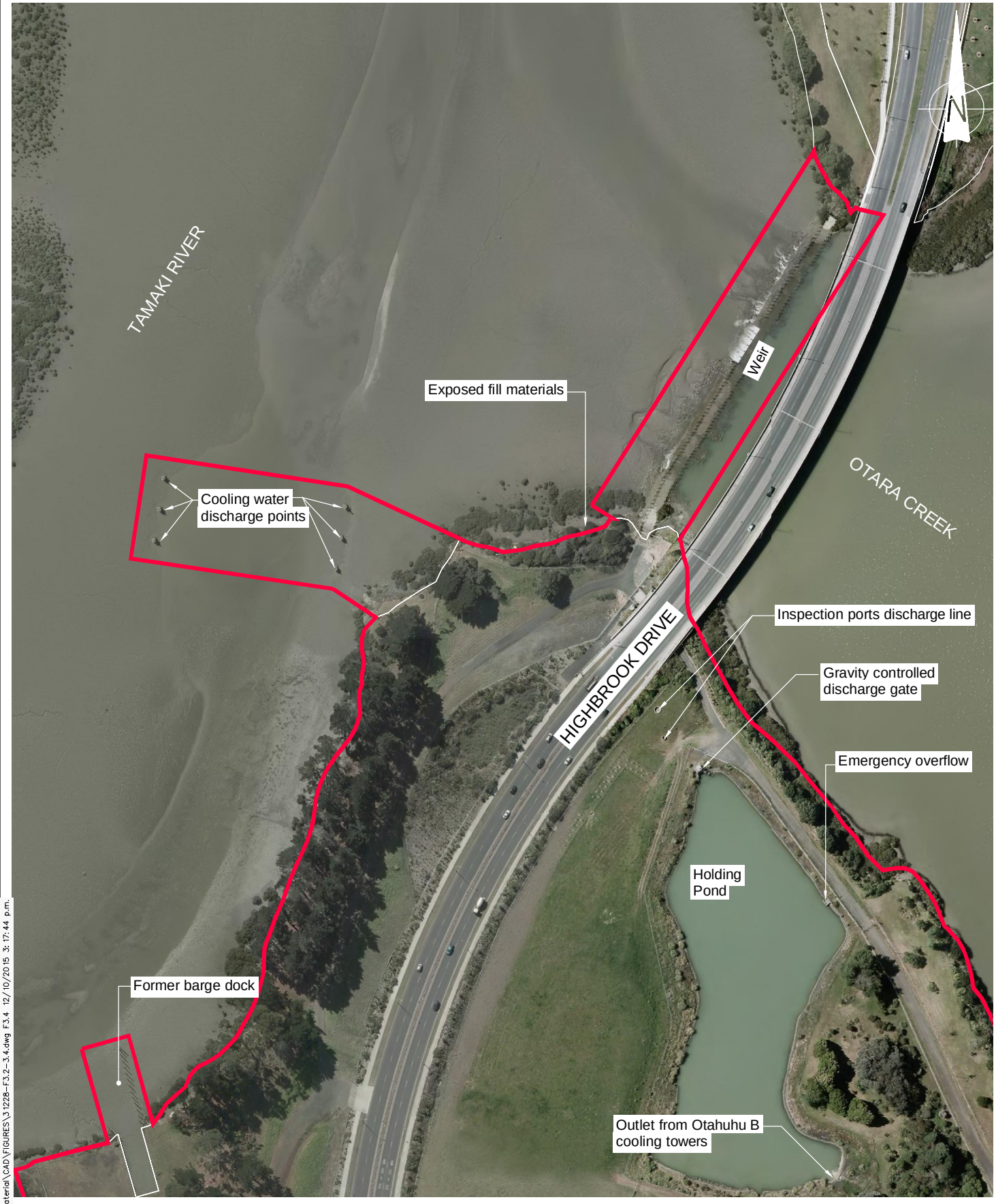
CONTACT ENERGY LTD

GROUND CONTAMINATION ASSESSMENT SPARKY ROAD, OTARA

Historic Features

FIG. No. Figure 4.1

REV. 0



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Aerial photo and property boundaries sourced from Auckland Council GIS Website

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105 Carlton Gore Road, Newmarket, Auckland
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DRAFTING CHECKED		
APPROVED	rcp	Oct 15
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SCALES (AT A4 SIZE) 1: 2500		
PROJECT No. 31228		

CONTACT ENERGY LTD

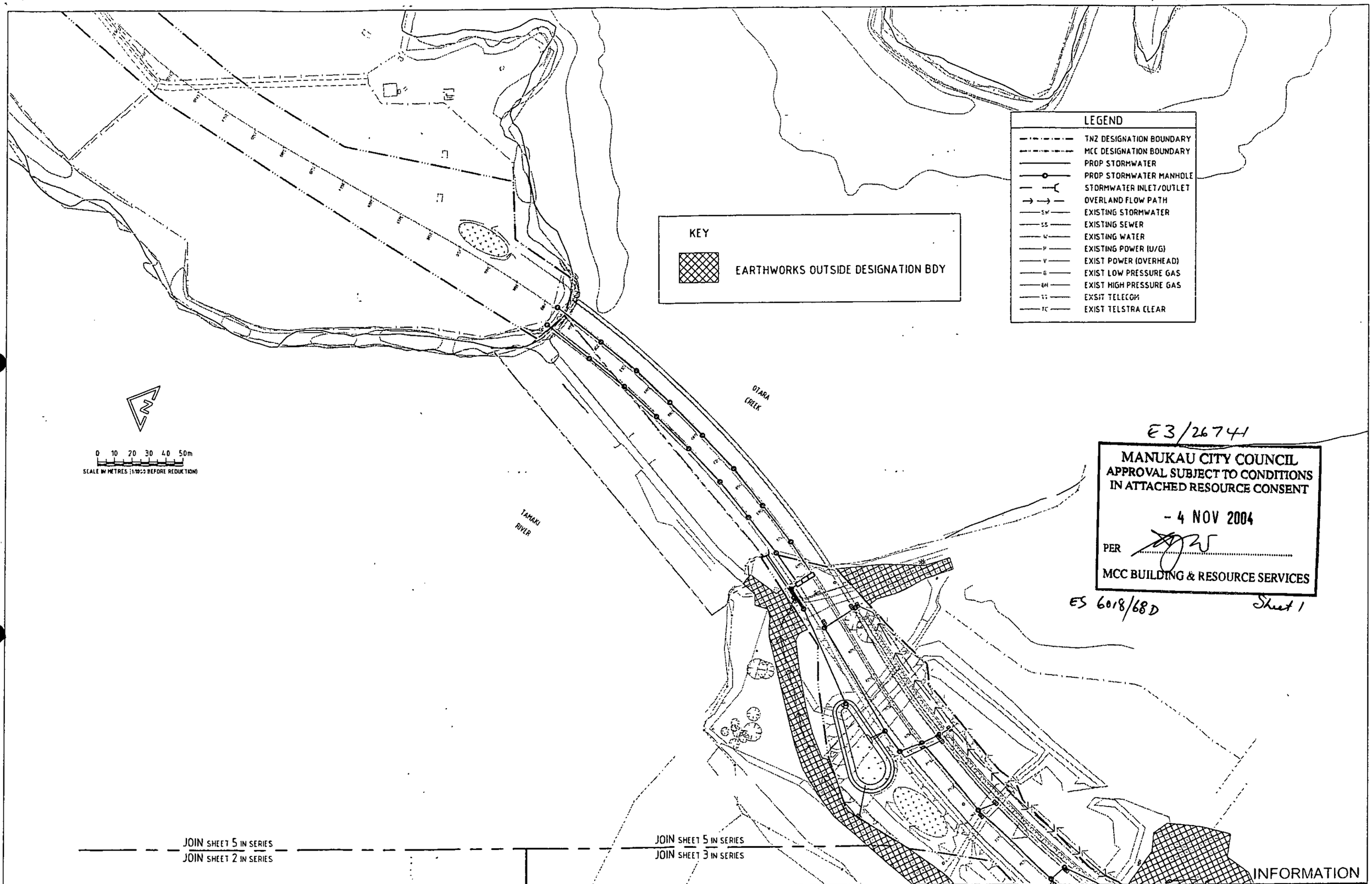
GROUND CONTAMINATION ASSESSMENT
HELLABYS ROAD, OTARA

Site Features – Highbrook Drive Area

FIG. No. Figure 3.4

REV. 0

ALLOCATION PLANS



E3/26741

MANUKAU CITY COUNCIL
APPROVAL SUBJECT TO CONDITIONS IN ATTACHED RESOURCE CONSENT

- 4 NOV 2004

PER .....

MCC BUILDING & RESOURCE SERVICES

ES 6018/68D Sheet 1

INFORMATION

No	Revision Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
A	INFORMATION	SK			

MANUKAU City Council

TRANSIT ARARAU AOTEAROA

GHD Ltd
Putney Way, Manukau City
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E aucmail@ghd.co.nz www.ghd.co.nz

Scale 1:1000 @A1	DO NOT SCALE	Client	MANUKAU CITY COUNCIL
Drawn SK_07/04	Designed	Project	WAIOURU PENINSULA TO SH1 CONNECTION
Drafting Check	Design Check	Title	EARTHWORKS AREAS OUTSIDE DESIGNATION 3 OF 3
Approved		Original Size	A1
Date		Drawing No:	51-19638-SK345
This Drawing must not be used for Construction unless signed as Approved		Rev:	A

JOIN SHEET 5 IN SERIES
JOIN SHEET 3 IN SERIES

JOIN SHEET 2 IN SERIES
JOIN SHEET 3 IN SERIES

KEY

EARTHWORKS OUTSIDE DESIGNATION BDY

TAMAKI RIVER

P4

PUTNEY WAY

LEGEND

- TNZ DESIGNATION BOUNDARY
- MCC DESIGNATION BOUNDARY
- PROP STORMWATER
- PROP STORMWATER MANHOLE
- STORMWATER INLET/OUTLET
- OVERLAND FLOW PATH
- EXISTING STORMWATER
- EXISTING SEWER
- EXISTING WATER
- EXISTING POWER (U/G)
- EXIST POWER (OVERHEAD)
- EXIST LOW PRESSURE GAS
- EXIST HIGH PRESSURE GAS
- EXSIT TELECOM
- EXIST TELSTRA CLEAR

0 10 20 30 40 50m
SCALE IN METRES (1:1000 BEFORE REDUCTION)

E3/26741

MANUKAU CITY COUNCIL
APPROVAL SUBJECT TO CONDITIONS IN ATTACHED RESOURCE CONSENT
- 4 NOV 2004
PER
BUILDING & RESOURCE SERVICES

ES 6018/68D

Sheet 2

WYMONDLEY ROAD

OTB 010
1050ø
IL= -1.06
LL= 7.64

JOIN SHEET 3 IN SERIES
JOIN SHEET 4 IN SERIES

INFORMATION

A	INFORMATION	SK				

MANUKAU City Council

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E auckmail@ghd.co.nz www.ghd.co.nz

Scale	1:1000 @A1	DO NOT SCALE	
Drawn	SK_07-04	Designed	
Drafting Check		Design Check	
Approved			
Date			

This Drawing must not be used for Construction unless signed as Approved

Client MANUKAU CITY COUNCIL
Project WAIOURU PENINSULA TO SH1 CONNECTION
Title EARTHWORKS AREAS OUTSIDE DESIGNATION 1 OF 3

Original Size	Drawing No:	Rev:
A1	51-19638-SK343	A

KEY

EARTHWORKS OUTSIDE DESIGNATION BDY

DTB 011
1050Ø
IL= -0.33
LL= 12.77

DTB 010
1050Ø
IL= -1.06
LL= 7.64

JOIN SHEET 3 IN SERIES

JOIN SHEET 4 IN SERIES

WYMONDLEY ROAD

STIRLING STREET

KARAPA CRESCENT

BARDS ROAD

SHELLABYS ROAD

KINGSFORD PLACE

FERN CRES

0 10 20 30 40 50m
SCALE IN METRES (1:1000 BEFORE REDUCTION)

LEGEND

- TNZ DESIGNATION BOUNDARY
- MCC DESIGNATION BOUNDARY
- PROP STORMWATER
- PROP STORMWATER MANHOLE
- STORMWATER INLET/OUTLET
- OVERLAND FLOW PATH
- EXISTING STORMWATER
- EXISTING SEWER
- EXISTING WATER
- EXISTING POWER (U/G)
- EXIST POWER (OVERHEAD)
- EXIST LOW PRESSURE GAS
- EXIST HIGH PRESSURE GAS
- EXSIT TELECOM
- EXIST TELSTRA CLEAR

E3/26741

MANUKAU CITY COUNCIL
APPROVAL SUBJECT TO CONDITIONS
IN ATTACHED RESOURCE CONSENT
- 4 NOV 2004
PER
MCC BUILDING & RESOURCE SERVICES

E3/6018/68D

INFORMATION

No	Revision	Note * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
A	INFORMATION		SK			

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Scale	1:1000 @A1
Drawn	SK 07-04
Drafting Check	
Approved	
Date	
	DO NOT SCALE
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	Design Check

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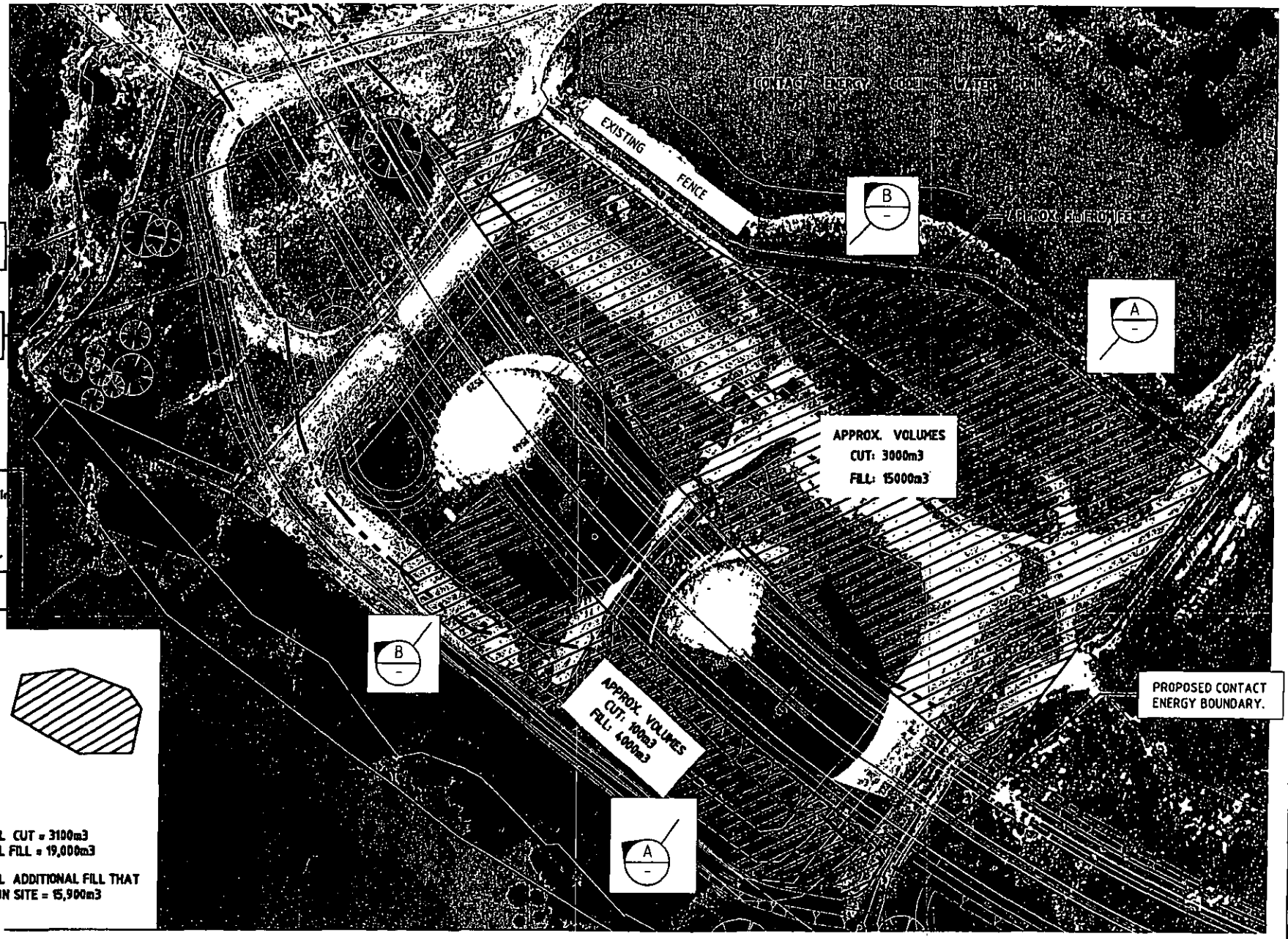
Client: MANUKAU CITY COUNCIL
Project: WAIOURU PENINSULA TO SH1 CONNECTION
Title: EARTHWORKS AREAS OUTSIDE DESIGNATION 2 OF 3
Original Size: A1
Drawing No: 51-19638-SK344
Rev: A



PROPOSED CONTACT ENERGY BOUNDARY.

PROPOSED WEIR ACCESS ROAD

E3/29494

Manukau City Council
Approval Subject to Conditions in attached Resource Consent

11 JAN 2005

Howard Wright
Proposal No 29494

Sheet 1

PROPOSED RESHAPING AND DISPOSAL OF UNSUITABLE MATERIAL AREA.

SUMMARY:

APPROX. TOTAL CUT = 3100m3
APPROX. TOTAL FILL = 19,000m3

APPROX. TOTAL ADDITIONAL FILL THAT CAN BE LOST ON SITE = 15,900m3

INFORMATION

Rev	Revision	Drawn	Checked	Approved	Date
B	ISSUED FOR INFORMATION (PREVIOUS REV RENAMED 0 TO A)	SK			11/05
A	INFORMATION	JTT			09/05

MANUKAU City Council

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Scale	1:500 @A1 — DO NOT SCALE
Drawn	JTT — Designed SK
Drafting Check	Design Check
Approved	
Date	21/09/2005

Client: MANUKAU CITY COUNCIL
Project: WAIOURU PENINSULA TO SH1 CONNECTION
Title: GENERAL LAYOUT PLAN PROPOSED FILL AREAS
Original Size: A1
Drawing No: 51-19638-SK779
Rev: B

Table 1: Diesel Storage Tanks / Tank Farm[1] & Stockpile (Geosciences 2019, amended by Babbage 2022)

	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	BaP	C15-C36
SS91	1.89	0.022	8.35	13	14.9	10.3	21.7	<0.01	<25
SS92	4.4	0.086	25.7	22.6	30.2	27.3	54.5	**0.02**	**31**
SS93	11.1	0.26	38.6	53.6	**85.4**	56.5	118	**0.89**	**98**
SS94	2.6	0.033	18.2	12.5	19.1	16.5	21.5	<0.01	<25
SS95	6.95	0.1	33.3	31.7	39	40.3	67.7	**0.04**	**54**
SS96	5.17	0.084	32.4	27.9	28.5	42.3	63.6	**0.05**	<25
SS97	4.38	0.046	47.4	31.2	22.4	46.4	41.9	<0.01	<25
SS98	8.4	0.32	60	41.1	**69**	45.2	114	<0.01	-
SS99	9.2	0.19	34.9	42.3	**83.5**	45.4	101	**0.35**	-
SS91-Comp	4.75	0.099	29	21	22.3	25.2	70.4	**0.01**	-
SS92-Comp	4.8	0.11	35	24.6	23.3	37.7	101	**0.02**	-
SS93-Comp	4.81	0.18	52.4	30.3	32.2	45.6	88.2	**0.05**	-
SS94-Comp	4.38	0.22	69.2	27.6	18.8	52.3	93.8	**0.04**	-
SS95-Comp	3.01	0.26	92.1	31.2	12.7	76	92.4	<0.01	-
SS100	7.51	0.094	20.1	18	20.1	18.1	31.1	<0.01	-
SS101	6.57	0.15	38.5	32.6	30.3	48.6	82	**0.06**	-
NES[3]	70	1,300	6,300	>10,000	3,300	NL	NL	35	>20,000
AUP(OP)[4]	100	7.5	400	325	250	105	400	20	>20,000
Background[5]	0.4-12	<0.1-0.65	3-125	20-90	<5-65	4-320	54-1,160	ND	ND
High Density Residential NES[9]	**45**	**230**	**1,500**	**>10,000**	**500**	**NL**	**NL**	**24**	**>20,000**
10% Produce Residential NES[9]	**20**	**3**	**460**	**>10,000**	**210**	**NL**	**NL**	**10**	**>20,000**

Notes:

1. All concentrations measured in mg/kg
2. National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health - Commercial / industrial outdoor worker (unpaved)
3. Auckland Unitary Plan (Operative in Part) - Table E.30.6.1.4.1 permitted activity soil acceptance criteria
4. Auckland Regional Council Technical Publication No. 193
5. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand - Tier 1 soil acceptance criteria for commercial / industrial use, surface soil (<1m) in silty clay soils for C15-C36 fraction
6. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand - Tier 1 soil acceptance criteria for protection of groundwater, surface soil (<1m) with groundwater at 2m, silty clay soils for C15-C36 fraction
7. Values in **BOLD** exceed the NES criteria, values in **BOLD** exceed the AUP(OP) criteria, values in **BOLD** exceed the background ranges
8. NA = Not applicable / NL = No limit / ND = Not detected
9. MfE, April 2012. Users Guide: National Environmental Standard for assessing and managing contaminants in soil to protect Human Health.

Table 2: Analytical Results [1] (Geosciences 2019, amended by Babbage 2022)

	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	BaP[5]
HIghbrook-1	6.4	<0.4	23	15	23	8.3	52	**0.1107**
Highbrook-2	8.1	<0.4	76	35	22	27	170	ND
Highbrook-3	5.3	<0.4	22	21	29	27	43	**0.3194**
Highbrook-4	9.3	<0.4	57	26	25	19	140	ND
Highbrook-5	6.7	<0.4	31	17	28	17	49	**0.0489**
Highbrook-6	7.1	<0.4	23	19	31	17	49	**0.4242**
Highbrook-7	11	<0.4	25	27	46	22	69	**0.3466**
NES[2]	70	1,300	6,300	>10,000	3,300	NL	NL	35
AUP(OP)[3]	100	7.5	400	325	250	105	400	20
Background[4]	12	<0.1-0.65	3-125	20-90	<5-65	4-320	54-1,160	ND
High Density Residential NES[9]	**45**	**230**	**1,500**	**>10,000**	**500**	**NL**	**NL**	**24**
10% Produce Residential NES[9]	**20**	**3**	**460**	**>10,000**	**210**	**NL**	**NL**	**10**

Notes:

1. All Concentrations measured in mg/kg
2. National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health - Commercial / industrial outdoor worker (unpaved)
3. Auckland Unitary Plan (Operative in Part) - Table E.30.6.1.4.1 Permitted activity soil acceptance criteria
4. Auckland Regional Council Technical Publication No. 153 - Background concentration ranges for inorganic elements in volcanic soils in the Auckland Region
5. For Benzo(a)pyrene, the equivalent BaP concentration is calculated as the sum of each of the detected nine carcinogenic PAHs, multiplied by their respective potency equivalency factors as per Table 40 of *The Methodology*
6. Values in **BOLD** exceed the NES criteria, values in **BOLD** exceed the AUP(OP) criteria, values in **BOLD** exceed the background ranges
7. ND = not detected, NL = no limit set
8. MfE, April 2012. Users Guide: National Environmental Standard for assessing and managing contaminants in soil to protect Human Health.