APPENDIX 24

DETAILED SITE INVESTIGATION [COOK COSTELLO CONSULTING ENGINEERS]

Contaminated Land Management Detailed Site Investigation Report

17-29 Dunn Street & 28-36 Empire Street, Kaitaia

for Northland Regional Council

cook | costello

4 April 2018

Project Number: 14163

Table of Contents

Summary contaminated sites report checklist					
Indicate the reports contained in this document	☐	Y	☐	☐	☐
Report section(s) and information to be presented	**PSI**	**SIR**	**RAP**	**SVR**	**MMP**
Executive summary	R ☐	R Y	R ☐	R ☐	R ☐
Scope of work	R ☐	R Y	R ☐	R ☐	R ☐
Site identification	R ☐	R Y	R ☐	R ☐	R ☐
Site history	R ☐	S Y	S ☐	S ☐	S ☐
Site condition and surrounding environment	R ☐	S Y	S ☐	S ☐	S ☐
Geology and hydrology	A ☐	R Y	S ☐	S ☐	S ☐
Sampling and analysis plan and sampling methodology	A ☐	R Y	X	R ☐	R ☐
Field quality assurance and quality control (QA/QC)	N ☐	R Y	X	R ☐	S ☐
Laboratory QA/QC	N ☐	R Y	X	R ☐	X
QA/QC data evaluation	N ☐	R Y	X	R ☐	X
Basis for guideline values	R ☐	R Y	R ☐	R ☐	R ☐
Results	A ☐	R Y	R ☐	R ☐	S ☐
Site characterisation	R ☐	R Y	R ☐	R ☐	R ☐
Remedial actions	X	X	R ☐	S ☐	S ☐
Validation	X	X	X	R ☐	S ☐
Site management plan	X	X	R ☐	S ☐	S ☐
Ongoing site monitoring	X	X	X	N ☐	R ☐
Conclusions and recommendations	R ☐	R Y	R ☐	R ☐	R ☐

1. EXECUTIVE SUMMARY

Cook Costello Consulting Engineers (Cook Costello) has been engaged by Northland Regional Council (NRC) to undertake a Detailed Site Investigation (SIR) for a range of properties located at 17-29 Dunn Street and 28-36 Empire Street, Kaitaia. It is understood NRC are considering purchasing these properties to use for flood mitigation works of the adjacent Awanui River, which will involve significant soil disturbance.

The scope considered by this Detailed Site Investigation report is to ascertain from previous investigations, site history, other collected information and laboratory testing whether activities from the Hazardous Activities and Industries List (HAIL Oct 2011) have occurred within the subject area, or in the surrounding area, in a manner which may affect the subject Piece of Land and pose risk to human health.

It has been determined through the SIR that activities listed in the HAIL are likely to have been carried out within the subject Piece of Land including:

- **HAIL E4:** *Commercial concrete manufacture or commercial cement storage.* Concrete batching and cement products manufacture have occurred at the site.
- **HAIL A2:** *Chemical manufacture, formulation or bulk storage.* Bulk storage of a range of chemicals, including additives.
- **HAIL F4:** *Motor vehicle workshops.* Transit Mixers and other vehicles serviced in a garage on the site.
- **HAIL A17:** *Storage tanks or drums for fuel, chemicals or liquid waste.* Waste oils stored in drums and diesel stored in an Intermediate bulk container (IBC) on the site.
- **HAIL A13:** *Bulk storage of petroleum or petrochemicals below ground.* Petrol and diesel stored in underground storage tanks (USTs). Diesel stored in above ground tanks.
- **HAIL E1:** *Buildings containing asbestos products known to be in a deteriorated condition.* Sections of the Prestress Shed are clad with asbestos in semi-deteriorated condition. Asbestos cement material and fibres detected in soil adjacent to the Prestress Shed.

It is considered possible that the following HAIL activity was carried out at the site, namely:

- **HAIL I:** *Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.* Elevated levels of lead (marginally above Industrial/Commercial guideline values) detected in soil in the southern portion of the site near the slurry pit. Reports of disposal of rubbish ash to the grass swale area in the northern portion of the site.

This report concludes that, from the 42 locations sampled on the subject piece of land:

- only one site (S1) identified a Priority Contaminant (lead) above Industrial/Commercial guideline values, with the majority of analytical results from the other sample locations consistent with or below relevant background levels.
- total chromium in S23, S25 (0.4), S25 (3.0), S26 (0.2) and S26 (3.0), and zinc in S27 exceeding background levels for non-volcanic soils, but were within the range for volcanic soils. As all of the S25 and S26 total chromium results were consistent with each other, this suggests a natural level of chromium in the soil.
- lead in composite S10/S12, composite S17/S19 and S27 indicated concentrations exceeding background levels. These slightly elevated results are likely to reflect anthropogenic sources, such as leaching from lead based paints.
- concentrations of TPH in excess of background values were identified in three areas of the site (S15, S25 0.4mbgl and S27). Their locations adjacent to a historic diesel day tank, fuel bowser and above ground storage tanks suggests possible minor losses of oil and/or diesel from past vehicles and/or activities/equipment. Although the results are above background, they are well below (<2% of) the priority contaminant guideline value.
- laboratory testing for Poly Aromatic Hydrocarbons (PAH) indicated that there was no tested sample with concentrations of tested compounds exceeding the Priority Contaminant guideline values, with most results below laboratory detection levels. Sample S25 (0.4mbgl) showed trace amounts of Fluoranthene, Fluorene, Phenanthrene, and Pyrene, which suggests the detection of bitumen material in this sample.
- of the ten sites sampled, only one location (S27) detected the presence of asbestos in soil. S27 is on the south eastern side of the Prestress Shed, a building identified in the site walkover as being clad with asbestos cement material in partially deteriorated condition. Measures should be taken to manage disturbance of this material to minimise the potential for dust generation.
- it is recommended to specifically include a section in the Construction Management Plan to address the disturbance and management of material containing elevated lead and asbestos fragments/fibres.

- Based on historic land use adjacent to the site it is considered very unlikely that contaminants have/will migrate into the subject Piece of Land.
- Based on the review of site history, interviews and soil sampling results, and the current and proposed land use for the site, it appears that site activities, to a large extent have not caused contamination that would detrimentally affect the continued use of the site for industrial/commercial purposes, and for the redevelopment of a portion of the site for flood protection, coupled with parkland/recreation uses.
- It is considered that the human health risk from continued use of the site for industrial/commercial purposes, and for the redevelopment of a portion of the site for flood protection, coupled with parkland/recreation uses due to land contamination is very low, on the understanding that the Asbestos/Construction Management Plan is complied with.

2. SCOPE OF WORK

The scope of this report is a Detailed Site Investigation (SIR) to ascertain whether activities from the Hazardous Activities and Industries List (HAIL Oct 2011) have occurred within the subject Piece of Land, or in the surrounding area, in a manner which may affect the subject Piece of Land and pose risk to human health.

Cook Costello has been engaged by Northland Regional Council to undertake a SIR of a 14.7 hectare 'piece of land' (the site) on an Industrial lot, located at 17-29 Dunn Street and 28-36 Empire Street, Kaitaia, as depicted in Figure 1.

The scope of work of this SIR is to identify whether any potential activities listed in the Hazardous Activities Industries List (HAIL) have been undertaken within the site or in the surrounding area and subsequently migrated to the site.

In the event that HAIL activities have occurred on the site, the scope of work is to ascertain the risk to human health from these.

This SIR has been carried out in accordance with the *Contaminated Land Management Guidelines No. 1 – Reporting on Contaminated Sites in New Zealand (Revised 2011)* and the agreed scope of work with the Northland Regional Council.

Sampling in this SIR has been carried out in accordance with Appendix B of the Contaminated Land Management Guideline No. 5 (MfE, 2011).

This investigation:

- Establishes the site history by desktop study (including historic aerial photographs of the site, and reviews of relevant Council records and correspondence and information within the Vision Consulting: 2017 - Desktop Preliminary Site Investigation), interviews of people knowledgeable with the site, and a site inspection/walkover, and selective soil sampling.
- Establishes the site condition and the surrounding environment.
- Considers geological and hydrological influences at the site.
- Provides a conceptual site model.
- Provides results from systematic and judgemental soil sampling.
- Provides characterisation of the site in terms of risk to human health due to contamination of the ground.

3. SITE IDENTIFICATION

3.1. Site Description and Current Land Use

The subject Piece of Land (the site) for which this report applies to is located at 17-29 Dunn Street and 28-36 Empire Street, Kaitaia as indicated by Figure 1. It is legally described as Lot 2 DP 56803, and Lots 254-258 DP 12724, and has a total land area of approximately 14.7 hectares.

Figure 1. Extent of the subject Piece of Land (yellow)

The site is located and approximately 150 kilometres north west of Whangarei, and approximately 400 metres to the north east of the main business centre of Kaitaia, as depicted in Figure 2. The site is currently zoned 'industrial' and is still in use for the production of ready mix concrete.

Figure 2: Property location map, with the subject Piece of Land circled (Google Earth)

3.2. Proposed Development

It is understood NRC are considering purchasing the site to use for flood mitigation works of the adjacent Awanui River, which runs adjacent to the eastern boundary. These works are likely to result in significant soil disturbance.

4. NES PROVISIONS

The objective of the NES is to ensure land affected by contaminants in soil is appropriately identified and assessed when soil disturbance and/or land development takes place and, if necessary managed to make the land safe for human use.

The NES applies to land that having, has had, or more likely than not has had a HAIL activity undertaken on it.

Section 5 of the NES Regulations apply to:

- Certain soil disturbance activities (subclause 4),
- Subdivisions of land (subclause 5), and
- Land use changes (subclause 6).

As NRC propose to disturb the soil to undertake the flood mitigation works, then the provisions of the NES apply.

5. RELEVANT DOCUMENTATION

- Vision Consulting: 2017 - Desktop Preliminary Site Investigation, 17-29 Dunn Street & 28, 30, 32, 34 and 36 Empire Street, Kaitaia.
- Far North District Council: 2018 - LIM No 2018/129, 34 Empire Street, Kaitaia
- Far North District Council: 2018 - LIM No 2018/130, 36 Empire Street, Kaitaia
- Auckland Regional Council: 2001 – TP153: Background Concentrations of Inorganic Elements in Soils from the Auckland Region
- URS: 2003 - Determination of Common Pollutant Background Soil Concentrations for the Wellington Region.
- The Institute of Geological and Nuclear Sciences: 1996 - Geological Map 1: Geology of the Kaitaia Area, 1:250 000

6. SITE HISTORY

A desktop assessment of the site was undertaken to identify any historic or current activities that may have resulted in any potential contaminants of concern.

The following information sources were reviewed to establish a history of the site:

- The Vision Consulting PSI
- Historical Aerial Photographs
- Historic Site Ownership and Use
- Consents and permits/FNDC records
- Northland Regional Council
- Interviews and other information, and
- Site walkover

6.1. Previous investigation of subject Piece of Land

In October 2017, Vision Consulting undertook a Desktop Preliminary Site Investigation (PSI), titled Desktop Preliminary Site Investigation, 17-29 Dunn Street & 28, 30, 32, 34 and 36 Empire Street, Kaitaia.

This report found that the site has been used for activities listed in the Hazardous Activities Industries List (HAIL) and provide the following evidence:

- **HAIL E4:** *Commercial concrete manufacture or commercial cement storage.* The 1966 and 1996 Building Permits detail the use of the buildings for Concrete Products Manufacture/Concrete Producing Plant.

- **HAIL A2:** *Chemical manufacture, formulation or bulk storage*. Gary Young (NRC) advised that *the site also has two 1000L diesel tanks (Ag) located at the back of the yard.* Henry Tene (Firth Industries) advised that *any hazardous materials used in production are stored in a designated location which is concreted and bunded. This located near the batch plant building.*
- **HAIL A13:** Bulk storage of petroleum or petrochemicals below ground. Henry Tene (Firth Industries) advised that *an underground fuel tank used to be present near the 'lunchroom'. Since then, the fuel has been delivered to the site in BP trucks as needed.*
- **HAIL A17:** *Storage tanks or drums for fuel, chemicals or liquid waste.* Gary Young (NRC) advised that the *site has a workshop used for the maintenance of the vehicles, this uses oil etc. waste is stored in 200L drum which when required are collected.*
- **HAIL E1:** *Buildings containing asbestos products known to be in a deteriorated condition (suspected)* as the 1966 Building Permit Application lists asbestos as a construction material.
- **HAIL F4:** *Motor vehicle workshops.* Gary Young (NRC) advised that the *site has a workshop used for the maintenance of the vehicles.* Henry Tene (Firth Industries) advised that *trucks were generally only parked on site and that only minimal maintenance, if any was undertaken.*
- **HAIL I:** *Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.* Suspected fill material is present in the northern corner of the site (part of a berm/stopbank that surrounds the site from the east).

6.2. Aerial imagery interpretation

Aerial imagery has been collected from the Vision PSI, Retrolens, Google Earth and Far North District Council. Key aerial images are presented in Appendix 1.

Based on aerial imagery, the past land uses are interpreted as:

1950: The site was undeveloped and covered in grass.

1968: The southern two thirds of the site was developed. The image quality is poor, although appears to contain industrial buildings understood to be used in the manufacture of concrete products.

2000: The whole site appears to be developed, with the northern portion being used as a laydown area and the southern portion being used for product storage. At least five buildings are located on the site.

2002: The image quality is good. In the centre of the site there appears to be a concrete batching plant, with associated ground bins, aggregate hopper, cement silo, conveyors and associated buildings. To the north of the batching plant is a larger building, and to the south three smaller buildings. The southern part of the site appears to being used for the storage of finished products (including water tanks). The northern part of the site appears to being used as laydown areas and product storage. There appears to areas around the batch plant that are covered in concrete, with other areas that are gravelled.

2003: The main use of the site remain the same. It appears that the building facing Dunn Street in the central portion of the site has been partially demolished, and the building on the south eastern side of the batching area has been demolished.

2011: Only the central portion of the site (batching plant) appears to be actively used. The building facing Dunn Street (in the central portion of the site) appears to have been demolished. At least two ponds are visible (dark squares) on the north eastern portion of the batch plant area. The building in the northern part of the site remains, however the majority of the material stored outside has been removed. The building in the southern part of the site appears to have been demolished and there does not appear to be any products stored in this area.

2013: The site is largely devoid of structures, apart from the northern building and the buildings/plant around the batch plant. The ground bins on the southern boundary of the site appear to remain. Google Maps Street View (taken in 2013) supports the observations from the aerial photograph.

2015: The site appears to be consistent with the 2013 image. Earthworks being undertaken along the eastern boundary of the site adjacent to the Awanui River. Toby Kay, Natural Hazards Advisor, NRC explained in an email dated 26 February 2018, that *NRC undertook works to re-align the stopbank on the true left bank of the river (to increase available cross section area).*

2016: The site appears to be consistent with the 2015 image.

6.3. Historic site ownership and use

The PSI report (Vision: 2017) advises that 17-29 Dunn Street and 34 Empire Street was being used for farmland prior to December 1966, when it was sold to Kaitaia Concrete Product Limited. The name of this company changed name to Stresscrete Kaitaia Limited/Busck Stresscrete Kaitaia Limited and Busck Concrete Kaitaia Limited in 1970 and 1988, respectively. In 1996, Firth Industries Limited purchased the site (name changed to Fletcher Concrete and Infrastructure Limited in 2002).

Stresscrete is a concrete precast manufacturer, designing and manufacturing engineered precast concrete components.

Busck Prestressed Concrete is a manufacturer of precast and prestressed concrete products.

Firth Industries Limited produces readymix concrete and concrete masonry products.

A review of the ownership of 28-34 Empire Street (using *Quickmaps*) on 1 March 2018, lists Fletcher Concrete and Infrastructure Limited as the owner.

In an email from Toby Kay, Natural Hazards Advisor, NRC dated 26 February 2018 advised that *36 Empire Street (Lot 254 DP 12724) appears to be owned by the Far North District Council for River Control Purposes*.

6.4. Consents & Permits

Based on the LIMs No 2018/129 and No 2018/130 provided by Far North District Council (2018) the following (relevant) consents have been issued:

- Resource Consent issued on 28-Mar-1966 for a Subdivision of Lots 253, 259, 260, 261 DP 12724 created DP 56803
- Building Consent issued on 01-Dec-1966 for Offices, Factory, Shed, Workshop etc
- Building Consent issued on 28-Apr-1999 for New Concrete Producing Plant

The 1966 Application for a Building Consent, submitted by Kaitaia Concrete Products Limited details the use of the building for Concrete Products Manufacture, and to be constructed with concrete foundations, iron roofing and block, asbestos and iron exterior walls, with a building footprint of 12,446 ft^2 (1,156 m^2).

The plan attached to the Application (Figure 3) includes the following features (from north to south): Prestressing Plant, Gantry and Storage, Parking, Office, Lunchroom, Garage, Concrete Batching Plant, Conveyor, Pipe Plant, Hopper, Ramp, Block Plant, Tank Shed, Sunken Roads, Storage, Store Shed, and Washing Tank.

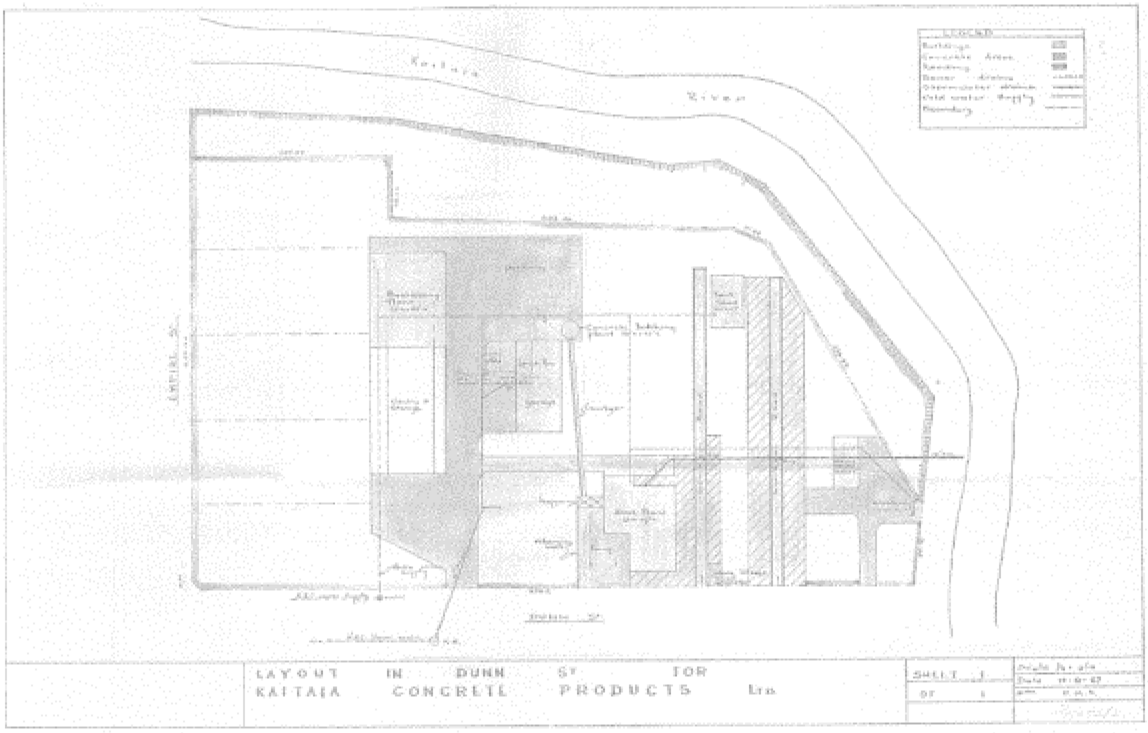


Figure 3: Plan attached to 1966 building consent application

The 1999 Application for a Building Consent, submitted on behalf of Firth Industries Ltd described the work as a New Concrete Producing Plant and used the existing 1966 plan with some minor alterations to the location concrete batching plant.

6.5. Northland Regional Council

A review of the Northland Regional Councils database of Hazardous Activities and Industries List (HAIL) (http://www.nrc.govt.nz/Environment/Waste-and-pollution/Hazardous-Activities-and-Industries-List/) identified the site as having a verified HAIL activity: E4 Commercial concrete manufacture or cement storage, as shown in Figure 4.

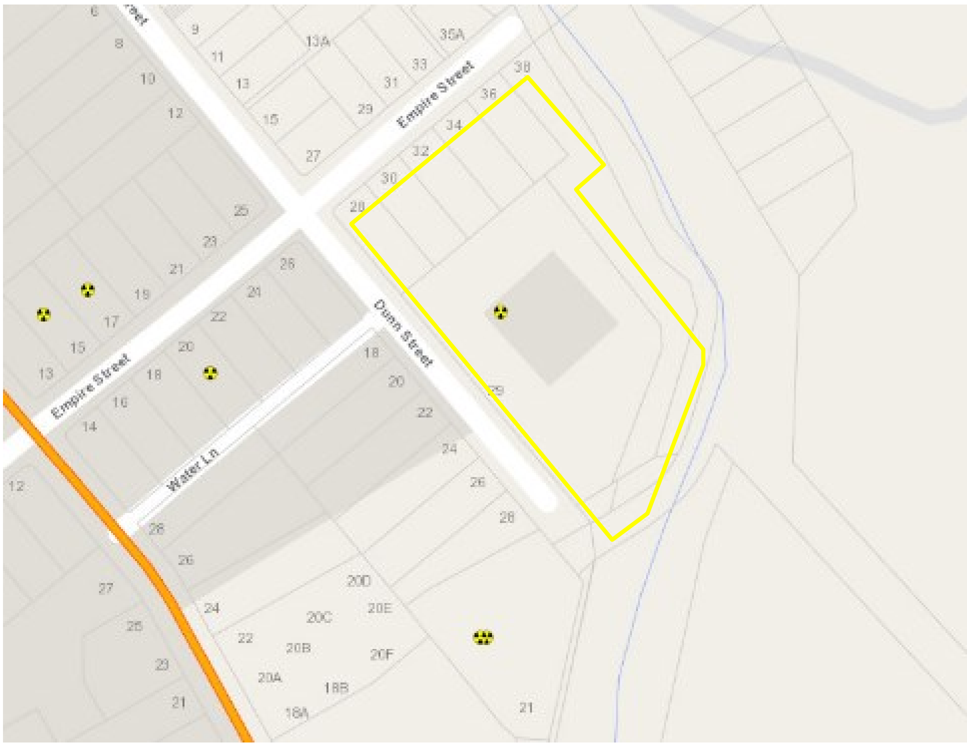


Figure 4: *NRC Selected Land-use Register of the site (bold yellow) and adjacent properties.*

Other verified HAIL activities around the site include a transport depot to the south of the site, commercial printing and two motor vehicle workshops to the east of the site.

Due to the activities undertaken, and their locations, it is considered unlikely that any of these activities will have an impact on the site.

6.6. Interviews and other information

A Google search identified an article from the New Zealand Ready Mixed Concrete Association (NZMCA) in October 2012:

http://www.nzrmca.org.nz/portals/213/images/pdfs/publications/NZRMCANewsletter2012-08.pdf

A HISTORY – THE KAITAIA READY MIX PLANT

Written by Brian Hall Ex-NZRMCA President and Northern Region Chairman

The Kaitaia Ready Mix concrete plant was built originally for Mr Joe Clough, who also had a concrete works in Jamieson Street at the time. There were four shareholders - Bob Shaw, Bellingham Quarries, Worth & Webber Builders and Joe Clough. The plant was constructed by existing staff, including myself, and was completed in 1965 at Dunn Street.

Staff also built two bulk cement silos, one 40 tonne, the other 12 tonne, along with two containers used to transport bulk cement from Whangarei.

At the time we started to produce ready mix, bulk cement was railed to Okaihau. There New Zealand Rail (NZR) supplied a compressor to blow the cement from their bulk *containers. Kaitaia Ready Mix had purchased a new 9 tonne trailer. However, this proved too small as when we were busy we would run out before the truck would get back. We built bigger units and then later NZR ceased to oppose the 40 mile rail exemption application limits, and we were able to cart direct from Portland.*

At a later date Stresscrete became involved, and a plant was built to produce bridge decks, piles, hollow core slabs, I beams, and Unispan floor slabs. Power Poles were also made, 30 and 40 footers.

I was asked to take on running the Ready Mix Plant and this involved attending a six week course at Masterton Ready Mix. The plant was owned by Tom Hallena, who was at the time manufacturing with hydraulically operated, truck mounted 3 and 4 cubic yard mixers. We had two of these and while they were quite good, we found it necessary to fit auxiliary motors as too much horse power was taken from the trucks.

Around 1980 several shareholders sold their shares to Shaw, Bellingham and Clough. By this time any concrete products were made with concrete from the Dunn Street rather than Jamieson Street plant. A machine to spin reinforced concrete pipes was built by company staff - a real masterpiece, capable of making 6 inch to 36 inch pipes. A machine to make 4 inch to 24 inch 'rota pack pipes' was also installed.

Around 1984 Joe Clough sold his shares to Busck Concrete Whangarei, and the old block machine was promptly pulled out. Chris Busck became involved in the overall affairs of the plant, although Bob Shaw was manager. Chris was a very clever man, and came up with some very good ideas to improve the ready mix plant.

We had decided that we should go for a plant grading, and with some assistance from John Ramsey in Whangarei this was achieved in 1986. In 1987 I was encouraged by Chris Busck to sit for my R.E.A and was successful in this. I also applied for membership as an associate to the Institute of Engineers.

In 1988 Bob Shaw and Don Bellingham purchased Buscks' shares, and it was at this time Northern Pulp commenced building the Pulp Board Factory in Kaitaia. This was taken over by Juken Nisho, with Downers assuming the contract to carry on the build.

The ready mix plant, with only 3 trucks, did over 10,000 cubic metres over a number of years for this project. It was definitely a case of "where there is a will there is a way".

It was around 1990 that Firth purchased the business, including all the various operations, including precast. Bob Shaw carried on as manager for several years, while I stayed on to manage the ready mix operation for about another year.

The only product manufactured at the upgraded site now is the ready mix. The plant rebuild was badly needed, as while it had done a wonderful job, it had out lived its usefulness.

Note from Maurie Hooper: In June 1966 Brian attended, on behalf of Kaitaia Ready-mix Concrete, what probably was the first training course promoted by the NZRMCA. It was held in Hamilton and conducted by the late Martin Glew. There were 24 participants from all over the North Island.

Rodney White (Director, Busck Prestressed Concrete) was contacted and asked about his knowledge of activities at the Kaitaia operation between 1966 and 1996. He advised that we joined Busck Stresscrete in 1972 and worked in the drawing office in Whangarei, but never visited the Kaitaia operations. In the late 1970's, the operations were sold (in part) to Robert Shaw/Bellingham Quarries. When asked about the types of chemicals were used onsite, he advised that similar products were used as are used now, with conventional mould release agents, and water reducers such as Sika BV40. He advised that most of the chemicals would have been incorporated into the product being manufactured. Rodney was not aware of the location of any fuel storage onsite.

A review of the MSDS for Sika BV40N (SDS Number: 000000607457) indicates that the product is not a hazardous substance or mixture and does not require any special environmental precautions.

David Bellingham (Bellingham Quarries) was contacted and advised that Bob Shaw was the Manager of the Kaitaia operation for many years, and would know most about the history of the site. His father (Don Bellingham) now in his 80's, bought into the company as he operated the quarry that supplied material to the concrete plant, and wanted to see the business continue.

Chris Busck (retired, Busck Prestressed Concrete) was contacted and asked about the Kaitaia operations. He advised that he bought the company in around 1969 and sold it in around 1982. The site was used for concrete products manufacture and readymix concrete. Materials used included cement, aggregate, sand and various additives, including plasticising and retarding agents. He advised that no flyash was used in the mixes as it was not available. Release agents were used in the concrete moulds, which would have been oil based. Most of this product was absorbed into the concrete as they needed to add new release agent on the mould every day. Later, they changed the release agents to a sugar based product.

When asked about the boiler in the Prestress Shed, Chris advised that it was used for steam curing, and was diesel fired. He believed that there were petrol and diesel tanks onsite, with diesel being used to running fixed and mobile plant/trucks. Minor vehicle servicing was carried out onsite, but was unsure where the waste oil was disposed to. He could not remember the exact location of the fuel tanks (as it was more than 30 years ago). He advised that Robert (Bob) Shaw was the Manager at the plant during this time and would know more detail about the site.

Bob Shaw (retired, past Site Manager) was contacted and asked about the Kaitaia operations. Bob was the Manager of the site for about 45 years, and at one stage employed 30 staff. He worked under various company names, including Busck Prestressed Concrete, Stresscrete, Kaitaia Streecrete and Firth Industries.

When asked about additives to the concrete mixes (including flyash), he advised that additives were similar to what is added today and that no flyash was added to concrete mixes. He advised that there were two underground storage tanks (USTs) onsite (petrol and diesel) and were located next to each other out from the workshop area. The tanks were removed over 20 years ago (possibly by Shell) and there was no evidence of leaks when removed.

In the garage at the site, Transit Mixers (3) (and other vehicles) were serviced, with waste oil being placed in drums. Clean waste oil was used to coat the prestress moulds, with dirty waste oil was removed offsite. After the removal of the underground tanks, an above ground tank was installed near the stopbank to provide fuel the diesel fired steam boiler used to steam cure products via an underground pipeline.

When asked about disposal of waste, he advised that rubbish was typically burnt onsite and that waste concrete was deposited in holes located behind the Prestress Shed. Transit Mixers were also washed down near the southern entrance (into the sludge pits), with runoff being piped through the stopbank and into the river. As water/wash water was not recycled in the early years, runoff from the batch area and southern part of the site was directed through a settling pit (formerly the sunken road) to the river. Runoff from the northern part of the site was directed to a pond and grass swale to the north of the Prestress Shed. Later on, water from the sunken road was used to wash Transit Mixers, with water being stored in a tank near Dunn Road in the southern part of the site.

To clarify the location of the underground storage tanks, Peter Weissing (NRC) assisted by visiting Mr Shaw at his home in Kaitaia and was asked to mark the location of storage tanks on an aerial photograph of the site (Figure 5).

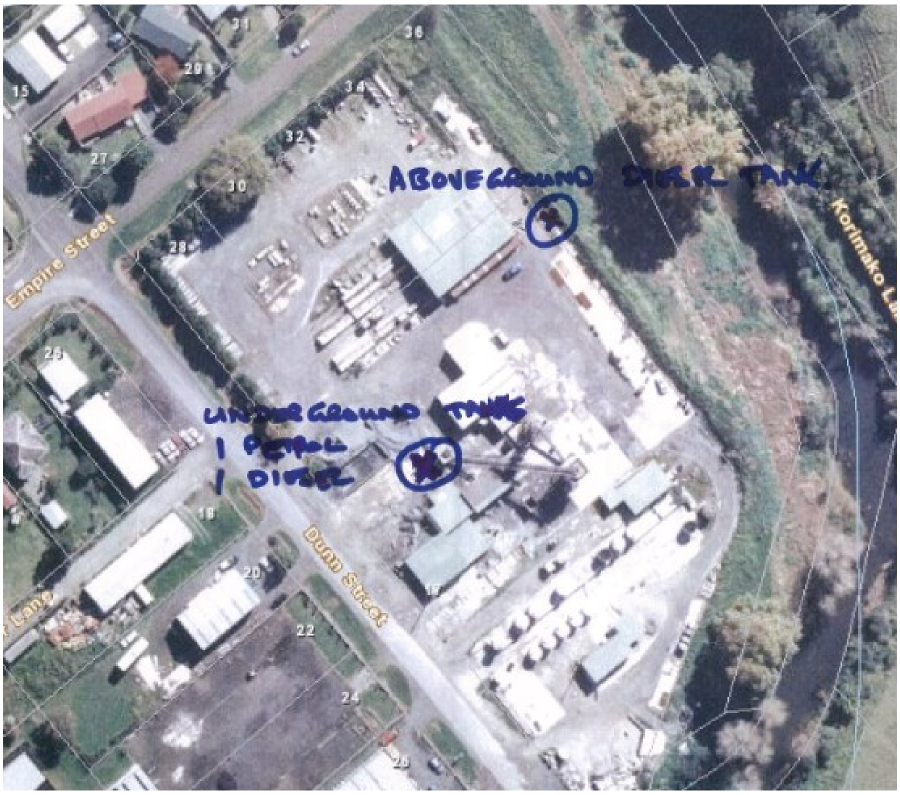


Figure 5: Reported locations of fuel storage tanks on the site

Emily Robinson (Consents Planner, FNDC) was asked if there were any records of USTs on the site. Emily responded in an email dated 27 February 2018, that *I had a look at our records for 34 Empire St, Kaitaia, and from a resource consents perspective I can't see any record of there being underground tanks on the site. That is to say, there are only old subdivision and building consents listed on the site, and they're unfortunately not scanned onto the system so I can't view them in any detail. Sorry that that's not particularly helpful.*

Martin Robinson (Environment Manager, Z Energy) was contacted to find out whether it had any records of tanks being removed from the site (as Shell fuel was reportedly delivered to site and Z Energy has taken over the downstream operations from Shell). Martin could not find any records about tank removal from the site, but did say that records prior to 1995 were limited.

Shannon Holroyd (Environmental & Compliance Manager, BP) was contacted to find out whether it had any records of tanks being removed from the site. Shannon responded in an email dated 7 March 2018, that *I have just been looking through our archives. I cannot find any of these site names or anything under either street name. BP did use to supply a few Firth commercial sites with tanks but they were all above ground assets and none anywhere near Kaitaia - same with Stresscrete. Sorry I cannot be more helpful.*

7. SITE CONDITION & SURROUNDING AREA

The site is presently in a similar state to that presented in Figure 1.

The site is currently being used to produce ready mix concrete.

The site is accessed off Dunn Street, via two entrances – one in the central portion of the site that leads to the office, and one on the southern portion of the site which is used by Transit Mixers to access the batching area. The land is relatively flat. A two to three metre high stopbank runs along the eastern boundary of the site adjacent to the Arawanui River.

The site contained two main structures – the Prestress Shed on the northern portion of the site and the batching plant/offices/stores in the central portion of the site.

There are residential dwellings to the north of the site (along Empire Street) and Industrial/Commercial sheds/offices (including Kaitaia Engineering, a bottled gas supply company, a hydraulic hose supply company and a Tattoo studio) along the eastern boundary of the site (Dunn Street).

7.1. Site Walkover

A site walkover was undertaken on 2 March 2018 in the presence of Nigel Furze (Area Operations Manager, Firth Industries). The weather was fine with occasional showers, moderate winds, and a temperature around 23 degrees. The vegetation on the site did not show signs of stress. The only noticeable odour was a cement type odour near the batching plant.

The site walkover started in the northern portion of the site and progressively moved south.

There are two remaining buildings on the site – the (derelict) Prestress Shed to the north of the site (Photograph 1) and the office/lunchroom/batch/store area in the central portion of the site. Quite a large portion of the site is either concrete pavement, or has had waste concrete placed on it. There were also areas of gravel and bitumen fill (Photographs 2 & 3) and a variety of equipment/plant stored on the site.

Photograph 1: View of Prestress Shed from top of stopbank on north east boundary with batching plant behind

Photographs 2 & 3: Waste concrete and bitumen/gravel fill over the northern portion of the site

Along the northern boundary of the site (adjacent to Empire Street) was what appeared to be concrete pontoons (Photograph 4), framing and columns (Photograph 5) and an old entrance sign (Photograph 6).

Photographs 4 & 5: Products/equipment along the northern boundary of the site

Photograph 6: Entrance signage on corner and Empire and Dunn Streets

Remnants of the prestress gantry remains (Photograph 7). The now derelict Prestress Shed (Photograph 8) has a concrete floor, corrugated metal roof and walls clad with corrugated metal and presumed asbestos cement material (ACM) (Photographs 9 & 10). The condition of the ACM on part of the southern wall of the Prestress Shed is likely to trigger HAIL as it was in a semi deteriorated state. Approximately one quarter of the northern wall and most of the (internal) southern wall of the Shed was clad with ACM. Above the corrugated ACM on the northern wall, there was also flat presumed ACM in good condition.

Photograph 7 & 8: Prestress gantry and inside of Prestress Shed looking north east

Photograph 9 & 10: Northern and southern (internal wall) of Prestress Shed.

On the eastern corner of the Prestress Shed was an Anderson diesel fuelled boiler and associated day tank (Photographs 11 & 12) sitting on a concrete floor.

Photograph 11 & 12: Anderson Packaged Boiler and Day Tank in the Prestress Shed.

The area around the aggregate stockpiles appeared to be concrete paved (Photograph 13), with the area entering the visitor carpark was mainly gravelled. The area outside the garage/workshop entrance appears to have had concrete pavement installed after that of the aggregate area, possibly indicating the location of historic underground storage tanks removal. The wall cladding on the office/lunchroom (Photograph 14) appeared to be ACM in good condition.

Photograph 13 & 14: Aggregate storage and presumed ACM cladding on office

Inside the garage/store area, there was evidence of a maintenance pit (filled in with gravel) (Photograph 15), several empty Intermediate Bulk Containers (IBCs) (Photograph 16), one IBC containing about 80 litres of MasterAir 905, an ultra-stable air-entraining admixture for use in all types of concrete (a Hazardous Substance Subclass 6.3/6.5 Category B).

Photograph 15 & 16: Garage and storage shed

This area contained small quantities of hydrocarbons and other chemicals in a bund made from a concrete tank (Photograph 17) and inside a bunded storage room (Photograph 18).

Photograph 17 & 18: Hydrocarbon/chemical bunding

Next to the store area was another storage area which contained oxides, steel fibres in 20-25 kg bags/buckets, as well as an air dryer, air compressor and storage reservoir (Photograph 19). The walls of the garage and store areas appears to be clad with corrugated metal, with a concrete floor.

Photograph 19: Storage of oxides/steel fibres and air compressor/storage reservoir

Next to the storage area was a concrete testing facility and an office (Photographs 20 & 21). Three of the internal walls of the office were clad with presumed flat ACM in good condition.

Photographs 20 & 21: Concrete testing area and office

Adjacent to the office was the concrete batching plant (Photographs 22 - 24). Aggregate is loaded into a hopper, which conveys the material up a conveyor into another hopper which feeds it into a lower hopper prior to transfer onto another conveyer and then into the rear of the Transit Mixer. Cement is added directly into the Transit Mixer from a silo located above where the Transit Mixer is loaded. The area around the batch plant is predominantly concrete paved.

Photographs 22-24: Concrete batching plant looking north east

Transit Mixers are washed out into a slurry pit near the batch shed, which overflows into a settlement pond (Photograph 25) and then into a long settlement pond (Photograph 26) which was historically a "sunken road'' used to load water tanks etc onto trucks. Water from the final settlement pond is reused to make ready mix. Historically, water from this settlement pond was either reused to wash out Transit Mixers and/or discharged to the stormwater system.


Photographs 25 & 26: Slurry pits//settlement ponds

The southern portion of the site contained stockpiles of gravel and waste concrete, and disused plant. All of the buildings had been demolished, with the footprints/foundations still visible. Most of the area was either concrete paved or gravelled.


Photographs 27 & 28: Yard area in southern portion of site looking south west

On the southern portion of the site was located a tank stand (Photograph 29) used to hold a tank used to store water for the washing of Transit Mixers. Adjacent to this on the south east boundary was a slurry pit/stockpile (Photograph 30) where Transit Mixers were historically washed out, but is now being used as a waste concrete stockpile area.


Photographs 29 & 30: Tank stand and slurry pit/stockpile

Stockpiles of material and plant can be viewed when standing on the stopbank on the south east corner of the site, looking towards the batch plant (Photographs 31 & 32).


Photographs 31 & 32: View from south east corner of site looking north north west

On the walk back to the lunchroom/office, the remnants of an above ground storage tank(s) area was identified (Photograph 33) on the eastern boundary of the site, and of the bowsers and (assumed) tank breather pipes (Photographs 34 - 36) on the north eastern side of the lunchroom.

Photograph 33: Bund footprint of above ground storage tank(s)

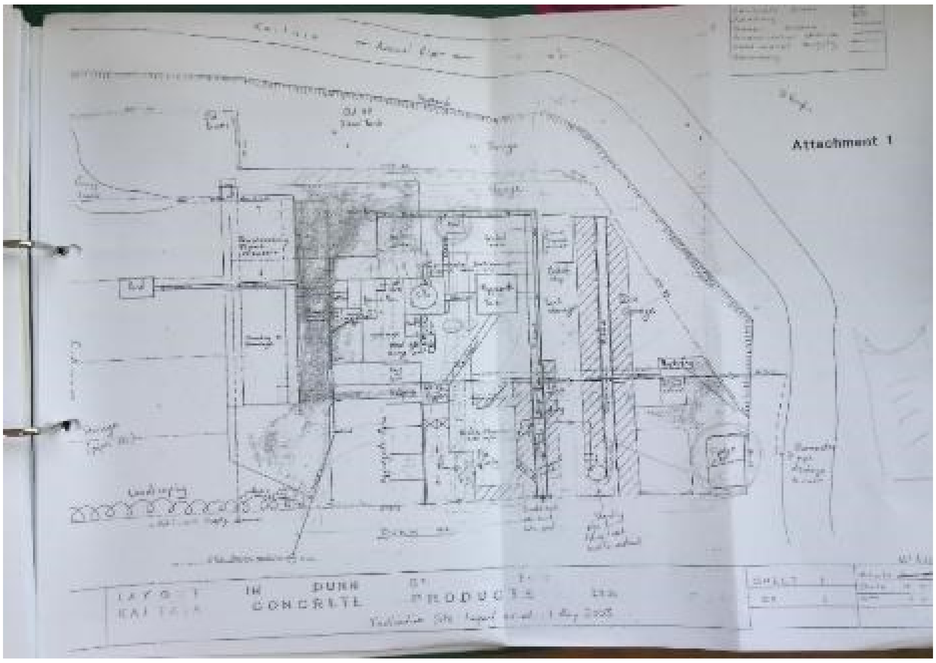
The bund location differs from what was observed onsite and information provided by Bob Shaw. It is possible that another above ground tank may have existed onsite, further north along the stopbank.



Photographs 34 - 36: Footings of fuel bowser and tank breather pipes

The bowsers and breather pipes are located on the north eastern side of the office/workshop/store. There are differing views on where the underground storage tanks were located. Bob Shaw indicated that the underground storage tanks were located to the south (on the other side) of the office/workshop/store to the bowsers, whilst Henry Tene (Firth Industries) advised that an underground fuel tank was located *in front of the lunchroom*.

Once the site walkover was completed, Nigel Furze (Firth) was asked about any documentation that may exist on the site that may provide additional information. Located in the batch office was a copy of an Environmental Audit report undertaken by Hill Young Cooper Ltd on 1 May 2003, on behalf of Firth. A copy of this report (minus the site plan) is provided in Appendix 2. The report contained information and photographs about management of water and waste and contained a site plan (Photograph 35). Item 12 discussed soil contamination on site. Possible locations of contamination included the slurry pits, old diesel tank area and drainage into soil from the precast areas.



Photograph 35: 2003 Audit Report site plan

The audit report and associated plan confirmed the information gathered during the site walkover.

7.2. HAIL activities identified from site history and site walkover

Based on the historic site ownership, consents, use, interviews, other collected information and site walkover, it is considered more likely than not that HAIL activities were carried out at the site, namely:

- **HAIL E4:** *Commercial concrete manufacture or commercial cement storage.* Concrete batching and cement products manufacture have occurred at the site.
- **HAIL A2:** *Chemical manufacture, formulation or bulk storage.* Bulk storage of a range of chemicals, including additives.
- **HAIL F4:** *Motor vehicle workshops.* Transit Mixers and other vehicles serviced in garage on the site.
- **HAIL A17:** *Storage tanks or drums for fuel, chemicals or liquid waste.* Waste oils stored in drums and diesel stored in an Intermediate bulk container (IBC) on the site.
- **HAIL A13:** *Bulk storage of petroleum or petrochemicals below ground.* Petrol and diesel stored in USTs. Diesel stored in above ground tanks.

It is considered possible that the following HAIL activities were carried out at the site, namely:

- **HAIL I:** *Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to* *human health or the environment.* Waste concrete and other waste disposed on the site.

- **HAIL E1:** *Buildings containing asbestos products known to be in a deteriorated condition.* Sections of the Prestress Shed are clad with presumed asbestos cement material in a semi-deteriorated condition.

8. GEOLOGY & HYDROLOGY

The soil type in the area is defined on NZMS290 Sheet O04/05 Kaitaia - Rawene (SOILS) as Kaitaia clay loam; imperfectly to very poorly drained soils of the estuarine flats and former lake beds.

The rock type in the area is defined on NZMS290 Sheet O04/05 Kaitaia - Rawene (ROCK TYPES) as **$A1_2$:** Alluvium: mainly mud and sand, some gravel and peat, forming river bed, flood plain and terrace deposits up to 20m thick and up to 10m above stream level; unconsolidated to very soft, unweathered.

The Institute of Geological and Nuclear Sciences Geology of the Kaitaia Area Geological Map 1 (Figure 6) defines the geology of the site as unconsolidated to poorly consolidated sand, mud, peat and shell deposits of estuarine, lacustrine, swamp, alluvial and colluvial origins (Q1a).

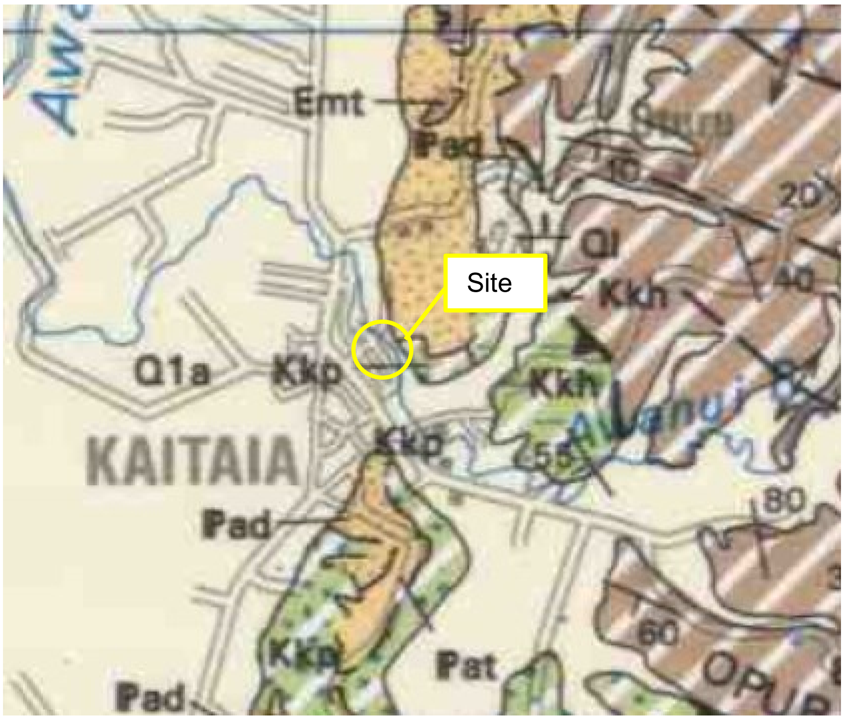


Figure 6. Extract of the Geological Map from The Institute of Geological and Nuclear Sciences Geological Map 1, Geology of the Kaitaia Area, 1:250 000 (1996).

Based on the topography of the site and the location of the Awanui River that along the eastern and north eastern boundary of the site, it is inferred that groundwater flows to the south east in the southern part of the site, east in the central portion of the site and north east in the northern part of the site.

9. SAMPLING & ANALYSIS PLAN AND SAMPLING METHODOLOGY

Based on the site history, collected information and the site walkover, the following sources of contamination and potential contaminants have been identified, as depicted in Table 1.

Location	Source of potential contamination	HAIL Activity	Potential contaminants
Whole site	Concrete manufacture, cement storage	E4	Cement, calcium hydroxide, alkalis, metals
Workshop/garage /storage area	Vehicle maintenance, storage of liquid waste, concrete additives	F4, A17, A2	Metals, TPH, PAH
Near lunchroom, near stopbank	Underground and above ground fuel storage	A13	Metals, TPH, PAH
Near workshop, near stopbank	Reported location of above and below ground fuel storage	A13	Metals, TPH, PAH
Onsite buildings (existing and demolished)	Asbestos cement material using in wall cladding. Lead based paints	E1	Asbestos, metals
Slurry pit and Lot 36	Disposal of material	I	Metals, TPH, PAH
Runoff from Prestress Shed	Oils used in moulds, wastewater discharge	I	Metals, TPH, PAH

Table 1. Sources of contamination and potential contaminants

Due to the nature of likely contaminants, and the likely activities on the site, it was considered that most of the likely contaminants would be at or near the surface, so predominantly surface sampling was undertaken (after removing the initial gravel/concrete cover layer). Due to the presence of historic and current concrete pavement over portions of the site, sampling did not occur beneath this pavement.

Locations sampled below the surface were located down gradient of the suspected location of the USTs (near the lunchroom) and on Lot 36.

9.1. Investigation methodology

The investigation methodology involved both systematic and judgemental sampling of soil from across the site. Test locations were spaced more closely around potential contaminants sources/waste receival areas from information gathered from site history, interviews and the site walkover.

Appendix B of the Contaminated Land Management Guideline No. 5 (MfE, 2011) suggests that the minimum number of sampling points required for detection of circular hotspots of 28.9m with a systematic sampling pattern at 95% confidence level for a 15,000m^2 site is 25.

The subject Piece of Land has an area of approximately 14,700m^2.

42 sample locations were selected to be sampled as part of the Detailed Site Investigation. This included 24 sites for heavy metals (where the samples were composited into 12 samples), 20 heavy metals samples, and 11 samples for TPH, and 10 samples for PAH and asbestos.

The sampling point location and parameters measured are provided in Figure 7 and Table 2.

Samples collected as part of the Detailed Site Investigation were taken from the side or base of the test pit or from the auger (for deeper samples). Test pitting was undertaken on 15 March 2018, under supervision of a Cook Costello senior environmental scientist.

Soil samples were collected by the Cook Costello senior environmental scientist during test pitting using a hand trowel and gloved hand. The hand trowel was scrubbed clean with potable water using a two stage/bucket wash system between samples and gloves replaced. Laboratory supplied sample containers were used (plastic for samples to be tested for metals and asbestos; glass for all other TPH/PAH), kept cool and dispatched to the laboratory the following day. The record of Chain of Custody is attached as Appendix 3.

10. QUALITY ASSURANCE AND QUALITY CONTROL

10.1. Field QA/QC

For the Detailed Site Investigation, sample collection, handling and dispatch was undertaken by a Cook Costello senior environmental scientist. The report was authored by Guy Watson and reviewed by Adrian Tonks, who are familiar and experienced with the Ministry for the Environment Contaminated Land Management guidelines and referenced documents.

All samples jars were marked with the sample type, sample location, depth (as required), date, and time of sample with this information being transferred onto the laboratory sampling request form.

The laboratory Chain of Custody form is attached in Appendix 3.

A hand trowel was used to collect soil samples from the test pit which was scrubbed clean with potable water using a two stage/bucket wash system between samples. Laboratory supplied sample containers were used, cooled and dispatched to Hill Laboratories Ltd a day after they were sampled.

All laboratory testing was carried out by Hill Laboratories Ltd within two weeks of sampling.

10.2. Laboratory QA/QC

Refer to Appendix 3 and 5 for laboratory QA/QC documentation, results and Chain of Custody form.

10.3. QA/QC Data Evaluation

All samples were collected by a Cook Costello senior environmental scientist using the same method and tested at the same laboratory.

For the Detailed Site Investigation, data was evaluated by Guy Watson and reviewed by Adrian Tonks, who are familiar and experienced with the Ministry for the Environment Contaminated Land Management guidelines and referenced documents.

No duplicate testing of samples was undertaken, although sample sites S25 and S26 were adjacent to each other and displayed consistent metals results.

11. BASIS FOR GUIDELINE VALUES

11.1. Guideline values for human health

This investigation aims to assess the risk to human health of use of the land for industrial purposes, using the:

- Ministry for the Environment – Environmental Guideline Value Database provides an appropriate source of guideline values for Priority Contaminant Metals and Organics.
- Ministry for the Environment – Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Module 4 – Tier 1 Soil Screening Criteria provides appropriate guideline values for TPH, and PAHs.

The adopted guideline values are tabulated alongside results in Section 12.

As the proposed land use of the subject piece of land may be parkland, it is appropriate to compare test results with both commercial / industrial and parkland / recreation land uses.

11.2. Background levels

Where applicable, background values are also tabulated alongside results in Section 12. Background values are selected to be representative of those values which might be expected at the site if no hazardous industry or activity had been undertaken at the site.

The background values account for processes such as leaching of metals from volcanic rock (aggregte) into the soil at the site. The background values also account for compounds introduced to the soil via air pollution. For example PAHs are not expected to occur in the soil at the site naturally, but it is likely that some amount have been introduced as a result of motor vehicle exhaust releasing these compounds into the air.

Background values are based on:

- Auckland Regional Council: 2001 – Background Concentrations of Inorganic Elements in Soils from the Auckland Region
- URS: 2003 - Determination of Common Pollutant Background Soil Concentrations for the Wellington Region

Where background levels are absent in literature, test results from locations within the site away from contaminant sources have been used (these test results are expected to be at background levels for the respective contaminant).

12. RESULTS

12.1. Sampling locations

On 15 March 2018, 42 locations were sampled on the subject Piece of Land, namely S1 – S42, as depicted in Figure 7. This included 24 sites for heavy metals (where the samples were composited into 12 samples), 20 heavy metals samples, and 11 samples for TPH, and 10 samples for PAH and asbestos.

The key historic/current site features are also included on Figure 7 to assist in providing context to sample location/results.

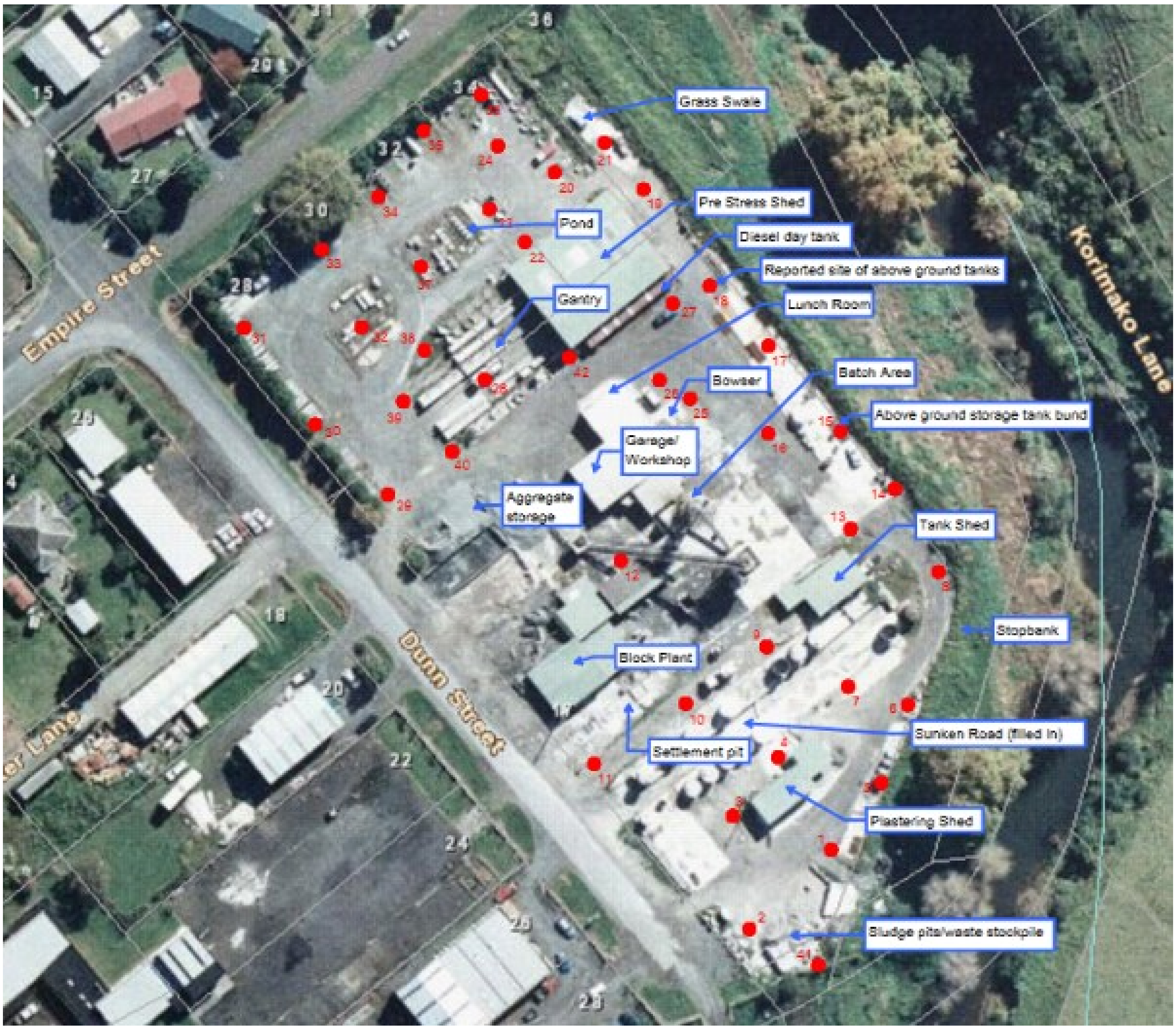


Figure 7. Sample locations and key historic/current site features

Table 2 details sample name, sample location, parameters measured and which samples were composited.

Name	Location	HM	HM Comp	Composite with	TPH	PAH	Asb
S1	NE of Slurry Pit	1			1	1	1
S2	Southern corner		1	S3			
S3	SW of Plaster Shed		2	S2			
S4	NW of Plaster Shed	2					2
S5	Southen Stopbank (S)		3	S6			
S6	Southen Stopbank (N)		4	S5			
S7	NE of Plaster Shed		5	S8			
S8	Bend of stopbank		6	S7			
S9	Sunken Rd NE 1	3			2	2	3
S10	Sunken Rd NE 2		7	S12			
S11	Sunken Rd near Dunn St	4					4
S12	Under conveyor		8	S10			
S13	NW corner of pipe shed	5					5
S14	Stopbank NE of hopper		9	S16			
S15	Stopbank next above ground storage	6			3	3	
S16	Batch plant yard area		10	S14			
S17	Stopbank between AGS		11	S19			
S18	Other above ground storage	7			4	4	
S19	Stopbank NE of Prestress		12	S17			
S20	Grass swale NW of Prestress	8			5	5	6
S21	Lot 36	9					7
S22	NW of Prestress	10					8
S23	Pond NW of Prestress	11			6	6	9
S24	Lot 24 mid (0.6m)		13	S28			
S25 S	Bowser E shallow (0.4m)	12			7	7	
S25 D	Bowser E deep (3.0m)	13			8	8	
S26 S	Bowser N shallow (0.2m)	14			9	9	
S26 D	Bowser N deep (3.0m)	15			10	10	
S27	SE corner of Prestress (near day tank)	16			11		10
S28	Gantry mid		14	S24			
S29	Settlement area near gate	17					
S30	Dunn St NW		15	S31			
S31	Dunn/Empire		16	S30			
S32	Laydown 1	18					
S33	Empire NW1 (Lot 30)		17	S34			
S34	Empire NW2 (Lot 32)		18	S33			
S35	Empire NW3 (Lot 32)		19	S36			
S36	Empire NW4 (Lot 34)		20	S35			
S37	Laydown 2		21	S39			
S38	NW Gantry	19					
S39	Gantry end		22	S37			
S40	Gantry SW		23	S41			
S41	Stopbank SE of Slurry pit		24	S40			
S42	SW corner of Prestress	20					
Lab Results		20		12	11	10	10

Table 2. Sample number, location, parameter measured and composited

For some samples, it was required to move the location of soil sampling from the planned location due to the presence of concrete pavement or waste concrete below the surface. Typically, surface vegetation was scraped back using an excavator to expose the underlying natural soil. Where waste concrete, gravel or bitumen fill was encountered, this material was removed and/or the sampling location moved slightly to enable the collection of native soil (as far as practicable). Photographs of the soil sample sites are presented in Appendix 4.

Personnel from Cook Costello carried out on-site sample collection and field testing. Hill Laboratories Ltd undertook laboratory testing of collected samples within the subject Piece of Land, with laboratory analytical results presented in Appendix 5.

12.2. Metals within the subject Piece of Land

Results of testing for Arsenic, Cadmium, Total Chromium, Copper, Lead, Nickel and Zinc are presented in Table 3.

Comparing these results to the Priority Contaminant guideline values for human health for Commercial/Industrial and Parkland Recreation use, the only tested sample which indicated concentrations of tested metals marginally exceeding the Commercial/Industrial guideline values was for lead in S1 (near the slurry pit on the southern portion of the site).

Being located close to the slurry pit, and on the outer boundary of the site, the elevated result is likely to reflect anthropogenic sources, such as vehicle battery acid disposal, fly tipping or the disposal of ash from the burning of wood coated with lead based paints.

Comparing these results to the typical background concentrations of metals for soils in the Auckland area, total chromium in S23, S25 (0.4), S25 (3.0), S26 (0.2) and S26 (3.0), and zinc in S27, indicated concentrations exceeding background levels for non-volcanic soils, but within the range for volcanic soils. As all of the S25 and S26 total chromium results were consistent with each other, this suggests a natural level of chromium in the soil.

Comparing these results to the typical background concentrations of metals for non-volcanic soils in the Auckland area, lead in composite S10/S12, composite S17/S19 and S27 indicated concentrations exceeding background levels, but well below Commercial/Industrial guideline values. These slightly elevated results are likely to reflect anthropogenic sources, such as leaching from lead based paints.

	Arsenic	Cadmium	Chromium III	Chromium VI	Copper	Lead	Nickel	Zinc
NES Priority Contaminant - Commercial/Industrial guideline values (mg/kg)	70	1300	NA	6300	NA	3300	3000	35000
NES Priority Contaminant - Parkland Recreation guideline values (mg/kg)	80	400	NA	2700	NA	8800	NA	NA
Background concentrations - Auckland Regional Council: 2001 (mg/kg) – non volcanic	0.4 – 12	<0.1– 0.65	2-55 (Measured range 2-149)		1 - 45	<1.5 – 65	0.9 – 35	9 - 180
Background concentrations - Auckland Regional Council: 2001 (mg/kg) – volcanic			3-125 (Measured range 3-286)		20 – 90		10 – 170	54 - 1160
S1	3	0.16	12		96	3400	11	44
S2 & S3	3	0.12	17		32	5.9	17	66
S4	<2	0.12	14		44	3.8	21	64
S5 & S6	2	<0.10	24		26	3.8	17	56
S7 & S8	<2	0.12	41		29	4.6	24	72
S9	6	<0.10	12		22	18.4	11	40
S10 & S12	3	0.13	13		42	198	19	92
S11	3	0.13	14		26	13.9	12	70
S13	11	0.13	27		52	13.0	19	74
S14 & S16	4	<0.10	17		29	15.6	16	50
S15	3	0.25	31		35	21	21	100
S17 & S19	17	6.5	54		47	149	27	161
S18	<2	0.15	54		31	21	31	102
S20	<2	0.13	42		31	9.3	26	81
S21	4	0.14	14		26	9.6	14	68
S22	6	0.12	8		18	34	12	140
S23	<2	0.40	64		36	14.3	33	108
S24 0.6 mbgl & S28	4	0.19	23		47	20	17	76
S25 0.4 mbgl	<2	0.21	78		39	18.4	38	100
S25 3.0 mbgl	<2	0.12	81		38	4.6	37	88
S26 0.2 mbgl	<2	0.52	74		39	5.8	35	112
S26 3.0 mbgl	<2	0.15	76		36	4.3	34	81
S27	4	0.37	22		66	96	25	930
S29	3	0.10	14		34	13.6	19	186
S30 &S31	3	0.11	10		33	23	16	65
S32	<2	0.11	9		40	56	17	83
S33 &S34	5	0.13	12		41	21	21	90
S35 &S36	4	0.15	17		33	42	14	64
S37 &S39	5	<0.1	10		33	25	15	58
S38	6	0.10	13		37	18.6	18	75
S40 & S41	7	0.15	15		32	48	16	72
S42	7	<0.10	10		15	8.4	5	102

*Total Chromium mbgl – metres below ground level

International threshold based health investigation guideline

Results above non-volcanic background values

Results above Industrial/Commercial guideline values

Table 3. Tabulation of results from testing for Heavy Metals

12.3. Total petroleum hydrocarbons within the subject Piece of Land

Results of testing for C_7-C_9, C_{10}-C_{14}, C_{15}-C_{36} and TPH (C_7-C_{36}) are presented in Table 4.

		C_7-C_9	C_{10}-C_{14}	C_{15}-C_{36}	Total (C_7-C_{36})
Soil acceptance criteria - Commercial / industrial guideline values (mg/kg))	<1mbgl Silty CLAY	8800	1900	NA	NA
	1-4mbgl Silty CLAY	20000	8900	NA	NA
Soil acceptance criteria - Residential guideline values (mg/kg))	<1mbgl Silty CLAY	2700	7300	NA	NA
	1-4mbgl Silty CLAY	560	2700	NA	NA
S1		<8	<20	<40	<70
S9		<8	<20	<40	<70
S15		<9	28	3100	3100
S18		<9	<20	<40	<70
S20		<8	<20	<40	<70
S23		<10	<20	<40	<70
S25 0.4 mbgl		<8	<20	1330	1330
S25 3.0 mbgl		<9	<20	<40	<70
S26 0.2 mbgl		<9	<20	<40	<70
S26 3.0 mbgl		<10	<20	<40	<70
S27		<8	<20	139	139

Results above laboratory detection level

Table4. Tabulation of results from testing for TPH

Comparing these results to the Priority Contaminant guideline values for human health for Commercial/Industrial and high density residential use, there is no tested sample which has indicated concentrations of tested compounds exceeding the Priority Contaminant guideline values.

Comparing these results to background concentrations detected at the site away from potential contaminant sources, the concentrations of C_7-C_9 and C_{10}-C_{14} were all below detection limits, apart from S15 (adjacent to above ground diesel storage tanks) which indicated trace amounts of C_{10}-C_{14}.

http://www.mfe.govt.nz/publications/environmental-reporting/figure-5-carbon-chain-length-typical-hydrocarbons details (Figure 8) differing (typical) carbon ranges for varying organics.

Product	Minimum Carbon number	Maximum Carbon number
Ligroine	4	7
Mineral spirits	7	11
Toluol	6	6
Petrol	4	12
Diesel	8	17
Xylol	7	7
Kerosene	8	17
Aviation turbine fuel	8	16
Gas oil, fuel oil	11	High
Transformer oil	15	High

Figure 8: Typical carbon chain range for different organics.

The concentration of C_{15}-C_{36} for S27 was above laboratory detection levels, but within the background range identified in URS: 2003 - Determination of Common Pollutant Background Soil Concentrations for the Wellington Region. However, as S27 is located close to a historic diesel day tank and boiler, the slightly elevated result may indicate minor historic losses from this activity.

The concentrations of C_{15}-C_{36} for S15 and S25 0.4mbgl were above laboratory detection levels, and above the background range. As S15 is adjacent to historic above ground storage tanks, and S25 is adjacent to a historic fuel bowser, it is possible that past losses from vehicles or equipment in these areas may have contributed to these elevated results.

12.4. Polycyclic Aromatic Hydrocarbons within the subject Piece of Land

Results of testing for PAHs are presented in Table 5.

	Soil screening criteria – Commercial/Industrial use guideline value (mg/kg)	Soil screening criteria – Parkland Recreation guideline value (mg/kg)	S1 (mg/kg)	S9I (mg/kg)	S15 (mg/kg)	S18 (mg/kg)	S20 (mg/kg)	S23 (mg/kg)	S25 0.4 mbgl (mg/kg)	S25 3.0 mbgl)	S26 0.2 mbgl (mg/kg)	S26 3.0 mbgl (mg/kg)
1-Methylnaphthalene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	0.021	<0.014	<0.017	<0.014
2-Methylnaphthalene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	0.038	<0.014	<0.017	<0.014
Perylene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	0.040	<0.014	<0.017	<0.014
Benzo[a]pyrene Potency Equivalenc Factor (PEF) NES	35	40	<0.03	<0.03	<0.04	<0.04	<0.03	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo[a]pyrene Toxic Equivalence (TEF)			<0.03	<0.03	<0.04	<0.04	<0.04	<0.04	<0.03	<0.04	<0.05	<0.04
Acenaphthylene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Acenaphthene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Anthracene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Benzo[a]anthracene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Benzo[a]pyrene (BAP)			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Benzo[b]fluoranthene + Benzo[j] fluoranthene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Benzo[e]pyrene	11	0.27	<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Benzo[g,h,i]perylene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Benzo[k]fluoranthene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Chrysene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Dibenzo[a,h]anthracene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Fluoranthene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	0.044	<0.014	<0.017	<0.014
Fluorene			<0.011	<0.012	<0.014	<0.014	0.013	<0.016	0.017	<0.014	<0.017	<0.014
Indeno(1,2,3-c,d)pyrene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	<0.014	<0.014	<0.017	<0.014
Naphthalene	230	71	<0.06	<0.06	<0.07	<0.07	<0.07	<0.08	<0.07	<0.07	<0.09	<0.07
Phenanthrene			<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	0.052	<0.014	<0.017	<0.014
Pyrene		1600	<0.011	<0.012	<0.014	<0.014	<0.013	<0.016	0.053	<0.014	<0.017	<0.014

Table 5. Tabulation of results from testing for PAHs

Comparing these results to the Priority Contaminant guideline values for human health for Commercial/Industrial and Parkland Recreation use, there is no tested sample which has indicated concentrations of tested compounds exceeding the Priority Contaminant guideline values.

Comparing these results to the assumed background concentrations detected at the site away from contaminant sources, apart from S25 (0.4mbgl), there is no tested sample which exceeding the background levels. Sample S25 (0.4mbgl) showed trace amounts of Fluoranthene, Fluorene, Phenanthrene, and Pyrene. Fluoranthene is a constituent of coal tar and petroleum-derived asphalt. Fluorene and Pyrene are obtained from coal tar. Both Phenanthrene and Pyrene consist of fused Benzene rings, suggesting the detection of bitumen material in this sample.

12.5. Asbestos within the subject Piece of Land

Results of testing for Asbestos is presented in Table 6.

	Asbestos Presence/Absence
S1	Asbestos NOT detected
S4	Asbestos NOT detected
S9	Asbestos NOT detected
S11	Asbestos NOT detected
S13	Asbestos NOT detected
S20	Asbestos NOT detected
S21	Asbestos NOT detected
S22	Asbestos NOT detected
S23	Asbestos NOT detected
S27	Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected ACM Debris and Loose Fibres

Table 6. Tabulation of results from testing for the presence of asbestos

Of the ten sites sampled, only one location (S27) detected the presence of asbestos, being Amosite (Brown Asbestos) and Chrysotile (White Asbestos) as Asbestos Cement Material (ACM) Debris and Loose Fibres.

S27 is on the south eastern side of the Prestress Shed, a building identified in the site walkover as being clad with asbestos cement material in partially deteriorated condition. Asbestos was not detected in other areas, possibly because buildings containing asbestos cement material were demolished before they became deteriorated and/or they were not constructed of asbestos cement material.

http://www.mbie.govt.nz/info-services/employment-skills/workplace-health-and-safety-reform/document-and-image-library/background-information-for-asbestos-chapter-discussion-document.pdf report that the types of asbestos used (in New Zealand) varied. The predominant fibre type was white chrysotile, which was cheaper and more easily worked. Amosite, or brown asbestos, was imported from Rhodesia (now Zimbabwe) and was only ever used in small quantities.

Asbestos is a risk to health only when it is inhaled as fine dust. Generally, asbestos-containing materials that are in good condition will not release asbestos fibres. https://www.healthed.govt.nz/resource/all-about-asbestos

If it is intended to disturb the soil where the asbestos is located, then care must be taken to keep the soil damp, separate it from other material, cover stockpiled material with a tarpaulin or similar, and either rebury it onsite or remove it offsite to an appropriate waste disposal facility. This issue should be managed by someone holding a Class A Asbestos Removal Licence and addressed through compliance with an appropriate Asbestos/Construction Management Plan.

13. CONCEPTUAL SITE MODEL

A risk to human health can only exist if there are sources of contamination and contaminants of potential concern (hazards), sensitive receptors (receptor), and migration pathways and exposure routes between these. The absence of any one of these components means no risk can exist. A conceptual site model is designed to identify the hazards, receptors and possible links between these.

It is proposed to use part of the subject Piece of Land for Industrial/Commercial use, with the remainder being used for Parkland Recreation as part of flood mitigation works. It is understood that these flood mitigation works may cover about one third of the eastern portion of the site.

During redevelopment works, significant earthworks are likely to occur, meaning that contact may occur with existing soil, as well as through potentially contaminated soil as dust being carried into neighbouring properties. Accordingly, potential routes of exposure includes inhalation, dermal contact and ingestion at this stage of development.

Site investigations have concluded that the only identified areas where elevated contaminant levels may exist would be from lead on the southern side of the slurry pit on the southern portion of the site (location S1) and from asbestos on the south eastern portion of the Prestress Shed in the northern portion of the site (location S27).

A conceptual model representing the site characteristics in written form and showing the possible relationships between source, pathway and receptors is included in Table 7 below.

Source	Pathway	Receptor
Dust from soil containing elevated level of lead	Inhalation of lead in dust during earthworks	Site workers, visitors and neighbouring properties, primarily during soil disturbance activities
Elevated level of lead in soil	Ingestion/dermal absorption of soil containing elevated lead	Site workers primarily during soil disturbance activities
Dust from soil containing asbestos fibres/asbestos cement material	Inhalation of asbestos fibres in dust during earthworks	Site workers, visitors and neighbouring properties, primarily during soil disturbance activities

Table 7. Conceptual Site Model

To reduce this risk, measures should be taken to:

- selectively remove soil containing asbestos material, as part of overall asbestos removal on the site,
- undertake soil disturbance activities when soil is damp or when wind conditions are calm,
- ensure appropriate hygiene procedures are in place to ensure hand-washing prior to eating and/or smoking.

14. SITE CHARACTERISATION

In 1966/7, the site was developed from farmland into a site for the production of ready mix concrete and concrete masonry products. This use continued until the late 1990s, with the progressive reduction in concrete masonry product manufacture in favour of ready mix concrete. Buildings on the site were progressived demolished in the early to mid 2000's, with the site being in a similar state as it is today for about the 10 years. Two main buildings remain – the Prestress Shed in the northern portion of the site and the Office/Workshop/Stores/Batch area in the central portion of the site.

It has been determined through a review of site history, interviews and soil sampling that activities listed in the HAIL are likely to have been carried out within the subject Piece of Land including:

- **HAIL E4:** *Commercial concrete manufacture or commercial cement storage.* Concrete batching and cement products manufacture have occurred at the site.
- **HAIL A2:** *Chemical manufacture, formulation or bulk storage.* Bulk storage of a range of chemicals, including additives.
- **HAIL F4:** *Motor vehicle workshops.* Transit Mixers and other vehicles serviced in a garage on the site.
- **HAIL A17:** *Storage tanks or drums for fuel, chemicals or liquid waste.* Waste oils stored in drums and diesel stored in an Intermediate bulk container (IBC) on the site.
- **HAIL A13:** *Bulk storage of petroleum or petrochemicals below ground.* Petrol and diesel stored in underground storage tanks (USTs). Diesel stored in above ground tanks.
- **HAIL E1:** *Buildings containing asbestos products known to be in a deteriorated condition.* Sections of the Prestress Shed are clad with asbestos in semi-deteriorated condition. Asbestos cement material and fibres detected in soil adjacent to the Prestress Shed.

It is considered possible that the following HAIL activities were carried out at the site, namely:

- **HAIL I:** *Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.* Elevated levels of lead (marginally above Industrial/Commercial guideline values) detected in soil in the southern portion of the site near the slurry pit. Reports of disposal of rubbish ash to the grass swale area in the northern portion of the site.

Large portions of the site were covered in concrete pavement. Most of this pavement was historic, although there were areas (such as outside the workshop/garage) which appear to have been poured (or repoured) at a later date. There were significant amounts of waste concrete, gravel and waste bitumen roading material encountered during site sampling. The waste concrete was located all over the site (including in the grass swale and pond (in Lots 32 and 26)), with gravel and waste bitumen roading material tending to be located in the northern portion of the site.

Laboratory testing of samples collected within the subject Piece of Land indicated that all tested heavy metals were well below any prescribed guideline value, apart from one location (S1) which had a result for lead marginally above the Commercial/Industrial guideline value, but well below the Parkland Recreation guideline value.

Laboratory testing indicated that all tested heavy metals were either at or relevant background levels, apart from:

- total chromium in S23, S25 (0.4), S25 (3.0), S26 (0.2) and S26 (3.0), and zinc in S27 which exceeding background levels for non-volcanic soils, but within the range for volcanic soils. As all of the S25 and S26 total chromium results were consistent with other, this suggests a natural level of chromium in the soil.
- lead in composite S10/S12, composite S17/S19 and S27 indicated concentrations exceeding background levels. These slightly elevated results are likely to reflect anthropogenic sources, such as leaching from lead based paints.

Laboratory testing for Total Petroleum Hydrocarbons (TPH) indicated that there was no tested sample with concentrations of tested compounds exceeding the Priority Contaminant guideline values, with most results below laboratory detection levels.

The concentration of C_{10}-C_{14} for S15 and C_{15}-C_{36} for S15, S25 0.4mbgl and S27 were above laboratory detection levels. Their locations adjacent to a historic diesel day tank, fuel bowser and above ground storage tanks suggests possible losses from past vehicles and/or activities/equipment.

Laboratory testing for Poly Aromatic Hydrocarbons (PAH) indicated that there was no tested sample with concentrations of tested compounds exceeding the Priority Contaminant guideline values, with most results below laboratory detection levels. Sample S25 (0.4mbgl) showed trace amounts of Fluoranthene, Fluorene, Phenanthrene, and Pyrene, which suggests the detection of bitumen material in this sample.

Of the ten sites sampled, only one location (S27) detected the presence of asbestos in soil. S27 is on the south eastern side of the Prestress Shed, a building identified in the site walkover as being clad with asbestos cement material in partially deteriorated condition.

Further, based on historic land use adjacent to the site it is considered very unlikely that contaminants have/will migrate into the subject Piece of Land.

Based on the review of site history, interviews and soil sampling results, and the current and proposed land use for the site, it appears that site activities, to a large extent have not caused contamination that would detrimentally affect the continued use of the site for industrial/commercial purposes, and for the redevelopment of a portion of the site for flood protection, coupled with parkland/recreation uses. The presence of an elevated level of lead (S1) and asbestos in soil (S27) should be addressed through compliance with an appropriate Asbestos/Construction Management Plan.

15. CONCLUSIONS & RECOMMENDATIONS

This Detailed Site Investigation and results from the Preliminary Site Investigation conclude:

- the subject Piece of Land has been used for activities listed in the HAIL.
- sampling from 42 locations on the subject Piece of Land only identified two sample locations that:
    - exceeded a Priority Contaminant guideline value for human health for the current land use (lead in S1).
    - identified the presence of asbestos in soil (S27).
- fragments of asbestos cement material and fibres were identified in the soil on the south eastern side of the Prestress Shed on the northern portion of the site. Measures should be taken to manage disturbance of this material to minimise the potential for dust generation. Further, this soil should be managed as part of the removal of asbestos cement material cladding from the Prestress Shed.
- concentrations of TPH in excess of background values were identified in three areas of the site (S15, S25 0.4mbgl and S27). Their locations adjacent to a

historic diesel day tank, fuel bowser and above ground storage tanks suggests possible minor losses of oil and/or diesel from past vehicles and/or activities/equipment. Although the results are above background, they are well below (<2% of) the priority contaminant guideline value.

- concentrations of PAHs in excess of background values were identified in one area of the site (S25 0.4mbgl) which showed trace amounts of Fluoranthene, Fluorene, Phenanthrene, and Pyrene, suggestive of the detection of bitumen material.
- it is considered that the human health risk resulting from the proposed development due to land contamination is very low, on the understanding that the presence of asbestos in soil is managed by someone holding a Class A Asbestos Removal Licence and the slightly elevated lead result in S1 is managed by a suitably experienced Environmental Professional and addressed through compliance with an appropriate Asbestos/Construction Management Plan.

16. LIMITATIONS

This report has been prepared for the benefit of Northland Regional Council as our client with respect to Contaminated Land Management Detailed Site Investigation. It shall not be relied upon for any other purpose. The reliance by other parties on the information or opinions contained in this report shall, without our prior review and agreement in writing, be at such parties' sole risk.

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

Cook Costello have 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 which is thorough enough to preclude the presence of materials at the site which 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 now 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.

Guy Watson
Senior Environmental Scientist
BSc (Env Science)

Adrian Tonks
Engineer
BE (ESc), GIPENZ, IQP (WDC 024)

APPENDIX 1: HISTORIC AERIAL IMAGERY


11 May 1968 (Retrolens)

2000 (FNDC GIS)


31
29
15
27
36
34
32
30
28
Empire Street
26
24
18
20
22
24
26
28
17
Dunn Street
Korimako Lane
ter Lane
2002 (FNDC)

14 Oct 2003 (Google Earth)

11 January 2004 (Google Earth)

26 February 2011 (Google Earth)

10 October 2012 (Google Earth)

1 October 2013 (Google Earth)

2015 (NZTA)

6 April 2016 (Google Earth)

Street View in 2013 (Google Maps)

APPENDIX 2: 2003 AUDIT REPORT

Firth
LEADING BY DESIGN

ENVIRONMENTAL AUDIT CERTIFIED PLANTS

SITE- KAITAIA

DATE- 1 May 2003

1) DOES THE CONCRETE BATCHING PLANT HAVE AN EFFECTIVE SETTLING SYSTEM TO TREAT ALL WASTEWATER AND ADJACENT CONTAINED STORMWATER

YES **[NO]** DON'T KNOW

- *Refer to Indicative Site Layout Plan (Attachment 1).*
- *Most of the wastewater and stormwater from the batching area flows into a small pond in front of the batching area (refer Photographs 1 and 2). This pond does not have a very large capacity, but does not receive large volumes of wastewater, as the truck washout area is in a separate part of the site. The water in the batching area is primarily from the wash down of the outside of the trucks, the spray bars, and stormwater (which would pick up cement dust from around the batching plant). This pond also receives stormwater from part of the yard area and off the roof of some of the buildings in the office/ lunch room area (photo 3). Once the pond is full it overflows into a drain (photos 4 and 5) which flows eventually into a stormwater drain (photos 6 and 7) and out to the Awanui River.*
- *A small amount of water from around the batching area flows back away from this pond and soaks into the ground underneath the weigh hopper (photograph 8).*
- *Wastewater from the precast area drains into one of two ponds before discharge to ground (Photographs 9 to 12).*
- *Wastewater from the plastering area flows into the stormwater drain and out to the Awanui River (photographs 13 and 14).*
- *Wastewater from truck washout flows into a 2-stage settling pond before being recycled again for truck washout (photograph 15). Some recycled wastewater from the truck washout area (under the standing pipe) flows down into the sunken road and thus to the stormwater system and river (photograph 16).*
- *The 3,000 gallon (13,600 litre) recycled wastewater storage tank has an overflow pipe and cementitoius deposits on the outside of the tank indicate that it overflows (refer photograph 17). The washout ponds would quickly fill during rain, and the ballcock pump would continue to pump wastewater into the storage tank, causing it to overflow. Overflows would collect in the sunken road and then drain out to the stormwater system and thus the river.*

- *Wastewater from the pipe spinning area flows into the truck washout pond and is therefore recycled (photograph 18).*
- *There is another wastewater settling pond near the wash-out pond (photographs 19 and 20), but this flows out into the stormwater pipe (and thus to the river), so the flow into this pond is closed with a bung to try to prevent the washout water from discharging into the stormwater system.*

2) DOES THE CONCRETE BATCHING PLANT RECYCLE WATER FROM THE SETTLING SYSTEM

[YES] NO DON'T KNOW

- *Only for truck wash out, as described above.*

3) DOES ANY WASTEWATER OVERFLOW FROM THE CONCRETE BATCHING SYSTEM

[YES] NO DON'T KNOW

- *Wastewater from truck washout area overflows into the stormwater system as described in question 1 above.*
- *During a heavy rainfall event the level of the Awanui River rises, causing the stormwater outflow gate to the Awanui River to close, preventing any drainage from the site. This causes the site to flood. During these conditions the stormwater would mix with the wastewater, and also possibly pick up small amounts of other contaminants from the yard such as oil deposits. This eventually drains back out through the stormwater pipe to the river, once the river level has receded.*

4) DOES ANY WASTEWATER DISCHARGE TO STORMWATER

[YES] NO DON'T KNOW

- *This includes wastewater overflow from washout area, wastewater from the plastering area, wastewater and stormwater (mixed) from the batching plant, as described above.*
- *Mixed wastewater and stormwater also discharges to the stormwater drain during and after rainfall events, as described in question 3 above.*

5) DOES ANY WASTEWATER DISCHARGE TO SOIL

[YES] NO DON'T KNOW

- *Wastewater from the precast area flows into two separate settling ponds (refer photographs 10 and 21). One of the ponds flows into a grass swale type drain and then drains away into the ground (photographs 10, 11 and 12). The other pond overflows into the unsealed yard area and then drains away into the ground (photo 21).*
- *A small amount of wastewater from the batching area drains away and soaks into the ground under the weigh hopper (see photo 8)*

6) DOES ANY WASTEWATER DISCHARGE TO SEWER (TRADEWASTE)

YES **[NO]** DON'T KNOW

7) IS STORMWATER TREATED BEFORE DISCHARGE

YES **[NO]** DON'T KNOW

- *Some stormwater is treated in settling ponds, but most of the stormwater from around the tank manufacturing area and surrounds flows into the sunken road and then into the stormwater drain.*
- *After rain events the stormwater ponds / floods on large areas of the site before draining away through the stormwater sumps.*

8) IS THERE A "RAIN ONLY – DRAINS TO SEA" SIGN CLEARLY PAINTED ADJACENT TO ALL STORMWATER GRATES

YES **[NO]** DON'T KNOW

9) IS A PLAN OF THE STORMWATER SYSTEM READILY AVAILABLE

YES **[NO]** DON'T KNOW

- *A plan was sourced from Far North District Council (Attachment 2), showing the pipes leaving the site, but the scale makes it hard to read. There is no plan showing the stormwater collection and routing within the site.*

10) IS THERE A PLAN OF THE SEWER SYSTEM READILY AVAILABLE

[YES] NO DON'T KNOW

- *The only known sewer pipes on the site are in the lunch room / toilets area. These are connected to the FNDC sewer in Dunn St, as shown on the 1967 site plan (Attachment 3).*

Environmental Audit
Firth Certified – Kaitaia
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1 May 2003

11) IS THERE A MANAGEMENT PLAN FOR THE WATER SYSTEM

YES **[NO]** DON'T KNOW

- *The water system on the site is difficult due to the size of the site, the number of activities on the site (which are spread out around the site), it's low-lying position, and the flooding problem.*
- *It may be possible to improve the water system in some respects, such as by recycling settled wastewater and / or stormwater for concrete production. Some modifications to the outflow to the Awanui River may also help alleviate the flooding problem (eg: raising the level of the outflow gate). These issues should be investigated with a view to finding practical, cost-effective solutions, taking into account the economics of the site as well as other issues such as OSH.*
- *The situation should be reviewed, actions identified and implemented, and a management plan prepared once the system is established, and included in Vol I of the EMP.*

12) IS THERE ANY SOIL CONTAMINATION ON SITE

[YES] NO DON'T KNOW

- *Likely contamination where waste areas soak into the unsealed ground underneath (photograph 22).*
- *Possible contamination also around the old diesel tank (no longer used – refer photograph 23).*
- *Wastewater drainage into soil also from pre cast areas and batching plant as described above.*

13) ARE ALL WASTE MATERIALS DISPOSED PROPERLY OFF SITE

YES **[NO]** DON'T KNOW

- *Sludge left to dry (photograph 22) before removal from the site by a local contractor (Murray Reid). Not known what the contractor does with it.*
- *Solid waste pile next to the sludge pits should be removed from the site by an authorised contractor and disposed of to an approved landfill.*
- *General rubbish goes into a black skip bin (photograph 24) before removal from the site by a waste contractor approximately once a week.*
- *Old drums and other solid waste are stored in various locations around the site (refer photographs 23 and 25). These should be removed from the site by an authorised contractor and disposed of to an approved landfill.*
- *Note the Firth Environmental Standard requires:*

  Waste materials to be stored on a suitably sized impervious concrete pad and walls;

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1 May 2003

plus
Waste materials to be removed by authorised contractor to approved landfill or cleanfill;
plus
Water run-off from waste materials pile is either to be routed to the batching plant wastewater system;
or
If stored away from the wastewater system of the batching plant, then the storage area shall have its own treatment system, or be contained and removed from the site by an authorised contractor to an approved landfill.

Operational Procedures:

The disposal of solid waste materials shall be by an authorised contractor to an approved landfill.

The Plant Manager shall obtain a letter from the solid waste removal contractor stating the authorisation for the disposal of the solid waste and also a copy of contractor's resource consent for the discharge of this solid waste.

The Plant Manager shall obtain a letter from the "suction tanker" contractor stating the authorisation for the disposal of the liquid from the waste pile containment system and also a copy of contractor's resource consent for the discharge of this liquid waste.

A clear written record of disposing of the solid and liquid waste materials shall be made in the site environmental diary.

14) ARE SPILL RESPONSE KITS IN PLACE

YES **[NO]** DON'T KNOW

- *Spill Response kits should be obtained. The standard Spill Response kit for Firth is known as "MWheel O" yellow Wheely Bin, supplied by Process Lubricants Ltd, Auckland.*

15) ARE ALL STAFF TRAINED IN USE OF SPILL RESPONSE KIT

YES **[NO]** DON'T KNOW

- *A clear written record of the staff trained should be kept in Volume IV of the Environmental Management Plan or Health & Safety Training Manual Record.*

16) ARE ALL ABOVE GROUND TANKS BUNDED

YES **[NO]** DON'T KNOW

- *The additive tanks are not bunded (see photo 26)*
- *Bunding surrounding above ground tanks should be built to a size that is able to contain 110% of the largest tank volume, plus 10% of second largest tank volume, plus 200mm of rain if uncovered, but ideally should be roofed. Water level in bunds should be checked regularly and cleaned out with sucker truck when level reaches 25% of storage capacity.*

17) IF THERE IS AN UNDERGROUND TANK DOES IT COMPLY WITH HAZARDOUS SUBTSANCES REGS AND FIRTH STANDARDS

YES NO DON'T KNOW **[N/A]**

- *No underground tanks on site. Not applicable*

18) ARE ALL TRANSFORMERS BUNDED

YES NO DON'T KNOW **[N/A]**

- *No transformer on site. Not applicable*

19) ARE ALL FUEL OIL/ DRUMS IN BUNDED / CONTAINED FACILITIES

YES **[NO]** DON'T KNOW

- *There is a 300 litre diesel tank stored in the workshop, unbunded (refer photograph 27).*
- *The drums of oil in the workshop are also unbunded, including those in the dangerous goods store, where there is evidence of oil leaking out under the door (refer photographs 27 and 28).*
- *Bunding surrounding drums should be built to a size that is able to contain 100% of the total volume stored, plus at least 200mm of rain if uncovered (outside).*

20) IS THERE A NOISE PROBLEM FROM THE OPERATION

YES **[NO]** DON'T KNOW

- *Site is in an industrial area. There are some houses approximately 140m from the batching plant, in Empire Street, although these are also in the Industrial zone. There have been 2 complaints in the past from these residents regarding noise. Site practices have been modified accordingly including deliveries of cement only between the hours of 7am – 7pm Mon – Sat, and notifying residents if there will be an early start.*
- *There is a letter on file from FNDC (Sept 4 2000) indicating that the noise levels in Empire Street at the "residential boundary" exceeded the District Plan noise limits. However, the Council does not seem to have taken into account that the properties in Empire Street are in fact*

zoned Industrial so the rule that they have referred to does not apply (it requires the noise level to be measured at the boundary of any site in the residential or rural zones). The land on the opposite side of the river is zoned Rural Living, and the nearest house in a rural zone is approximately 150m from the site on the opposite side of the river. The nearest residential zone is around 300m to the north in Allen Bell Drive.

21) ARE THERE ANY DUST OR FUME EMISSIONS FROM THE OPERATION

[YES] NO DON'T KNOW

- *Most of the yard is unsealed, resulting in dust from vehicle movements. The vehicle entrance is also unsealed (similar to other properties in the street), resulting in some dust being tracked out onto the road (photograph 29).*
- *The most sensitive nearby properties are the houses north of the site in Empire Street. There is excellent landscaping between the Firth site and the houses, which helps to prevent windblown dust.*
- *There has been one complaint in the past regarding dust.*
- *To a lesser extent there are also dust emissions from activities such as the loading of aggregate and sand into the weigh hopper, unloading of aggregate trucks, cement transfer and the like.*

22) IS THERE A DUST SUPPRESSION PLAN IN PLACE

YES **[NO]** DON'T KNOW

- *Some measures in place including a dust sock on the cement silo and spray bars and wind curtains in the batching area (refer photograph 30).*
- *The Firth Environmental Standard requires at least a 12-metre length of driveway inside of access ways to be concreted or paved to minimise dust emissions and to reduce sediment loading of stormwater.*
- *A Dust Management Plan should be developed and implemented as part of an Environmental Management Plan for the site*
- *It is recommended that the following procedures be put in place -*
    - *Dust sock be checked regularly and maintenance recorded in the Site Environmental Diary(EMP, Vol IV)*
    - *Consideration be given to options to reduce dust emissions from the yard and accessways. Use of water sprinklers in high use areas during dry weather is likely to be the most practicable option.*

  These should be specified in Environmental Management Plan, Volume I Procedures.
- *These actions should be recorded in the Site Environmental Diary (EMP, Volume IV).*

23) IS THE SITE SPEED LIMIT ADEQUATELY DISPLAYED AND ENFORCED

YES **NO** DON'T KNOW

- *There is no sign indicating the speed limit.*
- *Recommend sign be installed indicating a maximum speed limit of 10 kph. This should be enforced and will assist in reducing dust emissions from vehicle movements.*

24) ARE ALL GAS BOTTLES SECURELY LOCATED

YES **NO** DON'T KNOW

- *Some gas bottles are stored in the workshop but not secured (photo 27). Some are stored in the dangerous goods shed.*
- *Note Firth Standard requires:*

  All gas bottles, whether full or empty, to be restrained from falling by galvanised steel chain;

  plus

  When on a trolley they shall be fastened only by a galvanised steel chain (not a rope, belt, bungy cord or other form).

25) ARE ANY COMPLAINTS RECEIVED FROM OUTSIDE

YES NO DON'T KNOW

- *3 complaints have been received in the past. 2 regarding noise and 1 regarding dust.*
- *Noise issues related to cement deliveries late at night and early starts. These issues have been addressed through limiting the hours for cement deliveries and notifying neighbours of early starts.*

26) IS THE SITE ADEQUATELY AND EFFECTIVELY LANDSCAPED

YES NO DON'T KNOW

- *Excellent landscaping along the Emipre Road frontage, and along the part of the Dunn Street frontage closest to the houses (photographs 31 and 32).*

27) IS GOOD HOUSEKEEPING IN EVIDENCE

YES **NO** DON'T KNOW

- *Old drums and other solid waste in various places around the site (see photographs 22, 23, and 25). These should be removed and disposed of appropriately by an authorised contractor*
- *None of the boundaries of the site are fenced.*

SIGNED-

NOTES- RATING =NUMBER OF POSITIVE ANSWERS / 25

AN ANSWER 'YES' TO A QUESTION SUCH AS (3) IS A NEGATIVE

A 'DON'T KNOW' IS A NEGATIVE

N/A IS NOT APPLICABLE AND DOES NOT COUNT AS PART OF OVERALL SCORE.

RATING = 4 / 25

Photo 1

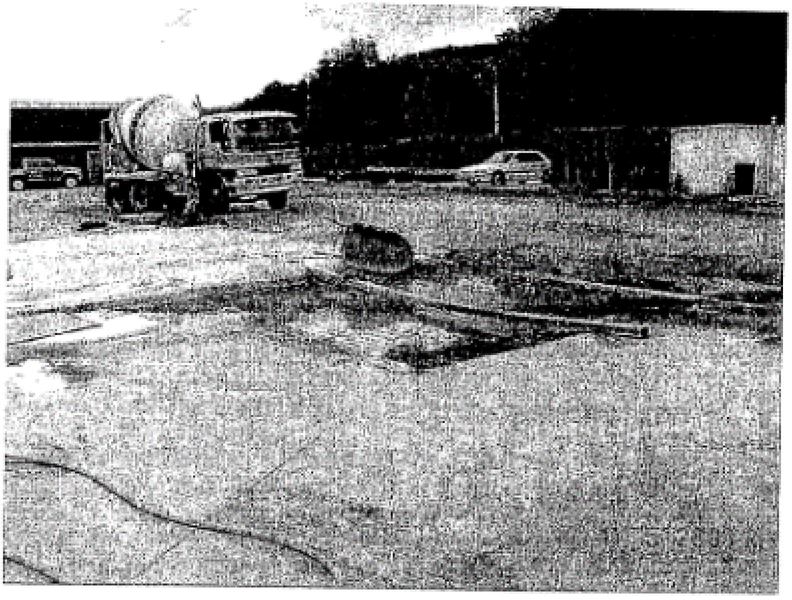


Photo 2

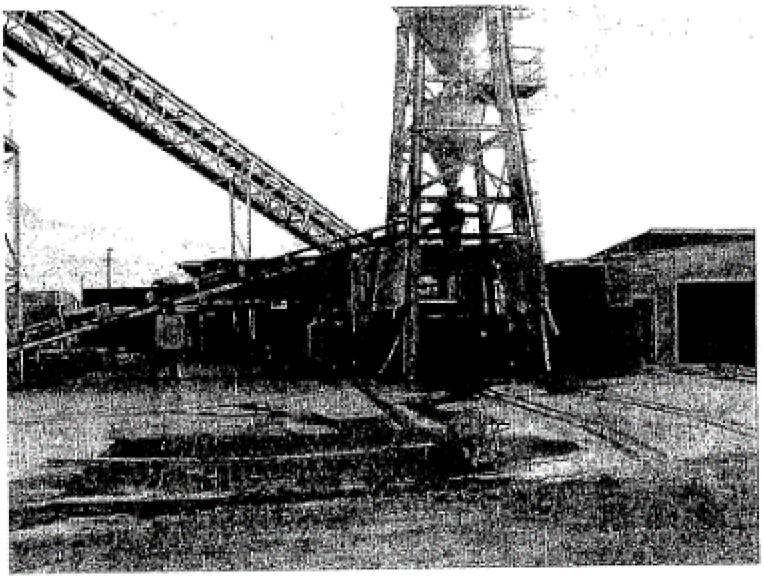
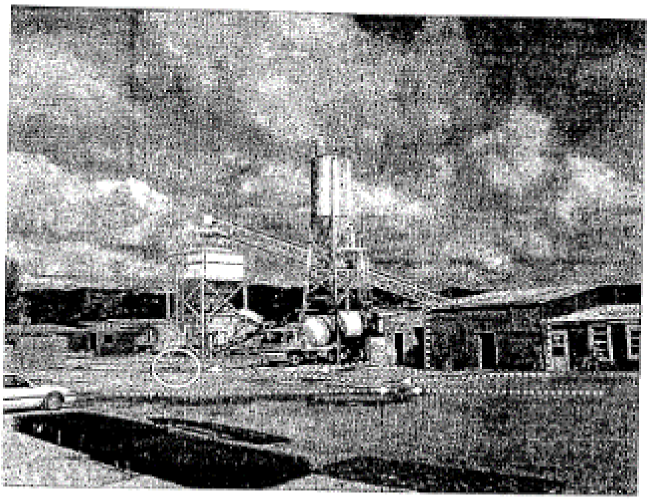
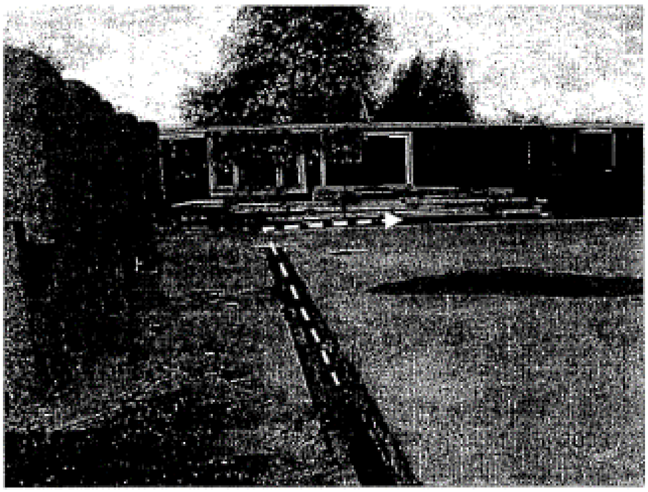


Photo 3



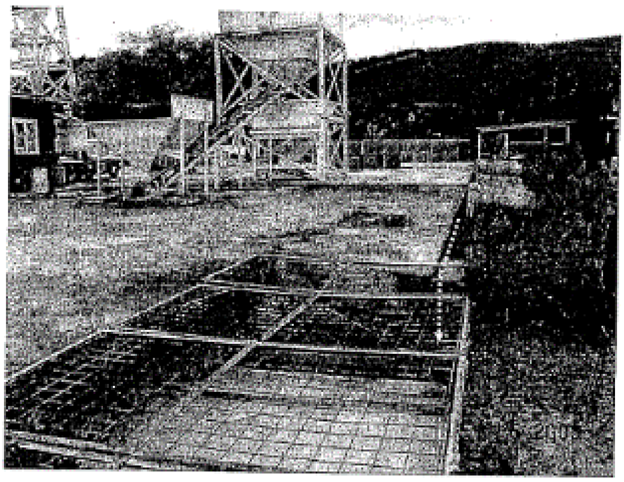
The small pond (circled) also receives stormwater from the roof of some buildings and off large areas of yard. Arrows indicate some of the stormwater flows.

Photo 4



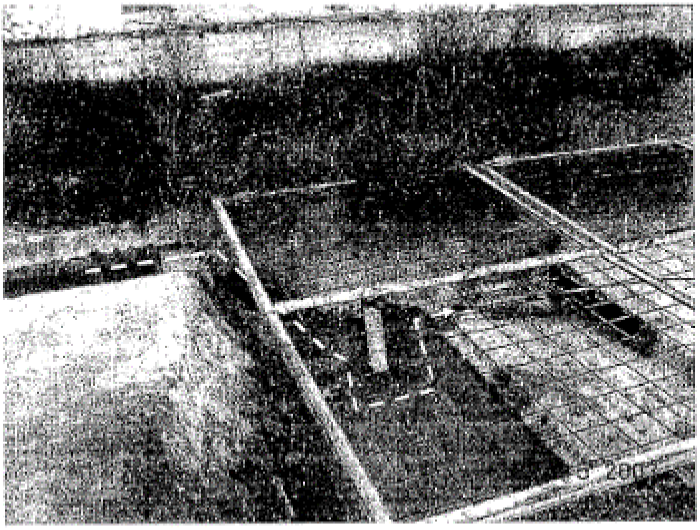
Drain taking water from around the batching plant towards the stormwater drain.

Photo 5



Water from batching plant.

Photo 6



Water from around batching plant flowing in to stormwater drain.

Photo 7

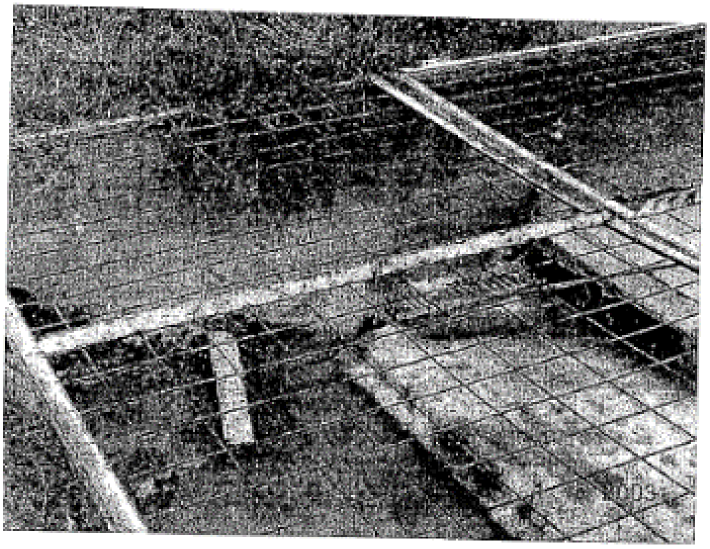
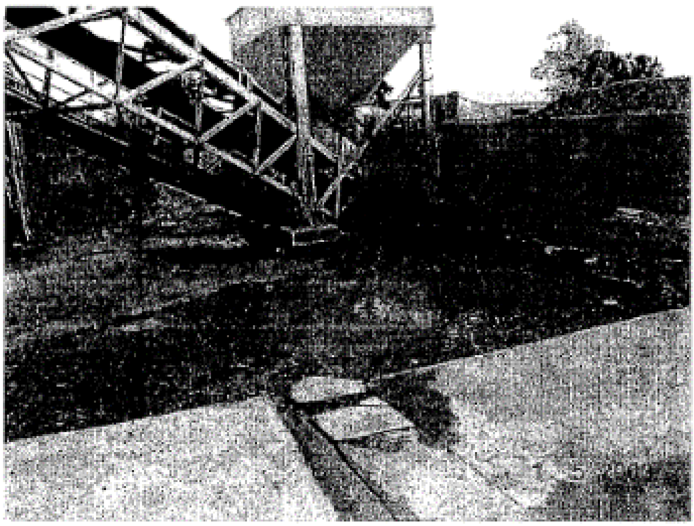
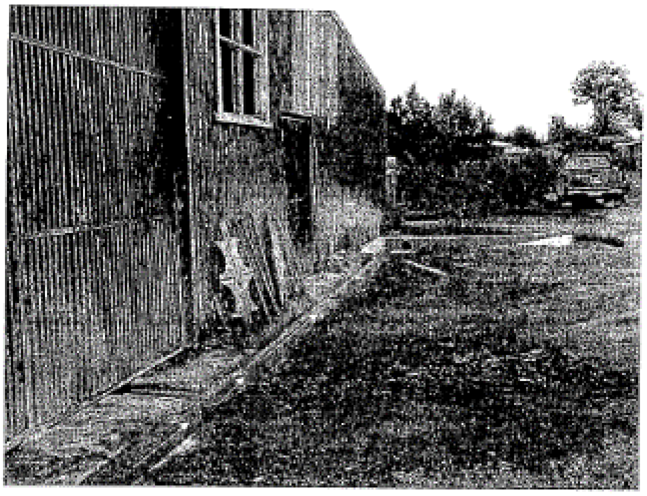


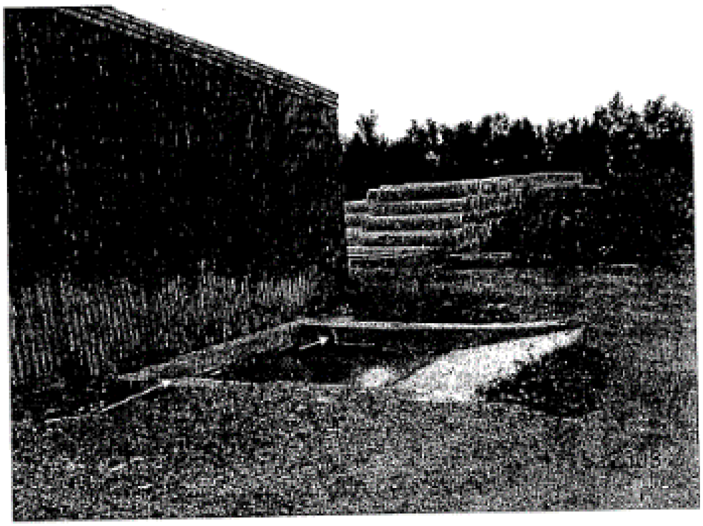
Photo 8





Wastewater from the precast building flows out into a drain and along into a settling pond. Arrows show direction of wastewater flow.

Photo 10

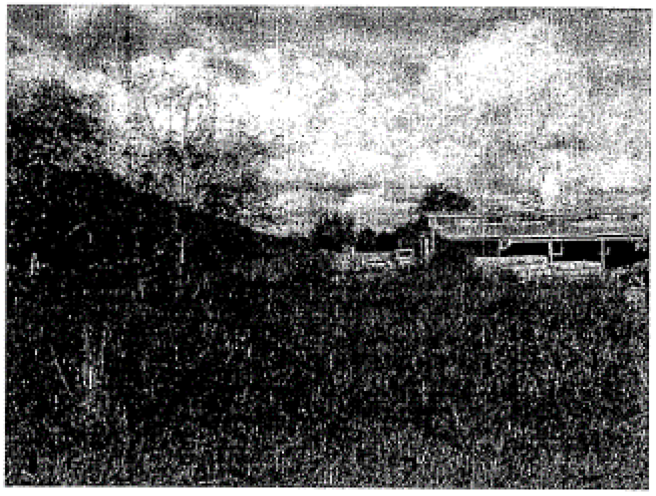


Wastewater settling pond at rear of precast building.

Photo 11

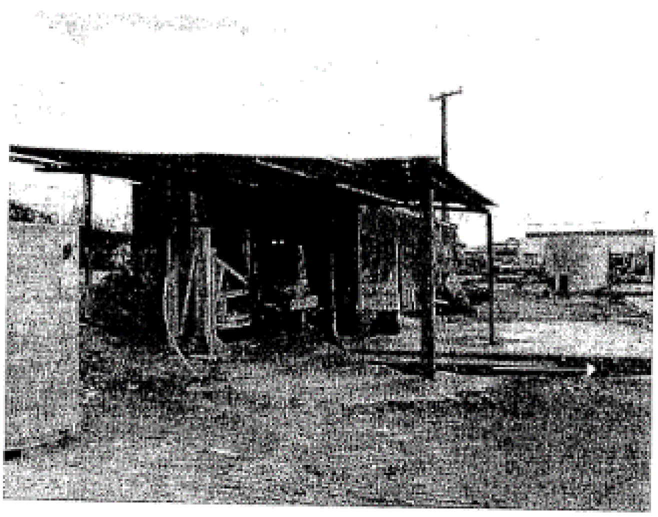
Discharge point from settling pond at rear of precast building into grass swale area.

Photo 12



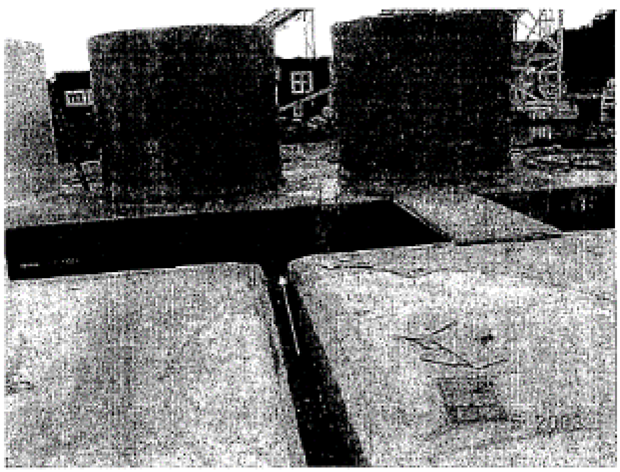
Wastewater from the pond at the rear of the precast area drains away into the ground in this grass swale area near the Empire Street boundary.

Photo 13



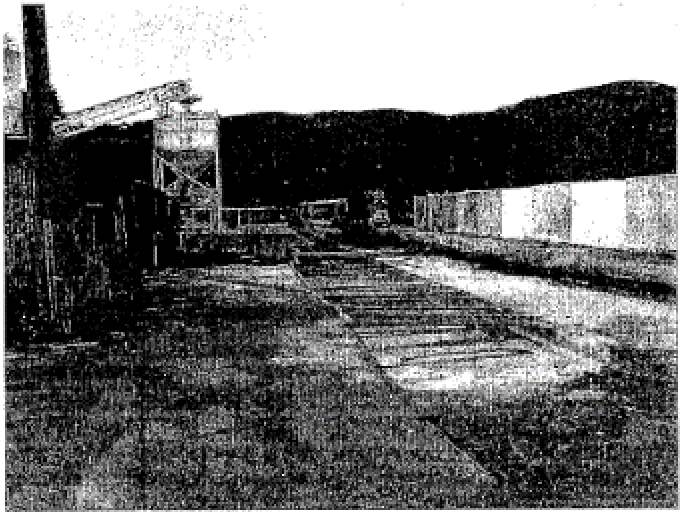
Plastering area. Arrow shows direction of wastewater flow.

Photo 14



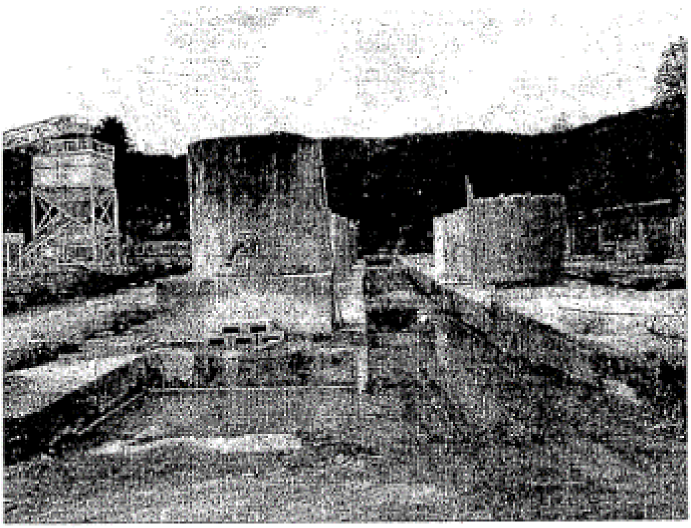
Wastewater from plastering area flows out into the sunken road and then into the stormwater drain. The plastering area is used very rarely (a few times a year).

Photo 15



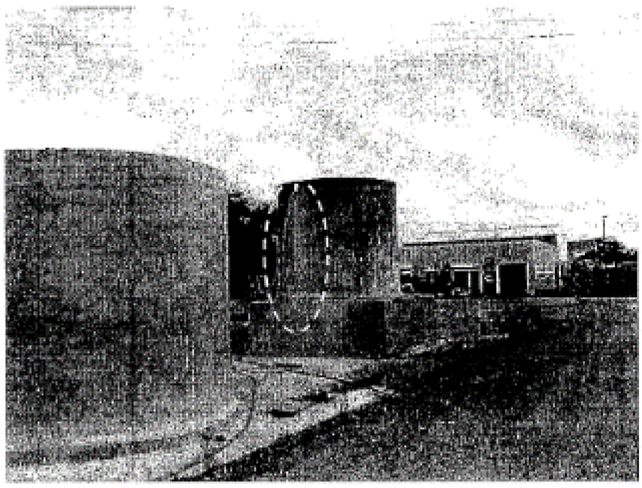
Wash out pond.

Photo 16

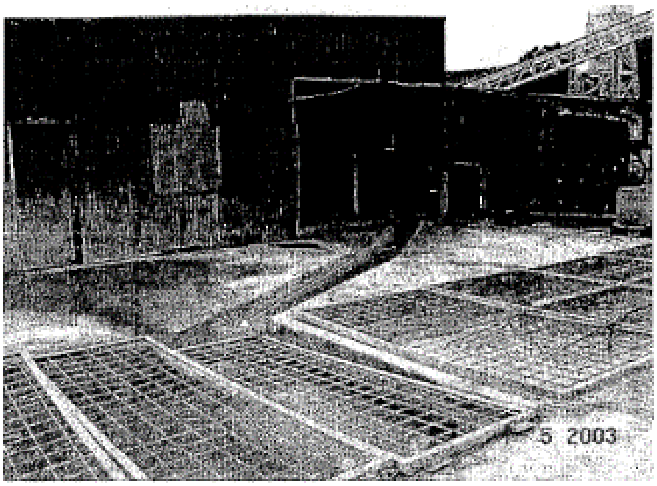


Wastewater from under the truck wash out standing pipe overflows into the sunken road and then into the stormwater system and river.

Photo 17

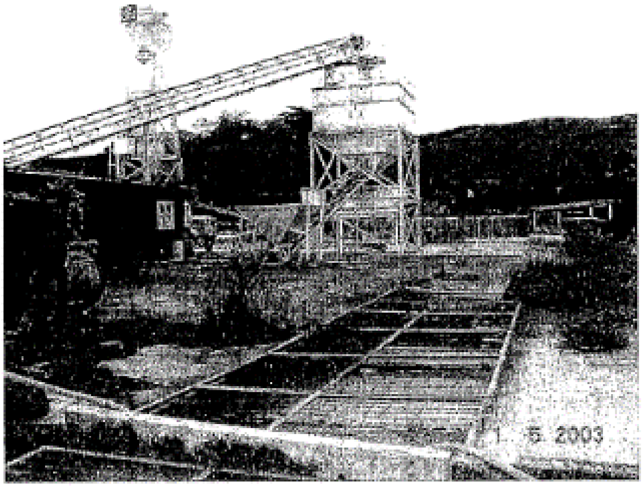


Overflow from wastewater storage tank.



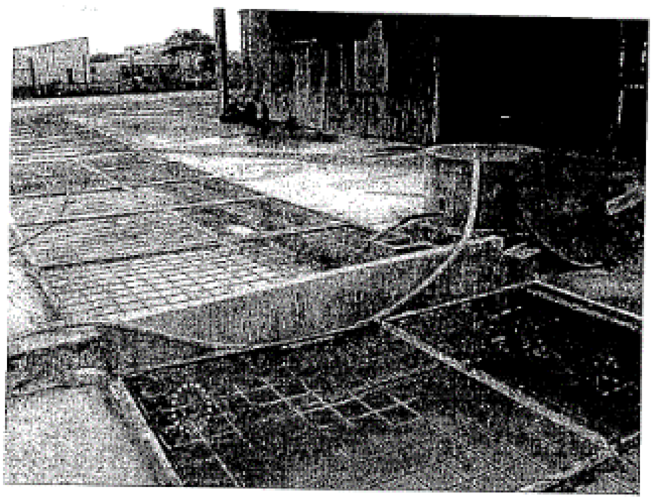
Wastewater from pipe spinning area is discharged into washout pond.

Photo 19



Wastewater pond that drains out to the stormwater system. This is closed off with a bung to prevent wastewater from flowing in to it from the washout ponds. It primarily just fills up with stormwater when it rains.

Photo 20



The pond the the bottom of this photograph is the one described in photograph 14. The bung is circled.

Photo 21

Photo 22

Photo 23

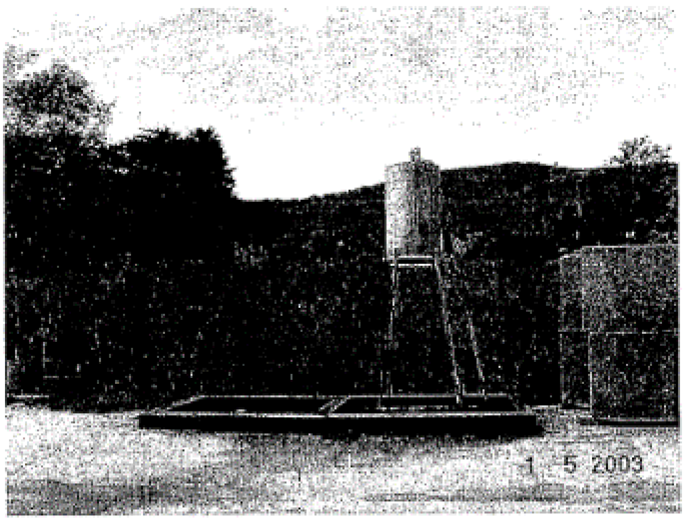


Photo 24

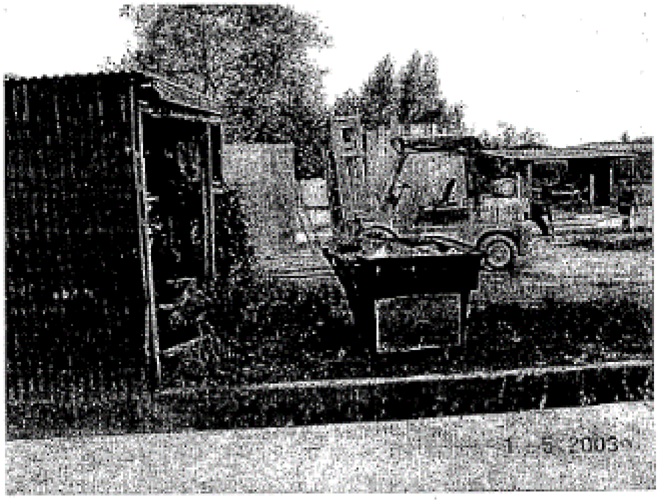


Photo 25

Photo 26

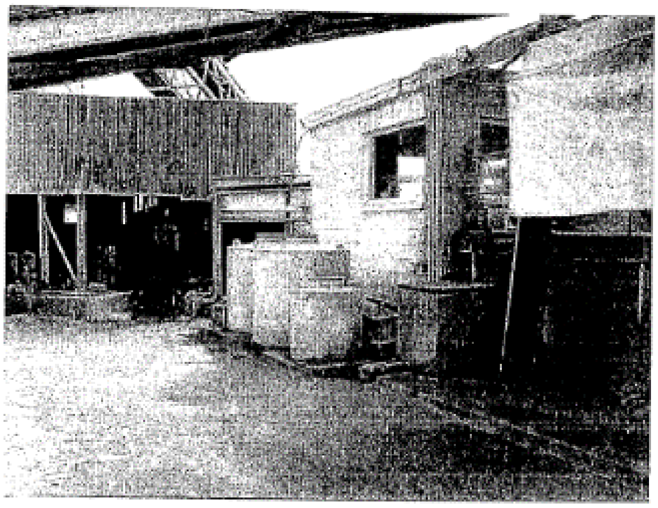
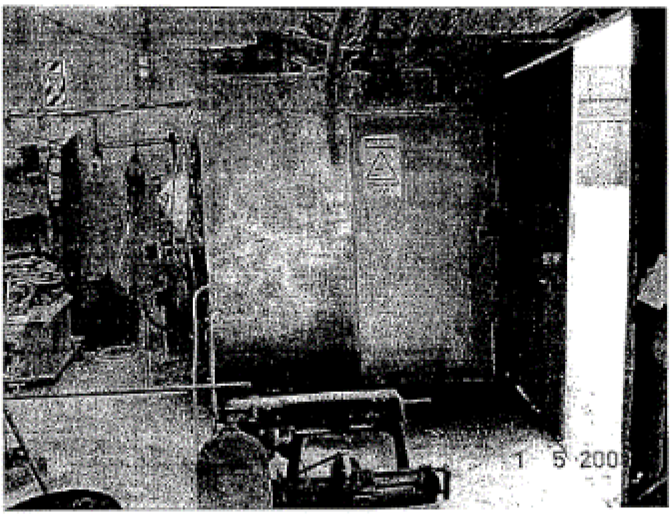


Photo 27

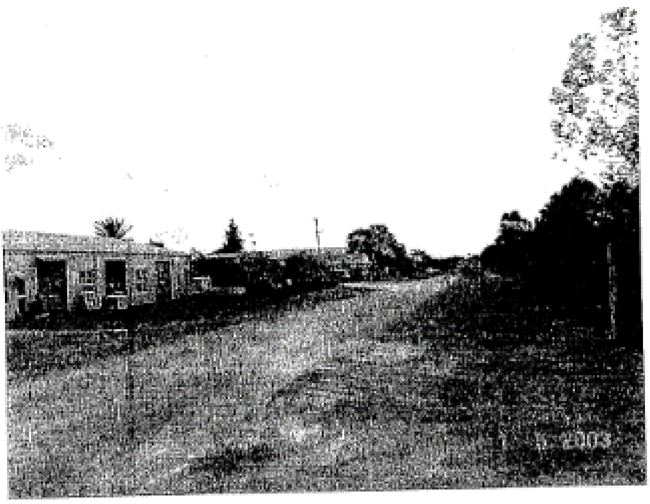
Diesel is in the white tank in centre of photo.

Photo 28



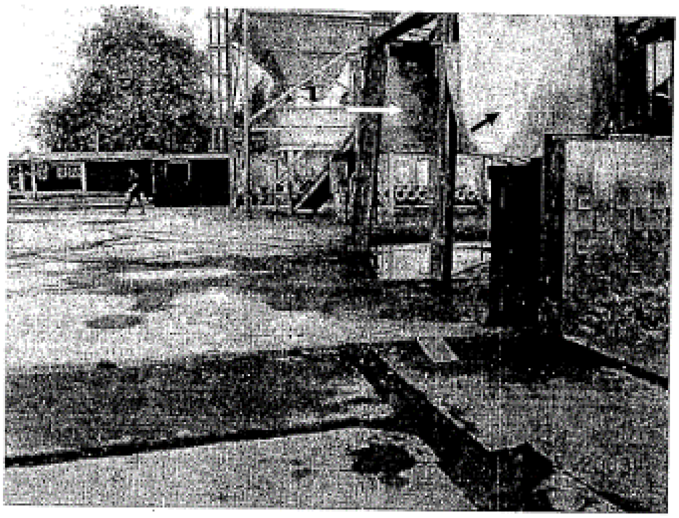
Dangerous goods store. Oil leak on floor in front of yellow door.

Photo 29



Vehicle entrance to the site from Dunn St.

Photo 30



Wind "curtains" around the batching area (indicated with arrows).

Photo 31

Landscaping along the Empire Street frontage.

Photo 32

Landscaping along part of the Dunn Street frontage.

APPENDIX 3: CHAIN OF CUSTODY FORM

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **194 5947**
Date Recv: 17-Mar-18 09:09
Received by: Navneet Kaur
3119459479

Quote No 90384
Primary Contact Guy Watson 233730
Submitted By Guy Watson 233730
Client Name CCL 2015 Limited 218037
Address T/A Cook Costello, 2 Norfolk Street
Whangarei 0110
Phone 09 438 9529 Mobile
Email ccl@coco.co.nz guyw@coco.co.nz
Charge To CCL 2015 Limited 218037
Client Reference Kaitaia/Whangarei
Order No

Results To — Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.
☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☐ Email Other
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
☐ Tick if you require COC to be emailed back
Date & Time: 11.20am 16/3/18
Name: Guy WATSON
Signature: [signature]

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp:

☐ Sample & Analysis details checked
Signature:

ADDITIONAL INFORMATION

10 Asbestos
10 PAH
11 TPH
24 HM (24 composite) =12 results.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)
NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types
Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	S1	15/3/18 9.10	S	AsbSoilProfile, HMsSoil, PAHSc, TPHoI
2	S2	15/3/18 9.17	S	HMsSoil > composite
3	S3	15/3/18 9.22	S	HMsSoil
4	S4	15/3/18 9.36	S	HMsSoil, AsbSoilProfile
5	S5	15/3/18 9.30	S	HMsSoil > Composite
6	S6	15/3/18 9.36	S	HMsSoil
7	S7	15/3/18 9.40	S	HMsSoil > Composite
8	S8	15/3/18 9.45	S	HMsSoil
9	S9	15/3/18 9.50	S	AsbSoilProfile, HMsSoil, PAHSc, TPHoI
10	S10	15/3/18 9.56	S	HMsSoil - composite with S12

Hill Laboratories
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W www.hill-laboratories.com

Office use only (Job No)

Quote No 90384

Primary Contact Guy Watson 233730

Submitted By Guy Watson 233730

Client Name CCL 2015 Limited 218037

Address T/A Cook Costello, 2 Norfolk Street
Whangarei 0110

Phone 09 438 9529 Mobile

Email ccl@coco.co.nz

Charge To CCL 2015 Limited 218037

Client Reference Kaitaia/Whangarei

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Sent to Hill Laboratories — Date & Time: / Name: / Signature:
☐ Tick if you require COC to be emailed back

Received at Hill Laboratories — Date & Time: / Name: / Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen — Temp:

☐ Sample & Analysis details checked
Signature:

ADDITIONAL INFORMATION

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types
Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	S11	15/3/18 10.00	S	AsbSoilProfile, HMsSoil.
2	S12	15/3/18 10.05	S	HMs Soil composite with S10
3	S13	15/3/18 10.20	S	AsbSoilProfile, HMsSoil
4	S14	15/3/18 10.30	S	HMsSoil - composite with S16
5	S15	15/3/18 10.35	S	HMsSoil, TPHoI, PAHsc
6	S16	15/3/18 10.42	S	HMsSoil - composite with S14
7	S17	15/3/18 10.48	S	HMsSoil - composite with S19
8	S18	15/3/18 10.55	S	HMsSoil, TPHoI, PAHsc
9	S19	15/3/18 11.00	S	HMs Soil - composite with S17
10	S20	15/3/18 11.10	S	AsbSoilProfile, HMsSoil, TPHoI, PAHsc

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Office use only
(Job No)

Quote No	90384	
Primary Contact	Guy Watson	233730
Submitted By	Guy Watson	233730
Client Name	CCL 2015 Limited	218037
Address	T/A Cook Costello, 2 Norfolk Street Whangarei 0110	
Phone	09 438 9529	Mobile
Email	ccl@coco.co.nz	
Charge To	CCL 2015 Limited	218037
Client Reference	Kaitaia/Whangarei	
Order No		

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☐ Email Primary Contact ☐ Email Submitter ☐ Email Client
☐ Email Other
☐ Other

ADDITIONAL INFORMATION

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories — Date & Time: / Name: / Signature:
☐ Tick if you require COC to be emailed back

Received at Hill Laboratories — Date & Time: / Name: / Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen — Temp:

☐ Sample & Analysis details checked
Signature:

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types
Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	S21	15/3/18 11.20	S	AsbSoilProfile, HMs Soil
2	S22	15/3/18 11.35	S	AsbSoilProfile, HMs Soil
3	S23	15/3/18 11.55	S	AsbSoilProfile, HMsSoil, TPH$_{oi}$, PAH$_{sc}$
4	S24 0.6	15/3/18 12.05	S	HMsSoil - composite with S28
5	S25 S (0.4)	15/3/18 12.20	S	HMsSoil, TPH$_{oi}$, PAH$_{sc}$
6	S25 Deep (3.0)	15/3/18 12.30	S	— " —
7	S26 Shallow (0.2)	15/3/18 1.00	S	— " —
8	S26 Deep (3.0)	15/3/18 1.20	S	— " —
9	S27	15/3/18 1.40	S	AsbSoilProfile, HMsSoil, TPH$_{oi}$
10	S28	15/3/18 2.10	S	HMs Soil - composite with S24

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Quote No 90384

Primary Contact Guy Watson 233730

Submitted By Guy Watson 233730

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Phone 09 438 9529 *Mobile*

Email ccl@coco.co.nz

Charge To CCL 2015 Limited 218037

Client Reference Kaitaia/Whangarei

Order No

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☐ *Email Other*
☐ *Other*

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☐ *Tick if you require COC to be emailed back*
Date & Time:
Name:
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition *Temp:*
☐ *Room Temp* ☐ *Chilled* ☐ *Frozen*

☐ Sample & Analysis details checked
Signature:

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types

Soil (Soil)

No.	*Sample Name*	*Sample Date/Time*	*Sample Type*	*Tests Required*
1	S29	15/3/18 2.15	S	HMs Soil
2	S 30	15/3/18 2.25	S	HMs Soil > composite
3	S 31	15/3/18 2.30	S	HMs Soil
4	S 32	15/3/18 2.32	S	HMs Soil
5	S 33	15/3/18 2.40	S	HMs Soil > composite
6	S 34	15/3/18 2.42	S	HMs Soil
7	S 35	15/3/18 2.44	S	HMs Soil > composite
8	S 36	15/3/18 2.46	S	HMs Soil
9	S 37	15/3/18 2.48	S	HMs Soil - composite with 39
10	S 38	15/3/18 2.52	S	HMs Soil

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Client Name	CCL 2015 Limited	218037
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Order No		

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☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time:
☐ Tick if you require COC to be emailed back Name:
Signature:

Received at Hill Laboratories Date & Time:
Name:
Signature:

Condition Temp:
☐ Room Temp ☐ Chilled ☐ Frozen

☐ Sample & Analysis details checked
Signature:

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

ADDITIONAL INFORMATION

Quoted Sample Types

Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	S39	13/3/18 2.58	S	HMs Soil - composite with S37
2	S40	13/3/18 3.00	S	HMs Soil } composite.
3	S41	13/3/18 3.06	S	HMs Soil }
4	S42	13/3/18 3.10	S	HMs Soil
5				
6				
7				
8				
9				
10				

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Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job Information Summary

Client:	CCL 2015 Limited	**Lab No:**	1945947
Contact:	Guy Watson	**Date Registered:**	17-Mar-2018 9:52 am
	C/- CCL 2015 Limited	**Priority:**	High
	2 Norfolk Street	**Quote No:**	90384
	Whangarei 0110	**Order No:**	
		Client Reference:	Kaitaia/Whangarei
		Add. Client Ref:	
		Submitted By:	Guy Watson
		Charge To:	CCL 2015 Limited
		Target Date:	26-Mar-2018 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	S1 15-Mar-2018 9:10 am	Soil	GSoil300, PSoil250, PSoil250Asb	Heavy Metals, Screen Level; Asbestos in Soil; Polycyclic Aromatic Hydrocarbons Screening in Soil; Total Petroleum Hydrocarbons in Soil
2	S2 15-Mar-2018 9:17 am	Soil	PSoil250	Composite Environmental Solid Samples
3	S3 15-Mar-2018 9:22 am	Soil	PSoil250	Composite Environmental Solid Samples
4	S4 15-Mar-2018 9:26 am	Soil	PSoil250, PSoil250Asb	Heavy Metals, Screen Level; Asbestos in Soil
5	S5 15-Mar-2018 9:30 am	Soil	PSoil250	Composite Environmental Solid Samples
6	S6 15-Mar-2018 9:35 am	Soil	PSoil250	Composite Environmental Solid Samples
7	S7 15-Mar-2018 9:40 am	Soil	PSoil250	Composite Environmental Solid Samples
8	S8 15-Mar-2018 9:45 am	Soil	PSoil250	Composite Environmental Solid Samples
9	S9 15-Mar-2018 9:50 am	Soil	GSoil300, PSoil250, PSoil250Asb	Heavy Metals, Screen Level; Asbestos in Soil; Polycyclic Aromatic Hydrocarbons Screening in Soil; Total Petroleum Hydrocarbons in Soil
10	S10 15-Mar-2018 9:56 am	Soil	PSoil250	Composite Environmental Solid Samples
11	S11 15-Mar-2018 10:00 am	Soil	PSoil250, PSoil250Asb	Heavy Metals, Screen Level; Asbestos in Soil
12	S12 15-Mar-2018 10:05 am	Soil	PSoil250	Composite Environmental Solid Samples
13	S13 15-Mar-2018 10:20 am	Soil	PSoil250, PSoil250Asb	Heavy Metals, Screen Level; Asbestos in Soil
14	S14 15-Mar-2018 10:30 am	Soil	PSoil250	Composite Environmental Solid Samples
15	S15 15-Mar-2018 10:36 am	Soil	GSoil300, PSoil250	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Total Petroleum Hydrocarbons in Soil
16	S16 15-Mar-2018 10:42 am	Soil	PSoil250	Composite Environmental Solid Samples
17	S17 15-Mar-2018 10:48 am	Soil	PSoil250	Composite Environmental Solid Samples
18	S18 15-Mar-2018 10:55 am	Soil	GSoil300, PSoil250	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Total Petroleum Hydrocarbons in Soil
19	S19 15-Mar-2018 11:00 am	Soil	PSoil250	Composite Environmental Solid Samples
20	S20 15-Mar-2018 11:10 am	Soil	GSoil300, PSoil250, PSoil250Asb	Heavy Metals, Screen Level; Asbestos in Soil; Polycyclic Aromatic Hydrocarbons Screening in Soil; Total Petroleum Hydrocarbons in Soil
21	S21 15-Mar-2018 11:20 am	Soil	PSoil250, PSoil250Asb	Heavy Metals, Screen Level; Asbestos in Soil
22	S22 15-Mar-2018 11:35 am	Soil	PSoil250, PSoil250Asb	Heavy Metals, Screen Level; Asbestos in Soil
23	S23 15-Mar-2018 11:55 am	Soil	GSoil300, PSoil250, PSoil250Asb	Heavy Metals, Screen Level; Asbestos in Soil; Polycyclic Aromatic Hydrocarbons Screening in Soil; Total Petroleum Hydrocarbons in Soil
24	S24 0.6 15-Mar-2018 12:05 pm	Soil	PSoil250	Composite Environmental Solid Samples
25	S25 S (0.4) 15-Mar-2018 12:20 pm	Soil	GSoil300, PSoil250	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Total Petroleum Hydrocarbons in Soil

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
26	S25 Deep (3.0) 15-Mar-2018 12:30 pm	Soil	GSoil300, cPSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Total Petroleum Hydrocarbons in Soil
27	S26 Shallow (0.2) 15-Mar-2018 1:00 pm	Soil	GSoil300, PSoil250	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Total Petroleum Hydrocarbons in Soil
28	S26 Deep 3.0 15-Mar-2018 1:20 pm	Soil	GSoil300, PSoil250	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Total Petroleum Hydrocarbons in Soil
29	S27 15-Mar-2018 1:40 pm	Soil	GSoil300, PSoil250, PSoil250Asb	Heavy Metals, Screen Level; Asbestos in Soil; Total Petroleum Hydrocarbons in Soil
30	S28 15-Mar-2018 2:10 pm	Soil	PSoil250	Composite Environmental Solid Samples
31	S29 15-Mar-2018 2:15 pm	Soil	PSoil250	Heavy Metals, Screen Level
32	S30 15-Mar-2018 2:25 pm	Soil	PSoil250	Composite Environmental Solid Samples
33	S31 15-Mar-2018 2:30 pm	Soil	PSoil250	Composite Environmental Solid Samples
34	S32 15-Mar-2018 2:32 pm	Soil	PSoil250	Heavy Metals, Screen Level
35	S33 15-Mar-2018 2:40 pm	Soil	PSoil250	Composite Environmental Solid Samples
36	S34 15-Mar-2018 2:42 pm	Soil	PSoil250	Composite Environmental Solid Samples
37	S35 15-Mar-2018 2:44 pm	Soil	PSoil250	Composite Environmental Solid Samples
38	S36 15-Mar-2018 2:46 pm	Soil	PSoil250	Composite Environmental Solid Samples
39	S37 15-Mar-2018 2:48 pm	Soil	PSoil250	Composite Environmental Solid Samples
40	S38 15-Mar-2018 2:52 pm	Soil	PSoil250	Heavy Metals, Screen Level
41	S39 15-Mar-2018 2:58 pm	Soil	PSoil250	Composite Environmental Solid Samples
42	S40 15-Mar-2018 3:00 pm	Soil	PSoil250	Composite Environmental Solid Samples
43	S41 15-Mar-2018 3:06 pm	Soil	PSoil250	Composite Environmental Solid Samples
44	S42 15-Mar-2018 3:10 pm	Soil	PSoil250	Heavy Metals, Screen Level
45	Composite of S2 & S3	Soil	cGSoil	Heavy Metals, Screen Level
46	Composite of S5 & S6	Soil	cGSoil	Heavy Metals, Screen Level
47	Composite of S7 & S8	Soil	cGSoil	Heavy Metals, Screen Level
48	Composite of S10 & S12	Soil	cGSoil	Heavy Metals, Screen Level
49	Composite of S14 & S16	Soil	cGSoil	Heavy Metals, Screen Level
50	Composite of S17 & S19	Soil	cGSoil	Heavy Metals, Screen Level
51	Composite of S24 0.6 & S28	Soil	cGSoil	Heavy Metals, Screen Level
52	Composite of S30 & S31	Soil	cGSoil	Heavy Metals, Screen Level
53	Composite of S33 & S34	Soil	cGSoil	Heavy Metals, Screen Level
54	Composite of S35 & S36	Soil	cGSoil	Heavy Metals, Screen Level
55	Composite of S37 & S39	Soil	cGSoil	Heavy Metals, Screen Level
56	Composite of S40 & S41	Soil	cGSoil	Heavy Metals, Screen Level

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 9, 15, 18, 20, 23, 25-29
Composite Environmental Solid Samples	Individual sample fractions mixed together to form a composite fraction.	-	2-3, 5-8, 10, 12, 14, 16-17, 19, 24, 30, 32-33, 35-39, 41-43

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	1, 9, 15, 18, 20, 23, 25-28
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	1, 9, 15, 18, 20, 23, 25-28
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 4, 9, 11, 13, 15, 18, 20-23, 25-29, 31, 34, 40, 44-56
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	0.002 - 0.05 mg/kg dry wt	1, 9, 15, 18, 20, 23, 25-28
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	1, 9, 15, 18, 20, 23, 25-29
Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 4, 9, 11, 13, 20-23, 29
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 4, 9, 11, 13, 20-23, 29
<2mm Subsample Weight	Sample ashed at 400°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1, 4, 9, 11, 13, 20-23, 29
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1, 4, 9, 11, 13, 20-23, 29
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 4, 9, 11, 13, 20-23, 29

APPENDIX 4: SAMPLE LOCATION PHOTOGRAPHS


S1


S2


S3


S4


S5


S6


S7


S8


S9


S10


S11


S12


S13


S15


S16


S17

S18

S20

S21

S22

Search for S23

S23

S24


S25 (S)


S25 hole


S25 (D)


S26 (S)


S26 hole


S26 (D)


S27


S28


S29


S31


S34


S36


S37


S41

S42

APPENDIX 5: SAMPLE RESULTS

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	CCL 2015 Limited	**Lab No:**	1945947 SPv1
Contact:	Guy Watson	**Date Received:**	17-Mar-2018
	C/- CCL 2015 Limited	**Date Reported:**	26-Mar-2018
	2 Norfolk Street	**Quote No:**	90384
	Whangarei 0110	**Order No:**	
		Client Reference:	Kaitaia/Whangarei
		Submitted By:	Guy Watson

Sample Type: Soil

Sample Name:		S1 15-Mar-2018 9:10 am	S4 15-Mar-2018 9:28 am	S9 15-Mar-2018 9:50 am	S11 15-Mar-2018 10:00 am	S13 15-Mar-2018 10:20 am
Lab Number:		1945947.1	1945947.4	1945947.9	1945947.11	1945947.13
Individual Tests						
Dry Matter	g/100g as rcvd	89	-	82	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	< 2	6	3	11
Total Recoverable Cadmium	mg/kg dry wt	0.16	0.12	< 0.10	0.13	0.13
Total Recoverable Chromium	mg/kg dry wt	12	14	12	14	27
Total Recoverable Copper	mg/kg dry wt	96	44	22	26	52
Total Recoverable Lead	mg/kg dry wt	3,400	3.8	18.4	13.9	13.0
Total Recoverable Nickel	mg/kg dry wt	11	21	11	12	19
Total Recoverable Zinc	mg/kg dry wt	44	64	40	70	74
Asbestos in Soil						
As Received Weight	g	219.2	180.7	144.9	151.9	241.1
Dry Weight	g	199.4	165.2	116.4	124.5	226.8
<2mm Subsample Weight	g ashed wt	50.1	46.3	57.5	59.1	54.8
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Perylene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.03	-	< 0.03	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.03	-	< 0.03	-	-
Acenaphthylene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Acenaphthene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Anthracene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Chrysene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Fluoranthene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Fluorene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	-	< 0.012	-	-

IANZ ACCREDITED LABORATORY

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

Sample Type: Soil						
	Sample Name:	S1 15-Mar-2018 9:10 am	S4 15-Mar-2018 9:26 am	S9 15-Mar-2018 9:50 am	S11 15-Mar-2018 10:00 am	S13 15-Mar-2018 10:20 am
	Lab Number:	1945947.1	1945947.4	1945947.9	1945947.11	1945947.13
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Naphthalene	mg/kg dry wt	< 0.06	-	< 0.06	-	-
Phenanthrene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Pyrene	mg/kg dry wt	< 0.011	-	< 0.012	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	-	< 8	-	-
C10 - C14	mg/kg dry wt	< 20	-	< 20	-	-
C15 - C36	mg/kg dry wt	< 40	-	< 40	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	-	< 70	-	-

	Sample Name:	S15 15-Mar-2018 10:36 am	S18 15-Mar-2018 10:55 am	S20 15-Mar-2018 11:10 am	S21 15-Mar-2018 11:20 am	S22 15-Mar-2018 11:35 am
	Lab Number:	1945947.15	1945947.18	1945947.20	1945947.21	1945947.22
Individual Tests						
Dry Matter	g/100g as rcvd	71	72	79	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	< 2	< 2	4	6
Total Recoverable Cadmium	mg/kg dry wt	0.25	0.15	0.13	0.14	0.12
Total Recoverable Chromium	mg/kg dry wt	31	54	42	14	8
Total Recoverable Copper	mg/kg dry wt	35	31	31	26	18
Total Recoverable Lead	mg/kg dry wt	21	21	9.3	9.6	34
Total Recoverable Nickel	mg/kg dry wt	21	31	26	14	12
Total Recoverable Zinc	mg/kg dry wt	100	102	81	68	140
Asbestos in Soil						
As Received Weight	g	-	-	196.5	187.5	163.9
Dry Weight	g	-	-	161.2	160.5	128.4
<2mm Subsample Weight	g ashed wt	-	-	50.4	58.1	68.4
Asbestos Presence / Absence		-	-	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Perylene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	< 0.04	< 0.03	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Acenaphthylene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Acenaphthene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Anthracene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Chrysene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Fluoranthene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Fluorene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Naphthalene	mg/kg dry wt	< 0.07	< 0.07	< 0.07	-	-
Phenanthrene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-
Pyrene	mg/kg dry wt	< 0.014	< 0.014	< 0.013	-	-

Sample Type: Soil

Sample Name:		S15 15-Mar-2018 10:38 am	S18 15-Mar-2018 10:55 am	S20 15-Mar-2018 11:10 am	S21 15-Mar-2018 11:20 am	S22 15-Mar-2018 11:35 am
Lab Number:		1945947.15	1945947.18	1945947.20	1945947.21	1945947.22
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 9	< 9	< 8	-	-
C10 - C14	mg/kg dry wt	28	< 20	< 20	-	-
C15 - C36	mg/kg dry wt	3,100	< 40	< 40	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	3,100	< 70	< 70	-	-

Sample Name:		S23 15-Mar-2018 11:55 am	S25 S (0.4) 15-Mar-2018 12:20 pm	S25 Deep (3.0) 15-Mar-2018 12:30 pm	S26 Shallow (0.2) 15-Mar-2018 1:00 pm	S26 Deep 3.0 15-Mar-2018 1:20 pm
Lab Number:		1945947.23	1945947.25	1945947.26	1945947.27	1945947.28
Individual Tests						
Dry Matter	g/100g as rcvd	65	72	71	60	69
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	< 2	< 2	< 2	< 2
Total Recoverable Cadmium	mg/kg dry wt	0.40	0.21	0.12	0.52	0.15
Total Recoverable Chromium	mg/kg dry wt	64	78	81	74	76
Total Recoverable Copper	mg/kg dry wt	36	39	38	39	36
Total Recoverable Lead	mg/kg dry wt	14.3	18.4	4.6	5.8	4.3
Total Recoverable Nickel	mg/kg dry wt	33	38	37	35	34
Total Recoverable Zinc	mg/kg dry wt	108	100	88	112	81
Asbestos in Soil						
As Received Weight	g	173.3	-	-	-	-
Dry Weight	g	105.9	-	-	-	-
<2mm Subsample Weight	g ashed wt	40.6	-	-	-	-
Asbestos Presence / Absence		Asbestos NOT detected.	-	-	-	-
Description of Asbestos Form		-	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.016	0.021	< 0.014	< 0.017	< 0.014
2-Methylnaphthalene	mg/kg dry wt	< 0.016	0.038	< 0.014	< 0.017	< 0.014
Perylene	mg/kg dry wt	< 0.016	0.040	< 0.014	< 0.017	< 0.014
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.05	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Acenaphthene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Anthracene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Benzo[a]anthracene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Benzo[e]pyrene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Benzo[k]fluoranthene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Chrysene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Fluoranthene	mg/kg dry wt	< 0.016	0.044	< 0.014	< 0.017	< 0.014
Fluorene	mg/kg dry wt	< 0.016	0.017	< 0.014	< 0.017	< 0.014
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.016	< 0.014	< 0.014	< 0.017	< 0.014
Naphthalene	mg/kg dry wt	< 0.08	< 0.07	< 0.07	< 0.09	< 0.07
Phenanthrene	mg/kg dry wt	< 0.016	0.052	< 0.014	< 0.017	< 0.014
Pyrene	mg/kg dry wt	< 0.016	0.053	< 0.014	< 0.017	< 0.014
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 10	< 8	< 9	< 10	< 9
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	1,330	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	1,330	< 70	< 70	< 70

Lab No: 1945947 v 1 Hill Laboratories Page 3 of 7

Sample Type: Soil						
	Sample Name:	S27 15-Mar-2018 1:40 pm	S29 15-Mar-2018 2:15 pm	S32 15-Mar-2018 2:32 pm	S38 15-Mar-2018 2:52 pm	S42 15-Mar-2018 3:10 pm
	Lab Number:	1945947.29	1945947.31	1945947.34	1945947.40	1945947.44
Individual Tests						
Dry Matter	g/100g as rcvd	82	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	3	< 2	6	7
Total Recoverable Cadmium	mg/kg dry wt	0.37	0.10	0.11	0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	22	14	9	13	10
Total Recoverable Copper	mg/kg dry wt	66	34	40	37	15
Total Recoverable Lead	mg/kg dry wt	96	13.6	56	18.6	8.4
Total Recoverable Nickel	mg/kg dry wt	25	19	17	18	6
Total Recoverable Zinc	mg/kg dry wt	930	186	83	75	102
Asbestos in Soil						
As Received Weight	g	200.2	-	-	-	-
Dry Weight	g	165.2	-	-	-	-
<2mm Subsample Weight	g ashed wt	52.8	-	-	-	-
Asbestos Presence / Absence		Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.	-	-	-	-
Description of Asbestos Form		ACM Debris and Loose Fibres	-	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	-	-	-	-
C10 - C14	mg/kg dry wt	< 20	-	-	-	-
C15 - C36	mg/kg dry wt	139	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	139	-	-	-	-

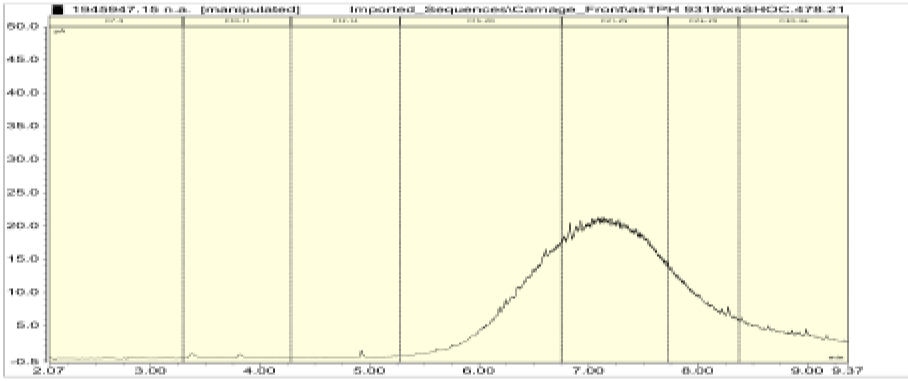
	Sample Name:	Composite of S2 & S3	Composite of S5 & S6	Composite of S7 & S8	Composite of S10 & S12	Composite of S14 & S16
	Lab Number:	1945947.45	1945947.46	1945947.47	1945947.48	1945947.49
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	2	< 2	3	4
Total Recoverable Cadmium	mg/kg dry wt	0.12	< 0.10	0.12	0.13	< 0.10
Total Recoverable Chromium	mg/kg dry wt	17	24	41	13	17
Total Recoverable Copper	mg/kg dry wt	32	26	29	42	29
Total Recoverable Lead	mg/kg dry wt	5.9	3.8	4.6	198	15.6
Total Recoverable Nickel	mg/kg dry wt	17	17	24	19	16
Total Recoverable Zinc	mg/kg dry wt	66	56	72	92	50

	Sample Name:	Composite of S17 & S19	Composite of S24 0.6 & S28	Composite of S30 & S31	Composite of S33 & S34	Composite of S35 & S36
	Lab Number:	1945947.50	1945947.51	1945947.52	1945947.53	1945947.54
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	17	4	3	5	4
Total Recoverable Cadmium	mg/kg dry wt	6.5	0.19	0.11	0.13	0.15
Total Recoverable Chromium	mg/kg dry wt	54	23	10	12	17
Total Recoverable Copper	mg/kg dry wt	47	47	33	41	33
Total Recoverable Lead	mg/kg dry wt	149	20	23	21	42
Total Recoverable Nickel	mg/kg dry wt	27	17	16	21	14
Total Recoverable Zinc	mg/kg dry wt	161	76	65	90	64

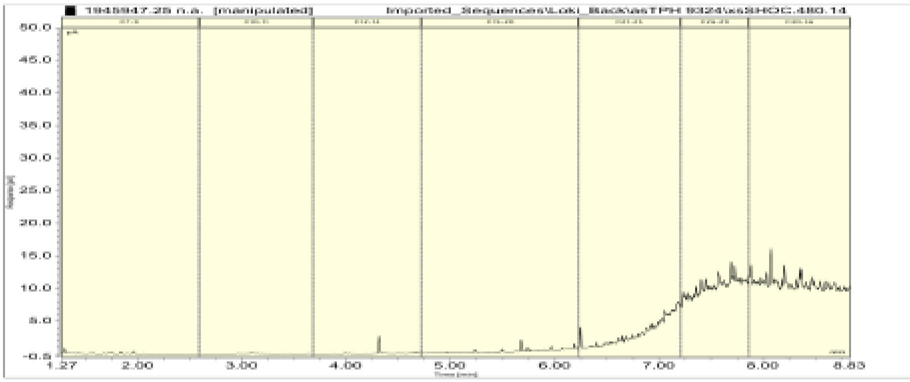
	Sample Name:	Composite of S37 & S39	Composite of S40 & S41			
	Lab Number:	1945947.55	1945947.56			
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	3	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.15	-	-	-
Total Recoverable Chromium	mg/kg dry wt	10	15	-	-	-
Total Recoverable Copper	mg/kg dry wt	33	32	-	-	-
Total Recoverable Lead	mg/kg dry wt	25	48	-	-	-

Sample Type: Soil						
	Sample Name:	Composite of S37 & S39	Composite of S40 & S41			
	Lab Number:	1945947.55	1945947.56			
Heavy Metals, Screen Level						
Total Recoverable Nickel	mg/kg dry wt	15	16	-	-	-
Total Recoverable Zinc	mg/kg dry wt	58	72	-	-	-

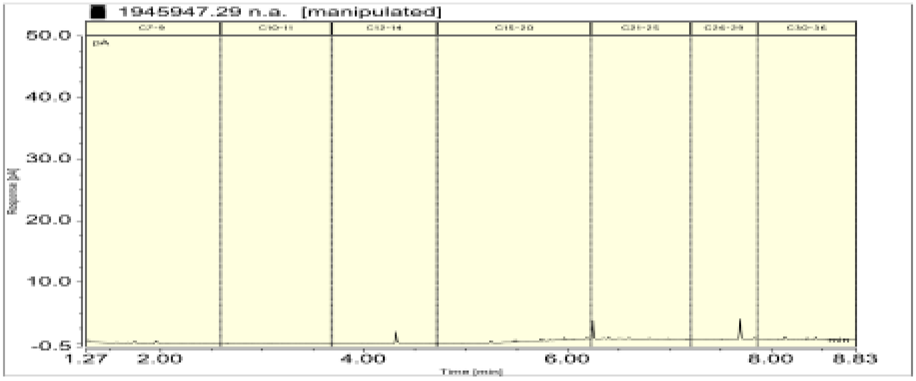
1945947.15
S15 15-Mar-2018 10:36 am
Client Chromatogram for TPH by FID



1945947.25
S25 S (0.4) 15-Mar-2018 12:20 pm
Client Chromatogram for TPH by FID



1945947.29
S27 15-Mar-2018 1:40 pm
Client Chromatogram for TPH by FID



Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 9, 15, 18, 20, 23, 25-29
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	2-3, 5-8, 10, 12, 14, 16-17, 19, 24, 30, 32-33, 35-39, 41-43
Benzo(a)pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	1, 9, 15, 18, 20, 23, 25-28
Benzo(a)pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	1, 9, 15, 18, 20, 23, 25-28
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 4, 9, 11, 13, 15, 18, 20-23, 25-29, 31, 34, 40, 44-56
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. (KBIs:5786,2805,2695)	0.002 - 0.05 mg/kg dry wt	1, 9, 15, 18, 20, 23, 25-28
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample (KBIs:5786,2805,10734)	8 - 60 mg/kg dry wt	1, 9, 15, 18, 20, 23, 25-29
Asbestos in Soil			

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 4, 9, 11, 13, 20-23, 29
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 4, 9, 11, 13, 20-23, 29
<2mm Subsample Weight	Sample ashed at 400°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1, 4, 9, 11, 13, 20-23, 29
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1, 4, 9, 11, 13, 20-23, 29
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 4, 9, 11, 13, 20-23, 29

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental