

Assessment of Environmental Effects

Mount Cook, Wellington

Prepared for Wellington Water Limited
Prepared by Beca Limited

7 August 2019



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Revision History

Revision N°	Prepared By	Description	Date
1	Mel Wykes	Draft for review	16/05/2019
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Action	Name	Signed	Date
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on behalf of	Beca Limited		

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1 Introduction

This Assessment of Effects on the Environment (AEE) informs an application for resource consent (land use) made on behalf of Wellington Water Ltd in accordance with section 88 of the Resource Management Act 1991 (the RMA) and Regulation 9 of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the NESCS).

The Ōmaroro Reservoir project relates to the construction, operation, and maintenance of a 35,000m³ reservoir within the Wellington Town Belt in the Prince of Wales Park, Mount Cook, which is permitted under a Designation. The proposed construction works include utilising the Prince of Wales Playing Fields (the subject of this application) for material storage and stockpiling. The playing fields will be returned to their current recreational use following completion of the reservoir construction.

A Detailed Site Investigation (DSI) (dated May 2019) has been undertaken to characterise contamination present in materials beneath the playing fields as a result of current and historical activities. This DSI is included at **Appendix A**. This DSI was prepared following two Preliminary Site Investigation (PSI) reports, one for the upper field (dated Oct 2012) and one for the lower field (dated October 2017), which identified that the playing fields have generally been used for recreational purposes since being incorporated within the Wellington Town Belt in the early 1890's.

Ground investigation works were undertaken in February 2019 and comprised 14 test pits which were excavated to a maximum extent of 2m bgl, from which 29 samples (plus two duplicate samples) were taken. Soil analytical results showed low levels of heavy metals, PAH and organochlorine pesticides in a number of samples across the site at varying depths. However, no contaminant concentrations exceeded the NESCS criteria for 'commercial / industrial outdoor worker (unpaved)', or 'recreational' criteria based upon the site's continued future use as a sports turf, nor did they exceed the adopted environmental protection criteria.

The DSI demonstrates that the existing soils at the site do not pose a significant risk to human health or the environment. While the exposure pathway assessment has identified no potentially complete exposure pathways, a Contaminated Soils Management Plan (CSMP) has been prepared (included at **Appendix C**) to mitigate any movement of land to surface water.

The activity proposed on the site involves soil disturbance in excess of the permitted activity criteria set out in Regulation 8 of the NESCS; therefore land use consent is required from Wellington City Council (WCC). The proposed activity is not considered to constitute a change in land use under the NESCS, and the low soil contaminant concentrations and proposed future land use (recreational playing fields) are not considered to be 'reasonably likely to harm human health'. The effects on human health of the proposed soil disturbance are therefore considered to be less than minor.

The site does not meet the definition of a contaminated site or contaminated land under the Greater Wellington Regional Council (GWRC) operative or proposed regional plans; therefore, consent is not required from GWRC.

The purpose of this report is to provide a description of the proposed works, an assessment of the effects on the environment and management of those effects and assessment against the NESCS.

This consent is sought for 10 years, which aligns with the Designation.

2 Site and Existing Environment

2.1 Site and Surrounding Area

The site is known as the 'Prince of Wales Playing Fields'. In total, the two playing fields occupy an area of approximately 16,900m². Both fields fall under the legal description Part Lot 2 DP 10337. The location of the property is shown in Figure 1 below.

The upper playing field was formed by cutting into the ridgeline that runs along the side of Rolleston Street to above Asquith Terrace/Dorking Street. Pedestrian and maintenance access to the field is from the top of Rolleston Street and there is an additional pedestrian access at the top of Hargreaves Street. The lower playing field was cut into the east facing side of the ridgeline. The lower field is accessed from Salisbury Terrace along the eastern side of the field, which continues south to a carpark and the Wellington Scottish Athletics and Poneke Kyokushin Karate Dojo clubrooms. A sports pavilion at the north end of the field can be accessed by a steep drive off Salisbury Terrace. There is also a track connecting the upper and lower fields.

The sports fields are used for both organised/formal and casual/informal recreation activities. Both fields are managed by Wellington City Council Parks, Sports and Recreation team as tier two fields and are intensively used during the summer months but have lower use in winter.



Figure 1: Location of the Prince of Wales Playing Fields. Area within this application outlined in red. (Source: WCC Webmap)

2.2 Detailed Site Investigation (May 2019)

A Detailed Site Investigation was carried out for the site which included a risk assessment relating to the effects of contaminated soil on human health (refer to **Appendix A**).

The DSI was undertaken to characterise contamination present in materials beneath the playing fields as a result of current and historical activities. The DSI was prepared following two Preliminary Site Investigation (PSI) reports, one for the upper field (dated Oct 2012) (**Appendix D**) and one for the lower field (dated October 2017) (**Appendix E**). The PSI reports identified that the sites have generally been used for recreational purposes since being incorporated within the Wellington Town Belt in the early 1890's. The following and key findings and MfE Hazardous Activities and Industries List (HAIL) activities were identified for the site:

- A10 (persistent pesticide use associated with the maintenance of the sports turf.
- The PSI for the upper playing field reported that the site may have been the location of a clay brick manufacturing facility or was potentially used for the disposal of waste material or products associated with the operation. The HAIL codes for the upper playing field have therefore been identified as A10 and G5 (waste disposal to land).

It is also assumed that earthworks have historically been undertaken on the site to achieve the current topography, although no details of these works are available within the historic record.

Ground investigation works were undertaken in February 2019 and comprised 14 test pits which were excavated to a maximum extent of 2m bgl, from which 29 samples (plus two duplicate samples) were taken.

Soil analytical results showed low levels of heavy metals, PAH and organochlorine pesticides in a number of samples across the site at varying depths. However, no contaminant concentrations exceeded the NESCS criteria for 'commercial / industrial outdoor worker (unpaved)', or 'recreational' criteria based upon the site's continued future use as a sports turf, nor did they exceed the adopted environmental protection criteria.

The soil analytical results do not indicate that the site has been significantly impacted as a consequence of historical land use activities, such as pesticide application and potentially disposal of clay works products, and the human health and environmental risk is considered low. The exposure pathway assessment identified no potentially complete exposure pathways.

In summary, the analytical results indicate that the proposed soil disturbance related to the construction of the Omaroro Reservoir is deemed to pose a low risk to human health.

3 Proposal

The proposed reservoir and associated works have received consent under the Wellington Town Belt Act (the Town Belt Consent) and the Resource Management Act (Designation reference SR394052). Consent has also been received from Greater Wellington Regional Council for groundwater take, earthworks and discharge of stormwater associated with the reservoir construction (ref WGN 180065).

In summary, the consented works comprise:

- The Omāroro reservoir structure and pipe tunnel
- Access to the reservoir and pipe tunnel
- Associated connections to the bulk water supply, local water supply, and local stormwater networks
- Activities associated with the reinstatement of the upper and lower Prince of Wales playing fields for recreation use.

With regard to the playing fields specifically, the consented scheme allows for the use of both upper and lower fields for material storage and stockpiling during construction. Prior to the placement of excavated material on the playing fields, the topsoil will be removed. The total quantity of topsoil which will be stripped from the site will be 1,000m³. It is intended that this topsoil will be stockpiled on site and reused as part of the construction works, although this is subject to finalisation of the construction methodology. Should the material be taken off site, then due to the low-level concentrations of heavy metals, PAH and organochlorine pesticides it is likely that the classification of managed fill will apply. The appointed contractor will follow best practice procedures and the acceptance of the soil would be confirmed with the disposal site operators prior to the commencement of any soil disturbance.

4 Consent Requirements

4.1 National Environmental Standards

Section 104(1)(b)(i) of the RMA requires that regard is to be given to any relevant provisions of an NES.

The NESCS became effective on 1 January 2012 and Section 43D (4) of the RMA confirms that the NES:CS, which existed before the designation was confirmed, prevails over the designation.

The NESCS is intended to increase the protection of human health from contaminants in soils. The NES:CS contains a set of nationwide regulations for undertaking certain land use activities and subdivisions in relation to contaminated or potentially contaminated land.

The NESCS applies to land that currently has, or historically had, an activity or industry undertaken on it that is included in the Ministry for the Environment Hazardous Activities and Industries List (HAIL), or land which is used as production land. In this case, the playing fields have generally been used for recreational purposes since being incorporated within the Wellington Town Belt in the early 1890's and have therefore been subject to persistent pesticide use associated with the maintenance of the sports turf. In addition, the PSI for the upper playing field reported that the site may have been the location of a clay brick manufacturing facility or was potentially used for the disposal of waste material or products associated with this operation.

The NESCS terms land that is considered to be "potentially or actually affected" as a 'piece of land'. If one of the below activities is to take place on a 'piece of land' that is not covered by the permitted activity provisions then consent is required:

- Subdivision
- Land use change
- Soil disturbance
- Soil sampling
- Removing fuel storage systems

Soil disturbance is applicable to this application.

4.1.1 Soil Disturbance

Under Regulation 8(3) of the NESCS, soil disturbance of up to 25m³ per 500m² and disposal of up to 5m³ per 500m² is allowed as a Permitted Activity. The playing fields have a total area of 16,900m². The total permitted volume of soil disturbance is therefore 845m³, of which 169m³ can be disposed of offsite as a Permitted Activity.

The proposed works comprise stripping topsoil, which is likely to involve 1,000m³ of soil disturbance. This is in excess of the 845m³ threshold, and therefore does not meet the Permitted Activity requirements.

Although the current intention is for the topsoil to be stockpiled on site and reused within the construction process, this is subject to confirmation of the final construction methodology. There is the potential for the topsoil to be removed from the site. Should all the topsoil be removed, this would involve 1,000m³ of soil which would exceed the 169m³ threshold, and therefore does not meet the Permitted Activity requirements.

4.1.2 Change of land use

The proposed activity is not considered to constitute a change in land use under the NESCS.

The site has historically been used for recreational purposes and will in future return to this use. The use of the site for the storage and stockpiling of materials will be temporary and associated with the construction of

the Ōmaroro Reservoir, which is consented under the current designation. The low concentration of contaminants present in the soil and the proposed future land use activity are not considered to be ‘reasonably likely to harm human health’.

Assessment under Regulation 8(4) (subdividing or changing use) is therefore not required for this activity.

4.1.3 Overall Status

In accordance with Regulation 8(5), if a requirement described in any of the sub clauses 8(1) to (4) is not met, then the activity is a controlled activity under Regulation 9 of the NES:CS while it meets the following requirements of 9(1). The site meets these requirements, as set out below:

Requirements of 9(1)	Comment
(a) A detailed site investigation of the piece of land must exist	A DSI has been completed and is attached at Appendix A
(b) The report on the detailed site investigation must state that the soil contamination does not exceed Regulation 7	The detailed site investigation in Appendix A concludes that the soil contamination does not exceed applicable standards in Regulation 7
(c) The consent authority must have the report	The DSI is attached at Appendix A
(d) Conditions arising from the application of sub clause (2), if there are any must be complied with	Any conditions arising from the application of sub clause (2) will be complied with.

The requirements of Regulation 9(a)-(d) can be met, therefore, the proposed soil disturbance is a controlled activity.

4.2 Greater Wellington Regional Council

The Greater Wellington Proposed Natural Resources Plan (PNRP) defines contaminated land as:

“Land that has a hazardous substance in or on it that -

- (a) has significant adverse effects on the environment; or*
- (b) is reasonably likely to have significant adverse effects on the environment”*

Low levels of heavy metals, PAH and organochlorine pesticides were encountered at the site. These low levels are not considered reasonably likely to ‘have significant adverse effects on the environment’ and as such the site is not considered to be ‘contaminated’ as per the definition in the Wellington Region Natural Resources Plan.

No consent is therefore required from Greater Wellington Regional Council.

4.3 WCC Consideration of Consent

4.3.1 Section 104A of the RMA

This application is for a Controlled Activity. Section 104A of the RMA provides for the assessment of controlled activities and states:

After considering an application for a resource consent for a controlled activity, a consent authority –

- (a) *Must grant the resource consent, unless it has insufficient information to determine whether or not the activity is a controlled activity; and*
- (b) *May impose conditions on the consent under Section 108 only for those matters –*
 - (i) *Over which control is reserved in national environmental standards or other regulations; or*
 - (ii) *Over which it has reserved its control*

4.3.2 Matters of which control is reserved in the NESCS

The matters over which control is reserved in NESCS are set out in Regulation 9(2) for soil disturbance. These matters are addressed individually in Section 5 of this report and stated below.

Regulation 9(2) of the NESCS

The matters over which control is reserved are as follows:

- (a) *The adequacy of the detailed site investigation, including –*
 - (i) *Site sampling;*
 - (ii) *Laboratory analysis;*
 - (iii) *Risk assessment.*
- (b) *How the activity must be-*
 - (i) *Managed, which may include the requirement of a site management plan;*
 - (ii) *Monitored;*
 - (iii) *Reported on;*
- (c) *The transport, disposal and tracking of soil and other materials taken away in the course of the activity;*
- (d) *The timing and nature of the review if the conditions in the resource consent;*
- (e) *The duration of the resource consent.*

5 Assessment of Effects on the Environmental

5.1 General Managements Procedures for the Project

Section 88(2) of the RMA requires that an application for resource consent include an assessment of effects on the environment in such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

5.2 Matters of Control under the NESCS

In order to manage potential adverse effects of contaminated soil on human health and the environment a Contaminated Soils Management Plan (CSMP) has been prepared and is included at **Appendix C**.

The CSMP provides a framework and general procedures for the management of the effects of contaminated soil on human health and the management of contaminated soil and other contaminated materials or structures potentially present in the ground that may be disturbed or require removal as part of the project. Specialist controls presented in the CSMP include:

- A summary of human health controls for health and safety planning/training requirements, personal protective equipment, and personal monitoring;
- A summary of responsible parties to the land disposal works;
- A summary of environmental controls for odour, dust, noise, spoil stockpiling, spoil disposal, groundwater disposal; and
- Procedures for encountering unknown contamination.

Whilst no unacceptable risk has been identified for this site, the works will be undertaken in general accordance with this plan.

In summary, soil analytical results within the DSI found no exceedances of the Soil Contaminant Standards under the NESCS. Therefore, works at the site associated with the construction of the Ōmaroro Reservoir are deemed to pose a low risk to human health. Implementing relevant mitigation measures identified in the CSMP will provide a conservative approach to the management and mitigation of the identified low risk of the construction works to human health.

For these reasons, the effects on human health are considered less than minor.

5.3 Matters of control under the NES:CS

For a Controlled Activity in relation to soil disturbance, Regulation 9(2) of the NESCS sets out those matters over which control is reserved (refer to Section 5.2.2). This assessment only covers these areas.

5.3.1 Regulation 9 of the NESCS (a)

(a) *The adequacy of the detailed site investigation including –*

- (i) *Site sampling*
- (ii) *Laboratory analysis*
- (iii) *Risk Assessment.*

Soil sampling was undertaken in general accordance with the Ministry for the Environment Contaminated Land Management Guideline No.5 “Site Investigation and Analysis of Soils” and the site investigation works were undertaken by suitably qualified environmental scientist as required by the NESCS. All chemical laboratory analyses were performed by Hill Laboratories.

The NESCS provides a set of chemical specific soil contaminant standards (SCSs) that define an adequate level of protection for human health. Soil samples from this site were assessed against this and deemed to pose a low risk to human health.

5.3.2 Regulation 9 of the NESCS (b)

(b) How the activity must be -

(i) managed, which may include the requirement of a site management plan:

(ii) monitored

(ii) reported on

The CSMP has been developed to address such risks, as well as the processes for managing contaminated sites and soils; controls for dust, stormwater and sediment; contamination testing and monitoring procedures. Relevant procedures and controls will be implemented at this site from the plan, commensurate with the identified low-level risk to human health.

5.3.3 Regulation 9 of the NESCS (c)

(c) the transport, disposal and tracking of soil and other materials taken away in the course of this activity.

The topsoil on the playing fields will be stripped, and this material, along with other materials associated with the construction of the Omaroro Reservoir, will be stored on the playing fields. While the intention is to reuse the topsoil within the construction of the reservoir there is potential for the soil to be removed from site. This will be confirmed once the construction methodology has been finalised.

Procedures and controls relevant to the transport, disposal, and tracking of contaminated soil will be carried out in accordance with best practice. Full details will be provided within the Construction Management Plan and Construction Traffic Management Plan which are secured by conditions attached to the Notice of Requirement Consent (Conditions DC.16 and DC.22 respectively).

5.3.4 Regulation 9 of the NESCS (d) and (e)

(d) the timing and nature of the review of the consent conditions in the resource consent:

(e) the duration of the resource consent.

The duration of the consent requested is 10 years, which aligns with the Notice of Requirement Designation (Condition DC.3). This reflects the fact that the restoration of the playing fields will be one of the final phases of the reservoir construction.

Conditions of consent are proposed to ensure actual and potential effects on the environment are avoided, remedied, or mitigated.

6 Proposed Mitigation Measures

The DSI found low, but detectable, concentrations of heavy metals, PAH and organochlorine pesticides across the site at varying depths. However, there was no exceedance of human health or environmental risk guidelines for any contaminant. As such, the effects on human health are considered less than minor.

Conservative controls and procedures will be put in place and are outlined in the CSMP, despite the low level of risk of adversely affecting human health and the environment (e.g. good hygiene practices, gloves when physically handling soils, erosion and sediment controls, dust suppression where applicable, accidental discovery protocol and soil management instructions). These are commensurate with the level of risk at the site.

7 Proposed Conditions

It is proposed that the following conditions are imposed on this consent in order to manage potential human health effects associated with contaminated soil that will apply to these works.

1. The proposed activity shall be undertaken in accordance with the Contaminated Soils Management Plan (May 2019) and other information supplied by the consent holder in accordance with the conditions attached to the Designation (Designation reference SR394052).
2. The Consent Holder shall be consistent with the following standards and guidelines:
 - i. Contaminated Land Guidelines No.1 – Reporting on Contaminated Sites in New Zealand
 - ii. Contaminated Land Guidelines No. 5 – Site Investigation and Analysis of Soils
3. A suitably qualified Contaminated Land Specialist shall be involved in a pre-earthworks site briefing with the Environmental Manager and all personnel involved with the earthworks to brief all personnel working on the site of the requirements of the Contaminated Soils Management Plan.
4. In the event of unexpected contamination and hazardous materials discovery at the site, the Consent Holder shall comply with the procedure outlined in Section 5 of the Contaminated Soils Management Plan.
5. The soil disturbance activities approved by this Consent shall be completed within 10 years of the commencement of this consent.

8 Statutory Assessment

8.1 Resource Management Act 1991 (RMA)

Any decisions on proposed works must be consistent with the purpose and principles of the RMA as set out in Part 2 (Purpose and Principles) of the Act and have regard to the matters contained in Section 104 of the RMA.

8.2 Section 5 RMA

The purpose of the RMA as set out in Section 5, is to promote the sustainable management of sustainable resources. Potential adverse effects have been identified and mitigation measures proposed to avoid, remedy or mitigate any adverse effects on human health and the wider environment, through the provision of the CSMP.

8.3 Section 6 RMA

Section 6 of the RMA requires the recognition of matters of national importance in relation to managing the use, development, and protection of natural and physical resources. The construction of the Ōmaroro Reservoir is strategically important to the Wellington region and is subject to a confirmed Designation. Full consideration of the matters of national importance were considered in detail in the Notice of Requirement. This resource consent application for soil disturbance does not introduce any matters which have not been previously considered.

8.4 Section 7 RMA

Section 7 provides a list of further matters that particular regard must be given to. This includes the maintenance and enhancement of the quality of the environment and amenity values. Section 7(b) requires the efficient use and development of natural and physical resources. The environmental and amenity impacts of the reservoir construction have been assessed in detail within the Notice of Requirement application, and the conditions attached to the designation require the submission of a suite of management plans to mitigate the potential impacts. This resource consent application for soil disturbance does not introduce any matters which have not been previously considered.

In addition, this application is accompanied by a CSMP, which provides management procedures for the movement and use of soils. The transport, storage and use of contaminated soils will follow protocols outlined in the CSMP so that the quality of the environment is maintained (Section 7(f)).

8.5 Section 8 RMA

Section 8 of the RMA relates to the principles of the Treaty of Waitangi. The Notice of Requirement included consultation with both Ngati Toa and Port Nicholson Trust, who were identified as potentially affected iwi interests. Consultation with iwi will be ongoing through the construction of the reservoir, including the soil disturbance works included within this application. This consultation will be through the Community Reference Group, which is required under the Town Belt Act consent.

8.6 Summary

Based on the assessment above it is considered that appropriate regard has been given to the provisions of Part 2 and it is considered that the proposal is consistent with the purpose and principles of the RMA.

8.7 Wellington City Council District Plan

The Operative Wellington City Council District Plan Chapter 31 addresses contaminated land. The objective within Chapter 31 of this District Plan is to manage the remediation, use, development and subdivision of contaminated and potentially contaminated land so as to avoid or mitigate the risk of adverse effects on human health. This is in line with the requirements of the NESCS.

While the District Plan does not reference the NESCS specifically it does state the following:

The Ministry for the Environment, Ministry of Health and the Department of Labour have published several guidelines for the management of contaminated land and it is expected that applicants will adhere to these guidelines (particularly the Contaminated Land Management Guidelines 1-5 and any relevant Ministry for the Environment industry-specific contaminated land guidelines as appropriate) in completing the site analysis and preparing the approach to decontamination.

As set out within this application, the proposals are consistent with the requirements of the NESCS, which ensures that that land affected by contaminants in soil is appropriately identified and assessed before it is developed, and if necessary the land is remediated, or the contaminants contained to make the land safe for human use. The requirements of the NESCS align with the objective and policies within the Operative Wellington District Plan. It is considered that the proposals meet the requirements of the NESCS and are therefore consistent with the District Plan.

Resource consent is not required under the rules of the District Plan due to the site designation for the reservoir and associated works.

9 Notification and Consultation

9.1 Affected Parties

Soil analytical results within the DSI found no exceedances of the Soil Contaminant Standards under the NESCS. Therefore, works at the site associated with the construction of the Ōmaroro Reservoir are deemed to pose a low risk to human health. Implementing relevant mitigation measures identified in the CSMP will provide a conservative approach to the management and mitigation of the identified low risk of the construction works to human health.

The land is within the Town Belt and is owned by Wellington City Council. There will be no public access to this site during the construction process when the soil disturbance will take place. For these reasons, the effects on human health are considered less than minor.

As such, it is considered that no parties are affected by the proposal.

9.2 Notification requirements under the NES:CS

In accordance with Regulation 9(5) if the NESCS the consent authority “must not give public notification of an application for a resource consent” in regard to Controlled Activities.

9.3 Consultation

Given the standard nature of this application under the NESCS and the fact that ongoing consultation is taking place through the Community Reference Group (as required by the Town Belt Act consent), no consultation has been undertaken specifically for this proposal.

10 Conclusion

Overall, the proposal requires consent as a Controlled Activity consent under the NESCS.

The proposed soil disturbance at the Prince of Wales Playing Fields is unlikely to present an adverse risk to human health. This is due to the concentrations of contaminant not exceeding the Soil Contaminant Standards under the NESCS.

It is intended that this topsoil which is to be stripped from the playing fields will be stockpiled on site and reused as part of the construction works, although this is subject to finalisation of the construction methodology. Should the material be taken off site, then due to the low-level concentrations of heavy metals, PAH and organochlorine pesticides it is likely that the classification of managed fill will apply. The appointed contractor will follow best practice procedures and the acceptance of the soil would be confirmed with the disposal site operators prior to the commencement of any soil disturbance.

Appropriate mitigation measures will be in place and are outlined in the CSMP despite the low level of risk of adversely affecting human health and the environment.

As the proposed activity is controlled, the application can be processed by way of non-notification given the NESCS explicitly states that controlled activities under the standard shall not be publicly notified.

A

Appendix A – Detailed Site Investigation

B

Appendix B – Drawings



RESOURCE CONSENT
NOT FOR CONSTRUCTION

No.	Rev.	Description	By	Chk.	Appd.	Date
A		FOR NES CONSENT APPLICATION	BM	WM	DS	28.05.19



Original Scale: 1:100	Design Drawn: R.HAMCOCK 29.05.19	Approved For Construction? Date:
Reduced Scale: 1:1000	Verifier Design Check	

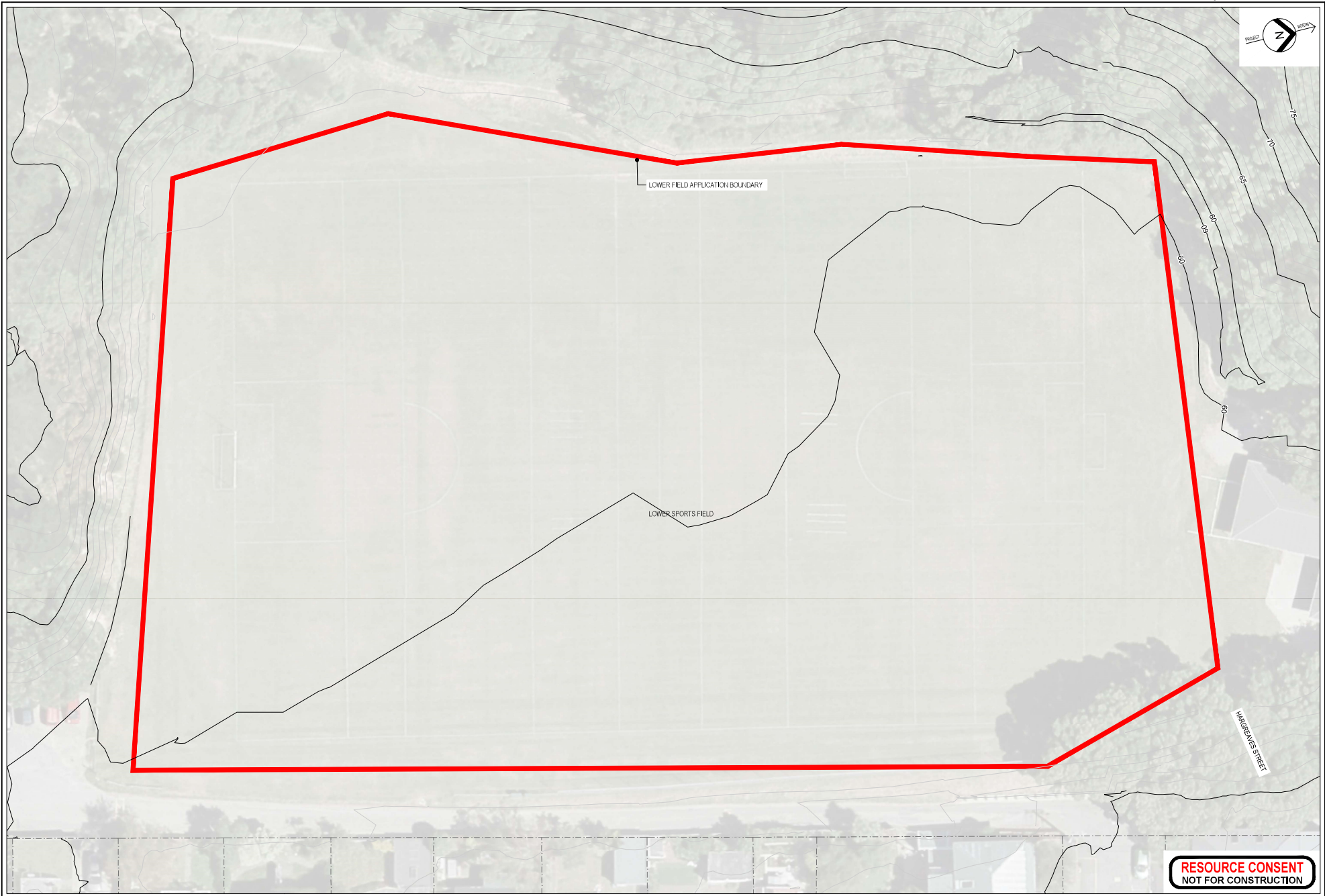
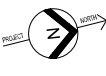
*Refer to Revision 1 for Original Signature



Project: OMARORO RESERVOIR

Title: OVERVIEW PLAN

Discipline: PLANNING
Drawing No: 3262332-DA-1001
Rev: A



**RESOURCE CONSENT
NOT FOR CONSTRUCTION**

No.	Revision	By	Chk.	Appd.	Date
A	FOR NES CONSENT APPLICATION	BM	WM	DS	29.05.19



Original Scale (A3) 1:200	Design	R.HANCOCK	29.05.19	Approved For Construction*
Revised Scale (A3) 1:400	Drawn			Date
	Verifier			
	Design Check			

* Refer to Paragraph 1 for Original Signature



Client: **OMARORO RESERVOIR**

Title: **LOWER FIELD EXISTING CONTOUR OVERLAY**

Discipline: **PLANNING**
 Drawing No: **3262332-DA-1002**
 Rev: **A**



**RESOURCE CONSENT
NOT FOR CONSTRUCTION**

No.	Rev.	By	Chk.	Appd.	Date
A		BM	WM	DS	28.05.19
FOR NES CONSENT APPLICATION					



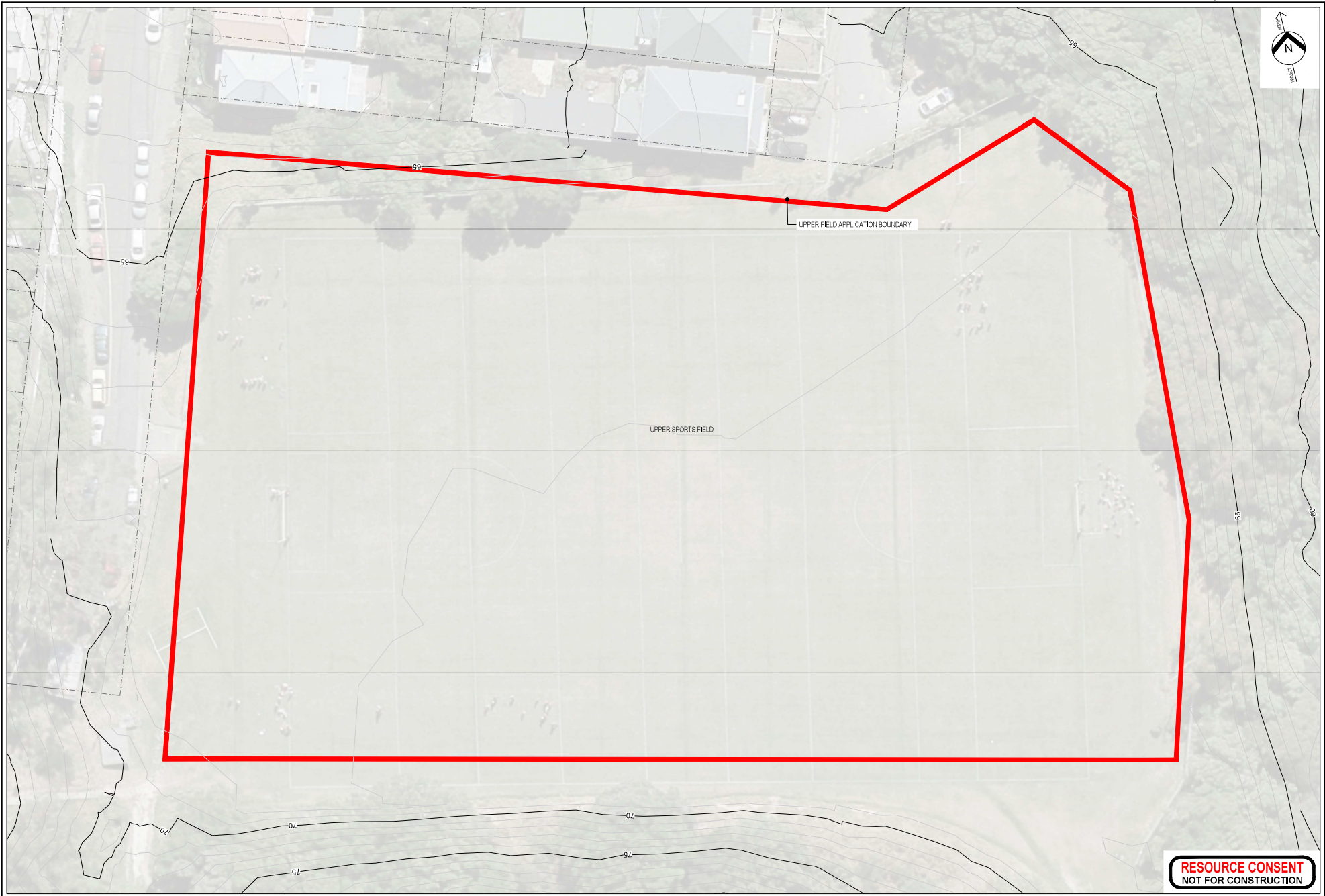
Original Scale (A3) 1:200	Design	Drawn	29.05.19	Approved For Construction*
Fielded Scale (A3) 1:400	Verifier	Checked		Date
	* Refer to Revision 1 for Original Signature			



Project: **OMARORO RESERVOIR**

Title: **LOWER FIELD PROPOSED CONTOUR OVERLAY**

Discipline: **PLANNING**
Drawing No: **3262332-DA-1003** Rev: **A**



RESOURCE CONSENT
NOT FOR CONSTRUCTION

No.	Rev.	By	Chk.	Appd.	Date
A	FOR RESOURCE CONSENT	BM	WM	DS	28.05.19



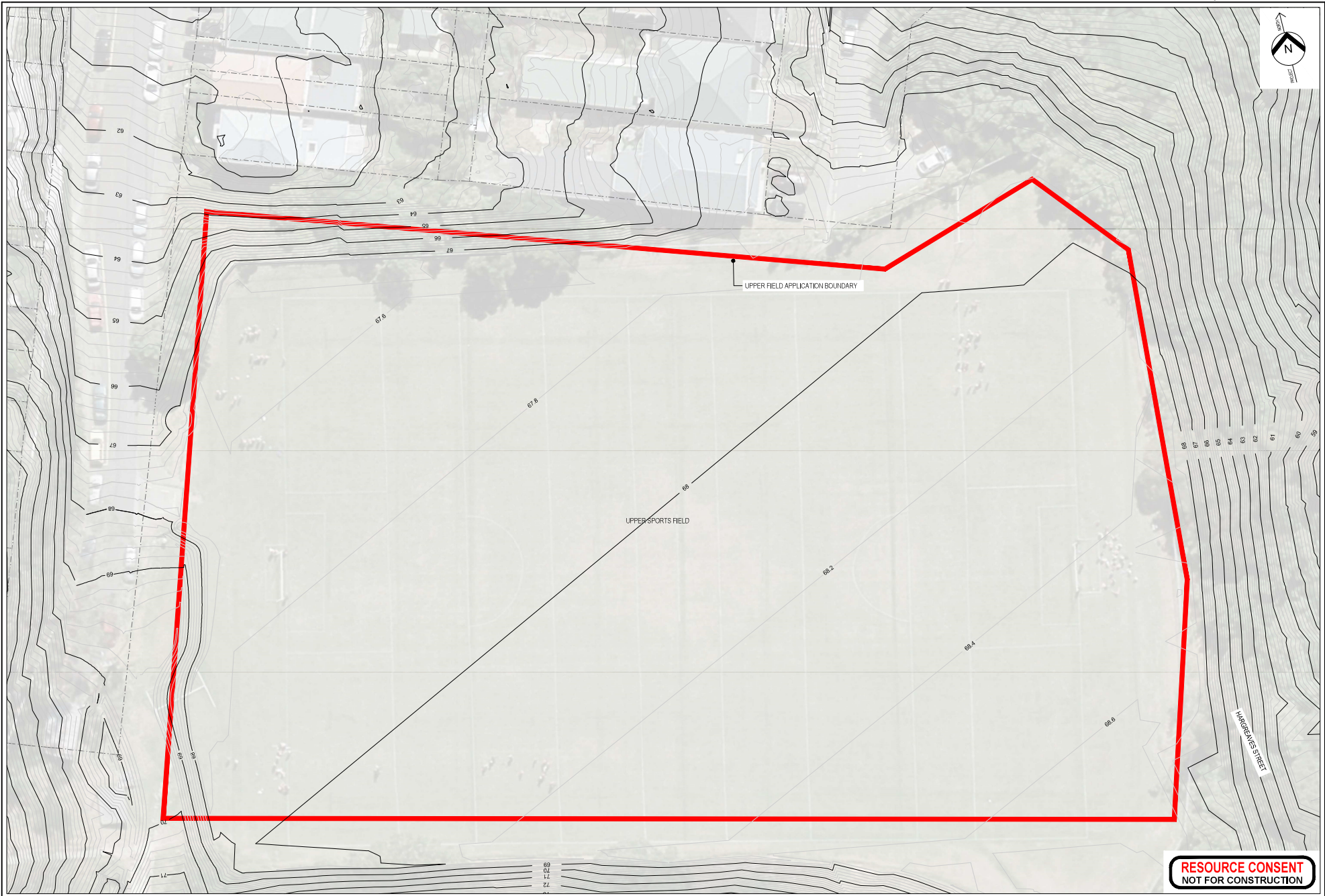
Original Scale (A3)	1:200	Design	R.HAMCOCK	29.05.19	Approved For Construction*
Fielded Scale (A3)	1:400	Verifier			Date
* Refer to Revision 1 for Original Signature					



Project: OMARORO RESERVOIR

Title: UPPER FIELD EXISTING CONTOUR OVERLAY

Discipline: PLANNING
Drawing No: 3262332-DA-1004
Rev: A



RESOURCE CONSENT
NOT FOR CONSTRUCTION

No.	Rev.	Author	Check	Appr.	Date
A		RM	DM	DS	28.05.19



Original Scale (A3)	1:200	Design	R.HANCOCK	29.05.19	Approved For Construction*
Fielded Scale (A3)	1:400	Verifier			Date
*Refer to Revision 1 for Original Signature					



Client: OMARORO RESERVOIR

Title: UPPER FIELD PROPOSED CONTOUR OVERLAY

Discipline: PLANNING
Drawing No: 3262332-DA-1005
Rev: A

C

Appendix C – Contaminated Soil Management Plan

Prince of Wales Playing Fields - Contaminated Soils Management Plan

Prepared for Wellington Water Limited

Prepared by Beca Limited

7 August 2019



Revision History

Revision N°	Prepared By	Description	Date
1	Mel Wykes	Draft for internal review	16/05/2019
2	Mel Wykes	Final version for review	10/06/2019
3	Mel Wykes	Final version	07/08/2019

Document Acceptance

Action	Name	Signed	Date
Prepared by	Mel Wykes		10/06/2019
Reviewed by	Andrew Henderson		28/05/2019
Approved by	Richard Hickman		07/08/2019
on behalf of	Beca Limited		

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Appendices

Appendix A

Detailed Site Investigation Report

1 Introduction

Beca Ltd has been commissioned by Wellington Water Limited (WWL) to prepare a Contaminated Soils Management Plan (CSMP) for the Prince of Wales Playing Fields, which are to be used as part of the construction works associated with the Ōmaroro Reservoir.

The purpose of this CSMP is to identify procedures that shall be undertaken during site redevelopment to control the disturbance and movement of soils, including any potentially contaminated soils.

A Detailed Site Investigation (DSI) (dated May 2019) has been undertaken to characterise contamination present in materials beneath the playing fields as a result of current and historical activities. This DSI is included at **Appendix** and a brief summary is provided in **Section 1.4** below. This DSI was prepared following two Preliminary Site Investigation (PSI) reports, one for the upper field (dated Oct 2012) and one for the lower field (dated October 2017), which identified that the playing fields have generally been used for recreational purposes since being incorporated within the Wellington Town Belt in the early 1890's.

The planning controls of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (2012) (NESCS) are applicable. The activity proposed on the site involves soil disturbance in excess of the permitted activity criteria set out in Regulation 8 of the NESCS; therefore land use consent is required from Wellington City Council (WCC). This CSMP will support the consent application for soil disturbance under the NESCS.

The site does not meet the definition of a contaminated site or contaminated land under the Greater Wellington Regional Council (GWRC) operative or proposed regional plans; therefore, consent is not required from GWRC.

1.1 Site Location and Description

The site is known as the 'Prince of Wales Playing Fields'. In total, the two playing fields occupy an area of approximately 16,900m². Both fields fall under the legal description Part Lot 2 DP 10337. The location of the property is shown in Figure 1 below.

The upper playing field was formed by cutting into the ridgeline that runs along the side of Rolleston Street to above Asquith Terrace/Dorking Street. Pedestrian and maintenance access to the field is from the top of Rolleston Street and there is an additional pedestrian access at the top of Hargreaves Street. The lower playing field was cut into the east facing side of the ridgeline. The lower field is accessed from Salisbury Terrace along the eastern side of the field, which continues south to a carpark and the Wellington Scottish Athletics and Poneke Kyokushin Karate Dojo clubrooms. A sports pavilion at the north end of the field can be accessed by a steep drive off Salisbury Terrace. There is also a track connecting the upper and lower fields.

The sports fields are used for both organised/formal and casual/informal recreation activities. Both fields are managed by Wellington City Council Parks, Sports and Recreation team as tier two fields and are intensively used during the summer months but have lower use in winter.



Figure 1 - Location of the St. James Theatre and Counties building. (Source: Greater Wellington Regional Council (GWRC) Web Map Viewer)

1.1.1 Surrounding Land Use

Land to the north and east of the site is residential. To the south and west of the site is Wellington's Town Belt; an open space used for recreational purposes. Approximately 320m to the north east of the site is Massey University and further to the east, in the suburb of Newtown is Wellington Regional Hospital.

1.2 Summary of Geology and Hydrogeology

The Geological Map of New Zealand¹ shows the site to be underlain by grey sandstone-mudstone sequences and poorly bedded sandstone with minor coloured mudstone, conglomerate, basalt chert and rare limestone of the late Triassic/early Jurassic Rakaia Terrane.

1.3 Proposed Works

The proposed reservoir and associated works have received consent under the Wellington Town Belt Act (the Town Belt Consent) and have been approved in accordance with Designation SR394052. Consent has

¹ Begg, J.G.; Johnston, M.R. (compilers) 2000: Geology of the Wellington area: scale 1:250,000. Lower Hutt: Institute of Geological & Nuclear Sciences. Institute of Geological & Nuclear Sciences 1:250,000 geological map 10. 64 p. + 1 folded map

also been received from Greater Wellington Regional Council for groundwater take, earthworks and discharge of stormwater associated with the reservoir construction (ref WGN 180065).

In summary, the consented works comprise:

- The Omāroro reservoir structure and pipe tunnel
- Access to the reservoir and pipe tunnel
- Associated connections to the bulk water supply, local water supply, and local stormwater networks
- Activities associated with the proposed reinstatement of the upper and lower Prince of Wales playing fields for recreation use.

With regard to the playing fields specifically, the consented scheme allows for the use of both upper and lower fields for material storage and stockpiling during construction. Prior to the placement of excavated material on the playing fields, the topsoil will be removed. The total quantity of topsoil which will be stripped from the site will be 1,000m³. It is intended that this topsoil will be stockpiled on site and reused as part of the construction works, although this is subject to finalisation of the construction methodology. Should the material be taken off site, then due to the low-level concentrations of heavy metals, PAH and organochlorine pesticides it is likely that the classification of managed fill will apply. The appointed contractor will follow best practice procedures and the acceptance of the soil would be confirmed with the disposal site operators prior to the commencement of any soil disturbance.

1.4 Summary of Site History

A DSI was undertaken to characterise contamination present in materials beneath the playing fields as a result of current and historical activities. This DSI has been prepared following two Preliminary Site Investigation (PSI) reports, one for the upper field (dated Oct 2012) and one for the lower field (dated October 2017). The PSI reports identified that the sites have generally been used for recreational purposes since being incorporated within the Wellington Town Belt in the early 1890's. The PSI for the upper playing field stated that it is believed that the area may previously have been the site of a clay brick manufacturing facility, based on the historic correspondence reviewed.

It is also anticipated that the site has been the subject of earthworks in the past to achieve the current topography, although no details of these works are available.

The following and key findings and MfE Hazardous Activities and Industries List (HAIL) activities were identified for the site:

- A10 (persistent pesticide use associated with the maintenance of the sports turf.
- The PSI for the upper playing field reported that the site may have been the location of a clay brick manufacturing facility or was potentially used for the disposal of waste material or products associated with the operation. The HAIL codes for the upper playing field have therefore been identified as A10 and G5 (waste disposal to land).

Ground investigation works were undertaken in February 2019 and comprised 14 test pits which were excavated to a maximum extent of 2m bgl, from which 29 samples (plus two duplicate samples) were taken.

Soil analytical results showed low levels of heavy metals, PAH and organochlorine pesticides in a number of samples across the site at varying depths. However, no contaminant concentrations exceeded the NESCS criteria for 'commercial / industrial outdoor worker (unpaved)', or 'recreational' criteria based upon the site's continued future use as a sports turf, nor did they exceed the adopted environmental protection criteria.

Soil analytical results do not indicate that the site has been significantly impacted as a consequence of historical landuse activities, such as pesticide application and potentially disposal of clay works products, and the human health and environmental risk is considered low.

1.5 Contamination Status of Site Soils and Identified Hazards

Review of the site historical information has identified land use activities which may have resulted in the contamination of soil and/or groundwater at the site, summarised in the table below. Previous investigations indicated that the land may have previously been the site of a clay brick manufacturing facility. The use of the area as a sports turf also indicated the possibility of pesticides and herbicides.

Contaminants of potential concern associated with these activities have also been identified.

Table 1 Contaminants of Potential Concern

Activity	HAIL Code	Contaminants of Potential Concern
■ Sports turf and playing fields	■ A10 – Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glasshouses or spray sheds	■ Arsenic, lead, copper, mercury; wide range of organic compounds including acidic herbicides, organophosphates, and organochlorines
■ Uncontrolled waste disposal to land	■ G5 – Waste disposal to land	■ Heavy metals, PAH, semi-volatile organic compounds

1.6 Development Implications

The NESCS applies to land, as per Regulation 5(7) outlined below:

“Land covered:

- (7) *The piece of land is a piece of land that is described by 1 of the following:*
- (a) *an activity or industry described in the HAIL is being undertaken on it;*
 - (b) *an activity or industry described in the HAIL has been undertaken on it;*
 - (c) *it is more likely than not that an activity or industry described in the HAIL is being or has been undertaken on it.”*

Based on the above it is considered that on a ‘more likely than not’ basis, one or more HAIL activities have been undertaken on the site.

The NESCS applies to this proposal as the development at the site involves the disturbance of soil on a ‘piece of land’ that has been identified as having had a HAIL activity undertaken on it.

Under Regulation 8(3) of the NESCS, soil disturbance of up to 25m³ per 500m² and disposal of up to 5m³ per 500m² is allowed as a Permitted Activity. The playing fields have a total area of 16,900m². The total permitted volume of soil disturbance is therefore 845m³, of which 169m³ can be disposed of offsite as a Permitted Activity.

The proposed works comprise stripping topsoil, which is likely to involve 1,000m³ of soil disturbance. This is in excess of the 845m³ threshold, and therefore does not meet the Permitted Activity requirements.

Although the current intention is for the topsoil to be stockpiled on site and reused within the construction process, this is subject to confirmation of the final construction methodology. There is the potential for the topsoil to be removed from the site. Should all the topsoil be removed, this would involve 1,000m³ of soil which would exceed the 169m³ threshold, and therefore does not meet the Permitted Activity requirements.

In accordance with Regulation 8(5), if a requirement described in any of the sub clauses 8(1) to (4) is not met, then the activity is a controlled activity under Regulation 9 of the NES:CS while it meets the following requirements of 9(1). The site meets these requirements with provision of the DSI and low levels of contaminants which have been identified.

Therefore, the proposed soil disturbance is a **Controlled Activity**.

2 Management Procedures

This section sets out general management procedures and requirements that will be adhered to throughout the earthworks.

1. It is recommended that implementation of this CSMP is contractually enforced throughout the duration of the site construction works.
2. This CSMP applies to the site that is the subject of this consent application, which includes the area of land owned by WCC known as the 'Prince of Wales Playing Fields'. In total, the two playing fields occupy an area of approximately 16,900m². Both fields fall under the legal description Part Lot 2 DP 10337.
3. All personnel involved in the site construction works are to be familiar with this CSMP and ensure that the requirements of this CSMP have been followed.
4. A copy of this CSMP is to remain available onsite at all times so that reference can be made to it when undertaking any site works.
5. The CSMP is intended to assist the site Contractor in meeting their legal obligations related to potentially contaminated soils with respect to health, safety and the environment. It is not intended to cover the general site safety procedures required for typical excavation and construction activities at the site. The CSMP is not intended to relieve the Contractor of their legal responsibilities.
6. Excavation, demolition and construction activities at the site may be subject to other controls/rules/policies under the relevant district and regional plans, including but not limited to, the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. Any conditions imposed by the regulatory authorities must be adhered to. However, it is expected that this CSMP will be incorporated into any consent/permit involving excavation/disturbance work at the site to ensure the risks associated with contaminated soils are managed appropriately.
7. The specific requirements and provisions of this management plan will be under the control of the site Contractor.

3 Site Management

The below management procedures shall be undertaken for all site works involving the disturbance of soil or direct exposure of soil to workers. As low levels of contaminants have been detected across the site at varying depths, the following procedures apply to all soils contained within the bounds of the site.

As stated in **Section 1.3** of this CSMP, it is proposed to store the topsoil which has been stripped from the site in stockpiles. As such, management procedures are required to ensure the stockpiles are routinely maintained, monitored and that limited contact by persons surrounding the site occurs. The following section is considered sufficient in managing the associated risks.

3.1 Pre-development Site Set-up

A site meeting shall be held and attended by the Client, the Contractor, the Engineer and personnel involved with the earthworks (eg sub-contractor, if any) to discuss the risks and site procedures for handling any soils at the site. The Contractor shall prepare a site specific Contractor’s Health & Safety Plan (CHSP) for the earthworks which shall cover potential exposure to soils.

Procedures relating to the management of noise, dust, stormwater, stockpiling and the site working hours shall be detailed in the Contractor’s Construction Management Plan (CMP) and shall be implemented by the Contractor. All procedures shall comply with the relevant Council bylaws and conditions of applicable consents.

Prior to works commencing, the Contractor shall establish the following controls to aid in the management of aspects of site safety and environmental compliance:

- Restriction of access to the earthworks areas to authorised personnel (such as warning tape or barriers), following appropriate site induction procedures;
- Signage, including site works information, health and safety requirements, site reporting requirements;
- Health and safety facilities such as personal protection equipment;
- Stormwater (surface runoff) diversion and collection systems; and
- Dust control systems.

Procedures relating to the management of dust, sediment, stormwater and stockpiling are detailed below and shall be implemented by the Contractor. All procedures shall comply with the relevant Council bylaws and conditions of any applicable consents.

3.1.1 Site Contacts

The following contact details shall be included in this CSMP prior to works commencing:

Engineer to Contract for civil works:

Engineer’s Representative:

Environmental Scientist/Engineer:

3.1.1 Dust Control Procedures

Standard good practice for dust controls shall be implemented by the Contractor including the following, as determined in conjunction with the Engineer:

- Timing of works including prevalent wind direction.
- Dampening any exposed soils during dry and windy conditions through use of a water truck or portable water sprays.
- Covering any stockpiles.
- Reduction of vehicle speeds on site.
- Minimising drop heights from loaders.

If strong odours are detected during excavation, excavation is to cease until the appropriate assessment has been made by the Engineer's Representative.

3.1.2 Stormwater and Sediment Control Procedures

Erosion and sediment controls shall be installed by the Contractor prior to earthworks / excavations commencing and shall be designed for the treatment of surface water runoff in accordance with Greater Wellington Regional Council Erosion and Sediment Control Guidelines for the Wellington Region (2002).

Stormwater runoff should be preferentially maintained onsite and allowed to infiltrate wherever possible to reduce the volume of water and material discharged.

During rain events, sediment that has been stockpiled or left in a destabilised condition can become mobilised in surface water run-off resulting in discharges off-site.

To limit as far as practicable the potential effects from a rainfall event, a range of mitigation and management techniques will be employed, including but not limited to:

- Where possible limit earthworks to drier days;
- Avoiding the stockpiling of sediment as far as practicable;
- Loading excavated materials directly to waiting covered trucks for off-site disposal, as far as practicable;
- Washing trucks on an as-needed basis to minimise tracking sediment beyond the site; and
- Cesspit protection measures such as filter socks and sand bags should be used to trap any sediment from collected runoff.

Sediment captured from the excavation of soils shall be stockpiled, as described in Section 3.1.3.

3.1.3 Stockpile Procedures

Stockpiles shall be maintained in accordance with Condition DC.21 of the Designation, which states:

By 6pm every working day earthwork stockpiles shall not exceed the following height limits, measured from the base of each stockpile:

- a) *Upper Playing field- 5.5m in height*
- b) *Lower Playing field - 7m in height.*

The stockpiles shall be managed by the Contractor as follows:

- Stockpiles shall be sited within an area away from the main working area to minimise potential contact by site workers;
- Stockpiled materials shall be placed on suitable material (i.e. polythene sheet) to prevent contaminants leaching into clean soils; and

- Where adverse weather is forecast, the stockpiled material shall be covered by a suitable material (such as polythene) to prevent the ingress of rainwater into the material and therefore minimise the potential for generation of leachate or sediment in stormwater.

3.2 Soil Excavation/ Disturbance Procedures

3.2.1 Onsite Soil Management and Movement

Excavated soil is to be immediately stockpiled and the procedures outlined in **Section 3.1.3** are to be employed.

The Contractor shall ensure that records are kept of all excavations and soil movements on-site. These shall include the location and dimensions of the excavation, the ground conditions, and the soil's movement on site and whether waste materials, unusual staining and/or odour were observed.

3.2.2 Off-Site Disposal

If materials are to be disposed of off-site, then landfill acceptance of excavated materials to be disposed offsite shall be obtained prior to works commencing. Offsite disposal of contaminated soil must be to a facility licensed to accept such material and approval shall be obtained by the Contractor prior to transportation. The Contractor must retain copies of all disposal receipts/documentation and provide these to Wellington Water Ltd within 5 days of receipt.

The excavation, handling and off-site removal of the material shall be managed by the Contractor as follows:

- Materials requiring excavation for disposal to a licensed landfill or reuse at another commercial location shall be excavated and loaded directly into trucks where possible (limiting stockpiling), subject to the necessary approvals being obtained as outlined above.
- All trucks shall be covered before leaving site and any soils brushed off wheels to avoid tracking onto public roads. Should the site become wet and material adheres to wheels a wheel wash facility shall be installed and truck wheels washed before exiting the site.
- The Contractor shall maintain a register of soil movements and records such as location of excavation, disposal location, quantity of material and off site weighbridge documents.

3.2.3 Contamination Discovery

The procedures outlined below provide the Contractor with protocols to identify potential contamination if suspected contaminated soils or hazardous materials are discovered during the excavation works other than contaminated soils already identified in this CSMP. These protocols will enable the appropriate action to avoid exposure of contaminants to site workers or the dispersion of contaminants into the surrounding environment.

Contamination indicators or hazardous materials may include but are not limited to the following:

- Unusual odours
- Discoloured or stained water seeps and soils
- Petroleum hydrocarbon contaminated soil and/or free product
- Liquid waste, putrescible waste, household refuse and any material that normally would be sent to a licensed landfill
- Suspected Asbestos Containing Material (ACM)
- Intact or broken drums and containers.

During the earthworks on site, the Contractor shall actively monitor for the conditions/materials specified above. In the event that one of these is identified, the Contractor should take the following actions:

- Stop all earthworks within a 5m radius of the area where the suspected material/emission/discharge has been recorded
- Immediately notify the site supervisor
- Cordon off the area as practicable with a suitable barrier.
- Work shall not resume or commence within a 5m radius of the area unless authorised by the Engineer's Representative

The site supervisor shall contact the Engineer's Representative who will consult with the suitably qualified and experienced practitioner and advise on the appropriate course of action. The suitably qualified and experienced practitioner shall:

- Notify the regulatory authorities, that contamination has been discovered and contingency action is being implemented.
- Characterise the contamination by collecting samples for chemical laboratory analysis.
- If appropriate, advise the Contractor to excavate the suspected contaminated material and stockpile (as detailed in Section 3.1.4) or place in a covered container to allow works to continue with minimum delay.
- If stockpiling/containerising is inappropriate, advise construction work to proceed to an area clear of contamination indicators until material testing, as necessary, defines the material characteristics.
- When the material characteristics have been established, advise the site supervisor as to whether the materials may remain on site or what remedial measures are required to manage this material on-site.
- Instruct relevant staff so that all appropriate information such as location and quantity of material and off-site weighbridge dockets are recorded.

Should asbestos be observed or suspected during the earthworks, all work shall cease and Health & Safety at Work (Asbestos) Regulations (2016) will be followed. Works can recommence once all asbestos has been removed safely. Any such asbestos works (assessment, delineation, removal and verification) shall be undertaken by a specialist asbestos contractor.

3.3 Imported Materials

Material imported to the site for the purposes of filling and landscaping shall be certified cleanfill. Records must be provided by the Contractor to demonstrate that any imported material is obtained from a quarry or other certified source. Material shall not be imported from any site that is, or would be considered, a Hazardous Activities and Industries List (HAIL) site (MfE, 2011), unless sampled by a suitably qualified environmental scientist/engineer to show that it is suitable for the intended land use and is acceptable to the client.

3.4 Groundwater Procedures

If groundwater is encountered during the excavation works, the Contractor shall:

- Contain groundwater within the excavation and not allow it to discharge across the site surface.
- If dewatering is required, the pumped groundwater discharge could be discharged to Wellington City Council's reticulated wastewater system with prior approval.

4 Health and Safety Procedures

Given the land use activities that have occurred at the site, there is the potential to encounter contaminated soils and/or groundwater as part of the proposed site works. Prior to work being undertaken, a Job Safety and Environment Analysis (JSEA) will be carried out by the Contractor that will identify the appropriate personal protective equipment (PPE) and behaviours to reduce the exposure risk. Note the contaminants identified at this site potentially pose a low health risk to construction workers.

Workers may be exposed to contaminants via the accidental ingestion of, or skin contact with soil and/or groundwater and/or surface water. To prevent this exposure, procedures should be followed by workers who are likely to come in contact with contaminated soil and/or water, including the following:

- Wear cloth overalls.
- All staff physically involved in works likely to result in hand contact with contaminated materials should wear gloves.
- Wear a P2 dust mask if conditions generate dust.
- Minimise hand to mouth contact.
- Wash hands and face prior to eating, drinking or smoking.
- No eating or drinking within the excavation area.
- Wash any skin abrasions immediately and treat to prevent infections.
- Follow any additional requirements in the Contractor (Site Specific) Health and Safety Plan.

Further hazards may be identified during the course of the works. The Contractor is responsible for reviewing any new work element and assessing whether there are any new associated hazards, and whether these can be eliminated, isolated or minimised. The Contractor shall then instruct all staff on the health and safety procedures associated with the new hazard and update the site CHSP.

5 Limitations

This report has been prepared by Beca Ltd solely for Wellington Water Limited (Client). Beca has been requested by the Client to provide a Contaminated Soils Management Plan (CSMP) in relation to the Prince of Wales Playing Fields, legal description Part Lot 2 DP 10337. This report is prepared solely for the purpose of the management of contaminated soils encountered during this project. The contents of this report may not be used by the Client for any purpose other than in accordance with the stated scope.

This report is prepared solely for the Client. Beca accepts no liability to any other person for their use of or reliance on this report, and any such use or reliance will be solely at their own risk.

Unless specifically stated otherwise in this report, Beca has relied on the accuracy, completeness, currency and sufficiency of all information provided to it by, or on behalf of, the Client or any third party, and has not independently verified the information provided. Beca accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the information provided.

The contents of this report are based upon our understanding and interpretation of current legislation and guidelines ("Standards") as consulting professionals, and should not be construed as legal opinions or advice. Unless special arrangements are made, this report will not be updated to take account of subsequent changes to any such Standards.

This report should be read in full, having regard to all stated assumptions, limitations and disclaimers.

Appendix A

Detailed Site Investigation Report



D

Appendix D – Preliminary Site Investigation for Upper Field



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Capacity Infrastructure Services
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New Zealand

31 October 2012

Attention: Keith Woolley

Dear Keith

Hospital Prince of Wales Reservoir, Upper Playing Field, Preliminary Contamination Investigation

CH2M Beca Ltd (Beca) has been commissioned by Wellington City Council (WCC) to provide a preliminary soil contamination assessment of the upper playing field at the Prince of Wales Park, Mt Cook, Wellington.

We understand that the park area may previously have been the site of a clay brick manufacturing facility. Brickworks usually require kilns to fire the bricks, which produce ash and clinker requiring disposal - often on site. Ash and clinker can contain heavy metals and products of combustion such as polycyclic aromatic hydrocarbons (PAH). The use of the area in recent times as a sports turf also indicates the possibility of pesticides and herbicide use for the maintenance of the turf area.

At the client's request, soil samples were collected during the preliminary geotechnical works on the periphery pitch area of the upper playing field and analysed for contaminants to give an initial indication of their likely presence.

Brief details of the sampling are included in this interim report, along with the results of the chemical laboratory analysis of the samples. It should be noted that this report does not constitute a full contamination assessment, rather a preliminary indication of whether contaminants are present.

1 Site Assessment Methodology

1.1 Approach to Ground Investigation

A geotechnical site investigation was undertaken between 11 and 21 September 2012 by J.Wall Ltd, with the borehole drilling subcontracted to Griffiths Drilling (NZ) Ltd, under the supervision of Beca.

The site investigations comprised the following:

- Two machine boreholes (BH01 and BH02) to depths of 8.45m and 10m respectively;
- Seven machine excavated test pits (ST02, ST05 and TP01 to TP05) to depths ranging from 0.36m to 3.7m;
- Four hand augers for geotechnical purposes (HA01, HA02, HA03B and HA04) to depths ranging from 0.9m to 3.45m to verify ground conditions.
- Four hand augers samples (HAS 1 (NW), HAS 2 (SE), HAS 3 (NE), HAS 4 (SW)) from the top 150mm to provide soil samples for contamination testing.

A map of the sampling locations for this report is included as **Attachment 1**.

For further details including sampling locations please refer to the report *Hospital Prince of Wales Reservoir Geotechnical Report – Addendum*, Beca, October 2012.

It should be noted that as agreed with the client this contamination investigation is not in accordance with Ministry for the Environment guidelines, and should be viewed as a preliminary contamination investigation only.

1.2 Site Investigation Activities

Soil samples for the purposes of contamination testing were collected from locations BH01, BH02 and HAS 1 (NW), HAS 2 (SE), HAS 3 (NE) and HAS 4 (SW). A map of the sampling locations is included as **Attachment 1**.

One surface (0m – 0.15m below ground level (bgl)) sample was collected at each location. Additional deeper samples were collected from locations BH01 and BH02 at approximate 1m intervals, as dictated by encountered lithology.

A total of 11 samples were collected. Sample details are provided in **Table 1**.

1.3 Laboratory testing

All chemical laboratory analyses were performed by R J Hill Laboratories Ltd (Hill Laboratories) who are IANZ accredited. The analysis suite is provided in **Table 1**. All samples submitted to Hill Laboratories for testing were accompanied by Chain of Custody forms which detailed the required handling and testing instructions. Copies of the Chain of Custody forms are available on request. The Hill Laboratories report is included as **Attachment 3**.

Table 1 – Summary of Soil Sampling and Analysis

Location	Investigation hole depth (m bgl)	Laboratory Number	Sample Depth (m)	Soil Type	Analysis Suite
HAS 1 (NW)	0.15	1051240.1	0 – 0.15	Silt	HM, OCP/ONP, PAH
HAS 2 (SE)	0.15	1051240.2	0 – 0.15	Silt	HM, OCP/ONP, PAH
HAS 3 (NE)	0.15	1051240.3	0 – 0.15	Silt	HM, OCP/ONP, PAH
HAS 4 (SW)	0.15	1051240.4	0 – 0.15	Silt	HM, OCP/ONP, PAH
BH01	8.45	1051240.5	0 – 0.15	Silt	HM, PAH
		1051240.6	0.9 – 1.2	Silt	HM, PAH
		1051240.7	1.9 – 2.2	Silt	HM, PAH
		1051240.8	2.9 – 3.1	Silt	HM, PAH
BH02	10.0	1051240.9	0 – 0.15	Silt	HM, PAH
		1051241.10	0.9 – 1.2	Silt	HM, PAH
		1051241.11	1.9 – 2.1	Silt	HM, PAH

HM = Heavy Metals (Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Zinc).
OCP/ONP = Organochlorine and Organonitro&phosphate Pesticides
PAH = Polycyclic Aromatic Hydrocarbons

The analysis suite for each sample was selected based on the history of the site, the potentially contaminating activities that may have occurred, and the likely contaminants associated with those activities.

2 Investigation Results

The results of the investigation showed the presence of low levels of organochlorine pesticide, DDT, and heavy metals (cadmium, lead and nickel) in shallow surface samples collected from the hand auger locations within the sports turf area. Low levels of PAH were also detected in these samples, as well as the shallow surface samples from the borehole locations.

Results of the sampling were compared against 'commercial/industrial outdoor worker' and 'recreational' assessment criteria selected from the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES (Soil)).

A Regional Resource Consent assessment has not been undertaken at this stage.

There were no results which exceeded the NES (Soil) criteria, although there were some elevated levels of heavy metals (cadmium, lead and nickel) and PAH above background levels. The assessment criteria at this stage indicate whether or not there is a potential human health risk to construction workers or current site users (i.e. above recreational or commercial/industrial assessment criteria).

A summary of the analytical results and adopted assessment criteria is presented in the Laboratory Results Summary Sheet in **Attachment 2**.

3 Discussion

The results of the investigation show that there has been historical application of DDT to the sports playing field (noting three sampling positions are located on the periphery of the field). There is also the presence of low levels of PAH in shallow soil samples, and some elevated levels of heavy metals above background levels. Certain elements or compounds of anthropogenic origin are widespread in the environment and accumulate in soils and are also present at what are effectively background levels. Such compounds include trace metals and hydrocarbons, including PAH.

3.1 Regulatory Requirements

The use of persistent pesticides on a sports turf is an activity listed on the Hazardous Activities and Industries List (HAIL). The NES (Soil) Regulations apply to a piece of land where a HAIL activity has occurred. The NES (Soil) Regulations provide a set of nationally consistent set of planning controls for certain activities occurring on HAIL land, including soil disturbance, underground tank removal, soil sampling, subdivision and land use change.

As the development activities at the sports turf involve soil disturbance by removing the top soil, then the activity must comply with the NES (Soil) Regulations.

For the soil disturbance to be a Permitted Activity under Regulation 8(3) of the NES (Soil), then no more than 25m³ per 500m² of soil can be disturbed and no more than 5m³ can be disposed of off site. The sports turf is approximately 7700m² and is assumed to have had pesticides applied across the entire area. Therefore 385m³ can be disturbed and 77m³ can be disposed. The disturbance and disposal volumes required for the project are significantly higher than this, and so the activity cannot comply with the Permitted Activity conditions.

A resource consent will be required to undertake the soil disturbance under either Regulation 9, 10 or 11 of the NES (Soil). Where a Detailed Site Investigation (DSI) report exists which states that the soil contamination does not exceed the standards in Regulation 7, then the activity can proceed as a Controlled Activity. Where a Detailed Site Investigation (DSI) report exists which states that the soil contamination does exceed the standards in Regulation 7, then the activity proceeds as a Restricted Discretionary Activity. Where no DSI exists, the activity proceeds as a Discretionary Activity.

The Regulations apply regardless of the level of contamination and control certain types of activities on contaminated land including soil disturbance.

4 Recommendations

Should WCC wish to undertake a DSI then we would recommend the following:

- Undertake an intrusive investigation in accordance with MfE Guidelines. This would involve the collection of additional samples from the surface of the sports turf to confirm the anticipated uniform presence of DDT. Further investigation may be required where there are known areas of ash/clinker deposits from the old brickworks. Consideration should be given as to whether a potentially contaminating activity has occurred within the area being excavated for the reservoir.
- Reporting of the DSI to MfE Guidelines, and preparation of a management and/or remediation plan for the disturbance of soils on site.
- Submission of DSI report and management plan alongside an application for land use consent under Regulation 9 or 10 of the NES (Soil) (depending on the risk posed by the contaminants identified through the investigation).

Alternatively, WCC may wish to default to an application for a Discretionary Activity consent under Regulation 11 of the NES (Soil), rather than undertaking a DSI. The implications of this are that the consenting team in WCC would have full discretion over how the works are managed, and may require an investigation to be undertaken.

We would be pleased to discuss the options available with WCC and provide a cost estimate for carrying out a DSI.

Yours faithfully

Genevieve Smith
Senior Environmental Scientist

on behalf of

CH2M Beca Ltd

Direct Dial: +64 9 308 4576

Email: genevieve.smith@beca.com

Attachment 1 – Map of Sample Locations

Attachment 2 – CH2M Beca Laboratory Results Summary Sheet

Attachment 3 – Hill Laboratories Report

Attachment 1
Geotechnical Site Plan
(Showing Sampling Locations)



Survey Legend

FEATURE	DESCRIPTION
	Bottom of Bank
	Top of Bank
	Building
	Edge of Concrete
	Centreline of Culch
	Fence
	Gate
	Edge of Track
	Road Centreline
	Manhole
	Power Pole
	Fire Hydrant
	Sign
	Water Meter
	Sluice Valve
	Major Contour 5m
	Minor Contour 1m

Notes:
 Height Datum: New City Datum
 Origin of Heights: Wellington Primary/TGRM
 (New City Datum = Wellington V.D. 1953)
 Coordinate Datum: NZTM2000
 Origin of Coordinates: Wellington Airport
 (WGS1984) LINC continuous tracking station
 Pot holeing survey programmed for September

Geotechnical Legend

APPROXIMATE LOCATION OF PROPOSED RESERVOIR

ALIGNMENT OF SLOPE STABILITY SECTION

BOREHOLE (OPUS, 2011)

TEST PIT (OPUS, 2011)

BOREHOLE (BECA, 2012)

TEST PIT (BECA, 2012)

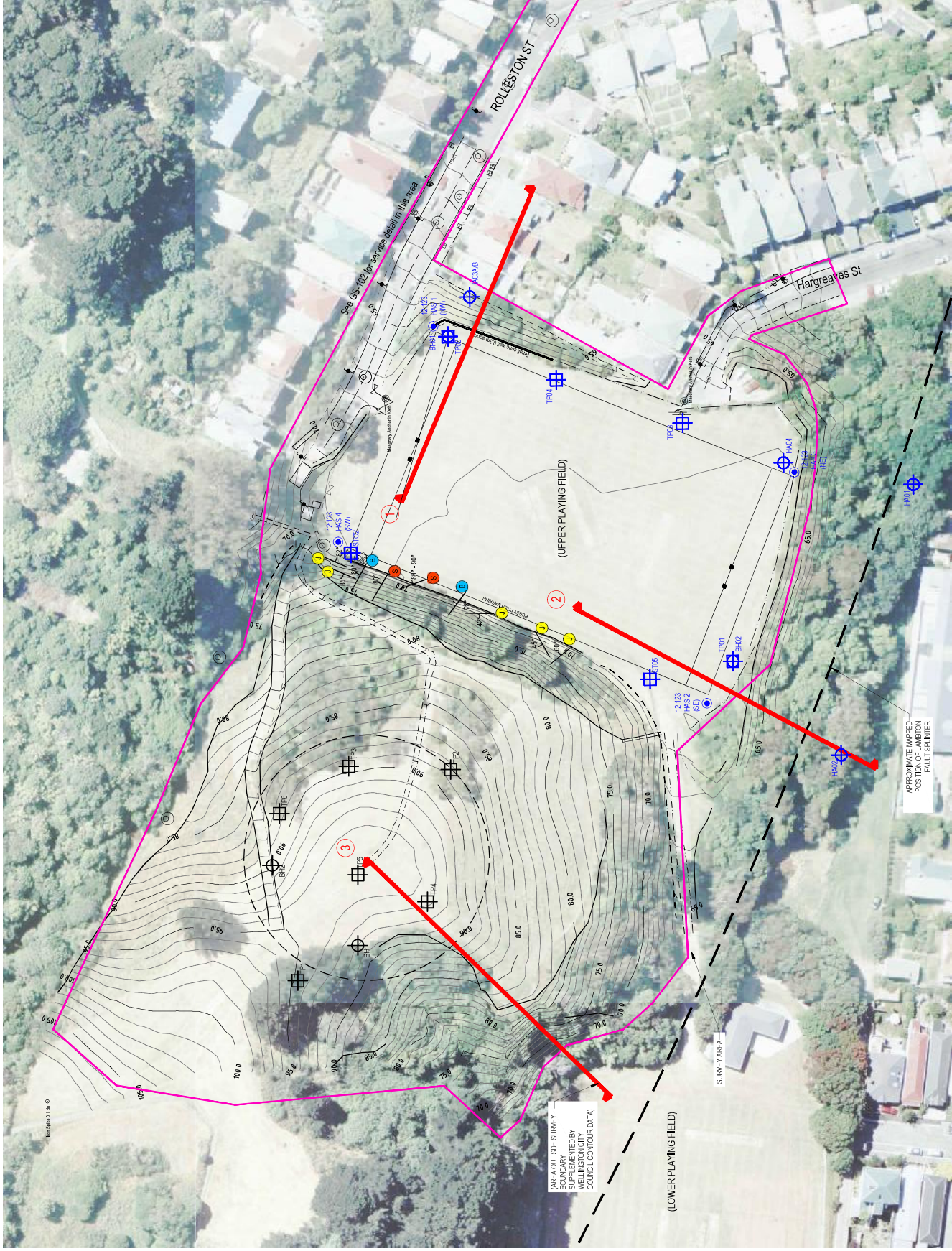
CONTAMINATION SAMPLES (BECA, 2012)

DEFECTS:

- BEDDING**
- JOINT**
- SHEARED**

DIP ANGLE

FOR INFORMATION NOT FOR CONSTRUCTION



PROJECT		HOSPITAL PRINCE OF WALES RESERVOIR	
APPENDIX A		GEOTECHNICAL SITE PLAN	
DATE		27/06/12	
DESIGNER		capacity	
DRAWN BY		CH2M BIOC	
CHECKED BY		[Signature]	
APPROVED BY		[Signature]	
SCALE		1:500	
DATE		27/06/12	
PROJECT NO.		6517439-CE-250	
DRAWING NO.		G	
REVISIONS		[Table with columns: No., Rev., Description, Date]	

Attachment 2

CH2M Beca Laboratory Results Summary Sheet

CH2M BECA SOIL ANALYSIS RESULTS - WCC PRINCE OF WALES PARK														
Sample Date	20-Sep-12	21-Sep-12	21-Sep-12	21-Sep-12	21-Sep-12	21-Sep-12	21-Sep-12	21-Sep-12	20-Sep-12	20-Sep-12	20-Sep-12	Assessment Criteria		
Hand Auger/BH Number	HAS 01 (NW)	HAS 02 (SE)	HAS 3 (NE)	HAS 4 (SW)	BH01 (NW)	BH01 (NW)	BH01 (NW)	BH01 (NW)	BH02	BH02	BH02	Background levels ^a	Recreational ^b	Commercial / industrial outdoor worker (unpaved) ^b
Sample Number	12-123	12-123	12-123	12-123	12-123	12-123	12-123	12-123	12-123	12-123	12-123	<2.7	80	70
Laboratory Number	1051240.1	1051240.2	1051240.3	1051240.4	1051240.5	1051240.6	1051240.7	1051240.8	1051240.9	1051241.1	1051241.1	<0.1-0.11	400	1,300
Sample Depth (m)	0 - 0.15	0 - 0.15	0 - 0.15	0 - 0.15	0 - 0.15	0.9 - 1.2	1.9 - 2.2	0.9 - 1.2	0 - 0.15	0.9 - 1.2	0.9 - 1.2	6-16	2,700	6,300
Soil Type	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	3-25	>10,000	>10,000
Heavy metals (mg/kg)												5.9-76.8	860	3,300
Asenic	7	3	5	5	2	2	2	4	3	3	3	4-13	130 ^c	1,800 ^c
Cadmium	0.29	0.11	0.15	0.14	0.17	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	24-105	23,000 ^b	31,000 ^d
Chromium	12	12	14	13	19	16	17	15	12	19	18	-	-	-
Copper	11	9	19	11	16	12	12	14	9	16	16	-	-	-
Lead	57	49	100	123	80	24	25	40	47	22	21	-	-	-
Nickel	7	6	7	8	8	14	11	10	7	13	15	-	-	-
Zinc	73	50	88	61	83	85	60	87	54	65	76	-	-	-
Organochlorine Pesticides (mg/kg)														
2,4'-DDD	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	Not tested	<0.06	<0.03	<0.03	-	-	-
4,4'-DDD	0.017	0.035	0.023	0.032	0.032	0.032	0.032	Not tested	<0.06	<0.03	<0.03	-	-	-
2,4'-DDE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	Not tested	<0.06	<0.03	<0.03	-	-	-
4,4'-DDE	0.081	0.079	0.28	0.189	0.28	0.189	0.189	Not tested	<0.06	<0.03	<0.03	-	-	-
2,4'-DDT	0.029	<0.010	0.014	0.073	0.014	0.073	0.073	Not tested	<0.06	<0.03	<0.03	-	-	-
4,4'-DDT	0.162	0.44	0.24	0.38	0.24	0.38	0.38	Not tested	<0.06	<0.03	<0.03	-	-	-
Total DDT	0.308	0.584	0.577	0.694	0.577	0.694	0.694	Not tested	<0.06	<0.03	<0.03	-	-	-
All Other Compounds												-	400	1,000
Organic phosphorus Pesticides (mg/kg)														
Below Detection														
All Compounds														
Below Detection														
Polycyclic Aromatic Hydrocarbons (mg/kg)														
Acenaphthene	<0.03	<0.04	<0.04	<0.04	<0.05	<0.04	<0.03	<0.04	<0.06	<0.03	<0.03	-	-	-
Acenaphthylene	<0.03	<0.04	<0.04	<0.04	<0.05	<0.04	<0.03	<0.04	<0.06	<0.03	<0.03	-	-	-
Anthracene	0.05	0.04	0.09	0.04	0.05	0.04	0.03	<0.04	<0.06	<0.03	<0.03	<0.002-0.05	-	-
Benzo[a]anthracene	0.06	0.05	0.24	0.05	0.08	0.08	0.08	<0.04	0.07	<0.03	<0.03	-	-	-
Benzo[a]pyrene (BaP)	0.07	0.06	0.3	0.06	0.11	<0.04	<0.03	<0.04	0.09	<0.03	<0.03	<0.002-0.27	-	-
Benzo[b]fluoranthene	0.06	0.06	0.23	0.06	0.11	<0.04	<0.03	<0.04	0.11	<0.03	<0.03	-	-	-
Benzo[k]fluoranthene	0.04	<0.04	0.14	0.04	0.05	<0.04	<0.03	<0.04	0.1	<0.03	<0.03	-	-	-
Chrysene	0.07	0.05	0.26	0.05	0.09	<0.04	<0.03	<0.04	0.09	<0.03	<0.03	-	-	-
Dibenz[a,h]anthracene	<0.03	<0.04	0.04	0.04	<0.05	<0.04	<0.03	<0.04	<0.06	<0.03	<0.03	-	-	-
Fluoranthene	0.15	0.1	0.66	0.09	0.19	<0.04	<0.03	<0.04	0.19	<0.03	<0.03	<0.002-0.55	-	-
Fluorene	<0.03	<0.04	<0.04	<0.04	<0.05	<0.04	<0.03	<0.04	<0.06	<0.03	<0.03	-	-	-
Indeno[1,2,3-c,d]pyrene	0.06	0.05	0.21	0.05	0.08	<0.04	<0.03	<0.04	0.09	<0.03	<0.03	-	-	-
Naphthalene	<0.15	<0.17	<0.17	<0.16	<0.3	<0.16	<0.15	<0.16	<0.3	<0.14	<0.14	<0.002-0.01	-	-
Phenanthrene	0.12	0.06	0.49	0.05	0.1	<0.04	<0.03	<0.04	0.11	<0.03	<0.03	<0.002-0.26	-	-
Pyrene	0.16	0.12	0.68	0.11	0.22	<0.04	<0.03	<0.04	0.22	<0.03	<0.03	<0.002-0.57	-	-
BaP equivalent	0.099	0.089	0.377	0.088	0.140	<0.1	<0.07	<0.1	0.153	<0.07	<0.07	-	40	35

^a Determination of common pollutant background soil concentrations for the Wellington region, GWRC 2003. Values applicable to 'Main Soil Type 2 (Greywacke)' have been used.

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

^c Environment Agency (EA), Soil Guideline Values for nickel in soil. Science report SC050021 / Nickel SGV (2009). 'Commercial' land use values used for outdoor worker exposure, 'Residential' land use values conservatively used for recreational user exposure

^d United States Environmental Protection Agency (USEPA), Regional Screening Level Summary Table April 2012. 'Industrial' soil values used for outdoor worker exposure, 'Residential' values used as conservative assessment for recreational user exposure

Grey shading indicates values above background levels.

Bold indicates values above NES criteria

- indicates no guideline value



Attachment 3

Hill Laboratories Report



ANALYSIS REPORT

Client:	Beca Infrastructure Limited	Lab No:	1051240	SPV1
Contact:	Kate Jackson C/- Beca Infrastructure Limited PO Box 6345 Wellesley Street AUCKLAND 1141	Date Registered:	25-Sep-2012	
		Date Reported:	09-Oct-2012	
		Quote No:		
		Order No:		
		Client Reference:	12:123	
		Submitted By:	Kate Jackson	

Sample Type: Soil						
Sample Name:	12:123 HAS 1 (NW) 20-Sep-2012 10:30 am	12:123 HAS 2 (SE) 21-Sep-2012 10:00 am	12:123 HAS 3 (NE) 21-Sep-2012 10:15 am	12:123 HAS 4 (SW) 21-Sep-2012 12:00 pm	12:123 BH01 (NW) 0-15cm 21-Sep-2012 12:45 pm	Lab Number:
	1051240.1	1051240.2	1051240.3	1051240.4	1051240.5	
Individual Tests						
Dry Matter	g/100g as rcvd	79	75	75	79	58
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	7	3	5	5	5
Total Recoverable Cadmium	mg/kg dry wt	0.29	0.11	0.15	0.14	0.17
Total Recoverable Chromium	mg/kg dry wt	12	12	14	13	13
Total Recoverable Copper	mg/kg dry wt	11	9	19	11	16
Total Recoverable Lead	mg/kg dry wt	57	49	100	123	80
Total Recoverable Nickel	mg/kg dry wt	7	6	7	8	8
Total Recoverable Zinc	mg/kg dry wt	73	50	88	61	83
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
alpha-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
beta-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
delta-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
cis-Chlordane	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
trans-Chlordane	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	-
2,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
4,4'-DDD	mg/kg dry wt	0.017	0.035	0.023	0.032	-
2,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
4,4'-DDE	mg/kg dry wt	0.081	0.079	0.28	0.189	-
2,4'-DDT	mg/kg dry wt	0.029	< 0.010	0.014	0.073	-
4,4'-DDT	mg/kg dry wt	0.162	0.44	0.24	0.38	-
Dieldrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan I	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan II	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan sulphate	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin Aldehyde	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin ketone	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Heptachlor	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Heptachlor epoxide	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachlorobenzene	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-
Methoxychlor	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	-



Sample Type: Soil						
Sample Name:	12:123 HAS 1 (NW) 20-Sep-2012 10:30 am	12:123 HAS 2 (SE) 21-Sep-2012 10:00 am	12:123 HAS 3 (NE) 21-Sep-2012 10:15 am	12:123 HAS 4 (SW) 21-Sep-2012 12:00 pm	12:123 BH01 (NW) 0-15cm 21-Sep-2012 12:45 pm	
Lab Number:	1051240.1	1051240.2	1051240.3	1051240.4	1051240.5	
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Acetochlor	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Alachlor	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	-
Atrazine	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Atrazine-desethyl	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Atrazine-desisopropyl	mg/kg	< 0.12	< 0.13	< 0.13	< 0.12	-
Azaconazole	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
Azinphos-methyl	mg/kg	< 0.12	< 0.13	< 0.13	< 0.12	-
Benalaxyl	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
Bitertanol	mg/kg	< 0.12	< 0.13	< 0.13	< 0.12	-
Bromacil	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Bromopropylate	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Butachlor	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Captan	mg/kg	< 0.12	< 0.13	< 0.13	< 0.12	-
Carbaryl	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Carbofuran	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Chlorfluazuron	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Chlorothalonil	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Chlorpyrifos	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Chlorpyrifos-methyl	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Chlortoluron	mg/kg	< 0.12	< 0.13	< 0.13	< 0.12	-
Cyanazine	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Cyfluthrin	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Cyhalothrin	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Cypermethrin	mg/kg	< 0.12	< 0.13	< 0.13	< 0.12	-
Deltamethrin (Tralomethrin)	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Diazinon	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
Dichlofluanid	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Dichloran	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	-
Dichlorvos	mg/kg	< 0.09	< 0.09	< 0.09	< 0.09	-
Difenoconazole	mg/kg	< 0.09	< 0.09	< 0.09	< 0.09	-
Dimethoate	mg/kg	< 0.12	< 0.13	< 0.13	< 0.12	-
Diphenylamine	mg/kg	< 0.12	< 0.13	< 0.13	< 0.12	-
Diuron	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Fenpropimorph	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Fluazifop-butyl	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Fluometuron	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Flusilazole	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Fluvalinate	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	-
Furalaxyl	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
Haloxifop-methyl	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Hexaconazole	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Hexazinone	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	mg/kg dry wt	< 0.3	< 0.4	< 0.4	< 0.3	-
Iprodione	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Kresoxim-methyl	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
Linuron	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Malathion	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Metalaxyl (Mefenoxam)	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Methamidophos	mg/kg	< 0.3	< 0.4	< 0.4	< 0.3	-
Metolachlor	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	-
Metribuzin	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Molinate	mg/kg	< 0.12	< 0.13	< 0.13	< 0.12	-
Myclobutanil	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-

Sample Type: Soil						
Sample Name:	12:123 HAS 1 (NW) 20-Sep-2012 10:30 am	12:123 HAS 2 (SE) 21-Sep-2012 10:00 am	12:123 HAS 3 (NE) 21-Sep-2012 10:15 am	12:123 HAS 4 (SW) 21-Sep-2012 12:00 pm	12:123 BH01 (NW) 0-15cm 21-Sep-2012 12:45 pm	
Lab Number:	1051240.1	1051240.2	1051240.3	1051240.4	1051240.5	
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Naled	mg/kg	< 0.3	< 0.4	< 0.4	< 0.3	-
Norflurazon	mg/kg	< 0.12	< 0.13	< 0.13	< 0.12	-
Oxadiazon	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Oxyfluorfen	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
Paclobutrazol	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Parathion-ethyl	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Parathion-methyl	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Pendimethalin	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Permethrin	mg/kg	< 0.02	< 0.02	< 0.02	< 0.02	-
Pirimicarb	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Pirimiphos-methyl	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Prochloraz	mg/kg	< 0.3	< 0.4	< 0.4	< 0.3	-
Procymidone	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Prometryn	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
Propachlor	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Propanil	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	-
Propazine	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
Propiconazole	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	-
Pyriproxyfen	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Quizalofop-ethyl	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Simazine	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Simetryn	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Sulfentrazone	mg/kg	< 0.3	< 0.4	< 0.4	< 0.3	-
TCMTB [2-(thiocyanomethylthio) benzothiazole, Busan]	mg/kg dry wt	< 0.12	< 0.13	< 0.13	< 0.12	-
Tebuconazole	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Terbacil	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Terbufos	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Terbumeton	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Terbuthylazine	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
Terbuthylazine-desethyl	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Terbutryn	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Thiabendazole	mg/kg	< 0.3	< 0.4	< 0.4	< 0.3	-
Thiobencarb	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Tolyfluanid	mg/kg	< 0.03	< 0.04	< 0.04	< 0.03	-
Triazophos	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Trifluralin	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Vinclozolin	mg/kg	< 0.06	< 0.07	< 0.07	< 0.06	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.03	< 0.04	< 0.04	< 0.04	< 0.05
Acenaphthylene	mg/kg dry wt	< 0.03	< 0.04	< 0.04	< 0.04	< 0.05
Anthracene	mg/kg dry wt	< 0.03	< 0.04	0.09	< 0.04	< 0.05
Benzo[a]anthracene	mg/kg dry wt	0.05	0.04	0.23	0.04	0.08
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.06	0.05	0.24	0.05	0.08
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	0.07	0.06	0.30	0.06	0.11
Benzo[g,h,i]perylene	mg/kg dry wt	0.06	0.06	0.23	0.06	0.10
Benzo[k]fluoranthene	mg/kg dry wt	0.04	< 0.04	0.14	< 0.04	0.05
Chrysene	mg/kg dry wt	0.07	0.05	0.26	0.05	0.09
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.03	< 0.04	0.04	< 0.04	< 0.05
Fluoranthene	mg/kg dry wt	0.15	0.10	0.66	0.09	0.19
Fluorene	mg/kg dry wt	< 0.03	< 0.04	< 0.04	< 0.04	< 0.05
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.06	0.05	0.21	0.05	0.08
Naphthalene	mg/kg dry wt	< 0.15	< 0.16	< 0.17	< 0.16	< 0.3

Sample Type: Soil						
Sample Name:	12:123 HAS 1 (NW) 20-Sep-2012 10:30 am	12:123 HAS 2 (SE) 21-Sep-2012 10:00 am	12:123 HAS 3 (NE) 21-Sep-2012 10:15 am	12:123 HAS 4 (SW) 21-Sep-2012 12:00 pm	12:123 BH01 (NW) 0-15cm 21-Sep-2012 12:45 pm	
Lab Number:	1051240.1	1051240.2	1051240.3	1051240.4	1051240.5	
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Phenanthrene	mg/kg dry wt	0.12	0.06	0.49	0.05	0.10
Pyrene	mg/kg dry wt	0.16	0.12	0.68	0.11	0.22
Sample Name:	12:123 BH01 (NW) 0.9-1.2m 21-Sep-2012 12:50 pm	12:123 BH01 (NW) 1.9-2.2m 21-Sep-2012 12:55 pm	12:123 BH01 (NW) 2.9-3.1m 21-Sep-2012 1:00 pm	12:123 BH02 0-15cm 20-Sep-2012 1:15 pm	12:123 BH02 0.9-1.3m 20-Sep-2012 1:20 pm	
Lab Number:	1051240.6	1051240.7	1051240.8	1051240.9	1051240.10	
Individual Tests						
Dry Matter	g/100g as rcvd	80	79	79	41	81
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	2	2	4	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	19	17	15	12	19
Total Recoverable Copper	mg/kg dry wt	16	12	14	9	16
Total Recoverable Lead	mg/kg dry wt	24	25	40	47	22
Total Recoverable Nickel	mg/kg dry wt	14	11	10	7	13
Total Recoverable Zinc	mg/kg dry wt	85	60	87	54	65
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.06	< 0.03
Acenaphthylene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.06	< 0.03
Anthracene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.06	< 0.03
Benzo[a]anthracene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	0.07	< 0.03
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.04	< 0.03	< 0.04	0.09	< 0.03
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	0.11	< 0.03
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	0.10	< 0.03
Benzo[k]fluoranthene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.06	< 0.03
Chrysene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	0.09	< 0.03
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.06	< 0.03
Fluoranthene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	0.19	< 0.03
Fluorene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.06	< 0.03
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	0.09	< 0.03
Naphthalene	mg/kg dry wt	< 0.16	< 0.15	< 0.16	< 0.3	< 0.14
Phenanthrene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	0.11	< 0.03
Pyrene	mg/kg dry wt	< 0.04	< 0.03	0.04	0.22	< 0.03
Sample Name:	12:123 BH02 1.9-2.1m 20-Sep-2012 1:25 pm					
Lab Number:	1051240.11					
Individual Tests						
Dry Matter	g/100g as rcvd	83	-	-	-	-
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	3	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	18	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	16	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	21	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	15	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	76	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.03	-	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.03	-	-	-	-
Anthracene	mg/kg dry wt	< 0.03	-	-	-	-

Sample Type: Soil						
Sample Name:		12:123 BH02 1.9-2.1m 20-Sep-2012 1:25 pm				
Lab Number:		1051240.11				
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Benzo[a]anthracene	mg/kg dry wt	< 0.03	-	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.03	-	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.03	-	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.03	-	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.03	-	-	-	-
Chrysene	mg/kg dry wt	< 0.03	-	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.03	-	-	-	-
Fluoranthene	mg/kg dry wt	< 0.03	-	-	-	-
Fluorene	mg/kg dry wt	< 0.03	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.03	-	-	-	-
Naphthalene	mg/kg dry wt	< 0.14	-	-	-	-
Phenanthrene	mg/kg dry wt	< 0.03	-	-	-	-
Pyrene	mg/kg dry wt	< 0.03	-	-	-	-

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	Samples
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-11
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	-	1-11
Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS	Sonication extraction, Dilution cleanup, GC-MS analysis. Tested on as received sample	-	1-4
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.	-	1-11
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-11
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-11

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.

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Ara Heron BSc (Tech)
Client Services Manager - Environmental Division

E

Appendix E – Preliminary Site Investigation for Lower Field



CH2M Beca

www.ch2mbeqa.com

Report

Preliminary Site Investigation (Contamination) - Prince of Wales Reservoir (Lower Playing Field)

Prepared for Wellington Water Ltd

Prepared by CH2M Beca Ltd


2 October 2017



Revision History

Revision N°	Prepared By	Description	Date
1	Leah Clark	Final	02/10/2017

Document Acceptance

Action	Name	Signed	Date
Prepared by	Leah Clark		19/09/2017
Reviewed by	Phillip Ware		19/09/2017
Approved by	Matt Trlin		02/10/2017
on behalf of	CH2M Beca Ltd		

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Executive Summary

Beca Ltd (Beca) has been commissioned by Wellington Water Limited (Wellington Water) to undertake a Preliminary Site Investigation (PSI) for the lower playing field at the Prince of Wales Park in Mount Cook, Wellington. This investigation forms part of the wider Wellington Water Omāroro Reservoir Project (the Project).

The purpose of the desk study was the following:

- Identify the potential for contaminants in soils as a result of current or historical activities within the lower playing field.
- Review contaminated land consent requirements for the proposed works under the following legislation:
 - Wellington City District Plan
 - Proposed Natural Resources Plan for the Wellington Region
 - Regional Plan for Discharges to Land for the Wellington Region
 - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).

Information obtained through this PSI has determined that the lower playing field has formed part of the Wellington Town Belt since the early 1890s and has been used for recreational purposes since this time.

The wider site has also been used for recreational activities comprising a second playing field (the upper playing field), walking tracks and native and non-native bush.

The lower playing field has been identified 'at a more likely than not' level of certainty to have had an activity on the Hazardous Activities and Industries List (HAIL) undertaken on it.

The following HAIL activities have been identified for the lower playing field following the information search:

- A10: Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glass houses or spray sheds.

There is the potential for the soils within Area A, and the wider site, to be contaminated as a result of this activity.

During construction works, there is a potential exposure risk to construction workers, future site users, and the general public and possible discharges to the environment from surface runoff. These potential risks are likely to be low given the likely distribution and type of contaminants which have been measured in numerous other playing fields within New Zealand. The risks can be managed during the earthworks stage with controls and procedures.

Disturbance of soil on the site, in accordance with the proposed earthworks outlined in the project, will trigger a requirement for consenting approval under NESCS.

Based on the results of this investigation, there are two available consenting pathways going forward (Options A and B).

Option A: A Discretionary Activity consent can be applied for in accordance with Regulation 11 of the NESCS for the proposed projects soil disturbance works since a Detailed Site Investigation (DSI) has not been carried out for the site. As no soil samples have currently been taken from Area A, the extent of potential contamination from herbicides/pesticides is unknown. Soil sampling will characterise potential

contamination associated with HAIL areas and determine any storage and disposal/relocation procedures. This type of investigation would entail soil sampling in areas of future proposed earthworks. Should Option A be pursued, soil sampling (and reporting of results) will need to be included as a condition of consent within the Discretionary Activity Consent (NESCSCS) application.

Option B: Alternatively, a DSI can be carried out ahead of seeking consents under the NESCSCS which would entail an intrusive investigation (soil sampling) of the site. If the outcome of this DSI identified contaminant concentration results below that of the human health guidelines under the NESCSCS, a controlled activity consent would be required under regulation 9(1) of the NESCSCS for subsequent earthwork activity on the site. If contaminants concentrations are identified as being above the recommended guidelines, a Restricted Discretionary Consent would need to be applied for in accordance with Regulation 10 of the NESCSCS.

If the recommended future soil testing identifies a potentially complete risk pathway that requires management, a Contaminated Soils Management Plan (CSMP) will be required. We recommend that undertaking a DSI in advance of seeking consents under the NESCSCS (Option B) will provide Wellington Water with a higher level of certainty in planning and delivering the next stages of the project. It will also enable Wellington Water to proactively plan how it will respond to addressing contaminant management issues related to managing site earthworks, particularly if any test result exceed NESCSCS guidelines.

The results of soil sampling (under both Options A and B) will also determine if the proposed works are a permitted activity under the Wellington City District Plan, or if an additional resource consent is also required for a Discretionary Activity (Restricted) in accordance with Rule 32.2.1 of the Wellington City District Plan (Chapter 31 and 32: Contaminated Land).

The relevant rules under the Regional Plan for Discharges to Land for the Wellington Region and the Proposed Natural Resources Plan for the Wellington Region are not applicable at this time. However should soil sampling indicate that the site is a 'contaminated site' for the purposes of the application of the Wellington Regional Plan (Rules 21 and 22) and/or a site containing 'hazardous substance(s)' under the Proposed Natural Resources Plan for the Wellington Region (Rules R55 and R56), additional consents will also be required under both of these plans.

The assessment of the likely presence or absence of asbestos products in buildings, structures, or in ground, is outside the scope of this investigation as is any review of risks relating to asbestos.

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Appendices

Appendix A

Certificate of Title

Appendix B

Historical Aerials

Appendix C

WCC Property File

Appendix D

Site Walkover Photographs

1 Introduction

Beca Ltd (Beca) has been commissioned by Wellington Water Limited (Wellington Water) to undertake a Preliminary Site Investigation for the lower playing field at the Prince of Wales Park in Mount Cook, Wellington. This investigation forms part of the wider Wellington Water Omāroro Reservoir Project (the Project).

Wellington Water is undertaking works to locate, construct and operate a buried 35,000m³ concrete reservoir within the Prince of Wales Park. The proposed reservoir, the Prince of Wales/Omāroro reservoir, is required for servicing the Wellington low level water supply zone providing potable water to approximately 70,000 residents, a significant range of commercial and industrial businesses and various critical community facilities.

This report will be used to support consent applications under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS).

1.1 Background

The site forms part of the Brooklyn Hills Town Belt Management Sector within the Wellington Town Belt (Town Belt) and subject to management under the Wellington Town Belt Act (WTBA).

On any given day there is currently less than one day's water storage in-zone to manage a significant network disruption event. The bulk supply network is also not capable of meeting peak demand where it is used to supplement supply in the zone, requiring sufficient in-zone reservoir storage to supplement peak demand.

The proposed Prince of Wales/Omāroro reservoir is required to significantly expand the zone's local water storage capacity, for the following purposes:

- Operational and strategic/disaster resilience:
 - To enhance the zone's resilience to both temporary and significant water supply disruption events, such as may be associated with a natural hazard event.
- Network management and maintenance:
 - To assist with optimising the function of the local water supply network and without disrupting water supply enable Wellington Water to undertake needed maintenance activities on the existing reservoirs and network.
- Growth and wellbeing:
 - To support existing economic activity and growth, along with community health and wellbeing.

Wellington Water sought easement from Wellington City Council to locate, construct and operate a buried 35,000m³ concrete reservoir within the Prince of Wales Park. This easement has been granted by Wellington City Council. The lower playing field will be used for stockpiling during construction of the reservoir and reinstated upon completion of construction.

The construction of the reservoir could, subject to funding, commence as early 2018/2019 and is expected to take approximately 2-3 years to complete.

1.2 Purpose and Scope

The purpose of the desk study was the following:

- Identify the potential for contaminants in soils as a result of current or historical activities within the lower playing field.
- Review contaminated land consent requirements for the proposed works under the following legislation:
 - Wellington City District Plan
 - Proposed Natural Resources Plan for the Wellington Region
 - Regional Plan for Discharges to Land for the Wellington Region
 - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).

The scope of works included a desk-based review of historical background information. The following information sources were reviewed:

- Review of selected Wellington City Council (WCC) property files.
- Wellington Regional Council Selected Land Use Register (SLUR) and any associated relevant reports.
- Certificate of Title.
- Historical aerial photographs available from the Retrolens website, the National Library Website, Wellington City Council Web Map, and Google Earth.
- Discharge consent information within 100m of the site.
- Site walkover and interview with persons knowledgeable of the history of the site (e.g. previous site owners).

This assessment has been undertaken and reported in general accordance with the *Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 1 – Reporting on Contaminated Sites in New Zealand* (2011) and *MfE Contaminated Land Management Guidelines No. 5 – Site Investigation and Analysis* (2011).

The assessment of the likely presence or absence of asbestos products in buildings, structures, or in ground, is outside the scope of this investigation as is any review of risks relating to asbestos.

2 Site Description

2.1 Site Location and Area

The Prince of Wales Park is located in Mount Cook, Wellington. The site is legally described as Part Lot 2 Deposited Plan 10337 and it has an approximate area of 27.3164 hectares (**Figure 1**). The area under investigation, the lower playing field, herein referred to as 'Area A', has an approximate area of 10,000m³ and is outlined in yellow, shown in **Figure 2**.



Figure 1: Location of the wider site Part Lot 2 DP 10337 (Area A outlined in yellow). Source: Greater Wellington Regional Council Map Viewer.



Figure 2: Location of Area A. Source: Greater Wellington Regional Council Map Viewer.

2.2 Proposed Works

The Project involves the construction of a fully buried single combined reservoir with tunnel at the Upper Prince of Wales Park. The reservoir has a storage volume of 35,000 m³ and design life of 100 years. It will supply water to the Wellington Low Level Water Supply Zone, including the Central Business District, Mount Cook, and Newtown. It has been designed as an importance level 4 (IL4) structure under the Building Act, with a post seismic event disaster recovery water storage and supply function and will contribute toward enhancing the operational and strategic resilience of Wellington’s water storage network.

2.2.1 Bulk Earthworks Volumes

Earthworks for the entire Prince of Wales/Omāroro Reservoir Project will take place within an area of approximately 2.6-3.6 hectares including:

- the Prince of Wales Reservoir site;
- the upper playing field; and
- the lower playing field.

There are three potential earthworks scenarios¹ (all volumes exclude topsoil and are approximate in-situ values so do not provide for bulking). A summary of approximate earthworks volumes under each of the three potential scenarios are summarised in **Table 1** below:

Scenario 1: The reservoir construction requires excavation of 56,000m³ of material. Of this, 25,000m³ of suitable material will be stockpiled on the upper and/or lower sports field and used as backfill once the reservoir is constructed. The surplus material (30,800m³) will be disposed of off-site.

Playing fields used for stockpiling will have their top soil stripped (upper playing field 8000m², and lower playing field 10,000m², each to a depth of 150mm) and stored on site (or disposed off-site), while the fields are used for this purpose. Playing surfaces will be reinstated after stockpiles are removed.

Scenario 2: The reservoir construction requires excavation of 56,000m³ of material. Of this, 25,000m³ of suitable material will be stockpiled on the upper and/or lower sports field and used as backfill once the reservoir is constructed. In addition, the upper sports field will be raised by up to 1.5m using 8,000m³ of additional suitable excavated material. The surplus material (22,700m³) will be disposed of off-site.

Playing fields that are raised and/or are used for stockpiling will have their top soil stripped (Upper playing field 8000m², and lower playing field 10,000m², each to a depth of 150mm) and stored on site (or disposed off-site), while the fields are used for this purpose. Playing surfaces will be reinstated after stockpiles are removed.

Scenario 3: The reservoir construction requires excavation of 56,000m³ of material. Of this, 25,000m³ of suitable material will be stockpiled on the upper and/or lower sports field and used as backfill once the reservoir is constructed.

In addition, both the sports field will be raised by up to 1.5m using 16,100m³ of additional suitable excavated material (approximately 8000m³ to be placed on the lower field). The surplus material (14,700m³) will be disposed of off-site.

Playing fields that are raised and/or are used for stockpiling will have their top soil stripped (Upper playing field 8000m², and lower playing field 10,000m², each to a depth of 150mm) and stored on site (or disposed off-site), while the fields are used for this purpose. Playing surfaces will be reinstated after stockpiles are removed.

In addition, approximately 5,500m³ of earth/rock material will be imported for use as fill material under all three of the scenarios. This will include material for reservoir foundations and drainage material.

¹ There is a fourth possible scenario – using both the upper and lower fields for stockpiling, but only raising the lower field; however, this is unlikely and earthworks volumes are similar to scenario 2 so it has not been considered separately.

Table 1: Approximate earthworks volumes under each of the three potential scenarios (all volumes in-situ).

	Volume excavated (m ³)	Volume stockpiled for backfill (m ³)	Additional volume utilised (m ³)	Volume imported fill (m ³)	Volume surplus material (m ³)
Scenario 1	56,000	25,000	Nil	5,500	30,800
Scenario 2	56,000	25,000	8,000 (to raise upper sports field)	5,500	22,700
Scenario 3	56,000	25,000	16,100 (to raise both sports fields, 8000 of which to raise the lower playing field only)	5,500	14,700

2.2.2 Top Soil Earthwork Volumes:

The lower playing field is proposed to be rehabilitated and raised to be used once again as a full size playing field, following use for storage during construction of the reservoir. Therefore, there will be no change of land use of the lower playing field upon completion of construction.

Estimated top soil stripping and reinstatement volumes for the playing fields are shown in **Table 2**. Under each of the earthworks scenarios, the lower field will be stripped of 1,500m³ of topsoil.

Table 2: Estimated stripping and reinstatement dimensions for the upper and lower playing fields at the Prince of Wales Park.

	Area (m ²)	Depth (mm)	Volume (m ³)
Upper Field	8,000	150	1,200
Lower Field	10,000	150	1,500

3 Environmental Setting

3.1 Current Land Use

The Prince of Wales Park is situated in the suburb of Mt Cook, within the Town Belt. The site includes two playing fields, access to the upper (north) playing field is from the end of Rolleston and Hargreaves Streets, and access to the lower (south) playing field (Area A) is from Salisbury Terrace. There are a number of existing pathways providing access through the Prince of Wales Park, ranging from tracks through grass to gravelled or paved pathways.

The upper playing field is located to the north of Area A, connected by a public walkway. To the west and south are native and non-native trees within the wider Prince of Wales Park site. There are residential properties to the east of Area A with a path located parallel along the eastern boundary.

3.2 Surrounding Land Use

The wider site is surrounded by residential properties to the east and north. There is a large commercial building to the south east of the wider site which is currently used for recreation and sports. There is an artificial turf adjacent to the aforementioned sports centre to the south east.

To the north west of the wider site is a commercial building which is currently used as a gym. There is also an existing partially buried 10ML reservoir (Bell Road reservoir), which presents itself as flat rectangular concrete surface to the north west of the wider site adjacent to Bell Road.

There are public walkways connecting the wider site to Bell Road, Rolleston Street, Hargreaves Street, Dorking Road, Westland Road and Connaught Terrace.

The Hospital Prince of Wales Reservoir Geotechnical Report, prepared by Beca in 2012 stated that the proposed reservoir site is understood to have been originally developed as a Park, with no other historical usage on record (although Mt Cook, or Pukeahu in Maori, was the site of a pa in pre-European times). Historically a brick manufacturing facility is understood to have been located on the upper playing field area.

3.3 Topography

Area A is flat as it is currently used as a recreational playing field.

The topography of the wider site is that of a rounded spur landform sloping downhill from Dorking Road to the proposed reservoir location on an open grassed and vegetated rounded knoll overlooking the upper Princes of Wales playing field.

The knoll slopes to its west down to a small vegetated gully containing an unnamed tributary of the Waitangi Stream.

To the north, a tree and grass vegetated bank slopes down to the flat grassed upper playing field.

To the east and south the knoll descends down a vegetated slope to a formed access track linking the upper and lower playing fields, and to the Papawai Stream which runs along the western edge of the lower playing field.

The regional topography of Wellington City and the Greater Wellington Region is mountainous as the region consists of several active fault lines. A contour map of the site is shown in **Figure 3** below.



Figure 3: Contour map of Area A (outlined in yellow), the wider Price of Wales Park site (outlined in red) and surrounding area. (Source: Wellington City Council Web Map).

3.4 Sensitive Receptors/Hydrology

The wider site area contains two small tributaries of the Waitangi Stream.

The Papawai Stream flows through the site along the edge of the lower field and exits the site into the stormwater network at the top of Papawai Terrace. The stream is separated from the lower field by an earth bund, constructed some years ago to prevent on-going flooding of the field.

The Papawai Stream is perennial; of the two tributaries in the vicinity of the project area, one is dry without flow or pools, the other is intermittent in its lower reaches reducing to ephemeral further up.

An unnamed tributary of the Waitangi Stream flows down a gully to the west of the site, which exits the site into the stormwater network at the top of Rolleston Road.

This unnamed tributary is perennial in its lower reaches, but reduces to intermittent pools and eventually becomes ephemeral.

As the Wellington Harbour is located approximately 1,700 metres from the northern boundary of the site, it is assumed that the Wellington Harbour is the ultimate receiving environment. Therefore, it is also assumed that ground water flows in a north east direction.

3.5 Geology

According to the New Zealand Institute of Geological Nuclear Sciences², the underlying geology of the site is Rakaia terrane, described as '*sandstone with mudstone conglomerate basalt chert limestone*'.

The Hospital Prince of Wales Reservoir Geotechnical Report, prepared by CH2M Beca in 2012 confirmed this, describing the mapped geology to be underlain by Late Triassic greywacke and argillite rock of the Rakaia terrain (Begg and Johnston, 2000). These rock types are typically steeply bedded, pervasively jointed and veined, and often shattered or sheared, all of which can reduce the strength of the rock mass.

The nearest mapped active fault to the proposed reservoir site is the Wellington Fault (within 2km). There are no active faults mapped through the reservoir site itself however, the Lambton Fault is mapped crossing the lower playing field of Prince of Wales Park, and the Terrace Fault west of the proposed reservoir site.

A geotechnical report, 'Hospital Prince of Wales Reservoir Geotechnical Report – Addendum', prepared by CH2M Beca in 2012, described a summary of the soil profile of the upper playing field which found uncontrolled fill, residual soil, and highly weathered greywacke.

3.6 Hydrogeology

The closest available groundwater depth information has been retrieved from information held by CH2M Beca (The Hospital Prince of Wales Reservoir Geotechnical Report, prepared by Beca in 2012) from groundwater level measurements a distance of approximately 200 metres north west of Area A and a higher elevation of approximately 20 metres. At this location, which is located on Rakaia terrane, described as '*sandstone with mudstone conglomerate basalt chert limestone*', the groundwater depth was measured between 2 and 6 metres below ground level (bgl).

The ultimate receiving environment for these waterways is Wellington Harbour, as discussed in section 3.4 of this report.

According to the GWRC Web Map Viewer, there are 10 bores located within a 1 kilometre radius of Area A.

There is a resource consent (WGN170301) located approximately 300m south east of Area A to construct and maintain a bore (BQ32/0040) for emergency water supply purposes. The GWRC Web Map Viewer did not provide groundwater depth information or borehole use for this consented bore.

A bore search was received from GWRC on 8 September 2017. This search identified 48 boreholes within a 2km radius of the wider site. The search did not provide groundwater depth information nor the use of the boreholes.

According to the GWRC Web Map Viewer, there are no groundwater abstraction wells within 100m of the site boundary.

² Heron D. W. (custodian) 2014. Geological Map of New Zealand 1:250 000. Institute of Geological & Nuclear Sciences.

4 Information Search

4.1 Certificate of Title

The Certificate of Title (CT) for Part Lot 2 DP 10337 was obtained for the site and is included in **Appendix A**. The CT shows that Wellington City Council has ownership of the site.

An historical CT from 1927 was sourced from one the property file received from Wellington City Council on 15 September 2017. The CT shows that the site was used as a recreation ground.

4.2 Historical Aerial Photographs

Historical aerial photographs for the site have been sourced from the Retrolens website for the years 1938, 1945 and 1988. Historical aerials for the years 1956 and 1969 were sourced from the National Library website and later aerials for 1996, 2006 and 2013 have been sourced from the Wellington City Council Web Map website. The Wellington City Council Web Map website also provided a historical survey layer for the year 1892. The most recent aerial for 2017 has been sourced from Google Earth. The aerial photographs have been reviewed to identify any changes in land use activities on Area A, the wider site and surrounding properties, with the following observations made:

- **1892 (survey overlay)**
 - Area A and the wider site lies within the Town Belt.
 - Hargraves Street and Rolleston Street appear to follow their current alignments.
- **1938**
 - Area A and the wider site appear to be undeveloped pastoral land.
 - There are various walkways within the wider site.
 - There appear to be trees within the land directly south of Area A.
- **1945**
 - This historical aerial photograph only shows Area A and the southern part of the land parcel.
 - Area A remains unchanged.
- **1956**
 - Area A remains unchanged.
 - There appears to be another flat and undeveloped grassed area of land to the north west of Area A.
- **1969**
 - Area A remains unchanged.
- **1988**
 - Area A remains unchanged.
 - There are two structures to the south of Area A. One structure is small with a red roof and the other is slightly larger with a green roof to the south west of the smaller residential building.
 - There appears to be a small structure with a brown roof to the north of Area A.
 - There is a large rectangular paved surface located in the north western corner of the site.
 - There is a small structure to the east of the large paved area.
 - There appears to be a small shed on the western corner of the northern-most flat, grassed area.
 - There is also a small paved area to the south east corner of Area A which connects to a paved path which runs parallel to the eastern edge of Area A.
- **1996**
 - Area A and the wider site remain unchanged.
- **2006**
 - Area A remains unchanged.
 - The structure with the red roof is no longer present on the site.

- The structure to the east of the paved area within the north west corner of the site is no longer present on the site.
- The vegetation and trees have become more mature.
- **2013**
 - Area A and the wider site remain unchanged.
- **2017**
 - Area A and the wider site remain unchanged.

Historical aerial images are provided in **Appendix B**.

4.3 Regional Council Information

4.3.1 Selected Land Use Register (SLUR) / Contaminated Site Enquiry

A Contaminated Site Enquiry response was obtained from Greater Wellington Regional Council (GWRC) on 6 September 2017.

Selected Land Use Register (SLUR) Statements indicate whether land uses that appear on the Hazardous Activities and Industries List (HAIL) are known to currently or historically have taken place on site. The site does not appear on the GWRC SLUR and it is therefore assumed that GWRC do not hold relevant documentation to suggest that land uses that appear on the Hazardous Activities and Industries List (HAIL) are known to currently or historically have taken place on site. As such, a SLUR statement was not provided by GWRC.

4.3.2 Discharge Consents

Information on discharge consents was sourced from the Greater Wellington Regional Council Web Map Viewer on 8 September 2017.

According to the GWRC Web Map Viewer, no discharge consents currently apply to the site.

There is an active discharge consent approximately 680m to the north west of Area A to discharge contaminants to air associated with and arising from the dry abrasive blasting of power transmissions tower foundations in the Wellington Region (WGN080489).

There is an active discharge consent located approximately 700m east of Area A, to discharge into air contaminants associated with the operation of diesel and natural gas-fired combustion appliances for the purposes of heat and electricity generation.

There is an active discharge consent (WGN050339) located approximately 1.2km south west of Area A to discharge contaminants into air from the operation of a natural gas-fired boiler.

These active consents are located sufficiently far from Area A, therefore it is highly unlikely that these activities will have had an adverse effects on the soil quality of Area A.

There is one expired discharge consent (WGN150153), located approximately 660m to the north east of Area A to, which comprise the follow activities;

- a) discharge water containing contaminants to the stormwater network associated with the development of a service station;
- b) to undertake excavations that will intercept groundwater associated with the installation of underground storage tanks; and

- c) to dewater excavation pits associated with the removal and installation of underground storage tanks.

This expired consent is located downgradient and sufficiently far from Area A, and is therefore highly unlikely to have adversely impacted the soil quality of Area A.

4.4 City Council Information

The electronic property file for the Area A was viewed by Beca on 15 September 2017. Information relevant to the site history and potential contamination sources has been retrieved and reviewed below, and is included in **Appendix C**.

A map prepared by Thomas Ward (Authorised Surveyor) on January 1894 shows that this site was part of the Town Belt.

A memo addressed to the Reserves Committee dated 16 March 1920 from the Director regarding the Salisbury Terrace Recreation Grounds details how approximately 10 years earlier, P. Hutson Limited was granted permission to excavate clay for pipe making on the site (the exact location on the wider site is unknown). These interests were transferred to Enoch Tonks. The proposed works were terminated by Council. The letter states that a large mound of rock had been left on the site which was subsequently removed from the site and shifted to an unspecified location. This letter also states that a stormwater drain was also installed within the gully to the north west of the playing area (the specific location was not specified). Earthworks described in the letter included the alteration of the grade of the playing area to be one in 45 to one in 75 to allow for football. At the time, the flat area was 78 by 77 yards, and the Director recommended that this be increased by another 50 yards to the south to create a full size sports playing field. The letter stated that this extra 50 yards would contribute to a total of 18,000 yards of clay.

A letter addressed to the Deputy Mayor dated 24 March 1920 from the Director of Parks and Reserves regarding the Salisbury Terrace Recreation Ground details the cost of carrying out works to furnish one full sized football ground.

An untitled survey map on 1937 shows that the site was part of the Town Belt.

A plan prepared by Roberts and Mercer Architects and Structural Engineers dated 30 November 1954 showed details of a Sports Pavilion in the Prince of Wales Park for the Wellington City Corporation. The plans show a building to be located to the west of Salisbury Terrace, to the north of Area A.

In April 1998, the Wellington City Council applied for a consent to demolish a dwelling and two sheds located at 1A Westland Road. These structures were located to the south east of Area A.

A building consent to demolish a single garage located at 1A Westland Road was granted by Wellington City Council in 2006. This shed was located directly south east of Area A over within a small paved area.

In 2010, the Scottish Athletic Club applied for a building consent for the deletion of works in part of the building located at 1D Westland Road as part of the building was destroyed by a fire.

4.5 Site Walkover

A site walkover was conducted by a suitably qualified Environmental Scientist on 6 September 2017. Photographs are provided in **Appendix D**.

The walkover confirmed the current land use of Area A, being a recreational playing field with a clubroom to the north of the area under investigation.

Area A is flat. There are steep banks to the west and south of Area A around the west and north perimeter, being approximately 1 metre high.

Area A is largely grassed with healthy coverage. There is a gravelled vehicle access track to the east of Area A and a steep bank to the south.

Immediately adjacent to Area A is residential housing to the east, and park land to the south, west and north. The park land is comprised of the upper playing field to the north, trees, and several public walkways.

The wider Prince of Wales Park is currently used for sports and recreation purposes, with an additional sports playing field (the upper playing field), the Wellington Harriers Club building, and a number of bush walk paths.

No surface water courses were identified, however there is a small drainage ditch which runs along the southern perimeter of the site.

4.6 Interview with Site Personnel

Email correspondence was held with Mr Laurence Orr (Sportsfields Manager) from Wellington City Council on 12 September 2017.

Mr Orr described the field maintenance procedures for the lower playing field to be a yearly application of Conquest herbicide (active ingredient is 100g/L of picloram as the amine salt and 300g/L triclopyr as the butoxyethyl ester in the form of an emulsifiable concentrate).

Mr Orr was not aware of any of the following events to have occurred on Area A or the wider site:

- pollution or spill incidents;
- previous locations of chemical stores and/or other potentially contaminating activities;
- potentially contaminating activities on neighbouring sites; or
- chemical storage on Area A or the wider site.

4.7 Client Provided Information

A Preliminary Contamination Investigation, undertaken by CH2M Beca in 2012 for the upper playing field was commissioned by Wellington City Council which found that the site may previously have been the site of a clay brick manufacturing facility. This report concluded that brickworks usually require kilns to fire the bricks, which produce ash and clinker requiring disposal - often on site. Ash and clinker can contain heavy metals and products of combustion such as polycyclic aromatic hydrocarbons (PAH). The use of the area in recent times as a sports turf also indicates the possibility of pesticides and herbicide use for the maintenance of the turf area.

Soil samples were collected during the preliminary geotechnical works on the periphery pitch area of the upper playing field and analysed for contaminants to give an initial indication of their likely presence.

The results of the investigation showed the presence of low levels of organochlorine pesticide, DDT, and heavy metals (cadmium, lead and nickel) in shallow surface samples collected from the hand auger locations within the sports turf area. Low levels of PAH were also detected in these samples, as well as the shallow surface samples from the borehole locations.

Results of the sampling were compared against 'commercial/industrial outdoor worker' and 'recreational' assessment criteria selected from the NESCS.

There were no results which exceeded the NESCS criteria, although there were some elevated levels of heavy metals (cadmium, lead and nickel) and PAH above background levels.

It shall be noted that this assessment does not directly relate to potential contaminants in the soil within Area A. This report investigated an adjacent (the upper playing field) therefore soil concentrations can only be used as supplementary information which helps contextualise historic land use activities within the wider site and surrounding area.

4.8 Additional Considerations

For the purposes of this investigation, it shall be noted that where flat playing surfaces have been created within previously undulating areas some of these areas have been found to have been subject to the use of uncontrolled fill within the creation earthworks. This situation is often more likely the older the time of the original formation. It is not considered that the likelihood of waste material within the site soils is at a 'more likely than not' level based on the information reviewed. This can only be confirmed by an intrusive investigation by way of localised soil sampling which may be required to characterise potential soil contamination throughout Area A.