

PROJECT **Westpark Rangiora  
Rangiora**

PROJECT NO. **240845**

CO-ORDINATES (NZTM)

**E 1564845**

**N 5205588**

GROUND LEVEL **+40.00** m RL

TESTED / SUPERVISED BY **C. MANGOS**

DATE **14/03/2014**

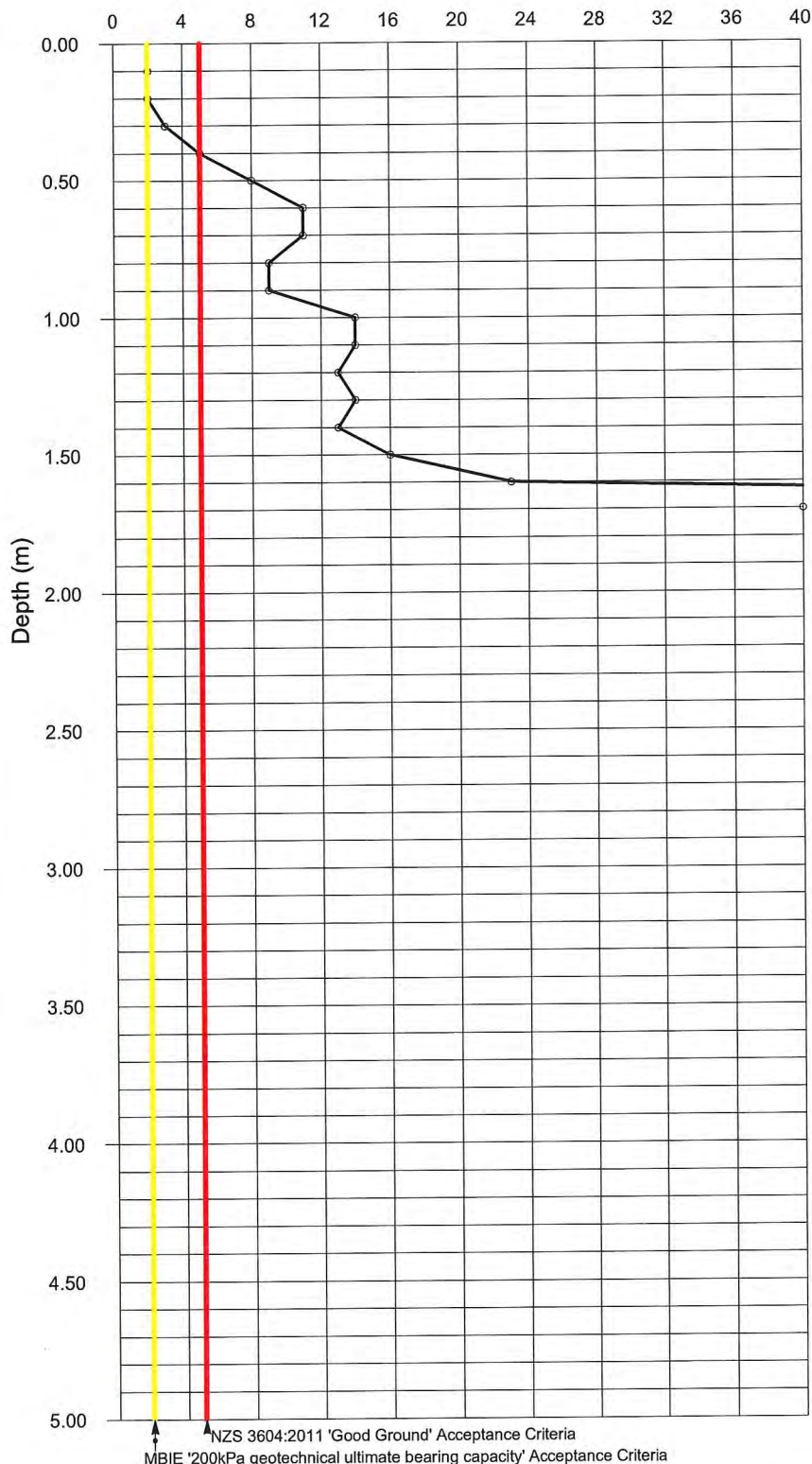
CHECKED BY **T. MITCHELL**

DATE **20/03/2014**

**Results**

| Depth (m) | Blows per 100 mm | Depth (m) | Blows per 100 mm |
|-----------|------------------|-----------|------------------|
| 0.0       | 2                | 3.5       |                  |
|           | 2                |           |                  |
|           | 3                |           |                  |
|           | 5                |           |                  |
| 0.5       | 8                | 4.0       |                  |
|           | 11               |           |                  |
|           | 11               |           |                  |
|           | 9                |           |                  |
|           | 9                |           |                  |
| 1.0       | 14               | 4.5       |                  |
|           | 14               |           |                  |
|           | 13               |           |                  |
|           | 14               |           |                  |
|           | 13               |           |                  |
| 1.5       | 16               | 5.0       |                  |
|           | 23               |           |                  |
|           | 100              |           |                  |
| 2.0       |                  |           |                  |
|           |                  |           |                  |
| 2.5       |                  |           |                  |
|           |                  |           |                  |
| 3.0       |                  |           |                  |
|           |                  |           |                  |
| 3.5       |                  |           |                  |

**Number of blows per 100mm**



PROJECT **Westpark Rangiora  
Rangiora**

PROJECT NO. **240845**

CO-ORDINATES (NZTM)

**E 1564743**

**N 5205476**

TESTED / SUPERVISED BY **C. MANGOS**

DATE **14/03/2014**

CHECKED BY **T. MITCHELL**

DATE **20/03/2014**

GROUND LEVEL **+40.00 m RL**

**Results**

| Depth (m) | Blows per 100 mm | Depth (m) | Blows per 100 mm |
|-----------|------------------|-----------|------------------|
| 0.0       | 3                | 3.5       |                  |
|           | 2                |           |                  |
|           | 3                |           |                  |
|           | 4                |           |                  |
| 0.5       | 8                | 4.0       |                  |
|           | 8                |           |                  |
|           | 8                |           |                  |
| 1.0       | 10               | 4.5       |                  |
|           | 8                |           |                  |
|           | 9                |           |                  |
|           | 9                |           |                  |
| 1.5       | 11               | 5.0       |                  |
|           | 10               |           |                  |
|           | 10               |           |                  |
|           | 10               |           |                  |
|           | 10               |           |                  |
|           | 8                |           |                  |
|           | 6                |           |                  |
|           | 6                |           |                  |
| 2.0       | 7                |           |                  |
|           | 17               |           |                  |
|           | 60               |           |                  |
| 2.5       |                  |           |                  |
|           |                  |           |                  |
| 3.0       |                  |           |                  |
|           |                  |           |                  |
| 3.5       |                  |           |                  |

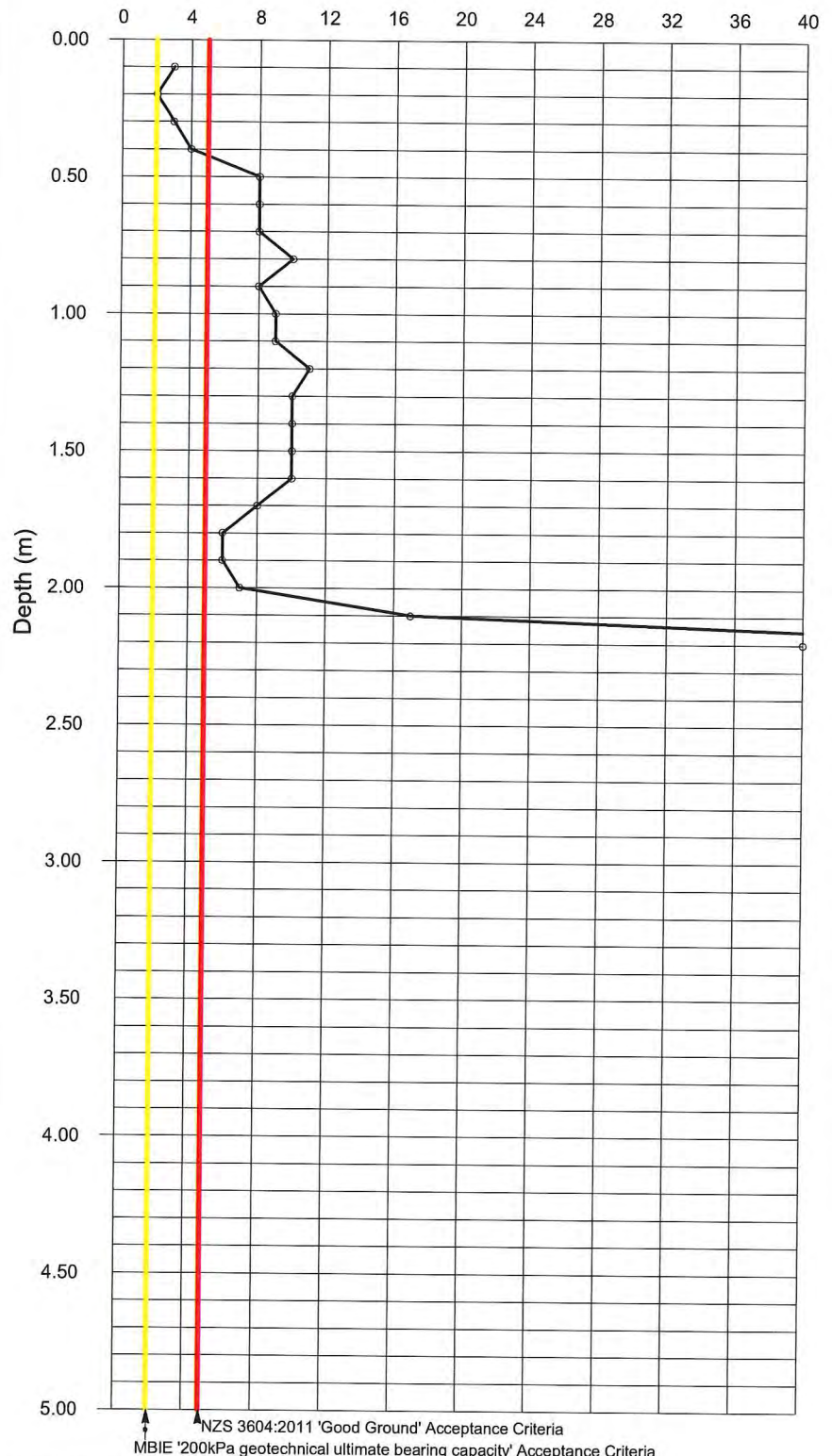
**Remarks:**

30 blows for 50mm in the last increment.

Coordinates approximated from CERA public viewer, accurate to +/- 1.0m.

Effective refusal; 20+ blows per 100mm penetration.

**Number of blows per 100mm**



NZS 3604:2011 'Good Ground' Acceptance Criteria  
MBIE '200kPa geotechnical ultimate bearing capacity' Acceptance Criteria



# DYNAMIC CONE (SCALA) PENETROMETER TEST RECORD

SCALA PENETROMETER NO.  
**DCP 5**

PROJECT **Westpark Rangiora  
Rangiora**

PROJECT NO. **240845**

CO-ORDINATES (NZTM)

**E 1564848**

**N 5205433**

GROUND LEVEL **+40.00** m RL

TESTED / SUPERVISED BY **C. MANGOS**

DATE **14/03/2014**

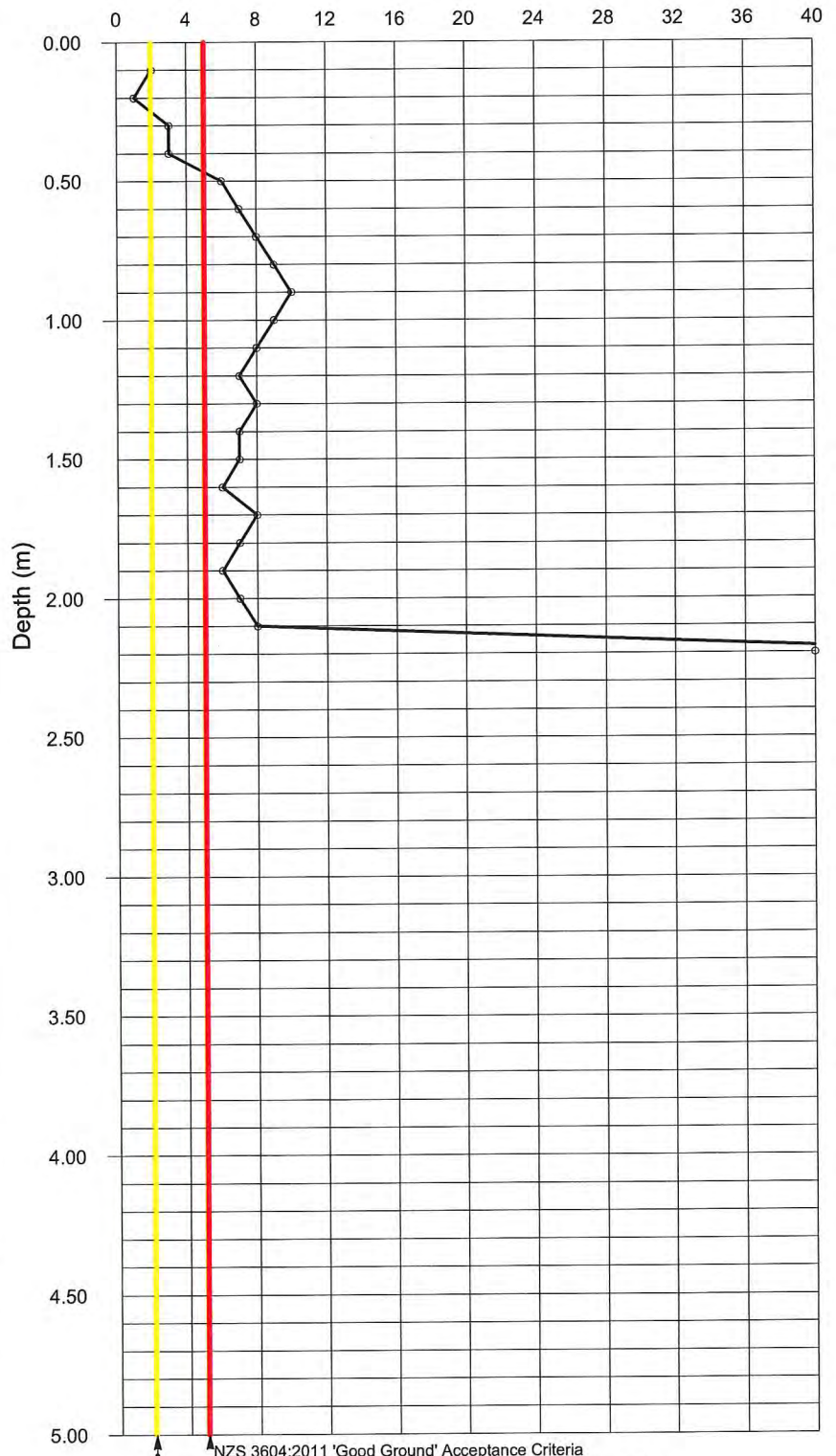
CHECKED BY **T. MITCHELL**

DATE **20/03/2014**

## Results

| Depth (m) | Blows per 100 mm | Depth (m) | Blows per 100 mm |
|-----------|------------------|-----------|------------------|
| 0.0       | 2                | 3.5       |                  |
|           | 1                |           |                  |
|           | 3                |           |                  |
|           | 3                |           |                  |
| 0.5       | 6                | 4.0       |                  |
|           | 7                |           |                  |
|           | 8                |           |                  |
|           | 9                |           |                  |
|           | 10               |           |                  |
| 1.0       | 9                | 4.5       |                  |
|           | 8                |           |                  |
|           | 7                |           |                  |
|           | 8                |           |                  |
|           | 7                |           |                  |
| 1.5       | 7                | 5.0       |                  |
|           | 6                |           |                  |
|           | 8                |           |                  |
|           | 7                |           |                  |
|           | 6                |           |                  |
| 2.0       | 7                |           |                  |
|           | 8                |           |                  |
|           | 50               |           |                  |
| 2.5       |                  |           |                  |
|           |                  |           |                  |
|           |                  |           |                  |
| 3.0       |                  |           |                  |
|           |                  |           |                  |
|           |                  |           |                  |
| 3.5       |                  |           |                  |

## Number of blows per 100mm



## Remarks:

25 blows for 50mm in the last increment.

Coordinates approximated from CERA public viewer, accurate to +/- 1.0m.

Effective refusal; 20+ blows per 100mm penetration.

NZS 3604:2011 'Good Ground' Acceptance Criteria  
MBIE '200kPa geotechnical ultimate bearing capacity' Acceptance Criteria

PROJECT **Westpark Rangiora  
Rangiora**

PROJECT NO. **240845**

CO-ORDINATES (NZTM)

**E 1564790**

**N 5205266**

TESTED / SUPERVISED BY **C. MANGOS**

DATE **14/03/2014**

CHECKED BY **T. MITCHELL**

DATE **20/03/2014**

GROUND LEVEL **+40.00 m RL**

**Results**

| Depth (m) | Blows per 100 mm | Depth (m) | Blows per 100 mm |
|-----------|------------------|-----------|------------------|
| 0.0       | 3                | 3.5       |                  |
|           | 1                |           |                  |
|           | 3                |           |                  |
|           | 3                |           |                  |
| 0.5       | 7                |           |                  |
|           | 8                |           |                  |
|           | 8                |           |                  |
|           | 10               |           |                  |
|           | 11               |           |                  |
| 1.0       | 12               |           |                  |
|           | 13               |           |                  |
|           | 14               |           |                  |
|           | 12               |           |                  |
| 1.5       | 9                |           |                  |
|           | 9                |           |                  |
|           | 9                |           |                  |
|           | 9                |           |                  |
|           | 6                |           |                  |
|           | 8                |           |                  |
| 2.0       | 8                |           |                  |
|           | 10               |           |                  |
|           | 14               |           |                  |
|           | 60               |           |                  |
| 2.5       |                  |           |                  |
|           |                  |           |                  |
| 3.0       |                  |           |                  |
|           |                  |           |                  |
| 3.5       |                  |           |                  |

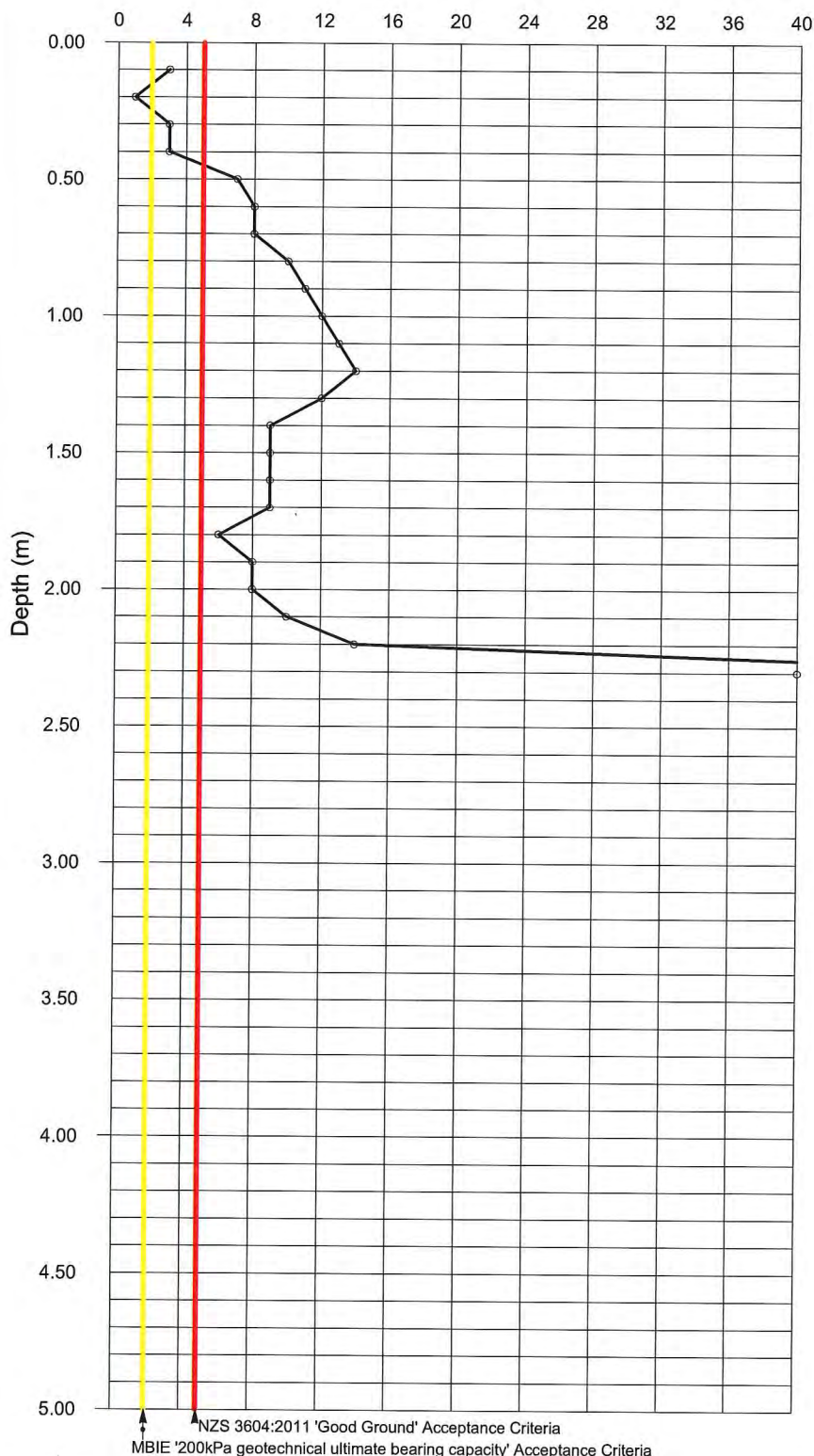
**Remarks:**

30 blows for 50mm in the last increment.

Coordinates approximated from CERA public viewer, accurate to +/- 1.0m.

Effective refusal; 20+ blows per 100mm penetration.

**Number of blows per 100mm**





PROJECT **Westpark Rangiora**  
**Rangiora**

PROJECT NO. 240845

CO-ORDINATES (NZTM)

**E 1564930**

N 5205137

GROUND LEVEL **+40.00** m RL

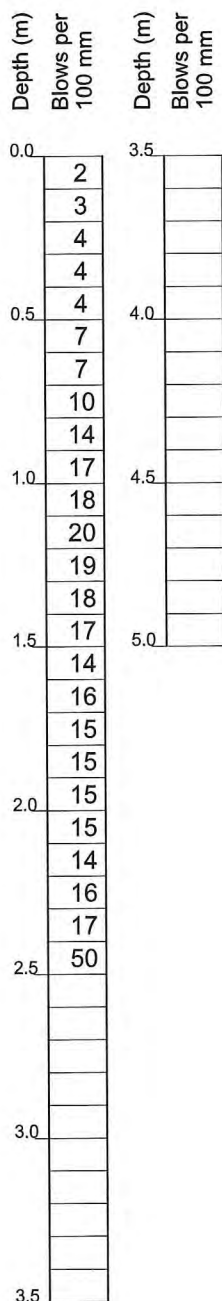
TESTED / SUPERVISED BY C. MANGOS

DATE 14/03/2014

CHECKED BY T. MITCHELL

DATE 20/03/2014

## Results



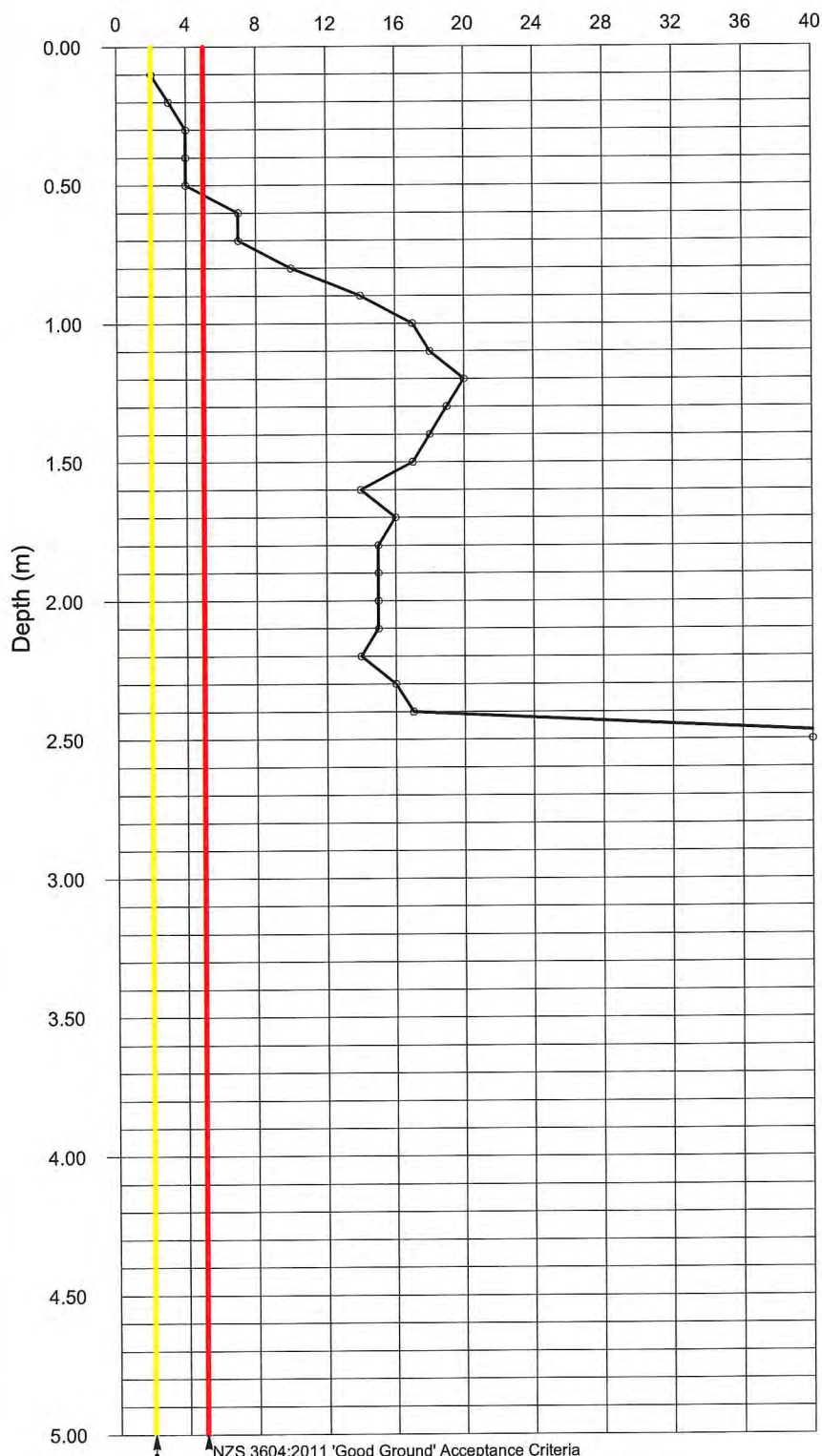
## Remarks:

25 blows for 50mm in the last increment.

Coordinates approximated from CERA public viewer, accurate to +/- 1.0m.

Effective refusal; 20+ blows per 100mm penetration.

## Number of blows per 100mm



MBIE '200kPa geotechnical ultimate bearing capacity' Acceptance Criteria

PROJECT **Westpark Rangiora  
Rangiora**

PROJECT NO. **240845**

CO-ORDINATES (NZTM)

**E 1564816**

**N 5205015**

GROUND LEVEL **+40.00 m RL**

TESTED / SUPERVISED BY **C. MANGOS**

DATE **14/03/2014**

CHECKED BY **T. MITCHELL**

DATE **20/03/2014**

**Results**

| Depth (m) | Blows per 100 mm | Depth (m) | Blows per 100 mm |
|-----------|------------------|-----------|------------------|
| 0.0       | 2                | 3.5       |                  |
|           | 3                |           |                  |
|           | 3                |           |                  |
|           | 4                |           |                  |
| 0.5       | 4                | 4.0       |                  |
|           | 7                |           |                  |
|           | 9                |           |                  |
|           | 9                |           |                  |
|           | 9                |           |                  |
| 1.0       | 11               | 4.5       |                  |
|           | 11               |           |                  |
|           | 11               |           |                  |
|           | 10               |           |                  |
|           | 11               |           |                  |
| 1.5       | 14               | 5.0       |                  |
|           | 13               |           |                  |
|           | 14               |           |                  |
|           | 17               |           |                  |
|           | 19               |           |                  |
| 2.0       |                  |           |                  |
|           |                  |           |                  |
| 2.5       |                  |           |                  |
|           |                  |           |                  |
| 3.0       |                  |           |                  |
|           |                  |           |                  |
| 3.5       |                  |           |                  |

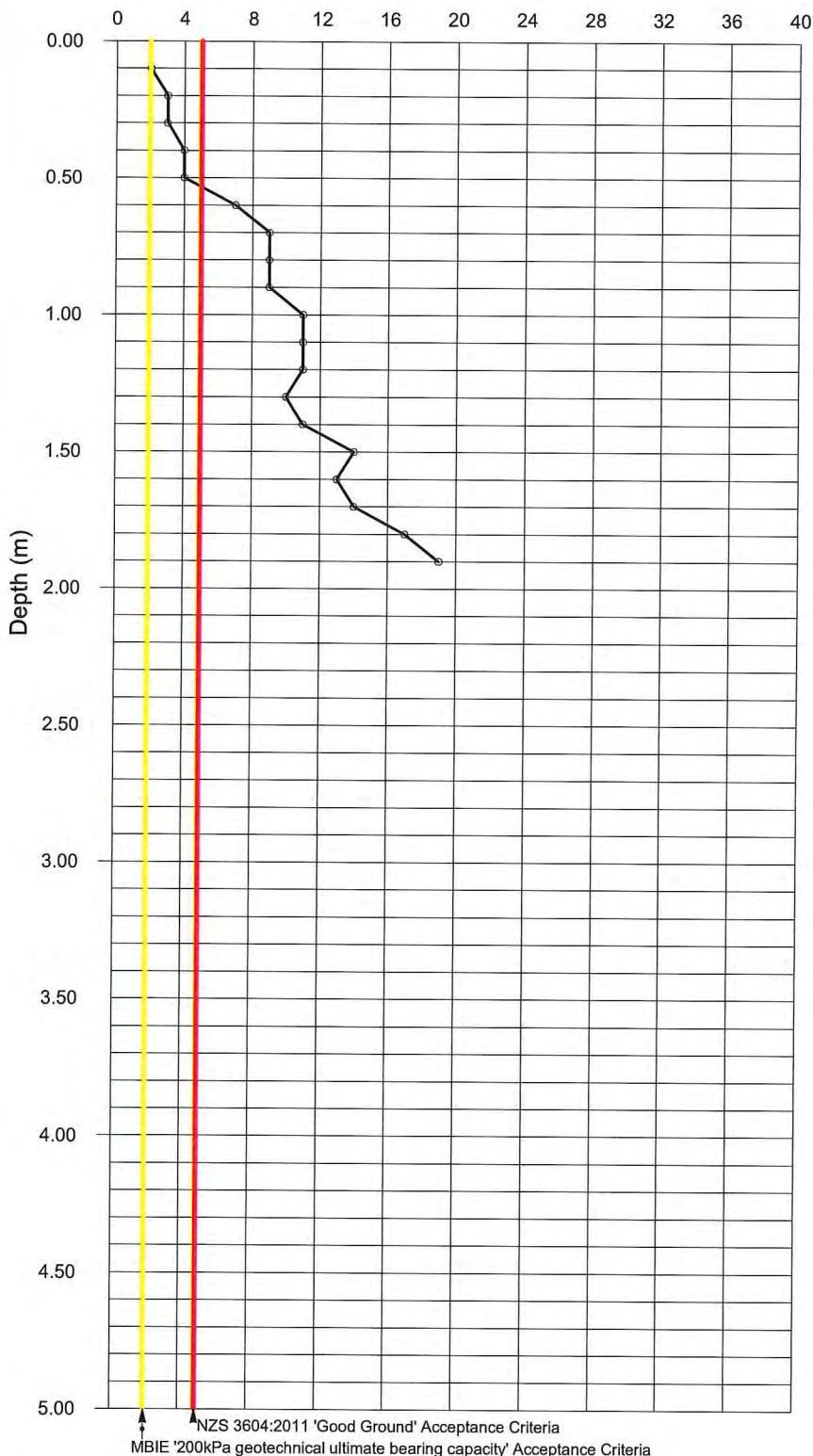
**Remarks:**

19 blows for 100mm in the last increment.

Coordinates approximated from CERA public viewer, accurate to +/- 1.0m.

Effective refusal; 20+ blows per 100mm penetration.

**Number of blows per 100mm**







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# Appendix H

## Environmental Site Assessment





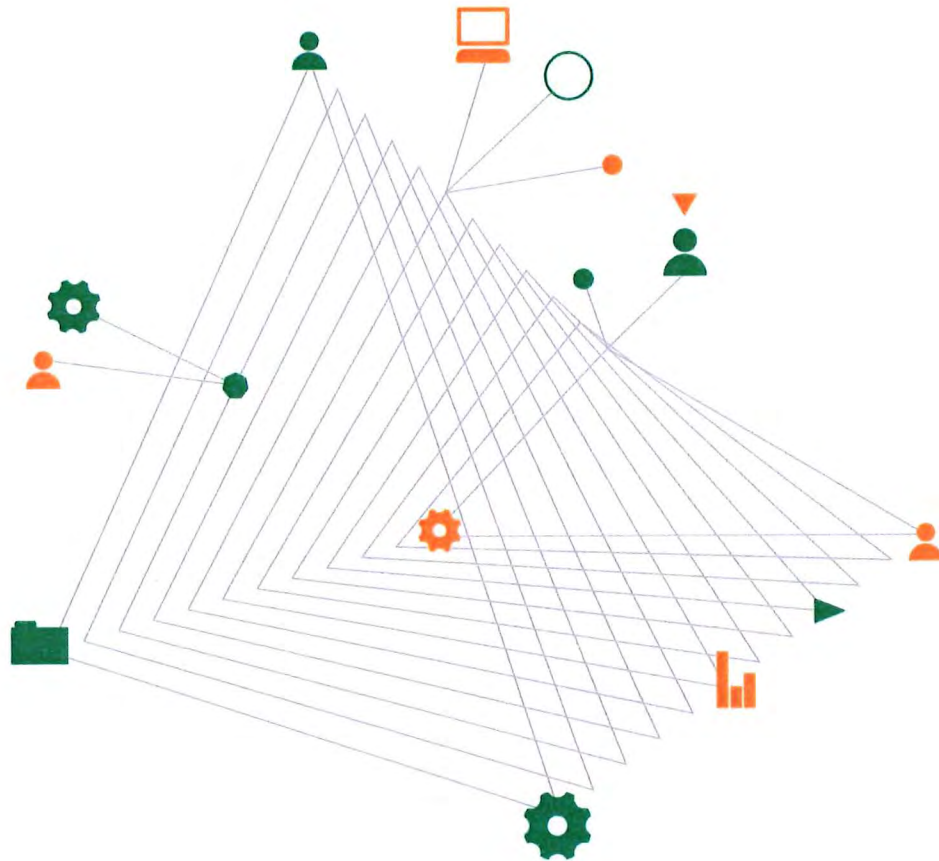


**Westpark Rangiora Limited**

**Environmental Site Assessment**

100 Oxford Road and 198 Lehmans Road,  
Rangiora

24 July 2014



Experience  
comes to life  
when it is  
powered by  
expertise

## Executive summary

Westpark Rangiora Ltd is proposing to subdivide the properties known as 100 Oxford Road and 198 Lehmans Road, Rangiora (the "site") for residential redevelopment. Coffey Geotechnics (NZ) Ltd (Coffey) was commissioned by Peter Freeman of Westpark Rangiora Ltd to conduct an environmental site assessment (ESA) of the site. The intent of the ESA was to determine whether activities on the Ministry for the Environment's Hazardous Activities and Industries List (HAIL) have occurred on site and, if necessary, provide recommendations for additional environmental investigation required to allow subdivision to proceed.

Based on our review of background information for the site, potential HAIL activities at the site include historical market gardening in the southern and northern portions of the site, a historical horse training track in the north-eastern portion of the site (now a grazing paddock), historical poultry farming on 100 Oxford Road and farm and general waste at 198 Lehmans Road. These areas were targeted for sampling as part of the DSI portion of the works (refer to Figure 2).

Coffey collected 10 shallow soil samples at the site (i.e. 0.1 to 0.2 mbgl). Eight of the ten samples collected were submitted for laboratory analysis. All eight samples were analysed for heavy metals; six samples were also analysed for organochlorine pesticides. The sample concentrations were compared to the following criteria:

- National human health-based criteria presented in the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NES) based on a standard residential land use (i.e. assuming 10% of produce consumed is grown on-site).
- Background Concentrations of Selected Trace Elements in Canterbury Soils, Addendum 1: Additional Samples and Timaru Specific Background Levels, Environment Canterbury (ECan, 2007).
- Average residual concentration of  $\Sigma$ DDT in the Canterbury region, as reported by Morton and Butcher (1990).

The findings show one or more heavy metals were detected above the adopted ECan background levels in six of the eight samples analysed. Arsenic in one sample also slightly exceeded the NES human health criterion (20 mg/kg) with a result of 21 mg/kg. No other heavy metal results exceeded the NES human health criteria.

$\Sigma$ DDT was detected above the laboratory reporting limit in four of the six samples analysed, namely SS1, SS2A, SS2B and SS4. In three of these samples,  $\Sigma$ DDT exceeded the adopted background level. No  $\Sigma$ DDT results exceeded the NES human health criteria.

On the basis on the findings of this assessment, it is considered unlikely that soil contaminant levels would preclude the future use of the site for residential purposes. Therefore, the site is considered suitable for the proposed subdivision.

However, given the slight exceedance of the NES human health criterion for arsenic at location SS8 (21mg/kg), this area is recommended for further investigation prior to initiation of site redevelopment works to determine the extent of any impacted soils.

Therefore, Coffey recommend preparation of a remedial action plan (RAP) to support the future application for resource consent to redevelop the site. At a minimum, the RAP will include:

- A methodology to investigate potential elevated arsenic levels in soil in the vicinity of sample location SS8;
- A remedial strategy for management of soils impacted with arsenic above human health criteria;



- Responsibilities and record-keeping requirements to ensure site works proceed as detailed in the RAP.
- General environmental safeguards required to complete any remedial works in a manner that does not results in unacceptable risks to people or the environment (e.g. appropriate PPE, sediment and erosion control etc.).
- Guidance on the necessary approvals, permits or licences required by regulatory authorities to undertake redevelopment works, including remediation of any arsenic-impacted soils.

Given the limited extent of remedial works anticipated to be required, it is likely that the remediation works could be performed in conjunction with initial site preparatory works associated with redevelopment activities. As such, the remedial works could be made a condition of the resource consent granted to allow site redevelopment to proceed. However, this strategy should be confirmed with CCC/ECan.

# Environmental Site Assessment

Prepared for  
Westpark Rangiora Limited

Prepared by  
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24 July 2014

ENNZCHRI52059AA

## Quality information

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| Revision | Description | Date       | Originator | Reviewer | Approver |
|----------|-------------|------------|------------|----------|----------|
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| FINAL    | FINAL       | 24/07/2014 | RB         | AH       | EM       |

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# Table of contents

|   |           |
|---|-----------|
| <b>1. Introduction.....</b>                               | <b>1</b>  |
| 1.1. Background.....                                      | 1         |
| 1.2. Objective.....                                       | 1         |
| 1.3. Scope of works .....                                 | 1         |
| <b>2. Site Information .....</b>                          | <b>3</b>  |
| 2.1. Site condition .....                                 | 3         |
| 2.2. Surrounding environment .....                        | 3         |
| 2.2.1. Land use .....                                     | 3         |
| 2.2.2. Topography .....                                   | 3         |
| 2.2.3. Geology.....                                       | 3         |
| 2.2.4. Hydrogeology.....                                  | 3         |
| <b>3. Site history .....</b>                              | <b>5</b>  |
| 3.1. Historical aerial photographs .....                  | 5         |
| 3.2. Summary of literature relating to the site.....      | 6         |
| 3.2.1. Certificates of title.....                         | 6         |
| 3.2.2. Environment Canterbury (ECan).....                 | 6         |
| 3.2.3. Previous environmental site investigations .....   | 6         |
| 3.2.4. New Zealand Fire Service.....                      | 6         |
| 3.3. Site walkover .....                                  | 6         |
| 3.4. Interviews.....                                      | 7         |
| <b>4. Site characterisation .....</b>                     | <b>8</b>  |
| 4.1. Potential HAIL activities .....                      | 8         |
| 4.2. Sensitive receptors .....                            | 8         |
| <b>5. Site contamination investigations .....</b>         | <b>9</b>  |
| 5.1. Sampling methodology .....                           | 9         |
| 5.2. Quality assurance / quality control procedures ..... | 10        |
| <b>6. Comparison criteria.....</b>                        | <b>11</b> |
| <b>7. Results.....</b>                                    | <b>11</b> |
| 7.1. Visual and olfactory evidence of contamination ..... | 11        |
| 7.2. Analytical results.....                              | 11        |
| 7.3. QA / QC results.....                                 | 12        |
| 7.3.1. Sample Handling and Holding Times .....            | 12        |
| 7.3.2. Laboratory Quality Control .....                   | 12        |
| <b>8. Summary and conclusions.....</b>                    | <b>13</b> |
| <b>9. Recommendations .....</b>                           | <b>13</b> |



|                             |           |
|-----------------------------|-----------|
| <b>10. References .....</b> | <b>15</b> |
|-----------------------------|-----------|

## **Attachments**

Important Information About Your Coffey Report

## **Tables**

Table 1: Summary of Historical Aerial Photographs

Table 2: Potential HAIL Activities at the Site

Table 3: Sampling Programme

Table 4: Summary Soil Analytical Results

## **Figures**

Figure 1: Site Location

Figure 2: Site Features and Sampling Locations

Figure 3: Contour Plan

## **Appendices**

Appendix A: Proposed Development Plan

Appendix B: Site Photographs and Field Notes

Appendix C: Historical Aerial Photographs

Appendix D: Property Information

Appendix E: Full Laboratory Analytical Report

# 1. Introduction

This environmental site assessment (ESA) presents the findings of a combined contaminated land Stage 1 Preliminary Site Investigation (PSI) and Stage 2 Detailed Site Investigation (DSI). This ESA was conducted to support the proposed subdivision of the properties known as 100 Oxford Road and 198 Lehmans Road, Rangiora (the "site"). The investigation was commissioned by Peter Freeman of Westpark Rangiora Ltd following submission of Coffey's proposal, dated 11 June 2014.

## 1.1. Background

Coffey understands the site is proposed for residential subdivision. Appendix A shows the proposed development, which covers an area of approximately 15 hectares and includes service roads, two stormwater ponds and multiple single family residential areas.

The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NES) apply to all sites where an activity or industry on the Ministry for the Environment (MfE's) Hazardous Activities and Industrial List (HAIL) is, has or is more likely than not to have occurred.

A search of the Environment Canterbury (ECan) Listed Land Use Register (LLUR) did not identify the site as being potentially contaminated. However, following a brief review of the publically available historical aerial photographs provided on the ECan GIS database, it appears the site may have been used for market gardening activities and as a horse track. The balance of the land use has primarily been used for grazing.

## 1.2. Objective

The objective of this ESA was to determine the HAIL status of the site and, if necessary, provide recommendations for additional environmental investigation required to allow subdivision to proceed.

## 1.3. Scope of works

In order to achieve the above objective, this investigation was undertaken in accordance with the staged process defined by the Ministry for Environment (MfE) Contaminated Land Management Guidelines No. 5: *Site Investigation and Analysis of Soils* (revised 2011). The findings of our investigation are presented herein in accordance with the MfE Contaminated Land Management Guideline No.1: *Reporting on Contaminated Sites in New Zealand* (revised 2011).

In summary, the following scope of works was undertaken:

- A site walkover was performed to consider land contamination indicators (e.g. visual evidence of waste dumping/material spills, chemical storage and/or usage areas, sheep dip activities, anomalous die-back in vegetation, ground staining).
- Interview with the current property owners to understand the type of farming and potential for agrichemical contamination.
- Review of publically available aerial photographs.
- Review of relevant statements downloaded from ECan's LLUR.

In addition, due to the potential for agrichemical contamination of shallow surface soils at the site (refer to Section 4), Coffey undertook the following soil sampling works, which comprise a DSI for the site:

- Collection of 10 shallow soil samples, two of which were put on “cold hold” at the analytical laboratory.
- Analysis of eight soil samples for common agricultural contaminants including heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, zinc, and mercury) (all eight samples) and organochlorine pesticides (OCPs) (six of the eight samples analysed).
- Comparison of the soil sampling results against:
  - NES soil assessment criteria for a standard residential land use assuming 10% of produce consumed is home-grown.
  - Background Concentrations of Selected Trace Elements in Canterbury Soils, Addendum 1: Additional Samples and Timaru Specific Background Levels, Environment Canterbury (ECan, 2007).
  - Average residual concentration of  $\Sigma$ DDT in the Canterbury region, as reported by Morton and Butcher (1990).



## **2. Site Information**

### **2.1. Site condition**

The site layout is shown on Figure 2, and photographs of the site are presented in Appendix B (Photographs 1 to 15). The site is located approximately 2.4 km northwest of Rangiora town centre and includes the properties known as 198 Lehmans Road and 100 Oxford Road (refer to Figure 1).

The site covers an area of approximately 15.5 hectares and is to be subdivided into several residential sections with service roads and two storm water ponds on the southern boundary. The residential sections are to be developed into single family residential land use, which corresponds to the land use that the standard residential NES criteria are based on (i.e. assuming 10% of produce consumed has been grown on-site).

Coffey staff conducted a site walkover on 20 June 2014. The site is rectangular in shape and is currently utilised for a mixture of residential housing and grazing. The site currently contains two residential dwellings, several large sheds and pasture areas.

### **2.2. Surrounding environment**

#### **2.2.1. Land use**

The site is bound by Lehmans Road to the west, Oxford Road to the south and residential dwellings and farm land to the east and north, respectively. The area surrounding the site is used for a mixture of rural, lifestyle block residential and standard residential land. Residential subdivisions exist west and north of the site with rural and lifestyle blocks existing south and east of the site. A small area of market gardening/orcharding activities exist to the east and north of the site.

#### **2.2.2. Topography**

Topographic maps indicate that the site is located on historical flood plains gently sloping in a south-eastern direction. The site lies at an elevation between 40m and 45m above mean sea level. A contour plan is presented in Figure 3.

#### **2.2.3. Geology**

Geological records (Barrell *et al*, 2008) describe the site as underlain by fan deposits with brownish grey river alluvium deposited in the late Pleistocene age.

Observations during fieldworks indicate surface soils consist of organic silt (topsoil) in the upper 0.15 m bgl, which is underlain by silty sand.

#### **2.2.4. Hydrogeology**

ECan record for one onsite borehole (M35/2905) shows an approximate depth to groundwater of 6.0 mbgl.

No information was available regarding likely groundwater flow direction directly beneath the site. The nearest water body is the Ashley River approximately 2.2 kilometres north of the site.

### 3. Site history

The following sections summarise the historical activities undertaken within or in the immediate vicinity of the site, as determined from the information sources described in Section 1.3.

#### 3.1. Historical aerial photographs

Historical aerial photographs of the site and the surrounding area taken between 1941 and 2013 were obtained from ECan's GIS webmap and are presented in Appendix C. Table 1 presents a summary of observations made from the review of these photographs.

Table 1: Summary of Historical Aerial Photographs

| Aerial Photograph | Key Points Identified  |
|-------------------|--|
| 1941              | In the 1941 aerial photograph, it appears that the site and surrounding properties are being used for livestock grazing. Only one residential dwelling is present on the site, which appears to be the current building on 100 Oxford Road. Several sheds/barns are also present on this property, both near the residential dwelling and in the paddocks to the north of the dwelling.  |
| 1980              | <p>The 1980 aerial photograph shows much of the land has had some growing/harvesting, which may be related to hay grown for livestock feed. There is potential some of the growing (e.g. in the south-western and north-western corners of the site) is market gardening.</p> <p>A second residential dwelling on 198 Lehmans Road has been constructed along with a few more sheds/buildings on 100 Oxford Road.</p> <p>The surrounding area has undergone minimal change since the 1941 photograph.</p>  |
| 1984              | <p>The 1984 aerial photograph shows that a horse track has been constructed on the eastern half of two paddocks with one extra shed present on the 100 Oxford Road property. On 198 Lehmans Road, two small sheds (one in each paddock) have been constructed adjacent to the horse track along with two larger sheds on the southern boundary of the property.</p> <p>The surrounding area has undergone minimal change since the 1980 photograph.</p>  |
| 2004              | <p>The 2004 photograph shows the site and surrounding area is unchanged from the 1984 layout except a few sheds/barns appear to have been removed from the 100 Oxford Road property. Additionally, market gardening activities may again be visible in the south-western and north-western corners of the site.</p> <p>The properties to the east of the site appear to have been subdivided into smaller residential sites with areas of market gardening. Additionally, a new road has been constructed along the site's eastern boundary.</p> |
| 2013              | The 2013 photograph shows the site and surrounding area as it is currently with one less shed than that present in the 2004 aerial photograph.   |



## **3.2. Summary of literature relating to the site**

The following sections provide a summary of the data sources reviewed during the site history search. All property title information is presented in Appendix D.

### **3.2.1. Certificates of title**

The 198 Lehmans portion of the site is legally described as Part Rural Section 1175. The current certificate of title (CT) was not obtained for this investigation. A CT requested on 13 September 2013 (CB384/211) by Bailey' Realty was reviewed by Coffey during this investigation. This CT indicates that the site was owned by:

- Susan Maree Edwards (1/5 share);
- Barry Francis Hopping (1/5 share);
- Noel Lindsay Rowe (1/5 share); and
- Susan Maree Edwards and Barry Francis Hopping as executors (2/5 share).

Coffey understand that in 27 June 2014, the site was purchased by the Client.

A current certificate of title was not obtained for the property at 100 Oxford Road.

### **3.2.2. Environment Canterbury (ECan)**

ECan responded to Coffey's two LLUR enquiries with Property Statements, dated 16 June 2014 and 16 July 2014 (Appendix D). According to these statements, the site is not listed as a HAIL site. In addition, the LLUR statements confirm there are no investigations on ECan's files associated with the site.

A search of resource consents issued by ECan in relation to the site and surrounding land was undertaken using ECan's GIS portal. Only one resource consent was identified; NCY880477, which commenced 2 September 1988 and expired 30 April 1999. The Resource Consent allows the property owner to take up to 66 m<sup>3</sup> of water per day from bore well M35/2905 for spray irrigation of pasture and lucerne. The Resource Consent was renewed as CRC990495 on 1 April 1999 and is to expire 29 March 2034.

### **3.2.3. Previous environmental site investigations**

Coffey is not aware of any previous environmental investigations relevant to the site.

### **3.2.4. New Zealand Fire Service**

A request for information relating to incidents (including hazardous material and pollution incidents) attended by the New Zealand Fire Service (NZFS) in the vicinity of the site was lodged with the NZFS on 26 June 2014. Six fires have been recorded within a 100m radius of the site since NZFS began keeping records in 1998. No fires or incidents were recorded by NZFS on the site itself.

## **3.3. Site walkover**

Coffey conducted a site walkover on 20 June 2014. During this site visit, the following information regarding the site was recorded (refer to photographs and field forms in Appendix B):

- The site is currently utilised for residential lifestyle blocks and sheep grazing;
- The sheep grazing takes place over approximately the northern two thirds of the site ;
- The site does not appear to contain any underground or above ground storage tanks;
- Some visible signs of general farm waste were observed near the eastern boundary of 198 Lehmans Road (refer to Photograph 3).
- There are six large farm sheds at 100 Oxford Road utilised for storage of hay and gardening equipment and two stables located at 198 Lehmans Road;
- No visible signs of past farm buildings or sheep dips were observed;
- No visible signs of underground services were observed; and
- One overhead power line was observed in the northern portion of the site.

### 3.4. Interviews

Interviews with the owner at 100 Oxford Road in June 2014 confirmed the property had been utilised a residential lifestyle block since approximately 1980. According to the current owner of 100 Oxford Road, the site has historically been used for:

- A horse training track on 198 Lehmans Road.
- Vegetable produce home business on 100 Oxford Road (1980-2009). The on-site building that still exists and but appears to no longer be utilised for commercial use (refer to Photograph 13). The current use of the building is unconfirmed;
- Sheep grazing at 198 Lehmans Road (from at least the 1940s to present day); and
- Poultry farming at 100 Oxford Road (1980 - 2009).

## 4. Site characterisation

### 4.1. Potential HAIL activities

The information discussed above indicates that the site has generally been used for a mixture of rural residential and agricultural grazing land. During the 1980's and 1990's, the 100 Oxford Road property was also used for vegetable growing and poultry farming. On the basis of the background information reviewed, Coffey has identified several potential HAIL activities to have occurred on-site (Table 2).

Table 2: Potential HAIL Activities at the Site.

| Potential HAIL Activities                                      | Location of Potential HAIL Activities  |
|--|--|
| Persistent pesticide bulk storage or use<br>(item A10 of HAIL) | Historical market gardens in south-eastern and south-western corners of the site (100 Oxford Road) |
|  | Potential historical market garden activities in north-western corner of the site                  |
|  | Historical horse training track in north eastern grazing paddock                                   |
| Pest control (item A11 of HAIL)                                | Poultry farming (100 Oxford Road)  |
| Waste disposal to land (item G5 of HAIL)                       | Farm waste near the eastern boundary of 198 Lehmans Road.  |

Given the historical and current agricultural use of the site, heavy metals (including mercury) and OCPs were established as the primary contaminants of concern for the above HAIL activities.

### 4.2. Sensitive receptors

The site walkover and review of site history information indicates the following key potential receptors that may be relevant to the site:

- Earthworks contractors who may come into contact with potentially contaminated soil during any proposed residential site redevelopment works; and
- Future occupiers of the residential properties at the site.

No significant ecological receptors (e.g. sensitive water bodies) are located on or in the immediate vicinity of the site.

## 5. Site contamination investigations

In order to assess the risk of the identified potential HAIL activities, soil sampling works were undertaken on 20 June 2014. Photographs taken during the fieldwork are presented in Appendix B. All Coffey fieldwork was carried out in compliance with a project-specific Health Safety Security and Environment Plan.

The intrusive investigation activities are summarised below. The sampling locations are presented on Figure 2.

### 5.1. Sampling methodology

Soil samples were collected and handled in general accordance with MfE Contaminated Management Guideline No. 5.

The following procedures were adopted during the investigation works:

- At 10 locations, a hand trowel was used to collect a soil sample from approximately 0.1-0.2 mbgl (i.e. immediately below the grass root system).
- Prior to collecting each sample, sampling equipment was decontaminated by washing with potable water followed by a decontamination solution and rinsing with deionised water. Samples were placed directly into laboratory-supplied sample containers.
- All samples were placed directly into chilled storage following collection prior to transport, under standard Coffey chain of custody procedures, to R J Hill Laboratories Ltd of Hamilton (Hill Laboratories) for analysis.
- Eight of the 10 samples were analysed by Hill Laboratories for the contaminants noted in Table 3.
- Soil results were compared to criteria appropriate for the proposed future land use (i.e. residential land use with 10% produce consumed being grown on-site) and regional background concentrations.

The selected sampling locations are presented on Figure 2 and outlined below in Table 3.

Table 3: Sampling programme.

| Sample ID | Potential HAIL Activities                            | Contaminants Analysed                |
|-----------|--|--------------------------------------|
| SS1       | Historical market garden (north-west corner of site) | Heavy metals including mercury, OCPs |
| SS2A      | Horse training track                                 | Heavy metals including mercury, OCPs |
| SS2B      | Horse training track                                 | Heavy metals including mercury, OCPs |



| Sample ID | Potential HAIL Activities                            | Contaminants Analysed                |
|-----------|--|--------------------------------------|
| SS3       | No potential HAIL activity identified                | Not analysed                         |
| SS4       | Near old farm shed                                   | Heavy metals including mercury, OCPs |
| SS5       | By farm rubbish/debris                               | Heavy metals                         |
| SS6       | No potential HAIL activity identified                | Not analysed                         |
| SS7       | Historical market garden (south-west corner of site) | Heavy metals including mercury, OCPs |
| SS8       | Historical market garden (south-east corner of site) | Heavy metals including mercury, OCPs |
| SS9       | Old poultry farming area                             | Heavy metals                         |

## 5.2. Quality assurance / quality control procedures

The quality assurance / quality control (QA / QC) procedures employed during the works included:

- Collection of soil samples by suitably qualified staff under standard Coffey operating procedures.
- Submission of all samples to the analytical laboratory within the generally acceptable holding times for the contaminants of concern.
- A laboratory accredited by International Accredited and New Zealand (IANZ), Hill Laboratories, was engaged to conduct all laboratory analysis.

## 6. Comparison criteria

Soil analytical results were assessed against:

- National human health-based criteria presented in the NES based on a standard residential land use (assuming 10% produce consumed is grown on-site).
- Background Concentrations of Selected Trace Elements in Canterbury Soils, Addendum 1: Additional Samples and Timaru Specific Background Levels, Environment Canterbury (ECan, 2007).
- Average residual concentration of  $\Sigma$ DDT in the Canterbury region, as reported by Morton and Butcher (1990).

The adopted comparison criteria are presented alongside the soil data in Table 4.

Note that, for chemicals not listed in the NES, soil guideline values were obtained from the documents referenced in the hierarchy defined in the MfE Contaminated Land Management Guideline No.2 – Hierarchy and Application in New Zealand of Environmental Guideline Values (MfE, 2011b). The MfE's hierarchical reference documents include New Zealand and international guidance documents that provide soil acceptance criteria for a number of different land uses, potential exposure pathways, soil types and depths of contamination.

For this assessment, the only guidance document referenced from this list was Australia's National Environmental Protection Measure (NEPM) (2013). NEPM criteria were used for two heavy metals (nickel and zinc). Values for residential land use have been selected in accordance with the proposed end use of the site and as a conservative estimate to protect site workers during the redevelopment work. Criteria for the Residential A category are referenced, which is described in the NEPM as *"Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools"*.

## 7. Results

The analytical results are presented in Table 4 and the analytical reports, as received from the laboratory, are provided in Appendix E.

### 7.1. Visual and olfactory evidence of contamination

No visual or olfactory evidence (i.e. staining or odour) was noted in any of the samples collected.

### 7.2. Analytical results

#### Heavy Metals

One or more heavy metals were detected above the adopted ECan background levels in six of the eight samples analysed. Arsenic in one sample also slightly exceeded the NES human health criterion (20 mg/kg) with a result of 21 mg/kg. No other heavy metal results exceeded the NES human health criteria.

#### OCPs

Six samples were analysed for OCPs.  $\Sigma$ DDT was detected above the laboratory reporting limit in four of the six samples analysed, namely SS1, SS2A, SS2B and SS4. In three of these samples,  $\Sigma$ DDT exceeded the adopted background level. No  $\Sigma$ DDT results exceeded the NES human health criteria.

### **7.3. QA / QC results**

The results of QA / QC procedures employed during the works are presented in the following sections.

#### **7.3.1. Sample Handling and Holding Times**

The chain of custody records (refer to Appendix E) show that the samples scheduled for chemical analysis were submitted to Hill Laboratories on 23 June 2014 and registered by the lab on 24 June 2014. Analysis was completed and reported on 30 June 2014. This is within the accepted holding times for the analytes.

#### **7.3.2. Laboratory Quality Control**

Hill Laboratories are accredited by IANZ and as such, are required to comply with accreditation conditions that include the confirmation of validity and suitability of results. Any such breaches in laboratory quality control are to be notified at the time of release of the analytical results. No breaches were reported by Hill Laboratories.

## 8. Summary and conclusions

The client is proposing to subdivide the site. The proposed development is expected to include the development of service roads, two stormwater ponds and lots for single-family residential homes.

The site appears to have been predominantly used for residential lifestyle blocks, including grazing land and a horse training track. Additionally, between 1980 and 2009, the southern portion of the site was used for commercial market gardening and poultry farming, with their own shop located on site.

During Coffey's site walkover, waste and rubbish was observed at one location near the eastern boundary of the 198 Lehmans Road property. Therefore, the historical and current potential HAIL activities identified at the site are:

- Persistent pesticide bulk storage or use (historical market gardens and potentially the horse training track);
- Pest control (historical poultry farming); and
- Waste disposal to land.

To investigate potential soil contamination at the site Coffey collected 10 shallow soil samples at the site (i.e. 0.1 to 0.2 mbgl). Eight of the ten samples collected were submitted for laboratory analysis. All eight samples were analysed for heavy metals; six samples were also analysed for organochlorine pesticides.

The findings show one or more heavy metals were detected above the adopted ECan background levels in six of the eight samples analysed. Arsenic in one sample also slightly exceeded the NES human health criterion (20 mg/kg) with a result of 21 mg/kg. No other heavy metal results exceeded the NES human health criteria.

$\Sigma$ DDT was detected above the laboratory reporting limit in four of the six samples analysed, namely SS1, SS2A, SS2B and SS4. In three of these samples,  $\Sigma$ DDT exceeded the adopted background level. No  $\Sigma$ DDT results exceeded the NES human health criteria.

On the basis on the findings of this assessment, it is considered unlikely that soil contaminant levels would preclude the future use of the site for residential purposes. Therefore, the site is considered suitable for the proposed subdivision.

However, given the slight exceedance of the NES human health criterion for arsenic at location SS8 (21mg/kg), this area is recommended for further investigation prior to initiation of site redevelopment works to determine the extent of any impacted soils.

## 9. Recommendations

Based on the results of this ESA, Coffey recommend preparation of a remedial action plan (RAP) to support the application for resource consent to redevelop the site. At a minimum, the RAP will include:

- A methodology to investigate potential elevated arsenic levels in soil in the vicinity of sample location SS8;



- A remedial strategy for management of soils impacted with arsenic above human health criteria;
- Responsibilities and record-keeping requirements to ensure site works proceed as detailed in the RAP.
- General environmental safeguards required to complete any remedial works in a manner that does not results in unacceptable risks to people or the environment (e.g. appropriate PPE, sediment and erosion control etc.).
- Guidance on the necessary approvals, permits or licences required by regulatory authorities to undertake redevelopment works, including remediation of any arsenic-impacted soils.

Given the limited extent of remedial works anticipated to be required, it is likely that the remediation works could be performed in conjunction with initial site preparatory works associated with redevelopment activities. As such, the remedial works could be made a condition of the resource consent granted to allow site redevelopment to proceed. However, this strategy should be confirmed with CCC/ECan.

## 10. References

**Barrell, D.J.A. *et al*, (2008)**, Geology of the Christchurch Area, Institute of Geological and Nuclear Sciences Limited, Map 16, 1:250,000

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

**MfE (2011b)** Contaminated Land Management Guideline No. 1: Reporting on Contaminated Sites in New Zealand. Ministry for the Environment, Wellington, New Zealand. (Revised 2011).

**MfE (2011c)**. Ministry for the Environments Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils. Ministry for the Environment, Wellington, New Zealand. (Revised 2011).

**Morton, J. and Butcher, M. (1990)**. DDT Residues in Canterbury Soils. (Confidential interim unpublished report.) MAFTechnology: Lincoln.

**NEPM (2013)**. National Environmental Protection Measure (Assessment of Site Contamination) 1999, updated 2013, Schedule B1, Health Investigation Levels (HIL) for soil contaminants based on residential land use (Class A).

## Limitations



## Important information about your Coffey Environmental Report

### **Introduction**

This report has been prepared by Coffey for you, as Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice,

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

### **Your report has been written for a specific purpose**

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

### **Limitations of the Report**

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Coffey should be kept apprised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statutes and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

### **Interpretation of factual data**

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but



steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Coffey would be pleased to assist with any investigation or advice in such circumstances.

### **Recommendations in this report**

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

### **Report for benefit of client**

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

To avoid misuse of the information presented in your report, we recommend that Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property's purchaser. This report should not be applied for any purpose other than that stated in the report.

### **Interpretation by other professionals**

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Coffey prepared the report and has familiarity with the site, Coffey is well placed to provide such

assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Coffey disowns any responsibility for such misinterpretation.

### **Data should not be separated from the report**

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

### **Responsibility**

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.



# Tables

## **Environmental Site Assessment 100 Oxford Road and 198 Lehmans Road, Rangiora**

Table 4: Summary of Soil Analytical Results

| Analyte                                 | Human Health Criteria by NES <sup>1</sup> and MIE Hierarchy (mg/kg) | Environment Canterbury's Level 2 Background Concentrations of Trace Elements for Recent Soils <sup>4</sup> | SS1<br>0.1 - 0.2 mbgl<br>(mg/kg) | SS2-A<br>0.1 - 0.2 mbgl<br>(mg/kg) | SS2-B<br>0.1 - 0.2 mbgl<br>(mg/kg) | SS4<br>0.1 - 0.2 mbgl<br>(mg/kg) | SS5<br>0.1 - 0.2 mbgl<br>(mg/kg) | SS7<br>0.1 - 0.2 mbgl<br>(mg/kg) | SS8<br>0.1 - 0.2 mbgl<br>(mg/kg) | SS9<br>0.1 - 0.2 mbgl<br>(mg/kg) |
|---|---|--|----------------------------------|------------------------------------|------------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| <b>Heavy metals</b>                     |   |  |                                  |                                    |                                    |                                  |                                  |                                  |                                  |                                  |
| Total Recoverable Arsenic               | 20  | 12.58  | 4                                | 6                                  | 8                                  | 13                               | 5                                | 6                                | 21                               | 9                                |
| Total Recoverable Cadmium               | 3   | 0.19   | 0.18                             | 0.16                               | 0.23                               | 0.43                             | 0.2                              | 0.69                             | 0.17                             | 0.18                             |
| Total Recoverable Chromium <sup>2</sup> | 460   | 22.7   | 20                               | 19                                 | 19                                 | 104                              | 19                               | 22                               | 19                               | 20                               |
| Total Recoverable Copper                | >10,000   | 20.3   | 14                               | 13                                 | 13                                 | 39                               | 14                               | 16                               | 32                               | 30                               |
| Total Recoverable Lead                  | 210   | 40.96  | 19.2                             | 19.2                               | 19.7                               | 105                              | 20                               | 55                               | 89                               | 99                               |
| Total Recoverable Mercury               | 310   | 0.11   | < 0.10                           | < 0.10                             | < 0.10                             | < 0.10                           | -                                | 0.15                             | < 0.10                           | -                                |
| Total Recoverable Nickel                | 400 <sup>3</sup>  | 20.7   | 18                               | 17                                 | 17                                 | 21                               | 16                               | 16                               | 16                               | 16                               |
| Total Recoverable Zinc                  | 7,400 <sup>3</sup>  | 93.9   | 79                               | 77                                 | 77                                 | 320                              | 86                               | 710                              | 109                              | 175                              |
| <b>Organochlorine Pesticides</b>        |   |  |                                  |                                    |                                    |                                  |                                  |                                  |                                  |                                  |
| Aldrin                                  | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| alpha-BHC                               | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| beta-BHC                                | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| delta-BHC                               | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| gamma-BHC (Lindane)                     | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| cis-Chlordane                           | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| trans-Chlordane                         | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| Total Chlordane [(cis+trans)*100/42]    | -   | -  | < 0.04                           | < 0.04                             | < 0.04                             | < 0.04                           | -                                | < 0.04                           | < 0.04                           | -                                |
| Dieldrin                                | 2.6   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| 2,4'-DDD                                | #   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| 4,4'-DDD                                | #   | -  | 0.016                            | 0.01                               | 0.017                              | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| 2,4'-DDE                                | #   | -  | < 0.010                          | < 0.010                            | 0.01                               | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| 4,4'-DDE                                | #   | -  | 0.57                             | 0.28                               | 0.47                               | 0.112                            | -                                | < 0.010                          | < 0.010                          | -                                |
| 2,4'-DDT                                | #   | -  | 0.054                            | 0.03                               | 0.058                              | 0.012                            | -                                | < 0.010                          | < 0.010                          | -                                |
| 4,4'-DDT                                | #   | -  | 0.3                              | 0.166                              | 0.32                               | 0.085                            | -                                | < 0.010                          | < 0.010                          | -                                |
| Total DDT                               | 70 <sup>5</sup>   | 0.27 <sup>6</sup>  | 0.94                             | 0.486                              | 0.875                              | 0.209                            | -                                | < 0.010                          | < 0.010                          | -                                |
| Endosulfan I                            | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| Endosulfan II                           | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| Endosulfan sulphate                     | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| Endrin                                  | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| Endrin aldehyde                         | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| Endrin ketone                           | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| Heptachlor                              | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| Heptachlor epoxide                      | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| Hexachlorobenzene                       | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |
| Methoxychlor                            | -   | -  | < 0.010                          | < 0.010                            | < 0.010                            | < 0.010                          | -                                | < 0.010                          | < 0.010                          | -                                |

**Notes:**

Undeclared text indicates concentration exceeds the adopted NES human health criterion.  
 Bold text indicates concentration exceeds the Environment Canterbury criterion. No other criteria were exceeded.  
 All results in mg/kg = milligrams per kilogram  
 A hyphen (-) indicates criteria are not available or sample not tested for this analyte  
 # Indicates these compounds are summed and assessed against a Total DDT criterion.  
 mbgl = metres below ground level

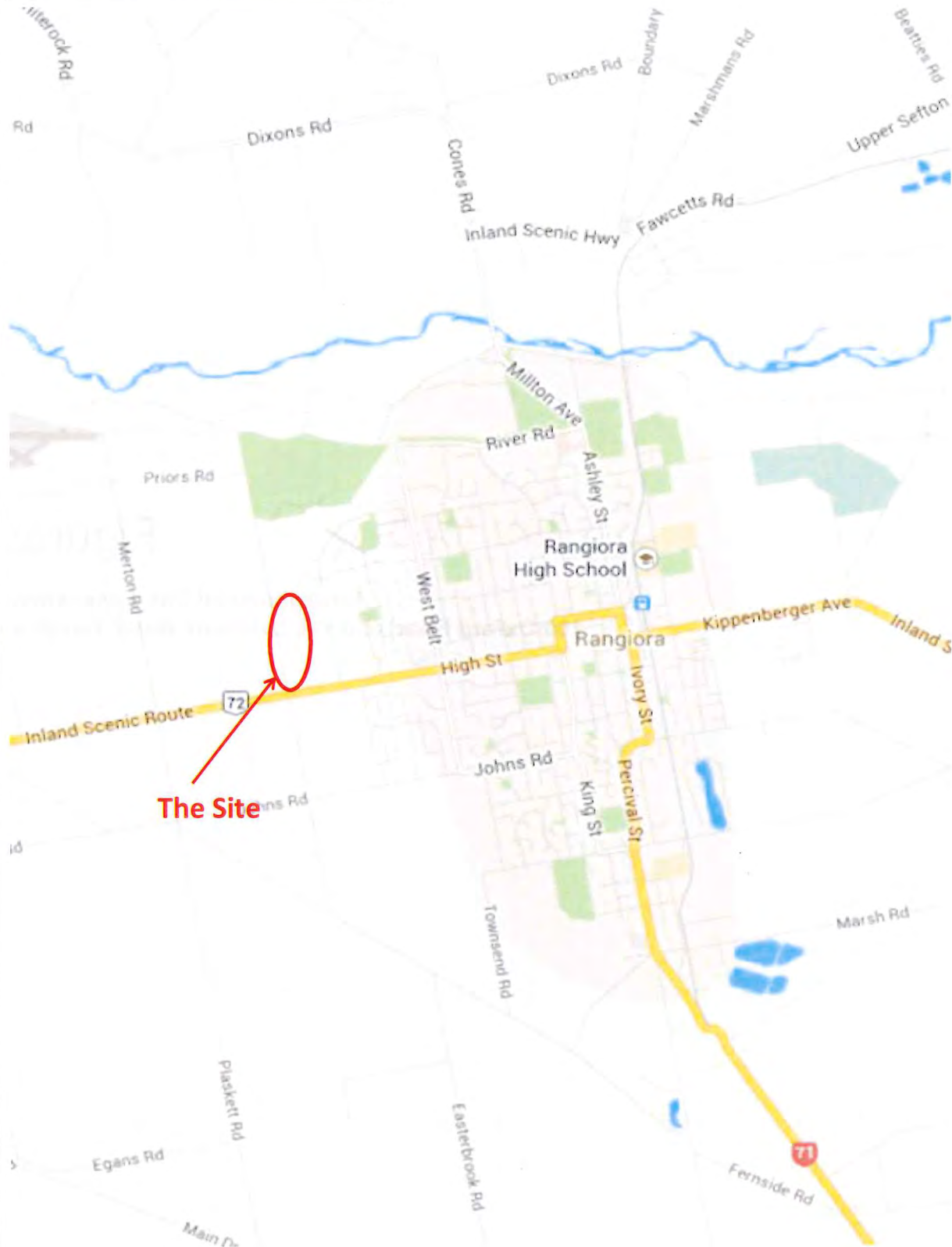
1. Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES). Criteria selected for protection of residential use with 10% produce.
2. For a conservative screening level assessment, criterion presented is for Chromium (VI).
3. Australian National Environment Protection (Assessment of Site Contamination) Measure 1999, updated 2013. "Residential A" health based investigation level has been adopted.
4. Background Concentrations of Selected Trace Elements in Canterbury Soils, Addendum 1: Additional Samples and Timaru Specific Background Levels, Environment Canterbury, 2007.
5. Total DDT refers to the sum of the detected DDT compounds.
6. Average residual concentration of ΣDDT in the Canterbury region as reported by Morton and Bucher, 1990.

# Figures

**Environmental Site Assessment  
100 Oxford Road and 198 Lehmans Road, Rangiora**

**Legend**

Approximate Site Location



Basemap Source - Courtesy of Google Maps

scale



|               |          |
|---------------|----------|
| drawn         | RB       |
| approved      |          |
| date          | 24.07.14 |
| scale         | NA       |
| original size | A4       |



|             |   |            |   |
|-------------|---|------------|---|
| client:     | Westpark Rangiora Ltd.                          |            |   |
| project:    | 100 Oxford Road and 198 Lehmanns Road, Rangiora |            |   |
| title:      | Site Location Plan                              |            |   |
| project no: | ENNZCHR152059AA                                 | figure no: | 1 |
| rev:        |   |            |   |









Appendix A - Proposed Development Plans





- OUTLINE DEVELOPMENT AREA
- EXISTING ROAD
- LOCAL ROAD
- URBAN COLLECTOR ROAD
- PROPOSED ROAD DESIGN
- PEDESTRIAN CYCLEWAY ACCESS
- LOCAL PURPOSE RESERVE
- STORMWATER MANAGEMENT AREA
- MEDIUM DENSITY

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CLIENT

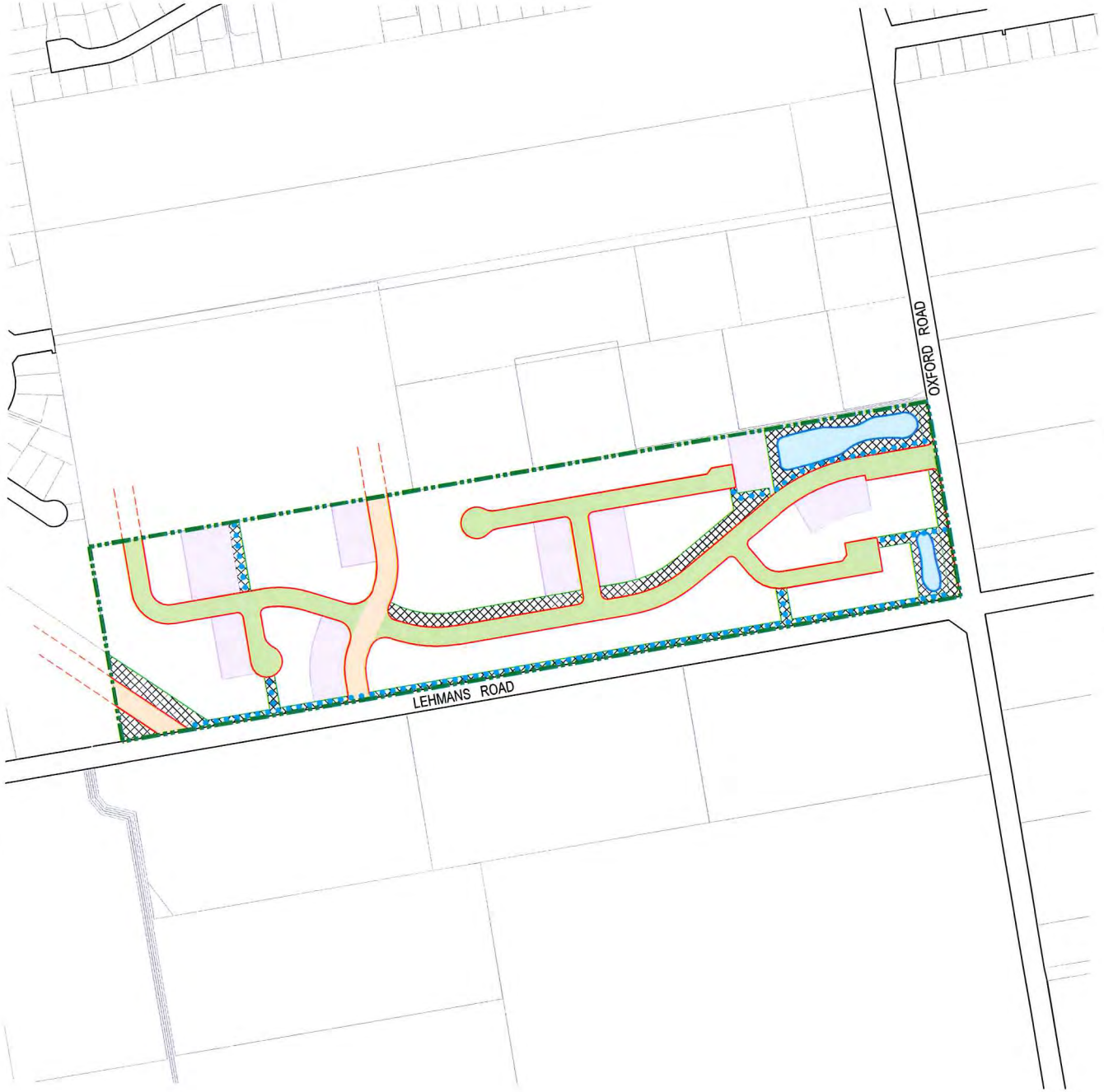
| REV | DATE     | REVISION DETAILS                    | APPROVED   |
|-----|----------|-------------------------------------|------------|
| A   | 09/05/14 | ISSUE                               | M HANRAHAN |
| B   | 29/05/14 | REISSUE - INCREASED MEDIUM DENSITY  | J TRIST    |
| C   | 30/05/14 | REISSUE - CYCLEWAY AMENDMENTS       | J TRIST    |
| D   | 30/05/14 | REISSUE - MEDIUM DENSITY ALTERATION | J TRIST    |

| SCALE      | SIZE       | PRELIMINARY          |
|------------|------------|----------------------|
| 1:400      | A3         | NOT FOR CONSTRUCTION |
| DATE       | DATE       | DATE                 |
| DESIGNED   | DESIGNED   | DESIGNED             |
| M HANRAHAN | M HANRAHAN | M HANRAHAN           |
| CHECKED    | CHECKED    | CHECKED              |
| J TRIST    | J TRIST    | J TRIST              |

| PROJECT      | PROJECT      |
|--------------|--------------|
| WESTPARK     | WESTPARK     |
| LEHMANS ROAD | LEHMANS ROAD |

PROPOSED  
OUTLINE DEVELOPMENT PLAN

| PROJECT | PROJECT           | DRAWING NUMBER | DATE |
|---------|-------------------|----------------|------|
| 240845  | 0000 - DRG - SU - | 01             | - D  |



SCALE 1:4000  
40 0 80 160m

## **Appendix B - Site Photographs and Field Notes**



Photograph 1: Taken from the center of the property at 198 Lehmans Road, facing east with one of the hay sheds shown to



Photograph 2: Taken from the western padock on 100 Oxford Road looking east.



|   |    |           |          |           |       |                  |
|---|----|-----------|----------|-----------|-------|------------------|
| CLIENT: Westpark Rangiora Ltd.                                |    | PROJECT:  | 52059AA  | DESIGNED: | RB    | SITE PHOTOGRAPHS |
|   |    | DWG #:    |          | DRAWN:    |       |                  |
|   |    | REVISION: |          | STATUS:   | FINAL |                  |
| SCALE:  | NA |           |          |           |       |                  |
| PROJECT TITLE: 100 Oxford Road and 198 Lehamns Road, Rangiora |    | DATE:     | 24.07.14 |           |       | FIGURE NUMBER: 1 |
|   |    |           |          |           |       |                  |

coffey




Photograph 3: Grain feeder located on the southwestern corner of the property at 198 Lehmans Road.



Photograph 4: Old storage shed located near the main dwelling at 100 Oxford Road.



|   |  |           |          |           |       |                  |
|---|--|-----------|----------|-----------|-------|------------------|
| CLIENT: Westpark Rangiora Ltd.                                |  | PROJECT:  | 52059AA  | DESIGNED: | RB    | SITE PHOTOGRAPHS |
|   |  | DWG #:    |          | DRAWN:    |       |                  |
|   |  | REVISION: |          |           |       |                  |
| PROJECT TITLE: 100 Oxford Road and 198 Lehamns Road, Rangiora |  | SCALE:    | NA       | STATUS:   | FINAL |                  |
|   |  | DATE:     | 24.07.14 |           |       | FIGURE NUMBER: 2 |





Photograph 5: One of the sections of the horse stable located on the southern boundry of 198 Lehmans Road.



Photograph 6: Old working shed found at the western end of the horse stables on the southern boundry of 198 Lehmans



|   |  |           |          |           |       |                  |
|---|--|-----------|----------|-----------|-------|------------------|
| CLIENT: Westpark Rangiora Ltd.                                |  | PROJECT:  | 52059AA  | DESIGNED: | RB    | SITE PHOTOGRAPHS |
|   |  | DWG #:    |          | DRAWN:    |       |                  |
|   |  | REVISION: |          |           |       |                  |
| PROJECT TITLE: 100 Oxford Road and 198 Lehmans Road, Rangiora |  | SCALE:    | NA       | STATUS:   | FINAL | FIGURE NUMBER: 3 |
|   |  | DATE:     | 24.07.14 |           |       |                  |



Photograph 7: One of the two old stable currently fill of rubbish, found at the western end of the horse stables on the southwestern corner of 198 Lehmans Road.



Photograph 8: One of the two old stable currently fill of rubbish, found at the western end of the horse stables on the southwestern corner of 198 Lehmans Road.



CLIENT: Westpark Rangiora Ltd.

PROJECT: 52059AA

DESIGNED: RB

SITE PHOTOGRAPHS

DWG #:

DRAWN:

REVISION:

SCALE: NA

STATUS: FINAL

DATE: 24.07.14

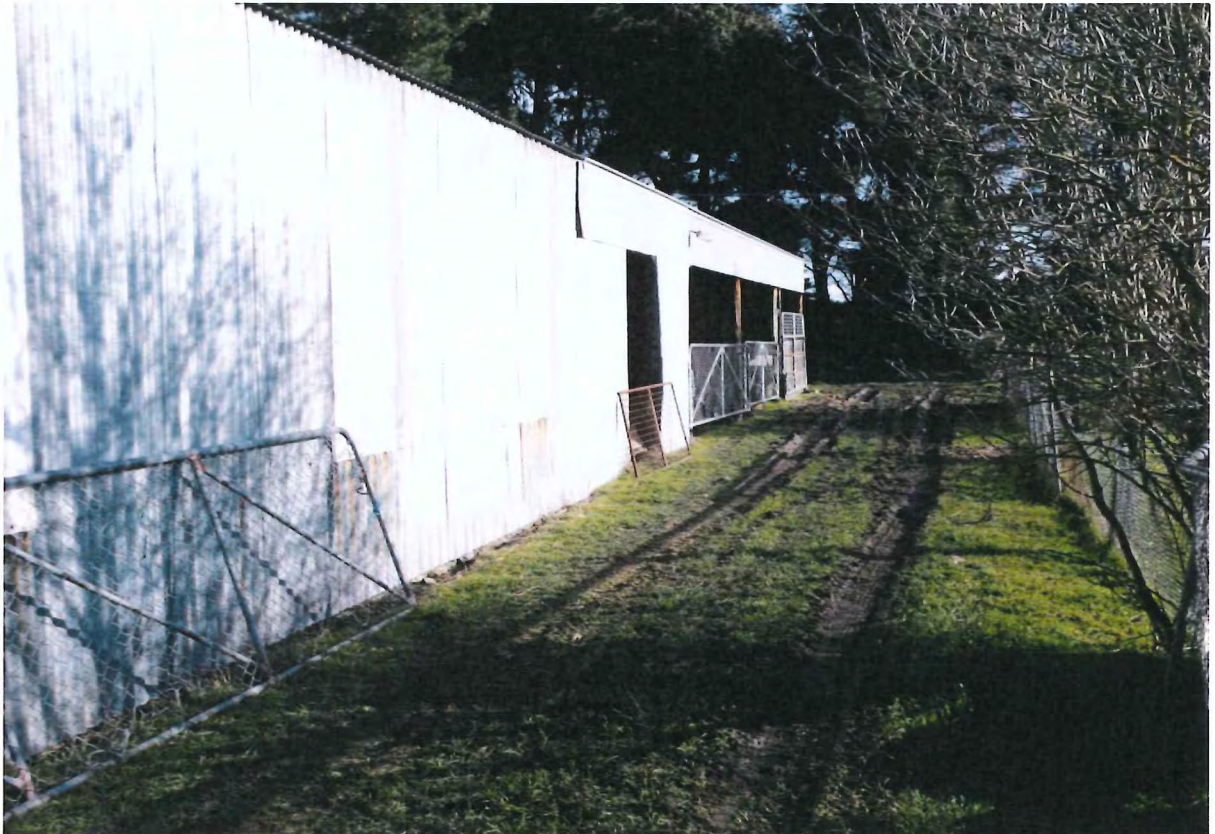
FIGURE NUMBER: 4

PROJECT TITLE: 100 Oxford Road and 198 Lehmans Road, Rangiora

**coffey**



Photograph 9: Driveway going past the stables located on the southwestern corner of 198 Lehmans Road.



Photograph 10: Second set of stables located on the southeastern corner of 198 Lehmans Road.



|  |  |           |          |           |       |                  |
|--|--|-----------|----------|-----------|-------|------------------|
| CLIENT: Westpark Rangiora Ltd.   |  | PROJECT:  | 52059AA  | DESIGNED: | RB    | SITE PHOTOGRAPHS |
|  |  | DWG #:    |          | DRAWN:    |       |                  |
|  |  | REVISION: |          |           |       |                  |
| PROJECT TITLE: 100 Oxford Road and 198 Lehamns Road, Rangiora                                |  | SCALE:    | NA       | STATUS:   | FINAL |                  |
|  |  | DATE:     | 24.07.14 |           |       |                  |
| coffey  |  |           |          |           |       |                  |



Photograph 11: Active burning of wood and waste in a barrel located near the dwelling at 100 Oxford Road.



Photograph 12: Old blade sharpener located in the southeastern corner of 198 Lehmans Road.



|                                |  |           |          |           |       |                  |
|--------------------------------|--|-----------|----------|-----------|-------|------------------|
| CLIENT: Westpark Ranglora Ltd. |  | PROJECT:  | 52059AA  | DESIGNED: | RB    | SITE PHOTOGRAPHS |
|                                |  | DWG #:    |          | DRAWN:    |       |                  |
|                                |  | REVISION: |          | STATUS:   | FINAL |                  |
| PROJECT TITLE:                 | 100 Oxford Road and 198 Lehamns Road, Ranglora | SCALE:    | NA       |           |       | FIGURE NUMBER: 6 |
|                                |  | DATE:     | 24.07.14 |           |       |                  |