Roydon Quarry
Draft Stormwater Management Plan

Proposed Roydon Quarry
Templeton,
Christchurch.

This page has been left blank intentionally

REPORT DETAILS

Project Name: Draft Roydon Quarry Stormwater Management Plan	
Document Type: Draft Quarry Stormwater Management Plan	
Date: 13 November 2019	
Document Author:	Marsha Mason and Stuart Edwards

AUTHORISATION FOR ISSUE

Environmental Advisor	Name:	Date:
Quarries Divisional Manager	Name:	Date:

TABLE OF CONTENTS

List of Tables

List of Appendices

1.0 INTRODUCTION

1.1 Background

Fulton Hogan Limited (Fulton Hogan) is a leading infrastructure, construction, roadworks and aggregate supplier in New Zealand. Fulton Hogan currently has three fixed aggregate quarries located in the greater Christchurch area and began its operations in the Canterbury region over 50 years ago.

The Roydon Quarry site, located in Templeton, is proposed to be another long-term operation. Fulton Hogan has sought resource consents from Canterbury Regional Council and Selwyn District Council to authorise this proposed quarry and the associated activities. This draft stormwater management plan (SWP) has been prepared to accompany this consenting process.

To avoid duplication in this document, a description of the best dust management techniques and spill management techniques are addressed in the Proposed Roydon Quarry Dust Management Plan, and the Proposed Roydon Quarry Spill Management Plan. These documents should be read in conjunction with this document.

1.2 Document Purpose

This SWP has been developed to address key aspects of the management of stormwater at the site, and contains the following elements:

- site context and overview;
- receiving environment;
- stormwater management;
- auditing and non-conformance; and
- document review.

1.3 Overarching Stormwater Management Philosophy

All stormwater controls implemented on site will be designed and managed in a manner that minimises the risk of stormwater runoff adversely affecting the groundwater quality beneath the site, and that any adverse effects from water ponding onsite to the Christchurch International Airport (CIAL) are no more than minor.

Stormwater that falls on unsealed surfaces will infiltrate to ground. Stormwater runoff from road surfaces will infiltrate to ground along the road edges. Stormwater runoff from rooves and other hardstand surfaces areas will be conveyed to stormwater treatment systems.

1.4 Environmental Policy

Fulton Hogan is serious about its environmental obligations and seeks ongoing improvement in its environmental performance through ISO 14001 certified environmental management system. Fulton Hogan's Environmental Policy is included as **Appendix 1**.

2.0 SITE CONTEXT AND OVERVIEW

2.1 Site Location

The site is located within a block of land bound by Curraghs Road, Dawsons Road, Maddisons Road, and Jones Road, and comprises an area of approximately 170 hectares, as shown on Figure 1. The sites street addresses are 107 Dawsons Road and 220 Jones Road, located on the edge of the Selwyn District, with the opposite side of Dawsons Road being the western border of Christchurch City.

2.2 Site Character and Proposed Activities

The existing site, comprised of multiple properties, is almost entirely used for pastoral grazing including sheep farming, whereas others serve as dairy support units for part of the year. Shelter belts exist along a number of the site boundaries including much of the northern boundary, part of the Dawsons Road boundary and along the entirety of the Curraghs Road boundary. Additional vegetation is located throughout the site, being of an exotic nature and for the most part located around existing dwellings on the property.

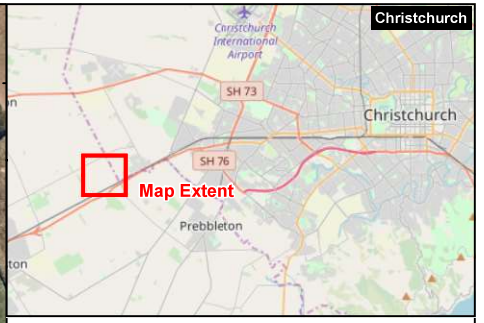
The development of the existing site into the proposed quarry will take place in a number of phases, comprising the following activities:

- Use of suitable on-site material (supplemented by imported topsoil) to create perimeter bunds.
- Planting around bunds to establish boundary screening.
- Development of quarry pit area – removal of topsoil and subsoil overburden material and initial extraction to develop a working pit.
- Construct site infrastructure such as site entrances, haul roads, establish processing plant and field conveyors, weighbridge, workshop and site offices etc.
- Extraction of aggregate in stages as indicatively shown on Figure 1.
- Rehabilitation of worked out areas.

2.3 Site Responsibility

The overall management of the site will be the responsibility of the Roydon Quarry Manager or delegated authority and will include:

- Ensuring compliance with relevant resource consents conditions;
- Communicating resource consent requirements to staff, contractors and all other relevant parties;
- Ensuring compliance with the SWP and all other associated documents;
- Maintenance of the stormwater management devices.
- Investigating effectiveness of operating procedures and communicating if any changes need to be made;
- Implementation of inspection and maintenance activities;
- Holding records for any inspections and maintenance activities;
- Reviewing environmental incidents;
- Leading staff to ensure environmental responsibility is being practiced.



LEGEND

- Site boundary
- Central Processing and Stockpiling Area
- Indicative staging direction
- Access road
- Proposed staging

NOTES

1. Aerial: LINZ and Eagle Technology, CC-BY-3.0-NZ.
2. Map image: © OpenStreetMap (and) contributors, CC-BY-SA
3. Schematic only, not to be interpreted as an engineering design or construction drawing.

0 200 400 METRES

REFERENCE SCALE: 1:7,000 (at A3)

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

CLIENT
FULTON HOGAN LIMITED

PROJECT
ROYDON QUARRY

TITLE
RC185627/CRC192408A

CONSULTANT
GOLDER

YYYY-MM-DD	2019-09-23
PREPARED	AE
REVIEW	KB
APPROVED	KB

PROJECT NO.	REPORT	REV.	FIGURE
1781870	001	0	**01**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3

Path: K:\GIS\Projects_Dynamic\2017\1781870_RC_Dawsons_Road\MapDocument\Extension\1781870-001-R-Rev0_A3L_GIS.mxd

3.0 RECEIVING ENVIRONMENT

3.1 Geology and Soils

The Geological Map of New Zealand [1] identifies the geology of the site and the surrounding area as Holocene river deposits, comprising grey river alluvial gravels with minor sands, silts and clays beneath plains or low-level terraces (identified as Q1a). Grey river alluvium is common across the Canterbury Plains and is being quarried at several locations within the Greater Christchurch area. Surficial sediments covering approximately one-fifth of the site are categorised as stabilised river sand dunes (Q1d). These river sands are common throughout the West Melton area, however no current quarry operations appear to intersect dune features in the Christchurch area. Davey (2006)[2] has identified several geological units below the site which include:

- Springston Formation – gravels with some peat and clay from ground level to approximately 10 m bgl.
- Riccarton Gravel – gravels from approximately 10 m bgl to 35 m bgl.
- Bromley Formation – gravels with peat and clay from approximately 35 m bgl to 45 m bgl.
- Linwood Gravel – gravels from approximately 70 m bgl to 75 m bgl.
- Heathcote Formation – peat and clay from approximately 75 m bgl to 125 m bgl.
- Burwood Gravel – gravel with some clay below approximately 125 m bgl.

The gravel is overlain by a shallow layer of superficial soils, typically in the vicinity of 0.5 to 1.0 m depth. Recent borehole installations (BX23/0833 BX23/0084, BX23/0085 and BX23/0086) at the site to 21 m depth showed a soil profile comprising thin topsoil underlain by sand and sandy gravel subsoil. While there is some variability in overburden depth across the site, the site exhibits between 0.4 and 1.1 m of topsoil and sand across the site.

The Landcare Canterbury Soil Information database[3] describes the soils as 'Templeton moderately deep silty loam' in the northwest part of the site and the 'Eyre shallow stony loam' in the southeast of the site.

The Canterbury Land and Water Regional Plan (LWRP) planning map (Map A-058) does not identify the site as being within a high soil erosion risk area.

3.2 Groundwater

The proposed quarry extraction site is located over what Davey (2006) describes as a distinct unconfined aquifer within the Springston Formation, below which sits Aquifer 1 formed by the Riccarton Gravels. The site is located within the Selwyn-Waihora zone of the Canterbury Water Management Strategy and in the Selwyn Waimakariri Groundwater Allocation Zone but lies outside the Christchurch Groundwater Protection Zone 1 (CGPZ1), as identified by the LWRP Planning Map (Christchurch Map 11). The absence of a distinct claybound layer in the borelog for the site bore M36/0257 suggests that there is little hydraulic separation between the Riccarton Gravels and overlying Springston Formation gravels. Therefore, unconfined aquifer groundwater levels across the site area are considered representative of the top regional aquifer, Aquifer 1.

[1] https://www.gns.cri.nz/Home/Our-Science/Energy-Resources/Geological-Mapping/Geological-Maps/1-250-000-QMAP/QMAP-text-maps

[2] Definition of the Canterbury Plains Aquifers. Selwyn to Waimakariri Rivers Areas 11. ECan publication U06-10. Davey (April 2006).

[3] Landcare Research S-map. https://smap.landcareresearch.co.nz

3.3 Surface Water

The closest natural waterbody to the site is the Waimakariri River which is approximately 12.5 km north, and is hydraulically connected to the regional groundwater system.

Man-made surface water bodies run through the site and are used for irrigation, and stock water supply purposes. Man-made drains are present along some of the site road boundaries which carry water following periods of heavy rainfall.

A network of water races exists in the area surrounding the proposed quarry site. The groundwater levels are much lower (some 13.5 m deep on average) than the base of these water races and channels, thus little hydraulic connection exists.

3.4 Existing Stormwater Network

The area is predominantly rural in character and consequently there is no reticulated stormwater management system. All stormwater, including that from impervious surface such as roads, hardstand areas and roofs is infiltrated to ground.

4.0 STORMWATER MANANGEMENT

The stormwater management approach and design philosophy are developed to specifically address the following matters:

1. The water quality of the stormwater to be discharged should not adversely affect the groundwater quality beneath the site. Truck washing and refuelling will be undertaken in designated paved and rooved areas so that no stormwater will be mixed with contamination associated with these activities. Stormwater from rooves and hardstand areas have a risk of being slightly contaminated albeit small. To minimise the risks to groundwater quality, stormwater from these source areas are conveyed to stormwater treatment, which will be stormwater infiltration basins. These will be 'dry ponds'.

2. The ponding of stormwater in excess of 48 hours could increase the chance of birds taking refuge within the site, and has been identified as a key hazard for CIAL given the increased risk of bird-strike to aircraft within the flight path. Therefore, any stormwater infiltration basin will be a 'dry pond' which means that the water diverted to it will infiltrate and only temporarily pond.

As such, all stormwater controls at the Roydon Quarry will be designed to ensure that there is no ponding for greater than 48 hours, and that discharges are appropriately contained/or treated prior to discharge. The following sections outline how these aspects will be designed and managed to mitigate against the identified risks.

4.1 Stormwater Discharge Sources

Three potential sources of stormwater discharges have been recognised from the proposed activity, and are identified as coming from rooves, consolidated surfaces e.g. unsealed haul roads and sealed impervious areas. The stormwater management from all these areas will ultimately be by way of infiltration to ground following appropriate treatment where needed.

In addition to stormwater discharges to ground, there are smaller potential discharge volumes arising from truck deck washing and vehicle wash-down facilities, and utilities wastewater from onsite offices and workshops. These discharges will be managed separately from the stormwater and after appropriate treatment (e.g. oil/water separator and/or sedimentation tank, where needed), these are stored in holding tanks and disposed of appropriately.

4.2 Stormwater Control Design

The location of all potential sediment discharge activities during the operational phase of the quarry, the location of sediment control measures, on-site catchment boundaries, and sources of stormwater runoff are outlined in Figure 2 and described in detail in the following sections.

Central Processing/Stockpile Area

The Central Processing/stockpile area (CPSA), after the road access to the site is established, will be progressively excavated to approximately six metres below ground level (about three metres above highest groundwater level).

The CPSA will have areas of consolidated land where the loader regularly operates, and areas of high infiltration rate under stockpiles and no-trafficked areas. It is proposed that the CPSA be contoured such that there is a natural fall towards the south west corner of the central processing site. This will naturally direct stormwater towards the location of the vegetated stormwater infiltration basin of the site.

The CPSA will also be encircled by a sealed roadway, providing truck and trailer access to the stockpile area for loading. This will allow for the channelling of run-off from both the CPSA and road by a sealed stormwater channel running along the road margin.

Extraction/Cleanfill

Stormwater runoff from operational unsealed surfaces such as extractive areas and cleanfill areas will be managed via infiltration to ground. This water will naturally drain to the lowest point in the site and percolate through gravels.

Ponding may be experienced within the pit following prolonged heavy rainfall. Given the very high infiltration rates prevalent in the locale, and the separation to groundwater, it is highly unlikely that surface water ponding will persist longer than 48 hours following the cessation of a rainfall event.

No works will occur in standing surface water. Site rehabilitation will also progressively restore groundcover across the worked-out areas and will form a further element of attenuation of stormwater and run-off discharges.

Impervious Surfaces

There are two classes of impervious surfaces where stormwater will be pre-treated before infiltration to ground, which are hardstand areas (e.g. parking lots) and building rooves. Stormwater runoff from these surfaces will be captured and diverted to the vegetated stormwater infiltration basin, which will be lined with soils and provides for treatment:

Stormwater discharges from consolidated surfaces, such as unsealed haul roads, but also sealed road surfaces, will be infiltrated to ground through the unconsolidated ground adjacent to the consolidated surface.

The concept design for the stormwater infiltration basin is as follows:

- Based on HIRDS and requirements stated in CCC (2003), the basin should be sized to capture at least 25 mm rainfall depth. With the total surface area of sealed surfaces (roofs and hardstand areas) being 2500 m2, the size of the basin should be at least 330 m2.
- The basin will be a ‘dry pond’ and water will not pond more than 48 hours following a significant storm event. As such, the infiltration rate of the basin would need to be at least 12 mm/hr.
- The basin will be lined with at least 300 mm topsoil matrix consisting of clean organic matter and clay rich soils that have the capacity to treat the stormwater to the guideline values specified in NZWERF (2004):
    - 90% removal of Total Suspended Solids;
    - 90% removal of Biochemical Oxygen Demand (BOD);

- 75% removal of hydrocarbons; and
- 85% removal of heavy metals (zinc, copper, lead).

Vehicle/Truck Deck Washing

Two areas where the washing of vehicles will occur has been proposed in the application. Their designs are as follows:

Truck deck wash area:

- At this place, only the decks of trucks and trailers will be washed on a bunded impervious surface. As this area is sealed but not covered, there will be a stormwater component to the discharge volume. The preference is to store this discharge for recycling.

Vehicle wash-down area:

- This area will be used to wash-down vehicles and equipment prior to maintenance. The area will be bunded and covered with wash-down water treated by a sedimentation tank, and a 3 stage oil/water separator
  - The specification of this area will be:
    - An impervious pad, bunded and covered
    - Stormwater discharge from the roof is conveyed, via to a balancing tank to the site stormwater management system.
    - Contaminated wash water to be collected in appropriately sized holding tank, treated through a sedimentation tank and an oil-water separator.
    - Water after treatment through the oil/water separator will be stored in a tank for appropriate disposal.
    - The contaminants and hydrocarbons separated from water is to be discharged at an appropriate site.

4.3 Inspection and Maintenance

The inspection and maintenance of the described stormwater discharge controls will be the responsibility of the Quarry Manger and will be in accordance with the manufactures specifications and/or or best practice guidelines. The stormwater infiltration basins require infrequent maintenance such as sediment removal, liner repair, plant harvesting, and plant replacement. Specifically, areas that require effective infiltration rates to ground will be inspected before and after a heavy rainfall event.

The infiltration basin will be maintained so that the vegetation is in a healthy and uniform state. This maintenance may include but not be limited to:

(a) Maintaining a uniform cover of vegetation with a minimum length of 50 millimetres; and not exceeding 150 millimetres.
(b) The removal of any cut vegetation ,
(c) Irrigation;
(d) Replanting of vegetation, at least annually, where erosion or die-off has resulted in bare or patchy soil cover; and
(e) Rejuvenation of the infiltration basin to ensure that the infiltration rates are appropriate.

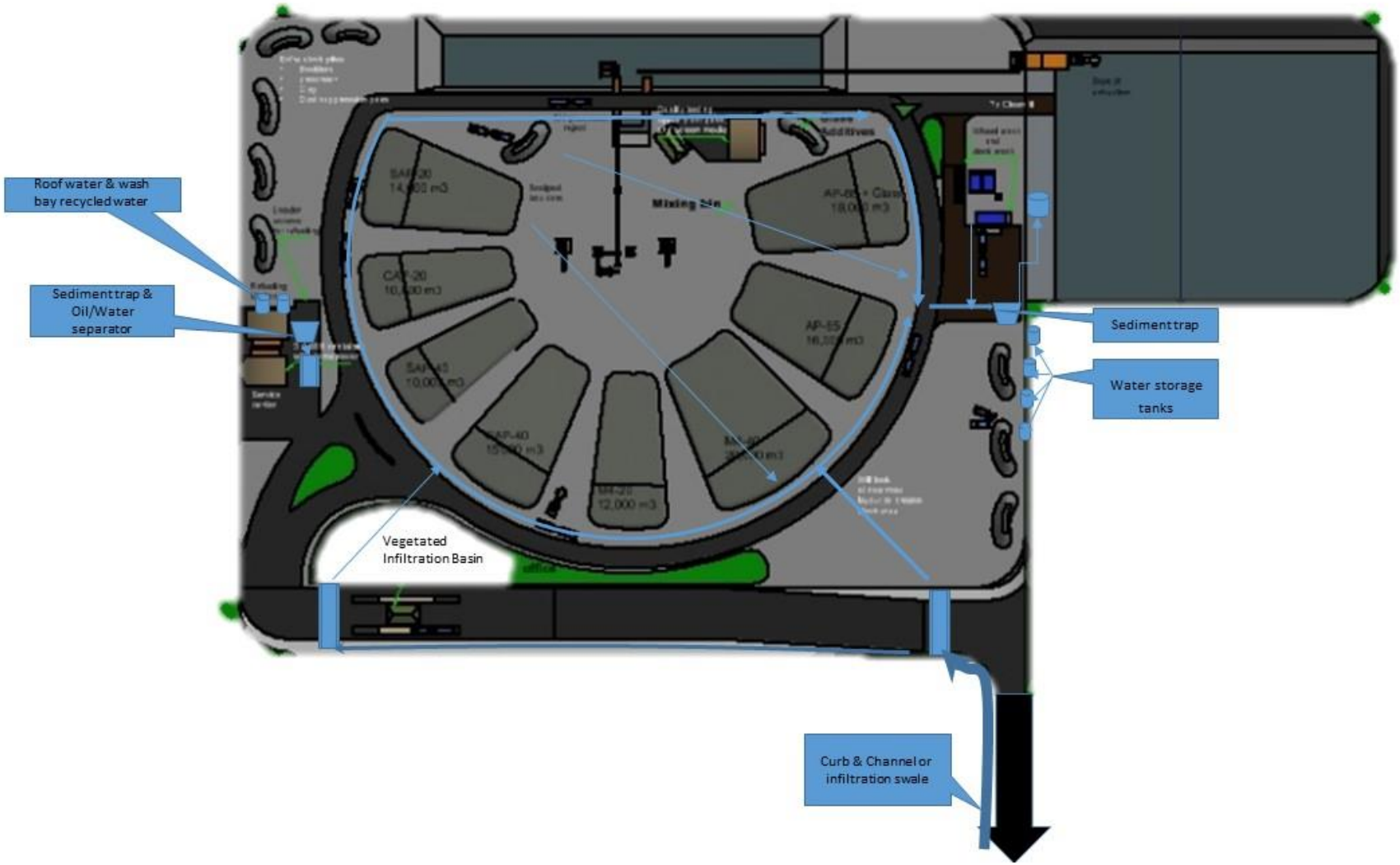
The infiltration basin will be inspected at least three monthly. Any litter, or hydrocarbons in the will be removed immediately and disposed of appropriately. Accumulated sediment more than three millimetres thick will be removed. All debris and sediment will be removed from the first flush basin when it reaches 300 millimetres depth.

The oil-water separator at the vehicle wash-down area will be inspected at least monthly to ensure it has not exceeded 60 percent of its storage capacity.

The truck deck wash sediment catchment area will be inspected at least weekly to ensure that it has not exceeded 60 percent of its storage capacity.

Should these control measures fail or be assessed as sub-standard, additional controls or maintenance will be deployed immediately.

Figure 2: Proposed Indicative Stormwater Layout Design



5.0 AUDITING AND NON-CONFORMANCE

5.1 Environmental Auditing

The Roydon Quarry site will be audited annually against its resource consent requirements, and associated management plans including the SWP. In addition to formal inspections and compliance monitoring, informal monitoring will be conducted by the Roydon Quarry Manager or appropriate delegate, on an ongoing basis through the likes of Stay Safe Engagements or Spot Audits.

5.2 Non-Conformance

All incidents including non-compliance with environmental controls, environmental incidents, complaints, hazards and near misses will be entered as an Opportunity For Improvement (OFI) form into Fulton Hogan's incident management system (CAMs – Case and Action Management Systems). This allows incidents to be recorded, tracked, investigated and closed off when dealt with appropriately.

5.3 Complaint Response

A record is to be kept of all complaints received in relation to site activities, and will record the details of the complaint, and any subsequent investigation and actions taken.

A copy of a completed complaint form is to be filed in following completion of the investigation and within 24-hours of receiving the complaint. The complaint investigation must record the following information:

- Complainant details;
- Information about the incident as described by the complaint;
- Who received the complaint and how it was received;
- Weather conditions at the time of the complaint;
- Details of any stormwater exiting site that may not meet quality standards by the person investigating the complaint;
- Identification of the possible cause of the complaint following the investigation;
- Details of the corrective action taken at the time to resolve the incident;
- Details of the preventative actions to be taken to ensure the likelihood of such events occurring in the future are minimised.

An investigation of the complaint will require the site manager or delegated staff member to make visual observations about activities occurring on site. This may include going to the location where the complainant observed the impact.

6.0 DOCUMENT REVIEW

Fulton Hogan will review this document on a five yearly basis, or under the following circumstances:

- For the purpose of improving the efficacy of the stormwater control measures at the site;
- Consistent with the conditions of Canterbury Regional Council consent requirements.
- Following significant environmental incidents;
- At the completion of environmental audits;

Appendix 1 – Environmental Policy

Environmental Policy

Working together to protect our environment

We will:

- Work towards minimising our environmental footprint through innovation, energy and resource efficient operations focused on reducing, reusing and recycling
- Meet or exceed all obligations and consent conditions applicable to our activities
- Recognise that environmental management encompasses diverse aspects including flora, fauna, water, community and cultural interests
- Identify impacts to the environment and implement effective controls
- Set objectives and targets to measure, manage and improve our performance
- Train our people to identify environmental risks and opportunities to improve our performance
- Work closely with our subcontractors and suppliers to ensure they meet our expectations
- Drive continual improvement through the proactive use of environmental management systems

Our people will be environmental leaders by:

- Minimising the long term environmental impact of our activities
- Planning for and addressing all environmental risks and opportunities
- Pursuing innovative ways to improve our environmental performance

C W Bruyn
Group Chief Executive Officer

December 2017

Fulton Hogan