Memorandum

30 April 2015

To: Tess Drewitt, Environmental Consultant
Jacobs New Zealand Limited
P.O. Box 10-283
WELLINGTON

From: Lindsay Buckingham

Subject: Development of Integrated Storage and Manufacturing Facility for Taha Fertiliser Industries Ltd – Awarua Industrial Park, Invercargill

Introduction:

The purpose of this memorandum is to outline the current work commissioned by Taha International Corporation to develop a permanent integrated storage and fertiliser manufacturing facility with Southland.

I am an Invercargill based independent project management consultant who has been engaged since late February 2015 by the Taha International Corporation from Bahrain to oversee, manage and coordinate several aspects of their business here in New Zealand operating as Taha Asia Pacific Ltd and Taha Fertiliser Industries Ltd.

One key aspect of this engagement is to proceed with urgency to develop a permanent integrated storage and fertiliser manufacturing facility. This facility will be able to store all Ouvea Premix material produced to date and which is currently stored in temporary storage facilities including the former Mataura paper mill site. It also includes provision to store on-going Ouvea Premix production from the onsite recycling facility at the Tiwai Point aluminium smelter, plus other materials associated with the manufacture of fertiliser.

Over the last 3 years, Taha has looked at numerous potential sites for a permanent facility. However, all of the potential sites, including Mataura, have proved to be unsuitable for various reasons. This previous work has led to the conclusion and decision by Taha that a permanent facility must be sited within a designated area zoned for heavy industrial use.

Scope of Development:

The site chosen for this permanent integrated storage and manufacturing facility will be within the Awarua Industrial Park developed by the Invercargill City Council. The

Awarua industrial park consists of some 400 Ha of land which is available for industrial development and has an industrial use zone classification under the Invercargill City Plan with heavy industry being a permitted activity.

Latitude 46 Consultants Ltd is managing the project to develop this facility and has in turn engaged several other specialist consultants to assist with the feasibility study to select the most appropriate site within the industrial park. The consultants engaged include:

- William J Watt Consulting Ltd – Planning Consultant
- Kensington Consulting - Civil Structural Engineer
- Jacobs NZ Ltd – Air Discharge consenting
- Ballantyne Quantity Surveying Services Ltd – Quantity Surveying

The initial steps currently underway are to select a site which will allow the full development of both storage and manufacturing facilities.

The project will be implemented in two stages, the first stage being the storage facility and the second being the fertiliser manufacturing facility. The second stage will require Taha to apply for an air discharge permit for the operation of the fertiliser manufacturing facility. It is therefore important that an air discharge consent can be obtained for the selected site. Jacobs is currently undertaking a due diligence on the site and surrounding activities to ensure the necessary air discharge permit can be obtained.

Proximity to the existing occupiers of the Awarua industrial park, being Balance Agri-Nutrients Ltd, South Pacific Meats Ltd and Open Country Dairy Company Ltd will also have some influence on site selection. All three of these occupiers have existing air discharge permits for their respective industrial activities. Jacobs needs to ensure that site selection does not result in cumulative discharges (taking into account existing discharges) that have a more than minor effect on the environment.

Kensington Consulting are developing the specific building design. This work includes initial geotechnical investigations, structural design, compliance with HZNO (EPA) standards for storage of hazardous materials, ventilation, fire protection, storm water drainage, roading, hard standing and associated works.

William J Watt Consulting Ltd and Ballantyne Quantity Surveying Services Ltd are providing advice within their respective fields of expertise.

Two meeting have been held to date with Dean Johnston, Chief Executive of Invercargill Property Ltd (ICPL), an entity owned by the Invercargill City Council who is ultimately the owner and developer of the Awarua industrial park. In summary ICPL are very keen to have Taha develop its integrated storage and manufacturing facility within the Awarua industrial park and has been very supportive in helping make this happen. The development of the Taha facility will require a significant commitment by ICPL to develop roading, water, sewerage, power infrastructure within the development area. ICPL have provided an undertaking that infrastructure development will take place as and when required in full support of Taha's site requirements.

A conditional sale and purchase agreement is being prepared and this will be finalised once the preferred site has being selected and confirmed as being suitable for the intended use.

Once the site selection is confirmed Latitude 46 Consultants Ltd will then put in place contract(s) to facilitate the detailed design and construction of stage 1 being the permanent storage facility.

The steps subsequent to site selection include site acquisition, establishing land title, obtaining land use resource consent, bid & award of design/build contract, detail building design, obtaining building consent followed by construction of site works and the building proper. Based on my experience as a project manager this will take 12 months to achieve. Upon completion of the building and issuance of code compliance certificate under the Building Act the storage of material can commence. At the rate of two trucks completing two return trips per day the relocation of the material from Mataura to Awarua will take a further 100 working days or 5 months giving a total project duration of 17 months. Taha have requested a 2 year consent period to allow for contingency should there be any delays.

Regards

Lindsay Buckingham

Latitude 46 Consultants Ltd

Project Managers

Invercargill

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1 May 2015

G J Paterson
P.O. Box 43
Dunedin 9054

Dear Greg

121 Kana Street Mataura

Thank you for your acceptance of our recent quote to test the systems at the Old Mataura paper mill, 121 Kana Street Mataura. Fire Protection Complaince will test and maintain the following specified systems as listed in accordance with the compliance schedule:

- SS 3/3 Interfaced fire doors, SS 4 Emergency lighting, SS 14/2 Signs
- SS 15/2 Final exits, SS 15/3 Fire separations, SS 15/4 Signs

Fire Protection Complaince Limited will test and maintain the Spinkler system when the repairs have been completed.

We will be able to issue the correct documents upon the anniversary of the annual warrant of fitnes date.

Should you have any queries please feel free to ask.

Yours faithfully
Fire Protection Compliance Limited

Karen Baker
Compliance administrator.

Stephen Macknight Ltd
BE (Hons), MIPENZ, CPENG

Engineering & Design Consultant

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Court, 3 Crawford St PO Box 343
Dunedin New Zealand
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1 May 2015

Jacobs
Level 3
86 Customhouse Quay
PO Box 10283,
Wellington.

FAO Tess Drewitt

Dear Tess

Re Structural Assessment Mataura Paper Mill Buildings

We have carried out a preliminary structural assessment on the buildings at the former Mataura paper mill, in order to comment on their suitability for use to store bags of fertiliser.

The site consists of a number of buildings of different ages and structural types. From early timber framed buildings to very solid reinforced concrete structures.

In this report and accompanying IEP (initial Evaluation Procedure), we have looked at the most susceptible building in terms of seismic resistance. The remaining buildings will have greater seismic resistance, with the more modern reinforced concrete and lightweight steel buildings being over 100% NBS (New building Standard) in terms of earthquake resistance.

The building accessed has walls of unreinforced masonry with reinforced concrete bands and columns. These are connected to a lightweight timber and steel roof structure. The floor and foundations are of reinforced concrete.

Provided this type of structure is well tied together, and there is no significant damage or decay, this type of structure has been shown to preform reasonably well in a seismic event.

In this case we would do not believe the structure to be 'Earthquake Prone', as it would not collapse in a moderate earthquake, and poses only a small risk to those either inside or adjacent to the exterior of the building, in a significant seismic event.

We therefore believe that this building is suitable for its intended use for storage, and the remaining newer buildings are suitable for this use, and other related uses, in terms of structural and seismic capacity, provided they continue to be maintained.

Please call it you require any other information regarding this.

Regards

Steve Macknight
Stephen Macknight Ltd

Table IEP-1: Initial Evaluation Procedure – Step 1

Table IEP-1 **Initial Evaluation Procedure Step 1** **Page 1....**

(Refer Table IEP - 2 for Step 2; Table IEP - 3 for Step 3, Table IEP - 4 for Steps 4, 5 and 6)

Building Name	Matura Paper Mill - Original Building	**Ref.**	100
Location	Kana St Matuara	**By**	SJM
		Date	1/05/15

Step 1 - General Information

1.1 Photos (attach sufficient to describe building)

1.2 Sketch of building plan

Rectangular warehouse building

1.3 List relevant features

This report covers the oldest, least sound building
Brick & reinforced concrete façade
One Level with lightweight roof on steel/ timber structure
Generally remains in good condition

1.4 Note information sources

	tick as appropriate
Visual Inspection of Exterior	X
Visual Inspection of Interior	X
Drawings (note type)	X
Specifications	
Geotechical Reports	
Other (list)	

Table IEP-2: Initial Evaluation Procedure – Step 2

Table IEP-2 Initial Evaluation Procedure Step 2

(Refer Table IEP - 1 for Step 1; Table IEP - 3 for Step 3; Table IEP - 4 for Steps 4, 5 and 6)

Building Name	Matura Paper Mill - Original Building	**Ref.**	100
Location	Kana St Mataura	**By**	SJM
Direction Considered:	**a) Longitudinal** **b) Transverse**		
(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)		**Date**	1/05/15

Step 2 - Determination of $(\%NBS)_b$

2.1 Determine nominal $(\%NBS) = (\%NBS)_{nom}$

a) Date of Design and Seismic Zone

tick as appropriate

Period	Seismic Zone	Tick	
Pre 1935			See also notes 1, 3
1935-1965		X	
1965-1976	Seismic Zone; A		
	B		
	C		
1976-1992	Seismic Zone; A		See also note 2
	B		
	C		
1992-2004			

b) Soil Type

		Tick
From NZS1170.5:2004, Cl 3.1.3	A or B Rock	
	C Shallow Soil	X
	D Soft Soil	
	E Very Soft Soil	
From NZS4203:1992, Cl 4.6.2.2 (for 1992 to 2004 only and only if known)	a) Rigid	
	b) Intermediate	

c) Estimate Period, T 0.4 Seconds

Can use following:

$T = 0.09h_n^{0.75}$	for moment-resisting concrete frames
$T = 0.14h_n^{0.75}$	for moment-resisting steel frames
$T = 0.08h_n^{0.75}$	for eccentrically braced steel frames
$T = 0.06h_n^{0.75}$	for all other frame structures
$T = 0.09h_n^{0.75}/A_c^{0.5}$	for concrete shear walls
$T \le 0.4$sec	for masonry shear walls

Where h_n = height in m from the base of the structure to the uppermost seismic weight or mass.

$A_c = \Sigma A_i(0.2 + L_{wi}/h_n)^2$

A_i = cross-sectional shear area of shear wall i in the first storey of the building, in m²

l_{wi} = length of shear wall i in the first storey in the direction parallel to the applied forces, in m

with the restriction that l_{wi}/h_n shall not exceed 0.9

d) $(\%NBS)_{nom}$ determined from Figure 3.3 4 $(\%NBS)_{nom}$

Note 1: For buildings designed prior to 1965 and known to be designed as public buildings in accordance with the code of the time, multipy $(\%NBS)_{nom}$ by 1.25.
For buildings designed 1965 - 1976 and known to be designed as public buildings in accordance with the code of the time, multiply $(\%NBS)_{nom}$ by 1.33 - Zone A
1.2 - Zone B

1

Note 2: For reinforced concrete buildings designed between 1976-84 multiply $(\%NBS)_{nom}$ by 1.2

1

Note 3: For buildings designed prior to 1935 multiply $(\%NBS)_{nom}$ by 0.8 except for Wellington where the factor may be taken as 1.

1

4 $(\%NBS)_{nom}$

Continued over page

Table IEP-2: Initial Evaluation Procedure – Step 2 continued

Table IEP-2 **Initial Evaluation Procedure Step 2 continued**

2.2 Near Fault Scaling Factor, Factor A

If $T \leq 1.5$sec, Factor A = 1

a) Near Fault Factor, *N(T,D)*
(from NZS1170.5:2004, Cl 3.1.6) — 1.0

b) Near Fault Scaling Factor = 1/N(T,D) — **Factor A** 1.0

2.3 Hazard Scaling Factor, Factor B

a) Hazard Factor, *Z, for site*
(from NZS1170.5:2004, Table 3.3) — 0.17

b) Hazard Scaling Factor

For pre 1992 = 1/Z
For 1992 onwards = Z_{1992}/Z

(Where Z_{1992} is the NZS4203:1992 Zone Factor from accompanying Figure 3.5(b)) — **Factor B** 5.9

2.4 Return Period Scaling Factor, Factor C

a) Building Importance Level
(from NZS1170.0:2004, Table 3.1 and 3.2) — 2.0

b) Return Period Scaling Factor from accompanying Table 3.1 — **Factor C** 1.0

2.5 Ductility Scaling Factor, D

a) Assessed Ductility of Existing Structure, μ
(shall be less than maximum given in accompanying Table 3.2) — 1.3

b) Ductility Scaling Factor

For pre 1976 = k_{μ}
For 1976 onwards = 1

(where k_{μ} is NZS1170.5:2004 Ductility Factor, from accompanying Table 3.3) — **Factor D** 1.14

2.6 Structural Performance Scaling Factor, Factor E

a) Structural Performance Factor, S_p
from accompanying Figure 3.4 — 0.9

b) Structural Performance Scaling Factor = $1/S_p$ — **Factor E** 1.1

2.7 Baseline %NBS for Building, $(\%NBS)_b$

(equals $(\%NSB)_{nom}$ x A x B x C x D x E) — 29.8%

Table IEP-3: Initial evaluation procedure – Step 3

Table IEP-3 Initial Evaluation Procedure Step 3 — Page ......

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2; Table IEP - 4 for Steps 4, 5 and 6)

Building Name Matura Paper Mill - Original Building — **Ref.** 100
Location Kana St Matuara — **By** SJM
Direction Considered: a) Longitudinal X b) Transverse
(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt) — **Date** /05/15

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

Critical Structural Weakness	Building Score	Effect on Structural Performance *(Choose a value - Do not interpolate)*		
		Severe	Significant	Insignificant
3.1 Plan Irregularity *Effect on Structural Performance* — Factor A	1.0	0.4 max	0.7	1
Comment				
3.2 Vertical Irregularity *Effect on Structural Performance* — Factor B	1.0	0.4 max	0.7	1
Comment				
3.3 Short Columns *Effect on Structural Performance* — Factor C	1.0	0.4 max	0.7	1
Comment				

3.4 Pounding Potential
(Estimate D1 and D2 and set D = the lower of the two, or =1.0 if no potential for pounding)

a) Factor D1: - Pounding Effect
Select appropriate value from Table

Note:
Values given assume the building has a frame structure. For stiff buildings (eg with shear walls), the effect of pounding may be reduced by taking the co-efficient to the right of the value applicable to frame buildings.

Factor D1 1.0

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	0.7	0.8	1
Alignment of Floors not within 20% of Storey Height	0.4	0.7	0.8

b) Factor D2: - Height Difference Effect
Select appropriate value from Table

Factor D2 1.0

Table for Selection of Factor D2	Severe	Significant	Insignificant
	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Height Difference > 4 Storeys	0.4	0.7	1
Height Difference 2 to 4 Storeys	0.7	0.9	1
Height Difference < 2 Storeys	1	1	1

Factor D 1.0 ***(Set D = lesser of D1 and D2 or.. set D = 1.0 if no prospect of pounding)***

	Building Score	Severe	Significant	Insignificant
3.5 Site Characteristics - *(Stability, landslide threat, liquefaction etc)* *Effect on Structural Performance* — Factor E	1.0	0.5 max	0.7	1

3.6 Other Factors

Factor F 1.5 — **For ≤ 3 storeys - Maximum value 2.5, otherwise - Maximum value 1.5. No minimum.**

Record rationale for choice of Factor F:

One level, lightwight roof, structural elements tied toqether

3.7 Performance Achievement Ratio (PAR) 1.5
(equals **A x B x C x D x E x F**)

Table IEP-3: Initial evaluation procedure – Step 3

Table IEP-3 Initial Evaluation Procedure Step 3 **Page ......**

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2; Table IEP - 4 for Steps 4, 5 and 6)

Building Name	Matura Paper Mill - Original Building	**Ref.**	100.0
Location	Kana St Matuara	**By**	SJM
Direction Considered: a) Longitudinal	b) Transverse X		
(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)		**Date**	1/05/15

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

Critical Structural Weakness	Building Score	Effect on Structural Performance *(Choose a value - Do not interpolate)*		
3.1 Plan Irregularity *Effect on Structural Performance*		Severe	Significant	Insignificant
Comment	**Factor A** 1.0	0.4 max	0.7	1
3.2 Vertical Irregularity *Effect on Structural Performance*		Severe	Significant	Insignificant
Comment	**Factor B** 1.0	0.4 max	0.7	1
3.3 Short Columns *Effect on Structural Performance*		Severe	Significant	Insignificant
Comment	**Factor C** 1.0	0.4 max	0.7	1

3.4 Pounding Potential
(Estimate D1 and D2 and set D = the lower of the two, or =1.0 if no potential for pounding)

a) Factor D1: - Pounding Effect
Select appropriate value from Table

Note:
Values given assume the building has a frame structure. For stiff buildings (eg with shear walls), the effect of pounding may be reduced by taking the co-efficient to the right of the value applicable to frame buildings.

Factor D1 1.0

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	0.7	0.8	1
Alignment of Floors not within 20% of Storey Height	0.4	0.7	0.8

b) Factor D2: - Height Difference Effect
Select appropriate value from Table

Factor D2 1.0

Table for Selection of Factor D2	Severe 0<Sep<.005H	Significant .005<Sep<.01H	Insignificant Sep>.01H
Height Difference > 4 Storeys	0.4	0.7	1
Height Difference 2 to 4 Storeys	0.7	0.9	1
Height Difference < 2 Storeys	1	1	1

Factor D 1.0 ***(Set D = lesser of D1 and D2 or.. set D = 1.0 if no prospect of pounding)***

		Severe	Significant	Insignificant
3.5 Site Characteristics - *(Stability, landslide threat, liquefaction etc)* *Effect on Structural Performance*	**Factor E** 1.0	0.5 max	0.7	1

3.6 Other Factors

Factor F 1.5 — **For ≤ 3 storeys - Maximum value 2.5, otherwise - Maximum value 1.5. No minimum.**

Record rationale for choice of Factor F:

One level, lightwight roof, structural elements tied together

3.7 Performance Achievement Ratio (PAR)
(equals **A x B x C x D x E x F**) 1.5

Table IEP-4: Initial evaluation procedure – Steps 4, 5 and 6

Table IEP- 4 **Initial Evaluation Procedure Steps 4, 5 and 6** **Page ...**

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2; Table IEP - 3 for Step 3)

Building Name	Matura Paper Mill - Original Building	**Ref.**	100
Location	Kana St Matuara	**By**	SJM
		Date	1/05/15

Step 4 - Percentage of New Building Standard (%*NBS*)

	Longitudinal	Transverse
4.1 Assessed Baseline (%*NBS*)$_b$ (from Table IEP - 1)	0.30	0.30
4.2 Performance Achievement Ratio (PAR) (from Table IEP - 2)	1.50	1.50
4.3 PAR x Baseline (%*NBS*)b	0.45	0.45
4.4 Percentage New Building Standard (%*NBS*) (Use lower of two values from Step 3.3)		44.7%

Step 5 - Potentially Earthquake Prone? (Mark as appropriate)	**%NBS > 33**	NO
	%NBS ≤ 33	YES
Step 6 - Potentially Earthquake Risk? (Mark as appropriate)	**%NBS ≥ 67**	NO
	%NBS < 67	YES

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade C

Evaluation Confirmed by... [signature] **Signature**

Stephen Macknight **Name**

141494 **CPEng. No**

Relationship between Seismic Grade and %*NBS*:

Grade:	**A+**	**A**	**B**	**C**	**D**	**E**
%NBS:	**> 100**	**100 to 80**	**80 to 67**	**67 to 33**	**33 to 20**	**< 20**

7 March 2012

File Ref R:DMHS-02-10-01
SOS #1001568

Tim Strange
Taha Fertilisers Industries Limited
SKM, PO Box 10283
Wellington 6143

Dear Tim

Determination of the Status of Ouvea Premix

Thank you for your application to determine if Ouvea Premix is considered to be hazardous and if it is covered by an existing approval under the Hazardous Substances and New Organisms (HSNO) Act 1996.

Based on the information available and the details you have provided, our advice is that Ouvea Premix is considered to be hazardous and will fall into the group standard approval ***Additives, Process Chemicals and Raw Materials (Subsidiary Hazard) Group Standard 2006 [HSNOT Approval Number HSR002503],*** which has an approval under the HSNO Act. A copy of this group standard can be found on the EPA website at http://www.epa.govt.nz/hazardous-substances/about/approvals/group-standards/Pages/default.aspx

If you consider that Ouvea Premix may fit more appropriately into a different group standard, or if you use Ouvea Premix for a different purpose, you may move the product to another group standard providing it fits within the scope of that group standard. You do not need to contact us further in this situation but must ensure that the appropriate conditions are applied. If you need further help regarding which group standard may be applicable, please contact us for advice. In further correspondence with us regarding Ouvea Premix, please be sure to quote our reference number (SOS1001568).

Please also note that although we consider the product, Ouvea Premix to be covered by an existing approval, the constituent components will need their own individual approvals if they are to be separately imported. Therefore, if you are intending to manufacture Ouvea Premix in New Zealand, you will need to ensure that each component has its own approval under the HSNO Act. Your supplier should be able to advise you on this.

For your information, the preliminary hazard classification assigned to Ouvea Premix is 6.3A (skin irritant), 6.4A (eye irritant), 9.1C (aquatic ecotoxicant).

The folloing substances may require notification to the New Zealand Inventory of Chemicals (NZIoC):
Aluminium Carbide, CAS#1299-86-1
Aluminium Nitride CAS#24304-00-5

This advice is provided in good faith and to the best of our ability given the information available.

Note: The 'User Guide to Thresholds and Classifications under the HSNO Act' has been revised (March 2008). An electronic version is available at http://www.epa.govt.nz/Publications/ER-UG-03-2.pdf.

Yours sincerely

Benjamin Sowman
Administration Assistant
Hazardous Substances

Internal Memo

To	Nic Conland	**Date**	24 April 2012
From	Tim Strange	**Project No**	AE04036
Copy			
Subject	**Description of Hazardous Substances Controls for Ouvea Premix**		

1. Introduction

This document describes the controls that need to be in place for Ouvea Premix under the Hazardous Substances and New Organisms Act 1996.

2. HSNO Classification

The Environmental Protection Authority (EPA) has classified Ouvea premix as:

- **6.3A** Skin irritant
- **6.4A** Eye irritant
- **9.1C** Aquatic ecotoxicant

This product has been assigned to the 'Additives, Process Chemicals and Raw Materials (Subsidiary hazard)' group standard **HSR002503.**

A copy of the Status of Substance request and the letter from the EPA providing the classification of this product is provided in **Appendix A** and **B**. It is recommended that a copy of these be retained on file as a record of the classification under the HSNO regime.

3. HSNO Controls

In order to comply with the Hazardous Substances and New Organisms Act 1996, this product must be controlled in the manner that meets the conditions of the 'Additives, Process Chemicals and Raw Materials (Subsidiary hazard) Group Standard 2006, which are set out in Schedule 1 of the Group Standard.

The Group Standard refers to the following regulations and guidance documents:

- Labelling of Hazardous Substances: Hazard and Precautionary Information (July 2006)
- Hazardous Substances (Identification) Regulations 2001
- The Land Transport Rule
- The Civil Aviation Rule
- The Maritime rule
- Hazardous Substances (Emergency Management) Regulations 2001

- Hazardous Substances (Disposal) Regulations 2001
- Site and Storage Conditions for Toxic, Corrosive and Ecotoxic Substances (July 2006)
- UN Model Regulations
- Hazardous Substances (Tank Wagons and Transportable Containers) Regulations 2004
- Workplace Exposure Standards. Occupational Safety and Health Service, Department of Labour, January 2002.

The following sections describe the relevant requirements as of 26 April 2012. However, any amendments to the Group Standard or associated regulations should be monitored in order to determine whether the requirements change.

Currently this product is not classified as a Dangerous Good for transport. Therefore the Land Transport, Civil Aviation and Maritime Transport rules for DGs do not apply.

3.1 Labelling

This substance may not be sold or supplied unless labelled according to these provisions.

3.1.1 Hazard information

1) Label must provide:

- Product name
- Contact details for NZ importer, supplier or manufacturer
- A 24 hour emergency telephone number

2) Label must state “Read label before use’.
3) The label must include the information contained in **Appendix C**. This information has been obtained from the ‘Labelling of Hazardous Substances (hazard and precautionary information)’ document published by ERMA New Zealand (now the EPA):

3.1.2 Small Packages

If this product is contained in small packages (5kg or less) the pictogram in column 3 of Table 1 is not required. Neither are the signal words, hazard or response statements for the 9.1C classification.

3.1.3 Disposal information

The label must describe an appropriate means for disposing of the substance (see Disposal below for what is considered to be appropriate)

3.1.4 Multiple packages

If labelling is obscured by outer packaging, the outer packaging must be labelled as per the Table in Appendix C.

3.1.5 Exporting

If this product is being exported from New Zealand it must be labelled as per the Table in Appendix C.

3.1.6 Bulk Transport

If this product is being transported in bulk it must be labelled as per the Table in Appendix C.

3.2 Approved Handler

Approved handler requirements do not apply to this product.

3.3 Material Safety Data Sheets

The following requirements relate to the Material Safety Data Sheets (MSDSs) for this product:

- When selling or supplying this product a safety data sheet will need to be provided unless one has already been provided to the receiver.
- An MSDS should be carried when transporting this product
- The MSDS must be available in every place of work where this product is being manufactured, stored or used
- The MSDS must be readily available (within 10 minutes) and be easy to understand by any fully trained worker
- If asked the manufacturer or supplier of the premix must provide a MSDS to any person in charge of a place of work where this product is stored or used.

3.3.1 Contents of MSDS

Information on an MSDS must provide the following information in the order listed below:

Identification of the substance and supplier

- Product name
- Recommended uses
- Name of supplier, NZ contact details including emergency contact

Hazards identification

- Describe hazards of the substance, which may include its HSNO hazard classification
- Hazard information, including signal words, hazard statement(s) and precautionary statement(s)

Composition/information on ingredients

- Chemical identity of each hazardous ingredient, their CAS number and their concentration ranges

First aid measures

- First aid instructions according to each relevant route of exposure
- Whether medical attention is required and its urgency
- Information on the most important symptoms and effects, acute and delayed, from exposure

Fire fighting measures

- Information on the appropriate type of extinguishers or fire fighting agents, including extinguishers that may not be appropriate for a particular situation
- Any advice on hazards that may arise from combustion products; and
- Precautions for fire fighters and protective clothing requirements

Accidental release measures

- Advice on protective clothing requirements and emergency procedures
- Any environmental precautions from accidental spills and release
- Advice on how to contain and clean up a spill or release

Handling and storage

- Precautions for safe handling
- Conditions for safe storage, including incompatibilities

Exposure controls/personal protection

- Exposure limits set for the substance or any of its components, or in their absence, relevant overseas exposure limits
- Engineering controls
- Individual protection measures, including PPE

Physical and Chemical Properties

- Description of relevant physical and chemical properties for the substance, including units of measurement and reference conditions where appropriate
- Where necessary for interpretation of data reported, the method of determination

Stability and reactivity

- An indication of the chemical stability of the substance under normal anticipated storage and handling conditions
- List of conditions to avoid to prevent a hazardous situation

- Information on incompatible substances or materials

Toxicological information

- A full description of the tox effects including the symptoms or signs of injury or ill health associated with each likely route of exposure
- The dose, concentration or conditions of exposure likely to cause injury or ill health
- Summary of data used to identify health effects

Ecological information

- Ecotoxicity
- Persistence and degradability
- Mobility

Disposal considerations

- Disposal methods (including packaging)
- Special precautions to be undertaken during disposal
- Any methods of disposal that should not be used

Transport information

- The UN number – **If applicable**
- The proper shipping name – **If applicable**
- UN Dangerous Goods class and subsidiary risk – **If applicable**
- UN Packing Group – **If applicable**

Regulatory info

- HSNO approval number and/or title of the Group Standard
- Info on conditions of the group standard and any other regulatory requirements

Other information

- Date of preparation or revision of the MSDS
- Key/legend to abbreviations an acronyms used

A copy of the MSDS for this product is provided in **Appendix D**.

3.4 Site and Storage

Site storage conditions apply when the quantity of this product at any site exceeds 1000 kg. If this quantity is exceeded the relevant conditions set out in '**Site and Storage Conditions for Toxic, Corrosive and Ecotoxic Substances**' must be complied with.

For this product the current requirements relate to Emergency Response Plans and signage as described below.

3.4.1 Emergency Response Plan

An Emergency Response Plan will need to be prepared, or if there is an existing plan, information regarding this product must be included in it. The requirements of an Emergency Response Plan are described below.

Content of Plan

An emergency response plan must describe all of the reasonably likely emergencies that may arise from the breach or failure of the conditions on substances of the hazard classifications concerned.

For each emergency, the plan must:

a) Describe the actions to be taken to—
   - warn people at the place, and in surrounding areas that may be adversely affected by the emergency, that an emergency has occurred
   - advise those people about the actions they should take to protect themselves
   - help or treat any person injured in the emergency
   - manage the emergency so that its adverse effects are first restricted to the area initially affected, then as soon as practicable reduced in severity, then if reasonably possible eliminated
   - if any of the substances concerned remain, re-establish the conditions imposed on it when it was approved

b) Identify every person with responsibility for undertaking any of the actions described in subclause (a) (or any part of any of those actions) and give information on—
   - how to contact the person
   - any skills the person is required to have
   - any actions that person is expected to take

c) Specify—
   - how to obtain information about the hazardous properties of and means of controlling the substance or substances that may be involved
   - actions to be taken to contact any emergency service provider
   - the purpose and location of each item of equipment or material to be used to manage the emergency

- how to decide which actions to take
- the sequence in which actions should be taken.

Availability of equipment, materials, and people

All equipment and materials described in an Emergency Response Plan, and all responsible people described in an emergency response plan who are on duty, must—

- be present at the location concerned; or
- be available to reach the location of the substance within the times specified in the plan; or
- in the case of a trained person, be available to provide the advice or information specified in the plan within a time specified in the plan.

Availability of plans

An emergency response plan must be available to every person identified in (b) above as being responsible for executing the plan or a specific part of it, and to every emergency service provider identified in it.

Testing plans

An Emergency Response Plan must be tested at least every 12 months; and the test must demonstrate that every procedure or action in the plan is workable and effective. If there is a change to the persons, procedures, or actions specified in an emergency response plan, the plan must be tested within 3 months of the change; and the test must demonstrate that:

- the changed persons can perform their functions under the plan
- each changed procedure or action is workable and effective.

The carrying out and the results of every test must be documented and the documentation must be retained for at least 2 years.

Plan can be part of other management documentation

An Emergency Response Plan can be part of any other management documentation for an emergency whether:

- required by the Hazardous Substances and New Organisms Act 1996 or some other Act, or
- undertaken by a person or organisation for some other reason.

3.4.2 Signage

Duties of persons in charge of places in respect of signage

The person identified as being in charge in the Emergency Response Plan must ensure that appropriate signage is provided. The signage requirements are provided below:

Signage requirements

If this product is located in a building (but not within a specific Hazardous Substance storage room or compartment within that building) there must signage at every vehicular and pedestrian access to the building as well as at every vehicular and pedestrian access to land where the building is located. The signage must:

- state that hazardous substances are present
- describe the general type of hazard
- advise the action to be taken in an emergency

If hazardous substances are located in a particular room or compartment within a building or in an outdoor area signage must be erected at each entrance to the room/compartment or next to the storage area. This signage must:

- state that hazardous substances are present
- describe the general type of hazard of each of them
- advise the action to be taken in an emergency.

3.5 Packaging

When filled and closed packaging:

- Must not leak
- Should maintain its ability to retain contents, if parts are removed and packaging is resealed
- Must not react with the product in a way that weakens the packaging

If packaging has been used to store another substance previously:

- The substances must be compatible
- All practicable steps must be taken to remove all residues from the original substance

When the product is packed in quantities smaller than 400 kg packaging must comply with requirements of Schedule 4 of the Hazardous Substances (Packaging) Regulations 2001. This requires packaging to comply with the following test:

Packaging must withstand the impact at any orientation of a drop of 0.5 m on to a hard surface without losing its ability to retain its contents. If/when tested t must be done using Ouvea premix or another substance similar in physical characteristics (density, viscosity and particle size.

The above tests must be done with the closure mechanism fully closed and, in the case of vented packaging, the vent must be sealed.

3.6 Equipment

People handling this product must wear protective clothing or equipment that is designed to ensure the person:

- does not come into contact with it
- is not exposed to a concentration of the substance that is greater than the work place exposure standard for the substance

This does not apply if the product is packed in closed containers that comply with the packaging requirements specified in **Section 3.5**.

The supervisor of the place of work must ensure that PPE is accompanied by documentation containing information specifying:

- Circumstances in which PPE should be used
- Requirements for maintaining PPE

Equipment used to handle this product must retain the substance, without leaking at all temps and pressures for which the equipment is intended to be used. It must also dispense or apply the substance without leakage at a rate and in a manner that the equipment is designed for.

Equipment must be accompanied by documentation containing information about the use and maintenance of the equipment to enable the equipment to be used and maintained.

3.7 Transportation

This product is not classified as a Dangerous Good for transport, therefore the Land Transport, Civil Aviation and Maritime Transport rules for Dangerous Goods do not apply.

If using Tank Wagons or UN approved transportable containers for transport they must meet the requirements of the Hazardous Substances (Tank Wagons and Transportable Containers) Regulations 2004.

If being carried on a passenger service vehicle the product must:

- Be packed in a sealed container
- Not exceed 5 kg per package

3.8 Disposal

If necessary to dispose of this product, it must be disposed of by:

- Exporting from NZ as waste
- Treating it so that it is no longer a hazardous substance
- Discharging it into the environment in way that has no significant environmental effect

Treating includes depositing it in a landfill, incinerator or sewage facility providing this renders the substance non-hazardous by a means other than dilution, or where the concentration of the substance from the landfill does not exceed any relevant tolerable exposure limit.

3.8.1 Disposal of Packaging

The following requirements apply to packaging:

- Used to contain this product
- That has been in direct contact with it
- That is no longer to be used to contain the substance and is intended for disposal

If packaging is to be disposed of it must

- Be rendered incapable of containing any substance
- Be disposed of in a manner that is consistent with that of the substance it contained

However, packaging may be reused or recycled if:

- It has been treated to remove any residue
- The residue has been rendered non-hazardous

3.9 Exposure Limits

3.9.1 Workplace Exposure Standards

No specific Time Weighted Average (TWA) or Short Term Exposure Limit (STEL) has been assigned to this product. However, the following TWAs are relevant to the ingredients in this product:

- TWA – Aluminium oxide 10 mg/m^3
- TWA – Copper (dust) 1 mg/m^3
- TWA – Silicon 10 mg/m^3
- TWA – Manganese (dust) 1 mg/m^3

- TWA – Beryllium 0.002 mg/m^3

Definitions:

Time-Weighted Average (WES-TWA)

Most WES in New Zealand have a eight-hour TWA, representing a work shift of 8 hours over one day. This means that the value assigned for a WES-TWA should not be exceeded over the period of 8 hours during a working shift.

Short-Term Exposure Limit (WES-STEL)

The 15-minute exposure standard. Applies to any 15-minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply.

Yours sincerely

Tim Strange
Environmental Consultant
Phone: +64 4 914 8466
E-mail: tstrange@globalskm.com

Appendix A Status of Substance Request

Appendix B Status of Substance Decision

Appendix C Hazard and Precautionary Information to be included on labelling for Ouvea premix

Classification	Transport of DG pictogram	GHS Pictogram	Signal Word	Hazard statement code	Precautionary statement codes			
					Prevention	Response	Storage	Disposal
6.3A	NA		Warning	H315 - Causes skin irritation	P264 - Wash hands thoroughly after handling	P302 + P352 - IF ON SKIN: Wash with plenty of soap and water	No storage statements	P501
					P280 - Wear protective gloves	P321 - Specific treatment: use of specific cleansing agent not required.		
						P332 + P313 - If skin irritation occurs: get medical advice/attention		
						P362 - Take off contaminated clothing and wash before re-use		
6.4A	NA	No pictogram	Warning	H319 - Causes serious eye irritation	P264 - Wash eyes thoroughly after handling	P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing.	No storage statements	P501
					P280 – Wear eye/face protection	P337 + P313 - If eye irritation persists; get medical advice/attention		
9.1C	NA	No pictogram	No signal word	H412 - Harmful to aquatic life with long lasting effects	P273 - Avoid release to the environment	No response statements	No storage statements	P501

Note: The classification in the left hand column does not need to be included on the label

Appendix D Draft Material Safety Data Sheet for Ouvea

Hazardous Substance Classification

Material/Product	Classification	Group standard
Ouvea Premix	**6.3A** Skin irritant **6.4A** Eye irritant **9.1C** Aquatic ecotoxicant	**HSR002503** - Additives, Process Chemicals and Raw Materials (Subsidiary hazard)

Taha Corporation should keep on record a copy of the Status of Substance request and the letter from the EPA in response to this request which has confirmed the classification of Ouvea and assigned it to the Group Standard

Controls for the Management of Ouvea Premix

Note: Approved handler requirements do not apply to this ‘product’

This is not classified as a Dangerous Good for Transport, therefore the Land Transport, Civil Aviation and Maritime Transport rules for DGs do not apply.

Labelling

This substance may not be sold or supplied unless labelled according to these provisions.

Hazard information

1) Label must provide:
- Product name: **Ouvea Premix**
- Contact details for NZ importer, supplier or manufacturer: **Taha Fertilizer Industries Limited**
- A 24 hour emergency telephone number: **Taha to advise**

2) Label must state **“Read label before use’.**

3) Label must follow guidelines provided in the table below:

<table>
<tr><th rowspan="2">Classification</th><th rowspan="2">Transport of DG pictogram</th><th rowspan="2">GHS Pictogram</th><th rowspan="2">Signal Word</th><th rowspan="2">Hazard statement code</th><th colspan="4">Precautionary statement codes</th></tr>
<tr><th>Prevention</th><th>Response</th><th>Storage</th><th>Disposal</th></tr>
<tr><td rowspan="4">6.3A</td><td rowspan="4">NA</td><td rowspan="4">see pg 23 of labelling doc</td><td rowspan="4">Warning</td><td rowspan="4">H315 - Causes skin irritation</td><td>P264 - Wash hands thoroughly after handling</td><td>P302 + P352 - IF ON SKIN: Wash with plenty of soap and water</td><td rowspan="4">No storage statements</td><td rowspan="4">P501</td></tr>
<tr><td rowspan="3">P280 - Wear protective gloves</td><td>P321 -</td></tr>
<tr><td>P332 + P313 - If skin irritation occurs: get medical advice/attention</td></tr>
<tr><td>P362 - Take off contaminated clothing and wash before re-use</td></tr>
<tr><td rowspan="2">6.4A</td><td rowspan="2">NA</td><td rowspan="2">No pictogram</td><td rowspan="2">Warning</td><td rowspan="2">H319 - Causes serious eye irritation</td><td>P264 - Wash eyes thoroughly after handling</td><td>P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing.</td><td rowspan="2">No storage statements</td><td rowspan="2">P501</td></tr>
<tr><td>P280 – Wear eye/face protection</td><td>P337 + P313 - If eye irritation persists; get medical advice/attention</td></tr>
<tr><td>9.1C</td><td>NA</td><td>No pictogram</td><td>No signal word</td><td>H412 - Harmful to aquatic life with long lasting effects</td><td>P273 - Avoid release to the environment</td><td>No response statements</td><td>No storage statements</td><td>P501</td></tr>
</table>

Note: a single indication may be acceptable if it is capable of conveying the necessary message.

Note: If ouvea-premix is contained in small packages (5kg or less) the pictogram is not required. Neither is the signal word, hazard or response statements for the 9.1C classification

Disposal information The label must describe an appropriate means for disposing of the substance (see Disposal below for what is considered to be appropriate)
Multiple packages If labelling is obscured by outer packaging, the outer packaging must be labelled as per the guidelines in the table above
Exporting If Ouvea premix is being exported from NZ it must be labelled as per the guidelines in the table above
Bulk Transport The same labelling requirements apply

Safety data sheets

- When selling or supplying Ouvea a safety data sheet will need to be provided unless one has already been provided to the receiver
- An MSDS should also be carried during transport
- The MSDS must be available in every place of work where Ouvea is manufactured, stored or used
- It must be readily available (within 10 minutes) and be easy to understand by any fully trained worker
- If asked the manufacturer or supplier of the premix must provide a MSDS to any person in charge of a place of work where Ouvea is stored or used.

Contents of MSDS

Information on an MSDS must provide the following information in the order listed below:

Identification of the substance and supplier
- Product name
- Recommended uses
- Name of supplier, NZ contact details including emergency contact

Hazards identification
- Describe hazards of the substance, which may include its HSNO hazard classification
- Hazard information, including signal words, hazard statement(s) and precautionary statement(s)

Composition/information on ingredients
- Chemical identity of each hazardous ingredient, their CAS and their concentration ranges

First aid measures
- First aid instructions according to each relevant route of exposure
- Whether medical attention is required and its urgency
- Information on the most important symptoms and effects, acute and delayed, from exposure

Fire fighting measures
- Information on the appropriate type of extinguishers or fire fighting agents, including extinguishers that may not be appropriate for a particular situation
- Any advice on hazards that may arise from combustion products; and
- Precautions for fire fighters and protective clothing requirements

Accidental release measures
- Advice on protective clothing requirements and emergency procedures
- Any environmental precautions from accidental spills and release
- Advice on how to contain and clean up a spill or release

Handling and storage
- Precautions for safe handling
- Conditions for safe storage, including incompatibilities

Exposure controls/personal protection
- Exposure limits set for the substance or any of its components, or in their absence, relevant overseas exposure limits
- Engineering controls
- Individual protection measures, including PPE

Physical and Chemical Properties
- Description of relevant physical and chemical properties for the substance, including units of measurement and reference conditions where appropriate
- Where necessary for interpretation of data reported, the method of determination

Stability and reactivity
- An indication of the chemical stability of the substance under normal anticipated storage and handling conditions
- List of conditions to avoid to prevent a hazardous situation
- Information on incompatible substances or materials

Toxicological information
- A full description of the tox effects including the symptoms or signs of injury or ill health associated with each likely route of exposure
- The dose, concentration or conditions of exposure likely to cause injury or ill health

- Summary of data used to identify health effects

Ecological information
- Ecotoxicity
- Persistence and degradability
- Mobility

Disposal considerations
- Disposal methods (including packaging)
- Special precautions to be undertaken during disposal
- Any methods of disposal that should not be used

Transport information
- The UN number – **If applicable**
- The proper shipping name – **If applicable**
- UN Dangerous Goods class and subsidiary risk – **If applicable**
- UN Packing Group – **If applicable**

Regulatory info
- HSNO approval number and/or title of the Group Standard
- Info on conditions of the group standard and any other regulatory requirements

Other information
- Date of preparation or revision of the MSDS
- Key/legend to abbreviations an acronyms used

Site and Storage

Site storage conditions apply when the quantities at any site exceed 1000 kg.

Emergency Response Plan
Any place storing greater than 1000kg of Ouvea premix must have an Emergency Response Plan relating to all of the hazardous substances held in it.

Content of Plan
An emergency response plan must describe all of the reasonably likely emergencies that may arise from the breach or failure of the conditions on substances of the hazard classifications concerned.

For each emergency, the plan must:

A. Describe the actions to be taken to—
   I. warn people at the place, and in surrounding areas that may be adversely
   II. affected by the emergency, that an emergency has occurred; and
   III. advise those people about the actions they should take to protect
   IV. themselves; and
   V. help or treat any person injured in the emergency; and
   VI. manage the emergency so that its adverse effects are first restricted to the
   VII. area initially affected, then as soon as practicable reduced in severity, then
   VIII. if reasonably possible eliminated; and
   IX. if any of the substances concerned remain, re-establish the conditions
   X. imposed on it when it was approved; and

B. Identify every person with responsibility for undertaking any of the actions described in subclause (A) (or any part of any of those actions) and give information on—
   I. how to contact the person; and
   II. any skills the person is required to have; and
   III. any actions that person is expected to take; and

C. Specify—
   I. how to obtain information about the hazardous properties of and means of
   II. controlling the substance or substances that may be involved; and
   III. actions to be taken to contact any emergency service provider; and
   IV. the purpose and location of each item of equipment or material to be used to manage the emergency; and
   V. how to decide which actions to take; and
   VI. the sequence in which actions should be taken.

Availability of equipment, materials, and people
All equipment and materials described in an emergency response plan, and all responsible people described in an emergency response plan who are on duty, must—

1) be present at the location concerned; or
2) be available to reach the location of the substance within the times specified in
3) the plan; or
4) in the case of a trained person, be available to provide the advice or information
5) specified in the plan within a time specified in the plan.

Availability of plans
(1) An emergency response plan must be available to every person identified in (B) above as being responsible for executing the plan or a specific part of it, and to every emergency service provider identified in it.

Testing plans
(1) An emergency response plan must be tested at least every 12 months; and the test must demonstrate that every procedure or action in the plan is workable and effective.
(2) If there is a change to the persons, procedures, or actions specified in an emergency response plan, the plan must be tested within 3 months of the change; and the test must demonstrate that—
(a) the changed persons can perform their functions under the plan; and
(b) each changed procedure or action is workable and effective.

(3) The carrying out and the results of every test must be documented; and the documentation must be retained for at least 2 years.

Plan can be part of other management documentation
An emergency response plan can be part of any other management documentation for an emergency whether—
(a) required by the Hazardous Substances and New Organisms Act 1996 or some
other Act; or
(b) undertaken by a person or organisation for some other reason.

Duties of persons in charge of places in respect of signage
The person identified as being in charge must ensure that appropriate signage is provided;

Signage requirements
(1) If Ouvea premix is located in a building (but not a particular room or compartment within it, there must be positioned at every vehicular and pedestrian access to the building, and every vehicular and pedestrian access to land where the building is located, signage
that—
(a) states that hazardous substances are present; and
(b) describes the general type of hazard of each of them; and
(c) advises the action to be taken in an emergency.
(2) If hazardous substances are located in a particular room or compartment within a building, there must be positioned at each entrance to the room or compartment signage complying with subclause (4).
(3) If hazardous substances are located in an outdoor area, there must be positioned immediately next to that area signage complying with subclause (4).
(4) Signage required by subclauses (2) or (3) must—
(a) state that hazardous substances are present; and
(b) describe the general type of hazard of each of them; and
(c) advise the action to be taken in an emergency.

Packaging

Packaging - When filled and closed: ▪ Must not leak ▪ Should maintain its ability to retain contents, if parts are removed and packaging is resealed ▪ Must not react with a substance in a way that weakens the packaging
If packaging has been used to store another substance: ▪ The substances must be compatible ▪ All practicable steps must be taken to remove all residues from the original substance
When substance is packed in quantities smaller than 400 kg packaging must comply with requirements of Schedule 4 of the Hazardous Substances (Packaging) Regulations 2001. This requires packaging to comply with the following test: Packaging must withstand the impact at any orientation of a drop of 0.5 m on to a hard surface without losing its ability to retain its contents. If/when tested t must be done using Ouvea premix or another substance similar in physical characteristics (density, viscosity and particle size. The above tests must be done with the closure mechanism fully closed and, in the case of vented packaging, the vent must be sealed.

Equipment

People handling Ouvea must wear protective clothing or equipment that is designed to ensure the person: ▪ does not come into contact with it ▪ is not exposed to a concentration of the substance that is greater than the work place exposure standard for the substance Note: This does not apply if Ouvea is packed in closed containers that comply with the packaging requirements The supervisor of the place of work must ensure that PPE is accompanied by documentation containing information specifying: ▪ Circumstances in which PPE should be used ▪ Requirements for maintaining PPE
Equipment to handle Ouvea ▪ Equipment used to handle Ouvea must retain the substance, without leaking at all temps and pressures for which equipment is intended to be used, and ▪ Dispense or apply the substance without leakage at a rate and in a manner that the equipment is designed for ▪ Equipment must be accompanied by documentation containing information about the use and maintenance of the equipment to enable the equipment to be used and maintained.

Transportation

Tanks wagons and transportable containers If using Tank Wagons or UN approved transportable containers they must meet the requirements of the Hazardous Substances (Tank Wagons and Transportable Containers) Regulations 2004
Passenger service vehicle restrictions When carried on a passenger service vehicle the substance must: ▪ Be packed in a sealed container ▪ Not exceed 5 kg per package

Disposal

If necessary to dispose of Ouvea, it must be disposed of by: ▪ Exporting from NZ as waste ▪ Treating it so that it is no longer a hazardous substance ▪ Discharging it into the environment in way that has no significant environmental effect

Note:

- Treating includes depositing it in a landfill, incinerator or sewage facility providing this renders the substance non-hazardous by a means other than dilution, or
- The concentration of the substance from the landfill does not exceed any relevant tolerable exposure limit

Disposal of Packaging

Applies to packaging used to:

- Contain Ouvea premix
- Was in direct contact with it
- Is no longer to be used to contain the substance and is intended for disposal

Packaging must:

- Be rendered incapable of containing any substance
- Be disposed of in a manner that is consistent with that of the substance it contained

Packaging may be reused or recycled if:

- It has been treated to remove any residue
- The residue has been rendered non-hazardous

Exposure Limits

Workplace Exposure Standards

No specific TWAs or STELs have been assigned to this product. However, the following TWAs are relevant as they relate to components of Ouvea premix:

- TWA – Aluminium oxide 10 mg/m^3
- TWA – Copper (dust) 1 mg/m^3
- TWA – Silicon 10 mg/m^3
- TWA – Manganese (dust) 1 mg/m^3
- TWA – Beryllium 0.002 mg/m^3

SITE PLAN
SCALE 1:500 (A1)

SITE DETAILS

SITE 1 AREA - 8094 m2
LEGAL DESCRIPTION SECTION 5 BLOCK XVI TOWN OF MATAURA BRIDGE
(CT SL41/253)

SITE 2 AREA - 16837 m2
LEGAL DESCRIPTION SECTION 4 BLOCK XVI ,TOWN OF MATAURA BRIDGE
CLOSED RD BLOCK I , TOWN OF MATAURA BRIDGE
PART SECTION 11 BLOCK I TOWN OF MATAURA BRIDGE
LOT 1 & PART LOT 2, DP 147
(CT SL81/35)

SITE 3 AREA - 663 m2
LEGAL DESCRIPTION PART SECTION 11 BLOCK I TOWN OF MATAURA BRIDGE
(CT SL48/22)

SITE 4 AREA - 1366 m2
LEGAL DESCRIPTION SECTION 10 & PART SECTION 11 BLOCK I TOWN OF
MATAURA BRIDGE
(CT SL41/253)

SITE 5 AREA - 582 m2
LEGAL DESCRIPTION SECTION 12 BLOCK I TOWN OF MATAURA BRIDGE
(CT SL238/98)

SITE 6 AREA - 2008 m2
LEGAL DESCRIPTION SECTION 7 & 8 BLOCK I TOWN OF MATAURA BRIDGE
(CT SL7/126)

APPLICANT TAHA ASIA PACIFIC INDUSTRIES LTD
ADDRESS 109 & 116-130 KANA STREET, MATAURA

KEY:
SITE BOUNDARY
BUILDING PERIMETER

NOTE : BOUNDARY DIMENSIONS APPROXIMATE ONLY

APPROVAL ISSUE

REV	DATE	DRAWN	REV'D	APP'D	REVISION
C	09-03-15	DCC	TD	NC	SITE LAYOUT PLAN SHOWING HAZARDOUS STORAGE ONLY
B	23-09-14	DCC	TD	NC	APPROVAL ISSUE
A	16-08-14	DCC	TD		CLIENT REVIEW ISSUE

DRAWING NUMBER	REFERENCE DRAWING TITLE

JACOBS
Level 3
86 Customhouse Quay
WELLINGTON 6011
NEW ZEALAND
Tel: +64 4 473 4265
Fax: +64 4 473 3369
Web: www.jacobs.com

CLIENT TAHA ASIA PACIFIC LIMITED
PROJECT LAND USE CONSENTS
FOR THE STORAGE OF HAZARDOUS SUBSTANCES

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
DCC	TD	NC	NC
DESIGNED TD	DESIGN REVIEW NC	DATE 23-09-2014	DATE 23-09-2014

TITLE
MATAURA
KANA STREET SITE PLAN

SCALE 1:500
DRAWING No AE04729-NEP-DG-0002
REV C

A1

DATE: 9/03/2015 1:41:35 PM LOGIN NAME: CONNON, DAVID C
LOCATION: I:\AENV\WProjects\AE04729\Deliverables (issued)\Drawings\AE04729-NEP-DG-0002.dwg

MATERIAL SAFETY DATA SHEET

Ouvea Premix Date: 12 August 2013

PRODUCT AND COMPANY INFORMATION

PRODUCT NAME:	Ouvea Premix
DESCRIPTION:	Solid grey powder
PRODUCT USE:	Ingredient in the preparation of mineral fertiliser
SUPPLIER::	Taha Fertilizer Industries Limited
CONTACT INFORMATION:	Telephone: 03 218 1002; Address: 162b Bond Row, Invercargill, New Zealand
EMERGENCY PHONE:	

HAZARD IDENTIFICATION

DANGEROUS GOODS		Not applicable
HSNO CLASSIFICATION	**6.3A**	**Skin irritant.**
	6.4A	**Eye irritant.**
	9.1C	**Aquatic ecotoxicant**
SIGNAL WORDS:		**WARNING**
HAZARD STATEMENT:	H315	Causes skin irritation.
	H320	Causes eye irritation.
	H412	Harmful to aquatic life with long lasting effects.
PREVENTION STATEMENTS:	P264	Wash hands and eyes thoroughly after handling.
	P280	Wear protective gloves.
	P273	Avoid release to the environment.
RESPONSE STATEMENTS:	P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
	P321	Specific treatment: use of specific cleansing agent not required.
	P332 + P313	If skin irritation occurs: get medical advice/attention.
	P362	Take off contaminated clothing and wash before re-use.
	P305 + P351	IF IN EYES: Rinse cautiously with water for several minutes.
	P338	Remove contact lenses, if present and easy to do so. Continue rinsing.
	P337 + P313	If eye irritation persists; get medical advice/attention.

COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS No.	Concentration (%)
Aluminium oxide (Al_2O_3)	1344-28-1	25-50
Aluminium nitride (AlN)	24304-00-5	25-40
Magnesium Aluminate ($MgAl_2O_4$)	12068-51-8	5-30
Cryolite (Na_3AlF_6)	7429-90-5	2-4
Aluminium (Al)	7429-90-5	2-4
Sodium aluminate ($NaAl_{11}O_{17}$)	1302-42-7	2-5
Potassium Fluoride (KF)	7789-23-3	<1
Potassium Chloride (KCl)	7447-40-7	<1
Fluorite (CaF_2)	7789-75-5	<1
Quartz (SiO_2)	14808-60-7	<1

FIRST AID MEASURES

SKIN CONTACT:	Quickly remove contaminated clothing and wash before re-use. Wash skin with plenty of soap and water. Seek medical attention if irritation persists.
EYE CONTACT:	Remove contact lenses if present. Cautiously rinse eye with gently running water for 15 minutes. Do not rub the eye. Seek medical attention if eye irritation persists.
INHALATION:	If inhaled, remove to fresh air.

INGESTION:	Rinse mouth. Do NOT induce vomiting. Seek medical attention.

FIRE FIGHTING MEASURES

HAZARDS:	Non-flammable.
EXTINGUISHING MEDIA:	Water fog, foam, Carbon dioxide or dry chemical.
PROTECTIVE CLOTHING:	Wear protective gloves.
OTHER INFORMATION:	Do not allow washings to reach aquatic environment.

ACCIDENTAL RELEASE MEASURES

SPILL CLEAN UP METHOD:	Contain and recover. Use appropriate tools to put the spilled solid in a convenient waste disposal container. Avoid contamination of waterways. If material does enter waterways contact the local authority.
PROTECTIVE CLOTHING:	Wear protective gloves.

HANDLING AND STORAGE

HANDLING:	Wear gloves. Avoid contact with the skin and eyes Ecotoxic in the environment, avoid loss into waterways.
STORAGE:	Keep containers tightly closed.

EXPOSURE CONTROL/PERSONAL PROTECTION

ENGINEERING CONTROLS:	Handle in well ventilated area
PERSONAL PROTECTION:	Wear gloves.
EXPOSURE LIMITS:	No exposure limits have been specifically assigned to this product. Exposure limits for individual constituents are provided below: TWA – Aluminium oxide 10 mg/m^3 TWA – Aluminium nitride 2 mg/m^3 (as Al) TWA – Cryolite 2.5 mg/m^3 (as F) TWA – Aluminium 5 mg/m^3 (resp) STEL – Sodium aluminate 2 mg/m^3 TWA – Potassium Chloride 3 mg/m^3 TWA – Potassium Fluoride 2.5 mg/m^3 (as F) TWA – Fluorite 2.5 mg/m^3 (as F) TWA – Quartz 10 mg/m^3

PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Solid (grey powder)
pH:	Not applicable
SOLUBILITY:	Negligible
BOILING POINT:	2980°C
MELTING POINT:	2072°C

STABILITY AND REACTIVITY

STABILITY:	Stable, will not polymerise
REACTIVITY:	Reactive with acids

TOXICOLOGICAL INFORMATION

SKIN CONTACT:	May cause skin irritation
EYE CONTACT:	May cause eye irritation

ECOLOGICAL INFORMATION

Ecotoxic in the environment. Avoid loss into waterways.

DISPOSAL CONSIDERATIONS

CONTAINER DISPOSAL:	Dispose of empty containers safely. Avoid contamination of any water supply with product or empty container.
PRODUCT DISPOSAL:	Dispose of product safely. Avoid contamination of any water supply with product or empty

	container.

TRANSPORT INFORMATION

UN NUMBER:	Not applicable
PROPER SHIPPING NAME:	Not applicable
DANGEROUS GOODS CLASS	Not applicable
PACKING GROUP:	Not applicable

NZ REGULATORY INFORMATION

HSNO APPROVAL NUMBER:	HSR002503
GROUP STANDARD:	Additives, Process Chemicals and Raw Materials (Subsidiary hazard)
HSNO CLASSIFICATIONS:	6.3A Skin irritant
	6.4A Eye irritant
	9.1C Aquatic ecotoxicant
HSNO CONTROLS:	Approved handler requirements: Not applicable

OTHER INFORMATION

ISSUE DATE:	12 August 2013
DEFINITIONS:	TWA – Time Weighted Average (The 8 hour time-weighted average exposure standard designed to protect the worker from the effects of long term exposure)
	STEL – Short Term Exposure Limit (The acceptable average exposure over a short period of time, usually 15 minutes)

GHSNOTICE

Chemwatch 4803-37

Company Contact No. 0800 2436 2255

SULFATE OF AMMONIA

INGREDIENTS	CAS No	%	TWA
ammonium sulfate	7783-20-2	95	

NOT REGULATED UNDER UN CODE
FOR TRANSPORT OF DANGEROUS GOODS

PROPERTIES

Solid.
Mixes with water.

HAZARD PHRASES

WARNING
Determined by Chemwatch using GHS/HSNO criteria:
6.1D 6.3A 6.4A 9.1C
May cause respiratory irritation
Harmful if swallowed
Causes skin irritation
Causes serious eye irritation
Harmful to aquatic life

FIRST AID

POISONS INFORMATION CENTRE (0800 764 766)
Swallowed:
Give water (if conscious). Seek medical advice.
Eye:
Wash with running water.
Skin:
Remove contaminated clothing. Wash with water and soap.
Inhaled:
Fresh air. Rest, keep warm. If breathing shallow, give oxygen. Medical attention.

PRECAUTIONS FOR USE

Engineering Controls:
General Exhaust Ventilation adequate.
Glasses:
Chemical goggles.
Gloves:
PVC chemical resistant type.
Respirator:
Particulate
Flammability:
Does not burn.

SAFE HANDLING INFORMATION

Storage & Transport:
Store in cool, dry, protected area.
Spills & Disposal:
Avoid dust.
Sweep/shovel to safe place.
To clean the floor and all objects contaminated by this material, use water.
Fire/Explosion Hazard:
Toxic smoke/fumes in a fire.
Fire Fighting:
Keep surrounding area cool. Water spray/fog.

ADVICE TO DOCTOR

Treat symptomatically.

Material Safety Data Sheet

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

Material Name	:	**Shell Diesel**
Recommended Uses	:	Fuel for on-road diesel-powered engines.
Product Code	:	002D1791
Manufacturer/Supplier	:	**The Shell Company of Australia Limited** (ABN 46 004 610 459) 8 Redfern Road Hawthorn East Victoria 3123 Australia
Telephone	:	+61 (0)3 9666 5444
Fax	:	+61 (0)3 8823 4800
Emergency Telephone Number	:	1800 651 818 (within Australia only) +61 3 9663 2130 (International)

2. HAZARDS IDENTIFICATION

HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.
Classified as hazardous according to the criteria of NOHSC, and not classified as Dangerous Goods according to the Australian Dangerous Goods Code.

Symbol(s)	:	Xn Harmful. N Dangerous for the environment.
R-phrase(s)	:	R40 Limited evidence of carcinogenic effect. R65 Harmful: may cause lung damage if swallowed. R66 Repeated exposure may cause skin dryness or cracking. R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S-phrase(s)	:	S2 Keep out of the reach of children. S36/37 Wear suitable protective clothing and gloves. S61 Avoid release to the environment. Refer to special instructions/Safety data sheets. S62 If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.
Health Hazards	:	Slightly irritating to respiratory system. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache and nausea. May cause moderate irritation to skin. Repeated exposure may cause skin dryness or cracking. Harmful: may cause lung damage if swallowed. Limited evidence of carcinogenic effect.
Signs and Symptoms	:	If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance.

Material Safety Data Sheet

Safety Hazards : May ignite on surfaces at temperatures above auto-ignition temperature. Vapour in the headspace of tanks and containers may ignite and explode at temperatures exceeding auto-ignition temperature, where vapour concentrations are within the flammability range. Not classified as flammable but will burn. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire.

Environmental Hazards : Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Additional Information : This product is intended for use in closed systems only.

SUSDP Schedule : Not scheduled. When packed in containers having capacity of greater than 20 litres.

SUSDP Schedule S5. When packed in containers having capacity of less than 20 litres.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Preparation description : Complex mixture of hydrocarbons consisting of paraffins, cycloparaffins, aromatic and olefinic hydrocarbons with carbon numbers predominantly in the C9 to C25 range. May also contain several additives at <0.1% v/v each. May contain cetane improver (Ethyl Hexyl Nitrate) at <0.2% v/v.
May contain catalytically cracked oils in which polycyclic aromatic compounds, mainly 3-ring but some 4- to 6-ring species are present.

Hazardous Components

Chemical Identity	CAS	EINECS	Symbol(s)	R-phrase(s)	Conc.
Fuels, diesel, no.2	68476-34-6	270-676-1	Xn, N	R40; R65; R66; R51/53	< 100.00 %

Additional Information : Dyes and markers can be used to indicate tax status and prevent fraud.
Refer to chapter 16 for full text of EC R-phrases.

4. FIRST AID MEASURES

Inhalation : Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.

Skin Contact : Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye Contact : Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.

Ingestion : If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (37° C), shortness of breath, chest

		congestion or continued coughing or wheezing.
Advice to Physician	:	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Specific Hazards	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Oxides of sulphur. Unidentified organic and inorganic compounds. Carbon monoxide may be evolved if incomplete combustion occurs. Will float and can be reignited on surface water. Flammable vapours may be present even at temperatures below the flash point.
Suitable Extinguishing Media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media	:	Do not use water in a jet.
Protective Equipment for Firefighters	:	Wear full protective clothing and self-contained breathing apparatus.
Additional Advice	:	Keep adjacent containers cool by spraying with water.

6. ACCIDENTAL RELEASE MEASURES

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal. Observe all relevant local and international regulations. Evacuate the area of all non-essential personnel. Ventilate contaminated area thoroughly.

Protective measures	:	Do not breathe fumes, vapour. Do not operate electrical equipment. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.
Clean Up Methods	:	For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. Shovel into a suitable clearly marked container for disposal or reclamation in accordance with local regulations.

Additional Advice : Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26.

7. HANDLING AND STORAGE

General Precautions : Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Air-dry contaminated clothing in a well-ventilated area before laundering. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Never siphon by mouth. Contaminated leather articles including shoes cannot be decontaminated and should be destroyed to prevent reuse. For comprehensive advice on handling, product transfer, storage and tank cleaning refer to the product supplier.
Maintenance and Fuelling Activities - Avoid inhalation of vapours and contact with skin.
Classified as a C1 (COMBUSTIBLE LIQUID) for the purpose of storage and handling, in accordance with the requirements of AS 1940. Refer to State Regulations for storage and transport requirements. AS 1940:2004 The storage and handling of flammable and combustible liquids.

Handling : Avoid inhaling vapour and/or mists. Avoid prolonged or repeated contact with skin. When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Earth all equipment. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. The vapour is heavier than air, spreads along the ground and distant ignition is possible.

Storage : Drum and small container storage: Drums should be stacked to a maximum of 3 high. Use properly labelled and closeable containers. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other sources of ignition. Must be stored in a diked (bunded) well-ventilated area, away from sunlight, ignition sources and other sources of heat. Vapours from tanks should not be released to atmosphere. Breathing losses during storage should be controlled by a suitable vapour treatment system. The vapour is heavier than air. Beware of accumulation in pits and confined spaces.
Keep in a bunded area with a sealed (low permeability) floor, to provide containment against spillage. Prevent ingress of water.

Product Transfer : Avoid splash filling. Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes. Keep containers closed when not in use. Do not use compressed air for filling, discharging or handling. Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.

Recommended Materials : For containers, or container linings use mild steel, stainless steel. Aluminium may also be used for applications where it does not present an unnecessary fire hazard. Examples of suitable materials are: high density polyethylene (HDPE) and Viton (FKM), which have been specifically tested for compatibility with this product. For container linings, use amine-adduct cured epoxy paint. For seals and gaskets use: graphite, PTFE, Viton A, Viton B.

Unsuitable Materials : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), nitrile rubber (NBR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyvinyl chloride (PVC), polyisobutylene.; However, some may be suitable for glove materials.

Container Advice : Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers.

Additional Information : Ensure that all local regulations regarding handling and storage facilities are followed.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

Naphthalene	AU OEL	TWA	10 ppm	52 mg/m3	
	AU OEL	STEL	15 ppm	79 mg/m3	
Oil mist, mineral	AU OEL	TWA [Mist.]		5 mg/m3	

Additional Information : In the absence of a national exposure limit, the American Conference of Governmental Industrial Hygienists (ACGIH) recommends the following values for Diesel Fuel: TWA - 100 mg/m3 Critical effects based on Skin and Irritation.

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended. Eye washes and showers for emergency use.

Personal Protective Equipment	:	Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers. AS/NZS 1337: Eye protectors for industrial applications. AS/NZS 2161: Occupational protective gloves - Selection, use and maintenance. AS/NZS 1715: Selection, use and maintenance of respiratory protective devices. AS/NZS 1716: Respiratory protective devices.
Respiratory Protection	:	If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. All respiratory protection equipment and use must be in accordance with local regulations.
Hand Protection	:	Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Select gloves tested to a relevant standard (e.g. Europe EN374, US F739). When prolonged or frequent repeated contact occurs, Nitrile gloves may be suitable. (Breakthrough time of > 240 minutes.) For incidental contact/splash protection Neoprene, PVC gloves may be suitable.
Eye Protection	:	Chemical splash goggles (chemical monogoggles). Approved to EU Standard EN166.
Protective Clothing	:	Chemical resistant gloves/gauntlets, boots, and apron (where risk of splashing).
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Environmental Exposure Controls	:	Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Yellow. Pale straw. Colourless. Liquid.
Odour	:	May contain a reodorant
pH	:	Data not available
Initial Boiling Point and Boiling Range	:	170 - 390 °C / 338 - 734 °F
Freezing/melting point	:	Data not available
Flash point	:	Typical 63 °C / 145 °F (ASTM D-93 / PMCC)
Lower / upper Flammability	:	1 - 6 %(V)

or Explosion limits		
Auto-ignition temperature	:	> 220 °C / 428 °F
Vapour pressure	:	< 1 hPa at 20 °C / 68 °F
Specific gravity	:	Data not available
Density	:	Typical 0.84 g/cm3 at 15 °C / 59 °F
Solubility in other solvents	:	Data not available
n-octanol/water partition coefficient (log Pow)	:	3 - 6
Kinematic viscosity	:	2 - 4.5 mm2/s at 40 °C / 104 °F
Vapour density (air=1)	:	Data not available

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions of use.
Conditions to Avoid	:	Avoid heat, sparks, open flames and other ignition sources.
Materials to Avoid	:	Strong oxidising agents.
Hazardous Decomposition Products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

11. TOXICOLOGICAL INFORMATION

Basis for Assessment	:	Information given is based on product data, a knowledge of the components and the toxicology of similar products.
Acute Oral Toxicity	:	Low toxicity:LD50 >2000 mg/kg, Rat Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.
Acute Dermal Toxicity	:	Low toxicity:LD50 >2000 mg/kg, Rabbit
Acute Inhalation Toxicity	:	Low toxicity: LC50 >5 mg/l / 4 h, Rat High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.
Skin Irritation	:	May cause moderate skin irritation (but insufficient to classify). Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis.
Eye Irritation	:	Slightly irritating.
Respiratory Irritation	:	Slightly irritating.
Sensitisation	:	Not a skin sensitiser.
Repeated Dose Toxicity	:	Kidney: caused kidney effects in male rats which are not considered relevant to humans
Mutagenicity	:	In-vitro mutagenicity studies show that mutagenic activity is related to 4-6 ring polycyclic aromatic content.
Carcinogenicity	:	Limited evidence of carcinogenic effect. Repeated skin contact has resulted in irritation and skin cancer in animals.
Reproductive and Developmental Toxicity	:	Not expected to be a developmental toxicant.

12. ECOLOGICAL INFORMATION

Information given is based on a knowledge of the components and the ecotoxicology of similar products. Fuels are typically made from blending several refinery streams. Ecotoxicological studies have been carried out on a variety of hydrocarbon blends and streams but not those containing additives.

Acute Toxicity : Toxic:LL/EL/IL50 1-10 mg/l(to aquatic organisms)(LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract).

Mobility : Floats on water. Partly evaporates from water or soil surfaces, but a significant proportion will remain after one day. Large volumes may penetrate soil and could contaminate groundwater. Contains volatile constituents.

Persistence/degradability : Major constituents are inherently biodegradable. The volatile constituents will oxidize rapidly by photochemical reactions in air.

Bioaccumulation : Contains constituents with the potential to bioaccumulate.

Other Adverse Effects : Films formed on water may affect oxygen transfer and damage organisms.

13. DISPOSAL CONSIDERATIONS

Material Disposal : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination. Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Container Disposal : Send to drum recoverer or metal reclaimer. Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums. Do not pollute the soil, water or environment with the waste container. Comply with any local recovery or waste disposal regulations.

Local Legislation : Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be complied with.

14. TRANSPORT INFORMATION

ADG

Material Safety Data Sheet

This material is not classified as dangerous according to the Australian Dangerous Goods Code.

IMDG

Identification number	UN 3082
Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical name	(Gas oil - unspecified)
Class / Division	9
Packing group	III
Marine pollutant:	Yes

IATA (Country variations may apply)

UN No.	:	3082
Proper shipping name	:	Environmentally hazardous substance, liquid, n.o.s.
Technical name	:	(Gas oil - unspecified)
Class / Division	:	9
Packing group	:	III
Additional Information	:	Not classified under ADG 07 regulations as special provision AU 02 applies

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

SUSDP Schedule : Not scheduled. When packed in containers having capacity of greater than 20 litres.

S5. When packed in containers having capacity of less than 20 litres.

AICS : All components are listed or exempt

Classification triggering components : Contains fuels, diesel.

Other Information : National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011] List of Designated Hazardous Substances [NOHSC:10005]. Approved Criteria for Classifying Hazardous Substances [NOHSC:1008]. Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003]. Australian Dangerous Goods Code. Standard Uniform Scheduling of Drugs and Poisons.

16. OTHER INFORMATION

Additional Information : This document contains important information to ensure the safe storage, handling and use of this product. The information

Material Safety Data Sheet

in this document should be brought to the attention of the person in your organisation responsible for advising on safety matters.

R-phrase(s)

R40	Limited evidence of carcinogenic effect.
R51/53	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R65	Harmful: may cause lung damage if swallowed.
R66	Repeated exposure may cause skin dryness or cracking.

MSDS Version Number : 1.0

MSDS Effective Date : 12.04.2010

MSDS Revisions : A vertical bar (|) in the left margin indicates an amendment from the previous version.

MSDS Regulation :

Uses and Restrictions : This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the supplier.
This product is not to be used as a solvent or cleaning agent; for lighting or brightening fires; as a skin cleanser.

MSDS Distribution : The information in this document should be made available to all who may handle the product.

Disclaimer : This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Memorandum

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Date	28 April 2015
To	Bruce Clarke
From	C Bender
Subject	**Ouvea Premix Bench Test**

1. Introduction

Taha Fertiliser Industries Ltd (Taha) currently maintains a facility for the storage of bulk mineral fertiliser precursor which is obtained as a by-product of aluminium smelting operations at Tiwai Point. The material, Ouvea Premix, is derived from aluminium dross produced from the smelter, in which the dross is milled to obtain a consistent particle size, and then processed by a series of Eddy Separators to remove aluminium metal from the material. The resulting product consists primarily of aluminium oxides, and also has a significant amount (20-40% by weight) of aluminium nitride (AlN). AlN reacts with water over time to produce aluminium oxides and ammonia. Due to the significant nitrogen content of the material, and the slow release of nitrogen as ammonia, the premix has value as a fertiliser.

Taha is has developed a process to stabilisation and blending process to manufacture a variety of fertiliser blends using Ouvea Premix as a base material, and is currently in the process of developing a site for this purpose. In the meantime, the Ouvea Premix is being stored at a site in Mataura pending start-up of a purpose-built fertiliser manufacturing facility. Concern has been raised in regard to the storage of large amounts of Ouvea Premix at the Mataura site. In particular, the potential for the building to be inundated with water in the event of a major flood has raised concern that the Ouvea Premix will react with flood waters and potentially produce large volumes of ammonia gas.

In theory, the reaction of the Ouvea Premix with water produces ammonia at a slow rate, over a period of days to years depending on conditions such as temperature, availability of water, and mechanical processes. Furthermore any ammonia produced from the hydrolysis of AlN would remain in the aqueous phase rather than being emitted to air.

This bench test has been designed to test these assumptions by simulating the inundation of the Ouvea Premix stored at Taha's Mataura site and measuring emissions of ammonia resulting from reaction of Ouvea Premix with water.

2. Methodology

To simulate the exposure of Ouvea Premix to water in the event of a flood, measured samples of Ouvea Premix were added to glass reaction vessels sealable with rubber stoppers. A measured volume of water was added to each vessel, and meaurements of ammonia in the headspace of the vessels were obtained at regular intervals using Gastec colorimetric tubes. The pH of the water was also measured to give an indication of ammonia discharges into the aqueous phase.

The experiment was designed to simulate two separate scenarios. One reaction vessel contained Ouvea Premix in ziplock bags to simulate the immersion of bags of Ouvea Premix as stored on-site in water during an extreme flood event. The bags were punctured with small holes to simulate tears or other leaks in the bags which would result in water entry.

The second reaction vessel was designed to simulate a worst-case exposure of Ouvea Premix in the event of an extreme flood event. For this scenario, the Ouvea Premix was not bagged, and was placed loose in the vessel to provide maximum exposure to water.

Both reaction vessels contained 500 g of Ouvea Premix, to which was added 1200 mL of purified water. Ammonia gas was measured in the headspace of the reaction vessels prior to the addition of water, and at regular intervals following the addition of water, using Gastec tubes. The pH of the water in the vessels was also measured at these intervals to provide an indication of ammonia being produced and dissolved in solution. A third test scenario consisted of solely purified water as a blank.

Figure 1 shows the blank, and the two reaction vessels with the bagged and loose Ouvea Premix. Figure 2 shows the pH measurement of the samples shortly after the addition of water to the vessels.

Figure 1 Bench Test Setup Showing Three Samples

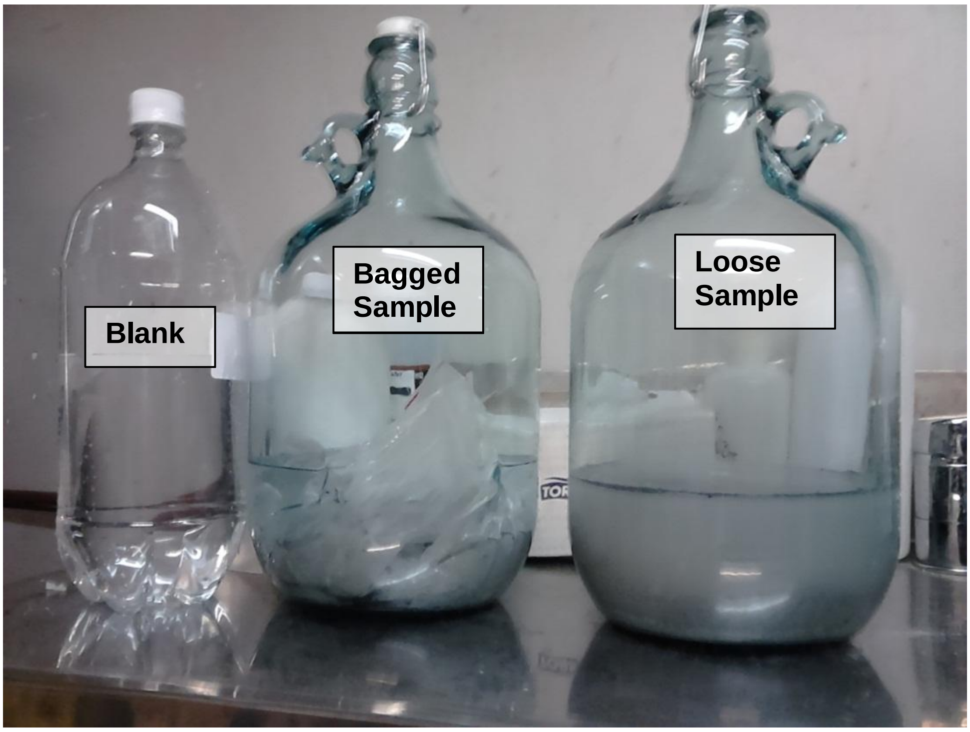


Figure 2 Measurement of pH and Temperature in Reaction Vessel

3. Results

Table 1 provides the data collected during the bench test which began at 10:45 a.m. on 15 April 2015 and ended at 12:45 on 17 April. Gastec readings for ammonia in the vessel headspace prior to the addition of water to the Ouvea Premix indicated the presence of ammonia, either from reaction with moisture already in the material or with moisture in the ambient air. However with the addition of water at t=0, the ammonia readings were zero for all three vessels.

The blank sample had a constant pH of around 6.5 to 7 throughout the experiment, and no ammonia at measurable levels, as would be expected. The vessels containing Ouvea Premix showed gradually increasing pH measurements and ammonia concentrations over time, with the loose sample showing a greater rate of increase.

Table 1 Ouvea Premix Bench Test Readings

Time	Blank		Bagged sample		Loose sample	
	pH	NH_3 (ppm)	pH	NH_3 (ppm)	pH	NH_3 (ppm)
Prior to addition of water	n/a	0	n/a	5	n/a	18
1 minute	6.5	0	6.5	0	6.5	0
15 minutes	6.4	0	6.5	0	8.1	0
1 hour	6.5	0	6.5	0	8.5	0
2 hours	6.5	0	7.8	0	9.1	0
3 hours	6.5	0	8.1	0	9.2	0
4 hours	6.6	0	8	0	9.2	0
5 hours	6.6	0	7.9	0	9.2	8
6 hours	6.7	0	8.0	0	9.2	10
7 hours	6.7	0	8.1	0	9.2	17
22 hours	7.0	0	8.9	0	9.3	17
27 hours	7.0	0	8.5	0	9.5	18
30 hours	6.8	0	8.5	0	9.5	20
46 hours	6.8	0	9	4	9.7	35
50 hours	6.8	0	9.1	5	9.7	37

At the conclusion of the experiment, liquid samples from all three sample containers were sent to ELS-Eurofins for analysis of nitrogen species (ammonia, nitrate, nitrite, total nitrogen) and fluoride. These results are provided in Table 2 below.

Table 2 Liquid sample analysis results (g/m3)

Analysis	Blank	Bagged sample	Loose sample
Ammonia (N-NH3)	<0.01	134	220
Nitrate (NO3)	0.59	0.91	1.31
Nitrite (NO2)	<0.01	0.03	0.07
Total Nitrogen			
Fluoride	0.09	82.3	162

4. Discussion

The data collected from this study suggests that ammonia generated from the reaction of Ouvea Premix with water predominantly enters the aqueous phase, with ammonia entering the gaseous phase only after the pH rises above a critical level (i.e. above a pH of 9). Furthermore the rate of ammonia generation is limited by the contact of the Ouvea Premix with water, as is illustrated by the difference in the rate of pH change and ammonia concentrations measured in the vessel containing loose sample as opposed to the vessel containing the bagged sample.

In regard to the applicability of these results to the storage of Ouvea Premix at Taha’s Mataura site, the scenario with the bagged samples most closely represents what would be expected to be generated from a flood scenario at the site, whereas the loose sample scenario represents a worst-case situation.

Based on these results, we would expect the ammonia generated from the inundation of stored Ouvea Premix to remain predominantly within the liquid phase, and would be discharged with the receding flood waters. Taking the results of the liquid sample analysis in Table 2, the generation potential of Ouvea Premix for ammonia can be calculated based on the volumes of water (1200 mL) and premix (500 g) placed in the reaction vessels.

Table 3 Ammonia generated over 2-day bench test

Analysis	Ammonia concentration (g/m^3)	Total mass of ammonia generated (mg)	Ammonia generation potential of Ouvea Premix in 48-hour immersion simulation
Bagged Ouvea Premix	134	161	0.32 kg/tonne
Loose Ouvea Premix	220	264	0.53 kg/tonne
Analysis	**Fluoride concentration (g/m^3)**	**Total mass of fluoride generated (mg)**	**Fluoride generation potential of Ouvea Premix in 48-hour immersion simulation**
Bagged Ouvea Premix	82	99	0.20 kg/tonne
Loose Ouvea Premix	162	194	0.39 kg/tonne

Ammonia gas measured in the headspace of the reaction vessels was for the most part at a low level relative to that measured in the liquid phase, particularly for the bagged sample, which had neglibile readings until near the end of the trial. The reaction vessel containing the loose Ouvea Premix showed gradually increasing ammonia concentrations in the headspace, with the maximum readings at the end of the test being 37 ppm.

FLOOD SIMULATION TRIAL VERSION 2

4/9/2015

Amended Trial as per Jacobs request.

After the results of the initial test were circulated, Jacobs had some suggestions for improving the methodology of the test, as well as increasing the scope of it to incorporate the effects of water absorption on the Ouvea premix, initially through the results gauged during the trial, and from these results Jacobs will conduct further Laboratory based tests.

Bruce Clark of Jacobs witnessed the bags being removed and the monitoring and measuring of water absorption at the duration of testing.

METHODOLOGY

As discussed, Jacobs has requested Taha undertake an additional bag test to support the Mataura resource consent application. The bag test should incorporate the following proposed methodology:

(1) Identify suitable location for bag test:

- We suggest conducting the bag test at Bond Row where there may already be fugitive ammonia emissions (and blending is already permitted by resource consent).
- Necessary PPE must be used.
- Sucker truck access will be required to empty skip water after test.
- Taha will need photo and written records of the bag test.

(2) Line skip bin with plastic liner, as per original methodology.

(3) Identify 4x1 tonne bags of Ouvea Premix (the same as those stored in Mataura), number the bags 1-4 and weigh them, keeping a record of bag weight. [Note: If possible to safely replicate the stacking arrangements at Mataura i.e. 3 high then this would be worthwhile following the other recommendations as per method]

(4) Place the bags in the skip – two on the bottom and two stacked on top (as they are stacked in Mataura). Keep a record of the location of each bag in the skip.

(5) Fill the skip with water, record height of the water above the lower bag(s).

(6) Record the initial pH level of the water.

(7) Cover the skip was plastic sheeting to confine any gases that may be omitted.

(8) Obtain further pH readings at 12 and 24 hours after bags have been submerged. Also keep a record of any observations of odour during the test (such as ammonia and hydrogen sulphide).

(9) After 24 hours, measure ammonia concentrations in the headspace with Gastec tubes (Bruce to conduct testing on arrival).

(10) Remove bags individually, allowing water that has entered the bag cavity (i.e. between the plastic and mesh-woven layer) but not come into contact with the material flow back into the skip.

(11) Weigh each bag individually. Keep a record of weight.

(12) If possible, open each bag and estimate the depth of water that has got into the bag from the top and the bottom (i.e. in centre meters).

(13) Bruce Clarke will also be able to assess the material inside the bags for ammonia production.

(14) Take a final pH reading of the water in the skip, prior to discharging the water safety.

(15) Dispose of or dry the tested material as appropriate.

Bruce Clarke will be in attendance when the bags are removed. As such, he can provide guidance on the methodology and required information at the time.

Flood simulation trial version 2

AMENDED TRIAL AS PER JACOBS REQUEST.

Bags weighed and labelled and placed inside the polythene lined skip bin, out the back of Bond Row premises.

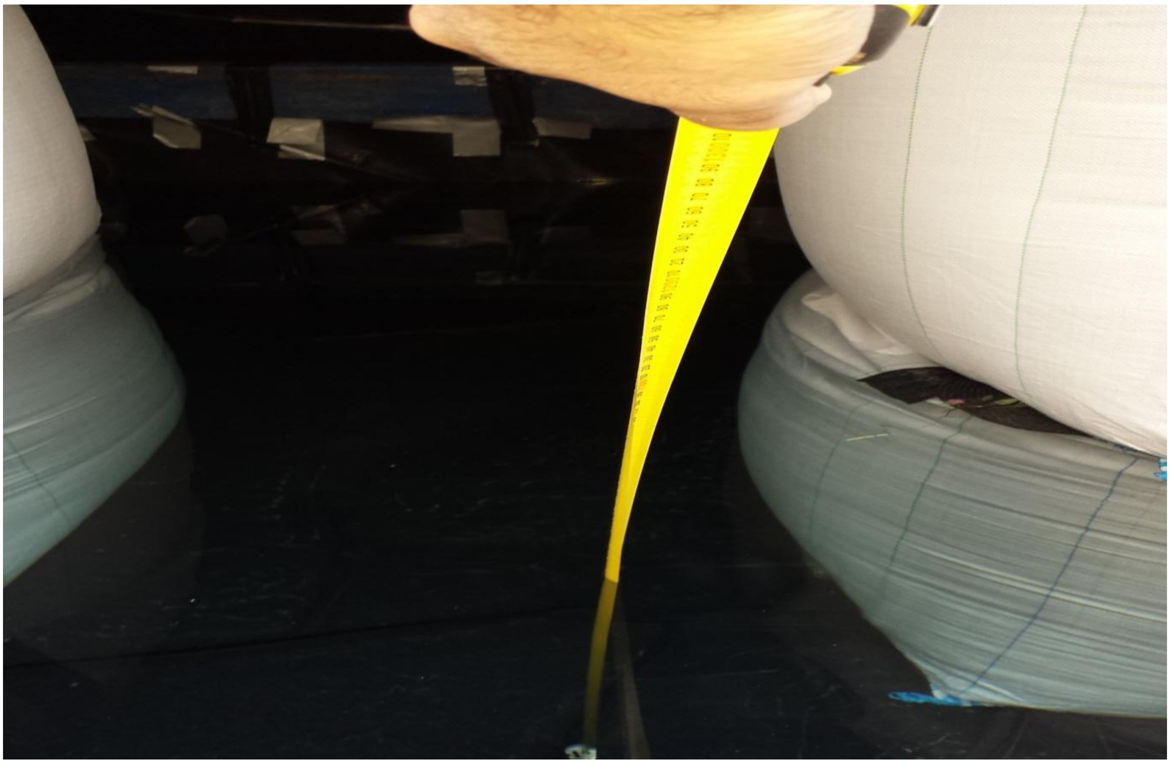
The bags were only able to be stacked two high for safety reasons, not three high as is the norm for storage facilities.

Bag 1 (bottom left hand side) dry weight. – 1036kg.

Bag 2 (top left hand side) dry weight. M- 1030kg.

Bag 3 (bottom right side) dry weight. -956kg.

Bag 4 (top right side) dry weight. 1014kg.



Bin then filled with water, only able to fill to a level reaching 900mm as water began escaping the bin if any higher. Due to the contents of the bags being Ouvea we didn't want any spillage.

The PH level was measured once max amount of water was in bin, at 2pm PH @ 8.9.

The bags were then covered with a polythene cover to attempt to trap any gas if emitted.

Readings were taken at this point (2pm) with the hand held gas monitor readings measured at:

Ammonia – 0.00

Hydrogen – 0

PH -8.9

11pm:

Ammonia – 0.00

Hydrogen – 0

PH – 8.2

8am:

Ammonia – 0.00

Hydrogen – 0

PH – 8.5

1:30pm (Test End)

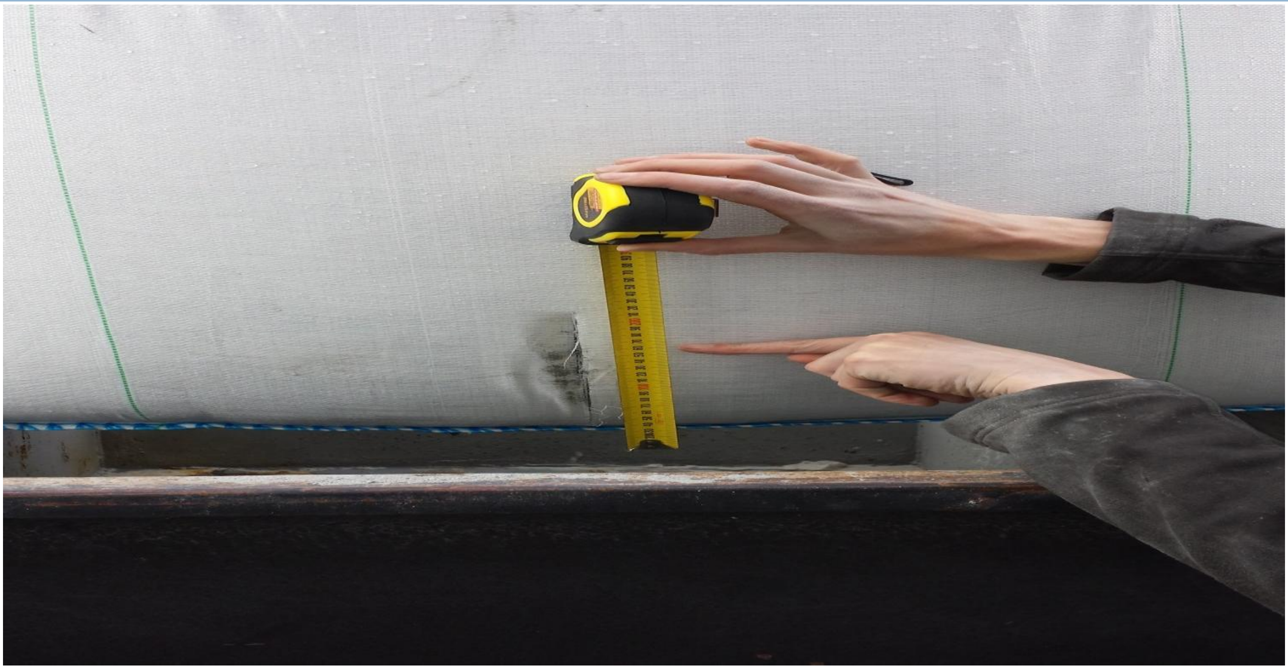
Ammonia – 0.00

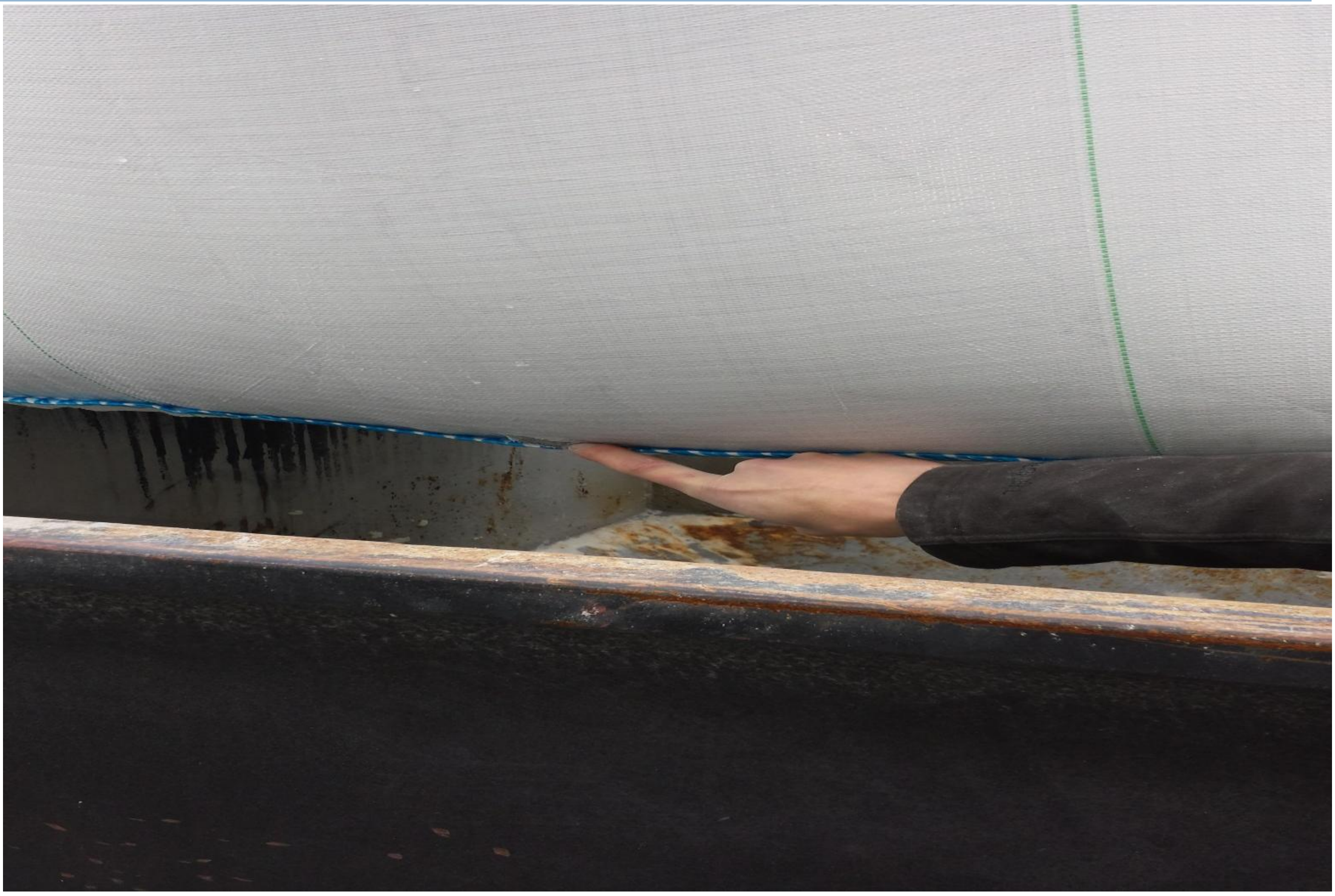
Hydrogen – 0

PH – 7.9

No odour was detected during the period the bags remained in the water.

The polythene liner was removed and then the bags were removed, some time was allowed for excess water to drain off/from bags, then the bags were re-weighed and cut to expose height water had been absorbed into the product.





Bag 1 End Weight – 1164kg. (1036kg-1164kg) 128kg increase in weight.

This bag was fully submerged. No water had entered through the top of bag. Water had entered through the bottom of the bag to a height of 160mm of the product.

Once the inner plastic liner was broken there was a reading on hand held gas monitor of 1ppm of Ammonia.

Bag 2 End Weight – 1032kg. (1030kg-1032kg) 2kg increase in weight.

This bag was only partially submerged. No water had entered through either the top or bottom of bag, product inside completely dry.

Once the inner plastic liner was broken there was no Ammonia detected on the gas monitor, 1000ppm+ of Hydrogen detected.

Bag 3 End Weight – 996kg. (956kg-996kg) 40kg increase in weight.

This bag was fully submerged. No water had entered through the top of the bag. Water had entered through the bottom to a height of 20mm of the product.

Once the inner plastic liner was broken 2ppm of Ammonia and 577ppm of Hydrogen were detected on the gas monitor.

Bag 4 End Weight – 1010kg. (1014kg-1010kg) 4kg decrease in weight.

This bag was only partially submerged. No water had entered through either the top or the bottom of the bag, product inside was completely dry.

Once the inner plastic liner was broken no Ammonia was detected, 2500ppm Hydrogen was detected.

Bruce Clark of Jacobs was present and verified these results, taking his own ammonia readings.

A sample of the water from the skip was taken for testing, and further laboratory testing is to be undertaken by Jacobs.

The water from the skip was pumped out and disposed of by Cleanways.

Pictured above is a photo of the bag taken on 14/04/15 (four days after trial) showing the lining of the bag inflating.

There was a reading of 100ppm Ammonia and 17ppm Hydrogen taken from this bag, and

the material was at 25.6degrees.

The bags used for the test were sent back to the TAP plant for re-processing.

Pictured above is the product which had become wet during the trial. (Picture taken 14/04/15)

Further analysis and results are to be forwarded from Jacobs.

Taha Fertiliser Industries Limited

ENVIRONMENTAL MANAGEMENT PLAN

- Final
- 23 April 2015

Taha Fertiliser industries Limited

ENVIRONMENTAL MANAGEMENT PLAN

- Final
- 23 April 2015

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Contents

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1. Environmental Management System

1.1. Purpose

This Environmental Management Plan (EMP) sets out the environmental management system for the operation of the Ouvea Premix storage sites in Southland, New Zealand, operated by Taha Fertiliser Industries Limited (Taha). This EMP:

- Highlights the main environmental aspects and impacts (and their planned mitigation);
- Provides further detail on the primary environmental risks for the sites (storm water and hazardous substances);
- Establishes an incident procedure and emergency response plan; and
- Allocates roles and responsibilities for the environmental management at the site.

This EMP is an evolving document and will be regularly updated to account for any changes to operational procedures and logistics.

The purpose of this EMP is to set the procedures that will be used to ensure that environmental impacts from the storage of Ouvea Premix are minimised and kept within the bounds of any relative resource consents. Taha takes its environmental responsibility seriously, and the storage of Ouvea Premix is an environmentally responsible process.

The environmental management systems are in accordance with requirements of the Hazardous Substances and New Organisms (HSNO) Act.

1.2. Environmental Objectives

The environmental objectives for the Taha storage sites are:

- Minimise negative environmental effects and risks from our storage sites on surrounding environments
- Meet the requirements of the relative District Plan, Regional Plan, and Resource Consent.

1.3. Scope

This environmental management plan covers all Taha's Ouvea Premix storage sites in Invercargill and Mataura, including:

- 68-121 and 113-128 Kana Street, Matuara (the Mataura site)
- 76-89 Annan Street, Invercargill
- 139 and 143 Liddel Street, Invercargill

The locations of these sites are provided in Appendix A.

2. Aspects and Impacts

Table 1 highlights the main environmental aspects and impacts faced by the operation of Taha Ouvea Premix storage sites.

Table 1 Aspects and Impacts

Activity	Aspect	Impact / Severity	Mitigation
Bulk materials – storage and handling	Spillage	Ouvea Premix is a dry goods hazardous substance. It would be an environmental problem if Ouvea Premix entered a waterway. Please refer to the current CBP & SPL for clean-up procedures (see Appendix C).	Ouvea Premix will only be transferred within the building and from the loading and unloading of vehicles in heavy duty plastic lined bulk bags. Care will be taken when handling bulk bags. Site will be kept in a tidy and orderly state. Any spill will be cleaned up quickly, by using spill kits, brooms and shovels. Incident response procedures are in place, and staff trained to follow them. Use PPE Equipment as provided for dealing with Ouvea Premix spills.
	Dust creation from wind	The sites are in industrial areas, but any dust generated as a result of spillages could create a respiratory annoyance for nearby people and could also enter nearby waterways.	Bulk materials in heavy duty plastic lined bulk bags will be stored inside out of direct wind. In windy conditions the warehouse doors will only be opened for vehicles entering or exiting the building. Materials will be covered during transport.
	Water reaches stored materials (e.g. flooding, fire-fighting, etc.).	Material could be washed away into the Mataura River of Waikana Stream in an extreme flooding event or following a spillage. In substantial amounts, this could have an effect on the nearby waterway. Refer to site maps provided. Water could also reach waterways through spills.	Spills will be prevented through spill prevention measures outlined above. Additionally, all spills during handling will be contained immediately to avoid contamination. Any internal storm-water pipes are rerouted to avoid material entering the storm water system. As such, it is considered extremely likely material will enter the waterway following a spillage. A Flood Protection Plan is in place which will be executed once flood “trigger points” are reached. Environment Southland’s website will be monitored daily for flood warnings. Any material that enters the waterway during a flood is expected to have minimal impacts. Once the flood

Activity	Aspect	Impact / Severity	Mitigation
			subsides, water remaining in the building can be contained.
	Air pollution	The most likely air pollution is odour, which could be a minor annoyance to people nearby.	Storage sites regularly monitored for ammonia and hydrogen inside and outside the sotre. Any odour complaints to be promptly investigated as per the incident procedure. Environment Southland has been consulted with and will respond to any reported odour incidents.
Transport of hazardous materials	Traffic	The loading and unloading of hazardous materials and increase in truck movements to and from the site may have an impact on traffic flows	Storage sites are designed to ensure trucks are able to load and unload with minimal traffic disturbance. Where necessary, on-site manoeuvring areas are provided for trucks to ensure they are not reversing onto main roads. Truck companies are informed of loading and unloading procedures, and will only load and unload in off-road areas. There will be no cross-road movement of material between the two sites. NZTA is aware of and has approved activities on State Highway for the Mataura site.
	Materials tracked outside by vehicle wheels	Ouvea Premix is not particularly eco-toxic, but could be a source of excessive nutrients to the nearby waterway.	All bulk bags to be inspected prior to transporting. All material is contained within heavy duty plastic lined bulk bags during transport, loading and unloading. All truck service providers are NZAS qualified.
Management and administration	Leadership	Positive environmental leadership will have a large positive influence on the environmental integrity of the stores operations through decision making and role modelling towards less senior staff.	Environmental management plan and policy easily accessible to all staff. Environmental aspects discussed positively and proactively by senior staff during meetings. Senior staff to lead by example.
	Resource use	Inefficient use of resources has a cumulative global negative environmental impact through increased greenhouse gas emissions, mining, and waste.	Senior staff to consider resource efficiency in decision making and procurement. Taha's blending is a "no waste" activity, whereby a waste substance (Ouvea Premix) is being used to generate another product. There is no trade waste created.

3. Most Significant Aspects

3.1. Spills and Stormwater

One of the most significant environmental risks for the storage of Ouvea Premix is the risk of Ouvea Premix coming into contact with water or entering the local water way resulting in the potential generation of ammonia gas being discharge to air or dissolving in water and converting to ammonium before being a potneital discharge to water..

Taha has developed a schematic of the stormwater systems for each site. The schematic shows the stop points and directions of flow from the highest risk areas of the sites.

The following prevention and mitigation activities will be carried out by Taha in regards to spills and stormwater:

- Incident response procedure is maintained and updated.
- Site will be kept in a tidy and orderly state.
- All Ouvea Premix materials are stored in heavy duty, plastic lined bulk forklifting bags to enable them to be easily moved.
- Care will be taken when handling materials and materials are kept in plastic lined bulk bags during transport, loading and unloading.
- Any internal spill will be contained within the building. This will avoid the possibility of spills entering storm water networks.
- To avoid spills external to the building, particular care will be taken during loading and unloading of hazardous substances.
- Any spills that occur at the point of unloading the bulker bags from the trucks into the store will be swept up immediately and the damaged bag taped up to prevent further spillage of material onvce moved into the store.
- Spill kits are kept on site. These include spades, brushes and all necessary PPE.
- Staffs are trained on the incident response procedure and how to use the spill kit. CBP's will be read and single point lessons will be available with all spill kits.
- The amount of hazardous material stored on site is minimised as far as logistically practical.

3.2. Flooding

At the Mataura site specifically, a number of flood mitigation measures have been built on the site (primarily 68=121 Kana Street next to the Mataura River) to prevent water entering the site and buildings in the event of a flood. These measures include:

- A flood water retaining wall along the majority of the north-western boundary of 68-121 Kana Street with the Mataura River, built to withstand 600 mm above the highest recorded flood (50-60 year event in 1978);
- Bolt on steel and concrete shutters attached to doors to prevent ingress of water, also built to withstand 600 mm above the highest recorded flood;
- All unused piping has been sealed and other essential stormwater piping have one-way valves installed to prevent the ingress of water; and
- Silica sandbags are stored on site to be used as emergency sand bagging in conjunction with polythene.

The location of steel and concrete shutters is identified in the site layout plan attached. Additional measures to prevent flood damage, should a flood occur, include:

- All hazardous substances are also stored in heavy duty plastic lined bags, which would be difficult to breach in the event of a flood to the extent that Ouvea Premix becomes fully saturated;
- The lower levels of the buildings on 68-121 Kana Street next to the Matuara River will not be used at all;
- Hazardous substances adjacent to the eastern side doorway of 116-128 Kana Street will be stored on pallets to prevent any contact with surface flooding off the adjacent bank;
- Waikana Stream will be regularly checked and cleared of debris to avoid blockage in a flood event; and
- The open drainage channel to the east of 116-128 Kana Street building will be checked and cleaned 6-monthly to prevent surface flooding.

In the event of a flood, the Flood Protection Plan (detailed in Section 4.2 to this EMP) will be executed. The Flood Protection Plan, including all flood protection measures, will be checked 6-monthly to ensure it is still fit-for-purpose. The 6-monthly check sheet is attached.

3.3. Hazardous substances

The Taha production activities require the storage and handling of large volumes of Ouvea Premix and small quantities of Diesel for forklift use. These materials are summarised in Table 2.

▪ **Table 2 Hazardous Substances and Bulk Materials Stored On Site**

Product name	**product description**	**Max Volume**	**storage type**	**spill mitigation**	**HSNO classifications**
Ouvea Pre-mix (cast-house and landfill)	Granular/ Powder	Annan St: 6,500T Liddel St: 2,800T Kana St: 10,000T	1-tonne, plastic-lined woven mesh forklift bags	6.3B hazardous material - Bags covered in plastic and stored indoors to prevent contact with moisture. Temperature will be controlled and is not to exceed 50C.	6.3A, 6.4A, 9.1C
Diesel	Liquid	100 litres	20 litre diesel drums	Stored indoors, temperature will be controlled and is not to exceed 50C.	3.1D, 6.1E, 6.3B, 6.7B, 9.1B.
Citric Acid	Powdered Crystals	350kg	25kg woven mesh bags	Stored in closed container indoors to prevent contact with moisture. Temperatu re will be controlled and is not to exceed 50ºC.	6.1E, 6.3B, 8.3A.
Silica Sand	Fine powder	150 T	1-tonne forklift bags	Not hazardous, shovel and wheelbarrow. Return to stock pile if uncontaminated.	Not hazardous

3.4. Air Pollution and Odour

The potential sources of contaminants discharged to air resulting from the storage facilities activities are:

- Minimal dust from the storage and handling of Ouvea Premix and bulk materials; and
- Fugitive emissions of ammonia gas, resulting from when the product gets damp (which could occur in the rare event of a major roof leak or flood, if the plastic lined bulk bags get inundated with water).

Activities with the potential to generate dust will be controlled by material handling and storage protocols. These include keeping the doors and windows of the buildings closed during transporting and handling, and storing the material in double-lined bags with a mesh-woven outer and plastic lining. As such, any dust emissions are considered unlikely.

Under normal circumstances, where product is dry, there will be no objectionable or offensive odour to the extent that it causes an adverse effect at or beyond the boundary of the site. Any air emissions, including ammonia gas, which may be discharged to the surrounding environment following an extreme flood event or through dampness will be temporary and at levels well below those that could impact on health of people living and working in the surrounding area.

3.5. Traffic and transport

Ouvea Premix will be delivered from the Alumina Recycling Plant at Tiwai to the storage/production facilities in Invercargill and Mataura (locations provided in Appendix A). Once a processing facility is secured, material will then be transported from storage facilities to the new processing facility.

The selected transport company will be fully responsible for transport of the 6.3a material from the Taha Asia Pacific site (located at Tiwai) to the designated Taha storage facilities, in Southland.

The selected transport companies are TNL Freight and Freight Haulage. They are both NZAS pre-qualified – which means they must prove (to TAHA and NZAS) that their company can:

- Suitably convey the material
- Meet all expectations for transport
- Keep the material contained

Drivers must be NZAS site inducted.

Ouvea Premix is not classified as a Dangerous Good for transport; therefore the Land Transport, Civil Aviation and Maritime Transport rules for Dangerous Goods do not apply.

To manage effects of the loading and unloading of hazardous substances at the storage facilities on traffic flow, the following will be undertaken:

- Site loading and unloading areas are designed to ensure minimal impacts on traffic flows.
- Where necessary, onsite manoeuvring areas are provided to ensure trucks do not need to reverse onto main roads.
- Loading and unloading areas and truck routes are clearly marked on site.
- Where loading or unloading requires trucks to park on the road (due to site constraints), appropriate measures such as road cones will be used to divert traffic.
- Loading/unloading to be avoided in wet conditions.
- No cross-road traffic associated with the movement of materials between sites will occur without obtaining the prior written approval from NZTA.

All materials will also be suitably packaged to avoid discharges or contamination during transport, loading and unloading.

NZTA has been consulted with regarding truck movements to and from the Mataura site onto the state highway.

4. Incident Procedure

For all identified environmental incidents (large or small), the following procedure is followed:

1) On site staff: Incident is isolated or halted if safe to do so (split bag on concrete floor)
2) On site staff: Notify-
   a) Emergency Services if required
   b) General Manager for any incident more than minor
   c) Environment Southland if there are any adverse environmental impacts (e.g. spill reaches stormwater system) within 4 hours of the event.
3) On-site staff: Respond and clean up, co-ordinating support from other staff or institutions if necessary. Staff can follow the H&S manual for procedure details.
4) On-site staff: Complete an environmental incident form (provided in Appendix B) Environmental officer: Investigate the incident
5) Environmental officer: Implement improvements to operations and the environmental management plan based on lessons learnt from the incident. Referring to the H&S manual step 3.

More specific guidance is provided for spills, transport incidents, and noise and odour complaints in the sections below.

4.1. Spills

The procedure above should be followed in the case of a spill. Specifically:

- Incident isolation is critical, and should be done to block the spill from reaching the stormwater system, any pits in the area, unsealed ground, and stormwater runoff areas. This can be achieved using the spill kit and the stormwater system shut-off valves.
- Additional guidelines (Single point lesson) are prepared for specific spill situations. Information is in the H&S manual.

4.2. Floods

In the event of a flood, the Flood Protection Plan will be implemented. The Flood Protection Plan consists of the following steps:

1) Environmental Manager to initiate Flood Protection Plan when one or both of the following “trigger points” occurs:

a. Environment Southland and Gore District Council's flood warning site issues flood warnings for Mataura River (site to be monitored daily by Environmental Manager); and/or
b. Visually, when the Mataura River falls start to "lake-over" and stop being a waterfall.

2) All orifices will be blocked using the steel shutters and sand bags starting from the south end of the building working north. Previously, this exercise has taken six hours for three staff to implement, However, Taha will have half the shutters permanently fitted, so estimates this would take three hours to implement with three staff members (note that while the site is unoccupied, permanent staff members will come from the Invercargill office to implement this stage).
3) Once all orifices are blocked, all staff will evacuate the premises, except for 1-2 senior level staff, who will double check all orifices, and that all other staff have left the site safely, before evacuating themselves.

As part of the 6-monthly check procedure, Taha will conduct a "flood drill" and a run-through of flood measures to ensure the Flood Protection Plan can be done effectively and within good time.

After floodwaters have subsided, contaminated flood waters remaining within the building can be contained in the loading bags by sand bags and walls that were placed through the Flood Protection Plan. Where possible, floodwater should be collected, pumped and sent for safe disposal.

4.3. Transport

Emergency responses during transport are most likely to be managed by the local emergency response agencies. The local fire stations have been advised of the activities. The General Manager shall be advised as soon as Taha is made aware that any of its material is involved in a transportation environmental emergency.

Response assistance shall be offered to the local emergency response agencies.

4.4. Odour Complaints

When an odour complaint is received, a Taha representative will investigate the compliant in accordance with Table 4.1 of the Ministry for the Environment's "Good Practice Guide for Assessing and Managing Odour in New Zealand". This will include doing a 360 degree odour test, recording the results and ensuring any odours related to Taha's activities are minimised where possible. Complaints should be recorded as per the table in Appendix B.

5. Roles and Responsibilities

Taha will have a staff member allocated the role of Environmental Officer. This role will include responsibility for the maintenance of the environmental management plan, the follow-up of any environmental incidents, the training of staff, the maintenance of plant, and regular audits. While the Environmental Officer is responsible for ensuring that these activities occur, they may delegate any or all or the tasks to more suitable people. The tasks and their frequency are provided in Table 3.

Table 3 Environmental Officer Tasks

Task	Frequency
Revise Environmental Plan	Annual
Carry out training (spill kit, environmental management plan, etc.)	New staff, annual update
Check equipment maintenance	Quarterly
Incident response	As required
Incident investigation	As required
Check ES flood warning website	Daily
Instigate Flood Protection Plan	As required
Check site tidiness	Weekly
Check environmental management plan, incident form, Current best procedures, MSDSs are readily available	Quarterly
Audit environmental procedures	Annually

Taha Environmental Officer is:

Dave Duncan

Production Supervisor

Work: 03 218 1004

Mob: 021 02383193

Mataura River Catchment flood warning information website:
http://www.es.govt.nz/media/11783/mataura_flood_warning_web.pdf

Appendix A Location of Present Storage Sites

Figure 1 Taha Asia Pacific Invercargill Storage Sites

Figure 2 Taha Asia Pacific Mataura Storage Sites

Appendix B Environmental Incident Form

Environmental Incident Form

This form should be completed as soon as practicable after any environmental incident and given to the Environmental Officer.

Date and time	
Location	
Weather	
Description of incident	
Staff in vicinity of the incident	
Response to the incident	
Further response required	
Lessons to be learnt from incident	

Signed ....   Date ....

Name ....   Role ....

Appendix C Flood Protection Plan check sheet

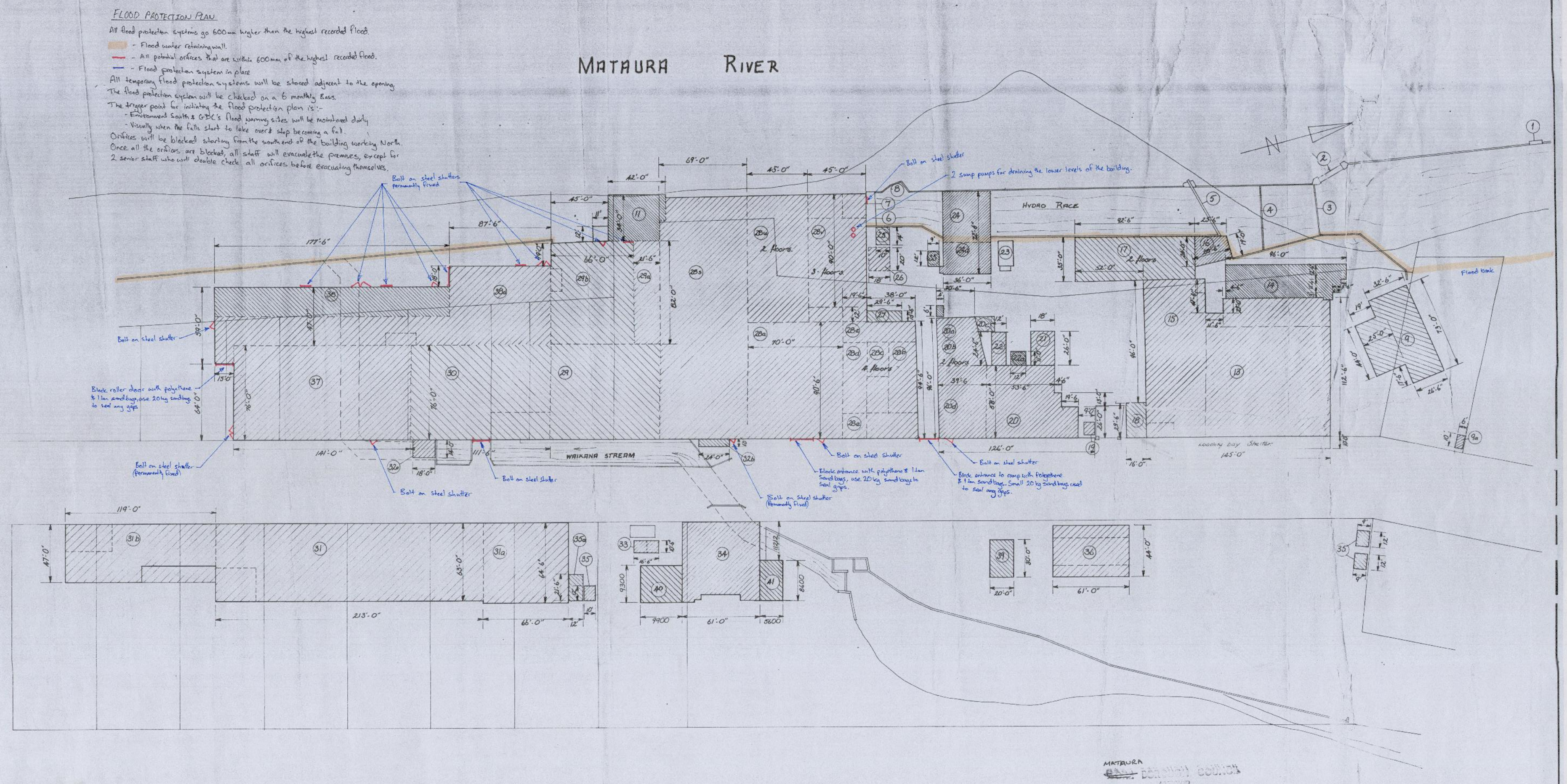
Flood Protection System Check sheet

Needs to be checked 6 monthly

1. All threads are functional and greased
2. The sealing rubbers are in good condition
3. All sealing shutters are present
4. Polyethylene and sandbags are present and in good condition
5. Permanent shutters checked for condition and sealing
6. Practice run of the plan done to ensure familiarity

Date Checked	Person preforming check	Signature

Appendix D Location of flood measures



1. Auxiliary Race, Gate
2. Main Race Gate
3. Footbridge
4. Washout Bridge
5. Leaf Washout Bridge
6. Intake Grating
7. Sluice Gate.
8. Washout Gate
9. Main Office Block
10.
11. Hydro Elect power Station.
12.
13. Raw Materials Storage
14. Water Treatment Plant
15. Waste. Pulp Storage & Conveyors
16. Pump Station
17. Pulp mill
18. Boiler Brick Storage.
19. Chimney Stack
20. Turbine, Power & Boiler House
21. Oil Fired Boiler House
22. Power House Amenities.
23. Fuel Oil Tank & Plant.
24. Stock Storage & Pumphouse.
25. Pump House (Fire Fighting)
26. Pump House.
27. Steel Racks.
28. Main Mill Buildings.
29. Winding Machines.
30. Cutting Machines.
31. Bag Factory & Stores
32. Bicycle Sheds.
33. Weighbridge & Office.
34. Tech Office, Laboratory & Store
35. Stores.
36. Carpenters & Paint Shop.
37. Salle
38. Despatch / Warehouse
39. Oil Storage Building
40. Extension to Tech Offices
41. " " Lab.

AMENDMENTS	DATE
F Re-Drawn and Traced with Engineering Bulk Storage Area	19.9.73
G Up-Dated	8.10.75
H Re-Drawn.	12.12.75

DRAWN	
TRACED	
CHECKED	
DATE	12.12.75

NEW ZEALAND PAPER MILLS LTD.,
KANA STREET
MATAURA,
NEW ZEALAND

DEPARTMENT MILL SITE

KEY SITE PLAN
INSURANCE SCHEDULE

MATERIAL & PART LIST ASSEMBLY DRAWING No.	
SCALE	1/32" to 1'-0"
JOB No	
DRAWING No.	11-174
FILE No.	ISSUE F G H

Appendix E Current Clean-Up CBP & SPL

HSEQ Management System	Document Type:	Procedure
	Version No:	1.0
	Current Risk:	Low
	Next Review Date:	August 2015
Title: Ouvea Premix Spills in Stores	Approved By:	Mark Egginton
	Date:	01.08.2012

Topic: Ouvea Spill Response Kit

Context
To ensure that initial resources are readily available for the immediate response to an Ouvea Premix spill in any of the Taha stores and warehouses to minimise potential hazards to personal and the environment.

Purpose
This kit is for the containment and clean-up of Ouvea Premix spills. It should never be used in the presence of water as Ouvea Premix is affected and gives off ammonia gas.

Resources
Personnel: One

Equipment: Ouvea Premix Response Kits

Safety Equipment
PPE Requirements – Disposable coveralls, gloves safety goggles and mask.

Links – JSAs etc
Single Point Lesson: Cleaning-up Ouvea Premix Spills

Frequency
As Needed

HSEQ Management System	Document Type:	Procedure
	Version No:	1.0
	Current Risk:	Low
	Next Review Date:	August 2015
Title: Ouvea Premix Spills in Stores	Approved By:	Mark Egginton
	Date:	01.08.2012

Topic: Ouvea Spill Response Kit

Procedure

Main Step	Actions	Issues
Location	• Spill kits are strategically located next to all store room doors door. • Blue coloured Mobile kit in a 2-wheel trolley with a shovel, broom and bulk bags at same location with Single Point Lesson.	
Safety	• All items in this kit are safe to use, but once items are used they must be placed in the used bag provided and returned to Supervisor for disposal.	Safety Use gloves, goggles and masks with materials.
Replacement	• This kit is intended for emergency use and any items that are used must be replaced.	
Kit Contents	• Spill response guide & Single Point Lesson:	
	• Socks: These are used to contain the spill and prevent it spreading.	3 x 7.6cm x 1.2m 2 x 7.6cm x 3.6m
	• Pads:	80
	• Bulk Bag: Provided for the collection of material pending disposal.	2 of (950 x 950mm)
	• Pillows:	2 x 45cm x 45cm
	• PPE: One set of Coveralls, Gloves, Goggles and a mask.	1
	• Shovel & Brush:	1 of each
Disposal	• Used PPE should be placed in disposable bag provided in the kit and along with split bulk bag shall be presented to Supervisor at either the TAP or TFI Plants for correct disposal and replacement.	
Report	• Supervisor to record spill in incident log and arrange immediate replacement of used items.	

HSEQ Management System	Document Type:	Procedure
	Version No:	1.0
	Current Risk:	Low
	Next Review Date:	August 2015
Title: Ouvea Premix Spills in Stores	Approved By:	Mark Egginton
	Date:	01.08.2012

Topic: Ouvea Spill Response Kit

Appendix 1: Procedure Details and History

Document Owner:	TAP & TFI Plant Managers *(Accountable Role)*	**Current Version Author:**	Mark A. Egginton

Version Number:	**Changes made**	**By Whom**
1.0	Reviewed, Insertion of Single Point Lesson.	Mark Egginton

Taha Asia Pacific Ltd

SINGLE POINT LESSON

Utilising the Spill Kit for cleaning up Ouvea Premix

Context: Loading, unloading and bag settlement can sometimes result in bulk bags splitting. These spills need to be cleaned up in a safe manner that will not impact on the environment or become a safety hazard due to slippery floors. Fully equipped spill kits are supplied and should be used.
Purpose: This kit is for the containment and clean-up of Ouvea Premix Spills and to ensure they are carried out in a safe and effective manner.

DO NOT USE WATER TO CLEAN THE SPILL

1. Put on the supplied PPE: coveralls, gloves, safety goggles, mask.

2. Use bunding and other equipment in spill kit if required.

2. Open up the one ton bag with liner and place on the floor close to the spillage area. You will need to open it up completely and push down to a workable level for you. Then you will be able to get shovel full's in the bag without any spillage.

3. Get the shovel and broom supplied and commence clean-up of the spillage ensuring to keep product away from any wet areas or spill ways.

4. Once the entire spill has been shovelled into the bag, tie the neck of the liner securely. Repeat as necessary.

5. Place your PPE in the disposal bags provided. Bring this back to work with you to be cleaned/replaced as needed.

6. Return or arrange for the damaged bag to the TFI Plant for proper disposal.

7. Notify your Supervisor that you have cleaned up a spill.

8. For further information refer to CBP: Ouvea Premix Spills in Stores.

Appendix D - Ouvea Pre-mix MSDS

MATERIAL SAFETY DATA SHEET

Ouvea Premix Date: 10 May 2012

PRODUCT AND COMPANY INFORMATION

PRODUCT NAME:	Ouvea Premix
DESCRIPTION:	Solid grey powder
PRODUCT USE:	Ingredient in the preparation of mineral fertiliser
SUPPLIER::	Taha Fertilizer Industries Limited
CONTACT INFORMATION:	Telephone: 03 218 1002; Address: 162b Bond Row, Invercargill, New Zealand
EMERGENCY PHONE:	

HAZARD IDENTIFICATION

DANGEROUS GOODS		Not applicable
HSNO CLASSIFICATION	**6.3A**	**Skin irritant.**
	6.4A	**Eye irritant.**
	9.1C	**Aquatic ecotoxicant**
SIGNAL WORDS:		**WARNING**
HAZARD STATEMENT:	H315	Causes skin irritation.
	H320	Causes eye irritation.
	H412	Harmful to aquatic life with long lasting effects.
PREVENTION STATEMENTS:	P264	Wash hands and eyes thoroughly after handling.
	P280	Wear protective gloves.
	P273	Avoid release to the environment.
RESPONSE STATEMENTS:	P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
	P321	Specific treatment: use of specific cleansing agent not required.
	P332 + P313	If skin irritation occurs: get medical advice/attention.
	P362	Take off contaminated clothing and wash before re-use.
	P305 + P351	IF IN EYES: Rinse cautiously with water for several minutes.
	P338	Remove contact lenses, if present and easy to do so. Continue rinsing.
	P337 + P313	If eye irritation persists; get medical advice/attention.

COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS No.	Concentration (%)
Aluminium oxide	1344-28-1	75-95
Metal fluoride salts	Not available	0-15
Copper	7440-50-8	<0.1
Metal nitrides	Not available	<3
Magnesium	7439-95-4	<1
Silicon	7440-21-3	<1
Manganese	7439-89-6	<1
Iron	7439-89-6	<1.5
Nickel	7440-02-0	<0.1
Beryllium	7440-41-7	<0.02

FIRST AID MEASURES

SKIN CONTACT:	Quickly remove contaminated clothing and wash before re-use. Wash skin with plenty of soap and water. Seek medical attention if irritation persists.
EYE CONTACT:	Remove contact lenses if present. Cautiously rinse eye with gently running water for 15 minutes. Do not rub the eye. Seek medical attention if eye irritation persists.
INHALATION:	If inhaled, remove to fresh air.

INGESTION:	Rinse mouth. Do NOT induce vomiting. Seek medical attention.

FIRE FIGHTING MEASURES

HAZARDS:	Non-flammable.
EXTINGUISHING MEDIA:	Water fog, foam, Carbon dioxide or dry chemical.
PROTECTIVE CLOTHING:	Wear protective gloves.
OTHER INFORMATION:	Do not allow washings to reach aquatic environment.

ACCIDENTAL RELEASE MEASURES

SPILL CLEAN UP METHOD:	Contain and recover. Use appropriate tools to put the spilled solid in a convenient waste disposal container. Avoid contamination of waterways. If material does enter waterways contact the local authority.
PROTECTIVE CLOTHING:	Wear protective gloves.

HANDLING AND STORAGE

HANDLING:	Wear gloves. Avoid contact with the skin and eyes Ecotoxic in the environment, avoid loss into waterways.
STORAGE:	Keep containers tightly closed.

EXPOSURE CONTROL/PERSONAL PROTECTION

ENGINEERING CONTROLS:	Handle in well ventilated area
PERSONAL PROTECTION:	Wear gloves.
EXPOSURE LIMITS:	No exposure limits have been specifically assigned to this product and there are no Short Term Exposure Limits (STELs). TWA – Aluminium oxide 10 mg/m^3 TWA – Copper (dust) 1 mg/m^3 TWA – Silicon 10 mg/m^3 TWA – Manganese (dust) 1 mg/m^3 TWA – Beryllium 0.002 mg/m^3

PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Solid (grey powder)
pH:	Not applicable
SOLUBILITY:	Negligible
BOILING POINT:	2980°C
MELTING POINT:	2072°C

STABILITY AND REACTIVITY

STABILITY:	Stable, will not polymerise
REACTIVITY:	Reactive with acids

TOXICOLOGICAL INFORMATION

SKIN CONTACT:	May cause skin irritation
EYE CONTACT:	May cause eye irritation

ECOLOGICAL INFORMATION

Ecotoxic in the environment. Avoid loss into waterways.

DISPOSAL CONSIDERATIONS

CONTAINER DISPOSAL:	Dispose of empty containers safely. Avoid contamination of any water suppl with product or empty container.
PRODUCT DISPOSAL:	Dispose of product safely. Avoid contamination of any water supply with product or empty container.

TRANSPORT INFORMATION

UN NUMBER:	Not applicable
PROPER SHIPPING NAME:	Not applicable
DANGEROUS GOODS	Not applicable

CLASS	
PACKING GROUP:	Not applicable

NZ REGULATORY INFORMATION

HSNO APPROVAL NUMBER:	HSR002503
GROUP STANDARD:	Additives, Process Chemicals and Raw Materials (Subsidiary hazard)
HSNO CLASSIFICATIONS:	6.3A Skin irritant
	6.4A Eye irritant
	9.1C Aquatic ecotoxicant
HSNO CONTROLS:	Approved handler requirements: Not applicable

OTHER INFORMATION

ISSUE DATE:	22 March 2012
DEFINITIONS:	TWA – Time Weighted Average (The 8 hour time-weighted average exposure standard designed to protect the worker from the effects of long term exposure)

Safety Data Sheet

AAKLAND CHEMICALS

Section 1: Identification of the Substance and the Supplier.

Product Name: **Citric acid**

Recommended use: Various

Company details: Aakland Chemicals (1997) Ltd

Address: 12 Wigram Close, Sockburn
PO Box 323, Christchurch 8140

Telephone number: +64 3 341 8490 **Facsimile**: +64 3 341 8491

Email: aakland.chemicals@xtra.co.nz

Emergency Phone No: 0800 243 622 (*0800 CHEMCALL*) for out of hours advice

Section 2: Hazards identification

HSNO classifications:

6.1 E May be harmful if inhaled
6.3 B Causes mild skin irritation
8.3 A Causes serious eye damage

Section 3: Information on Ingredients

Components	CAS Number	Proportion
Citric acid, anhydrous	77-92-9	>99 % w/w

Section 4: First Aid Measures

First Aid: Call a Doctor or National Poisons Centre 0800 POISON (0800 764 766) following first aid treatment.

Skin Contact: Rinse skin with plenty of water. Remove contaminated clothing and wash before re-use.
If skin irritation persists, get medical advice/attention.

Eye Contact: Rinse with water for several minutes, remove contact lenses if present and easy to do, continue rinsing. **Seek medical attention**

Ingestion: Rinse mouth, do **NOT** induce vomiting.
Call a POISONS CENTRE or doctor if you feel unwell.

Inhalation: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.
Call a POISONS CENTRE or doctor if you feel unwell.

Medical attention and special treatment: Treat symptomatically

Section 5: Fire Fighting Measures

Hazards from combustion products: On burning toxic fumes may develop including oxides of carbon. Autoignition temperature: 1011°C. As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source. Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.
Precautions for fire fighters and special protective equipment: Wear self-contained breathing apparatus and protective clothing when in close proximity or in confined spaces
Suitable extinguishing media: Water spray, dry chemical, alcohol foam, or carbon dioxide

Section 6: Accidental Release Methods

Method and materials for containment and clean up: Sweep up spilt material and transfer to plastic drums for approved disposal. Avoid contamination of waterways.

Section 7: Handling and Storage

Precautions for safe handling: Wear correct PPE gear when handling
Conditions for safe storage: Store in a cool, dry, ventilated area

Section 8: Exposure controls/Personal protection

Workplace Exposure guidelines:	Particulates not otherwise classified: WES-TWA 10mg/m3 Inspirable dust WES-TWA 3mg/m3 Respirable dust
Ventilation specification:	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible
Personal Protective equipment:	Wear protective clothing, gloves, eye-protection, dust mask

Section 9: Physical and Chemical Properties

Physical state:	Crystals
Colour:	Colourless
Odour:	Odourless
Solubility in water:	ca. 60 g/100 ml @ 20C (Anhydrous)
Specific gravity:	1.542 g/cm^3
Melting point (^{o}C):	ca. 100°C
pH:	5% aqueous solution; 1.8

Section 10: Stability and Reactivity

Chemical Stability: Stable under ordinary conditions of use and storage

Conditions to avoid: Heat, flames, ignition sources and incompatibles

Material to avoid: Metal nitrates (potentially explosive reaction), alkali carbonates and bicarbonates, potassium tartrate. Will corrode copper, zinc, aluminium and their alloys.

Hazardous reactions: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Section 11: Toxicological Information

Ingestion: Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhoea. Extremely large oral dosages may produce gastrointestinal disturbances. Calcium deficiency in blood may result in severe cases of ingestion

Eye contact: Corrosive and highly irritating; may also be abrasive.

Skin contact: Causes irritation to skin. Symptoms include redness, itching, and pain.

Inhalation: Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath.

Long term effects: Chronic or heavy acute ingestion may cause tooth enamel erosion.

Section 12: Ecological information

Ecotoxicity: Not Determined
Bioccumulative: No
Rapidly Degradable: Yes

Section 13: Disposal considerations

Disposal methods: Dispose of the product and packaging at an approved landfill or other approved facility. Avoid contamination of waterways. Do not use container for any other purpose.

Section 14: Transport information

Road and Rail Transport: Not classified as a Dangerous Good according to NZS 5433:1999 Transport of Dangerous Goods on Land

Marine, Air Transport: Similar listing as for Road and Rail Transport apply

Section 15: Regulatory Information

ERMA NZ Approval: HSR003138

Section 16: Other information

Disclaimer: This SDS summarises our best knowledge at the date of issue, the chemical health and safety limits of the material and general guidance on how to safely handle the material in the workplace. Since Aakland Chemicals (1997) Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material. If clarification or further information is needed, the user should contact Aakland Chemicals (1997) Ltd

To	Tess Drewitt, Environmental Consultant, Jacobs	**Date**	29 April 2015
From	Ben Fountain, Senior Flood Engineer, Jacobs	**Project No**	AE04729
Copy			
Subject	**Flood Hazard and Impact Assessment for Kana Street, Mataura**		

1. Introduction

This memo has been compiled to inform an application by Taha Asia Pacific Limited (Taha) for resource consent for the storage of Ouvea Premix, a hazardous substance, within the site.

The purpose of this memo is to:

(1) summarise the review of the readily available flood hazard information for the site at 61-121 Kana Street and 116-128 Kana Street, Mataura (together the "site"), and (based on this information) provide a high level assessment on flood hazard at the site;

(2) provide a high level assessment of the potential impact of flooding in the buildings on site, taking into account the flood hazard and existing flood protection measures; and

(3) recommend additional flood protection measures that could be employed on site to reduce and prevent water entering the buildings in a flooding scenario.

This memo is based on information obtained through a desk-top review of existing information obtained from Environment Southland and a visit to the site on 22 April 2015.

2. Flood Hazard

2.1 Historic Flood Events

The highest recorded flood in Mataura occurred in 1978 and was estimated to be a 1 in 50-60 year AEP flood event. Table 1 details the flood history information provided by Environment Southland of flooding at the site.

Table 1: Flood History at Kana Street Site [1]

Year	Return Period	Description
1913	Unknown	
1978	50-60 years	Largest known flood. Buildings on the west side of Kana Street were flooded to a depth of 1.5-1.8 meters in October 1978. Flood depth is recorded on the former tool wall in the building.
1980	25 years	Fourth largest known flood. Flooding to a depth of 1m occurred in January 1980.
1984	Unknown	Significant flooding in the Mataura River, high Waikana Stream. Floodwaters not known to have entered buildings at the site but floodwaters came right up to buildings on the east side of Kana St
1987	Not provided	Second largest known flood. No significant flood damage to the buildings as a result of flood protection measures
1999	Not provided	Third largest known flood. No significant flood damage to the buildings as a result of flood protection measures

2.2 Flood Protection Measures

The original stopbanks at Mataura were built in 1972/3 following flooding in 1968 and 1957 with freeboard of 0.5m above the 1913 flood. The flood in 1978 resulted in inundation of the town when a short reach of the stopbank was overtopped and two other short sections failed [2]. Following this flood, Environment Southland constructed new stopbanks which would contain a 1978 size flood event with 0.5m freeboard allowance. At the site, non-return valves were fitted to various pipes leading to the river and flood barriers constructed that could be placed over various openings in the event of the defences being overtopped. A flood contingency plan was also developed [1]. Due to these mitigation measures, the 1987 and 1999 floods in the Mataura River did not damage the site. A recent assessment of the stopbanks condition resulted in them being assigned a condition score of 3 (moderate) for both the left and right banks.

Analysis of the hydrology undertaken in 1989 predicted a 100 year return period event on the Mataura River at the Gore Highway bridge to be 2169m^3/s which could be contained by the stopbanks - designed to contain 2,300m^3/s with 0.5m freeboard. However, in 2011 Environment Southland requested a review of flood frequency in the Southland region by the National Institute of Water and Atmospheric Research (NIWA). This review revised the 100 year discharge to be 2,729m^3/s with the stopbanks now only protecting up to the 1 in 50 year event [3].

2.3 Current Flood Risk

The Gore District Plan shows the site is located within an area potentially floodprone from the Mataura River in floods larger than that of 1978, or a stopbank breach in smaller floods, as shown in Figure 1. The site is also subject to flooding from the Waikana Stream which flows through the site.

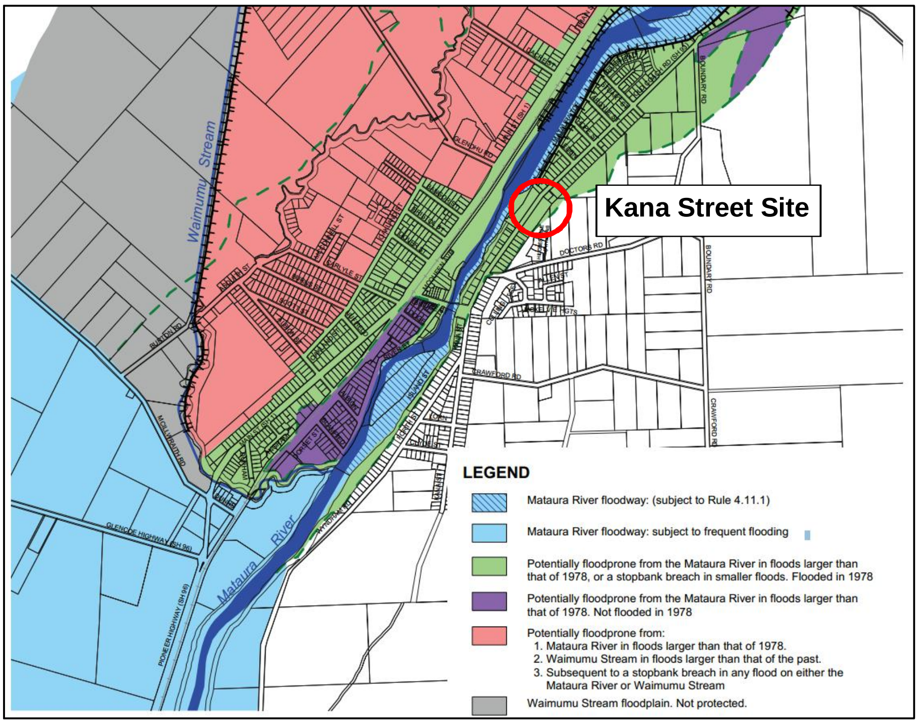


Figure 1: Gore District Plan Actual of Potential Inundation Map and site location [4]

2.4 Estimated Site Flood Levels

2.4.1 Mataura River

The recent condition assessment suggests that the stopbanks in Mataura are likely to protect the site up to the 50-60 year flood (i.e. the size of the 1978 flood). Larger flood events could result in the site flooding. There is also a risk of stopbank failure; this risk increases if the earth embankments are overtopped in a large flood.

A high level assessment has been undertaken to provide an indication of the depth of flooding that could be expected, adjacent to the Taha building, if the true left stopbank (being the stopbank on the eastern side of Mataura River) failed in a large flood event. The assumption that the true left stopbank fails is conservative as it is possible it could hold up or the true right stopbank fails first, which would minimise flooding on the site. It is difficult to predict the actual likelihood of stopbank failure of the true left stop bank in these circumstances, hence the reason a conservative approach has been taken.

The assessment has utilised a HEC-RAS model of the Mataura River that has been supplied by Environment Southland. It should be noted that this model provides only a rough order prediction of flooding levels in the river as it is difficult to accurately model the hydraulics around the waterfall in the middle of Mataura. As such, this assessment should be considered high level and conservative assumptions should be made in utilising the results.

Cross section 8 within this model is the closest to the site, the location of which is shown in Figure 2. In a large flood which overtops the embankments, a conservative assumption is that one of the banks will fail. If the upstream true left stopbank were to fail, the floodwaters would be forced down the 20m wide Kana Street between the flat area and the high ground immediately to the east. To estimate potential depths of flooding down the street, the hydraulic model was modified by removing the true left stopbank and adding the 20m width of Kana Street.

The 2011 flood frequency study undertaken by NIWA, estimated flood discharges for Mataura using the Mataura River recorder at the Tuturau site, which is shown in Table 2 [5].

Table 2: Flood discharge estimates for Mataura

Return Period (year)	Flood Discharge Estimate (m^3/s)
20	1877
50	2353
100	2729
200	3060
500	3529

The modified HEC-RAS model has been run using the flows predicted for the 100 year flood event. The model predicts that the flood level on Kana Street is 2.0m deep. In this scenario the model predicts that the water level is just below the top of the stopbanks on the true right hand bank as shown in Figure 2. This suggests that in larger flood events, such as the 500 year flood, the water levels would over top the true right hand bank and therefore are unlikely to get much deeper than the 2m on Kana Street.

If the true left stopbank were to fail in a large flood event, high velocity overland flows will occur on Kana Street potentially resulting in standing waves. High velocities combined with the potential for blockages means a minimum of 0.5m of freeboard should be added to any modelled depth. This high level conservative assessment suggests that a 100 year flood event could result in flood depths of up to 2.5m at the Taha site.

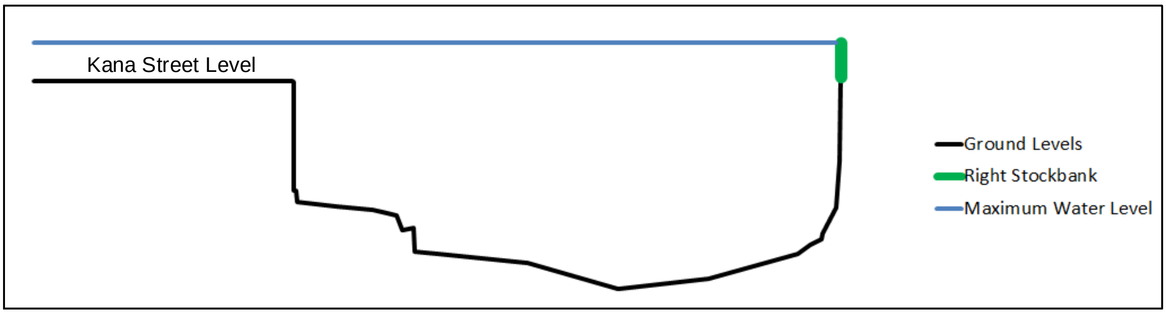


Figure 2: Maximum water level on the street constrained by the right stopbank

Considering the potential for deep flooding, it would be difficult to protect the building from large flood events on the Mataura River. However due to the large catchment size it is likely that there would be a significant amount, possibly days, of warning time to prepare for flooding.

JACOBS

Blue line – Cross section 8 44.4m wide

Red line – 90m distance between river bank and base of hill

Purple lines – 20m wide road

Green line – Waikana Stream

Figure 3: Taha site location (mapping taking from Gore District Council Intramaps)

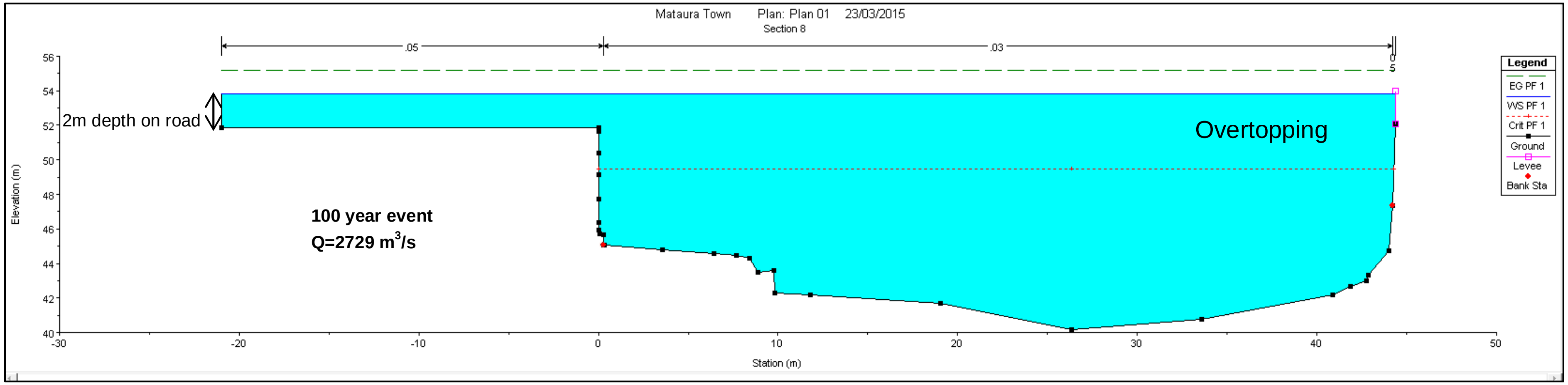


Figure 4: Model Cross Section 8 Water Levels on the scenario of the failure of the true left stopbank

2.4.2 Waikana Stream

The site is also at risk from the Waikana Stream. This is a much smaller catchment than the Mataura River and would have a much shorter response time and therefore less warning. The stream flows from the north east through a culvert under Kana Street and then runs parallel to the Taha storage buildings before passing through another culvert and into the Mataura River.

If the culvert beneath Kana Street was to become blocked or if the Waikana Stream were to flood during an extreme flood in the Mataura River that restricts the outflow of the stream, an estimate of the flood depth on Kana Street is as outlined below:

Peak Flow
Rational Method:
Q = CiA

C – Runoff Coefficient
i – Rainfall Intensity
A – Catchment Area

$$Q = AV$$

Velocity
Manning's Equation:

$$V = \frac{1.49\, R^{2/3} S^{1/2}}{n}$$

R – Hydraulic Radius
S – Slope
N – Manning's roughness

***Area**: Road width x depth of flooding*

The following assumptions have been made:

- 50 year rainfall event with a duration of 30 minutes giving a rainfall intensity of 24.6mm [6]
- Catchment area measured as 9822000m^2
- Runoff Coefficient of 0.3
- Manning's n value of 0.02
- Road Slope of 0.001
- Road width of 20m

This gives an approximate maximum depth of flooding on the street for a 50 year event of 1.0m.

It is important to note that the risk of blockage of the culverts under Kana Street is low. Upstream of the culverts there is a weir that will act as a debris trap with a wide overland flow path that will allow flood flows back into the stream (see Figure 3). Furthermore the eastern side of Kana Street is lower that the Mataura River side and overflows from the Waikana Stream will preferentially pass down the eastern side of the street.

Figure 3: Weir upstream of Waikana Stream Culvert under Kana Street

2.5 Summary of Flood Risk

This is a high level assessment of flood hazard and so conservative assumptions have been made to manage the uncertainty.

The Taha storage facility at 65-121 and 116-128 Kana Street, Mataura is protected from flooding from the Mataura River up to a 50 to 60 year return period flood event. The floodwalls and stopbanks that protect this area were designed to contain the 1978 flood event. Recent condition assessments of the flood protection in Mataura indicate that the protection measures are still able to provide this level of protection.

In larger flood events there is potential for the stopbanks that contain the river to be overtopped. High level hydraulic modelling of this area undertaken by Environment Southland indicates that the eastern stopbanks would just overtop in a 100 year flood event. The risk of stopbank failure increases in the event of overtopping. Should the stopbank on the Kana Street side of the Mataura River fail in an extreme flood event, the depths of flooding surrounding the Taha storage site could be up to 2.5m deep (including 0.5m freeboard).

The site is also at risk from flooding of the Waikana stream. If the outlet to the river was restricted or a blockage occurred on this stream, flood depths of up to 1.0m could be expected adjacent to the buildings on Kana Street in a 50 year return period event. However, the actual risk of blockage is unlikely.

3. Impact of Flooding

The review of the available hazard information indicates that the buildings at 65-121 and 116-128 Kana Street, Mataura are at risk of flooding from two main sources: the Waikana Stream and the Mataura River. If flooding was to occur adjacent to the storage buildings, there are a number of ways to reduce the risk to the stored Ouvea Premix.

3.1 Shallow Flooding

In the event of shallow flooding on Kana Street, as could be expected from overflows from the Waikana Stream in a 50 year event with blockages, it is possible that much of the flooding could be kept out of the storage buildings through the use of localised flood protection measures. Two of the storage buildings are elevated over 1.0m above Kana Street while the main storage building on the river side of Kana Street has purpose built barriers that can be secured across all the entrances (see Figure 4). It should be noted that a number of hours prior warning of the flood event would be required to erect these barriers.

Figure 4: Example of purpose built barriers that could increase the protection to 109 Kana Street

A site visit on 22 April 2015 identified the possibility of flood flows from the Waikana Stream passing down the rear of the building 116-128 Kana Street (see Figure 5). The floor level at the back of this building is at ground level and therefore if flood flows passed down the rear of the building water would almost certainly enter the building. However, simple measures could be undertaken to help prevent this. For example, a 1.0m earthbund could be created that would divert flood flows escaping the Waikana Stream onto the street (see Figure 5 and 6).

Figure 5: Potential secondary flowpath from the Waikana Stream that could endanger the building floor level of 116-130 Kana Street

Figure 6: Potential location of bund

3.2 Deep Flooding

In an extreme flood event, such as the failure of the Mataura River Stopbank during a 100 year flood, there is likely to be deep flooding adjacent to the storage buildings. In this event it is unlikely that flood waters could be prevented from entering the buildings. While the velocities of the flood flows on Kana Street will be fast, an inspection of the storage buildings suggests that within the buildings the velocities are likely to be slow if not stationary. There is almost no risk of the 1 tonne bags of Ouvea Premix being mobilised and carried out of the buildings.

The high level assessment of the flood hazard suggests that inundation of the main storage building (at 68-121 Kana Street), in the extreme scenario described above, could be deep. The floor level of the building is elevated slightly above the road level and therefore the maximum depth of water inside the main building is predicted to be up to 2.0m. In the other storage buildings, including 116-128 Kana Street, the inundation above floor level could be 1.0m in depth.

There are a range of measures to reduce the consequences of an extreme event that results in inundation inside the main building, including minimising the water contact with the Ouvea Premix through water proof bags and raising the bags above the flood waters. Should these measures not be practical for Taha, then much of the contaminated flood waters from bags in the buildings could be collected, once the flood subsides, in the loading pits in each of the storage buildings, before being pumped or treated (see Figure 7).

Figure 7: Sandbagging the entranceway will create a suitable location for the capture of contaminated water following a flood

4. Summary of Findings

The assessment of the flood hazards to 68-121 and 113-128 Kana Street, Mataura suggests that it is possible to provide up to a 50 year level of protection to the material stored in the buildings. This will require some localised protection such as the formation of a bund to divert overflows from the Waikana Stream from the east of the buildings on 113-128 Kana Street and a robust flood warning response plan to erect barriers across vulnerable entrance ways.

In extreme flood events, such as the 100 year flood in the Mataura River, the analysis suggests that it will be difficult to prevent inundation within the storage buildings. Inundation in the buildings would range from up to 1.0m in the buildings on 113-128 Kana Street and 2.0m in the main buildings on 68-121 Kana Street. Water inside the building is expected to be slow, if not stationary, and as such there is almost no risk of the bags being mobilised and washed out of the buildings in this magnitude event. There are a range of measures that could be undertaken within the building to further reduce the bags exposure to flood waters. If these measures are not practical for Taha, there is also the possibility of collected contaminated water once the flooding subsides.

5. Bibliography

[1] D. Bradley, *Environment Southland File Note*, 2014.

[2] Southland Catchment Board, “Phase II Stage III Mataura Borough Flood Protection Scheme Report,” 1983.

[3] Environment Southland, “Asset Management Review Mataura Stopbanks,” 2013.

[4] Gore District Council, “Gore District Plan,” [Online]. Available: http://www.goredc.govt.nz/assets/documents/plans-reports/district-plan/section-3-map-3.2-mataura.pdf. [Accessed March 2015].

[5] NIWA, “Review of Flood Frequency in the Southland Region,” 2011.

[6] NIWA, “High Intensity Rainfall System V3,” NIWA, 2015. [Online]. Available: http://hirds.niwa.co.nz/hirds_data/Mataura/NZMG/5438035/2190798/0,0,0/DDF. [Accessed March 2015].

Mataura Storage
Weekly Inspection

CONTACT HENARE FOR SITE ACCESS

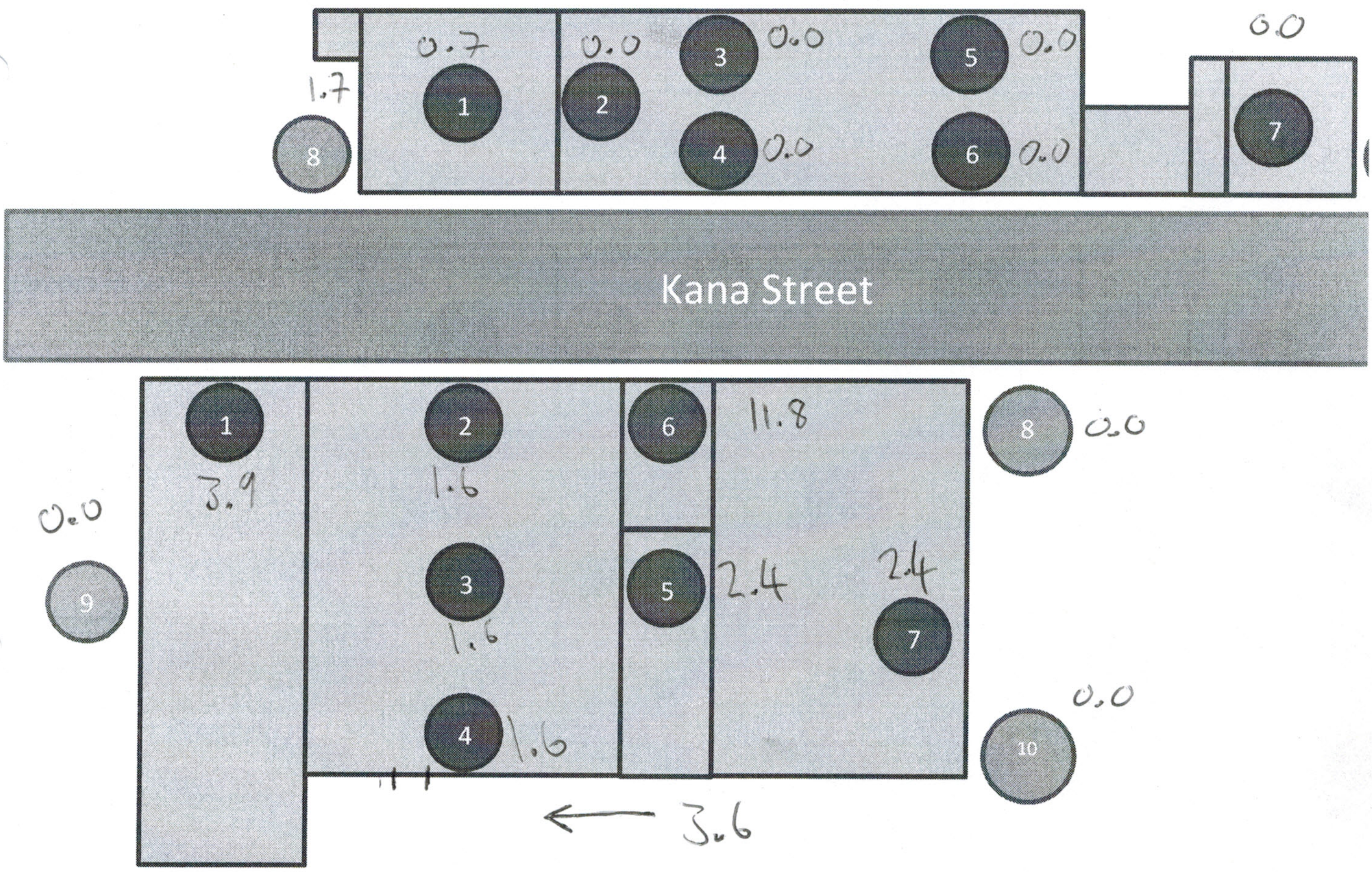
021 718 989

Inspected By: [signature]

Date: 8/4/15

Mataura Industrial Estate : Storage Ammonia Readings

DATE 8/4/15	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9
	1.7	0.7	0.0	0.0	0.0	0.0	0.0		
Weather	Current	fine			Previous	fine			
Weather	Current				Previous				
Weather	Current				Previous				
Weather	Current				Previous				
Weather	Current				Previous				



DATE 8/4/15	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10
	3.9	1.6	1.6	1.6	2.4	11.8	2.4	0.0	0.0	0.0
Weather	Current	fine			Previous	fine				
Weather	Current				Previous					
Weather	Current				Previous					

Weather	Current				Previous					
Weather	Current				Previous					

Water: Are there visible leaks?
Details:____

____

____

Have details been passed on to instigate repair: YES/NO. Who to: ______________

Timeframe indicated to complete repair: ________________________________

Are there any damaged bags: YES\NO. If so location______________________

Action taken to rectify:

____

____

Perimeter check: Is there any damage to the exterior of building: YES\NO.

Description:

____

____

____

Action Taken:

____

____

Is there any odour noticeable outside the building: YES/NO.

If yes, take readings and describe location then recheck for any damage inside.

Description:(include reading)____

____

____

Action Taken:(Who advised, timeframe etc)___________________________________

____

____

STORED PLANT:

Check condition of equipment and give a brief description if faults detected:____

____

Action Taken:(Who advised, timeframe
etc)

Cover intact: YES/NO.

Forklift Operational YES\NO **FILL OUT FORKLIFT LOG**

Mataura Storage Weekly Inspection

CONTACT HENARE FOR SITE ACCESS

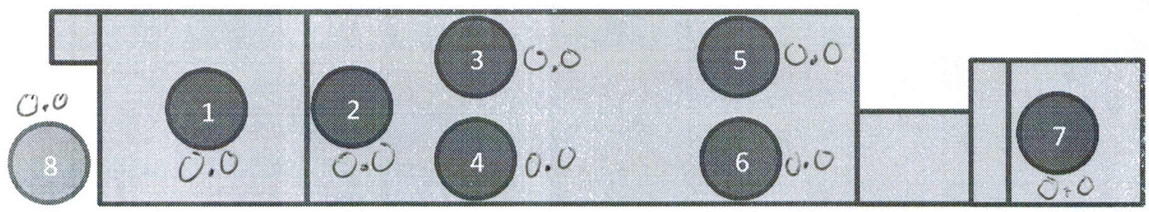
021 718 989

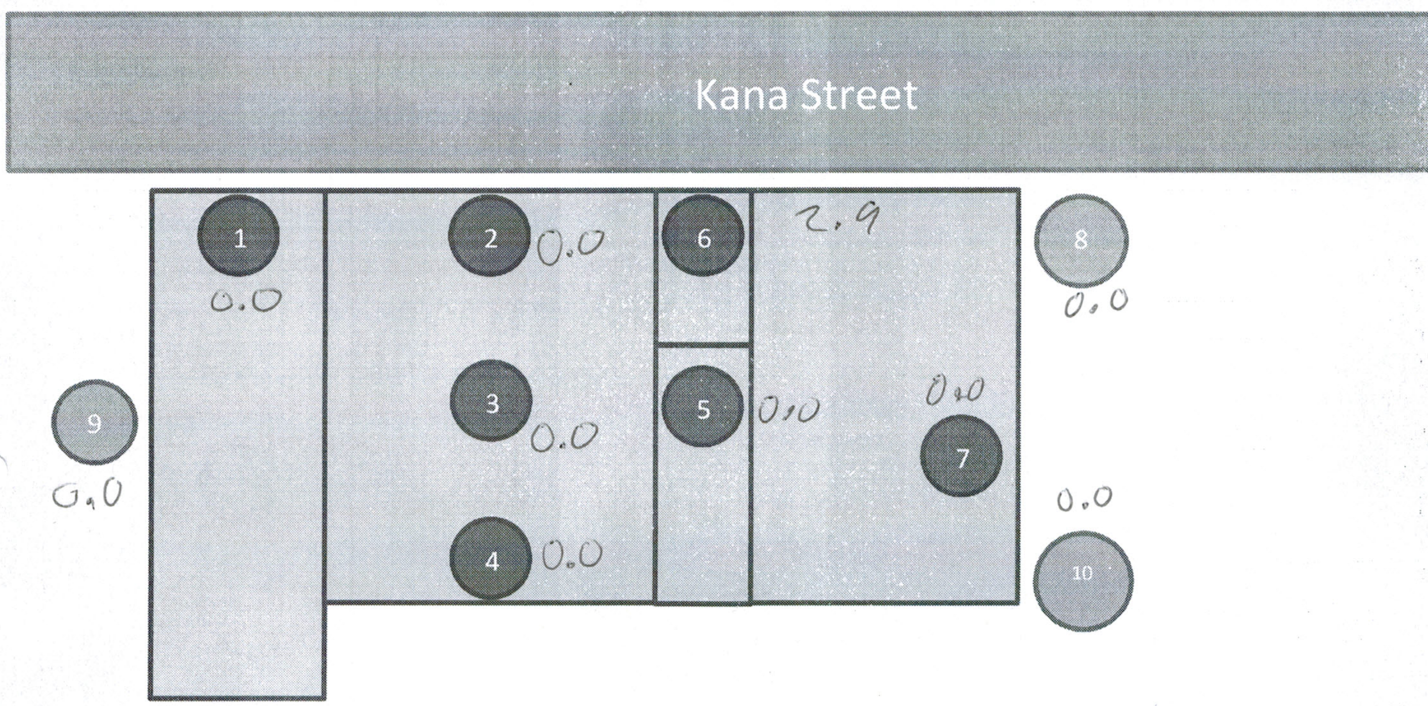
Inspected By: Karl Shaw

Date: 13/4/15

Mataura Industrial Estate : Storage Ammonia Readings

DATE 13/4/15	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Weather	Current	wet			Previous	fine			
Weather	Current				Previous				
Weather	Current				Previous				
Weather	Current				Previous				
Weather	Current				Previous				





DATE 13/4/15	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10
	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0
Weather	Current	wet			Previous	fine				
Weather	Current				Previous					
Weather	Current				Previous					

Weather	Current				Previous					
Weather	Current				Previous					

Water: Are there visible leaks?
Details:____

Have details been passed on to instigate repair: YES/NO. Who to: _______________

Timeframe indicated to complete repair: _______________________________________

Are there any damaged bags: YES\NO. If so location__________________________

Action taken to rectify:

Perimeter check: Is there any damage to the exterior of building: YES\NO.

Description:

Action Taken:

Is there any odour noticeable outside the building: YES/NO.

If yes, take readings and describe location then recheck for any damage inside.

Description:(include reading)____

Action Taken:(Who advised, timeframe etc)____

STORED PLANT:

Check condition of equipment and give a brief description if faults detected:____

____

____

Action Taken:(Who advised, timeframe
etc)____

____

____

Cover intact: YES/NO.

Forklift Operational YES\NO **FILL OUT FORKLIFT LOG**

Stephen Macknight Ltd
BE (Hons), MIPENZ, CPENG

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1 May 2015

Jacobs
Level 3
86 Customhouse Quay
PO Box 10283,
Wellington.

FAO Tess Drewitt

Dear Tess

Re Structural Assessment Mataura Paper Mill Buildings

We have carried out a preliminary structural assessment on the buildings at the former Mataura paper mill, in order to comment on their suitability for use to store bags of fertiliser.

The site consists of a number of buildings of different ages and structural types. From early timber framed buildings to very solid reinforced concrete structures.

In this report and accompanying IEP (initial Evaluation Procedure), we have looked at the most susceptible building in terms of seismic resistance. The remaining buildings will have greater seismic resistance, with the more modern reinforced concrete and lightweight steel buildings being over 100% NBS (New building Standard) in terms of earthquake resistance.

The building accessed has walls of unreinforced masonry with reinforced concrete bands and columns. These are connected to a lightweight timber and steel roof structure. The floor and foundations are of reinforced concrete.

Provided this type of structure is well tied together, and there is no significant damage or decay, this type of structure has been shown to preform reasonably well in a seismic event.

In this case we would do not believe the structure to be 'Earthquake Prone', as it would not collapse in a moderate earthquake, and poses only a small risk to those either inside or adjacent to the exterior of the building, in a significant seismic event.

We therefore believe that this building is suitable for its intended use for storage, and the remaining newer buildings are suitable for this use, and other related uses, in terms of structural and seismic capacity, provided they continue to be maintained.

Please call it you require any other information regarding this.

Regards

Steve Macknight
Stephen Macknight Ltd

Table IEP-1: Initial Evaluation Procedure – Step 1

Table IEP-1 **Initial Evaluation Procedure Step 1** **Page 1....**

(Refer Table IEP - 2 for Step 2; Table IEP - 3 for Step 3, Table IEP - 4 for Steps 4, 5 and 6)

Building Name	Matura Paper Mill - Original Building	**Ref.**	100
Location	Kana St Matuara	**By**	SJM
		Date	1/05/15

Step 1 - General Information

1.1 Photos (attach sufficient to describe building)

1.2 Sketch of building plan

Rectangular warehouse building

1.3 List relevant features

This report covers the oldest, least sound building
Brick & reinforced concrete façade
One Level with lightweight roof on steel/ timber structure
Generally remains in good condition

1.4 Note information sources

	tick as appropriate
Visual Inspection of Exterior	X
Visual Inspection of Interior	X
Drawings (note type)	X
Specifications	
Geotechical Reports	
Other (list)	

Table IEP-2: Initial Evaluation Procedure – Step 2

Table IEP-2 Initial Evaluation Procedure Step 2

(Refer Table IEP - 1 for Step 1; Table IEP - 3 for Step 3; Table IEP - 4 for Steps 4, 5 and 6)

Building Name	Matura Paper Mill - Original Building	**Ref.**	100
Location	Kane St Matuara	**By**	SJM
Direction Considered:	**a) Longitudinal** **b) Transverse**		
(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)		**Date**	1/05/15

Step 2 - Determination of $(\%NBS)_b$

2.1 Determine nominal (%NBS) = $(\%NBS)_{nom}$

a) Date of Design and Seismic Zone

tick as appropriate

Pre 1935			See also notes 1, 3
1935-1965		X	
1965-1976	**Seismic Zone; A**		
	B		
	C		
1976-1992	**Seismic Zone; A**		See also note 2
	B		
	C		
1992-2004			

b) Soil Type

From NZS1170.5:2004, Cl 3.1.3	**A or B Rock**	
	C Shallow Soil	X
	D Soft Soil	
	E Very Soft Soil	
From NZS4203:1992, Cl 4.6.2.2 (for 1992 to 2004 only and only if known)	**a) Rigid**	
	b) Intermediate	

c) Estimate Period, T 0.4 Seconds

Can use following:

$T = 0.09h_n^{0.75}$	for moment-resisting concrete frames
$T = 0.14h_n^{0.75}$	for moment-resisting steel frames
$T = 0.08h_n^{0.75}$	for eccentrically braced steel frames
$T = 0.06h_n^{0.75}$	for all other frame structures
$T = 0.09h_n^{0.75}/A_c^{0.5}$	for concrete shear walls
$T \leq 0.4$sec	for masonry shear walls

Where h_n = height in m from the base of the structure to the uppermost seismic weight or mass.

$A_c = \Sigma A_i(0.2 + L_{wi}/h_n)^2$

A_i = cross-sectional shear area of shear wall i in the first storey of the building, in m^2

l_{wi} = length of shear wall i in the first storey in the direction parallel to the applied forces, in m

with the restriction that l_{wi}/h_n shall not exceed 0.9

d) $(\%NBS)_{nom}$ determined from Figure 3.3 4 $(\%NBS)_{nom}$

Note 1: For buildings designed prior to 1965 and known to be designed as public buildings in accordance with the code of the time, multipy $(\%NBS)_{nom}$ by 1.25. For buildings designed 1965 - 1976 and known to be designed as public buildings in accordance with the code of the time, multiply $(\%NBS)_{nom}$ by 1.33 - Zone A; 1.2 - Zone B — 1

Note 2: For reinforced concrete buildings designed between 1976-84 multiply $(\%NBS)_{nom}$ by 1.2 — 1

Note 3: For buildings designed prior to 1935 multiply $(\%NBS)_{nom}$ by 0.8 except for Wellington where the factor may be taken as 1. — 1

4 $(\%NBS)_{nom}$

Continued over page

Table IEP-2: Initial Evaluation Procedure – Step 2 continued

2.2 Near Fault Scaling Factor, Factor A
If $T \leq 1.5$sec, Factor A = 1

a) Near Fault Factor, $N(T,D)$ (from NZS1170.5:2004, Cl 3.1.6) — 1.0

b) Near Fault Scaling Factor = 1/N(T,D) — Factor A: 1.0

2.3 Hazard Scaling Factor, Factor B

a) Hazard Factor, *Z, for site* (from NZS1170.5:2004, Table 3.3) — 0.17

b) Hazard Scaling Factor

For pre 1992	=	$1/Z$
For 1992 onwards	=	Z_{1992}/Z

(Where Z_{1992} is the NZS4203:1992 Zone Factor from accompanying Figure 3.5(b)) — Factor B: 5.9

2.4 Return Period Scaling Factor, Factor C

a) Building Importance Level (from NZS1170.0:2004, Table 3.1 and 3.2) — 2.0

b) Return Period Scaling Factor from accompanying Table 3.1 — Factor C: 1.0

2.5 Ductility Scaling Factor, D

a) Assessed Ductility of Existing Structure, μ (shall be less than maximum given in accompanying Table 3.2) — 1.3

b) Ductility Scaling Factor

For pre 1976	=	k_μ
For 1976 onwards	=	1

(where k_μ is NZS1170.5:2004 Ductility Factor, from accompanying Table 3.3) — Factor D: 1.14

2.6 Structural Performance Scaling Factor, Factor E

a) Structural Performance Factor, S_p from accompanying Figure 3.4 — 0.9

b) Structural Performance Scaling Factor = $1/S_p$ — Factor E: 1.1

2.7 Baseline %NBS for Building, $(\%NBS)_b$
(equals $(\%NSB)_{nom}$ x A x B x C x D x E) — 29.8%

Table IEP-3: Initial evaluation procedure – Step 3

Table IEP-3 **Initial Evaluation Procedure Step 3** **Page ......**

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2; Table IEP - 4 for Steps 4, 5 and 6)

Building Name	Matura Paper Mill - Original Building	**Ref.** 100
Location	Kana St Matuara	**By** SJM
Direction Considered: a) Longitudinal	X **b) Transverse**	
(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)		**Date** /05/15

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

Critical Structural Weakness	**Building Score**	**Effect on Structural Performance** *(Choose a value - Do not interpolate)*		
3.1 Plan Irregularity *Effect on Structural Performance*		Severe	Significant	Insignificant
Factor A	1.0	0.4 max	0.7	1
Comment				
3.2 Vertical Irregularity *Effect on Structural Performance*		Severe	Significant	Insignificant
Factor B	1.0	0.4 max	0.7	1
Comment				
3.3 Short Columns *Effect on Structural Performance*		Severe	Significant	Insignificant
Factor C	1.0	0.4 max	0.7	1
Comment				

3.4 Pounding Potential
(Estimate D1 and D2 and set D = the lower of the two, or =1.0 if no potential for pounding)

a) Factor D1: - Pounding Effect
Select appropriate value from Table

Note:
Values given assume the building has a frame structure. For stiff buildings (eg with shear walls), the effect of pounding may be reduced by taking the co-efficient to the right of the value applicable to frame buildings.

Factor D1 1.0

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	0.7	0.8	1
Alignment of Floors not within 20% of Storey Height	0.4	0.7	0.8

b) Factor D2: - Height Difference Effect
Select appropriate value from Table

Factor D2 1.0

Table for Selection of Factor D2	Severe	Significant	Insignificant
	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Height Difference > 4 Storeys	0.4	0.7	1
Height Difference 2 to 4 Storeys	0.7	0.9	1
Height Difference < 2 Storeys	1	1	1

Factor D 1.0 ***(Set D = lesser of D1 and D2 or.. set D = 1.0 if no prospect of pounding)***

3.5 Site Characteristics - *(Stability, landslide threat, liquefaction etc)* *Effect on Structural Performance*		Severe	Significant	Insignificant
Factor E	1.0	0.5 max	0.7	1

3.6 Other Factors

Factor F 1.5 **For ≤ 3 storeys - Maximum value 2.5, otherwise - Maximum value 1.5. No minimum.**

Record rationale for choice of Factor F:

One level, lightwight roof, structural elements tied togeather

3.7 Performance Achievement Ratio (PAR) 1.5
(equals **A x B x C x D x E x F**)

Table IEP-3: Initial evaluation procedure – Step 3

Table IEP-3 Initial Evaluation Procedure Step 3 **Page ......**

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2; Table IEP - 4 for Steps 4, 5 and 6)

Building Name	Matura Paper Mill - Original Building	**Ref.**	100.0
Location	Kana St Matuara	**By**	SJM
Direction Considered: a) Longitudinal	b) Transverse X		
(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)		**Date**	1/05/15

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

Critical Structural Weakness	Building Score	Effect on Structural Performance *(Choose a value - Do not interpolate)*		
3.1 Plan Irregularity *Effect on Structural Performance*		Severe	Significant	Insignificant
Factor A	1.0	0.4 max	0.7	1
Comment				
3.2 Vertical Irregularity *Effect on Structural Performance*		Severe	Significant	Insignificant
Factor B	1.0	0.4 max	0.7	1
Comment				
3.3 Short Columns *Effect on Structural Performance*		Severe	Significant	Insignificant
Factor C	1.0	0.4 max	0.7	1
Comment				

3.4 Pounding Potential
(Estimate D1 and D2 and set D = the lower of the two, or =1.0 if no potential for pounding)

a) Factor D1: - Pounding Effect
Select appropriate value from Table

Note:
Values given assume the building has a frame structure. For stiff buildings (eg with shear walls), the effect of pounding may be reduced by taking the co-efficient to the right of the value applicable to frame buildings.

Factor D1 1.0

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	0.7	0.8	1
Alignment of Floors not within 20% of Storey Height	0.4	0.7	0.8

b) Factor D2: - Height Difference Effect
Select appropriate value from Table

Factor D2 1.0

Table for Selection of Factor D2	Severe	Significant	Insignificant
	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Height Difference > 4 Storeys	0.4	0.7	1
Height Difference 2 to 4 Storeys	0.7	0.9	1
Height Difference < 2 Storeys	1	1	1

Factor D 1.0 ***(Set D = lesser of D1 and D2 or.. set D = 1.0 if no prospect of pounding)***

3.5 Site Characteristics - *(Stability, landslide threat, liquefaction etc)* *Effect on Structural Performance*		Severe	Significant	Insignificant
Factor E	1.0	0.5 max	0.7	1

3.6 Other Factors

Factor F 1.5 **For ≤ 3 storeys - Maximum value 2.5, otherwise - Maximum value 1.5. No minimum.**

Record rationale for choice of Factor F:

One level, lightwight roof, structural elements tied together

3.7 Performance Achievement Ratio (PAR) 1.5
(equals **A x B x C x D x E x F**)

Table IEP-4: Initial evaluation procedure – Steps 4, 5 and 6

Table IEP- 4 **Initial Evaluation Procedure Steps 4, 5 and 6** **Page ...**

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2; Table IEP - 3 for Step 3)

Building Name	Matura Paper Mill - Original Building	**Ref.**	100
Location	Kana St Matuara	**By**	SJM
		Date	1/05/15

Step 4 - Percentage of New Building Standard (%*NBS*)

	Longitudinal	Transverse
4.1 Assessed Baseline (%*NBS*)$_b$ (from Table IEP - 1)	0.30	0.30
4.2 Performance Achievement Ratio (PAR) (from Table IEP - 2)	1.50	1.50
4.3 PAR x Baseline (%*NBS*)b	0.45	0.45
4.4 Percentage New Building Standard (%*NBS*) (Use lower of two values from Step 3.3)		44.7%

Step 5 - Potentially Earthquake Prone? (Mark as appropriate)

%NBS > 33	NO
%NBS ≤ 33	YES

Step 6 - Potentially Earthquake Risk? (Mark as appropriate)

%NBS ≥ 67	NO
%NBS < 67	YES

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade C

Evaluation Confirmed by... [signature] **Signature**

Stephen Macknight **Name**

141494 **CPEng. No**

Relationship between Seismic Grade and %*NBS*:

Grade:	A+	A	B	C	D	E
%NBS:	> 100	100 to 80	80 to 67	67 to 33	33 to 20	< 20

Mataura Land Use Consent Application

Taha Fertilizer Industries Limited

Hazard Identification and Risk Assessment

AE04729_NEM-RPT-003 | REV0

30 April 2015

Mataura Land Use Consent Application

Project no:	AE04729
Document title:	Hazard Identification and Risk Assessment
Document No.:	AE04729_NEM-RPT-003
Revision:	Draft
Date:	17 April 2015
Client name:	Taha Fertilizer Industries Limited
Client no:	Taha
Project manager:	Tess Drewitt
Author:	Bruce Clarke
File name:	I:\AENVW\Projects\AE04729\Technical (controlled)\Risk assessment\Mataura Hazard Identification and Risk Assessment (Master).docx

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Document history and status

Revision	Date	Description	By	Review	Approved
Draft	30/4/2015	Draft report for internal review	B Clarke	N Conland	N Conland
Issue	1/5/2015	Issue to Taha Asia Pacific and Gore District Council	B Clarke	N Conland	N Conland

Contents

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to assess the effects and risks associated with the storage of hazardous substances a Taha Asia Pacific's Mataura bulk storage facility in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

Executive Summary

Introduction

Taha Fertilizer Industries Limited (Taha) has applied to the Gore District Council (GDC) for resource consent for a restricted discretionary activity to store nearly 10,000 tonnes of Ouvea Premix, which is a class 6 and 9 hazardous substance, at its storage facilities at 68-121 and 113-128 Kana Street Mataura, and for parking in an industrial area. GDC has notified this consent application. Taha is seeking a resource consent term of 2 years to provide time for it to secure a permanent site for storage and processing.

This Hazard Identification and Risk Assessment (HIRA) has been developed to support the Assessment of Environmental Effects (AEE). In particular, it seeks to address issues raised by GDC in its section 95 report and issues raised by submitters. Primarily, it clarifies the chemical properties of Ouvea Premix, the substance to be stored by Taha, and the chemical reaction of Ouvea Premix and water and the resulting production of ammonia under a credible accident event such as a flooding of the site..

Ouvea Premix properties

Ouvea Premix is a dry, granular substance, which is an output of the aluminium recovery and recycling process. Ouvea Premix is made up of aluminium oxide, aluminium nitride and magnesium aluminate to varying concentrations dependent on the source of the dross that is put through the aluminium metal recovery process operated by Taha at the Tiwai Point Smelter. Ouvea Premix has been classified as:

- Class 6.3A Skin irritant
- Class 6.4A Eye irritant
- Class 9.1C Aquatic eco-toxicant.

When mixed with water, Ouvea Premix has the potential to generate ammonia through a series of reactions. However, the ammonia generation potential is regulated by the reaction mechanism of Ouvea Premix with water. When the Ouvea Premix is fully immersed in water, the ammonia generated will dissolve into water ultimately forming ammonium. In this situation, the amount of ammonia gas generated is negligible. When product is damp or no longer immersed in water, the reaction mechanism will tend to slowly release ammonia gas over time. This reaction mechanism is not instantaneous and therefore there is no potential to generate a large concentrated gas cloud. All these reactions are moderated by the amount of material that gets wet.

South-Pathway-Receptor Environmental Risk Assessment

A source-pathway-receptor environmental risk assessment was undertaken to quantify the risk of storage activities to people and the surrounding environment by identifying potential hazards and identify credible exposure pathways. Through this assessment, the following two credible accident scenarios were identified:

1) Discharge of ammonia gas to atmosphere as a result of Ouvea Premix being wetted by a 1 in 100 year flood (considered an extreme event), which is then inhaled by exposed individuals; and
2) Discharge of ammonia and fluoride in flood water to the Mataura River and Waikana Stream following an extreme event.

A consequence analysis was then conducted on the two credible accident scenarios identified. The analysis found that:

1) The consequences of the generation of ammonia gas following an extreme event is considered to be acceptable. In particular, a maximum 1-hour average concentration of 2.2 mg/m^3 is predicted to occur approximately 100 metres from the source. This is below the No Adverse Effects Level for Human Equivalent (NOAEL(HEC)) for ammonia of 2.3 mg/m^3, which is the level of continuous exposure to ammonia below which will not result in observable health effects. The model indicates a rapid decrease in concentration over distance. At the predicted concentrations people in the area would typically not be able to smell any ammonia odour which has an odour threshold of around 38 mg/m^3.

2) The consequences of ammonia and fluoride entering watercourses following a 100 year event are also considered to be acceptable. The level of dilution provided by the Mataura River during a flood event is large and as a result the contaminant concentrations of the discharges will not reach a level which adversely affects the aquatic ecology or any other uses of the Mataura River.

Conclusions and recommendations

The qualitative risk assessment has assessed all hazards as having low to moderate levels of risk and is acceptable. The risk posed by the storage of Ouvea Premix at the Mataura site on the surrounding environment is acceptable, even when extreme flood events are considered.

The report recommends that:

- Taha needs to instigate its Environmental Management Plan at the site in order to adequately manage and monitor the storage of Ouvea Premix.
- Taha needs to develop procedures for managing and monitoring standing water in the building as a result of a flood event which will have potentially elevated concentrations of contaminants.

1. Introduction

Jacobs New Zealand Limited (Jacobs) has conducted a Hazard Identification and Risk Assessment (HIRA) related to the storage of Ouvea Premix in the former Mataura Paper Mill buildings by Taha Asia Pacific Limited (Taha). The purpose of this HIRA is to address concerns raised by Gore District Council (GDC) and submitters in relation to the potential offsite impacts on community health and safety, and the environment as a result of a major industrial accident (fire, flood, uncontrolled chemical reaction) at the site.

The HIRA process conducted by Jacobs follows the guidance for preparing a Safety Case contained in the Approved Code of Practice for Managing Hazards to Prevent Major Industrial Accidents and Guidance[1] on the Interpretation of Major Accident to the environment for the purposes of the COMAH Regulation[2].

In particular, this report describes:

- The hazardous substances and the installation used to store the material
- The chemical properties and intrinsic hazards pertaining to the storage of Ouvea Premix
- The hazards present and whether they could result in a credible accident scenario
- The consequences to people and the environment for the credible accident scenarios determined pertaining to the storage of hazardous substances at the site
- A source-pathway-receptor qualitative risk assessment as to the level of risk posed by the storage of hazardous substances at the site
- Taha's management, monitoring and emergency systems to mitigate the consequences of major industrial accidents.

In order to inform the HIRA pertaining to the storage of Ouvea Premix, Jacobs has conducted the following assessments:

(1) a desktop review of the potential chemical reactions and reaction processes;

(2) a number of trials in respect to how the bags used to store the Ouvea Premix operate when immersed in water to represent flood inundation conditions should they occur at the mill;

(3) a laboratory test to confirm that the theoretical reaction mechanisms of the Ouvea Premix with water occur as predicted and to calculate the theoretical release of contaminants (in particular ammonia in the gaseous and aqueous forms) and their resulting offsite consequences;

In addition, Jacobs has also conducted a flood risk assessment of the Mataura River and an onsite inspection of the existing onsite flood protection measures to inform the likelihood and potential consequence of a major flood event on the site. The flood assessment is attached in Appendix E.

This report should be read in conjunction with the Assessment of Environmental Effects submitted to GDC on 12 March 2015.

[1] Approved Code of Practice for Managing Hazards to Prevent Major Industrial Accidents, Occupational Safety and Health Service ,Department of Labour, July 1994

[2] Guidance[2] on the Interpretation of Major Accident to the environment for the purposes of the COMAH Regulation , Department of Environment, Transport and Regions, June 1999

2. Resource Management requirements

2.1 Resource Management Act – Gore District Plan

Taha proposes to continue to store 9951 tonnes of Ouvea Premix (a class 6 and 9 hazardous substance) at its storage site in Mataura for a maximum term of two years. Storing class 6 and 9 hazardous substances above the levels permitted in an industrial zone requires resource consent from GDC for a restricted discretionary activity. Resource consent is also required for minor non-compliance with off-street parking requirements for industrial sites. Table 3 summarises the resource consent requirements for the activity under the District Plan.

Table 1: Resource Consent Requirements

Rule	Explanation	Assessment	Status of proposal
6.9(2)	Storage of hazardous substances above permitted limits, being: • 1000kg (Class 6) • 5000kg (Class 9) Storage limits will be exceeded, as indicated in Table 2 in section 3 of this report.	Storage limits will be exceeded.	Restricted Discretionary
5.9.2, 5.9.4	Off-road parking requirements for industrial activities.	Minor non-compliances with off-street parking requirements.	Restricted Discretionary

While the activity is located within a flood inundation area, this does not restrict the ability for Taha to apply for resource consent under the Gore District Plan.

2.2 Other legislative requirements

In addition to the District Plan requirements, the management and control of hazardous substances during the construction and operation of the project shall be undertaken in accordance with the statutory requirements for the storage, use and disposal of hazardous substances under the Hazardous Substances and New Organisms Act 1996 (HSNO), HSNO regulations, and gazette notices.

In order to comply with HSNO, Ouvea Premix must be controlled in a manner that meets the conditions of the "Additives, Process Chemicals and Raw Materials (Subsidiary Hazard) Group Standard 2006", which are set out in Schedule 1 of the Group Standard. The Group Standard refers to the following regulations and guidance documents:

- Labelling of Hazardous Substances: Hazard and Precautionary Information (July 2006)
- Hazardous Substances (Identification) Regulations 2001
- The Land Transport Rule
- The Civil Aviation Rule
- The Maritime rule
- Hazardous Substances (Emergency Management) Regulations 2001
- Hazardous Substances (Disposal) Regulations 2001
- Site and Storage Conditions for Toxic, Corrosive and Ecotoxic Substances (July 2006)
- UN Model Regulations

- Hazardous Substances (Tank Wagons and Transportable Containers) Regulations 2004
- Workplace Exposure Standards. Occupational Safety and Health Service, Department of Labour, January 2002.

Further information on these legislative requirements and how they apply to the storage and handling of Ouvea Premix is provided in the “Hazardous Substances and Controls for Ouvea Premix” information sheet in Appendix A.

Currently Ouvea Premix is not classified as a Dangerous Good for transport. Therefore the Land Transport, Civil Aviation and Maritime Transport rules for Dangerous Goods do not apply.

3. Environmental Setting

3.1 Location

The site Taha is using to store Ouvea Premix is located at 68-121 and 116-130 Kana Street, Mataura. Kana Street runs through the middle of the site, with Taha occupying buildings on both sides of Kana Street. The site is known historically as an industrial site and, until 2000, it housed the Mataura Carter Holt Harvey Paper Mill for more than 100 years. The buildings on the site have been unoccupied since 2002. The entire site is zoned Industrial under the Gore District Plan.

The 68-121 Kana Street site (the "**river-side**" site) is located adjacent to the Mataura River, and the entire site is in an area identified in the Gore planning maps as potentially flood prone from Mataura River in floods larger than that of 1978, or a stop bank breach in smaller floods.

Waikana Stream runs down 113-128 Kana Street (the "**bank-side**" site) up to the point where it meets the old Mill Office, travels under the office and then crosses Kana Street via a culvert. It then runs down the river-side site buildings before entering another culvert, which takes the stream under the building to the Mataura River.

3.2 Character of the surrounding area

The industrially zoned area in Mataura comprises Taha's storage site and the Mataura meat works (owned by Alliance Group Limited), which is located across Mataura River. The meat processing facility operates killing chains, coal and oil fired boilers, wastewater treatment plant, rendering plant and skin processing operations. The facility has resource consent to discharge contaminants (particulate matter, sulphur dioxide, oxides of nitrogen) including odour to air[3]. The Mataura meatworks site uses anhydrous ammonia as a refrigerant and discharges around 700 kg of ammonia per year as a result of loses from the system (according to the Assessment of Environmental Effects).

The industrial area in central Mataura, including Taha's site, is surrounded by residential areas. The buildings on the bank-side site are adjacent to the Residential Zone boundary to the east and south. The buildings are separated from the Residential Zone to the east by a bush/shrub area approximately 40-50 metres wide and to the south by approximately 40 meters. The closest residential property, which is located in the Industrial Zone, is approximately 20 metres to the south of the bank-side buildings. The nearest residential property to the river-side site is approximately 60 metres to the east. This property is also located in the Industrial Zone.

There are a number of other notable landmarks near the site, including:

- The Kia Ngawari Te Kohanga Reo child care centre, which is approximately 100 metres to the south of the buildings on the bank-side site
- A traditional lamprey collecting area, which is approximately 200 metres south of the river-side site along the Mataura River
- Mataura School, which is approximately 500 metres south-west of the site, separated by the Mataura township and the Mataura River
- Mataura Medical Centre, which is approximately 500 metres south-west of the site on Bridge Street
- The Trust Bank Park, which is west from the site across the Mataura River.

Kana Street is State Highway 93 (Designation 24 in the District Planning Maps). It branches off from State Highway 1 approximately 400 metres south of the site on the other side of Mataura River. The nearest major intersection to the site is the intersection with Kana Street and Doctors Road, approximately 200 metres south of the site.

Figures 1 and 2 provide aerial photos of the site indicating notable features and zoning.

[3] Alliance Group Assessment of Environmental Effects(AEE), Air Discharge Resource Consent for Mataura Plant, Montgomery Watson, March 2000

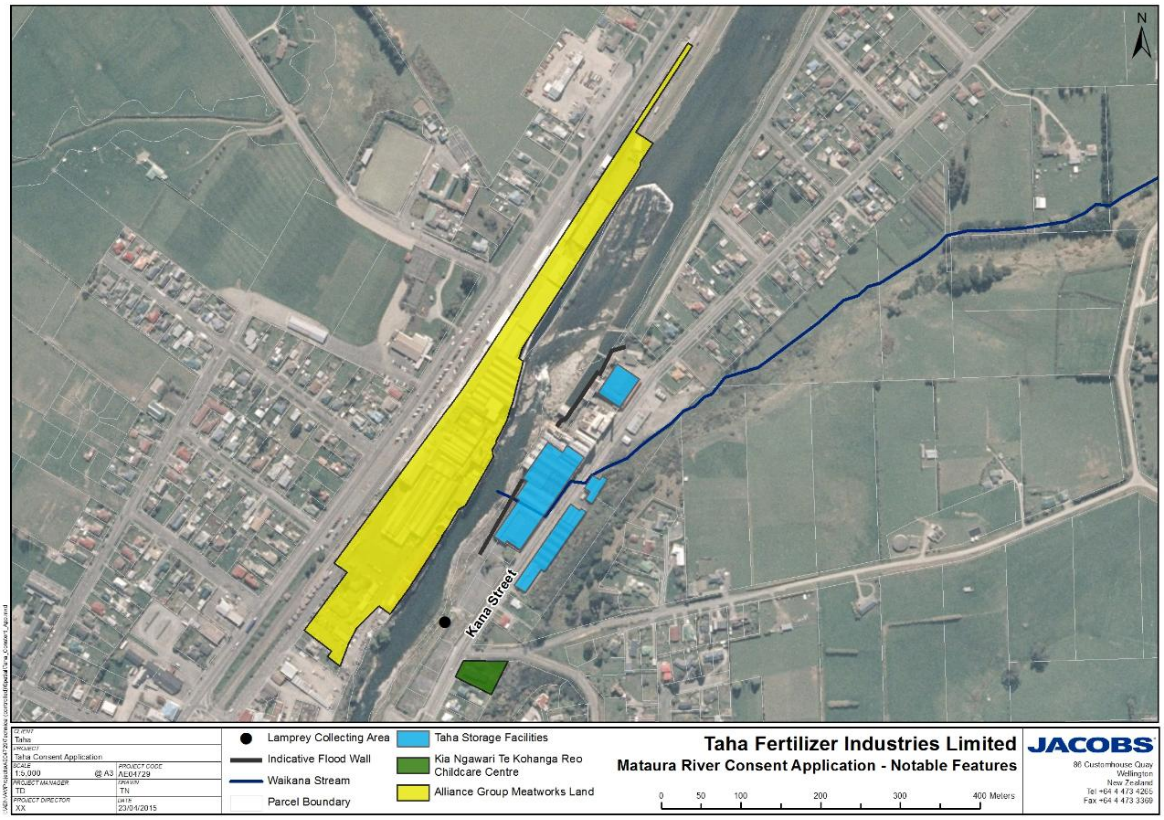


Figure 1. Site location and surrounding features

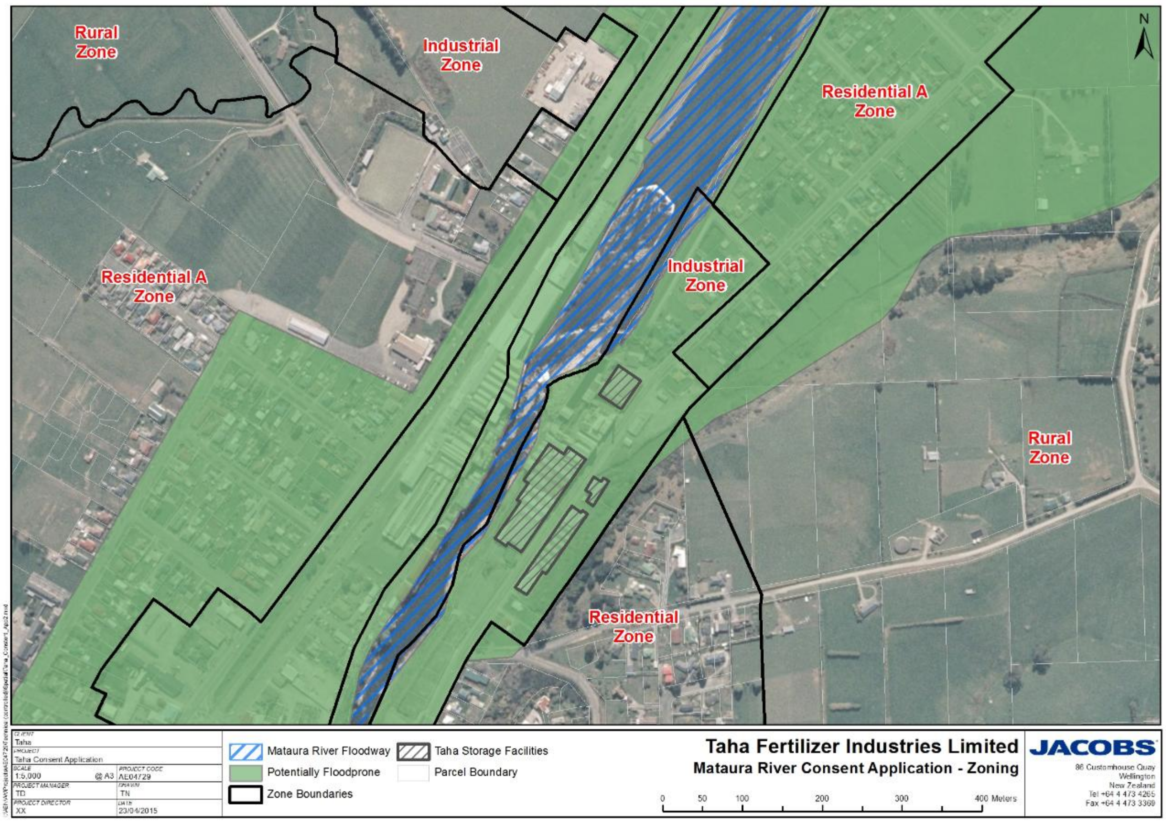


Figure 2. Site location and zoning

3.3 Meteorological Conditions of the Area

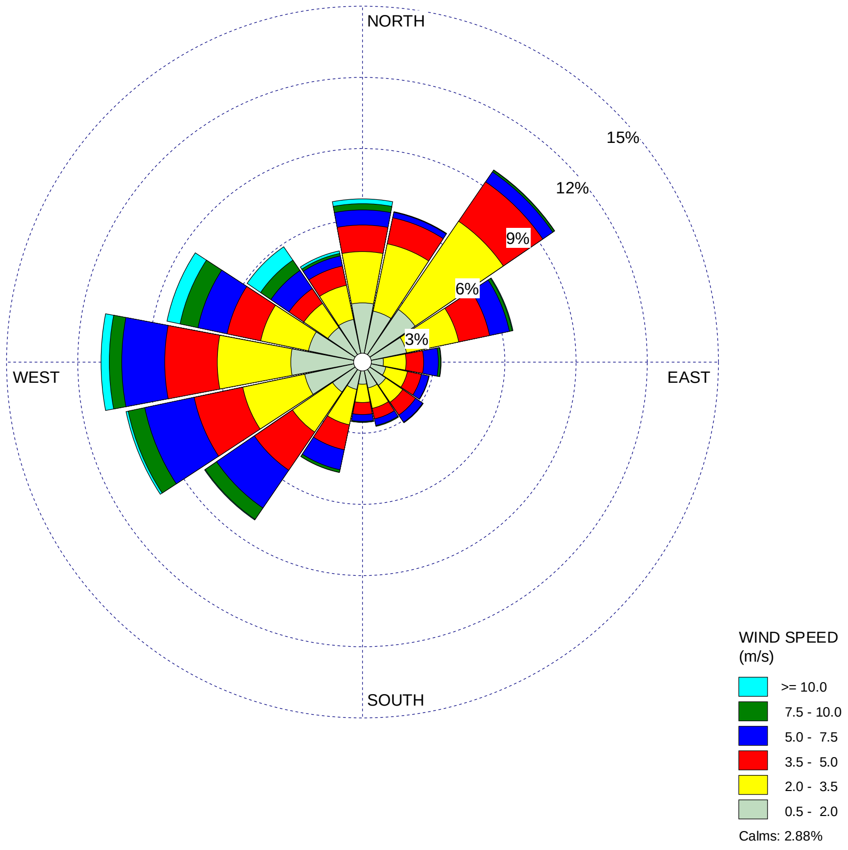
Cool winters with moderate to strong winds (particularly from the west) are the general meteorological feature of the area. Inversion layers can occur during relatively calm and clear conditions leading to build up of contaminants in air. This typically occurs in populated areas (namely Gore and Invercargill, and to a lesser extent smaller towns such as Mataura), where population density is high enough to allow accumulation of contaminants from domestic solid fuel burning during winter. Winter tends to be the calmest time of the year and inversion layers are reasonably common. Spring and summer tend to be characterised by stronger winds.

The nearest full time meteorological station is located at Gore, which is approximately 24 km to the north of the site. Figure 4 presents a windrose for the meteorological station at Gore for 2010-2012. The data was obtained from the National Climate Database operated by NIWA.

The windrose indicates that the most prevalent winds in the area are from the west and west-southwest, accounting for 18% and 13% of the time respectively. The average wind speed over the year was 3.4 m/s, with calms (winds less than 0.5 m/s) occurring less than 2.9% of the time. Strong winds greater than 5 m/s occurred 20% of the time.

Figure 3 : Gore Windrose (2010-2012)

WIND ROSE PLOT: **Gore windrose 2010-2012**	DISPLAY: **Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD: **Start Date: 1/01/2010 - 00:00** **End Date: 31/12/2012 - 23:00**	COMPANY NAME: **SKM**	
		MODELER: **CBender**	
	CALM WINDS: **2.88%**	TOTAL COUNT: **25972 hrs.**	
	AVG. WIND SPEED: **3.35 m/s**	DATE: **4/06/2014**	PROJECT NO.: **AE04669**

WRPLOT View - Lakes Environmental Software

4. Hazardous Substances

Taha proposes to store the types and quantities of hazardous substances as per Table 2. Ouvea Premix (Cast and Premix) will be the main substance stored at site and is a classified as class 6 and 9 hazardous substance under the Hazardous Substances Group Standard. This material is currently stored at the Mataura site in the buildings marked A, B, C and D in the site layout plan in Appendix B. Safety Data Sheets are provided in Appendix C.

Table 2 : Hazardous substances stored onsite

Product name	Description	Current volume	Storage type	Spill prevention	HSNO class
Cast Ouvea Premix	Granular/ powder	7556 tonnes	1-tonne double layer heavy duty bags with mesh-woven outside layer and plastic lining.	Stored indoors to prevent contact with moisture. Temperature will be controlled and is not to exceed 50ºC.	6.3A; 6.4A; 9.1C
Landfill Ouvea Premix	Granular/ powder	1614 tonnes	1-tonne double layer heavy duty bags with mesh-woven outside layer and plastic lining.	Stored indoors to prevent contact with moisture. Temperature will be controlled and is not to exceed 50ºC.	6.3A; 6.4A; 9.1C
DRP Baghouse material which is effectively fine Ouvea Premix	Fine powder < 1mm	774 tonnes	1-tonne double layer heavy duty bags with mesh-woven outside layer and plastic lining.	Stored indoors to prevent contact with moisture. Temperature will be controlled and is not to exceed 50ºC.	6.3A; 6.4A; 9.1C
Sulphate of Ammonia	Granular/ Powder	8 T	1-tonne double layer heavy duty bags with mesh-woven outside layer and plastic lining.	Stored indoors to prevent contact with moisture. Temperature will be controlled and is not to exceed 50ºC.	6.1D, 9.1D, 9.3C
Diesel	Liquid	100 litres	20 litre diesel drums	Stored indoors, temperature will be controlled and is not to exceed 50ºC.	3.1D, 6.1E, 6.3B, 6.7B, 9.1B.
Citric Acid	Powdered Crystals	350 kg	25kg woven mesh bags	Stored in closed container indoors to prevent contact with moisture. Temperature will be controlled and is not to exceed 50ºC.	6.1E, 6.3B, 8.3A.
Silica Sand	Fine powder	150 T	1-tonne forklift bags and 1.5tin 25 kg sandbags	Not hazardous, shovel and wheelbarrow. Return to stock pile if uncontaminated.	Not hazardous

The bulker bags used to store the Ouvea Premix are a double layer heavy duty bag with a polyethylene mesh woven outer layer with a clear heavy duty plastic inner. The bags are supplied by Bulk Handling New Zealand and are nominally one tonne capacity.

Figure 4 : Example of Bulker Bay used to Store Ouvea Premix

This type of bulker bag is commonly used in New Zealand and overseas for the transport and storage of powdered and granular materials such as fertilisers, soda ash, pot ash, lime, sulphur etc. The bags are fitted with two straps allowing them to be lifted and moved onto and off vehicles and around sites by forklift. A spout is located at the base of the bag and is fitted with rip cord mechanism which is sealed whilst the bag is being storage and is used to open the spout and allows the material to flow out into a hopper or into a vessel. The spout is closed when the bags are filled with Ouvea Premix at the NZAS site. Filling is via a spout located at the top of the bag and when filled the inner plastic liner is closed and sealed tight using a plastic tie, the out layer is then sealed and tied off. There will be no filling or emptying bags stored at the Mataura Site.

The bulker bags are stored directly on the concrete floor in the buildings used by Taha and are stacked up to three high, and shown in Figure 5.

Figure 5: Storage of Bulker Bags in South Storage Area

4.1 Transportation of materials

Taha does not intend to store any additional materials at the site. As such, there will be no further inward truck movements for unloading materials. However, Taha proposes to remove the material from the site once the processing site is fully operational and within 2 years of the resource consent being granted. Taha anticipates an average of 1-2 trucks in and out of the site per day to remove the material over this time. Access to the site will occur between 9am – 5pm weekdays only (unless access is necessary as part of Taha's incident response procedure).

The sites have existing truck access off Kana Street, which will be used for removing the materials. The riverside site has three main site access points, as indicated in the site layout plan in Appendix B:

- South-end access, which is external to the building and has an off-road loading area and truck turning bay (where the majority of unloading will take place)
- Road-side access, which enables trucks to enter the building for internal loading and manoeuvring inside the building to exit in a forward motion
- Northern access, which provides off road access to the site marked "Ouvea Premix store D" in the site layout plan.

The bankside site (marked "Ouvea Premix store A" on the site layout plan) has one access area at the north of the building. Trucks access this site by pulling off the road at the north of the building, before being off-loaded by a forklift.

Where required, bulk storage bags will be transported around the site using a forklift. There will be no cross-road movement of materials without prior written approval from NZTA.

4.2 Chemistry of Ouvea Premix

In order to determine the potential hazards and the consequences of those hazards and ultimately the level of risk posed by the storage of Ouvea Premix, it is important to understand the chemical composition of the material and how it reacts to various stimuli such as water, heat and other chemicals. This is commonly referred to as the intrinsic hazards of the material.

4.2.1 About Ouvea Premix

Ouvea Premix is a dry, granular substance, which is an output of the aluminium recovery and recycling process. Ouvea Premix is made up of aluminium oxide, aluminium nitride and magnesium aluminate to varying concentrations dependent on the source of the dross that is put through the aluminium metal recovery process operated by Taha at the Tiwai Point Smelter. Other components in the Ouvea Premix include aluminium fines, sodium and calcium salts, and other trace metals.

In a Statement of Substance (SoS) decision issued by the Environmental Protection Authority (EPA) (as provided in Appendix A), the EPA classified Ouvea Premix as:

- Class 6.3A Skin irritant
- Class 6.4A Eye irritant
- Class 9.1C Aquatic eco-toxicant.

This product has been assigned to the 'Additives, Process Chemicals and Raw Materials (Subsidiary Hazard)' group standard HSR002503. The classification indicates that the Ouvea Premix is not an acute or chronic toxic substance (Class 6.1) and is mild skin and irritant with some eco-toxic effects which is typical of a number of fertilisers classified under the Fertiliser Group Standard.

This product is not classified as a Dangerous Good for transport; therefore the Land Transport, Civil Aviation and Maritime Transport rules for Dangerous Goods do not apply.

Two primary types of Ouvea Premix generated by the aluminium recovery process are stored within Taha's Mataura site:

- Cast-house Ouvea Premix (76%): Ouvea Premix derived from freshly produced dross at the smelter, which is supplied to Taha Asia Pacific (TAP) from the cast-house.
- Landfill Ouvea Premix (16%): Dross recovered from the landfill at Tiwai Point, which has been stored in the landfill for a number of years prior to being processed into Ouvea Premix by TAP.

The significant difference between the Landfill Ouvea Premix and the Cast-house Ouvea Premix relates to the percentage of aluminium nitride in the material and this has a bearing on the potential for ammonia generation.

In addition to Cast-house and Landfill Ouvea Premix, the remaining 8% of Ouvea Premix Taha stores at Mataura consists of material from the metal recovery baghouse that has been milled to produce a homogenous mixture of particles, and then removing residual aluminium metal fines (known as DRP baghouse material).

Laboratory tests have been undertaken on the two primary types of Ouvea Premix. XRD analysis of the samples has indicated that the Casthouse Ouvea Premix contains up to 40% of Aluminium Nitride (AlN) by weight (ranging from 24 to 40 % with an average of around 30%). The Landfill Ouvea Premix by contrast contains up to 4% of AlN by weight, with most samples showing an AlN concentration of less than 1%. This difference is assumed to be due to the NZAS landfill dross reacting over time with water in the landfill environment, resulting in hydrolysis of the AlN to aluminium oxides and nitrogen compounds, and subsequent leaching of the nitrogen into the surrounding environment. The dross material in the landfill has an age of between 5 to 40 years and Taha are currently mining and processing from the landfill the older material to recover the remaining aluminium metal.

The storage of Ouvea Premix at the Mataura site has the potential to cause environmental effects should the Ouvea Premix mix with water and produce ammonia and hydrogen gas, or the material enter the water course. However the potential of the Ouvea Premix to generate ammonia is controlled by the percentage of AIN contained in the premix. Consequently, the Ouvea Premix in particular Casthouse and Landfill stored at Taha's Mataura site has varying potential for generation of ammonia with the Landfill Ouvea Premix AIN % being an order of magnitude (10 fold) lower than the Casthouse Ouvea Premix AIN %. As such the theoretical potential maximum mass of ammonia that can be generated from the Landfill Ouvea Premix is significantly lower than that for Casthouse Ouvea Premix. This difference in the generation potential is covered in section 4.2.2 below.

4.2.2 Ouvea Premix Reaction with Water

The reaction mechanism of water with Ouvea Premix is quite complicated and a good understanding of how it occurs under differing conditions (immersed water, as opposed to in air) is a key step in understanding the hazards of material and the level of risk posed.

If Ouvea Premix comes into contact with water (moisture), the aluminium nitride (AlN) may be degraded (hydrolysed) by water by the following series of reactions:

$$AlN + 2H_2O \rightarrow AlOOH + NH_3 \qquad (1)$$

$$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^- \qquad (2)$$

In the initial hydrolysis reaction (1), the AlN is converted to a porous, amorphous compound (AlOOH, or boehmite), which is then further hydrolysed to crystalline aluminium hydroxide ($Al(OH)_3$, or gibbsite). The rate of AlN conversion to ammonia is highly dependent on temperature, with typical reaction times ranging from ~10-100 seconds at high temperatures of around 100°C, to over a day at room temperature before reaching equilibrium)[4]. At room temperatures the hydrolysis reaction stops before completion, as the aluminium nitride particles become coated by a thin protective shell of aluminium hydroxide and aluminium oxide. The shell acts as a hydrophobic coating, and prevents further reaction of the AlN with water, even when the particles are submerged in water[4]. Full conversion of aluminium nitride to ammonia is therefore dependent on temperature, the availability of water, and any mechanical processing or friction that may agitate the material and allow a faster rate of hydrolysis through removing or displacing the 'shell'. Under normal conditions of storage at Taha, the material will be stored at low temperatures and involve limited friction such that oxidation of AlN by water will be limited.

On a conservative theoretical mass balance basis, the reaction of aluminium nitride in Casthouse Ouvea Premix may generate up to 165 kg of ammonia per tonne of material, which requires up to 300 litres of water per tonne. However, in practice, any ammonia formed at a very slow rate, with the hydrolysis reaction occurring over a period of days to years and fugitive gas emissions would be detected as an odour. For example, Jacobs's analysis of aluminium dross recovered from the NZAS landfill site has shown that material stored for up to 40 years still contains small quantities unhydrolysed aluminium nitride. Any ammonia formed will generally remain in situ with the product material due to the high solubility of ammonia in water as aqueous ammonium hydroxide and will not be released as ammonia gas.

The mass balance assumes 40% of the Casthouse Ouvea Premix is AlN by weight, 400 kg/tonne of the Premix consists of AlN. This equates to 135 kg nitrogen, or 165 kg NH_3 per tonne, assuming all AlN is converted to NH_3. Using similar assumptions for landfill dross, around 16.5 kg of NH_3 per tonne of material may be generated, again assuming complete conversion of AlN. It should be noted that, provided the material remains wet, the ammonia will remain in solution as aqueous ammonia or ammonium ion, as shown in equation (2) above.

In addition to the production of ammonia described above, the AIN is slightly heat releasing (exothermal), such that localised heating of the Ouvea Premix occurs. Depending on the amount of water the Ouvea Premix is exposed to; the release of ammonia will dissolve in the water it is standing in, coating the solid particles and turning the localised matrix alkaline (i.e. to a pH greater than 9). Under the conditions of localised heating and

[4] S. Fukumoto, T. Hookabe, and H. Tsubakino, *Hydrolysis behaviour of aluminium nitride in various solutions*, Journal of Materials Science **35** (2000) 2743-2748.

alkaline pH, a secondary reaction starts where tiny, high surface area particles of aluminium metal react with the now alkaline, localised, water conditions to produce small amounts of hydrogen (H_2), gas.

Hydrogen is not a toxic gas. The formation of hydrogen gas that occurs in individual heavy duty bags is expected to be extremely low given the small localised reactions. Any gas that is released outside the bags will rapidly disperse through building ventilation. Hydrogen only becomes a problem if allowed to accumulate in significant volumes in confined spaces, which is extremely unlikely to occur in these conditions.

4.3 Ammonia Generation Potential

Jacobs has undertaken two trials to determine the Ouvea Premix generation potential of ammonia in the gaseous form in order to inform the risk assessment.

3) The first trial was a benchtop test to determine the amount of ammonia gas from Cast-house Ouvea Premix when a theoretical bag was immersed in water and fully mixed in a water solution.

4) The second trial was to determine the potential amount of Ouvea Premix that would get wet if a bulker bag was immersed in water.

Set out below are the key findings from the trials. A full description of the methodologies applied in the trials results and conclusions is provided in Appendix D.

4.3.1 Benchtop Trial

The experiment consisted of placing 500mL of Casthouse Ouvea Premix in to two glass reaction vessels and adding 1200 mL of purified water. The glass vessels both had air-tight stoppers to prevent loss of ammonia from the vessels to outside air. The glass vessels were adapted to represent the following scenarios:

- One reaction vessel contained Ouvea Premix in ziplock bags to simulate the immersion of bags of Ouvea Premix as stored on-site in water during an extreme flood event. The bags were punctured with small holes to simulate tears or other leaks in the bags which could result in water entry.
- The second vessel was designed to simulate a worst-case exposure of Ouvea Premix in the event of an extreme flood event and total bag failure. For this scenario, the Ouvea Premix was not bagged, and was placed loose in the vessel to provide maximum exposure to water.
- A third sample consisted solely of purified water as a blank.

Ammonia gas was measured in the headspace of the reaction vessels prior to the addition of water, and at regular intervals following the addition of water, using Gastec tubes. The pH of the water in the vessels was also measured at these intervals to provide an indication of ammonia being produced and dissolved in solution.

The results of the trial indicate that a bag containing Ouvea Premix when immersed in water does not generate any ammonia gas in measurable quantities as long as the Ouvea premix remains immersed. The ammonia generated by the reaction of the Ouvea Premix with water is dissolved into the water as per reaction equation (2) and is therefore not released as a gas. When the water was removed from the reaction jars, and the wet Ouvea Premix sample left in the jars, after some hours some minor quantities of ammonia gas was measured in the headspace of the jars.

For the reaction jar where the Ouvea Premix was not bagged ammonia gas was not generated until the pH of the solution reacted around 9.2 which is when equilibrium with the ammonia dissolving into water is reached. This occurred after six hours of the Ouveas Premix being mixed with water. Ammonia gas continued to be generated in the reaction jar after the water had been removed, which effectively represents a wetted Ouvea Premix which is slowly drying out. The concentration in head space of the jar was measured at 35ppm (1 minute average) 22 hours after the water had been removed. This can be regarded as potential maximum release in the building given there is not containment of the liberated gas by the bags.

4.3.2 Bulker Bag Immersion Trial

It has been identified that there is a potential for water to enter the bags through the tear zip line spout at the base of the bag and through the top spout which is sealed using a plastic tie (inner bag). As such, Taha conducted a bag immersion trail based on a methodology developed by Jacobs to simulate how the bags are stored and how they would react in an extreme flood event. The bag trial was witnessed by the author of this report. Note that Taha conducted an earlier bag test, however, after review from Jacobs, it was identified that the earlier bag test did not accurately simulate an actual flood scenario, hence the reason a subsequent test with an amended methodology was taken.

The bag trail involved conducting an immersion test of 1-tonne bags of Ouvea Premix designed to determine the amount of water that could enter the double-lined bags representing similar conditions at the Mataura site should a flood event occur which results in water entering the building with inundation and immersion of the bags stored there. In summary:

- Two bags of Casthouse Ouvea Premix were totally submerged in water in a skip for a 24-hour period with a further two bags placed on top of he immersed bags to represent how the bags are stacked and stored at Mataura.
- The amount of water entering each bag was determined by weighing each of the bags before and after the trial.
- The amount of ammonia gas produced was determined using Gastec tubes and a Crowcon T3 reader.
- The water in which the samples were emerged in was also tested.

The test had the following findings:

- There was no change in weight of the bags not immersed and the maximum amount of water measured in the immersed bags was around 12% of the weight of the bag (128 kg of water into a 1,036 kg bag of Ouvea Premix).
- The bags were visually inspected and the submerged bags showed that virtually no water penetrated the bag via the upper spout and that the main point of entry of water into the bags was via the lower zip tear closed spout. The water penetrated to a height (measured from the base of the bag) of around 160mm.
- No ammonia gas was detected in the headspace of the skip. Minimal amounts of ammonia gas was detected in the headspace of the wetted bags (0.5-1ppm).

Assuming a water intrusion amount of up to 12% by weight, (as demonstrated in the immersion trial), 120 kgs of water per tonne of material is introduced to the material which contains a maximum of 40% AlN. Assuming all the water is used to hydrolyse aluminium nitride, this could produce up to 20.6kg ammonia per tonne of Casthouse Ouvea Premix, and 2.1 kg ammonia per tonne of Landfill Ouvea Premix, based on a maximum AlN concentration of 4%.

These are theoretical rates of generation, which may occur over a period of days or even years, given the self-limiting nature of the reaction. The mass of ammonia produced is reduced when you apply the average AIN concentrations for the Ouvea Premix products.

The water in which the bags were immersed was sampled and was found to have slightly elevated concentrations of fluoride and nitrate.

4.3.3 Summary of ammonia generation potential

The ammonia generation potential is regulated by the reaction mechanism of Ouvea Premix with water. When fully immersed, the ammonia generated will dissolve into water ultimately forming ammonium. In this situation, the amount of ammonia gas generated is negligible. When product is damp or no longer immersed in water, the reaction mechanism will tend to slowly release ammonia gas over time. This reaction mechanism is not instantaneous and therefore there is no potential to generate a large concentrated gas cloud. All these reactions are moderated by the amount of material that gets wet.

4.4 Evaluation Criteria

In order to evaluate whether the potential adverse effects of the discharge of ammonia from the Mataura site are acceptable or not the consequences of a credible accident scenario need to be assessed against evaluation criteria. In Table 3 we have listed a range of evaluation criteria which could be used to evaluate the consequences of a credible accident scenario where ammonia gas is discharged to air.

Table 3 : Evaluation Criteria for Ammonia

Authority	Evaluation criteria	ppm	mg/m3
NZ Workplace Exposure Standard	TWA	25	17
	STEL	35	24
US EPA IRIS	NOAEL	3.4	2.3
	RfC	0.1	0.1
USEPA Risk Management Programme	Toxic Endpoint (1-hr avg)	200	
NIOSH	IDLH	300	231
ATSDR	Odour Threshold	50	38
Texas CEQ	ESL (1-hr avg)	0.250	0.190
	ESL (annual avg)	0.025	0.019

The Ministry of Business, Innovation and Employment (MBIE) has published Workplace Exposure Standards (WES) for a range of air contaminants that have the potential to be toxic, or present health and safety risks to workers[5]. The WES typically assign time-averaged concentration limits which are not to be exceeded, and include a short term exposure limit (STEL) of 15 minutes, and a time weighted average (TWA) of 8 or 12 hours which is designed to represent exposure over a typical work shift. The STEL and 8-hour TWA for ammonia are 35 ppm and 25 ppm, respectively.

The workplace exposure standards are set at levels designed to prevent adverse health effects from workplace exposure to toxic compounds, and are based on well-documented data where it is available. However there are limitations to this approach, particularly in regard to the variability of response to toxic or irritant compounds from person to person. The MBIE document consequently states that:

> "*Defining an exposure level that will achieve freedom from adverse health effects is the major consideration for assigning these WES. However, compliance with the designated WES level does not guarantee that all workers are protected from discomfort or ill-health. The range of individual susceptibility to hazardous and toxic substances is wide, and it is possible that some workers will experience discomfort or develop occupational illness from exposure to substances at levels below the WES.*"

The USEPA has developed an Inhalation Reference Concentration (RfC)[6] for ammonia based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. In addition it considers toxic effects for both the respiratory system (portal-of-entry) and for the effects peripheral to the respiratory system (extra-respiratory effects). Inhalation RfCs were derived according to the Interim Methods for Development of Inhalation Reference Doses (EPA/600/8-88/066F August 1989) and subsequently, according to Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry (EPA/600/8-90/066F October 1994).

[5] MBIE, *Workplace Exposure Standards and Biological Exposure Indices*, *7th Edition*, February 2013.

[6] US Environmental Protection Agency, Integrated Risk Information System, 2,4-/2,6-Toluene Diisocyanate Mixture, 01/09/1995 (http://cfpub.epa.gov/iris/subst/0503.htm).

The RfC for ammonia is 0.1 mg/m^3. An RfC is an estimate (with uncertainty spanning an order of magnitude) of a daily exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

The No Adverse Effects Level for Human Equivalent Concentrations (NOAEL(HEC)) for ammonia which is determined from an occupational study provide a continuous exposure is 2.3 mg/m^3.

The USEPA Risk Management Program has been developed to assess the impacts of accidental releases form facilities with large quantities of very hazardous chemicals and to mitigate the consequences of any releases that occur. The Rick Management Program Guidance for Offsite Consequences provides a toxic end point for ammonia of 200ppm. This airborne concentration has been published by the American Industrial Hygiene Association (AIHA) and is the maximum airborne concentration below which it is believed that nearly all individuals can be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual’s ability to take protective action.

IDLH is an acronym for Immediately Dangerous to Life or Health, and is defined by the US National Institute for Occupational Safety and Health (NIOSH) as exposure to airborne contaminants that is "likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment." The IDLH is typically applied to emergency release scenarios rather in which a large volume of gaseous substance is released at once resulting in sufficiently high concentrations as to result in health risk. The IDLH for ammonia is 300 ppm (225 mg/m^3).

The New Zealand Ambient Air Quality Guidelines have promulgated “c*ritical levels”*, designed to protect ecosystem damage. The *critical level* for protecting ecosystems from ammonia in the New Zealand Ambient Air Quality Guidelines is 8 $\mu g/m^3$ as an annual average. This guideline is not appropriate for this situation as the release as a result of a flood event will be for a relatively short duration.

5. Mitigation Measures

In the Assessment of Environmental Effects (AEE), Taha provided a range of measures to mitigate the effects associated with storing Ouvea Premix at the Mataura site. These measures are important in identifying hazards and credible exposure pathways. This section summarises the mitigation measures proposed. The measures are further described in the Environmental Management Plan (EMP), which is attached in Appendix E.

5.1 Dust

In order to prevent dust from the handling of Ouvea Premix the material is loaded into double layer bulk bags at NZAS. These bags are sealed and this effectively eliminates the dust emission potential during the handling and storage of Ouvea Premix at the Mataura site. In addition, all bags are stored indoors and the main doors will only be left open when material is delivered or collected for transportation.

Bags will be transferred from the trucks to the storage areas by forklifts, with the truck unloading occurring on-site but outside buildings. Should a bag be damaged during truck unloading the amount of material spilt will be relatively minor and therefor the dust generation potential is also very minor. Taha has procedures to deal with spills of material at the site should they occur.

5.2 Spillage

Taha takes a preventative approach to spills, ensuring first and foremost that all necessary actions are taken to prevent spills from occurring. Preventative actions include:

- Taking particular care when handling hazardous substances
- Storing all hazardous substances in new, purpose built, heavy duty 1 tonne bags double lined bags with mesh-woven outers and plastic liners, which are designed for forklifting and will minimise the chance of spills during storage and handling;
- Ensuring building where substances are stored and where most of the loading will occur are fully secure and contain HSNO signage at the entrance to indicate the presence of hazardous substances onsite
- Keeping the site in a tidy and orderly state, and ensuring all staff are trained in how to handle hazardous substances to avoid spillage.

In the event of a spillage, staff will initiate the incident response procedure, which is detailed in the EMP. Ensuring hazardous substances are contained and do not enter watercourses following a spill is crucial. In particular:

- Staff take special care to ensure substances do not enter Waikana Stream, including closing and sandbagging nearby doors after a spill has occurred to avoid contamination
- The potential for hazardous substances to enter the stormwater network is minimal as downpipes running through the building are enclosed (a mark-up showing the indicative stormwater drainage channels and pipes is provided in the EMP)
- The internal water races have been covered by concrete over reinforced steel to avoid any material entering the Mataura River in a spill.

All material that is involved in a spill will be collected using onsite spill kits, contained and returned to storage if useable. If not useable, it will be downgraded into a different fertiliser product. As a result, any spillage that does occur will not result in hazardous waste being produced. The EMP further details how to use the onsite spill kits, including use of PPE.

5.3 Flooding

Taha has a two-tiered approach to preventing flood water from mixing with Ouvea Premix and to ensure Ouvea Premix does not enter the waterway in a flooding event. Primarily, the buildings have a number of mechanisms to prevent water ingress in a large scale flood (and subsequent egress of water and product), including many mechanisms that were successful in preventing water entering the buildings in previous floods. These mechanisms include:

- A flood water retaining wall along the majority of the north-western boundary of 68-121 Kana Street with the Mataura River, built to withstand 600 mm above the highest recorded flood
- Bolt on steel and concrete shutters attached to doors to prevent ingress of water, also built to withstand 600 mm above the highest recorded flood
- All unused piping has been sealed and other essential stormwater piping have one-way valves installed to prevent the ingress of water
- The internal water races have been covered by concrete over reinforced steel to prevent water from the Mataura River entering the building
- Waikana Stream is checked and cleared regularly to enable free drainage
- The open drainage channel to the east of 116-128 Kana Street building is checked and cleaned 6-monthly to prevent surface flooding
- Silica sandbags are stored on site to be used as emergency sand bagging in conjunction with polythene.

Secondly, in the unlikely event that water does enter the building in a flood (i.e. a flood higher than the largest recorded flood), Taha has employed additional defences, including:

- All hazardous substances are stored in double layer heavy duty bags with mesh-woven outside layer and plastic lining, which would be difficult to breach in the event of a flood
- The lower levels of the buildings on 109 Kana Street next to the Mataura River will not be used at all
- Hazardous substances adjacent to the eastern side doorway of 116-129 Kana Street are stored on pallets to prevent any contact with surface flooding off the adjacent bank.

In the event of a flood, the Flood Protection Plan, which is detailed in the EMP, will be initiated. The Flood Protection Plan, including all flood protection measures, are checked 6-monthly to ensure it is still fit-for-purpose.

6. Source- Pathway Receptor Environmental Risk Assessment

6.1 Introduction

The Source-Pathway-Receptor approach to quantifying risk to the environment and the surrounding community from the use and storage of hazardous substances is based on the approach that hazardous substances will not have an effect on the environment unless they can, by some means, reach a receptor in a concentration high enough to cause a change in the receptors state. In order to have a concentration high enough to cause a change in the receptors state one must consider the intrinsic toxicological properties of the material, the hazards and the incident scenarios which could generate a release, the pathways which will lead to the environment and community being exposed, the size and scale of the event, the concentrations at the receptor and the resulting level of effect.

In this section we will:

- Identify the hazards present in relation to the storage of Ouvea Premix and whether they could result in a credible accident scenario (has offsite consequences)
- Determine credible exposure pathways
- Determine the scale of the consequences to people and the environment for the credible accident scenarios determined pertaining to the storage of hazardous substances at the site
- Conduct a source-pathway-receptor qualitative risk assessment to determine the level of risk posed by the storage of hazardous substances at the site.

6.2 Hazards (Source)

Hazards have been identified relating to the storage of Ouvea Premix at the Mataura site. Each hazard could potentially result in an accidental release to the environment, or accidental human exposure, if a failure or incident event occurs. The likelihood of the incident occurring and the consequences of the event is covered in the following sections.

A hazard is defined as a source of potential harm, or situation with the potential to cause loss of adverse impacts. Hazards for the storage of hazardous substances are the Mataura sites include:

- Toxic/corrosive properties of the substance (intrinsic hazards)
- Eco-toxicity hazard
- Dust emissions
- Incompatibility of hazardous substances stored on site
- Fire/explosion hazard
- Natural hazard; and
- Vandalism hazard.

6.2.1 Toxic/corrosive Properties (Intrinsic Hazards)

Toxicity and corrosiveness are intrinsic hazards for many chemicals transferred, stored and used at industrial sites both during construction and operation. The toxicity hazards of the substances relate to the potential adverse effects on workers at the site via ingestion/inhalation or dermal/ocular exposure and the surrounding community in the event a major credible accident should occur. The level of toxicity is variable and relates to the intrinsic properties of the substance and its concentration.

Substances to be stored at the site with potential for toxic/corrosive properties are:

- Ouvea Premix
- Diesel oil
- Ammonium Sulphate
- Citric acid crystals.

The Safety Data Sheets for these materials show that they are relatively low in terms of toxicity with the most toxic being ammonium sulphate which classed as a 6.1D. Some of the materials also pose minor corrosiveness in terms of being a skin and eye irritants and, as such, if they remain in their containers they pose little risk to workers handling the material and to the general community should a spill of the material occur. Apart from diesel, all the products stored at this site are in a powder or crystalline form.

6.2.2 Eco-toxicity Hazard

The eco-toxicity hazards of the substances relate to the potential adverse impacts to ecosystems and natural resources.

Substances to be stored that pose potential eco-toxic hazards are:

- Ouvea Premix
- Diesel oil
- Ammonium Sulphate.

The quantities of diesel stored (100litres in five 20 litre drums) and ammonium sulphate (8 tonnes) is not large and the storage arrangements and spillage procedures for these materials will mean the likelihood of these materials entering any waterways and impacting on aquatic ecosystems is very low. For Ouvea Premix the potential eco-toxic on nearby waterways effects under normal storage conditions are negligible. However under flood conditions there could be some eco-toxic effects and these are evaluated in section 6.4 of this reportDust Hazard

Apart from diesel, the hazardous substances to be stored at the site are in a crystalline, granular or powder form. As such, these materials pose a potential dust hazard to workers and the surrounding area if they are not stored and transferred appropriately.

6.2.3 Fire/Explosion Hazard

Fire and explosion are intrinsic hazards for many chemicals transferred, stored and used at industrial sites both during construction and operation. The only substance to be transferred and stored at the facility which has a fire/explosion hazard is diesel oil. This hazard is relatively low given the relatively high flash point of diesel (Class 3.1D) and the small quantities of diesel that will be stored.

Ouvea Premix is not flammable. However, a fire at the subject site could result in toxic by-products (from the combustion of chemicals) being discharged to air. Ouvea Premix has a melting point of around 2000 degrees Celsius with the material rather than melting at a set temperature undergoing a series of phase transitions from powder through to partially semi solid liquid. At 1400 degrees Celsius the material will be stable and no real change will occur until at temperature of above 2000 degrees is reached. Therefore the potential for Ouvea Premix to decompose in a building fire is very low.

The reaction of Ouvea Premix with water can generate small amounts of hydrogen gas (H_2). Any formation of hydrogen gas that occurs in the individual heavy duty bags as a result of flooding or localised dampness is expected to be extremely low given the small localised reactions and will not result in a spontaneous ignition. Any gas that is released outside the bags will rapidly disperse through building ventilation. Hydrogen only becomes a problem if it is allowed to accumulate in significant volumes in confined spaces, which is extremely unlikely to occur in these conditions. In the event of a flood, monitoring of the storage area once the flood waters recedes is recommended to check that the hydrogen levels do not get up to levels approaching 10% (4,000pppm) of the lower explosive limit for hydrogen which is 4% v/v.

6.2.4 Incompatibility hazard

The chemical makeups of some substances make them unstable or reactive when combined with other incompatible substances. This incompatibility may present an intrinsic hazard for many chemicals transferred, stored, and used at industrial sites both during construction and operation.

Ouvea Premix will react though slowly when it comes into contact with water and will liberate ammonia at a relatively slow rate, as either ammonia in the aqueous (when fully immersed in water) or gas phase (wet to damp). The reaction mechanism for the generation of ammonia from Ouvea Premix reaction with water is described in detail in Sections 4.2 and 4.3 of this report.

6.2.5 Natural Hazards

Natural hazards associated with the operation of the site include flooding and earthquakes.

The site is on an area identified in the Gore District Plan as potentially prone to flooding in an event larger than the 1978 flood, which has been assessed as a 1 in 50-60 year flood. The flood assessment (provided in Appendix F) indicates that, in the 1 in 100 year event (which has a 1% probability in any given year), it is likely that one of the flood walls along the Mataura River would be overtopped. Assuming conservatively that the true left flood wall fails, this will result in a flood up to 2.5 m deep around the site.

In this situation it would not be possible to protect the building from inundation, resulting in flooding of up to 2.0m deep in the buildings. It could therefore be expected that bags below 2.0m would become fully inundated with water, allowing some water to enter the bags and wet the product. There is, however, almost no risk of the 1 tonne bags of Ouvea Premix being mobilised and carried out of the buildings.

In addition, the area could experience strong ground shaking during a large earthquake, and larger earthquakes on distant faults could give rise to similar levels of ground shaking as would occur during a localised fault rupture.

6.2.6 Vandalism Hazard

Deliberate damage by vandalism to the material stored on site or to the buildings the materials are stored in could result in fire or release of hazardous materials to the environment in addition to damage to property or person.

6.3 Exposure Pathways

The next stage of the Source-Pathway Receptor Environmental Risk Assessment is to determine for each hazard if there is a credible exposure pathway which will result in an offsite consequence to the environment of people living and working in the surrounding area. Only those hazards with credible exposure pathways will be taken through to the consequence and risk assessment stage of the model. Exposure can be managed by a series of measures which include eliminating, isolating or minimising the source of the exposure, the pathway and or the receptor. The measures proposed in Section 5 of this report are designed to eliminate, isolate and minimise the source of the exposure. In the analysis of credible exposure pathways the mitigation measures as described in Section 5 of this report are considered.

Typically, human exposure pathways are:

- Ingestion of contaminated water, soil or dust
- Ingestion of contaminated produce
- Inhalation of dust, gases or vapours generated at the site
- Dermal exposure to dust, gases or vapours generated at the site.

Typically, environmental exposure pathways are:

- Discharges to air and deposition of contaminants non soil and waterways

- Discharges to water via point source, fugitive and spillages
- Discharges to land resulting in land contamination, and groundwater contamination
- Discharges to land with overland flow paths to water.

The following section describes each of these pathways in relations to Taha's proposed storage activities.

6.3.1 Inhalation, ingestion and dermal exposure to dust

Dust generated from the handling of granular, powdered and crystalline material at the site is identified as a potential hazard which could result in offsite consequence. All the material handled and stored at the site is enclosed in either one tonne bulker bags which are double layered and with their spouts tied off or are in smaller bags which effectively eliminate the potential for the generation of dust at the site.

The bags are designed to meet the container drop requirements and would remain intact if dropped from a forklift cradle and should a bag split the volume of dust generated will be small. In addition, Taha proposes to load and unload all trucks onsite, thereby further reducing the potential for any dust emissions to be discharged beyond the site boundary resulting in contamination of land and waterways.

Due to the packaging used and that the site is used solely for the storage of powdered material the exposure of dust to the community and the environment is regarded in this situation not to be a credible exposure pathway.

6.3.2 Ingestion of contaminated produce

Dust generation from the storage of material at the site will have no offsite effects and as such will not result in produce contamination. Therefore, ingestion of contaminated produce as a result of discharges from the storage of dry materials is not considered a credible exposure pathway.

Any ammonia gas generated under normal conditions will generally remain in the bags, with a small quantity escaping from the bags into the building and then discharging via fugitive sources (holes in the building fabricate, doors etc.) before dispersing into the surrounding area. Ammonia is a gas and is highly reactive and as such does not remain in the environment for long periods of time. It is not readily taken up by plants (would tend to burn leaves in high concentrations) and therefore the ingestion of contaminated produce by ammonia is not a credible exposure pathway.

6.3.3 Inhalation and dermal exposure of gases

As described in section 4 of this report, ammonia in the gaseous form can be generated when Ouvea Premix is damp or wetted. Under normal storage conditions, very small quantities of ammonia are generated as a result of changes in humidity and from condensation forming in the plastic bags. This ammonia is captured in the sealed bags but small quantities will be released into the building and then some of this ammonia though highly diluted by the volume of air in the building is discharged as fugitive emissions to atmosphere where it disperses subject to the meteorological conditions at the time into the wider environment.

Monitoring conducted in the building by Taha and Jacobs indicate that the ammonia concentrations are relatively low with the majority of the areas that bags are stored (dry and no condensation) reading between zero to 0.6ppm. In areas where some bags have been exposed to damp conditions, ammonia gas readings are between 4.0 to 13 ppm of ammonia. Monitoring conducted outside the building has not recorded any ammonia apart from one occasion where ammonia was detected on the western side of the site, with the wind blowing from the west. This recorded was attributed to a potential ammonia leak from Alliance Mataura's operations. A sample of the weekly monitoring reports prepared by Taha is provided in Appendix G.

Ammonia gas is not readily absorbed via the skin and as such is not this is not a credible offsite exposure pathway. Ouvea Premix is a skin irritant and for this exposure to occur the community will need to come into direct contact with Ouvea Premix which as discussed above for dust is highly unlikely and as such is not a credible offsite exposure pathway.

In a potential 1 in 100 year flood event with the failure of the eastern stop bank a significant number of bulk bags containing Ouvea Premix could be inundated and therefore a far greater proportion of the material stored could be wetted as compared to normal storage conditions. The potential mass of ammonia gas released following an extreme flooding event could have offsite effects and is therefore a credible exposure pathway.

Also there is the potential for ammonia gas to be generated following a localised fire where sprinkler system is used. The top of the bags are tightly tied and with the double layer protection only a small quantity of water would penetrate the bags and this would be mainly form the water pooling on the concrete floor and entering the bags via the pour spout zip. During the d operation of the sprinklers any ammonia gas released from the bags would be scrubbed out of the air by the sprinkler sprays.

6.3.4 Discharge to Water

Under normal operations with the majority of the materials being stored at this site being in the granular or powder form and contained in bags in a building there is virtually no pathway for the material to enter nearby water courses, unless spilt material is deliberately washed into drains.

There is, however, likelihood that the site could be inundated in a 100year flood event should the east flood walls fail. This would result in the material stored becoming potentially wet and as determined in the laboratory bench trails and bag immersion tests result in some contaminants (predominantly ammonia and fluoride) dissolving over time into the standing water. With flood waters swirling in and around the buildings there is a pathway for contaminants released into the water in the building to enter the Mataura River and the Waikana Stream. There will also be some natural drainage from the building as the flood water recede which will also provide a flow path for contaminants released in to the flood waters. As such, discharge on contaminants (ammonia and fluoride) to water following a major event is a credible exposure pathway.

6.3.5 Credible Exposure Pathways

From the analysis conducted above we have determined that there are two credible exposure pathways which could result in discharges of contaminants from the storage of hazardous substances at the Mataura site which could impact on a receptors in the wider environment (people and river ecology). Both exposure pathways occur should a flood event result in inundation of the buildings on the Mataura site. They Are:

5) Discharge of ammonia gas to atmosphere as a result of Ouvea Premix being wetted by a flood which is inhaled by exposed individuals

6) Discharge of ammonia and fluoride in flood water to the Mataura River and Waikana Stream.

6.4 Consequence Analysis

6.4.1 Discharge of Ammonia Gas to Atmosphere

The flood hazard assessment has identified that a 100 year flood event which coupled with failure of the true left stop bank would result in flood heights on Kana Street of around 2.0 metres with a freeboard of 0.5 metres to account for standing waves in the flood flows. This would mean that flood waters would via doors and other openings enter the buildings which are used to store Ouvea Premix. It has been assumed in determining the potential consequences from the discharge of ammonia as a result of the slow reaction of Ouvea Premix with water that the building was flooded to a height of 2.0m and as a result two layers of the bulker baggers could be immersed in water.

In undertaking this consequence analysis it is important to remember the reaction rates of Ouvea Premix with water which are relatively slow and therefore the liberation of ammonia is slow. As well the release of ammonia gas into the surrounding environment which will occur over days once flood waters have receded rather than in an instantaneous release resulting in the formation and dispersion of a gas cloud downwind of the site. Whilst the Ouvea Premix is immersed in water the generation of ammonia gas is limited as the majority of ammonia produced is dissolves into the water and is present as aqueous ammonia.

The consequences of this ammonia release from the reaction of water with Ouvea Premix is therefore quite different to that of an emergency release of anhydrous ammonia from the failure event of a refrigeration system, such as operated by Alliance Mataura which is sudden, rapid release of a relatively large quantity of ammonia (dependent on the nature of the failure and the volume of ammonia in the system) that occurs for a short duration. The release event effectively forms a gas cloud which travels and disperses downwind from the site. For these types of major industrial incidents the consequences can be severe but occur over a very short period of time and as such this is why IDLH and toxic endpoints have been developed to assess downwind consequences.

We conducted a consequence analysis on the discharges of ammonia gas from the Taha storage site on the surrounding area based on series of conservative assumptions derived from the flood modelling, observations from the immersion trial (in which bags of Ouvea Premix were immersed in water), and the bench test (in which samples of Ouvea Premix were immersed in a laboratory setting to allow measurement of the gaseous and aqueous generation of ammonia). The assumptions and quantifications of ammonia release are provided in Table 3 below.

- Table 3 Quantification of Ammonia Discharges from Taha Site Inundation

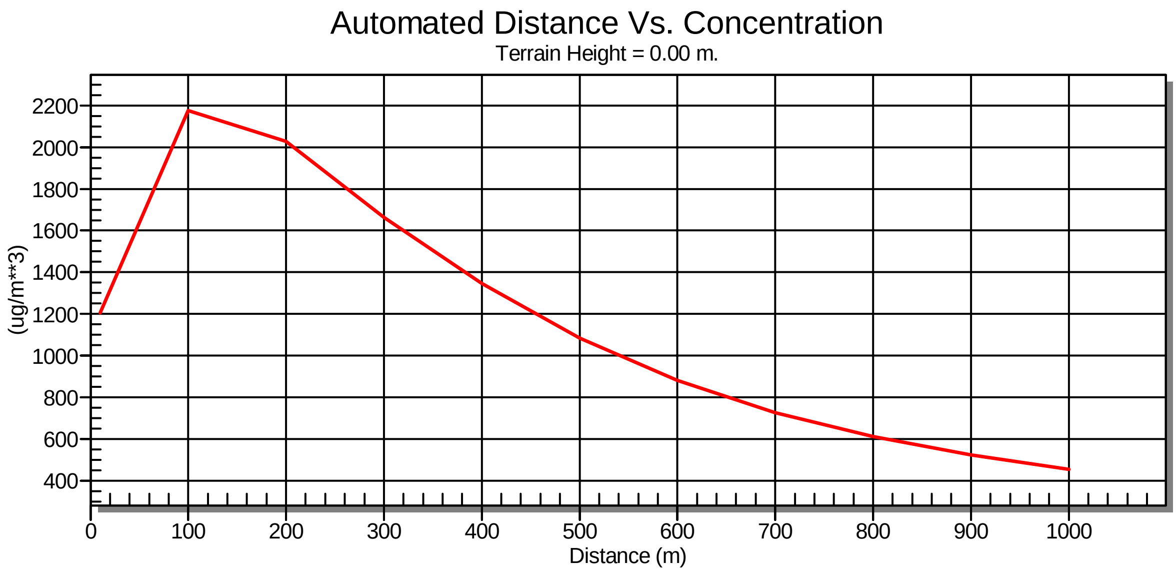
Parameter	Assumption	Quantity
Total amount of Ouvea Premix stored at site	All Ouvea Premix is treated as Casthouse Ouvea Premix	10,000 tonnes
Amount of Ouvea Premix inundated by flooding	Water level rises and covers two layers of bags height of the stacked Premix	6,667 tonnes
Amount of Ouvea Premix affected by water entry into bags	<15% as per bag immersion trial	1,000 tonnes
Total ammonia generated from Ouvea	Assume emission factor of 0.53 kg per tonne over a 48 hour period, as determined in bench test (for loose Ouvea Premix in water)	530 kg NH_3
Amount of ammonia released from bags	Assume half of ammonia released is retained in the bags as they are sealed	265 kg NH_3
Amount of ammonia released from building	Assume half of ammonia released from bags is retained within the building	132.5 kg NH_3
Discharge rate of ammonia from site	Assume ammonia is discharged at a continuous rate over 48 hours	0.77 g/s
Area of discharge	Defined building area used for area source emission	10,800m^2
Discharge rate of ammonia	Discharged constantly over the total area at height of 3m above ground.	7.1×10^{-5} $g/m^2/s$

Using the contaminant discharge rate provided in Table 3, screening dispersion modelling was performed using the USEPA Screen3 model to predict one hour average ground level concentrations of contaminants downwind from the storage site. Screen3 is a single source Gaussian plume model which provides maximum one hour average ground-level concentrations for a source. The model assumes flat terrain and a range of meteorological conditions and predicts the worst-case ground level concentrations for a contaminant as a one-hour average. The model is generally highly conservative in its predictions relative to more sophisticated dispersion models. Ammonia is not a dense gas and is discharged as a neutrally buoyant gas. The Screen3 model was run as an area source.

The results of the screening for ammonia are provided in

illustrating the decrease in ground level concentrations with distance from the source.

Figure 4 : Maximum Predicted 1-hour Average Concentrations of Ammonia with Distance from Storage Site



A maximum 1-hour average concentration of 2.2 mg/m^3 is predicted to occur approximately 100 metres from the source. This is below the NOAEL(HEC) concentration for ammonia of 2.3 mg/m^3, which is the level of continuous exposure to ammonia below which will not result in observable health effects. The model indicates a rapid decrease in concentration over distance. At the predicted concentrations people in the area would typically not be able to smell any ammonia odour which has an odour threshold of around 38 mg/m^3.

The modelling indicates that the consequences of the ammonia gas release will be acceptable.

6.4.2 Discharge of Ammonia and Fluoride into Flood Waters

Solution from the bench immersion tests of Casthouse Ouvea Premix were analysed for nitrogen species (ammonia, nitrate, nitrite, total nitrogen) and fluoride. These results are provided in Table below.

Table 5 Liquid sample analysis results (g/m^3)

Analysis	Blank	Bagged sample	Loose sample
Ammonia (N-NH_3)	<0.01	134	220
Nitrate (NO_3)	0.59	0.91	1.31
Nitrite (NO_2)	<0.01	0.03	0.07
Fluoride	0.09	82.3	162

Note that the lab results for total nitrogen were not available at the time of this report.

The contaminants generated by the Ouvea Premix into the water that the bags are immersed in would be discharged with the receding flood waters. Taking the results of the liquid sample analysis in Table 5, the generation potential of Ouvea Premix for aqueous ammonia can be calculated based on the volumes of water (1200 mL) and premix (500 g) placed in the reaction vessels.

Table 6 : Ammonia, Fluoride and Nitrate generated over 2-day bench test

Analysis	Ammonia concentration (g/m^3)	Total mass of ammonia generated (mg)	Ammonia generation potential of Ouvea Premix in 48-hour immersion simulation
Bagged Ouvea Premix	134	161	0.32 kg/tonne
Loose Ouvea Premix	220	264	0.53 kg/tonne
Analysis	**Fluoride concentration (g/m^3)**	**Total mass of fluoride generated (mg)**	**Fluoride generation potential of Ouvea Premix in 48-hour immersion simulation**
Bagged Ouvea Premix	82	99	0.20 kg/tonne
Loose Ouvea Premix	162	194	0.39 kg/tonne
Analysis	**Nitrate concentration (g/m^3)**	**Total mass of nitrate generated (mg)**	**Nitrate generation potential of Ouvea Premix in 48-hour immersion simulation**
Bagged Ouvea Premix	0.32	0.38	0.0008 kg/tonne
Loose Ouvea Premix	0.72	0.86	0.0017 kg/tonne

The flood waters that accumulated in the building will be discharged in part back into the Mataura River during the flood event and as the flood waters recede. Whilst in flood the Mataura River will have a flow rate for a 100 year event of around 2700 m^3/s which will provide a huge level of dilution for the discharged contaminants into the Mataura River and as such the consequences are predicted to be minimal on aquatic life. To demonstrate this we have used the same assumptions in the ammonia gas consequence analysis in respect to determining a discharge rate based on the quantity of material inundated.

Table 7 : Ammonia, Fluoride and Nitrate Discharge to Water Assumptions

Parameter	Assumption	Quantity
Total amount of Ouvea Premix stored at site	All Ouvea Premix is treated as Casthouse Ouvea Premix	10,000 tonnes
Amount of Ouvea Premix inundated by flooding	Water level rises and covers two layers of bags height of the stacked Premix	6,667 tonnes
Amount of Ouvea Premix affected by water entry into bags	<15% as per bag immersion trial	1,000 tonnes
Total ammonia generated from Ouvea	Assume emission factor of 0.53 kg per tonne in to water over a 48 hour period, as determined in bench test for loose Ouvea Premix in water	530 kg NH_3
Total amount of fluoride generated from Ouvea	Assume emission factor of 0.39kg per tonne in to water over a 48 hour period, as determined in bench test for loose Ouvea Premix in water	390kg F
Total amount of nitrate generated from Ouvea in water	Assume emission factor of 0.0017 kg per tonne in to water over a 48 hour period, as determined in bench test for loose Ouvea Premix in water	1.7 kg NO_3
Flood flow 100 year event	Assume a flood flow for a 48 period equating to 50 year event.	2350 m^3/s
Concentration of Ammonia in Mataura River	All the ammonia is discharged to the Mataura River.	1.3 mg/m^3
Concentration of Fluoride in Mataura River	All the fluoride is discharged to the Mataura River.	0.96 mg/m^3
Concentration of nitrate in Mataura River	All the nitrate is discharged to the Mataura River	0.0042 mg/m^3

The calculation assumes that all the ammonia over the 48 hour period will be discharged to the Matuara River and after appropriate mixing will result in a change in concentration of the river. ANZECC[7] freshwater guideline for protection of aquatic ecosystems (99% level of protection) is 320 µg/L and the predicted concentration as a result to the discharge of ammonia with flood waters after mixing is 1.3 µg/L. The ANZECC guidelines do not provide a guideline for fluoride. The New Zealand Drinking Water Standards provide a Maximum Acceptable Value for fluoride of 1.5 mg/L and the predicted a concentration of fluoride for the Taha sits discharges during a flood event in the Mataura River after mixing of 0.96 µg/L. For nitrate[8] NIWA has determined for freshwaters a chronic – high conservation value systems (99% protection) concentration of 1 mg/L . The predicted concentration of nitrate in the Mataura River as result of discharges form the Taha site in a flood event is 0.0042 µg/L.

The level of dilution provided by the Mataura River during a flood even is large and as a result the contaminant concentrations of the discharges will not reach a level which adversely effects the aquatic ecology.

Not all the water that enters the Taha Mataura storage site as a result of the flood will be discharged back to the Mataura River and there will be pools of water remaining in the building once the flood has receded. This water would remain in contact with the bulk gas of Ouvea Premix and as such contaminants from the Premix will continue to be dissolved in to the water. This standing water will need to be tested to determine its contamination concentrations and whilst the site is waiting for the laboratory results this water will needed to be prevented from being discharged to the Mataura River and Waikana Stream. Taha have advised that the pooled standing water would be bunded using sandbags and spill booms to prevent it discharging from the site. It is anticipated that the concentrations of key contaminants ammonia, fluoride ad nitrates will be more elevated in the standing water left over from the flood as compared to the flood event and these would most likely require treatment before being discharged.

[7] Australian and new Zealand Guidelines for Fresh and marine Water Quality 2000, Australian and New Zealand Environment Conservation Council (ANZECC

[8] Updating nitrate toxicity effects on freshwater aquatic species, NIWA, Prepared for Ministry of Building, Innovation and Employment : Funded by Envirolink, January 2013

7. Environmental Qualitative Risk Assessment

Using the information provided in section 6 of this repot, an environmental qualitative risk assessment was conducted for the site. The qualitative descriptors of likelihood and consequence and the risk matrix used to determine the level of risk is provided in Appendix H. The analysis is based on the guidance provided by NZS 4360 Risk Assessment using the following methodology:

- Identify the hazards using the station design information;
- Identify the potential effects of those hazards;
- Identify mitigation measures; and
- Use the Impact matrix has been that considers the following for each discharge or activity (hazard) when determining the level of 'significance' of the impact:
  - The scale of the resulting impact;
  - The severity of the impact;
  - The frequency of occurrence of the impact;
  - Duration of the impact; and
  - Offensiveness of the impact.

7.1.1 Level of risk

The following sections set out the environmental qualitative risk analysis conducted for all environmental hazards identified in respect of the storage of hazardous substances at the subject site. A summary of the hazards and the level of risk they pose are presented in Table 8 and further discussed in the following section.

Table 8 : Environmental Qualitative Risk Assessment

Hazard	Cause(s)	Effect	Mitigation	Risk Analysis		
				Consequence	Probability	Hazard Risk Index
Worker exposure to toxic substances	Human exposure to stored hazardous substances by ingestion or dermal/ocular exposure	Medical or first aid treatment may be required for exposed workers.	Hazardous substances stored in sealed bags. Compliance with Environmental Management Plans (EMPs) and associated procedures.	4	D	Low
Release of toxic substances to the environment	Spillage of minor quantities of hazardous substances	Exposure to environment of hazardous substances.	Compliance with EMPs and associated procedures Worker training in use of spill clean-up kits.	5	D	Low
	Discharge of dust from handling and storage of Ouvea Premix	Dust entering waterways and exposure to people living in surrounding area	All granules and powder are contained in double layer bags which prevent release of dust to air. Only small number of bags are handled out doors and if split dust release would be minimal.	5	C	Low
	Spillage of material from transport during transfer to storage areas in buildings	Spillage of hazardous materials in load- area (granular and powder). No off-site effects.	Transfer points are in the main located inside buildings. Transfer procedures will be updated and included in the local EMPs.	5	E	Low
	Ammonia during normal storage operations	Medical or first aid treatment to workers and odour nuisance offsite	The storage areas are kept dry to prevent water Ouvea reaction which generates ammonia, and monitoring is conducted in storage areas to check ammonia levels	5	C	Low
	Ammonia released as a result of a flood inundating Ouvea Premix bags	Medical or first aid treatment to workers and potential offsite effects to the community	Reaction rate of water with Ouvea is slow so release rate is not instantaneous resulting in a gas cloud. Bags and staking arrangements will restrict amount of water that enter the bags to react with Ouvea. Whilst bags are immersed in water the ammonia generated will be dissolve into the water rather than convert to gas	3	E	Low
	Ammonia and fluoride released to Mataura River as a result of flood inundating the storage area	Effects on aquatic ecosystems located in the	Reaction rate of water with Ouvea is slow so release rate is not instantaneous and occurs over the period of the flood. Bags and staking arrangements will restrict amount of water that enter the bags to react with Ouvea. The flood volumes are large in the Mataura River providing a high level of dilution of contaminants discharged into the river. Flood flows in the building will not result in the removal of bags from the building.	4	E	Low
Fire	Deployment of fire suppression in event of fire at the facility	Contamination of stormwater from firewater and foam from fire suppression.	Fluids including firewater are collected in catch ponds for reinjection with brine into reinjection wells.	4	D	Low

	Accidental combustion of minor quantities (diesel, paints etc) of hazardous substances	Fire damage to facility or workers.	Compliance with EMPs and associated procedures, including worker training in handling of hazardous substances and storage of materials in flammables cabinets.	**4**	**D**	**Low**
	Fire deliberately lit	Fire damage to facility or workers.	Security protocols to prevent unauthorized access to site. Fire detection and suppression systems deployed.	**4**	**E**	**Low**
	Fire resulting from electrical system failure	Fire damage to facility or workers.	Fire detection and suppression systems deployed.	**4**	**D**	**Low**
Vandalism	Unauthorized access to site by vandals	Damage to facility storage containers or equipment, potentially resulting in release of hazardous substances to the environment.	Site has security fencing in part and limited access.	**3**	**C**	**Med**
Flooding	Flooding from severe rain event	Release of hazardous substances to environment.	Flood protection which provides adequate protection for a 50 year flood event. Hazardous substances contained in double layer bulker bags.	**3**	**E**	**Low**

8. Conclusions and Recommendations

8.1 Conclusions

The ammonia generation potential is regulated by the reaction mechanism of Ouvea Premix with water. When fully immersed, the ammonia generated will dissolve into water ultimately forming ammonium. In this situation, the amount of ammonia gas generated is negligible. When product is damp or no longer immersed in water, the reaction mechanism will tend to slowly release ammonia gas over time. This reaction mechanism is not instantaneous and therefore there is no potential to generate a large concentrated gas cloud. All these reactions are moderated by the amount of material that gets wet.

From the hazard identification and assessment of potential exposure pathway we have determined that there are two credible exposure pathways which could result in discharges of contaminants from the storage of hazardous substances at the Mataura site which could impact on a receptors in the wider environment (people and river ecology). Both exposure pathways occur should a 100 year flood event result in inundation of the buildings on the Mataura site. They are:

- Discharge of ammonia gas to atmosphere as a result of Ouvea Premix being wetted by a flood which is inhaled by exposed individuals
- Discharge of ammonia, fluoride and nitrate in flood water to the Mataura River and Waikana Stream.

A consequence analysis was conducted on the discharges of ammonia gas and discharge of ammonia, fluoride and nitrate in flood water from the Taha storage site on the surrounding area based on series of conservative assumptions derived from the flood modelling, observations from the immersion trial (in which bags of Ouvea Premix were immersed in water), and the bench test (in which samples of Ouvea Premix were immersed in a laboratory setting to allow measurement of the gaseous and aqueous generation of ammonia.

Dispersion modelling of the ammonia, based on a discharge rate calculated based on a set assumptions, indicates that the consequences of the ammonia gas release will be acceptable. A mass discharge based equation was sued to calculate discharge rates of ammonia, fluoride and nitrate which has dissolved into site flood waters and have discharged in to the Mataura River during a flood event. The effects of this discharge due to the high level of dilution provided by the flood waters indicate that the effects on the aquatic ecosystems of the Mataura River will be minimal.

The qualitative risk assessment has assessed all hazards as having low to moderate levels of risk and is acceptable. The risk posed by the storage of Ouvea Premix at the Mataura site on the surrounding environment is acceptable, even when extreme flood events are considered.

8.2 Recommendations

Taha needs to instigate its Environmental Management Plan at the site in order to adequately manage and monitor the storage of Ouvea Premix.

Taha needs to develop procedures for managing and monitoring standing water in the building as a result of a flood event which will have potentially elevated concentrations of contaminants.

Appendix A. Site Layout Plan

Appendix B. Safety Data Sheets

Appendix C. Material testing

C.1 Bag Immersion Testing Methodology

As discussed, Jacobs has requested Taha undertake an additional bag test to support the Mataura resource consent application. The bag test should incorporate the following proposed methodology:

(1) Identify suitable location for bag test:

- We suggest conducting the bag test at Bond Row where there may already be fugitive ammonia emissions (and blending is already permitted by resource consent).
- Necessary PPE must be used.
- Sucker truck access will be required to empty skip water after test.
- Taha will need photo and written records of the bag test.

(2) Line skip bin with plastic liner, as per original methodology.

(3) Identify 4x1 tonne bags of Ouvea Premix (the same as those stored in Mataura), number the bags 1-4 and weigh them, keeping a record of bag weight. [Note: If possible to safely replicate the stacking arrangements at Mataura i.e. 3 high then this would be worthwhile following the other recommendations as per method]

(4) Place the bags in the skip – two on the bottom and two stacked on top (as they are stacked in Mataura). Keep a record of the location of each bag in the skip.

(5) Fill the skip with water, record height of the water above the lower bag(s).

(6) Record the initial pH level of the water.

(7) Cover the skip was plastic sheeting to confine any gases that may be omitted.

(8) Obtain further pH readings at 12 and 24 hours after bags have been submerged. Also keep a record of any observations of odour during the test (such as ammonia and hydrogen sulphide).

(9) After 24 hours, measure ammonia concentrations in the headspace with Gastec tubes (Bruce to conduct testing on arrival).

(10) Remove bags individually, allowing water that has entered the bag cavity (i.e. between the plastic and mesh-woven layer) but not come into contact with the material flow back into the skip.

(11) Weigh each bag individually. Keep a record of weight.

(12) If possible, open each bag and estimate the depth of water that has got into the bag from the top and the bottom (i.e. in centre meters).

(13) Bruce Clarke will also be able to assess the material inside the bags for ammonia production.

(14) Take a final pH reading of the water in the skip, prior to discharging the water safety.

(15) Dispose of or dry the tested material as appropriate.

C.2 Bench Ouvea Premix Immersion Testing

Appendix D. Environmental Management Plan

Appendix E. Flood Hazard Assessment

Appendix F. Matuara Store Weekly Monitoring Reports

Appendix G. Risk Descriptors and Risk Matrix

Qualitative Descriptors

1 Consequence

	Rating	Financial impact (to Top Energy)	Schedule Delay
1	**Severe**	>$100m	> 6 months late
2	**Major**	$10m - $100m	2-6 months late
3	**Moderate**	$1m - $10m	1-2 months late
4	**Minor**	$10k - $1m	1 week to 1 month late
5	**Insignificant**	<$10k	Less than a week late

	Safety	Environment	Community
1	Single fatality or permanent disability.	Major offsite release, long term environmental damage. Remediation in terms of years.	Widespread reputation loss to more than one business unit, extreme community outcry nationally.
2	Extensive injuries or chronic health issues.	Major offsite release, short to medium term environmental damage. Remediation in terms of months.	Widespread reputation loss to single business unit, widespread community outcry.
3	Lost Time Injury (off work recovery required) or short / medium term health issues.	Offsite release, no significant environmental damage. Remediation in terms of weeks.	Regional reputation loss, local community outcry.
4	Medical treatment required or short term acute health effects.	Major onsite release with some damage, no offsite damage. Numerous and/or widespread but small scale impacts on energy and waste. Remediation in terms of days.	Local client concern, local community concern.
5	Local treatment with short recovery - minor short term health effects.	Onsite release, containable with minimal damage. Localised impact on energy usage.	Workforce concern, low community concern.

2 Likelihood

A	**Almost Certain**
B	**Probable**
C	**Possible**
D	**Unlikely**
E	**Very unlikely**

	Project Frequency	Probability	Environmental Likelihood
A	More than once during the project.	>0.5	Common occurrence, high volume/use.
B	Once during the project.	0.1 - 0.5	Common occurrence, low volume/use.
C	Could happen during the project life.	0.01 - 0.1	Occasional occurrence, high volume/use.
D	Unlikely to occur during project life.	0.001 - 0.01	Occasional occurrence, low volume/use.
E	Very unlikely to occur during the project life.	<0.001	Rare occurrence.

Risk Ranking Matrix

Absolute Rankings		Insignificant 5	Minor 4	Moderate 3	Major 2	Severe 1
Almost certain	A	5	6	7	8	9
Probable	B	4	5	6	7	8
Possible	C	3	4	5	6	7
Unlikely	D	2	3	4	5	6
Very unlikely	E	1	2	3	4	5

Risk Categories		Insignificant 5	Minor 4	Moderate 3	Major 2	Severe 1
Almost certain	A	Medium	High	Very High	Very High	Very High
Probable	B	Medium	Medium	High	Very High	Very High
Possible	C	Low	Medium	Medium	High	Very High
Unlikely	D	Low	Low	Medium	Medium	High
Very unlikely	E	Low	Low	Low	Medium	Medium