Sensitive Land Use 1 - Banksmeadow Primary School
Sensitive Land Use 2 - Pagewood Primary School
Sensitive Land Use 3 - Botany Athletic Centre
Sensitive Land Use 4 - Eastgardens Shopping Centre
Sensitive Land Use 5 - Retirement Village
Sensitive Land Use 6 - South Sydney High School
Sensitive Land Use 7 - Our Lady of Annunciation School
Sensitive Land Use 8 - Marist Brothers High School
Sensitive Land Use 9 - Childcare Centre
Sensitive Land Use 10 - Matraville Primary School
Sensitive Land Use 11 - St Agnes Primary School
Sensitive Land Use 12 - 19A Baker Street
Sensitive Land Use 13 - Juice Factory
Sensitive Land Use 14 - Pagewood Child Care Centre

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HLA

Botany industrial park site boundary
CPWE
Sensitive land uses

Figure 2

Sensitive Surrounding Land Uses

Orica Australia Pty Ltd

Remediation of Car Park Waste Encapsulation
Botany Industrial Park
Preliminary Hazard Analysis

G:\Jobs\S6\S60400_S40499\S60432\PHA\S6043202 F3.cdr 03 07 2007 TO www.hla-enviro.com.au

Figure 3

Conceptual Site Layout

Orica Australia Pty Ltd

Remediation of Car Park Waste Encapsulation

Botany Industrial Park

Preliminary Hazard Analysis

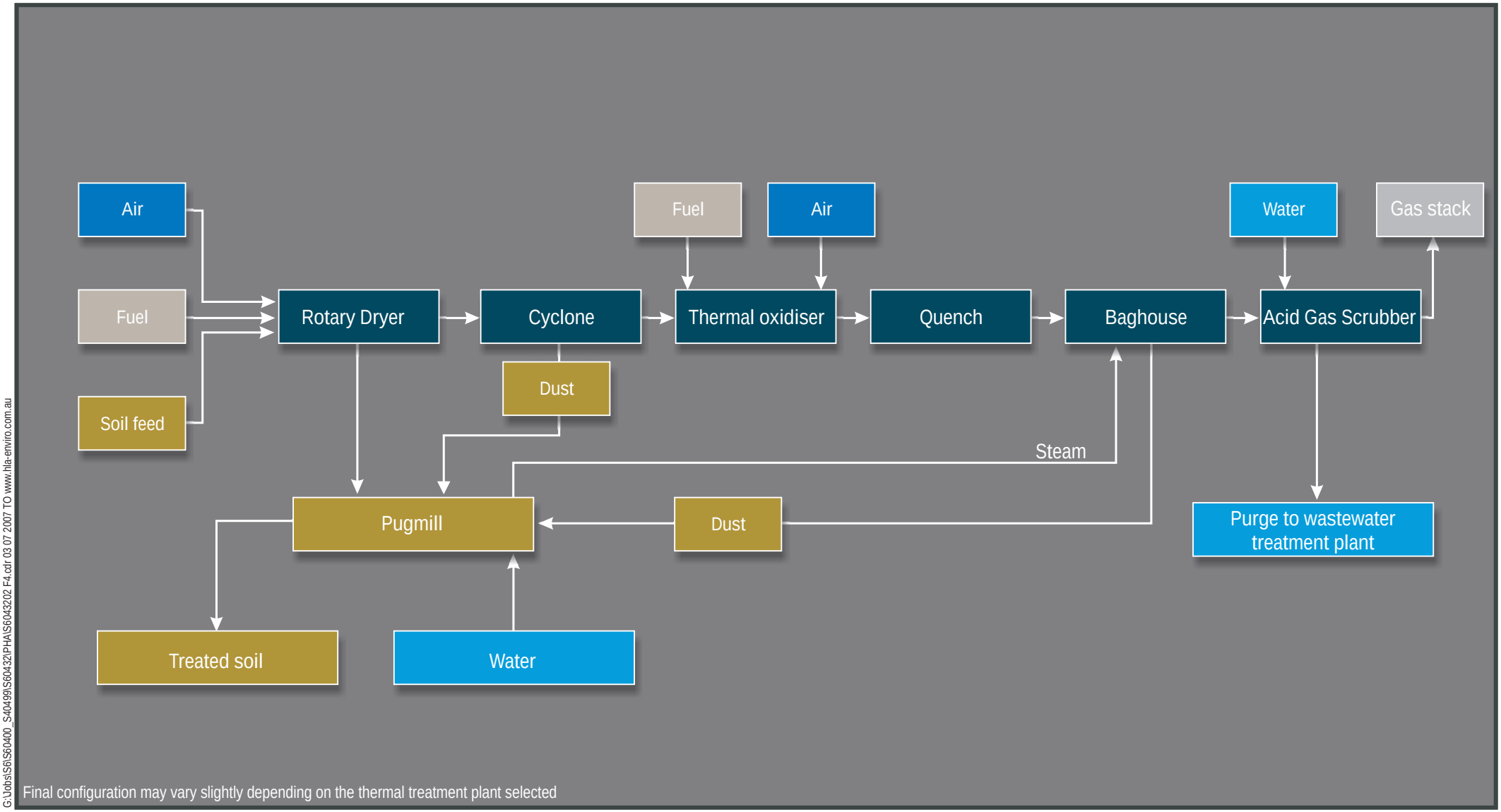

Figure 4
DTD Treatment Process
Orica Australia Pty Ltd
Remediation of Car Park Waste Encapsulation
Botany Industrial Park
Preliminary Hazard Analysis

APPENDIX 2. MSDS

The following MSDS are included in this Appendix:

1. Car Park Encapsulation Soil

Material Safety Data Sheet

Based on available information, not classified as hazardous according to criteria of NOHSC.
Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by Road and Rail.

1. Identification of the substance/preparation and of the company/undertaking

Product Name: **CAR PARK ENCAPSULATION SOIL**

Supplier: Orica Australia Pty Ltd
ABN: 004 117 828
Street Address: 1 Nicholson Street,
Melbourne 3000
Australia
Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937

Emergency Telephone: **1 800 033 111 (ALL HOURS)**

2. Composition/information on ingredients

Product Description: Car park encapsulation soil. Dark brown soil.

Components / CAS Number	Proportion	Risk Phrases
Other ingredient(s)	to 100%	-
-		
Chlorinated hydrocarbons	<0.1%	-
-		
Heavy metals	<0.1%	-
-		
Hexachlorobutadiene	<1%	-
87-68-3		

3. Hazards identification

Poisons Schedule: None allocated.

4. First-aid measures

Inhalation: Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.
Skin Contact: If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water. A component of this material can be absorbed through the skin with resultant toxic effects. Seek immediate medical assistance.
Eye Contact: If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.
Ingestion: Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek

medical assistance.
Notes to physician: Treat symptomatically.

5. Fire-fighting measures

Specific Hazards: Non-combustible material.
Fire-fighting advice: Decomposes on heating emitting toxic fumes. Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

Suitable Extinguishing Media: Not combustible, however, if material is involved in a fire use: Water fog (or if unavailable fine water spray), foam, dry agent (carbon dioxide, dry chemical powder).

6. Accidental release measures

Wear protective equipment to prevent skin and eye contact and breathing in dust. Work up wind or increase ventilation. Cover with damp absorbent (inert material, sand or soil). Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. Handling and storage

Handling advice: Avoid skin and eye contact and breathing in dust.

Storage advice: Store in a cool, dry, well ventilated place and out of direct sunlight. Keep containers closed when not in use - check regularly for spills.

8. Exposure controls/personal protection

Occupational Exposure Limits:
No value assigned for this specific material by the National Occupational Health and Safety Commission. However, Exposure Standard(s) for constituent(s):

Hexachlorobutadiene: 8hr TWA = 0.21 mg/m3 (0.02 ppm), Carcinogen Category 3, Sk

As published by the National Occupational Health and Safety Commission.

TWA - The time-weighted average airborne concentration over an eight-hour working day, for a five-day working week over an entire working life.

`Sk' Notice – absorption through the skin may be a significant source of exposure. The exposure standard is invalidated if such contact should occur.

Carcinogen Category 3 – substances suspected of having carcinogenic potential. The available information is not adequate for making a satisfactory assessment.

These Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric

contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Engineering Control Measures:
Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Exposure Standards. Natural ventilation should be adequate under normal use conditions. If inhalation risk exists: Use with local exhaust ventilation or while wearing dust mask. Keep containers closed when not in use.

Personal Protective Equipment:
Orica Personal Protection Guide No. 1, 1998: E - OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.

Wear overalls, safety glasses and impervious gloves. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.
If risk of inhalation exists, wear dust mask meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. Physical and chemical properties

Physical state:	Soil
Colour:	Dark Brown
Solubility:	Slightly soluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Melting Point/Range (°C):	Not available
Boiling Point/Range (°C):	Not available
Decomposition Point (°C):	Not available
pH:	5.9-8.9

10. Stability and reactivity

Stability: Stable.

11. Toxicological information

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation. Repeated or prolonged skin contact may lead to irritant contact dermatitis.

Inhalation: Breathing in dust may result in respiratory irritation.

Long Term Effects:
No information available for the product.

Toxicological Data:
No LD50 data available for the product.

12. Ecotoxicological information

Avoid contaminating waterways.

13. Disposal considerations

Refer to Waste Management Authority. Dispose of material through a licensed waste contractor.

14. Transport information

Road and Rail Transport
Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by Road and Rail.

Marine Transport
Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea.

Air Transport
Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air.

15. Regulatory information

Classification: Based on available information, not classified as hazardous according to criteria of NOHSC.
Poisons Schedule: None allocated.

All the constituents of this material are listed on the Australian Inventory of Chemical Substances (AICS).

16. Other information

This material safety data sheet has been prepared by SH&E Shared Services, Orica.

Reason(s) for Issue:
First Issue Primary MSDS

This MSDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Orica Limited 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 their Orica representative or Orica Limited at the contact details on page 1.

Orica Limited's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

APPENDIX 3. HAZARD IDENTIFICATION AND QUALITATIVE RISK ASSESSMENT

RISK REGISTER
Project: CPWE Remediation PHA
Client: Orica Australia Pty Ltd

Rev	Date	By	Checked	Description
A	18/07/2006	J Polich	-	Draft compiled from HS1 for comment and input to air dispersion scope
B	8/08/2006	J Polich	-	Draft - Updated with HS2 info
C	6/09/2006	J Polich	-	Minor updates with Orica comments
0	6/11/2006	J Polich	-	Issued with Rev 0 PHA report. No changes - minor formatting only.
1	10/05/2007	J Polich	-	Issued with Rev 2 PHA report. No significant changes - References (to HHIA and PAE Air Study) updated.

Notes:
1. This HAZID does not cover scenarios associated with existing activities. It assesses the risk associated with the proposed activities and has been prepared based on preliminary design.
2. Consequence ratings have generally been assigned based on **potential f**or Operator injury (Cat 3.1), fatality (Cat 4.1) or potential for environmental pollution (perceived / actual) or irritation / odour effects that could reach outside the remediation site (Cat 3.2)
3. Site boundary (i.e. "offsite effect") for this risk ranking is defined as outside the remediation facility including outside the BIP, or affecting BIP neighbours such as Olefines.
4. Risk scales are assigned including the identified controls

ID	Plant Area	Activity / Equipment	Material	Risk Event	Causes	Comments re Consequence	Controls - Prevention	Controls - Detection	Controls - Mitigation	Comments re Likelihood	CONSEQ RATING	LIKELIHOOD RATING	Risk Rating	Qualitative discussion in PHA?	Conseq and/or Freq Quantification in PHA?	Include in Air Quality Impact study (by PAE)?	Include in HHIA (by URS)?	Last Update in Rev
1	Excavation	Excavation	Contaminated soil	Exposure of contaminated soil surface area during excavation in building	Excavation activities required to transfer soil for treatment	Contaminants, odour outside BIP boundary. (Note that workers protected by ventilation, PPE and SCBA to ensure exposures kept to less than OELs) .	Excavation carried out within building. Building ventilated and exhaust passes through carbon beds to remove contaminants.			Unlikely with building and extraction / ventilation exhaust scrubbing in place	Cat 3.2	Very Unlikely	Level IV	No	No	No	No	A
2	Excavation	Excavation building	Contaminated soil	Exposure of contaminated soil surface area during relocation of buildings	Excavation activities required to transfer soil for treatment (assumes moveable building design rather than one very large building - current preferred design is 3 - 5 zones with 3 - 5 building moves)	Contaminants, odour outside BIP boundary. No acute effects - significance to be assessed in Air Quality Impact Study / HHIA.	Minimise size of exposed area as far as practicable		Exposed surface covered (HDPE) as far as practicable prior to relocation of building	Possible	Cat 3.2	Possible (likely)	**Level II**	No - part of "normal operation" if staged building option goes ahead.	No	**Yes**	**Yes**	B
3	Excavation	Excavation building	Contaminated soil	Failure of building ventilation system	Power failure, mechanical failure leading to fan shutdown	Loss of negative pressure / air flow into building . Leakage of contaminated air outside building via doors , louvres etc.	Building design minimises leakage (minimum apertures)	Fully attended operations Fan alarms (audible and visible)	Operating procedures to include stop operations and closing up building (which can be done manually without power within a few minutes)	Possible that this will occur. However duration would be short - less than 10 minutes to close up building.	Cat 3.2	Unlikely	Level III	Yes	No	**Yes**	**Yes**	A
4	Excavation	Excavation building	Contaminated soil	Failure of building ventilation exhaust carbon beds	Saturation of carbon, wrong media, beds bypassed	Contaminants exhausted from building ventilation stack. Possible odour outside BIP, potential breach of licence / operating approval conditions	No bypass around bed Two stage carbon bed One bed sized for full load	Periodic sampling between beds	Conc below ERPGS etc due to large air flows - dilution effective in this case	EXTREMELY UNLIKELY	Cat 3.2	Extremely Unlikely	Level IV	Yes	No	No	No	A
5	Truck Transport	Truck transfer within BIP	Contaminated soil	Spill of contaminated soil during transport	Vehicle accident	Spill of solid material - small localised effect area, minor impact, possible localised odour. Note: Solid waste material is not dusty and will not be dispersed by wind	Covered loads Site speed limits		Clean up procedures	While a number of controls are in place, incident is still rated as "possible"	Cat 1	Possible (likely)	Level III	Yes	No	No	No	A
6	Feed Soil Building	Feed soil building	Contaminated soil	Failure of building ventilation system	Power failure, mechanical failure leading to fan shutdown	Loss of negative pressure / air influx to building . Leakage of contaminated air outside building via doors , louvres etc.	Building design minimises leakage (minimum apertures)	Fully attended operations Fan alarms (audible and visible)	Operating procedures to include stop operations and closing up building (which can be done manually without power within a few minutes)	Possible that this will occur. However duration would be short - less than 10 minutes to close up building.	Cat 3.2	Unlikely	Level III	Yes	No	**Yes**	**Yes**	A
7	Feed Soil Building	Feed soil building	Contaminated soil	Failure of building ventilation exhaust carbon beds	Saturation of carbon, wrong media, beds bypassed	Contaminants exhausted from building ventilation stack. Possible odour outside BIP, potential breach of licence / operating approval conditions	No bypass around bed Two stage carbon bed One bed sized for full load	Periodic sampling between beds	Conc below ERPGS etc due to large air flows - dilution effective in this case	EXTREMELY UNLIKELY	Cat 3.2	Extremely Unlikely	Level IV	Yes	No	No	No	A

RISK REGISTER
Project: CPWE Remediation PHA
Client: Orica Australia Pty Ltd

ID	Plant Area	Activity / Equipment	Material	Risk Event	Causes	Comments re Consequence	Controls - Prevention	Controls - Detection	Controls - Mitigation	Comments re Likelihood	CONSEQ RATING	LIKELIHOOD RATING	Risk Rating	Qualitative discussion in PHA?	Conseq and/or Freq Quantification in PHA?	Include in Air Quality Impact study (by PAE)?	Include in HHIA (by URS)?	Last Update in Rev
8	Feed Soil Building	Blending activities	Contaminated soil	High level of contaminants in feed to DTD	Higher than average calorific material - eg peat, fly-ash, small area of concentrated HC contamination (eg leaking drums etc) Operator error / malicious intent	Excessive calorific value in rotary dryer leading to internal explosion. Unlikely to be have an offsite effect - potential consequence rated as potential injury / fatality to operator as part of explosion in rotary dryer event - see item 10.	Extensive pre- blending and sampling programme. Dedicated job role to supervise blending activities. Different appearance of the higher calorific materials to the main volume of contaminated sandy soil. Segregation of this material for blending in appropriate ratio.			Unlikely given controls in place and also relatively small volumes of high calorific value materials.		Unlikely	#N/A	Yes - as cause of upset in DTD	No	No	No	A
9	DTD	Natural gas supply	Natural gas	Leak of natural gas and fire	Mechanical failure of piping (corrosion, weld defect, gasket leak etc) Impact (eg heavy machinery)	Torch fire. Explosion unlikely given NG good dispersion characteristics, no confinement	Design /maintenance procedures for gas lines Pipebridge routes and gas piping to users (dryer and TO) avoids heavy vehicle work areas		EIV and manual isolation in gas lines as per required AS and gas code . All gas piping in open air , not within buildings- well ventilated, explosion very unlikely.	Small leak possible, fire large enough to cause operator injury unlikely	Cat 3.1	Unlikely	Level III	Yes	**Yes**	No	No	A
10	DTD	Rotary Dryer	Contaminated soil	Fire / explosion in rotary dryer	Inappropriate material (i.e high calorific value) sent to DTD for processing	Excess HCs volatilised in dryer leading to formation of vapour concentrations above LEL. Internal fire / explosion (Ignition source present as this is a direct-fired appliance). Asset damage, possible operator injury / fatality.	Feed pre treatment process include validation, pre-blending	Temperature monitoring of dryer and high temp trip of natural gas supply.		Unlikely given controls in place and also relatively small volumes of high calorific value materials.	Cat 4.1	Unlikely	**Level II**	Yes	No	No	No	A
11	DTD	Rotary Dryer	Natural gas	Fire / explosion in rotary dryer	Failure of natural gas supply isolation, leakage into burner, internal explosion when restart occurs	Fatality / injury to operators in vicinity. Asset damage	BMS to comply with AS and gas authority code requirements. Design detail not available however typically includes pre-ignition purge sequence	BMS to comply with AS and gas authority code requirements. Design detail not available however typically includes high / low pressure detection, flameout, double block and bleed isolation, low pressure gas use, burner startup purge sequence			Cat 4.1	Very Unlikely	Level III	Yes	No	No	No	A
12	DTD	Rotary Dryer	Contaminated soil	Maloperation of rotary dryer produces inadequately treated soil.	Low temperature - eg instruments faulty or wrongly calibrated, operator error	Soil not cleaned up as required.	Independent monitoring of key dryer control parameters.	Post treatment QC	Blending with treated soil	Unlikely given controls in place	CAT 3.1	Unlikely	Level III	Yes	No	No	No	A
13	DTD	Plant piping / ducting	Contaminant gases	Mechanical failure of ducting ex rotary dryer or quench	Excursion outside design temp / pressure conditions Impact Construction defects Wrong materials of construction (corrosion)	Release of VOCs stripped from soil into atmosphere if failure close to rotary dryer. Release of gaseous HCl if ex quench	Ducting routed away from heavy vehicle usage areas Material QC checks (procurement, installation)	High temperature trip ex rotary drier	Shutdown of DTD feed , limits release quantity to quantity in rotary drier		Cat 3.2	Unlikely	Level III	Yes	No	No	No	A
14	DTD	Thermal Oxidiser	Natural gas	Fire / explosion in TO	Failure of natural gas supply isolation, leakage into burner, internal explosion when restart occurs	Fatality / injury to operators in vicinity. Asset damage	BMS to comply with AS and gas authority code requirements. Design detail not available however typically includes pre-ignition purge sequence	BMS to comply with AS and gas authority code requirements. Design detail not available however typically includes high / low pressure detection, flameout, double block and bleed isolation, low pressure gas use, burner startup purge sequence			Cat 4.1	Very Unlikely	Level III	Yes	No	No	No	A
15	DTD	Thermal Oxidiser	Contaminant gases	Failure of natural gas supply resulting in no combustion of VOCs	Gas supply valves fail closed. Burner management system (BMS) initiates trip / fails. Loss of supply from supply pipeline, eg utility failure, damage to pipeline etc	Breakthrough of VOCs, possible dioxin formation. Contaminants exhausted via scrubber stack		Low gas pressure Low temperature ex TO	Automatic shutdown of feed to TO. Stop rotary dryer. Quench, baghouse and HCl scrubber continue to operate providing at least partial treatment of emissions.	Unlikely	Cat 3.2	Unlikely	Level III	Yes	No	**Yes**	**Yes**	A
16	DTD	Thermal Oxidiser	Contaminant gases	Maloperation of TO leads to poor efficiency in TO	Temperature control failure, poor mixing, wrong residence time	Breakthrough of VOCs, possible dioxin formation . Exhausted via scrubber stack - same as previous scenario but less severe		Temperature monitoring of TO	Quench, baghouse and HCl scrubber continue to operate providing at least partial treatment of emissions.		Cat 3.2	Unlikely	Level III	Yes	No	No	No	A

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17	DTD	Quench	Contaminant gases	Failure of quench water leads to poor scrubbing efficiency	Power failure, water supply failure, valve closed etc	Dioxin formation and carry through ex scrubber. Severe damage to downstream equipment - due to high temp ex quench If equipment remains intact, poor performance of HCl scrubber leading to HCl breakthrough and emissions from stack	Backup power supply Duty / standby water feed pump	Low water flow trips soil feed and gas supply High temperature trips feed conveyor to TO and stops rotary dryer.	Backup water supply (does not require power - uses air cylinder pressure to dump water to quench)	Unlikely given redundancy in design	Cat 3.2	Unlikely	Level III	Yes	No	No	No	A
18	DTD	Acid Gas Scrubber	HCl	Loss of HCl scrubber capability	Caustic exhausted, loss of caustic supply , loss of fan, loss of circulation flow etc	HCl breakthrough from scrubber stack	Backup power supply Duty / standby water feed pump	Low water scrubber flow or scrubber pH deviation / out of range trips soil feed and gas supply		Unlikely given redundancy in design	Cat 3.2	Unlikely	Level III	Yes	**Yes**	**Yes**	No	A
19	DTD	Activated Carbon Storage and Handling	Activated carbon	Fire in carbon layer on baghouse filters (if used)	Hotspot, contaminant concentration	Localised fire	Small inventory, minimal other combustible materials (fabric filters only)	Attended operation		Possible	Cat 2	Possible (likely)	Level III	No	No	No	No	A
20	DTD	Activated Carbon Storage and Handling	Activated carbon	Fire in stored carbon (if used)		Localised fire	Small inventory of carbon Type of carbon not subject to self-ignition	Attended operation	Limited inventory. Minimal combustibles stored	Unlikely	Cat 2	Unlikely	Level IV	No	No	No	No	A
21	DTD	Baghouse	Dust	Fire / explosion in baghouse	Operational malfunction - Flammable gases ex rotary dryer	Localised fire	BMS to comply with AS and gas authority code requirements. Design detail not available however typically includes pre-ignition purge sequence	BMS to comply with AS and gas authority code requirements. Design detail not available however typically includes high / low pressure detection, flameout, double block and bleed isolation, low pressure gas use, burner startup purge sequence	Limited inventory. Minimal combustibles in baghouse - only the filter bags within baghouse.	Unlikely that flammable gases would breakthrough. Possible hot spot fire?	Cat 3.1	Unlikely	Level III	No	No	No	No	C
22	DTD	All	Contaminant gases	Total power failure resulting in shut down of ID fan, and no emission treatment	Site wide power failure, substation failure, plant HV feeder cable failure (dug up, faulty joint etc), electrical component failure	Hot uncombusted gas emissions at ground level from rotary dryer. Operator injury. Possible odour / irritation outside remediation site boundary		Attended operation	Shutdown of feed to DTD (conveyor would stop) Control system UPS Back up diesel generator for critical equipment such as ID fan and acid scrubber to allow restart of emission controls (ID fan, quench, HCl scrubber) and at least partial treatment and exhaust via stack rather than at ground level		Cat 4.1	Very Unlikely	Level III	Yes	No	**Yes**	No	C
23	DTD	Caustic Storage and Handling	NaOH (40%)	Spill of caustic	Mechanical failure, unloading incident	Spill of corrosive, high pH material Main concern is if it reaches stormwater, unpaved ground.	Operating procedures Appropriate materials of construction		Storage / unloading in bunded area	Unlikely that effects escape outside bunded / kerbed area could occur.	Cat 1	Unlikely	Level IV	No	No	No	No	1
24	DTD	Caustic Storage and Handling	NaOH (40%)	Spill of caustic	Mechanical failure, unloading incident	Possible operator / driver injury (corrosive burns etc if in the vicinity)	Operating procedures Appropriate materials of construction		PPE Safety shower as per AS3780		Cat 3.1	Unlikely	Level III	No	No	No	No	1
25	DTD	Feed conveyor	Contaminated soil	Fire in feed soil conveyor	Friction, motor fire	Local fire, spill of material / damaged belt onto process pad area.	Slow speed conveyor	Attended operation and shutdown of conveyor	Minimal combustible inventories Fire extinguisher / hose reels. Run off to effluent from this area (not s/w).	Possible	Cat 2	Possible (likely)	Level III	No	No	No	No	B
26	All	External events	Flammables at Olefines	Significant incident at Olefines impacts remediation facility	Leak at C3/C4 truck loading area or storage	Explosion, BLEVE at Olefines - damaging DTD and Feed Soil building, fatality/ injury to remediation plant personnel, asset damage, release of volatiles Unignited gas cloud - multiple ignition sources in DTD, Soil Feed building, explosion with consequences as above.	Numerous controls in place at Olefines, including: - mechanical integrity - gas detection - ESD with isolation valves and XSFV at storages and tanker unloading.	Gas detectors on remediation site perimeter (As suggested in HS2)	Soil stockpiles along boundary to Olefines would provide some mitigation against explosion pressure wave. Co-ordinated emergency response.		Cat 4.2	Very Unlikely	**Level II**	Yes	No	No	No	B
27	All	External events	Contaminated soil, volatiles	Flood	Heavy rain, storms	Damage to plant, possible LOC. Local flooding of carpark and/or soil feed building , contaminated soil washed into stormwater system on the BIP or Corish Circle	Not in flood prone area. All exposed areas within ESB (building). Building designed to minimise water ingress. All vehicle entry / exit via In/Out air lock	Attended operation	Building and drainage design	Extremely unlikely	Cat 3.2	Extremely Unlikely	Level IV	Yes	No	No	No	A
28	All	External events	Contaminated soil, volatiles	Plane crash	Relatively close to airport, terrorism	Damage to plant, possible LOC	More likely to hit Olefines , CA etc				Cat 3.2	Extremely Unlikely	Level IV	Yes	No	No	No	A

RISK REGISTER
Project: CPWE Remediation PHA
Client: Orica Australia Pty Ltd

ID	Plant Area	Activity / Equipment	Material	Risk Event	Causes	Comments re Consequence	Controls - Prevention	Controls - Detection	Controls - Mitigation	Comments re Likelihood	CONSEQ RATING	LIKELIHOOD RATING	Risk Rating	Qualitative discussion in PHA?	Conseq and/or Freq Quantification in PHA?	Include in Air Quality Impact study (by PAE)?	Include in HHIA (by URS)?	Last Update in Rev
28	All	External events	Contaminated soil	Collapse of soil in excavation area engulfing operator	Earth tremor, heavy rain	Engulfment of operator, mud slide	Design of work area minimises risks during excavation	Can suspend operations if heavy rain makes work area unstable		NOT EARTHQUAKE PRONE AREA	Cat 3.2	Very Unlikely	Level IV	Yes	No	No	No	A
28	All	Heavy vehicles	Contaminated soil	Fire in loaded soil truck causes contents be engulfed by fuel fire leading to emission of CHCs	Engine fire, vehicle accident	Local effect,	Vehicle speed limits, defined roadways between excavation area and soil treatment building. Diesel fuelled tricks, engine maintenance, dedicated fleet of trucks	Driver, all transport within BIP	On board truck fire extinguisher, trained / licensed heavy vehicle drivers. Limited inventory in truck (< 20 te soil, max 3500mg/kg contaminants). Untreated soil is non combustible.	Unlikely	Cat 2	Unlikely	Level IV	No	No	No	No	C
29	All	Heavy vehicles	-	Collision with pedestrians	Interaction between plant and personnel in FSB / ESB	Operator injury / fatality	Separation of vehicle and pedestrian areas. Defined walkways				Cat 4.1	Possible (likely)	**Level I**	No - OHS / general industrial issue	No	No	No	A
29	All	Heavy vehicles	-	Vehicle overturns while excavating or moving soil	Soft soil, operator error	Operator injury / fatality	Vehicle speed limits, defined roadways between excavation area and soil treatment building		Roll cages fitted to excavators. Seat belts.	ROLLOVER OCCURRED DURING REMEDIATION AT VILLAWOOD WHILE EXCAVATOR WAS WORKING ON SOFT SLOPING SOIL- NO INJURIES.	CAT 3.2	Unlikely	Level III	No - OHS / general industrial issue	No	No	No	C

APPENDIX 4. CALCULATIONS

1. HCl Breakthrough due to Acid Scrubber Failure – Emission Rate Estimate

Rev	Date	By	Checked	Description				
A	02-Aug-06	J Polich	-	For Thiess comment				
B	03-Aug-06	J Polich	JW Hunt (Thiess)	Minor formatting updates				
Sherpa Project no:	20115							
Objective:	Estimate quantity of HCl formation for dispersion model input for scrubber failure scenario							
Data:								
1. Estimate of maximum HCl formation rate								
Total soil feed rate		35	te /hr					
MW Cl		35.45						
MW C		12						
material	**Feed contan**	**formula**	**MW**	**n (mmol/kg)**	**mass frac C**	**Total Cl**		
	mg/kg					**mg/kg**		
	(conc from Focus email 19/07/06)							
HCB	90	C6Cl6	284.7	0.316122234	0.75	67.24		
HCBD	3225	C4Cl6	260.7	12.37054085	0.82	2631.21		
HCE	455	C2Cl6	236.7	1.92226447	0.90	408.87		
PCE	65	C2Cl4	165.8	0.392038601	0.86	55.59		
OCS	230	C8Cl8	379.6	0.605900948	0.75	171.83		
Total	4065		260.5	15.6068671		3335	mg/kg	
Total in feed	142.3	kg / hr		0.55	kgmol/hr	116.7	kg Cl/ hr	
Mass balance		Cl^- +	H^+		=	HCl		
no kgmoles/hr		3.3				3.3		
mass / hr		116.7				120.0	(peak mass rate)	
It is noted that the soil along the dryer has a variable contaminant concentration profile.								
The soil in the final third has been heated and the contaminants already volatilised to the TO, i.e are no longer in soil in dryer.								
The soil in the first third has not been heated, contaminants will not be volatilised hence will not be available once feed shutdown								
(Shutdown will occur on scrubber failure)								
Hence only one third of contaminants are available for conversion to HCl hence breakthrough on scrubber failure								
Hence HCl breakthrough flowrate is 1/3 of peak			40.0	kg HCl/ hr				
2. Stack conditions	**from PAE email 8/8/06**							
Stack height	20	m	from Thiess email 14/06/06)					
Stack diameter	1.34	m	from Focus email 19/07/06)					
Exit temp	84	deg C	from Focus email 19/07/06)					
Exit velocity	18.3	m/s	from Focus email 19/07/06)					
Flow rate	19.7	Am3/s	0 deg C, 1 atm)					
Conversion	22.4	Am3/kgmol						
Total gas flow rate	0.87944801	kgmol/s						
	3166	kgmol/hr						
3. Average HCl concentration ex stack assuming scrubber failure								
Peak HCl conc in stack (no scrubbing)	1040	ppm	Assuming peak contam flow of 120kg/hr					
Av HCl conc in stack (no scrubbing)	347	ppm	Assuming av contam flow equivalent to 40kg/hr					
4. Estimate average contaminant loading in hot gas ex rotary dryer								
Av contam concentration in rotary dryer	173	ppm	Assumes normal flow through ID fan is same as flow through rotary dryer					

2. Plume rise

Rev	Date	By	Checked	Description
A	02-Aug-06	J Polich	-	For draft PHA

This program calculates the plume rise characteristics from the Briggs model

Reference: TNO, The Yellow Book, 1997, Chapter 4 (4.5.4.2)
Blue numbers / text indicates parameters to be supplied by the user

1. Collect the following data

a. Source radius	b_o	0.25	m	
b. Velocity at source	u_o	1	m/s	
c. Density of the source	p_o	0.454851	kg/m^3	
d. Density of air	p_a	1.2	kg/m^3	1.2 kg/m^3 at 20°C
e. Enter the Pasquill class (A to F)		F		
f. Enter the wind speed at 10 m/s above ground	u_a	2	m/s	
g. Concentration at the source	c_o	0.017	vol%	

2. Calculate the buoyancy flux factor, F_o

F_o = 0.4

3. Calculate the maximum distance to the final plume rise, x_r

x_r = 174 m

4. Calculate the plume rise due to buoyancy, Δh_B

Δh_B = 18 m

Check, for Classes A, B, C and D and low wind speeds, maximum plume rise is: 18 m (Δh_B must be equal to or less than this value)

Therefore, Δh_B = 18 m

5. Calculate the plume rise due to momentum forces, Δh_m

Δh_m = 0.75 m

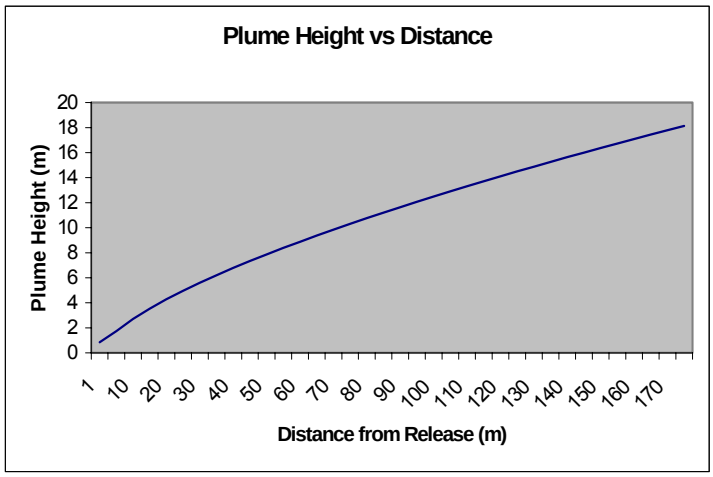
(x_r = 2.25 m)

6. Calculate the final plume rise, Δh_r

Δh_r = 18 m

7. Calculate the plume height (h(x)), the radius of the plume and concentration versus downwind distance (x)

x (m)	Plume Height (m)	Plume Radius (m)	Concentration vol%
1	1	0	0.0025
5	2	1	0.0008
10	3	1	0.0004
15	4	2	0.0002
20	4	2	0.0002
25	5	2	0.0001
30	6	2	0.0001
35	6	3	0.0001
40	7	3	0.0001
45	7	3	0.0001
50	8	3	0.0000
55	8	4	0.0000
60	9	4	0.0000
65	9	4	0.0000
70	10	4	0.0000
75	10	4	0.0000
80	11	5	0.0000



APPENDIX 5. REFERENCES

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