

FIGURES




Client:
WASTEROCK PTY LTD


Project:
Hazelmere Remediation and Regeneration Project

Location:
Lot 20 Adelaide Street, Hazelmere

Drawing Title:
SITE AND REGIONAL VIEW

Notes:
 Site Location



Drawn by: Dale A.	Scale: Scale Not Used	 North
Date: 10/09/2013		
Project No: E2012 - 031	Figure No: 1	Rev: v1





Client:
WASTEROCK PTY LTD

Project:
Hazelmere Remediation and Regeneration Project

Location:
Lot 20 Adelaide Street, Hazelmere

Drawing Title:
Previous Borehole & Test Locations

Notes:
 TP = Test Pit Location (PB, 2007)

Drawn by: Dale A	Scale: 0 50 m	 North
Date: 10/09/2013	Project No: E2012 - 031	Figure No: 2
	Rev: v1	




Client:
WASTEROCK PTY LTD

Project:
Hazelmere Remediation and Regeneration Project

Location:
Lot 20 Adelaide Street, Hazelmere

Drawing Title:
Groundwater Monitoring Well Locations

Notes:
 MW= Groundwater Monitoring Well

Drawn by: Dale A	Scale: 0 50 m	 North
Date: 10/09/2013	Project No: E2012 - 031	Figure No: 3
	Rev: v1	



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0 20 40 60 80m

SCALE 1:4000
ORIGINAL PLAN SIZE: A4

DATE: 20.06.2013

22 ELMSFIELD ROAD, MIDVALE WA 6056
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LEGEND:

 MW1 - BORE LOCATIONS



NORTH

DEPTH OF GROUNDWATER AND DIRECTION FLOW

LOT 20 ADELAIDE STREET
HAZELMERE



Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

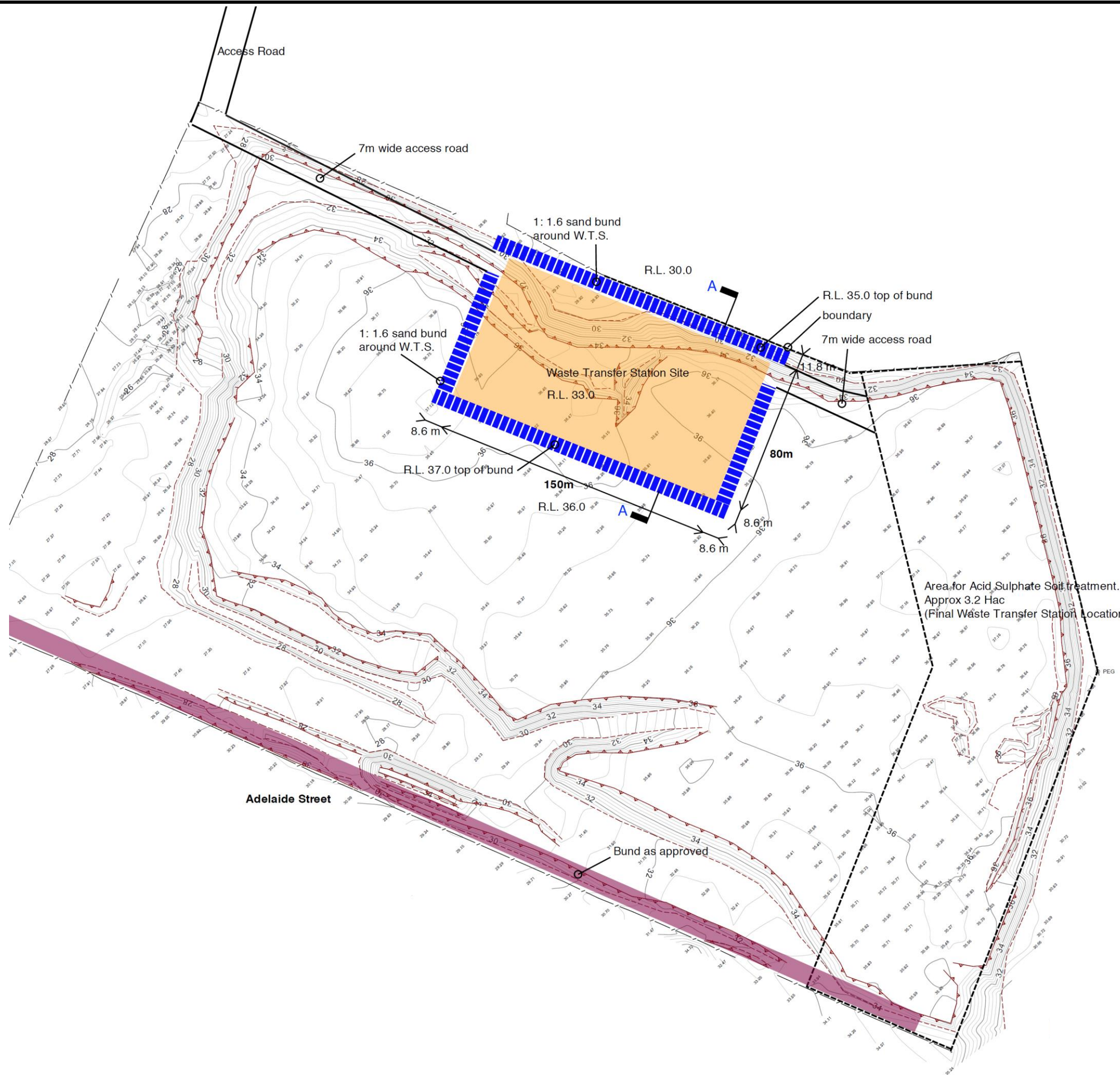
Lot 20 Adelaide Srt

Lot 20 Adelaide Street

Drawing Title:

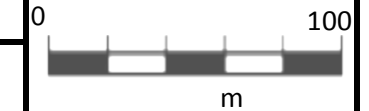
Survey of Site

Notes:



Drawn by:

Scale:



North

Date:

Project No:

Figure No:

Rev:

E2012 - 031

5

v1

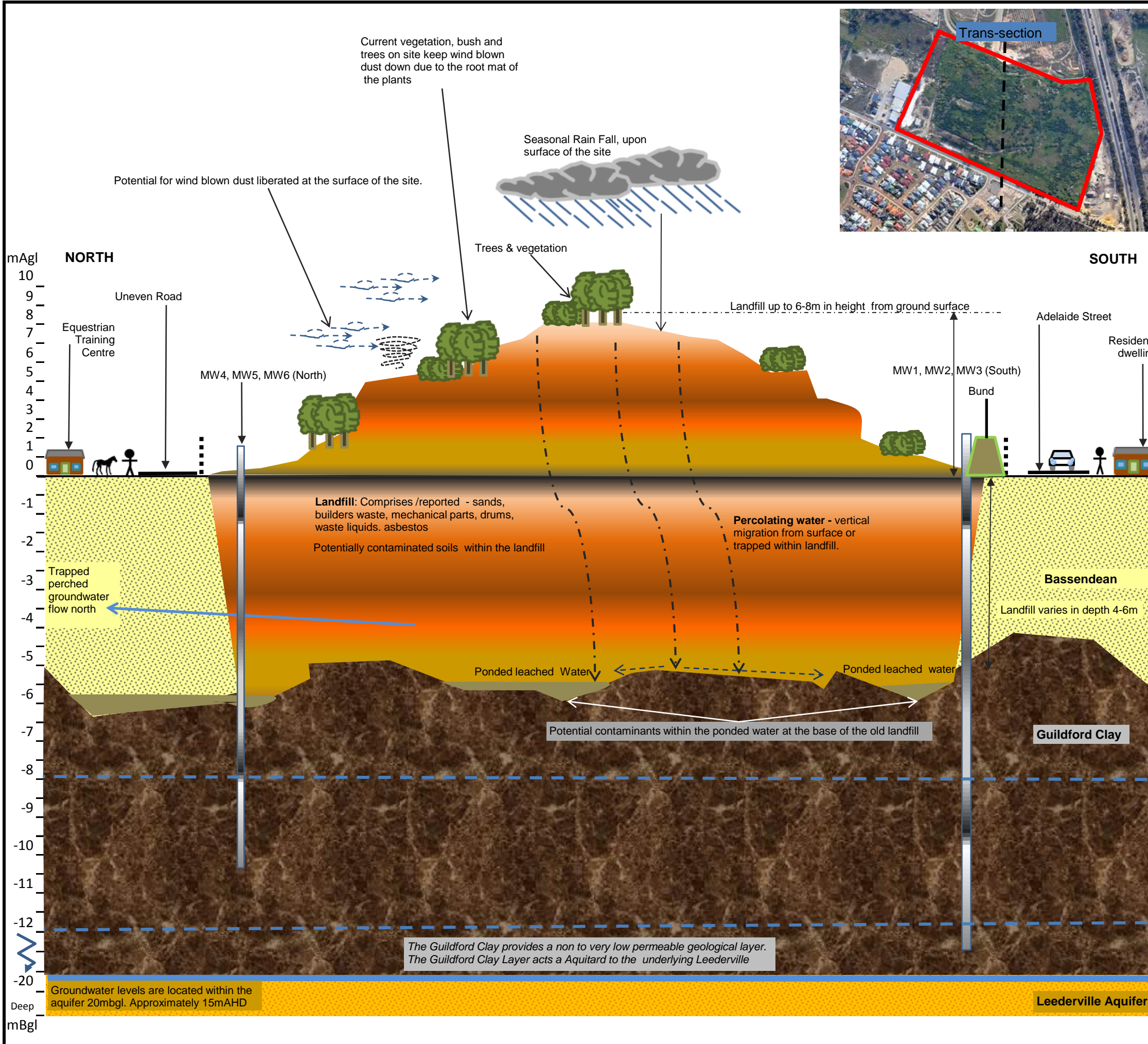


Client:
WASTEROCK PTY LTD

Project:
Hazelmere Remediation and Regeneration Project

20 Adelaide Street, Hazelmere, WA

Drawing Title:
Conceptual Site Model (Current)



Key:

- Bassendean Sand (4.5 to 6.5mbgl) Brinkerhoff.
- Guildford Clay (aquitard) documented up to 20mbgl.
- Leederville Aquifer (depth extensive)
- Historical landfill material.
- Pondered/leached waters at the base of the landfill possible hydrocarbon (DNAPL), metals, organics.
- Workers / Residents
- Animals
- Site Boundary
- Groundwater level
- Construction of Site bund - 2m high earth bund with a 1.8m fence with shroud
- Recorded groundwater depths by MDWES high and low - Due to the variation of depth of wells and orientation of the CSM only the inductive levels are presented.
- Groundwater level (aquifer)

Drawn by: MB	Scale: Not to Scale	 North
Date: 18/10/2013		
Project No: E2012 - 031	Figure No: 6a	Rev: v1



Client:

WASTEROCK Pty Ltd

Project:

Hazelmere Remediation and Regeneration Project

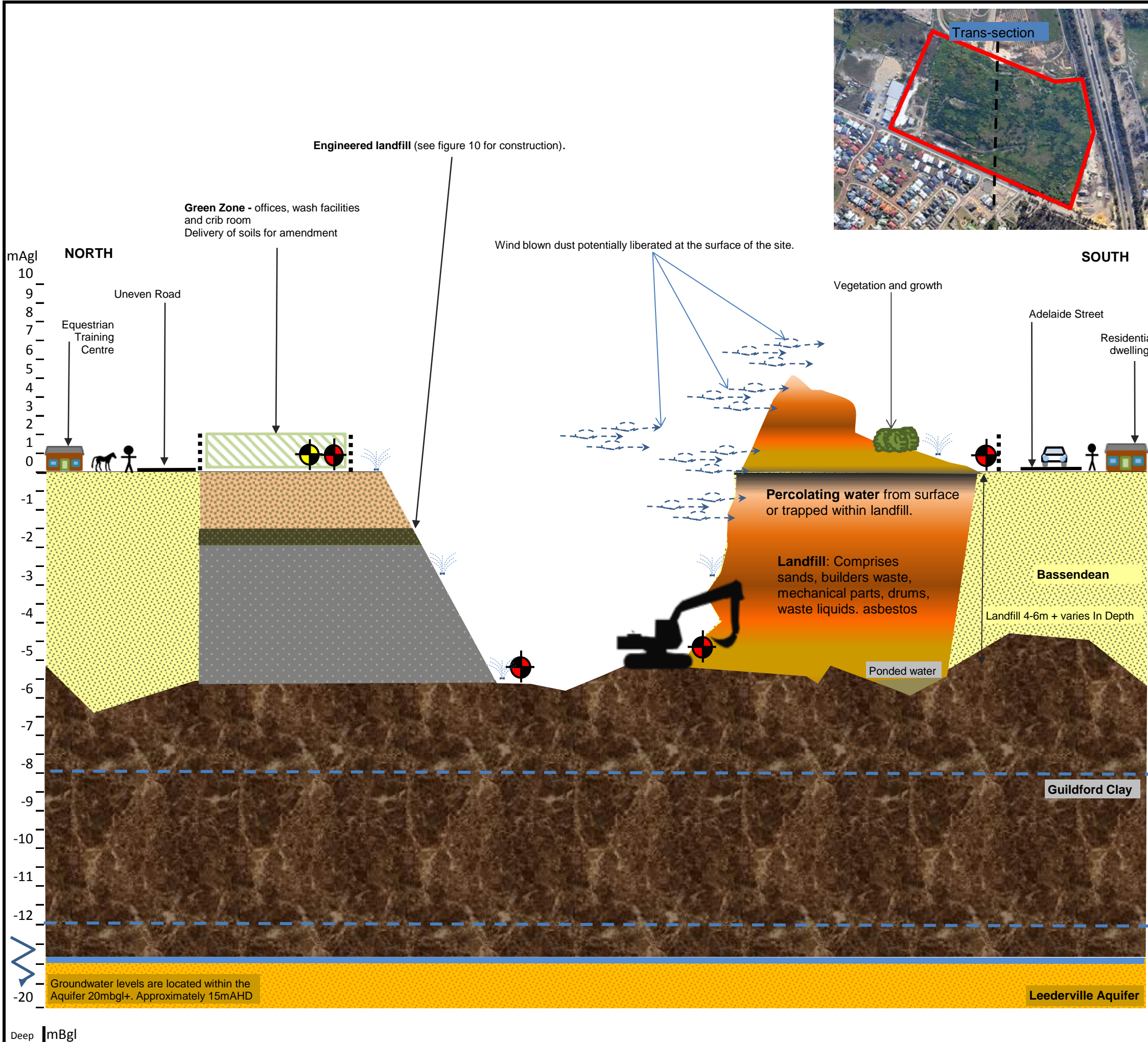
20 Adelaide Street, Hazelmere Perth, WA

Drawing Title:

Conceptual Site Model (Remediation)

Key:

- Bassendean Sand (4.5 to 6.5mbgl) Brinkerhoff.
- Guildford Clay (Aquitard) Documented up to 20mbgl.
- Leederville Aquifer (depth extensive)
- Historical landfill material.
- Poned/leached waters at the base of the landfill possible hydrocarbon (DNAPL), metals, organics.
- Workers / Residents
- Animals
- Site Boundary
- Excavator/On Site plant
- Air monitoring station (See Figure 11 for all locations)
- Weather Station
- Sprinkler system for dust suppression
- Groundwater level (aquifer)
- Indicative groundwater levels



Drawn by: MB

Date: 18/10/2013

Project No: E2012 - 031

Figure No: 6b

Scale: Not to Scale



Rev: v1



Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20 Adelaide Street, Hazelmere

Drawing Title:

Site Setup and Bund Details

Notes:

- Proposed waste transfer area
- Bund
- Maintenance area
- Proposed soil acceptance and treatment facility
- Approved sand bund to Adelaide Street frontage to prevent access and screen the site (see detail)
- Approved vehicle access track connecting site to Talbot Road
- Water supply (polypipe) from bore(s) to water tanks
- Location of groundwater extraction bore(s)
- Contours
- Existing shed to be relocated to works area
- Indicative excavation cells for remediation works to progress west to east
- Vehicle wash down bay
- 2 x 60,000L water tanks
- 97.18** Lot dimensions
- 31.0** Contour labels
- 36.12** Spot heights

• All images supplied by Rowe Group.

Drawn by:

Dale A

Scale:

Scale not Used

Date:

18/09/2013



North

Project No:

E2012 - 031

Figure No:

7

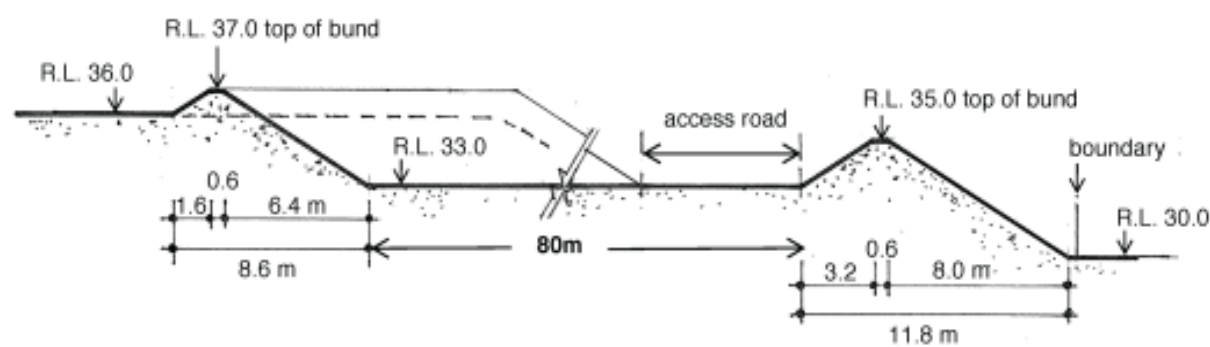
Rev:

v1

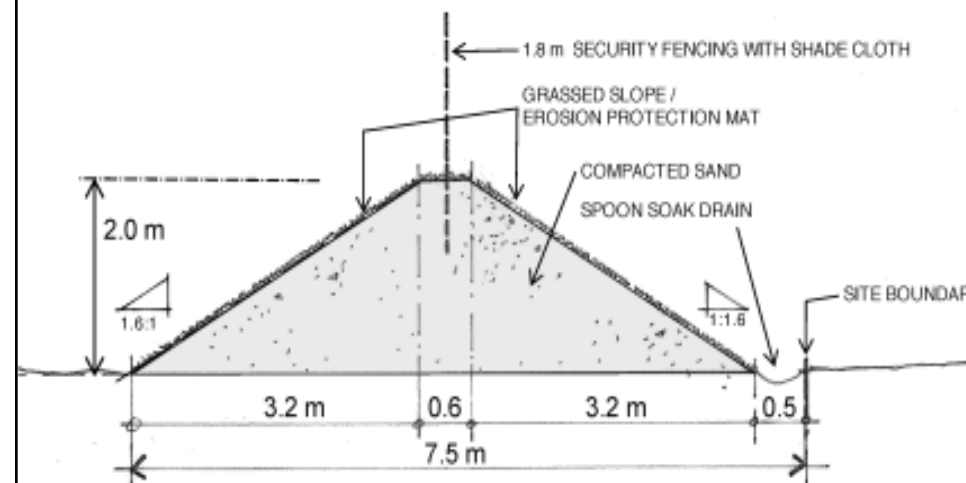


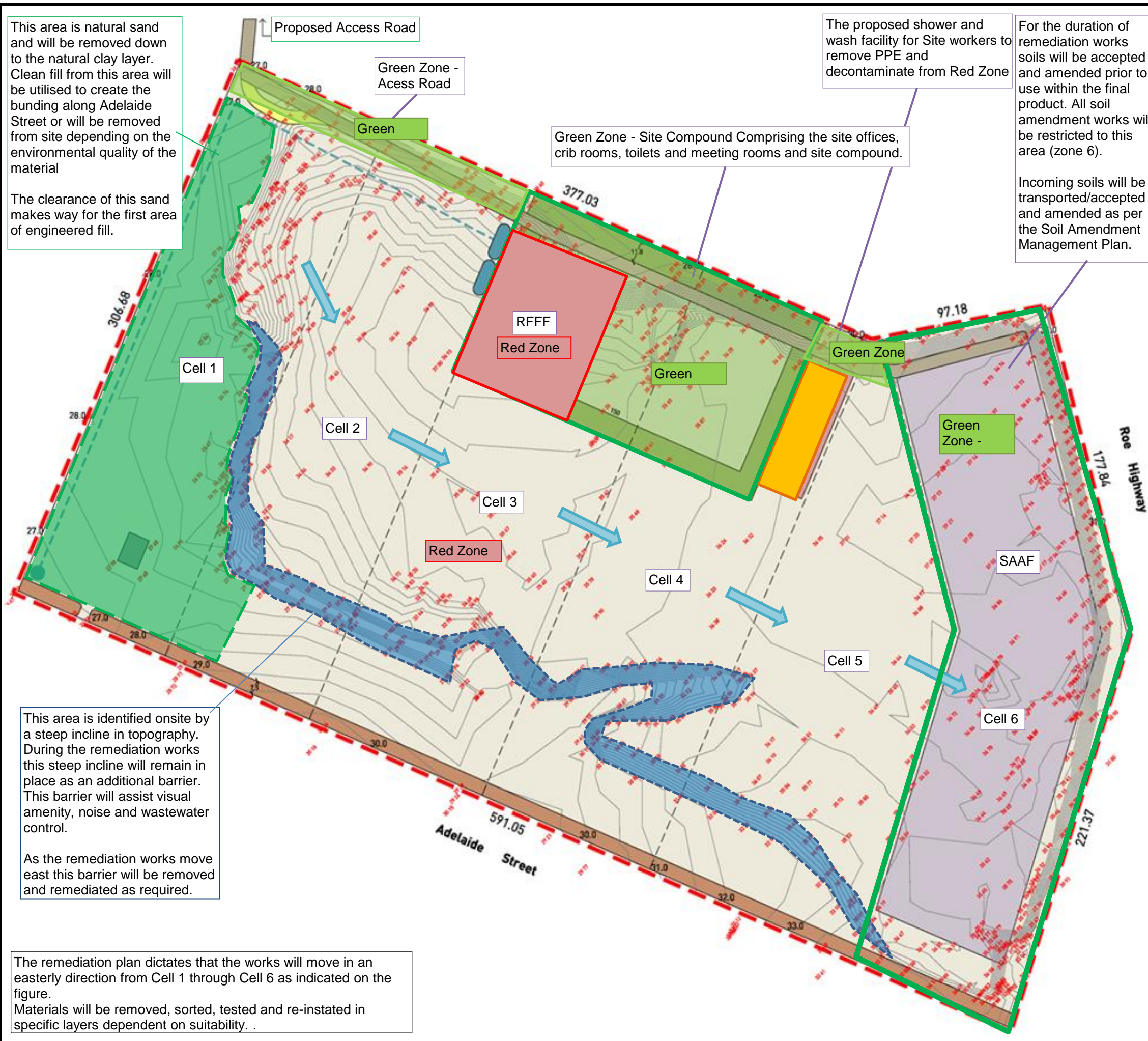
NB: The remainder of the site is to be enclosed by fencing / security fencing around the perimeter.

Cross Section (A) - Detailed View



Cross Section (B) - Detailed View





This area is natural sand and will be removed down to the natural clay layer. Clean fill from this area will be utilised to create the bunding along Adelaide Street or will be removed from site depending on the environmental quality of the material

The clearance of this sand makes way for the first area of engineered fill.

This area is identified onsite by a steep incline in topography. During the remediation works this steep incline will remain in place as an additional barrier. This barrier will assist visual amenity, noise and wastewater control.

As the remediation works move east this barrier will be removed and remediated as required.

The remediation plan dictates that the works will move in an easterly direction from Cell 1 through Cell 6 as indicated on the figure.

Materials will be removed, sorted, tested and re-instated in specific layers dependent on suitability.

The proposed shower and wash facility for Site workers to remove PPE and decontaminate from Red Zone

For the duration of remediation works soils will be accepted and amended prior to use within the final product. All soil amendment works will be restricted to this area (zone 6).

Incoming soils will be transported/accepted and amended as per the Soil Amendment Management Plan.

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Client:
WASTEROCK PTY LTD

Project:
Hazelmere Remediation and Regeneration Project

Location:
Lot 20 Adelaide Terrace, Hazelmere

Drawing Title:
PROPOSED SITE LAYOUT AND REMEDIATION PLAN

Notes:

Flow of Excavation

Notes:
 Once the red zones have been remediated then they will become green zones. The green zones will be excavated and remediated once the red zones have been cleared.

Drawn by:	Scale:	
Date: 20/10/2013	Scale not used	
Project No: E2012 - 036	Figure No: 8	Rev: v1



Acid Sulfate Soils (ASS)
Hydrocarbon Impacted Soils (HIS)

Soil Acceptance & Amendment Facility (SAAF)

Lab Analysis

A

Wood/Drums/Car Parts

Exported offsite

Current Landfill

Screening for Size

Fines <30mm

Medium 30-150mm

Big >150mm

Screening at 5mm

Fines <5mm

Fines 5-30mm

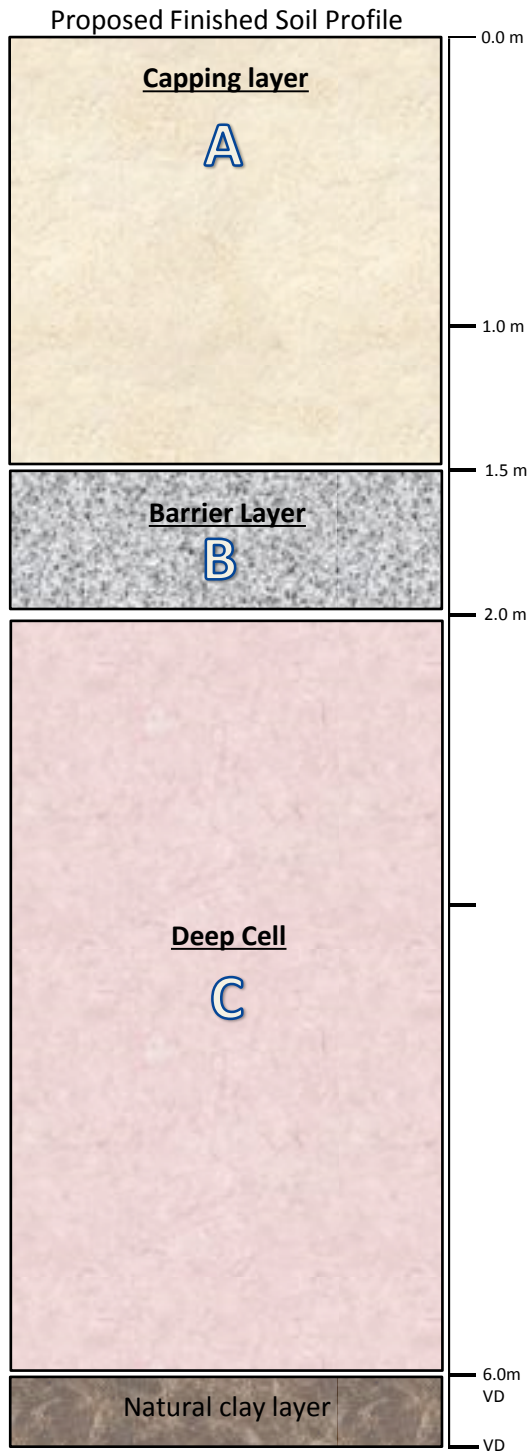
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D

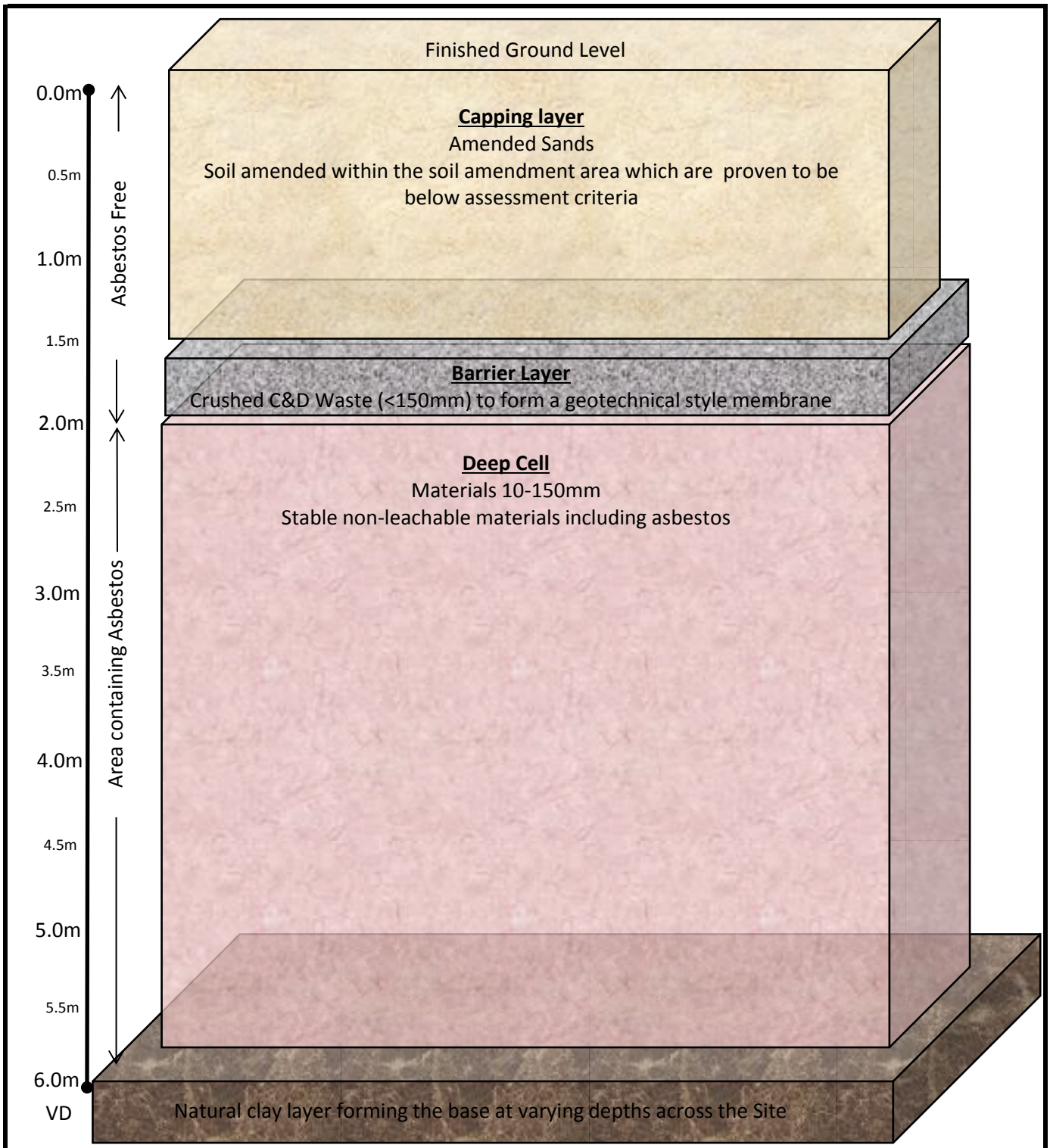
D

Material passed through a crusher

B



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Client: WASTEROCK PTY LTD		
Project: Hazelmere Remediation and Regeneration Project		
Location: Lot 20 Adelaide street, Hazelmere		
Drawing Title: SOIL LIFELINE		
Notes: <ul style="list-style-type: none"> • Depths indicated are below proposed finished ground level. • VD = Varying depths dependent on natural levels and the volume of Deep Fill. • AF/FA = Asbestos Fine and Friable Asbestos laboratory analysis. 		
Drawn by: Dale A	Scale: Not to Scale	
Date: 13/09/2013		
Project No: E2012-031	Figure No: 9	Rev: v2



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Notes:

- Depths indicated are below proposed finished ground level.
- VD = Varying depths dependent on natural levels and the volume of Deep Fill.

Client: WASTEROCK PTY LTD

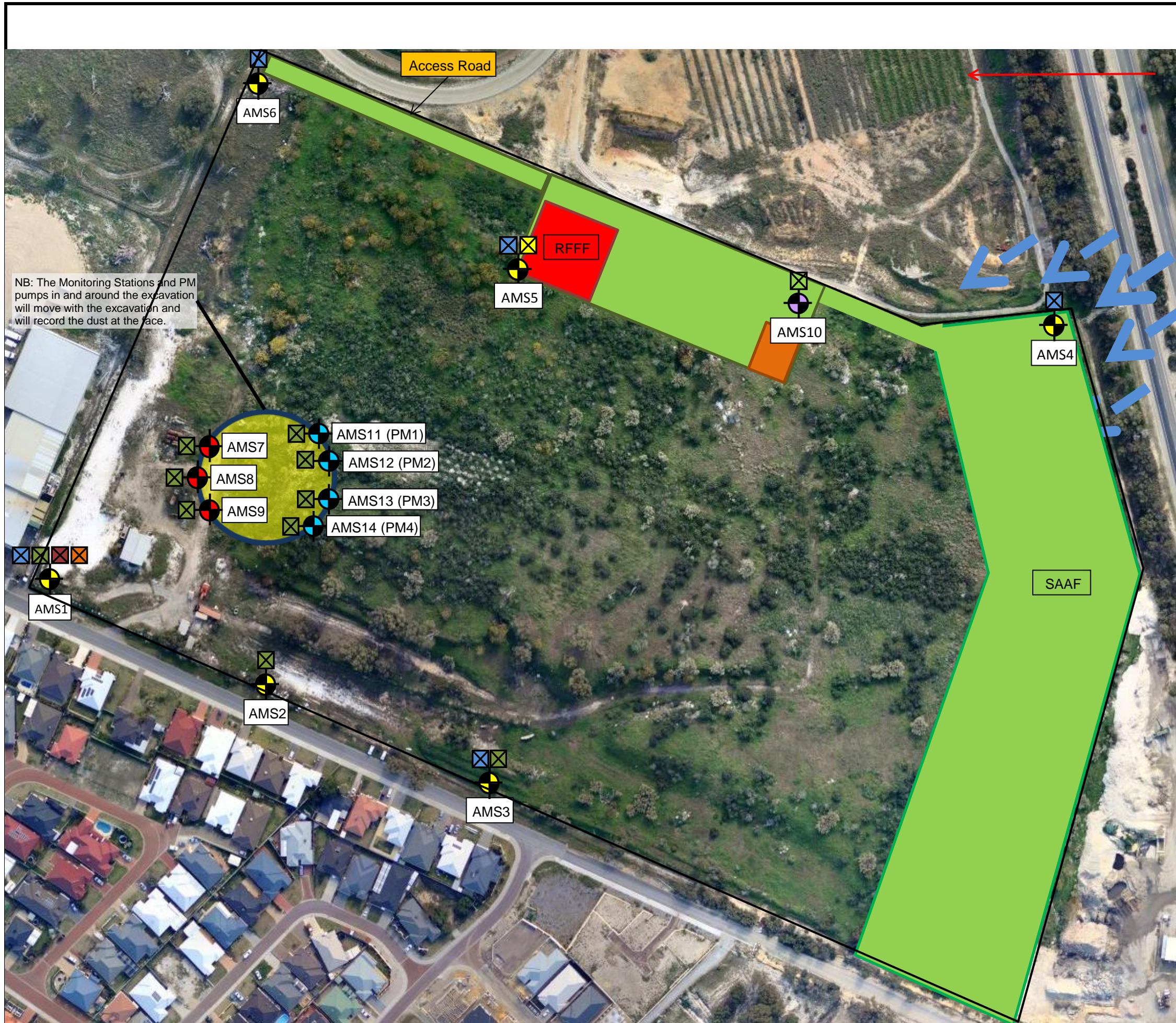
Project: Hazelmere Remediation & Regeneration Project

Location: Lot 20 Adelaide Street, Hazelmere

Drawing Title: Proposed Engineered Construction Diagram for Remediation

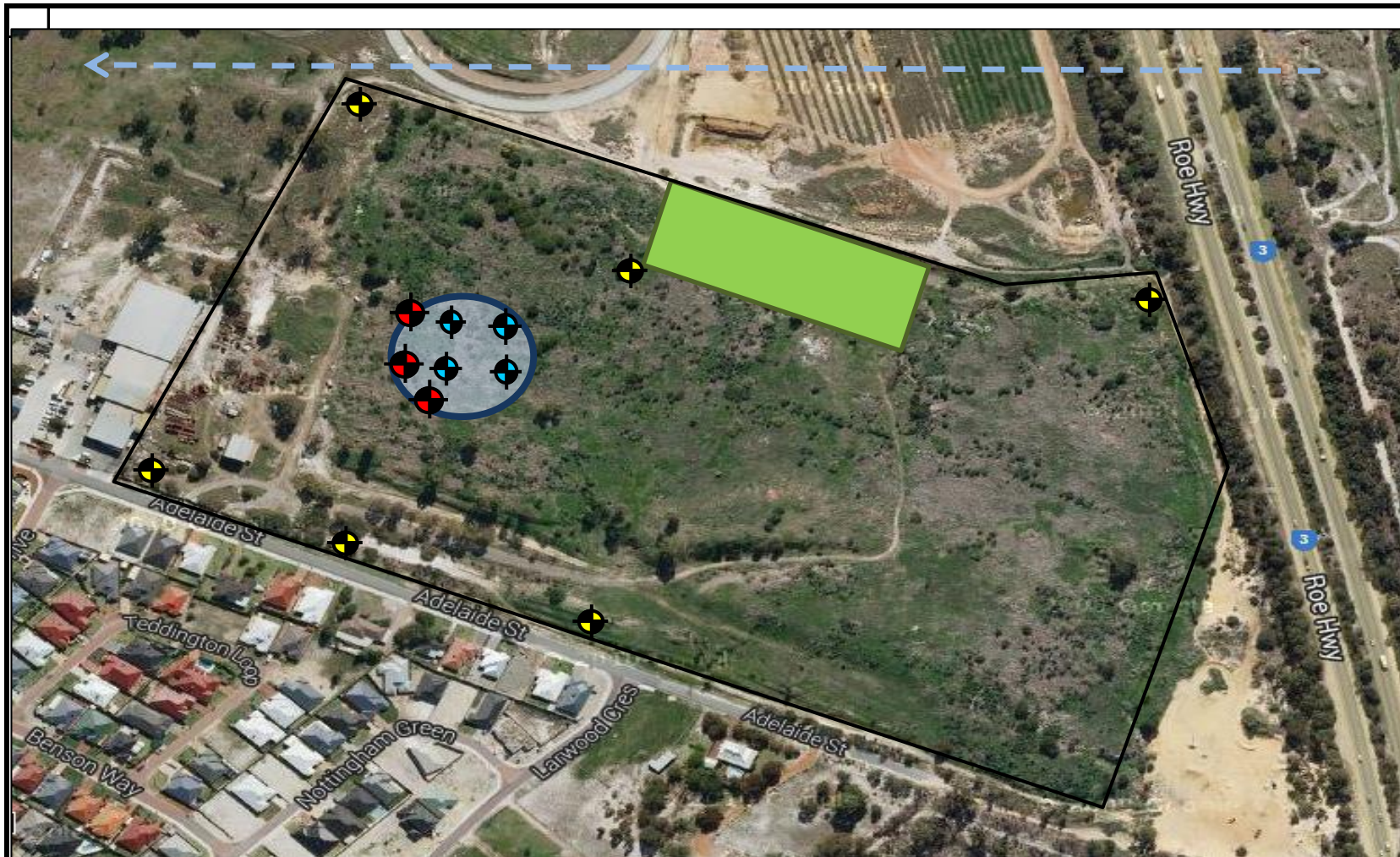
Drawn By: DA	Date: 11/09/2013	Scale: No Scale Used
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Project Number: E2012 - 031	Figure No: 10	Rev: v2
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NB: The Monitoring Stations and PM pumps in and around the excavation will move with the excavation and will record the dust at the face.

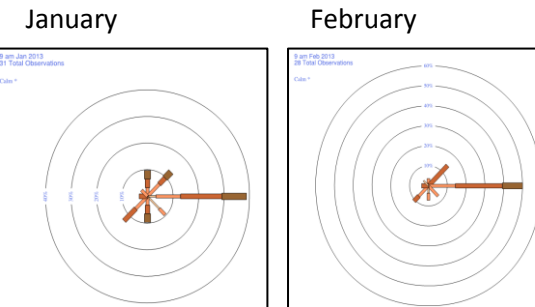
MDW Environmental Services PERTH PEEL ENVIRONMENTAL SERVICES T: (08) 9250 6960 F: (08) 92508269 www.environmentalservices.com.au info@environmentalservices.com.au		
Client:		
WASTEROCK PTY LTD		
Project:		
Hazelmere Remediation and Regeneration Project		
Lot 20 Adelaide Street, Hazelmere		
Drawing Title:		
Air Quality Monitoring Station Locations		
Notes:		
	AMS = Air Monitoring Stations	
	Movable monitoring Stations, to follow the excavation , dust generation at the face.	
	Personal Monitoring (PM) pumps	
	Crib room inside green zone compound. To ensure decontamination is happening.	
	Site Compound (Greenzone)	
	Red Zone Areas Also includes the Remediation of the historical landfill.	
	Changing Room and Shower Block	
	Dust	(QA lite (TES 2200 / Hi Vol / TEOM)
	Asbestos	(SKCPCXR8 / XR5000)
	Silica	(SKCPCXR8)
	Metals	(SKCPCXR8)
	Weather Station	
	Wind Direction	Excavation Zone (example)
Drawn by: MB	Scale: 0 50 m	
Date: 10/09/2013		
Project No:	Figure No:	Rev:
E2012 - 031	11	v1



MORNING

Historical Data			
Average Wind Direction			
Month	2011	2012	2013
January	E	E	E
February	E	E	E
December	E	E	-

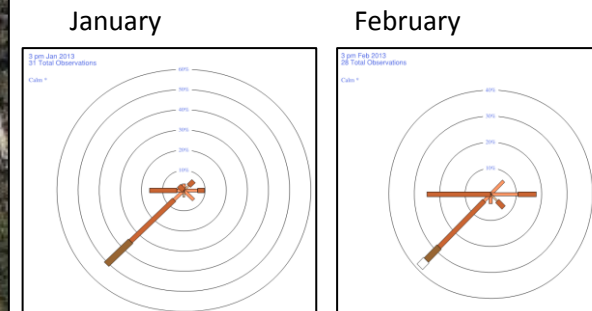
Wind Roses: 2013



AFTERNOON

Historical Data			
Average Wind Direction			
Month	2011	2012	2013
January	SW	SW	SW
February	SW	SW	SW
December	SW	SW	-

Wind Roses: 2013



Client:
WASTEROCK PTY LTD

Project:
Hazelmere Remediation and Regeneration Project

Location:
Lot 20, Adelaide St, Hazelmere, WA

Drawing Title:
Air QUALITY MANAGEMENT PLAN SUMMER WIND VARIATIONS ACROSS SITE

- Notes:
- Air Quality Monitoring Stations
 - Personal Monitors
 - Static Monitoring Stations
 - Excavation Area
 - Wind Direction

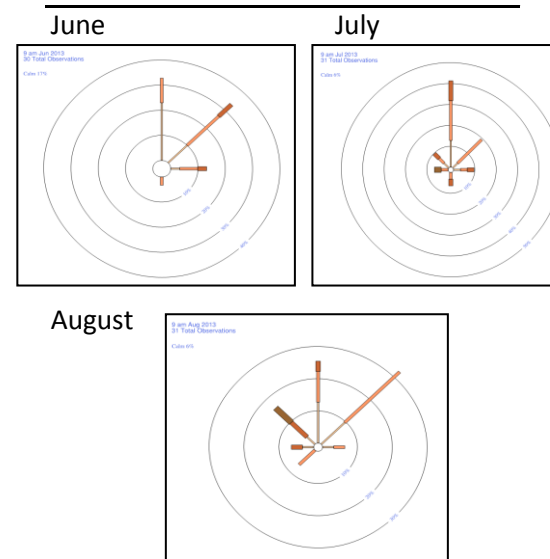
Drawn by: FT	Scale: 0 100 m	
Date: 7/10/2013	Project No: E2012-031	Figure No: 12
	Rev: v1	



MORNING

Historical Data			
Average Wind Direction			
Month	2011	2012	2013
June	N/NE	N/NE	N/NE
July	NE	NE	N
August	N/NE	N/NE	N/NE

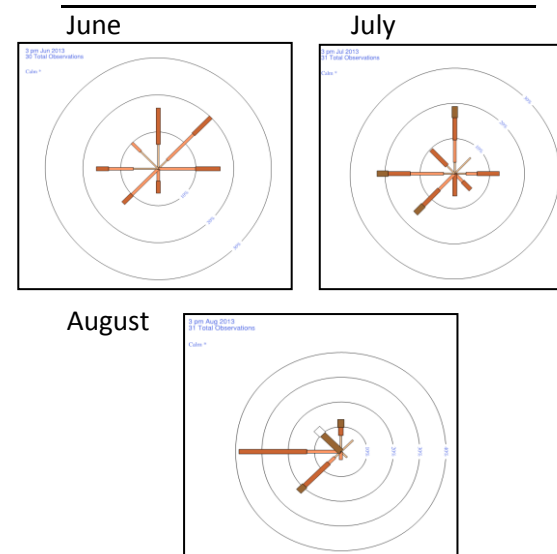
Wind Roses: 2013



AFTERNOON

Historical Data			
Average Wind Direction			
Month	2011	2012	2013
June	N/W	NE	NE
July	E	NE/N	N/W
August	W/SW	W	W

Wind Roses: 2013



Client:

WASTEROCK PTY LTD

Project:

Hazelmere Remediation and Regeneration Project

Location:

Lot 20, Adelaide St, Hazelmere, WA

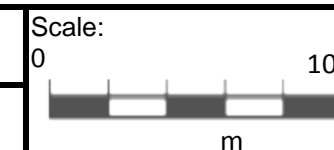
Drawing Title:

AIR QUALITY MANAGEMENT PLAN WINTER WIND VARIATIONS ACROSS SITE

Notes:

- Air Quality Monitoring Stations
- Personal Monitors
- Static Monitoring Stations
- Excavation Area
- Wind Direction

Drawn by:
FT



Date:
7/10/2013

Project No:

Figure No:

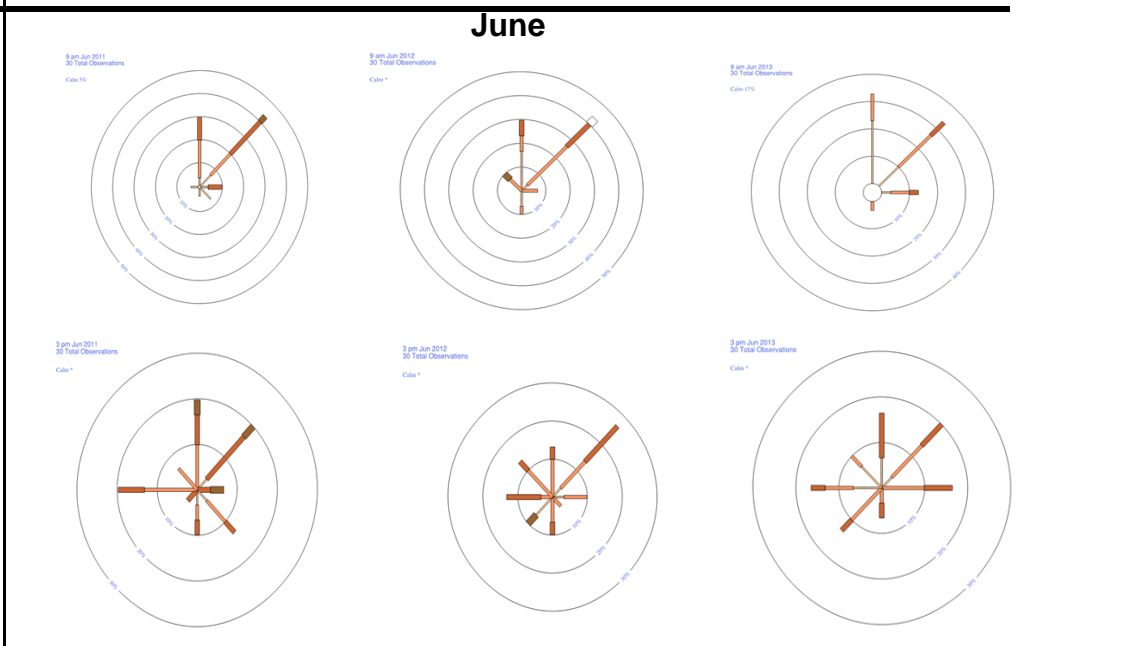
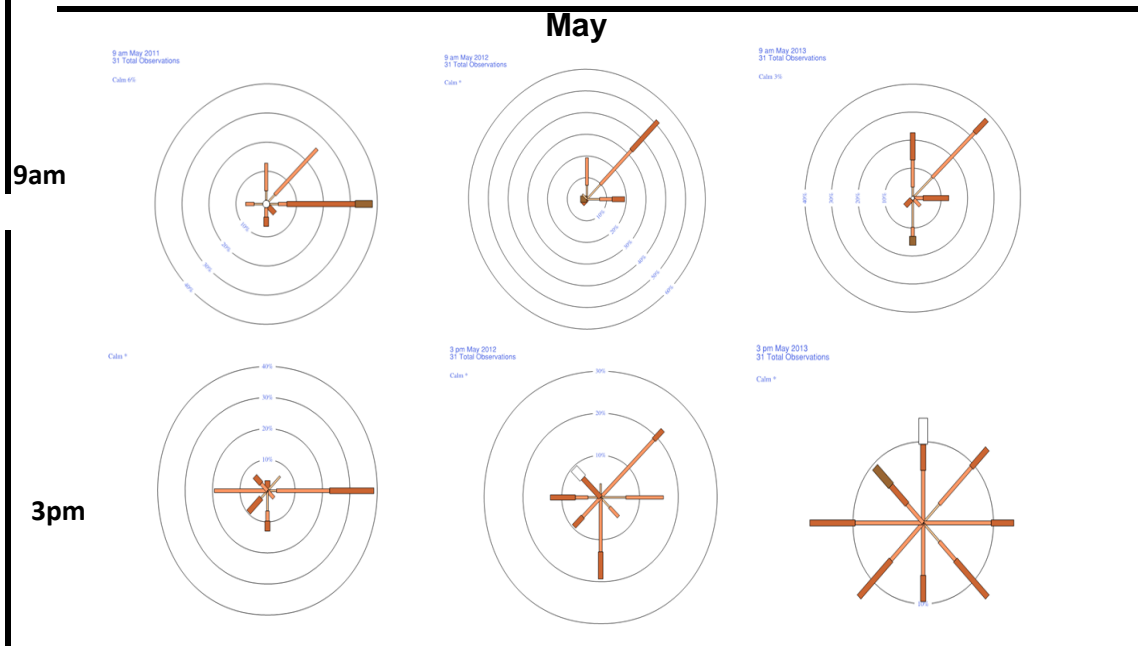
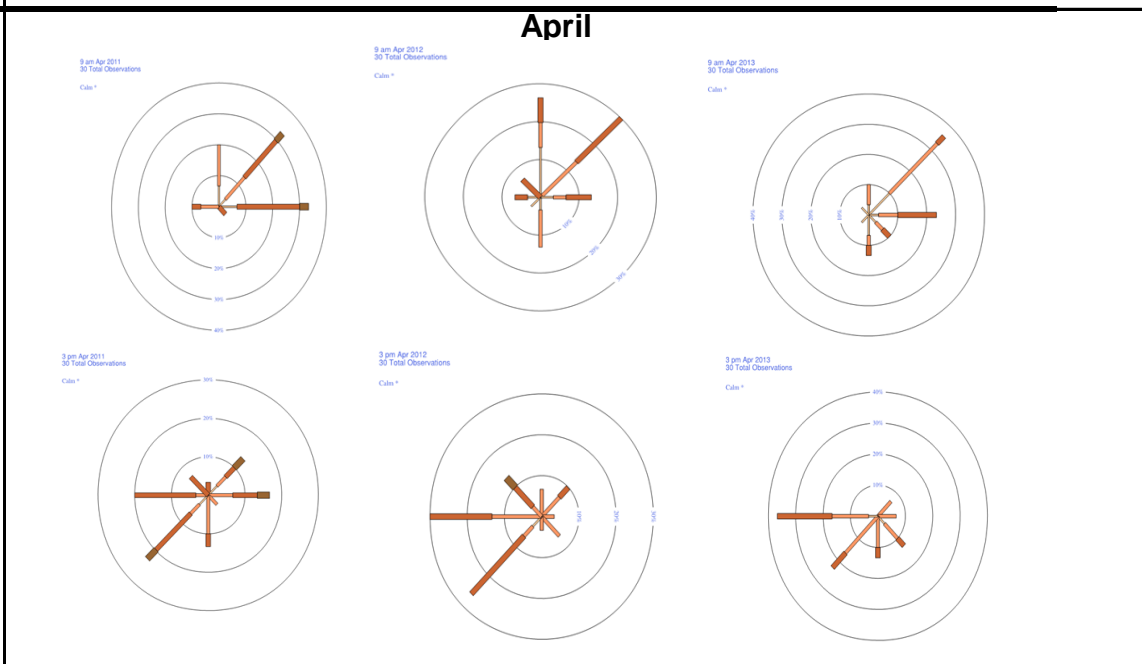
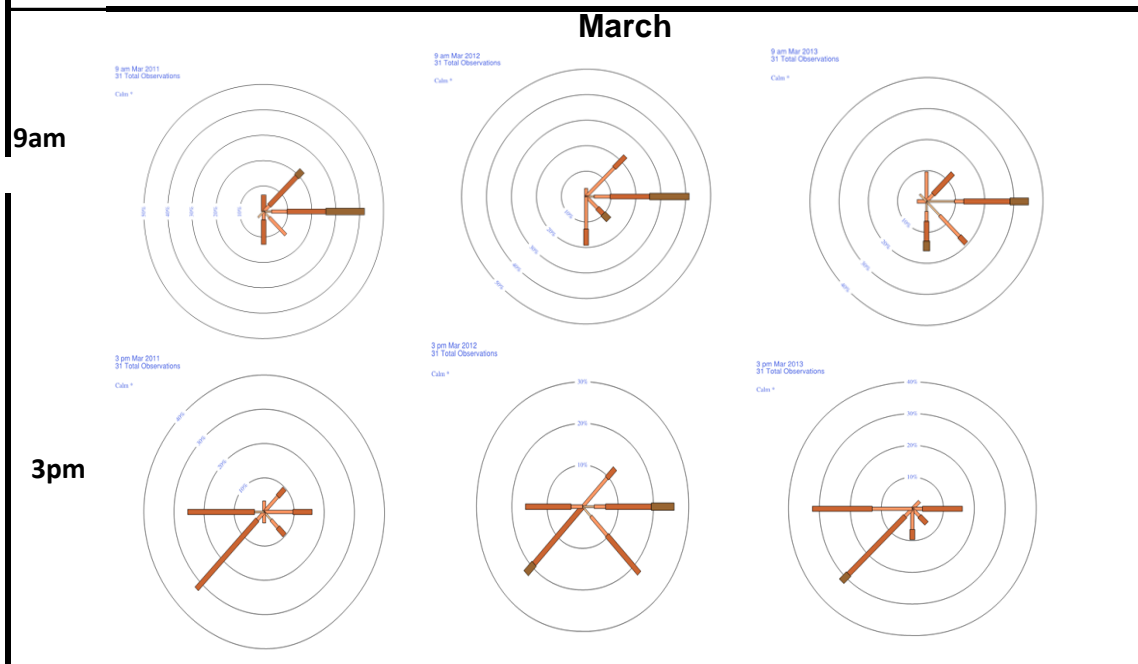
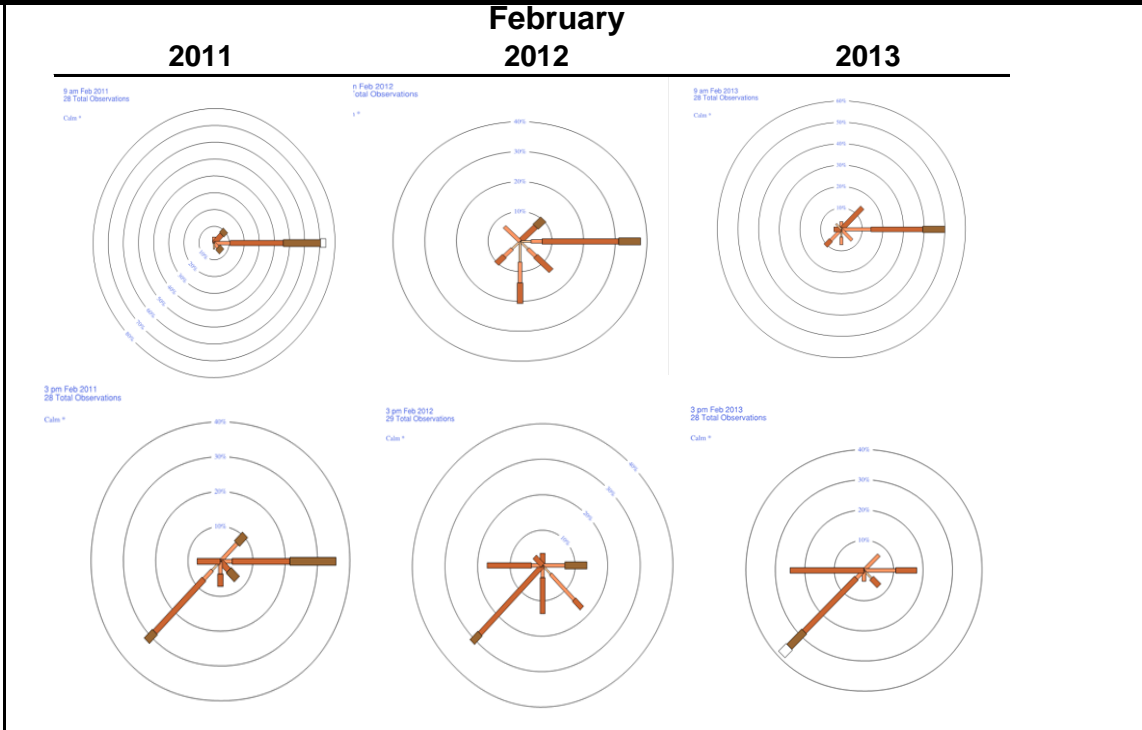
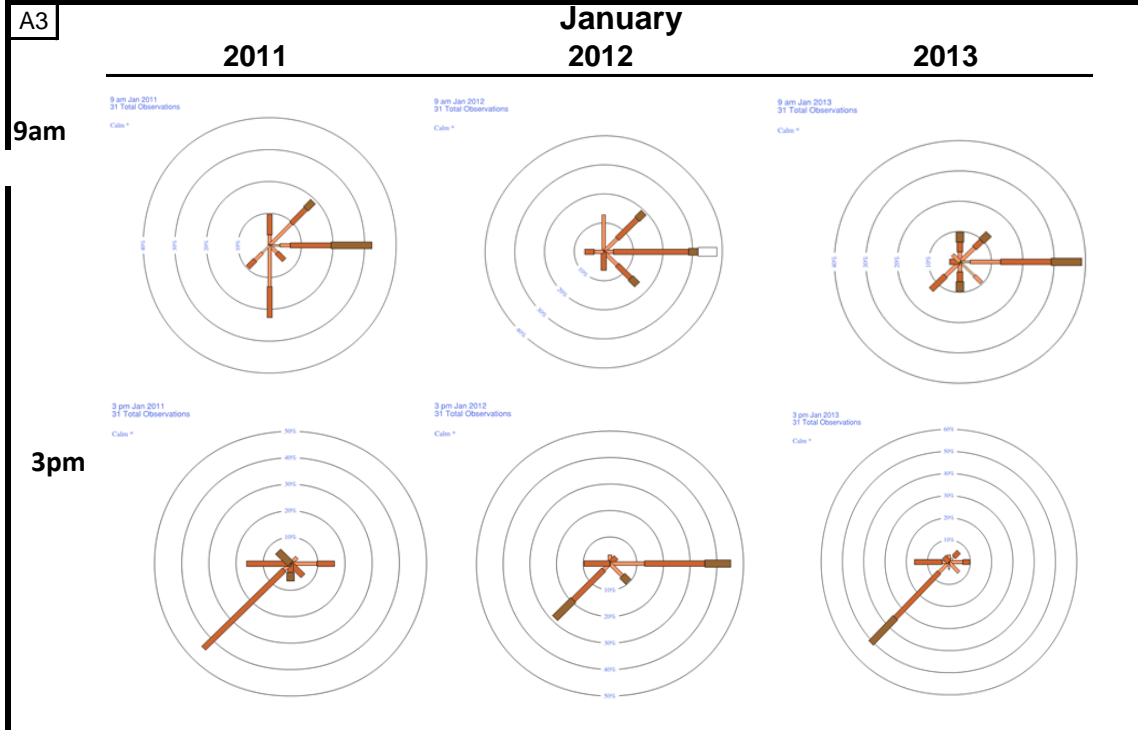
Rev:

E2012-031

13

v1

A3



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Client:
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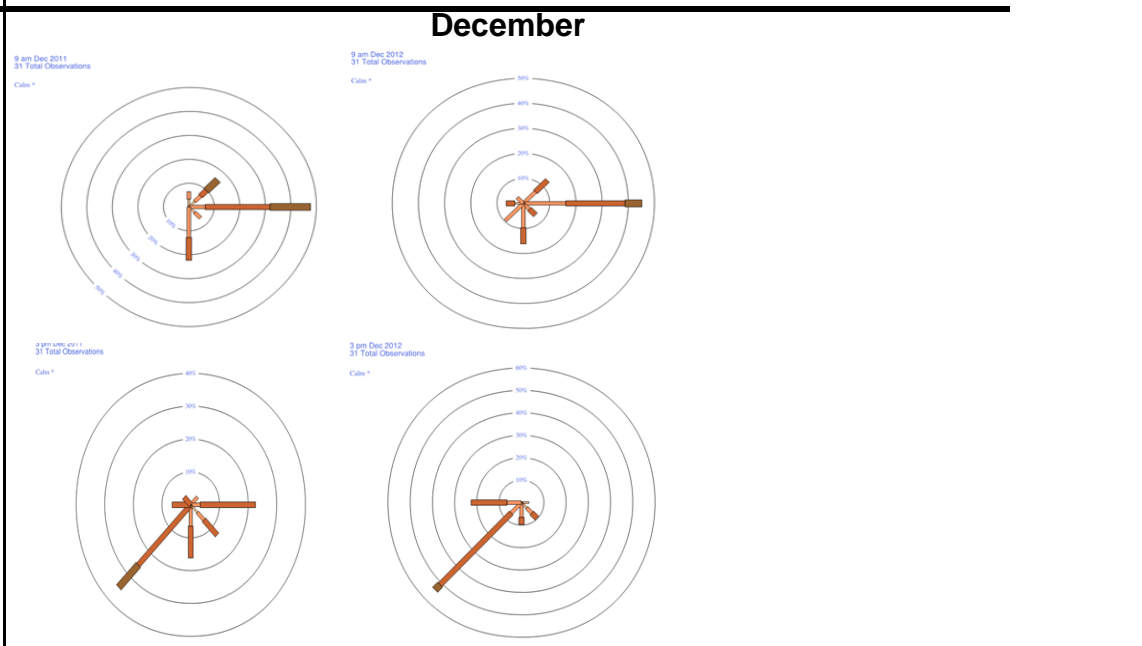
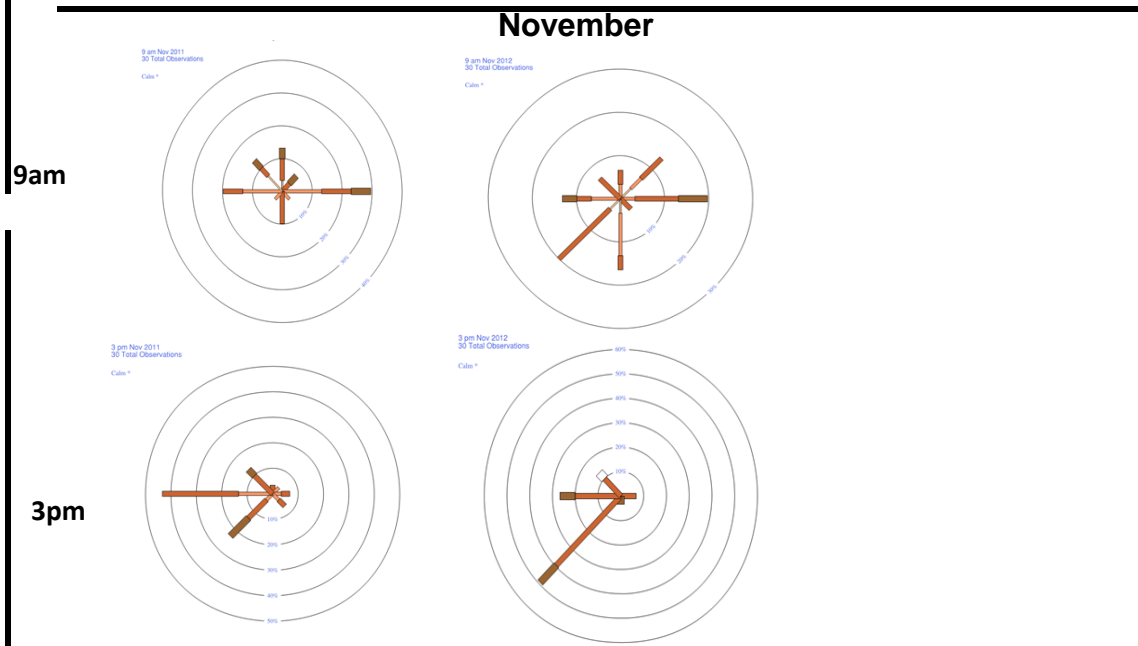
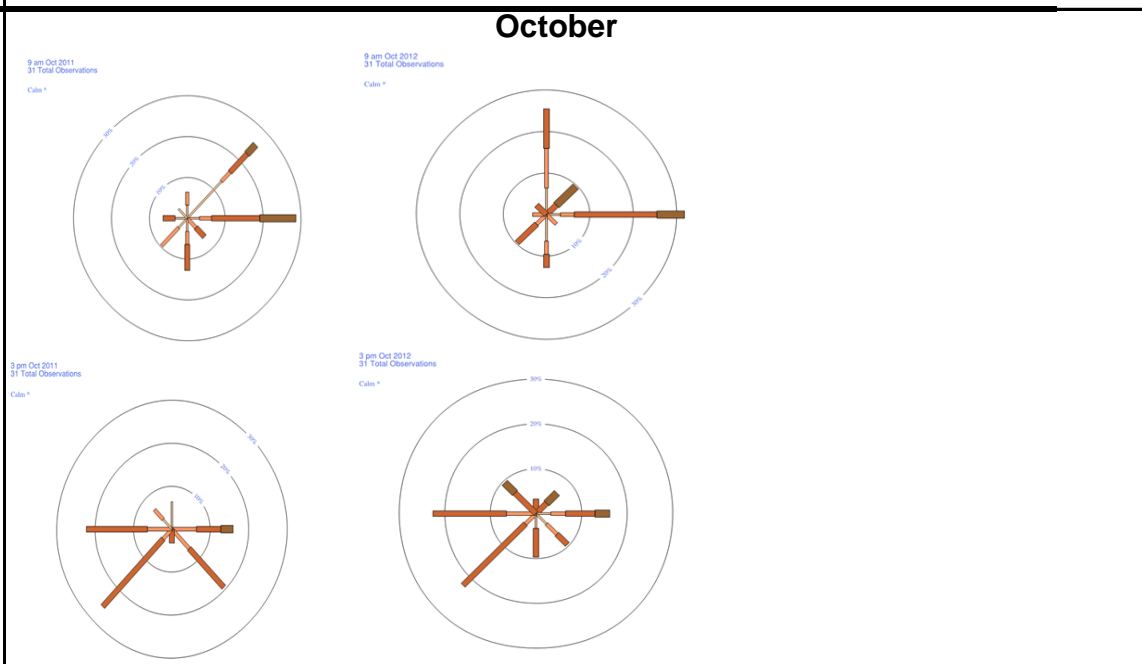
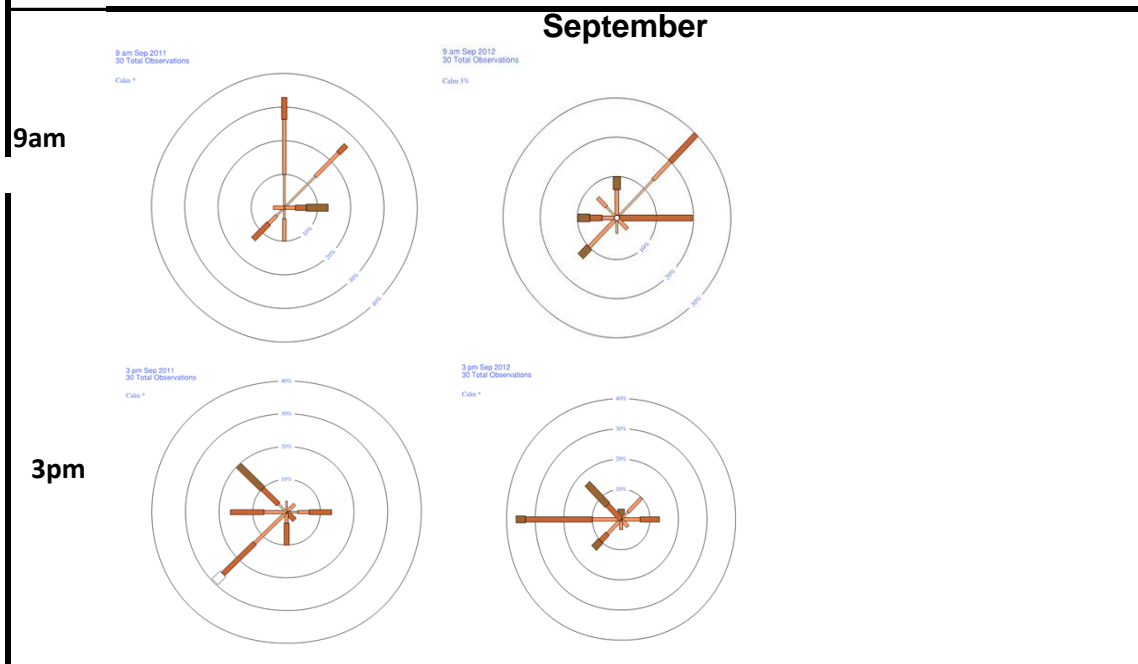
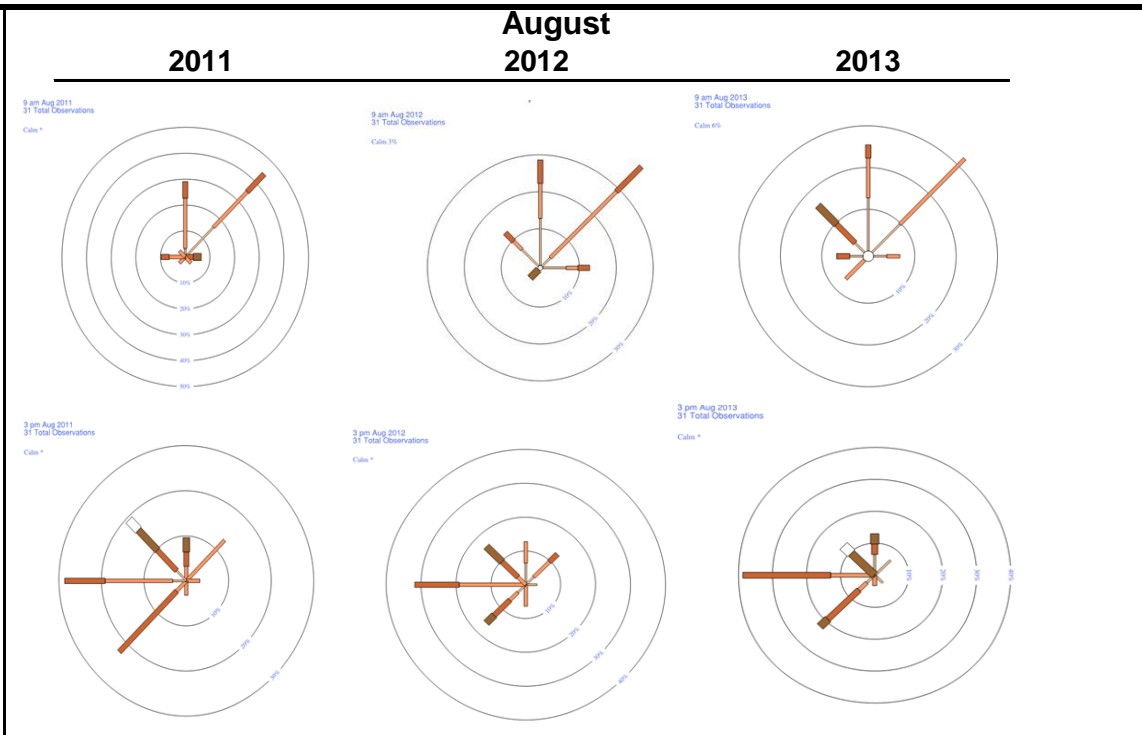
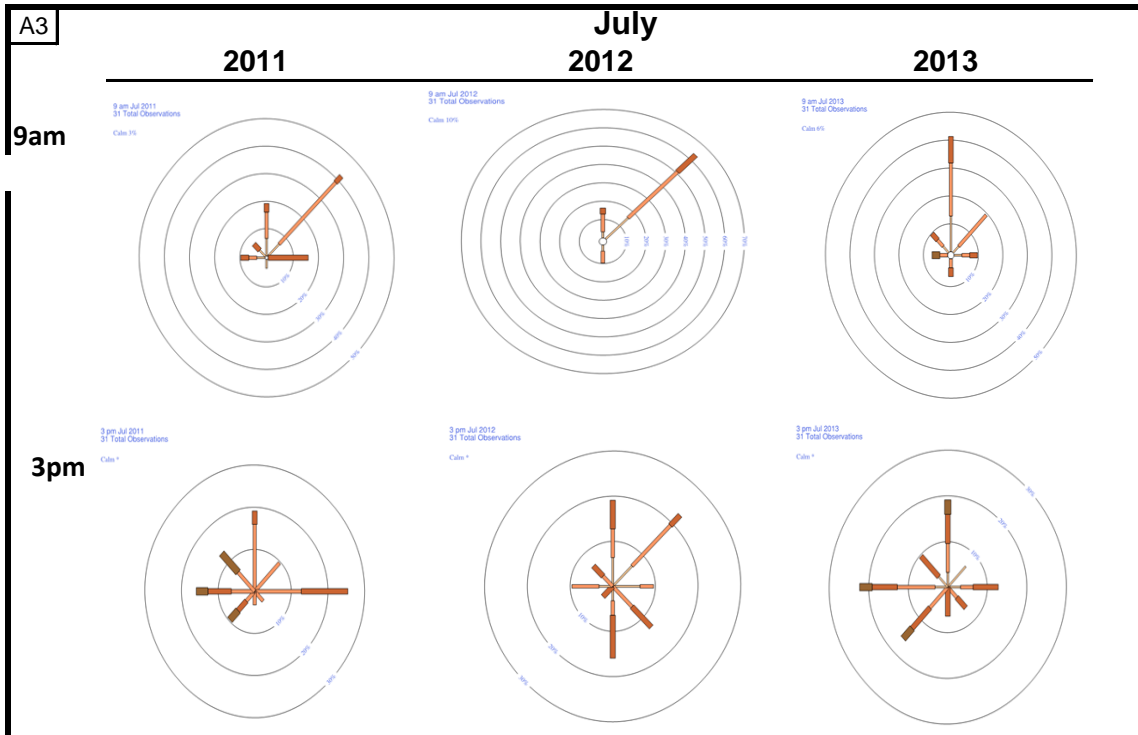
Project:
Hazelmere Remediation and Regeneration Project

Location:
Lot 20 Adelaide Street, Hazelmere

Drawing Title:
Monthly Wind Roses - January - June

Notes:
- Wind Reses sourced from Bureau of Meteorology

Drawn by: FT	Scale: 0 100 m	
Date: 7/10/2013	Project No: E2012- 031	Figure No: 14
	Rev: v1	



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Client:
WASTEROCK PTY LTD

Project:
Hazelmere Remediation and Regeneration Project

Location:
Lot 20 Adelaide Street, Hazelmere

Drawing Title:
Monthly Wind Roses - July - December

Notes:
- Wind Reses sourced from Bureau of Meteorology

Drawn by: FT	Scale: 0 100 m	
Date: 7/10/2013		
Project No: E2012- 031	Figure No: 15	Rev: v1

TABLES

Table 1a
Assessment Criteria (Soil)



Analyte / Assessment Criteria	Units	LOR	EIL	HIL-F
Total Metals				
Arsenic	mg/kg	5	20	500
Beryllium	mg/kg	1	-	100
Molybdenum	mg/kg	2	40	5100
Nickel	mg/kg	2	60	3000
Silver	mg/kg	2	-	-
Selenium	mg/kg	2	-	-
Cadmium	mg/kg	0.1	3.0	100
Lead	mg/kg	5	600	1500
Barium	mg/kg	10	300	190000
Chromium	mg/kg	2	400	600000
Cobalt	mg/kg	2	50	500
Copper	mg/kg	5	100	5000
Manganese	mg/kg	5	500	7500
Tin	mg/kg	-	50	610000
Vanadium	mg/kg	5	50	7200
Zinc	mg/kg	5	200	35000
Mercury	mg/kg	0.1	1.0	75
Trivalent Chromium	mg/kg	2	400	600000
Hexavalent Chromium	mg/kg	0.5	1	500
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	mg/kg	0.1	1.0	50
Other Inorganics				
Boron	mg/kg	0.5	-	15000
Cyanides (complexed)	mg/kg	0.5	50	2500
Cyanides (free)	mg/kg	0.5	10	1250
Phosphorus	mg/kg	1	2,000	-
Sulfur	mg/kg	0.5	600	-
Sulfate	mg/kg	0.5	2,000	-
Organochlorine Pesticides (OC)				
alpha-BHC	mg/kg	0.05	0.5	-
Hexachlorobenzene (HCB)	mg/kg	0.05	0.5	-
beta-BHC	mg/kg	0.05	0.5	-
gamma-BHC	mg/kg	0.05	0.5	-
delta-BHC	mg/kg	0.05	0.5	-
Heptachlor	mg/kg	0.05	-	50
Aldrin	mg/kg	0.05	0.5	-
Heptachlor epoxide	mg/kg	0.05	0.5	-
Total Chlordane (sum)	mg/kg	0.05	0.5	250
trans-Chlordane	mg/kg	0.05	0.5	-
alpha-Endosulfan	mg/kg	0.05	0.5	-
cis-Chlordane	mg/kg	0.05	0.5	-
Dieldrin	mg/kg	0.05	0.2	-
4,4'-DDE	mg/kg	0.05	0.5	-
Endrin	mg/kg	0.05	0.5	-
beta-Endosulfan	mg/kg	0.05	0.5	-
Endosulfan (sum)	mg/kg	0.05	0.5	-
4,4'-DDD	mg/kg	0.05	0.5	-
Endrin aldehyde	mg/kg	0.05	0.5	-
Endosulfan sulfate	mg/kg	0.05	0.5	-
4,4'-DDT	mg/kg	0.2	0.5	-
Endrin ketone	mg/kg	0.05	0.5	-
Methoxychlor	mg/kg	0.2	0.5	-
Sum of Aldrin + Dieldrin	mg/kg	0.05	-	50
Sum of DDD + DDE + DDT	mg/kg	0.05	1	1000
Organophosphorus Pesticides (OP)				
Dichlorvos	mg/kg	0.05	1	-
Demeton-S-methyl	mg/kg	0.05	1	-
Monocrotophos	mg/kg	0.2	1	-
Dimethoate	mg/kg	0.05	1	-
Diazinon	mg/kg	0.05	1	-
Chlorpyrifos-methyl	mg/kg	0.05	1	-
Parathion-methyl	mg/kg	0.2	1	-
Malathion	mg/kg	0.05	1	-
Fenthion	mg/kg	0.05	1	-
Chlorpyrifos	mg/kg	0.05	1	-
Parathion	mg/kg	0.2	1	-
Pirimphos-ethyl	mg/kg	0.05	1	-
Chlorfenvinphos	mg/kg	0.05	1	-
Bromophos-ethyl	mg/kg	0.05	1	-
Fenamiphos	mg/kg	0.05	1	-
Prothiofos	mg/kg	0.05	1	-
Ethion	mg/kg	0.05	1	-
Carbophenothion	mg/kg	0.05	1	-
Azinphos Methyl	mg/kg	0.05	1	-
Phenolic Compounds				
Phenol	mg/kg	0.5	-	42500
2-Chlorophenol	mg/kg	0.5	-	-
2-Methylphenol	mg/kg	0.5	-	31000
3-Methylphenol	mg/kg	1	-	31000
4-Methylphenol	mg/kg	1	-	3100
2-Nitrophenol	mg/kg	0.5	-	-
2,4-Dimethylphenol	mg/kg	0.5	-	-
2,4-Dichlorophenol	mg/kg	0.5	-	-
2,6-Dichlorophenol	mg/kg	0.5	-	-
4-Chloro-3-Methylphenol	mg/kg	0.5	-	-
2,4,6-Trichlorophenol	mg/kg	0.5	-	-
2,4,5-Trichlorophenol	mg/kg	0.5	-	-
Pentachlorophenol	mg/kg	2	-	-
Polynuclear Aromatic Hydrocarbons (PAH)				
Naphthalene	mg/kg	1	5	190
Acenaphthylene	mg/kg	1	-	-
Acenaphthene	mg/kg	1	-	-
Fluorene	mg/kg	1	-	-
Phenanthrene	mg/kg	1	10	-
Anthracene	mg/kg	1	10	170000
Fluoranthene	mg/kg	1	10	22000
Pyrene	mg/kg	1	10	17000
Benzo(a)Anthracene	mg/kg	1	-	-
Chrysene	mg/kg	1	-	-
Benzo(b)Fluoranthene	mg/kg	1	-	-
Benzo(k)Fluoranthene	mg/kg	1	-	-
Benzo(a)Pyrene	mg/kg	0.5	1	5
Indeno(1,2,3-cd)Pyrene	mg/kg	1	-	-
Dibenz(a,h)Anthracene	mg/kg	1	-	-
Benzo(g,h,i)perylene	mg/kg	1	-	-
Sum of PAH	mg/kg	0.5	-	100
Benzo(a)pyrene TEQ (WHO)	mg/kg	0.5	-	-

Table 1a
Assessment Criteria (Soil)



BTEX				
Benzene	mg/kg	0.2	1	5.6
Toluene	mg/kg	5	3	5200
Ethylbenzene	mg/kg	5	5	230
meta- & para-Xylene	mg/kg	5		
ortho-Xylene	mg/kg	5		
Sum of BTEX	mg/kg	0.2		
Total Xylenes	mg/kg	0.5	5	2600
Naphthalene	mg/kg	1		
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	mg/kg	10	100	-
C10 - C14 Fraction	mg/kg	50	500	-
C15 - C28 Fraction	mg/kg	100	1,000	-
C29 - C36 Fraction	mg/kg	100		
C10 - C36 Fraction (sum)	mg/kg	50		
Total Recoverable Hydrocarbons				
C6 - C10 Fraction	mg/kg	10		
C6 - C10 Fraction minus BTEX	mg/kg	10		
>C10 - C16 Fraction	mg/kg	50		
>C16 - C34 Fraction	mg/kg	100		
>C34 - C40 Fraction	mg/kg	100		
>C10 - C40 Fraction (sum)	mg/kg	50		

Table 1b (NEPM)
Assessment Criteria (Soil)



Chemical	Health-based investigation levels (mg/kg)			
	Residential ¹ A	Residential ¹ B	Recreational ¹ C	Commercial/ industrial ¹ D
Metals and Inorganics				
Arsenic ²	100	500	300	3 000
Beryllium	60	90	90	500
Boron	4500	40 000	20 000	300 000
Cadmium	20	150	90	900
Chromium (VI)	100	500	300	3600
Cobalt	100	600	300	4000
Copper	6000	30 000	17 000	240 000
Lead ³	300	1200	600	1 500
Manganese	3800	14 000	19 000	60 000
Mercury (inorganic) ⁵	40	120	80	730
Methyl mercury ⁴	10	30	13	180
Nickel	400	1200	1200	6 000
Selenium	200	1400	700	10 000
Zinc	7400	60 000	30 000	400 000
Cyanide (free)	250	300	240	1 500
Polycyclic Aromatic Hydrocarbons (PAHs)				
Carcinogenic PAHs (as BaP TEQ) ⁶	3	4	3	40
Total PAHs ⁷	300	400	300	4000
Phenols				
Phenol	3000	45 000	40 000	240 000
Pentachlorophenol	100	130	120	660
Cresols	400	4 700	4 000	25 000
Organochlorine Pesticides				
DDT+DDE+DDD	240	600	400	3600
Aldrin and dieldrin	6	10	10	45
Chlordane	50	90	70	530
Endosulfan	270	400	340	2000
Endrin	10	20	20	100
Heptachlor	6	10	10	50
HCB	10	15	10	80
Methoxychlor	300	500	400	2500
Mirex	10	20	20	100
Toxaphene	20	30	30	160

Table 1b (NEPM)
Assessment Criteria (Soil)



Herbicides				
2,4,5-T	600	900	800	5000
2,4-D	900	1600	1300	9000
MCPA	600	900	800	5000
Chemical	Health-based investigation levels (mg/kg)			
	Residential ¹ A	Residential ¹ B	Recreational ¹ C	Commercial/ industrial ¹ D
MCPB	600	900	800	5000
Mecoprop	600	900	800	5000
Picloram	4500	6600	5700	35000
Other Pesticides				
Atrazine	320	470	400	2500
Chlorpyrifos	160	340	250	2000
Bifenthrin	600	840	730	4500
Other Organics				
PCBs ⁸	1	1	1	7
PBDE Flame Retardants (Br1–Br9)	1	2	2	10

Notes:

(1) Generic land uses are described in detail in Schedule B7 Section 3

HIL A – Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools.

HIL B – Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

HIL C – Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space where the potential for exposure is lower and where a site-specific assessment may be more appropriate.

HIL D – Commercial/industrial, includes premises such as shops, offices, factories and industrial sites.

(2) Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability may be important and should be considered where appropriate (refer Schedule B7).

(3) Lead: HIL is based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HIL D where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate.

(4) Methyl mercury: assessment of methyl mercury should only occur where there is evidence of its potential source. It may be associated with inorganic mercury and anaerobic microorganism activity in aquatic environments. In addition the reliability and quality of sampling/analysis should be considered.

(5) Elemental mercury: HIL does not address elemental mercury. A site-specific assessment should be considered if elemental mercury is present, or suspected to be present,

(6) Carcinogenic PAHs: HIL is based on the 8 carcinogenic PAHs and their TEFs (potency relative to B(a)P) adopted by CCME 2008 (refer Schedule B7). The B(a)P TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF, given below, and summing these products.

Table 2
Assessment Criteria (Soil) Volatiles



SOIL VAPOUR HEALTH SCREENING LEVELS (MG/m3)

CRC Care Technical report no.10

Chemical (f)	HSL - A (Low Density Residential) and HSL -B (High Density Residential) (d)				
	0 >1m	1m to <2m	2m to <4m	4m to <8m	8m+
Sand (g)					
Toluene	1300	3800	7300	15000	89000
Ethyl benzene	330	1100	2200	4300	8700
Xylenes	220	750	1500	3000	6100
Naphthalene	0.78	3	6.1	12	25
Benzene	0.99	2.9	5.7	11	22
C6-C10	180	640	1300	2600	5300
>c10-C16	130	560	1200	2400	4800
Silt (g)					
Toluene	1400	14000	7300	15000	29000
Ethyl benzene	380	4200	2200	4300	8700
Xylenes	260	2900	1500	3000	6100
Naphthalene	0.9	12	6.1	12	25
Benzene	1.1	11	5.7	11	22
C6-C10	210	2600	1300	2600	5300
>c10-C16	160	2300	1200	2400	4800
Clay (g)					
Toluene	1600	23000	53000	110000	NL
Ethyl benzene	420	6800	16000	35000	NL
Xylenes	280	4800	11000	24000	50000
Naphthalene	1	18	44	94	200
Benzene	1.2	17	41	88	180
C6-C10	230	4200	9900	21000	44000
>c10-C16	180	3800	NL	NL	NL

Notes:

The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2m to <4m or a factor of 100 for source depths of 4m and deeper. To apply the attenuation factor for vapour degradation a number of conditions must be satisfied. Firstly, the maximum length of the shorter side of the concrete slab and surrounding pavement common exceed 15m, as this would prevent oxygen penetrating the centre of the slab. Secondly, measurements of oxygen in the subsurface is required to determine the potential for biodegradation to occur.

NL - denotes no level present as HSL exceeds concentration of pure gas.

(d) - HSLs for vapour intrusion into high density residential buildings are based on occupation of the ground floor. If residents occupy ground floor apartments, HSL-B should be used. If the ground floor consists of commercial properties or if the building contains a communal basement car park, commercial use HSL-D may be applied instead.

e) - The maximum possible soil vapour concentration has been calculated based on the vapour pressures of the pure chemicals. Where soil vapour HSLs exceed these values a soil-vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for a given scenario. For these scenarios no HSL is present for these chemicals. These are denoted as not limiting 'NL'.

(f) - Chemicals in TPH >16 fraction have physical properties which make this TPH fraction non-volatile, and therefore are not of concern for vapour intrusion.

(g) - For Soil assessment (texture Classification) undertaken in accord with AS 1726 the classification of SAND, SILT and CLAY may be applied as coarse, fine with liquid less than 50%, and fine with liquid greater than 50% respectively, as the underlying properties used to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, laboratory analysis should be carried out.

Table 3
Assessment Criteria (A)



Analyte / Assessment Criteria	Unit	Safe Work Australia (TWA)	NEPM (24 hours)
Dust			
PM 10	µg/m ³	-	50*
PM 2.5	µg/m ³	-	25* (Advisory Standard)
Asbestos			
Asbestos Fiber (Mixed Fibers)	fiber/mL	0.1 [#]	-
Silica			
Crystalline Silica	mg/m ³	0.1	-
Metals			
Arsenic	mg/m ³	0.05	-
Barium	mg/m ³	0.5	-
Cadmium	mg/m ³	0.01	-
Chromium	mg/m ³	0.5 [#]	-
Copper	mg/m ³	1	-
Manganese	mg/m ³	1	-
Nickel	mg/m ³	1	-
Lead	mg/m ³	0.15	-
Zinc	mg/m ³	10	-
Mercury	mg/m ³	0.025	-

NB:

* No current Safe Work Australia Standards for Dust as PM0 and PM2.5, therefore assessment criteria will be based on the daily Ambient Air NEPM Guidelines.

[#] In the event concentrations exceed the assessment criteria further analysis will be conducted to speciate contaminants.

In the event contaminants exceed in excess of the assessment criteria works may have to be stopped and reassessment of work practices will be required.

Table 4
Assessment Criteria (Water)



Analyte / Assessment Criteria	Units	LOR	Freshwater Ecosystems	ADWG HV	ADWG AV	DoH	Short-term Irrigation	Long-term Irrigation
pH Value	pH Unit	0.01	6.5-8.5		6.5-8.5			6.0-8.5
Electrical Conductivity	µS/cm	1	1500					
Total Dissolved Solids	mg/L	10						
Suspended Solids	mg/L	5						
Turbidity	NTU	0.1						
Total Alkalinity as CaCO ₃	mg/L	1						
Acidity as CaCO ₃	mg/L	1						
BOD	mg/L	2						
COD	mg/L	5						
Sulfate as SO ₄	mg/L	1		500	250	5000		
Sulfide	mg/L	0.1	0.001					
Alkalinity : Sulfate	ratio							
Chloride	mg/L	1				2500		
Sulfate : Chloride	ratio							
Dissolved Metals								
Aluminium	mg/L	0.01	0.055		0.2	2	20	5
Arsenic	mg/L	0.001	0.013	0.007		0.07	2	0.1
Cadmium	mg/L	0.0001	0.0002	0.002		0.02	0.05	0.01
Chromium	mg/L	0.001					1	0.1
Manganese	mg/L	0.001	1.9	0.5	0.1	5	10	0.2
Nickel	mg/L	0.001	0.011	0.02		0.2	2	0.2
Selenium	mg/L	0.01	0.005	0.01		0.1	0.05	0.02
Zinc	mg/L	0.005	0.008		3	30	5	2
Iron	mg/L	0.05	0.3		0.3	3	10	0.2
Ferrous Iron	mg/L	0.05						
Hexavalent Chromium	mg/L	0.01	0.001	0.05		0.5		
Total Metals								
Aluminium	mg/L	0.01	0.055		0.2	2	20	5
Arsenic	mg/L	0.001	0.013	0.007		0.07	2	0.1
Cadmium	mg/L	0.0001	0.0002	0.002		0.02	0.05	0.01
Chromium	mg/L	0.001					1	0.1
Copper	mg/L	0.001	0.0014	2	1	20	5	0.2
Lead	mg/L	0.001	0.0034	0.01		0.1	5	2
Manganese	mg/L	0.001	1.9	0.5	0.1	5	10	0.2
Molybdenum	mg/L	0.001		0.05		0.5	0.05	0.01
Nickel	mg/L	0.001	0.011	0.02		0.2	2	0.2
Selenium	mg/L	0.01	0.005	0.01		0.1	0.05	0.02
Silver	mg/L	0.001	0.00005	0.1		1		
Zinc	mg/L	0.005	0.008		3	30	5	2
Iron	mg/L	0.05	0.3		0.3	3	10	0.2
Nutrients								
Ammonia as N	mg/L	0.01	0.9					
Nitrite as N	mg/L	0.01		3		30		
Nitrate as N	mg/L	0.01		50		500		
Total Kjeldahl Nitrogen as N	mg/L	0.1						
Total Nitrogen as N	mg/L	0.1	1.0 ¹					5
Total Phosphorus as P	mg/L	0.01	0.1 ¹					0.05
Reactive Phosphorus as P	mg/L	0.01						
Organochlorine Pesticides (OC)								
alpha-BHC	µg/L	0.5						
Hexachlorobenzene (HCB)	µg/L	0.5						
beta-BHC	µg/L	0.5						
gamma-BHC	µg/L	0.5						
delta-BHC	µg/L	0.5						
Heptachlor	µg/L	0.5	0.01					
Aldrin	µg/L	0.5						
Heptachlor epoxide	µg/L	0.5						
trans-Chlordane	µg/L	0.5	0.03 ²					
alpha-Endosulfan	µg/L	0.5	0.03 ³					
cis-Chlordane	µg/L	0.5	0.03 ²					
Dieldrin	µg/L	0.5						
4,4'-DDE	µg/L	0.5						
Endrin	µg/L	0.5	0.01					
beta-Endosulfan	µg/L	0.5	0.03 ³					
4,4'-DDD	µg/L	0.5						
Endrin aldehyde	µg/L	0.5						
Endosulfan sulfate	µg/L	0.5						
4,4'-DDT	µg/L	2	0.006					
Endrin ketone	µg/L	0.5						
Methoxychlor	µg/L	2						
Total Chlordane (sum)	µg/L	0.5						
Sum of DDD + DDE + DDT	µg/L	0.5						
Sum of Aldrin + Dieldrin	µg/L	0.5						

Table 4
Assessment Criteria (Water)



Organophosphorus Pesticides (OP)								
Dichlorvos	µg/L	0.5						
Demeton-S-methyl	µg/L	0.5						
Monocrotophos	µg/L	2						
Dimethoate	µg/L	0.5	0.15					
Diazinon	µg/L	0.5	0.01					
Chlorpyrifos-methyl	µg/L	0.5						
Parathion-methyl	µg/L	2						
Malathion	µg/L	0.5	0.05					
Fenthion	µg/L	0.5						
Chlorpyrifos	µg/L	0.5	0.01					
Parathion	µg/L	2	0.004					
Pirimphos-ethyl	µg/L	0.5						
Chlorfenvinphos	µg/L	0.5						
Bromophos-ethyl	µg/L	0.5						
Fenamiphos	µg/L	0.5						
Prothiofos	µg/L	0.5						
Ethion	µg/L	0.5						
Carbophenothion	µg/L	0.5						
Azinphos Methyl	µg/L	0.5	0.02					
Monocyclic Aromatic Hydrocarbons								
Styrene	µg/L	5		30	4	4		
Isopropylbenzene	µg/L	5						
n-Propylbenzene	µg/L	5						
1,3,5-Trimethylbenzene	µg/L	5						
sec-Butylbenzene	µg/L	5						
1,2,4-Trimethylbenzene	µg/L	5						
tert-Butylbenzene	µg/L	5						
p-Isopropyltoluene	µg/L	5						
n-Butylbenzene	µg/L	5						
Oxygenated Compounds								
Vinyl Acetate	µg/L	50						
2-Butanone (MEK)	µg/L	50						
4-Methyl-2-pentanone (MIBK)	µg/L	50						
2-Hexanone (MBK)	µg/L	50						
Sulfonated Compounds								
Carbon disulfide	µg/L	5						
Fumigants								
2,2-Dichloropropane	µg/L	5						
1,2-Dichloropropane	µg/L	5						
cis-1,3-Dichloropropylene	µg/L	5						
trans-1,3-Dichloropropylene	µg/L	5						
1,2-Dibromoethane (EDB)	µg/L	5						
Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	µg/L	50						
Chloromethane	µg/L	50						
Vinyl chloride	µg/L	50						
Bromomethane	µg/L	50						
Chloroethane	µg/L	50						
Trichlorofluoromethane	µg/L	50						
1,1-Dichloroethene	µg/L	5		30		300		
Iodomethane	µg/L	5						
trans-1,2-Dichloroethene	µg/L	5						
1,1-Dichloroethane	µg/L	5						
cis-1,2-Dichloroethene	µg/L	5						
1,1,1-Trichloroethane	µg/L	5						
1,1-Dichloropropylene	µg/L	5						
Carbon Tetrachloride	µg/L	5		3		30		
1,2-Dichloroethane	µg/L	5		3		30		
Trichloroethene	µg/L	5						
Dibromomethane	µg/L	5						
1,1,2-Trichloroethane	µg/L	5	6500					
1,3-Dichloropropane	µg/L	5						
Tetrachloroethene	µg/L	5		50		500		
1,1,1,2-Tetrachloroethane	µg/L	5						
trans-1,4-Dichloro-2-butene	µg/L	5						
cis-1,4-Dichloro-2-butene	µg/L	5						
1,1,2,2-Tetrachloroethane	µg/L	5						
1,2,3-Trichloropropane	µg/L	5						
Pentachloroethane	µg/L	5						
1,2-Dibromo-3-chloropropane	µg/L	5						
Hexachlorobutadiene	µg/L	5		0.7		7		
Halogenated Aromatic Compounds								
Chlorobenzene	µg/L	5		300	10	10		
Bromobenzene	µg/L	5						
2-Chlorotoluene	µg/L	5						
4-Chlorotoluene	µg/L	5						
1,3-Dichlorobenzene	µg/L	5	260		20	20		
1,4-Dichlorobenzene	µg/L	5	60	40	3	3		
1,2-Dichlorobenzene	µg/L	5	160	1500	1	1		
1,2,4-Trichlorobenzene	µg/L	5	170			5		
1,2,3-Trichlorobenzene	µg/L	5	3	30	5	5		

Table 4
Assessment Criteria (Water)



Trihalomethanes								
Chloroform	µg/L	5						
Bromodichloromethane	µg/L	5						
Dibromochloromethane	µg/L	5						
Bromoform	µg/L	5						
Phenolic Compounds								
Phenol	µg/L	1	320					
2-Chlorophenol	µg/L	1	340	300	0.1	3000		
2-Methylphenol	µg/L	1						
3- & 4-Methylphenol	µg/L	2						
2-Nitrophenol	µg/L	1						
2,4-Dimethylphenol	µg/L	1						
2,4-Dichlorophenol	µg/L	1	120	200	0.3	2000		
2,6-Dichlorophenol	µg/L	1						
4-Chloro-3-Methylphenol	µg/L	1						
2,4,6-Trichlorophenol	µg/L	1	3	20	2			
2,4,5-Trichlorophenol	µg/L	1						
Pentachlorophenol	µg/L	2	3.6					
Polynuclear Aromatic Hydrocarbons								
Naphthalene	µg/L	1	16					
Acenaphthylene	µg/L	1						
Acenaphthene	µg/L	1						
Fluorene	µg/L	1						
Phenanthrene	µg/L	1						
Anthracene	µg/L	1						
Fluoranthene	µg/L	1						
Pyrene	µg/L	1						
Benz(a)anthracene	µg/L	1						
Chrysene	µg/L	1						
Benzo(b)fluoranthene	µg/L	1						
Benzo(k)fluoranthene	µg/L	1						
Benzo(a)pyrene	µg/L	0.5		0.01		0.1		
Indeno(1.2.3.cd)pyrene	µg/L	1						
Dibenz(a,h)anthracene	µg/L	1						
Benzo(g,h,i)perylene	µg/L	1						
Sum of polycyclic aromatic hydrocarbons	µg/L	0.5						
Benzo(a)pyrene TEQ (WHO)	µg/L	0.5						
BTEXN								
Benzene	µg/L	1	950	1		10		
Toluene	µg/L	2		800	25	25		
Ethylbenzene	µg/L	2		300	3	3		
meta- & para-Xylene	µg/L	2	200	600	20	20		
ortho-Xylene	µg/L	2	350	600	20	20		
Total Xylenes	µg/L	2		600	20	20		
Sum of BTEX	µg/L	1						
Naphthalene	µg/L	5	16					
Total Petroleum Hydrocarbons								
C6 - C9 Fraction	µg/L	20						
C10 - C14 Fraction	µg/L	50						
C15 - C28 Fraction	µg/L	100						
C29 - C36 Fraction	µg/L	50						
C10 - C36 Fraction (sum)	µg/L	50	600					
Total Recoverable Hydrocarbons								
C6 - C10 Fraction	µg/L	20						
C6 - C10 Fraction minus BTEX	µg/L	20						
>C10 - C16 Fraction	µg/L	100						
>C16 - C34 Fraction	µg/L	100						
>C34 - C40 Fraction	µg/L	100						
>C10 - C40 Fraction (sum)	µg/L	100	600					