University of Queensland Experimental Mine

Notification of Notifiable Activity and Contaminated Land Supporting Report

27 September 2013

Prepared by The Sustainability Office, Property and Facilities Division

1.0. Introduction and Preliminary Information

1.1. Scope and Purpose of this Report

The purpose of this report is to provide the relevant details to accompany the submission of the "Notification of Land" form to the Department of Environment and Heritage Protection (DEHP). This information is provided to satisfy the requirement to provide notice to DEHP that a notifiable activity has been carried out on land, in accordance with the requirements of the *Environmental Protection Act 1994* (Qld) (EP Act).

1.2. Scope and Purpose of this Report

1.2.1. Pre-UQ Ownership

Mining production was undertaken at Indooroopilly, by a number of companies, from 1919 to 1929. Production included aboveground and underground workings, developed over the time of its operation. During this period, silver-lead ore was mined, producing 1,796 t of lead and 227,343 oz of silver. Despite the presence of zinc shoots, there is no evidence of zinc production. On its closure in 1929, the site remained derelict until leased by UQ in 1951.

The Queensland Government purchased the property, currently known as the University of Queensland Experimental Mine (UQEM), in 1956 from the Brisbane City Council for use by The University of Queensland (UQ). UQ obtained outright ownership in 1967. Refer to Appendix A for a location map, including the UQEM lots.

1.2.2. UQ Ownership

Since acquisition, the University has used the site for research and teaching in extractive industries. Apart from maintenance facilities for the underground workings, development of the site has been for laboratory-scaled research, teaching and administrative activities.

For clarity of occupational health and safety statutory requirements for the site's mine workings, parts of the site directly related to the workings were made a "Declared Mine" under the *Mining and Quarrying Safety and Health Regulation 2001 (Qld) Schedule 4 Part 1*.

The University has never operated the site as a working mine (i.e. won materials for processing or sale). Workings have been used for demonstrative and teaching purposes and research into mining techniques and processes. More recently, the workings have been closed for all but maintenance purposes. There is no mining lease or other tenure under the *Mineral Resources Act 1989* (Qld) covering the site.

Since the mid/late 1990s, UQ has undertaken a number of environmental assessments. A site Environmental Management Plan has been implemented to minimise identified risks.

2.0. Recent Investigations

UQ commissioned a consultancy to investigate options in developing a Mine Closure Plan for when access to the mine workings is no longer required. The final report (May, 2013) identified potential environmental risks from current operations that would continue beyond the mine closure. In

response, UQ commissioned Environmental and Licensing Professionals Pty Ltd to further investigate water management across the site. In carrying out this work, soil samples were taken at locations approximating overland flow and stormwater discharge paths to qualify background environmental conditions and how they may relate to water quality leaving the UQEM.

Unexpected material was encountered beneath the surface by auger sampling and sent for analysis. Results identified elevated levels of lead (refer to data in Appendix C). In the consultant's experience, the materials' physical properties were also consistent with a mining waste.

As a result, UQ has concluded that the presence and nature of this material and the history of the site indicates that a notifiable activity under the EP Act (specifically Schedule 3, Section 24 – Mine Wastes) has taken place on the UQEM site. The nature of the investigation also indicates that specific lots within the site are confirmed contaminated with a hazardous contaminant.

3.0. Obligations to Notify

UQ is aware of its responsibility under the EP Act to notify the Department of Environment and Heritage Protection (DEHP) that it is now believed a notifiable activity has been carried out on some of the land owned by UQ and that some of the land owned by UQ is contaminated by a hazardous contaminant.

Further, UQ is aware of the prescribed format in which the notification is to be undertaken and this report has been prepared to compliment that notification.

4.0. Notifiable Activity Details

The following section provides details consistent with the requirements of Section 4 of the DEHP's *Notifiable Activity/Contaminated Land Notification of Land* form.

This Section refers specifically to the UQEM lots determined to have been used for the Notifiable Activity that are detailed in Section B.1. and B.2. of Appendix B.

4.1. Which notifiable activity is being or has been carried out

UQ has concluded that notifiable activity; *24 Mine wastes – (a) storing hazardous mine or exploration wastes, including, for example, tailings dams, overburden or waste rock dumps containing hazardous contaminants*; has been carried out at the UQEM.

4.2. When was the notifiable activity carried out

UQ has not carried out a notifiable activity on the UQEM site.

It is believed that the notifiable activity detailed in Section 4.1. was carried out during, or as a result of, the mine's production period of 1919 to 1929.

4.3. Activity details, including threshold amounts

UQ has neither undertaken nor has direct evidence of the notifiable activity being carried out. UQ can only make determinations based on available historic records, results of recent investigations and experience.

It is therefore suspected that hazardous mining waste has been stored on the UQEM lots nominated in Sections B.1. and B.2. of Appendix B for the following reasons:

- It is known that the site was an operational lead-silver mine from 1919 to 1929.
- It is understood the site had been unoccupied and left derelict between 1929 and 1951.
- It is known that elevated levels of lead have been identified in sub-surface materials by recent soil sampling on some of the lots of the UQEM (for more details refer to Section 5.0 below).
- It is the consultant's opinion that the nature of the two different identified lead contaminated materials are consistent with crushed rock and ground rock.
- It is reasonable to assume that crushed and ground rock with elevated lead concentrations in close proximity to a closed lead-silver mine is as a result of activities undertaken at that mine.
- The 1951 aerial photograph (with reference to Figure B.1. in Appendix B) shows definite contrast between different surface coverings on the site. Some of the recent soil sample locations are consistent with clearly disturbed areas on this photograph. It is reasonable to assume these areas indicate interference with the natural landscape.
- One sample (BH1) was taken near the main underground mine entry (116' Adit).
- No other conclusive evidence has been located that indicates this material has been stored on other lots.

From the above, UQ has concluded that during operations at the mine, it is likely waste materials have migrated or been placed on the nominated lots, defined by the clearly disturbed areas in the aerial photograph and/or by soil sampling results.

UQ therefore believes it reasonably expected that the UQEM lots detailed under Section 4.0. above have been used for the notifiable activity.

5.0. Contamination

The following section provides details consistent with the requirements of Section 5 of the DEHP's *Notifiable Activity/Contaminated Land Notification of Land* form.

This Section refers specifically to the UQEM lots determined to be contaminated by a hazardous contaminant as detailed in Section B.1. in Appendix B.

5.1. What is the name or type of hazardous contaminant/s that has caused contamination of the land?

UQ has confirmed concentrations of lead in selected soil samples in excess of the *National Environmental Protection Measures* (NEPM) guidelines "industrial D" on 6 lots of the UQEM site. Initial test work on the mobility of the lead through pH neutral leaching conditions also exceeded *Australia and New Zealand Environmental and Conservation Council 2000* (ANZECC) guideline trigger values for aquatic ecosystems. Zinc (under a pH neutral leach) also exceeded the ANZECC trigger value in a single sample tested (though did not exceed the NEPM guidelines).

5.2. Contamination incident

UQ does not know how the contamination has occurred. It is accepted that the material is consistent with mining waste (specifically crushed and ground rock) and the contaminant within this material is consistent with the ore won from the mine.

UQ does not know when the contamination occurred. The University has not caused the contamination during its occupancy/ownership of the site and it can therefore be certain it was before 1951. As the nature of the material is consistent with mining operations at this site, it's reasonable to assume contamination occurred during the operational years of the mine: 1919 to 1929.

5.3. What was the estimated quantity of the hazardous contaminant(s) involved

UQ has no indication of the quantity of the hazardous contaminant involved.

6.0. Evidence and Supporting Information

6.1. Site Investigation

Contamination was identified during a site environmental risk assessment (referred to in Section 2.0 above). The raw data from this investigation is attached in Appendix C.

This investigation also identified that the contaminated material is covered by at least 100 to 200 mm of uncontaminated soil in most areas.

6.2. Monitoring

UQ has recently established a water monitoring program which includes samples from Witton Creek immediately upstream of the UQEM creek frontage and at the Aaron Place crossing. This program was not established for the purpose of monitoring potential impacts of contaminated land.

However, the program is indicative for this purpose. Lead is one of the analytes being monitored. The upstream monitoring location indicates 'background' concentrations in the creek. The Aaron Place location is not representative of downstream of UQ's property as there is still creek frontage beyond the sample location.

The downstream location is however still considered a reasonable indicator as the contaminated land upstream is less heavily vegetated, all of the stormwater from the UQEM is directed over this land to the creek (some by overland flow), it is upstream of the council sewage pump station (potential contamination source) and access to the location is safer.

Since sampling was implemented in July, lead levels are very low (or not detectable) and generally the downstream site is at a similar level to the upstream site (refer to Appendix D). It is noted that the current sampling has been over an extended dry period and samples will show little, if any, influence of runoff.

UQ will continue to monitor Witton Creek. In the short term, weekly samples will continue until such time as some rainfall has also occurred. Beyond that it is intended to review the frequency of sampling.

6.3. Other Investigations

As part of continuing investigations, Environmental Licensing Professionals Pty Ltd are investigating the environmental condition of Witton Creek and any potential impacts from the UQEM site. Field work has been completed. It is understood that analysis of samples and interpretation of results is still to be completed before any advice is received.

Although not in response to the contamination issue, any ecological harm from lead should be identified through this investigation.

7.0. Other Considerations

7.1. Current Site Use

The lots detailed in Appendix B are generally heavily scrubbed or accessible via steep escarpments and generally not accessible to staff. Some have had development for teaching and research purposes. Access to the UQEM site is restricted to visitors. All visitors must be inducted and sign in/sign out to the UQEM.

Lots lot 137 on RP23531 and Lot 329 on SL7293 are the only lots outside the UQEM fence line and can be accessed by the public. However both lots are overgrown limiting access.

Appendix E provides a recent aerial photograph with the notified lots marked for reference.

7.2. Impact on Groundwater

The impact, if any, of the contaminated land on groundwater is unknown. UQ does not have a monitoring system in place other than monitoring quality sampling of groundwater infiltrating the mine underground workings.

7.3. Vegetation Management

The UQEM is a registered Land for Wildlife site and UQ has developed and has been implementing a landscape management plan to restore and enhance the site's natural values.

UQ will continue to implement this management plan to enhance vegetation coverage of the site. It is believed a well vegetated site will stabilise any surface soils covering the contaminated material, discourage access to much of the site and assist with water management.

7.4. Soil, Land and Occupational Health and Safety Management

The University will enhance the UQEM site's Environmental Management Plan to include issues of land management.

A procedure/s will be developed and incorporated which will focus on:

- Limiting excavation and soil disturbance.
- Requiring sampling of any suspect materials before disposal (where required). Confirmed contamination will also be notified to DEHP as required.
- Scheduled, periodic inspections of general surface cover of the affected lots to ensure suspect material is not visible (and corrective actions as necessary).

Staff (particularly grounds staff) and contractors will be trained in all new procedures. Requirements will be included in staff and site inductions as appropriate. UQ staff will be provided appropriate PPE and contractors will be expected to provide appropriate PPE if work is intended or suspected of impacting on materials.

7.5. Notifiable Activity Beyond UQEM Site

The aerial photograph included in the evidence suggests that disturbance of land has taken place beyond the boundary of the UQEM site. Based on the available evidence, it is not clear to UQ that the notifiable activity has taken place beyond the UQEM site.

Appendix A – UQEM Location Map

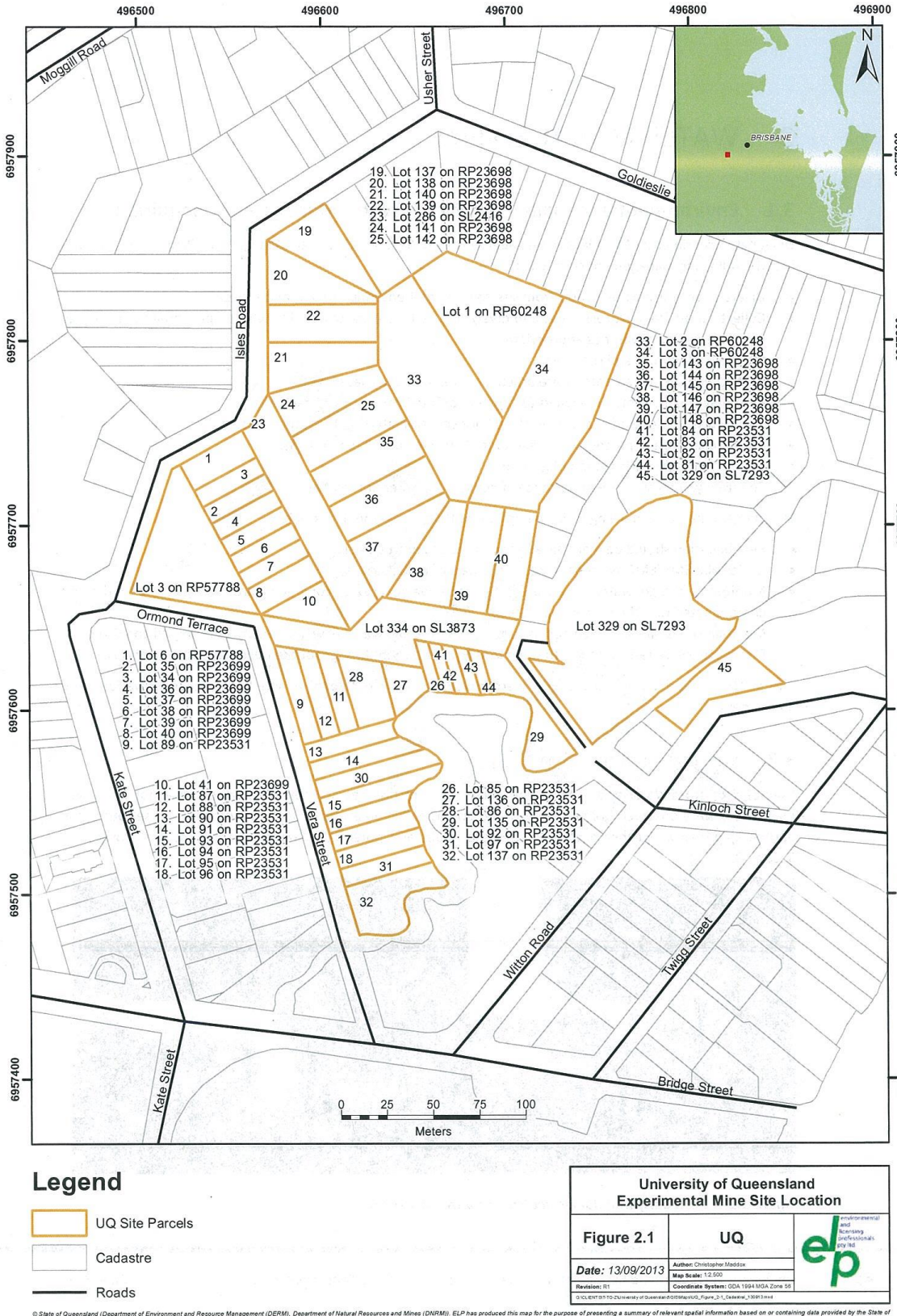

Figure A.1. UQEM Location Map

A.1. Full list of UQEM lots

The UQEM, address: 40 Isles Rd, Indooroopilly, QLD 4068, is comprised the following 48 lots.

- Lot 81 on RP23531
- Lot 82 on RP23531
- Lot 83 on RP23531
- Lot 84 on RP23531
- Lot 86 on RP23531
- Lot 85 on RP23531
- Lot 87 on RP23531
- Lot 88 on RP23531
- Lot 89 on RP23531
- Lot 90 on RP23531
- Lot 91 on RP23531
- Lot 92 on RP23531
- Lot94 on RP23531
- Lot 93 on RP23531
- Lot 95 on RP23531
- Lot 96 on RP23531
- Lot 97 on RP23531
- Lot 136 on RP23531
- Lot 137 on RP23531
- Lot 135 on RP23531
- Lot 137 on RP23698
- Lot 138 on RP23698
- Lot 139 on RP23698
- Lot140 on RP23698
- Lot 141 on RP23698
- Lot 142 on RP23698
- Lot 143 on RP23698
- Lot 144 on RP23698
- Lot 145 on RP23698
- Lot 146 on RP23698
- Lot 147 on RP23698
- Lot 148 on RP23698
- Lot 34 on RP23699
- Lot 35 on RP23699
- Lot 36 on RP23699
- Lot 37 on RP23699
- Lot 38 on RP23699
- Lot 39 on RP23699
- Lot 40 on RP23699
- Lot 41 on RP23699

- Lot 3 on RP57788
- Lot 6 on RP57788
- Lot 1 on RP60248
- Lot 2 on RP60248
- Lot 3 on RP60248
- Lot 286 on SL2416
- Lot 334 on SL3873
- Lot 329 on SL7293

Appendix B –Lots for notification of Notifiable Activity and Contaminated Land

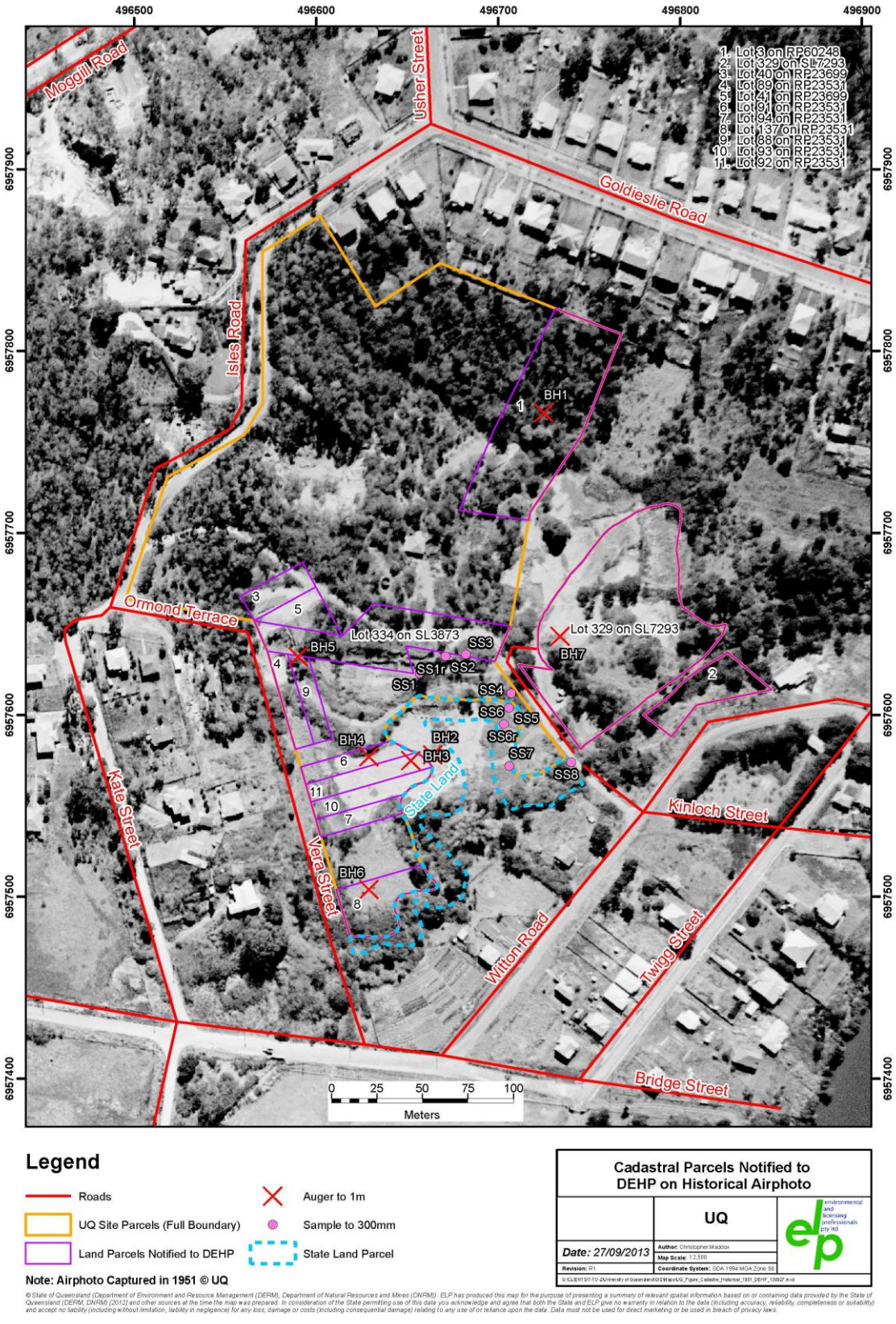

Figure B.1. Aerial Photograph indicating the UQEM lots, and lots determined as having been used for a notfiable activity and being contaminated.

B.1. UQEM Lots: Notifiable Activity and Contaminated Land

The following 6 UQEM lots, based on sampling, are contaminated and have been used for a notifiable activity:

- Lot 3 on RP60248 (4,806 m^2)
- Lot 88 on RP23531 (513 m^2)
- Lot 91 on RP23531 (562 m^2)
- Lot 92 on RP23531 (696 m^2)
- Lot 137 on RP23531 (1,644 m^2)
- Lot 329 on SL7293 (8,860 m^2)

Total area of nominated lots (contaminated land) is approximately 17,081 m^2.

B.2. UQEM Lots: Notifiable Activity

The following 6 UQEM lots have been determined as likely used for a notifiable activity from available information:

- Lot 334 on SL3873 (2,899 m^2)
- Lot 89 on RP23531 (559 m^2)
- Lot 93 on RP23531 (635 m^2)
- Lot 94 on RP23531 (503 m^2)
- Lot 41 on RP 23699 (625 m^2)
- Lot 40 on RP 23699 (582 m^2)

The total area of these nominated lots 5,803 m^2.

The total area of the lots on which a notifiable activity has been carried out (including the contaminated sites listed in Section B.1.) is 22,884 m^2.

Appendix C –Soil Assessment Raw Data

Soil Logs

All hole and sample locations were summary logged and described generally using the criteria outlined in AS 1726 – 1993 Geotechnical Site Investigations. The summary soil logs are included as **Table 0-1** to **Table 0-7** below. Photographs of spoil from selected holes is also included as **Figure 0-1** to **Figure 0-8.**

Table 0-1 BH1 Soil Description

Depth From	Depth To	Group Symbol	Description	Moisture	Consistency	Comment
0	0.2	SM	Loamy Sand, soil, brown , fine grained	Dry	Loose	
0.2	0.4	CL	Light Clay, pale brown	Dry	Loose	sampled
0.4	0.6	CL	As above, minor rock chips	Dry	Loose	
0.6	1.0	CL	Clay, Brown	Dry	Firm	Firm but crumbly. Looks like natural soils. Sample at 0.6m

Figure 0-1 BH1 Soils Photo

Table 0-2 BH2 Soil Description

Depth From	Depth To	Group Symbol	Description	Moisture	Consistency	Comment
0	0.2	GC	Gravel with sand, Brown	Dry	Loose	
0.2	0.4	SC	Sand, with Clay, pale brown	Moist	Loose	Looks like "deco". sampled
0.4	0.6	SC	Sand, with Clay and minor gravel, pale brown	Moist	Loose	
0.6	1.0	SC	Sand, with Clay, pale brown	Wet	Loose	Sample at 0.6m. Essentially all the same material from 0.2m down hole.

Figure 0-2 BH2 Soils Photo

Table 0-3 BH3 Soil Description

Depth From	Depth To	Group Symbol	Description	Moisture	Consistency	Comment
0	0.2	GC	Gravel, clayey, with sand, brown	Dry	loose	Sampled at 0.1m
0.2	0.4	SC	Sand, clayey, light brown	Dry	Loose	Gravelly at top. Sampled at 0.2m
0.4	0.6	SC	Sand, clayey, minor gravel, light to medium brown	Dry	Loose	
0.6	0.8	CH	Clay, brown.	Moist	Soft	No sand. Does not look like natural clay. Sample at 0.6m
0.8	1.0	SC	Sand, clayey, brown	Wet	Loose	

Figure 0-3 BH3 Soils Photo

Table 0-4 BH4 Soil Description

Depth From	Depth To	Group Symbol	Description	Moisture	Consistency	Comment
0	0.2	GC	Gravel, clayey, brown. Up to 5% black chips (?coal)	Dry	Loose	Suspect this is fill material
0.2	0.4	GC	Gravel, clayey, black and brown mixture of colour	Moist	Medium	Multi colour chips. Sample at 0.2m
0.4	0.6	CH	Clay, brown	Moist	Soft	Does not look like natural clay. Sample at 0.4m
0.6	0.8	SC	Sand, clayey with minor gravel, brown	Moist	Medium	
0.8	1.0	CL	Clay, sandy, brown	Wet	Soft	May not be natural clay

(note, no photo of the soil samples was taken for BH4).

Table 0-5 BH5 Soil Description

Depth From	Depth To	Group Symbol	Description	Moisture	Consistency	Comment
0	1.0	GC	Gravel, clayey, tan brown	Moist	Loose	Looks like all fill materials. Samples at 0.1, 0.2, 0.8m.

Figure 0-4 BH5 Soils Photo

Table 0-6 BH6 Soil Description

Depth From	Depth To	Group Symbol	Description	Moisture	Consistency	Comment
0	0.4	CH	Clay, dark brown	Moist	Soft	Looks natural. Sample at 0.2m
0.4	1.2	CH	Clay, light brown	Moist	Very Soft	Very sharp contrast in colour and texture with the interval above. Does not appear like natural clay. Sample at 0.4, 0.6, 0.8, 1.0m
1.2	1.4	CH	Clay, brown, with some light brown clay	Moist	Soft to Firm	Transitional unit. Sample at 1.2m
1.4	2.0	CH	Clay, brown with minor very fine orange mottle	Moist	Soft	Looks like natural clay

Figure 0-5 BH6 Soils 0 to 1.0m Photo

Figure 0-6 BH6 Soils 0.8 to 1.6m Photo

Figure 0-7 BH6 Soils 1.2m to 2.0m Photo

Table 0-7 B7 Soil Description

Depth From	Depth To	Group Symbol	Description	Moisture	Consistency	Comment
0	0.2	CL	Clay, brown with fine red mottles	Moist	Loose	
0.2	0.4	CL	Clay, silty, white	Moist	Loose	Does not look natural. Sample at 0.2m
0.4	0.7	SC	Sand, clayey, brown	Moist	Loose	Looks like deco, possibly not natural. Sample at 0.4m, 0.7m
0.7	0.8	CL	Clay, grey brown	Moist	Very Soft	Tree roots noted
0.8	1.0	SC	Sand, clayey, brown	Moist	Loose	Water seeped in to base of hole on completion. Sample at 0.9m

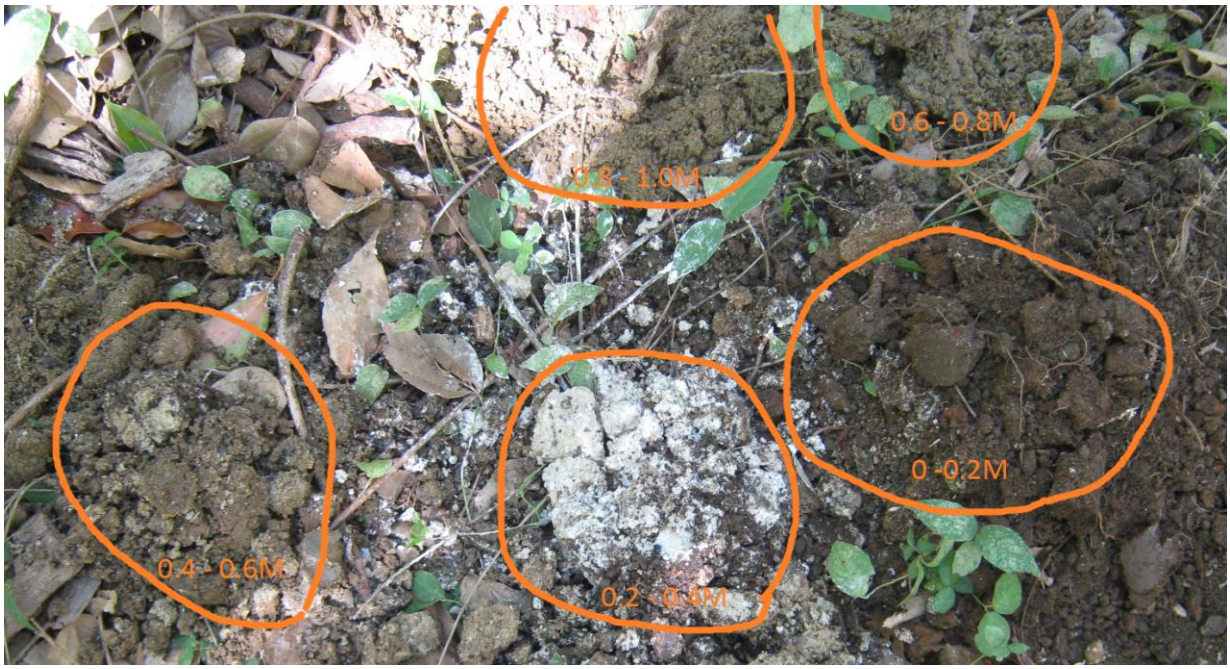

Figure 0-8 BH7 Soils 0 to 1.0m Photo

Table 0-8 Drill Sample Results

		Client sample ID			BH1/0.2 m	BH2/0.6 m	BH3/0.6 m	BH4/0.2 m	BH4/0.4 m
			NEPM Guideline Investigation Levels						
			Recreational "C"	Industrial "D"					
Analyte grouping/Analyte	**Units**	**LOR**							
EA002 : pH (Soils)									
pH Value	pH Unit	0.1			6.9	7.0	7.0	7.9	7.2
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	%	1.0			13.6	7.5	22.2	16.0	19.5
EG005T: Total Metals by ICP-AES									
Arsenic	mg/kg	5	300	3,000	53	101	145	23	96
Cadmium	mg/kg	1	90	900	2	9	8	4	11
Chromium	mg/kg	2	300	3,600	25	9	13	10	14
Copper	mg/kg	5	17,000	240,000	310	522	676	66	578
Lead	mg/kg	5	600	1,500	14100	9080	16100	760	11200
Nickel	mg/kg	2	1,200	6,000	18	5	8	13	10
Zinc	mg/kg	5	30,000	400,000	360	828	908	347	1340
EG035T: Total Recoverable Mercury by FIMS									
Mercury	mg/kg	0.1	80	730	<0.1	<0.1	<0.1	<0.1	<0.1

		Client sample ID	BH5/0.8	BH6/0.4	BH6/0.8	BH6/1.4	BH7/0.2	BH7/0.4

					m	m	m	m	m	m
			NEPM Guideline Investigation Levels							
			Recreational "C"	Industrial "D"						
Analyte grouping/Analyte	**Units**	**LOR**								
EA002 : pH (Soils)										
pH Value	pH Unit	0.1			6.4	6.0	6.6	6.4	8.0	8.2
EA055: Moisture Content										
Moisture Content (dried @ 103°C)	%	1.0			10.5	29.4	29.1	26.2	35.5	8.0
EG005T: Total Metals by ICP-AES										
Arsenic	mg/kg	5	300	3,000	44	84	98	16	40	85
Cadmium	mg/kg	1	90	900	7	17	14	2	10	5
Chromium	mg/kg	2	300	3,600	14	20	18	47	21	12
Copper	mg/kg	5	17,000	240,000	365	615	715	63	95	361
Lead	mg/kg	5	600	1,500	9920	12400	17300	58	1370	10100
Nickel	mg/kg	2	1,200	6,000	10	16	9	36	17	8
Zinc	mg/kg	5	30,000	400,000	877	1680	1280	124	2370	1240
EG035T: Total Recoverable Mercury by FIMS										
Mercury	mg/kg	0.1	80	730	<0.1	0.2	0.1	<0.1	0.1	<0.1

Table 0-9 Soil Sample Results

		Client sample ID			SS1	SS1R	SS2	SS3	SS4	SS5	SS6
			NEPM Guideline Investigation Levels								
			Recreational "C"	Industrial "D"							
Analyte grouping/Analyte	**Units**	**LOR**									
EA002 : pH (Soils)											
pH Value	pH Unit	0.1			8.5	8.6	8.4	8.7	7.3	7.6	7.9
EA055: Moisture Content											
Moisture Content (dried @ 103°C)	%	1.0			7.5	8.3	2.5	4.0	10.9	46.3	11.9
EG005T: Total Metals by ICP-AES											
Arsenic	mg/kg	5	300	3,000	15	14	30	24	16	43	16
Cadmium	mg/kg	1	90	900	<1	1	2	2	4	67	8
Chromium	mg/kg	2	300	3,600	11	18	16	12	1030	31	21
Copper	mg/kg	5	17,000	240,000	80	154	510	67	806	159	75
Lead	mg/kg	5	600	1,500	165	182	122	260	20	609	2430
Nickel	mg/kg	2	1,200	6,000	20	26	26	20	697	46	14
Zinc	mg/kg	5	30,000	400,000	278	296	340	378	94	5010	885
EG035T: Total Recoverable Mercury by FIMS											
Mercury	mg/kg	0.1	80	730	<0.1	<0.1	0.1	<0.1	0.9	0.2	<0.1

Table 0-10 Stream Sediment Sample Results

		Client sample ID			SS7	SS8
			ANZECC Sediment Quality Guidelines			
			Trigger value			
Analyte grouping/Analyte	**Units**	**LOR**				
EA002 : pH (Soils)						
pH Value	pH Unit	0.1			6.9	7.6
EA055: Moisture Content						
Moisture Content (dried @ 103°C)	%	1.0			47.3	23.2
EG005T: Total Metals by ICP-AES						
Arsenic	mg/kg	5	*na*		31	62
Cadmium	mg/kg	1	*1.5*		152	<1
Chromium	mg/kg	2	*80*		30	29
Copper	mg/kg	5	*65*		126	42
Lead	mg/kg	5	*50*		517	28
Nickel	mg/kg	2	*21*		40	19
Zinc	mg/kg	5	*200*		6400	96
EG035T: Total Recoverable Mercury by FIMS						
Mercury	mg/kg	0.1	*0.15*		<0.1	<0.1

Table 0-11 Leach Testing Results

		Client sample ID		BH1/0.2m	BH2/ 0.6m	BH4/ 0.4m	BH5/ 0.8m	BH6/ 0.4m	BH7/ 0.4m	SS4	SS5	SS6	SS7
			ANZECC 2000 Freshwater Trigger Value										
Analyte grouping/Analyte	**Units**	**LOR**	**95% level of protection**										
EG020W: Water Leachable Metals by ICP-MS													
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na	na	na	na	na	0.0008
Chromium	mg/L	0.001	0.001	na	na	na	na	na	na	<0.001	na	na	na
Copper	mg/L	0.001	0.0014	na	na	na	na	na	na	na	na	na	0.004
Lead	mg/L	0.001	0.0034	0.333	0.028	0.052	0.109	0.321	0.117	na	na	0.683	0.013
Nickel	mg/L	0.001	0.011	na	na	na	na	na	na	na	na	na	0.002
Zinc	mg/L	0.005	0.008	na	na	na	na	0.063	na	na	0.182	na	0.225
				na	na	na	na	na	na	na	na	na	na
EN60: Bottle Leaching Procedure				na	na	na	na	na	na	na	na	na	na
Final pH	pH Unit	0.1	-	6.9	7.0	7.3	7.4	7.0	9.3	8.0	8.0	8.2	7.9

na = not analysed

Appendix D – Water Monitoring Results

Parameter	WQO (Marine)		Witton Creek Upstream of UQEM								Witton Creek Aaron Place Crossing						
			25/07/2013	1/08/2013	8/08/2013	15/08/2013	22/08/2013	29/08/2013	5/09/2013	12/09/2013	25/07/2013	1/08/2013	8/08/2013	15/08/2013	22/08/2013	29/08/2013	5/09/2013	12/09/2013
pH	7.4 - 8.4		7.38	7.5	7.4	7.1	7.8	7.6	7.5	7.4	7.32	7.5	7.4	7.2	7.8	7.7	7.5	7.5
Turbidity	25	NTU	1.8	7.1	5	2.8	3.2	9.9	10	5	2.1	2.2	3	3.7	3.7	4.3	6.7	10
Silver	0.0014	mg/L	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Cadmium	0.0055	mg/L	nd	nd	nd	nd	nd	nd	nd	nd	0.00095	0.0026	nd	nd	nd	nd	nd	nd
Cobalt	0.001	mg/L	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chromium	0.0274 (iii)/0.0044 (iv)	mg/L	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Copper	0.0013	mg/L	nd	0.0068	nd	0.0027	nd	nd	nd	nd	0.0041	0.0022	nd	0.0022	nd	nd	nd	nd
Lead	0.0044	mg/L	nd	0.0015	nd	nd	nd	nd	nd	nd	0.0036	nd	nd	nd	nd	nd	nd	nd
Zinc	0.015	mg/L	0.038	0.065	0.011	0.0052	nd	nd	0.007	0.003	0.45	0.021	0.018	0.005	0.008	nd	0.007	0.004
Conductivity		mS/cm	nt	nt	nt	930	1100	1100	1200	1200	nt	nt	nt	967	2800	1200	1200	1300
Suspended Solids	25	mg/L	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
TDS	N/A	mg/L	nt	nt	nt	651	621	704	696	722	nt	nt	nt	677	1640	723	680	704
Acidity (as CaCO3)	N/A	mg/L	nt	nt	nt	nt	250	250	270	250	nt	nt	nt	nt	410	260	280	270

nd = Not detected
nt = not tested

Appendix E – Current Development at UQEM

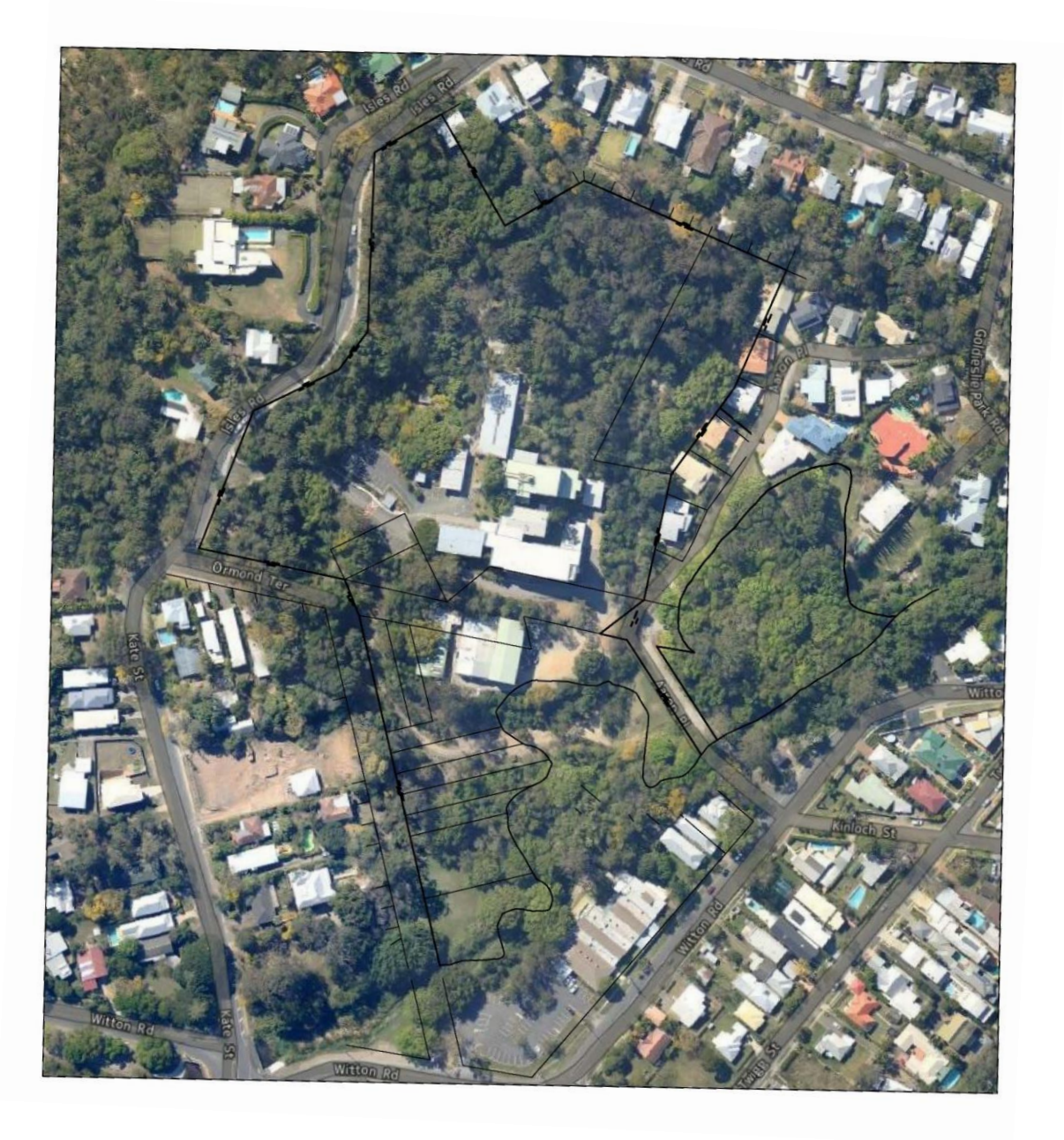

Figure E.1. 2013 aerial photograph of the UQEM with approximate overlay of notified lots.