

Appendix B

Groundwater Report

R E P O R T

Andranangoo Creek West Project and Lethbridge Bay West Mine Development EIS Groundwater Modelling To Assess Environmental Impacts

Prepared for

Matilda Minerals Ltd

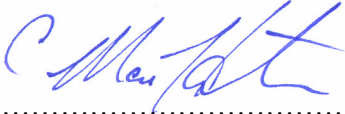
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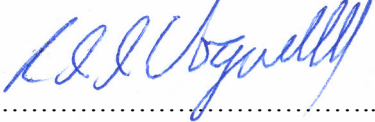


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Appendices

Appendix A	Bore Completion Diagrams
Appendix B	Acid Sulphate Soil Analytical Results

Matilda Minerals Ltd (Matilda) is planning to commence mining of the Andranangoo Creek West and Lethbridge Bay West deposits on Melville Island, north of Darwin (Figure 1). Dry slot mining of approximately 10,000t of zircon and 6,000t of rutile annually is anticipated, with a continuous rehabilitation program occurring close behind the mining face. The on-site processing will be limited to gravity separation of the heavy minerals. The heavy minerals will then be shipped offshore to a dry separation plant for final separation. A continuous water supply (fresh to brackish quality) of 5,760 kL/day (67 L/sec) will be required for the on-site wet plant. Water supply duty rates are much lower as 90% of the process water will be recycled. A potable camp supply of 100 kL/day will be required for each mine.

Prior to mine development, an Environmental Impact Statement (EIS) is required to obtain regulatory approval for the mine. To date, URS has been involved in preparation of a Notice of Intent (NOI) for the two projects.

Additional assessments are now required to satisfy the EIS guidelines as received from the Northern Territory Government (Office of Environment and Heritage). To satisfy the guidelines for the EIS, the following additional hydrogeological investigation work is required:

- (i) the installation and testing of aquifer test bores and groundwater monitoring bores; and
- (ii) (ii) groundwater flow and density coupled modelling.

2.1 Scope of Work

The scope of work for this project was outlined in URS proposal 03023827 and is summarised below.

- Allow an assessment of the environmental impacts of regional groundwater level lowering caused by the borefield operation (for process water supply). This work is an important aspect of the EIS in order to more accurately predict and quantify potential environmental impacts associated with water supply.
- Assess the impacts associated with changes in the position of the fresh groundwater/seawater interface or upconing of underlying seawater caused by borefield operation.
- Satisfy the requirements of the NT Government Regulators and thereby obtain approval for the mining.

In order to make the model as robust as possible, the following associated work is also required:

- Completion of groundwater drilling and testing programs to obtain additional information on aquifer occurrence in and around the mining area and a PASS assessment.
- Quantify aquifer parameters, which can then be used: (i) in the model construction; (ii) to determine the location of seawater intrusion throughout the mining area; and (iii) to assist in determining environmental impacts.
- Obtain data from other recent studies with which to construct and calibrate a realistic groundwater model.

2.2 Project Approach

The proposed approach for this project was outlined in URS proposal 03023827 and is summarised below.

2.2.1 Task 1 - Data Review, Model Conceptualisation and Liaison

In order to form a conceptual model of the mining area and surrounding region, geological and hydrogeological data were reviewed and additional information for the local stratigraphy and hydrogeological parameters was obtained in the field.

2.2.2 Task 2 - Groundwater Drilling and Testing Programs

We located prospective groundwater targets and determined bore drilling methods and locations. Aquifer test bores were installed (including one camp water supply bore) around the proposed slot mining areas at each deposit, as well as haul road dust suppression and port water supply bores.

2.2.3 Task 3 - Groundwater Model Construction and Features

The model incorporates groundwater information from the drilling and testing programs described above and this has allowed gradual model refinement during the work. Therefore, the model can be used to refine, predict and quantify the required water supply and environmental impacts.

The modelled area was discretised into different material types and layers in order to simulate the interpreted geology and hydrogeology as closely as possible. The model includes such features as:

- The geometry and properties of known aquifer systems.
- The interrelationship between the wetlands and process water supply bores.
- The location of the seawater interface.
- The relationship between groundwater and surface water.
- Groundwater and surface water recharge-discharge mechanisms.
- Regional groundwater flow.

The model was designed progressively to incorporate the additional groundwater drilling and testing information as it became available from the programs described above and this resulted in gradual model refinement during the work. The model can be used to refine, predict and quantify the available groundwater for processing supply for mining and also the potential environmental impacts associated with this groundwater pumping. Therefore, the model can satisfy the requirements for: (i) the mine water supply; and (ii) assessing potential environmental impacts for inclusion in the EIS.

2.2.4 Task 4 - Groundwater Model Calibration

The calibration of the model occurred in two steps:

- **Steady-State** – during this calibration stage, groundwater levels generated by the model were matched to known groundwater levels and flow directions across the mining region. This was achieved by small variations in model parameters, especially hydraulic parameters such as permeability and storativity. A successful steady-state calibration is a necessary precursor to the next stage of model development.
- **Transient** – this is the most difficult and time-consuming stage of model calibration. During this work, known aquifer response to pumping by bores was matched by simulating this pumping in the model. Model parameters were varied until a satisfactory drawdown response to actual pumping was achieved. After a successful transient calibration, the model was used for predictive simulations to forecast available groundwater supply and assess potential environmental impacts.

2.2.5 Task 5 - Predictive Simulations – Environmental Impacts and Closure

Environmental Impacts

The main potential groundwater-related environmental impacts resulting from the minesite are thought to be associated with: (i) groundwater level lowering near the borefields; (ii) the potential to draw seawater upwards or laterally from the ocean into areas of fresh groundwater or (iii) drawdown near PASS which may lead to groundwater contamination.

Groundwater lowering may result in vegetation stress, and have impacts on the ecological water requirements that are needed to sustain flora and fauna associated with wetlands or drainages of the area. In addition, groundwater level lowering may cause reduced dry season stream flows earlier than normal and influence ecosystems dependent on this stream flow.

The model was constructed to simulate the interaction of groundwater and surface water in the major drainages of the area. Specialised model cells, which represent potential points of leakage from surface water to groundwater were included in the model. These cells occur in drainages, and floodplains of these drainages. This has allowed modelled leakage to occur during wet season.

Drawdown predictions from the groundwater modelling have been used to evaluate impacts of process water supply on the wetland hydroperiods. This will be an important aspect of regulatory approval of the proposed mine development.

Mine Closure

We consider the development of a groundwater model to be important in mine closure. As with environmental impacts, studies of final water levels could eventually be required to obtain regulatory approval for the mine development.

2.2.6 Task 6 – EIS Groundwater Model Reporting

This report describes the groundwater characteristics of the deposits, the results of groundwater drilling and testing programs, the groundwater modelling results at the EIS stage and the potential environmental impacts associated with groundwater pumping for process water supply.

Groundwater Drilling and Testing Program

SECTION 3

3.1 Andranangoo Creek West Project

3.1.1 Groundwater Drilling

Four test production bores and nineteen groundwater monitoring bores were installed at the Andranangoo Creek West deposit during June and October 2005. MM series monitoring bores were completed by Wallis Drilling with a four wheel drive mounted air-core rig and the remaining bores installed by Underdale Drillers with a truck-mounted drilling rig using mud-rotary methods.

Air-core drilling monitoring wells were drilled at 75 mm diameter, and were lined with 25 mm uPVC casing. Mud-rotary monitoring bores were drilled at 140 mm and lined with 50 mm uPVC casing. All holes were lithologically logged and sampled. Aquifer test bores were drilled at 254 mm diameter and lined with 165 mm, nominal diameter uPVC or stainless steel screens.

Bore construction details are summarised in Table 1 and discussed below. Bore completion diagrams are presented in Appendix A with bore locations presented in Figure 2.

Table 1
Andranangoo Creek West Project – Bore Construction Details

Site	MGA Easting	MGA Northing	Ground RL (m RL)	PVC RL (m RL)	Drilled Depth	Slotted Interval	Aquifer Type	S.W.L (m RL)	S.W.L (m bgl)
MM1a	699,215.18	8,743,122.58	4.95	5.44	12	3.06-5.06	Sand	1.88	3.07
MM1b	699,215.36	8,743,122.96	5.02	5.18	12	9.75-11.75	Sand/Clay	1.63	3.39
MM2	699,690.33	8,743,042.37	4.37	4.68	30.5	5.22-30.22	Sand/Clay	1.84	2.53
MM3	699,693.39	8,743,309.26	3.38	3.81	9.5	2.46-9.46	Sand	1.47	1.91
MM4	700,313.60	8,743,190.77	3.50	3.86	12	3-12	Sand/Clay	1.65	1.85
MM5	700,998.14	8,743,302.48	3.43	3.76	9	1.1-8.1	Sand/Clay	1.10	2.33
MM6	701,494.37	8,743,187.24	3.28	3.57	9	1.16-8.16	Sand/Clay	1.09	2.19
MM7	701,899.83	8,743,197.49	2.65	2.94	10	0.72-9.72	Sand	0.64	2.01
MM8	702,493.72	8,742,941.74	3.21	3.50	12.56	3.56-12.56	Sand	0.75	2.46
MM9	700,397.93	8,742,643.99	20.99	21.29	42	29.69-41.69	Sand/Clay	3.23	17.76
MM10	702,749.46	8,743,377.40	3.23	3.22	16	3.71-15.71	Sand	0.80	2.44
MM11	703,188.20	8,743,726.34	3.57	3.86	15	3.12-12.12	Sand	1.10	2.47
MM12	703,575.71	8,743,401.84	3.32	3.46	12	3-10.58	Sand	0.95	2.37
Site 1 (P)	699,211.00	8,743,105.00	3.54	4.52	17	4.57-13.57	Sand/Clay	1.04	2.50

Groundwater Drilling and Testing Program

SECTION 3

Site 2	699,209.00	8,743,095.00	3.62	4.42	16	3.91-15.91	Sand/Clay	1.94	1.68
Site 3	698,694.00	8,743,153.00	4.00	4.96	17.5	4.14 - 16.14	Sand/Clay	1.65	2.35
Site 4 (P)	698,704.00	8,743,048.00	4.25	4.86	15	4.4-13.4	Sand/Clay	0.63	3.62
Site 5	698,702.00	8,743,038.00	4.17	5.21	12	2.97-11.97	Sand/Clay	1.80	2.37
Site 6	701,204.00	8,743,485.00	3.44	4.39	14.5	0.85-12.85	Sand/Clay	1.33	2.12
Site 7 (P)	701,206.00	8,743,353.00	3.17	3.57	15.5	1.01-10.01	Sand/Clay	0.01	3.16
Site 8	701,207.00	8,743,345.00	3.55	4.45	14	0.17-12.17	Sand/Clay	1.31	2.24
Site 9	701,998.00	8,743,825.00	3.39	4.21	17	5.23-17.23	Sand	1.33	2.06
Camp Bore	700,398.00	8,742,830.00	17.14	17.76	43	31-43	Sandstone	2.98	14.16

3.1.2 Test Production Bores

Three test production bores (Sites 1, 4 and 7) were constructed with 147 mm internal diameter uPVC casing and wire wound (0.5 mm aperture) stainless steel screens. One camp water supply bore was constructed and cased with 147 mm internal diameter casing with the screened section comprising slotted uPVC. The annulus in each bore was filled with washed filter gravel (3 - 6 mm).

The bores were developed by air-lifting techniques until silt-free groundwater returns were obtained.

3.1.3 Groundwater Monitoring Bores

Nineteen groundwater monitoring bores (MM1 to MM12 and Sites 2, 3, 5, 6, 8 and 9) were drilled and constructed using 25 mm (MM series bores) or 50 mm (Site series bores) blank and slotted uPVC casing, gravel packed with washed filter gravel. Bentontite seals were placed above the gravel pack and the bore annulus cement grouted to ground surface. A generalised north-south hydrogeological cross section is presented in Figure 3.

3.1.4 Bore and Aquifer Testing

Step-Drawdown Tests

The step-drawdown tests were used to determine bore pumping characteristics and estimate a pumping rate suitable for the constant-rate test. These tests comprised pumping the bore at rates that were increased incrementally in 60 minute steps. Analyses of these results were used to determine well and formation loss factors and to select a suitable rate for the constant -rate test.

Groundwater Drilling and Testing Program

SECTION 3

Groundwater level drawdown in a pumping bore has two components, formation loss and well loss. Formation loss is dependent on the hydraulic characteristics of the aquifer in the vicinity of the bore and is directly proportional to the pumping rate. Well loss is caused by turbulent flow and friction head loss through casing slots and around the pump, and thus depends on bore construction and development. It is generally considered proportional to the square of the pumping rate.

Therefore, drawdown in a pumping bore can be expressed by the formula:

$$S_w = BQ + CQ^2$$

where: S_w = Groundwater level drawdown (m)

Q = Pumping rate (kL/day)

B = Formation loss factor (day/m²)

C = Well loss factor (day²/m⁵)

$$WellEfficiency = \left(\frac{BQ}{BQ + CQ^2} \right) \times 100$$

The step-drawdown test results have been analysed by the Bierschenk and Wilson method, whereby S_w/Q is plotted against Q , giving a line with a y-intercept of B and slope C (Table 2, Figures 4 to 6).

Table 2
Step-Drawdown Test Results (Andranangoo Creek West)

Bore	Step Rate (kL/day)	Drawdown (30 mins) (m)	Formation Loss BQ (m)	Well Loss, CQ ² (m)	Well Efficiency (%)
Site 1(P)	190	1.40	1.33	0.07	95
Site 4(P)	86	1.05	1.03	0.06	94
Site 7(P)	-	-	-	-	-
Camp Bore	103	5.87	5.70	0.18	97

All test production bores have a high efficiency, probably because of the sandy nature of the aquifers and the relatively small pumping rates. Well efficiency generally decreases as pumping rate increases, due to the higher proportion of well loss (CQ^2) contributing to total drawdown ($BQ + CQ^2$) in the well. At higher pumping rates, the higher velocity of groundwater entering the well causes a higher proportion of well loss resulting in lower bore efficiency.

Groundwater Drilling and Testing Program

SECTION 3

Constant Rate and Recovery Tests

The constant-rate test in each production bore was commenced following the step-drawdown test and after groundwater levels had recovered to initial static levels. Upon completion of each constant-rate test, recovering groundwater levels were also measured and analysed. However, no recovery measurements were taken during the Site 7(P) test.

The test pumping was undertaken by the drilling contractors using electric submersible pumps. Pumping rates were measured through a flow meter. Electric contact meters (dip meters) were used to measure groundwater levels in both the pumped bore and suitable observation bores.

The constant-rate test results enable the hydraulic characteristics of the aquifers intersected by each test production bore to be determined. These parameters quantify the storage and transmission of groundwater in the aquifer.

The results of the constant-rate tests and the calculated hydraulic parameters are shown on Table 3, with drawdown plots for each test presented in Figures 7 to 10.

Table 3
Constant-Discharge Test Results – Andranangoo Creek West

Pumping Bore	Date of Test	Pumping Rate (kL/day)	Final Drawdown (m)	Observation Bores		Transmissivity (m ² /day)		Storativity
				Bore No.	Distance (m)	Theis Method	Cooper – Jacob	
Site 1(P)	27/10/2005	432	3.35	-	-	305	-	-
				MM1b	18.4	80	-	0.11
				Site 2	10.2	-	530	-
Site 4(P)	24/10/2005	181	5.60	-	-	360	-	-
				Site 5	10.2	-	730	-
Site 7(P)	30/10/2005	155	2.59	-	-	26	-	-
				-	-	-	17	-
Camp Bore	2/11/2005	173	15.70	-	-	12	-	-
				-	-	-	7	-

3.2 Lethbridge Bay West Project

3.2.1 Groundwater Drilling

Two test production bores and eight groundwater monitoring bores were installed at Lethbridge Bay West deposit (during June and October 2005) by Underdale Drillers using a truck-mounted drilling rig and mud-rotary methods.

Groundwater Drilling and Testing Program

SECTION 3

The monitoring bores were drilled at 140 mm and lined with 50 mm uPVC casing. All holes were lithologically logged and sampled. Test production bores were drilled at 254 mm diameter and lined with 165 mm, nominal diameter uPVC or stainless steel screens.

Bore construction details are summarised in Table 4 and discussed below. Bore completion diagrams are presented in Appendix A, with bore locations presented in Figure 11.

Table 4
Lethbridge Bay West Project – Bore Construction Details

Site	MGA Easting	MGA Northing	Ground RL (m RL)	PVC RL (m RL)	Drilled Depth	Slotted Interval	Aquifer Type	S.W.L (m RL)	S.W.L (m bgl)
Site 1 (A)	719,168.00	8,743,082.00	2.66	3.39	21	0.72-4.88	Sand	1.01	1.65
Site 1 (B)	719,168.00	8,743,082.00	2.66	3.39	21	14.64-20.64	Sand/Clay	0.90	1.76
Site 2	719,551.00	8,743,041.00	3.12	3.86	12	2.67-11.67	Sand/Clay	0.92	2.20
Site 3	719,990.00	8,743,009.00	3.21	3.92	12	2.70-11.70	Sand/Clay	0.87	2.34
Site 4	717,903.00	8,743,575.00	2.69	3.64	12	2.78-11.78	Sand/Clay	0.93	1.76
Site 5	718,571.00	8,743,429.00	3.32	4.12	12	2.63-11.63	Sand/Clay	1.25	2.07
Site 6	719,442.00	8,743,301.00	2.98	3.82	12	1.73-10.73	Sand/Clay	0.52	2.46
Site 8	718,532.00	8,743,236.00	3.46	4.26	9	2.37-8.37	Sand/Clay	0.83	2.63
Site 9 (P)	718,533.00	8,743,233.00	3.41	4.03	8	2.00-8.00	Sand/Clay	0.96	2.46
Camp Bore	718,367.00	8,742,658.00	18.72	19.35	42	27.1-39.1	Sand/Clay	3.10	15.62

3.2.2 Test Production Bores

One test production bores (Site 9) was constructed with 147 mm internal diameter uPVC casing and a wire wound (0.5 mm aperture) stainless steel screen. One camp water supply bore was constructed and cased with 147 mm internal diameter blank and slotted uPVC casing. The annulus in each bore was filled with washed filter gravel (3 - 6 mm).

The bores were developed by air-lifting techniques, until silt-free groundwater returns were obtained.

3.2.3 Groundwater Monitoring Bores

Seven groundwater monitoring bores (Sites 1 to 8) were drilled and constructed using 25 mm (MM series bores) or 50 mm (site series bores) blank and slotted uPVC casing, gravel packed with washed filter gravel. Bentonite seals were placed above the gravel pack and the bore annulus cement grouted to ground surface. A generalised north-south hydrogeological cross section is presented in Figure 12.

3.2.4 Bore and Aquifer Testing

Step-Drawdown Tests

The step-drawdown test (Camp Bore only) was used to determine bore pumping characteristics and estimate a pumping rate suitable for the constant-rate test. This test comprised pumping the bore at rates that were increased incrementally in 60 minute steps. Analyses of the results were used to determine well and formation loss factors and to select a suitable rate for the constant rate test.

The step-drawdown test results were analysed by the Bierschenk and Wilson method (Table 5, Figures 13).

Table 5
Step-Drawdown Test Results (Lethbridge Bay West)

Bore	Step Rate (kL/day)	Drawdown (30 mins) (m)	Formation Loss BQ (m)	Well Loss, CQ ² (m)	Well Efficiency (%)
Camp Bore	259	15.35	9.07	6.01	60

The Camp Bore has a low efficiency, possibly because of the slotted casing completion and the lower permeability aquifer.

Constant Rate and Recovery Tests

The constant-rate test in each production bore was commenced following the step-drawdown test and after groundwater levels had recovered to initial static levels for the Camp Bore. Upon completion of each constant-rate test, recovering groundwater levels were also measured and analysed.

The test pumping was undertaken by the drilling contractors using electric submersible pumps for the camp bore. Pumping rates were measured through a flow meter. Electric contact meters (dip meters) were used to measure groundwater levels in both the pumped bore and suitable observation bores. Small sampling pumps were used to conduct short-term aquifer testing at monitoring bore sites 3, 4, 6 and 9.

The constant-rate test results enable the hydraulic characteristics of the aquifers intersected by each test production bore to be determined. These parameters quantify the storage and transmission of groundwater in the aquifer.

The results of the constant-rate tests and the calculated hydraulic parameters are shown on Table 6, with drawdown plots for each test presented in Figure 14 to 19.

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Table 6
Constant-Discharge Test Results – Lethbridge Bay West

Pumping Bore	Date of Test	Pumping Rate (kL/day)	Final Drawdown (m)	Observation Bores		Transmissivity (m ² /day)		Storativity
				Bore No.	Distance (m)	Theis Method	Cooper – Jacob	
Camp Bore	9/11/2005	156	14.20	-	-	3.5 (Recovery)	-	-
Site 1B	15/11/2005	15	0.77	-	-	36	-	-
Site 3	15/11/2005	15	1.67	-	-	14	-	-
Site 4	15/11/2005	15	0.79	-	-	23 (Recovery)	-	-
Site 6	15/11/2005	15	0.43	-	-	-	-	-
Site 9(P)	15/11/2005	15	1.49	-	-	2.5 (Recovery)	-	-

3.3 Haul Road Dust Suppression Bores

3.3.1 Groundwater Drilling

Underdale Drillers completed test production bores with a truck-mounted drilling rig using mud-rotary methods.

Test production bores were drilled at 254 mm diameter and lined with 165 mm, nominal diameter blank and slotted uPVC casing. All holes were lithologically logged and sampled.

Bore construction details are summarised in Table 7 and discussed below. Bore completion diagrams are presented in Appendix A with bore locations presented in Figure 20.

Table 7
Haul Road Bore Construction Details

Site	MGA Easting	MGA Northing	Ground RL (m RL)	PVC RL (m RL)	Drilled Depth	Slotted Interval	Aquifer Type	S.W.L (m RL)	S.W.L (m bgl)
HR01	701982.00	8732778.00	60.29	61.31	45	22.1-34.1	Sandstone	47.08	13.22
HR03	717418.00	8705572.00	90.44	91.09	35.5	22.0-33.0	Sand	81.18	9.26
Pines Bore	704079.00	8702992.00	-	-	39	13.8-25.8	Sand/Clay	-	13.27

Production bores was constructed and cased with 147 mm internal diameter casing with the screened section comprising slotted uPVC (1 mm aperture). The annulus in each bore was filled with washed filter gravel (3 - 6 mm).

The bores were developed by air-lifting techniques, until silt-free groundwater returns were obtained.

3.3.2 Bore and Aquifer Testing

The step-drawdown tests were used to determine bore pumping characteristics and estimate a pumping rate suitable for the constant-rate tests. These tests comprised pumping the bore at rates that were increased incrementally in 60 minute steps. Analyses of these results were used to determine well and formation loss factors and to select a suitable rate for likely duty rates.

The step-drawdown test results have been analysed by the Bierschenk and Wilson method. (Table 8, Figures 21 to 24).

Table 8
Step-Drawdown Test Results (Haul Road Dust Suppression)

Bore	Step Rate (kL/day)	Drawdown (30 mins) (m)	Formation Loss BQ (m)	Well Loss, CQ ² (m)	Well Efficiency (%)
HR01	223	14.51	15.1	5.72	72
HR03	376	8.90	-	-	-
Pines Bore*	86	5.79	-	-	-
Three-ways	143	2.62	1.74	0.74	70

* - Short Term Constant Rate/Recovery Test

These bores have moderate efficiency, probably related to the slotted casing completion. Short term aquifer tests were completed on an existing bore “Three-ways” to determine the likely yield of the bore.

3.4 Regional Water Supply Bores

3.4.1 Groundwater Drilling

Two test production bores were drilled by Underdale Drillers with a truck-mounted drilling rig using mud-rotary methods. Why?

Test production bores were drilled at 254 mm diameter and lined with 165 mm, nominal diameter blank and slotted uPVC. All holes were lithologically logged and sampled. The initial Garden Point bore had insufficient sand to warrant completion and therefore a bore was constructed at a more prospective location (Garden Point No.2)

Bore construction details are summarised in Table 9 and discussed below. Bore completion diagrams are presented in Appendix A with bore locations presented in Figure 25.

Groundwater Drilling and Testing Program

SECTION 3

Table 9
Regional Water Supply Bore Construction Details

Site	MGA Easting	MGA Northing	Ground RL (m RL)	Drilled Depth	Slotted Interval	Aquifer Type	S.W.L (m RL)	S.W.L (m bgl)
Garden Point (Pensyl Yard)	655112.00	8737122.00	-	39	-	Clay	-	-
Housing Commission	652161.00	8757484.00	-	42	8.50-17.5	Sand	-	3.57
Garden Point No.2	655244.00	8737124.00	-	37	10.0-19.0	Sand	-	10.23

Test production bores were constructed and cased with 147 mm internal diameter blank and slotted (1 mm aperture) uPVC casing. The annulus in each bore was filled with washed filter gravel (3 - 6 mm).

The bores were developed by air-lifting techniques, until silt-free groundwater returns were obtained.

3.4.2 Bore and Aquifer Testing

The step-drawdown tests were used to determine bore pumping characteristics and estimate a pumping rate suitable for long-term tests. These tests comprised pumping the bore at rates that were increased incrementally in 30 minute steps. Analyses of these results were used to determine well and formation loss factors and to select suitable duty rates.

The step-drawdown test results have been analysed by the Bierschenk and Wilson method (Table 10, Figures 26 and 27).

Table 10
Step-Drawdown Test Results (Regional Water Supply Bores)

Bore	Step Rate (kL/day)	Drawdown (30 mins) (m)	Formation Loss BQ (m)	Well Loss, CQ ² (m)	Well Efficiency (%)
Garden Point No.2*	43	2.38	-	-	-
Housing Commission	105	0.50	0.36	0.10	77

* - Short Term Constant Rate/Recovery Test

The Housing Commission bore has a moderate to high efficiency, possibly as a result of the relatively low pumping rate during the test.

4.1 Regional Geology

The stratigraphy under the Tiwi Islands is summarised in Table 11 and described below.

Table 11
Stratigraphy of the Tiwi Islands
(Modified after Haig *et al*, 2003)

Formation	Age	Depth (m)	Lithology
Superficial Formations	Quaternary	< 10	Alluvial Silt/Sand/Gravel sediments.
Van Diemen Sandstone	Tertiary	0 - >60	Fine to medium grained quartzose sandstone.
UNCONFORMITY			
Moonkinu Member	Cretaceous	0 - 100	Very fine sandstone with interbeds of grey carbonaceous mudstone and siltstone.
Wangarlu Mudstone Member	Cretaceous	0 - 500	Mudstone/Siltstone.
Mullaman Beds	Cretaceous	600 - 750	Sandstone/Shale.
UNCONFORMITY			
Basement	Proterozoic	700+	Igneous/metamorphics.

The oldest rocks underlying the Tiwi Islands are Proterozoic basement comprising igneous and metamorphic rocks. Overlying the basement are thick units of Cretaceous Mullaman Beds that comprise sandstone and shale about 100 m thick. Overlying the Mullaman Beds is the Wangarlu Member (the oldest outcropping rock type on the Tiwi Islands) that comprises predominantly mudstone and is approximately 500 m thick.

Overlying the Wangarlu Member is the Moonkinu Member that comprises a very fine to fine-grained sandstone with interbeds of grey carbonaceous mudstone and siltstone. There is a sandstone horizon within the Moonkinu Member that comprises a regional confined aquifer.

Overlying the Cretaceous Moonkinu Member is the Tertiary Van Diemen Sandstone, a friable, white to yellow, medium to coarse-grained quartzose sandstone with subordinate intercalations of grey carbonaceous mudstone and siltstone of fluvial to paralic origin. The Van Diemen Sandstone dips and thickens to the north, with the unit exposed over a 60 m vertical section at Cape Van Diemen at the extreme northwestern tip of Melville Island (Matilda Minerals, 2004).

Unconsolidated Quaternary fluvial, paralic, deltaic and littoral deposits, overlie both the Moonkina Member and Van Diemen Sandstone. The most economically significant of these are the Pleistocene littoral quartzose sands associated with the palaeo-shoreline. Holocene (Recent) littoral deposits have

accumulated along the present coastline, variously abutting or transgressing the Cretaceous, Tertiary and Pleistocene deposits (Matilda Minerals, 2004).

4.2 Regional Groundwater Geology and Aquifer Occurrence

Regional groundwater resources of the Tiwi Islands have been described previously by Haig *et al*, 2003 and are summarised below.

4.2.1 Unconfined Aquifers

Regionally, unconfined aquifers occur in: (i) saturated portions of the Van Diemen Sandstone; and (ii) superficial sand sediments. Typically, there is a 10 to 30 m unsaturated zone in the Van Diemen Sandstone. Regionally, the Van Diemen Sandstone is present on most of Melville and Bathurst Islands, where the maximum known thickness is approximately 70 m.

4.2.2 Confined Aquifers

Regionally, the basal portion of the Mookinu Member (Sandy Horizon) is the main confined aquifer system under Melville and Bathurst Islands. It comprises grey sandstone with thin interbeds of grey siltstone and claystone and dips towards the northwest. The aquifer is approximately 30 to 60 m thick and occurs at about sea level (0 m AHD) in the central part of Melville Island and extends below sea level (-110 m AHD) at the north coast.

4.2.3 Aquifer Parameters

The hydraulic parameters of the aquifer systems are summarised below.

Table 12
Aquifer Parameters (After Haig *et al*, 2003)

Borefield	Transmissivity (T) m ² /day	Specific Yield (S _y)	Storage Coefficient
Unconfined Aquifer			
Milikapititi	200	0.1	N/A
Nguiu	110	0.1	N/A
Wurankuwa	50	0.1	N/A
Confined Aquifer			
Milikapiti	60	N/A	Unavailable
Wurankuwu	300	N/A	0.0001

N/A – Not Applicable

The transmissivity of the unconfined portion of the Van Diemen sandstone is moderate to high and ranges between 50 and 200 m²/day. Transmissivity of the confined portion is also moderate to high (60 to 300 m²/day).

4.2.4 Groundwater Quality

Regional groundwater quality is fresh for both unconfined (Van Diemen Sandstone) and confined aquifers (Mookinu Member, Sandstone Horizon). Bores constructed within unconfined aquifers located close to the coast can have brackish to saline groundwater, where a saltwater interface with the ocean is present. With the exception of pH, the groundwater in the unconfined and confined aquifers on Melville and Bathurst Islands is within the ANZECC water quality and monitoring guidelines for all community production bores (Haig *et al*, 2003).

Typical groundwater analyses for bores screened within the unconfined (Van Diemen Sandstone) and confined (Mookinu Member) aquifers are summarised in Table 13.

Table 13
Typical Groundwater Analysis Tiwi Islands (mg/L)
(After Haig *et al*, 2003)

	Unconfined Aquifer (RN027922)	Confined Aquifer (RN029292)
pH	5.6	6
EC (μS/cm)	40	20
TDS*	32	46
Na	5	2
K	<1	<1
Ca	2	<1
Mg	1	<1
Fe (Total)	0.1	1.9
Hardness (Total)	9	<1
Alkalinity (Total)	5	5
SiO ₂	12	11
Cl	9	6
SO ₄	<1	1
NO ₃	1	<1
HCO ₃	6	6
F	<0.1	<0.1

* TDS – total dissolved solids

4.3 Local Groundwater Geology and Aquifer Occurrence

4.3.1 Andranangoo Creek West Project

Aquifer Occurrence

Groundwater occurs within unconfined aquifers within the saturated Van Diemen Sandstone and superficial sediments on the coastal plain. Superficial sediments are limited in extent and thickness (generally less than 5 m) and usually coincide with the strand-line deposits. Underlying the superficial sediments is the Van Diemen Sandstone, which comprises medium to coarse-grained sand and silt with interbeds of clay. In the eastern project area, the superficial sediments are considerably thicker (MM7, 7m, MM8 >12.5, MM10 >15m MM11 9m and MM12 >12m) and may represent an old erosion channel in the Van Diemen Sandstone.

Groundwater Levels and Flow

Since early 2005, Matilda Minerals has established a regional network of groundwater monitoring bores to determine any potential impacts of the current mining operations on the groundwater resources of the area (Figure 2). The monitoring bores are located across the mine area and on the scarp where the camp water supply bore is located.

Groundwater levels across the mining area, for the end of the dry season in 2005, are presented in Figure 28. There is a northerly flow of groundwater from high elevations on the scarp to lower elevations on the coastal plain (about 1.5 m RL).

Based on recent groundwater monitoring, wet season groundwater levels are 2 to 3 m higher than dry season groundwater levels suggesting this is about the magnitude of seasonal variation.

Groundwater Quality

Groundwater samples were collected from Site 1(P), Site 4(P), Site 7(P) and the Camp Bore near the end of pumping tests. The samples were forwarded to for detailed analysis (Table 14).

Table 14
Recent Groundwater Analyses – Andranangoo Creek West

Analysis	Unit	Bore Number			
		Site 1(P)	Site 4(P)	Site 7 (P)	Camp Bore
pH		4.1	5.4	7.0	6.6
Total Dissolved Solids (TDS)	mg/L	248	78	151	58

Calcium	mg/L	<1	<1	35	2
Magnesium	mg/L	<1	<1	3	1
Sodium	mg/L	9	13	10	8
Potassium	mg/L	<1	<1	1	3
Sulphate	mg/L	<1	<1	2	<1
Chloride	mg/L	13	23	18	11
Nitrite	mg/L				<0.010
Nitrate	mg/L				<0.010
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	<0.001	<0.001	0.001	0.003
Copper	mg/L	0.002	0.001	<0.001	<0.001
Lead	mg/L	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.004	0.006	0.055	0.143
Nickel	mg/L	<0.001	<0.001	<0.001	0.002
Silver	mg/L	<0.001	<0.001	<0.001	<0.001
Thorium	mg/L	<0.001	<0.001	<0.001	<0.001
Uranium	mg/L	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	<0.005	<0.005	<0.005	0.016
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Alpha Activity	Bq/l	0.08	0.12	0.07	-
Total Beta Activity	Bq/l	0.14	0.22	<0.1	-
K ⁴⁰ corrected Beta	Bq/l	0.13	0.21	<0.1	-

The sodium chloride groundwater is fresh with laboratory salinities ranging from 58 to 248 mg/L TDS. Values of pH range from neutral at pH 7.0 to acidic at pH 4.1.

The camp bore groundwater does not exceed the Australian Drinking Water Health Guidelines for analytes measured, however manganese is slightly higher than the aesthetic guideline value of 0.1mg/L.

Salinity profiles (conductivity measurements) were undertaken on selective bores to determine the salinity distribution with depth on the coastal plain. Figure 29 shows the salinity distribution at the water table and Figure 30, at 9 m below ground surface. At the water table and at depth, groundwater is fresh, except for monitoring bores MM7, MM8, and MM12 in which the groundwater is saline.

4.3.2 Lethbridge Creek West Project

Aquifer Occurrence

Similar to Andranangoo Creek West, aquifers occur within superficial sediments on the coastal plain and the underlying Van Diemen Sandstone. From the drilling results, superficial sediments at Lethbridge Creek West are generally 5 m thick or less and comprise medium to coarse-grained sand. Locally, the Van Diemen Sandstone comprises fine to medium grained sand with clay and clay.

Groundwater Levels and Flow

A regional network of groundwater monitoring bores has been established by Matilda Minerals to determine any potential impacts of the current mining operations on the groundwater resources of the mining area (Figure 11). The monitoring bores are located across the mining area on the coastal plain and on the scarp where the camp water supply bore is located.

Groundwater levels across the mining area, for the end of the dry season in 2005, are presented in Figure 31. There is a northerly flow of groundwater from high elevations on the scarp to lower elevations on the coastal plain (elevation approximately 0.8 m RL).

Based on recent groundwater monitoring at Andranangoo Creek West, wet season groundwater levels are likely to be 2 to 3 m higher than dry season groundwater levels, suggesting this is about the magnitude of seasonal variation.

Groundwater Quality

Groundwater samples were collected from the Camp Bore and near the end of the Site 9 (P) pumping test and were forwarded for detailed laboratory analysis (Table 15).

Table 15
Recent Groundwater Analyses – Lethbridge Bay West

Analysis	Unit	Bore Number	
		Camp Bore	Site 9(P)
pH		5.8	7.6
Total Dissolved Solids (TDS)	mg/L	39	816
Calcium	mg/L	<1	80
Magnesium	mg/L	<1	16
Sodium	mg/L	8	206
Potassium	mg/L	<1	3

Sulphate	mg/L	<1	13
Chloride	mg/L	12	340
Nitrite	mg/L	<0.010	<0.010
Nitrate	mg/L	<0.010	<0.010
Arsenic	mg/L	0.002	-
Cadmium	mg/L	<0.0001	-
Chromium	mg/L	<0.001	-
Copper	mg/L	0.001	-
Lead	mg/L	<0.001	-
Manganese	mg/L	0.001	-
Nickel	mg/L	<0.001	-
Silver	mg/L	<0.001	-
Thorium	mg/L	<0.001	-
Uranium	mg/L	<0.001	-
Zinc	mg/L	0.010	-
Mercury	mg/L	<0.0001	-

The sodium-chloride groundwater is fresh with laboratory salinities ranging from 58 to 248 mg/L TDS and the pH (5.8) indicates that the groundwater is acidic.

The camp bore groundwater does not exceed the Australian Drinking Water Health Guidelines for analytes measured, however pH is lower than the aesthetic guideline value 6.5.

Salinity profiles (conductivity measurements) were undertaken on selective bores to determine the salinity distribution with depth on the coastal plain. Figure 32 shows the salinity distribution at the water table and Figure 33, at 9 m below ground surface.

Groundwater is brackish to saline throughout all areas of the coastal plain to a depth of 9 m. However, the bore at Site 8 had fresh groundwater, probably because the bore is located near the scarp and receives fresh groundwater from the Van Diemen Sandstone.

4.4 Potential Acid Sulphate Soils

Soil samples were taken using a spilt-spoon, hand auger sampler at four locations, three near existing production bores and one at Goose Lake, located approximately 500 m due south of monitoring bore MM4. Samples were taken at 0.25 m intervals to a depth of approximately 3 m, bagged and preserved by freezing. On-site field tests were not undertaken due to unavailability of hydrogen peroxide. Selective

samples below the water table were sent to ALS for suspension peroxide oxidation – combined acidity and sulphate analyses (SPOCAS). Table 16 summarises the samples collected.

Table 16
Potential Acid Sulphate Soil Testing – Andranangoo Creek West

	MM4	Site 1(P)	Site 4(P)	Site 7(P)	Goose Lake
Sample Interval mbgl	2.25-2.50	2.25-2.50	2.50-2.75	2.75-3.00	1.75-2.00
Sample Type	Sand	Sand	Sand	Sand	Sand

SPOCAS is a suspension peroxide oxidation method following the “sulphate trail” by determining the amount of 1M KCl extractable sulfur and the sulfur concentration after oxidation of soil sulphides. The ‘acidity trail’ is followed by measurement of TAA, TPA and TSA.. Liming rate is based on results for samples as submitted and incorporates a safety factor (fineness factor) of 1.5.

Analytical results are presented in Appendix B. For all samples, the sulphur trail was below the limits of recording (less than <0.02 % sulphur) and indicated that the samples were not likely to be acid forming. This is also support by low sulphate (less than 2 mg/L) in all bores sampled. It is probable, however, that acid generating environments may exist near wetlands, typically near site MM2.

5.1 Groundwater Flow Model Details

5.1.1 Model Code

The model code selected was MODFLOW-SURFACT. MODFLOW-SURFACT contains many advancements and improvements over the standard version of MODFLOW (USGS, 1989) including a more robust solution method and enhanced simulation capabilities for handling complex saturated/unsaturated subsurface flow. Features of MODFLOW-SURFACT include accommodation of desaturation and resaturation of multiple aquifers, handling of pumping wells screened across multiple model layers and addressing ponding effects for water tables rising above the ground surface. Visual MODFLOW Pro Version 4.1 was used as the pre- and post-processor.

5.1.2 Model Domain

The model domain measures 10 km east-west and 5.5 km north-south and was divided into 518,466 model cells (391 columns x 221 rows x 6 layers) with variable grid sizes. Each cell block represents a homogeneous hydrogeologic sub-unit of the hydrostratigraphic unit.

5.1.3 Model Setup and Layering

In order to capture the regional and local flow of groundwater and physical changes caused by mining, the numerical model includes the major groundwater flow domains. Five hydrogeological domains, identified in the conceptual model, were modelled as individual layers. Additionally, the upper Van Diemen Sandstone was subdivided into two layers (layers 2 & 3).

Table 17
Model Layers

Layer	Descriptions
1	Coastal Sand/Mineralised zone (to the north) and Van Diemen Sandstone (to the south)
2	Van Diemen Sandstone (upper)
3	Van Diemen Sandstone (upper)
4	Van Diemen Sandstone (Clay member)
5	Van Diemen Sandstone (Ferruginous sand member)
6	Moonkinu Member

5.1.4 Distribution of Hydraulic Properties

Uniform hydraulic conductivities (permeabilities) were assigned to layers 2, 3, 4, 5, 6. Layer 1 was sub-zoned based on the interpreted distributions of coastal sand in the north and north eastern part of the model. Figure 34 shows the hydraulic conductivity distribution in cross section.

5.1.5 Boundary Conditions

Rainfall over the island recharges the aquifers in the Van Diemen Sandstone. Groundwater in the Van Diemen Sandstone flows north through the study area and discharges at the coastline. This simplistic system is represented in the model by a constant groundwater head (10 m RL) in the Van Diemen Sandstone up-gradient of the site and a constant head at the coast line (0 m RL).

Rainfall recharge is assigned to the model domain and is applied directly to the water table. The rainfall recharge rate is calculated as a percentage of rainfall and is applied variably over the model domain depending on the lithology (upper layers) and topography. In general, rainfall recharge over the coastal sands and Van Diemen Sandstone is estimated to be approximately 40% and 12% of rainfall, respectively.

In order to accurately simulate water table rise to the land surface, a 'ponding elevation' of 0 m is applied to the model domain, whereby, if the water table rises above the ground surface the water is removed from the system to maintain the water table at or below the surface.

Evapotranspiration is assigned to vegetated parts of the model domain. Annual evapotranspiration is assumed to be 1000 mm/year, occurring dominantly in the dry season. Simulated evapotranspiration effects extend up to 3 m below ground level.

5.1.6 Test Production Bores

The site test production bores are screened across two layers in the model, in order to more accurately simulate abstraction from production bores using the Fracture Well package. This package automatically proportions the abstraction between the layers based on the transmissivity of the contributing well node.

5.1.7 Simplifying Assumptions for Modelling

Simplifying assumptions were made in order to discretise the groundwater flow conditions into a manageable package, without sacrificing the ability to simulate features that significantly contribute to the groundwater flow regime. These assumptions are summarised below:

Aquifer Base

The base of the model corresponds to an arbitrary cut off in the Moonkinu Member, which comprises low permeability sediments that do not form a significant part of the most active flow system.

Top of Model

The top of the model is the current topography based on site survey data for the immediate mining area and regional topographic maps for the remaining areas.

Boundary Conditions

The elevation of the constant head boundary simulating through-flow in the Van Diemen Sandstone (southern boundary) is based on regional groundwater water levels that indicate groundwater depths 10 to 15 m below ground surface.

The constant head boundary condition assigned to the coast is assumed to have a mean sea level of 0 m RL. Tidal variations have not been applied to the groundwater model.

Hydraulic Parameters and Material Types

The calibrated hydraulic parameters are interpreted to be representative beyond the calibrated domain of the model.

5.1.8 Limitations of the Model

The developed groundwater flow model has limitations. These limitations result from generalisations, interpretations and assumptions made in attempting to simulate the interpreted hydrogeology. The complexities of the hydrogeological regime at Andranangoo mean that this model should only be used as a guide to determine impact areas. The interpretation of predictive simulations should be based on the assumptions made.

5.2 Andranangoo Creek West Project

5.2.1 Model Calibration

The purpose of calibration is to establish that the model can reproduce measured groundwater levels and flows, both regionally and during aquifer tests, i.e. the model can reasonably represent the conceptual hydrogeological model of the deposit and environs.

Calibration of the model occurred in two steps and these are described below.

Steady State

A steady state calibration was completed by:

- Assigning estimated hydraulic properties to the various material types in the model;

-
- Assigning assumed groundwater levels to the model boundaries, based on topography and known groundwater levels in the modelled area; and
 - Running the model under current known hydraulic conditions for an infinite time (i.e., steady-state) to establish the regional groundwater flow gradient, flow pattern and groundwater elevations in the area.

Transient

The groundwater elevations resulting from the steady-state calibration were used as initial conditions for all transient simulations. Whenever the transient calibration involved significant changes to the hydraulic conductivity, the steady state calibration was repeated with the new set of hydraulic conductivity values to obtain a new set of initial conditions.

During the transient calibration process, the hydraulic parameters were varied slightly in order to get the best fit of modelled drawdown to actual drawdown measured in observation bores during aquifer tests. The transient calibration was repeated for each of the aquifer tests in the test production bores with simulated groundwater levels tracked at the observation bore locations.

This process involved adjusting the hydraulic parameters, within realistic ranges, so that the simulated groundwater levels in each of the observation bores during testing of the three test production bores (Figure 35) closely matched the observed groundwater levels in the monitored observation bores (Figure 28). Graphs of simulated drawdown were compared with actual drawdown that occurred during the tests.

During this iterative process it was determined that the calibrated hydraulic parameters assigned to the Van Diemen Sandstone and the coastal sands are relatively sensitive to the groundwater levels assigned in this area and hence the groundwater gradient established in the Van Diemen Sandstone. The groundwater levels assigned to the southern boundary of the model in the Van Diemen Sandstone are not well defined and became an important parameter in the calibration process.

The model is assumed calibrated when a set of hydraulic parameters closely reproduces the observed drawdown responses in each of the observation bores during the aquifer tests.

The results from aquifer test calibrations for test production bore sites 1, 4 and 7 are presented in Figure 36 to 38, respectively.

The results for seasonal water level calibration are presented in Figure 39.

5.2.2 Model Calibration Sensitivity

The model calibration analysis shows that the results are sensitive to the amount of throughflow from the Van Diemen Sandstone. Higher throughflow can be achieved by increasing the hydraulic conductivity of this formation or increasing the groundwater gradient in the formation. Observations during drilling and the modelling results indicate that this material should have a low to moderate hydraulic conductivity and

the results of the aquifer test indicate moderate to high throughflow. Therefore, the groundwater gradient in the Van Diemen Sandstone has to be reasonably steep to achieve model calibration. The balance between a realistic groundwater gradient and effective hydraulic conductivity was varied during the calibration of the model.

5.3 Derived Hydraulic Parameters

Numerous transient calibration runs were completed in order to match simulated aquifer test drawdown to actual and this produced a reasonably satisfactory calibration, given the lack of data. Table 18 summarises the hydraulic parameters derived from the calibrated model that broadly correspond with the values derived from the aquifer tests.

Table 18
Hydraulic Parameters Derived from the Andranangoo Creek West Calibrated Model

Layer	Formation/Lithology	Hydraulic Conductivity (Permeability)			Specific Storage	Specific Yield
		Kx	Ky	Kz		
		(m/d)	(m/d)	(m/d)	(1/m)	(-)
1	Superficial Sands	15	15	1	1e-3	0.25
2	Van Diemen Sandstone (upper)	20	20	0.005	1e-6	0.05
3	Van Diemen Sandstone (clay member)	0.01	0.01	0.001	1e-6	0.01
4	Van Diemen Sandstone (Ferruginous sandstone member)	12	12	0.2	1e-5	0.1
5	Moonkinu Member	0.001	0.001	0.0001	1e-6	0.01

5.3.1 Predictive Simulations

Using the calibrated model, simulations of the borefield operation were undertaken based on the processing site mine water balance (Figure 40). Based on 90% return water from the dewatering cyclone and a net loss of 360 kL/day from sand tailings return water through seepage, the required bore groundwater supply is 840 kL/day. A camp water supply of 100 kL/day is also required. Based on these water requirements, the groundwater model was run for three years (anticipated mine life at Andranangoo). Duty rates for the simulated production bores are presented in Table 19.

Table 19
Andranangoo Creek West - Simulated Bore Abstraction Rates

Bore	Simulated Rate (kL/day)
Site 1(P)	432
Site 4(P)	181
Site 7(P)	155
Camp Bore	173
Total	941

Figures 41 and 42 show the predicted water table elevations after three years of borefield operation for both dry and wet seasons. The groundwater levels show a groundwater gradient towards the coast where groundwater levels are maintained above 0 m RL for both seasons.

Figure 43 show the predicted groundwater level drawdown in Layer 1 at the end of the dry season, after three years of borefield operation. The cone of depression is greatest near the production bores where 0.4 m drawdown is observed up to 100 m from the operational bores on the coastal plain. The limit of water table drawdown (less than 0.1 m) extends to the coast at the end of the dry season. Groundwater drawdown in layer 3 (Figure 44) shows the cone of depression (less than 0.1 m) does not reach the coast.

5.4 Lethbridge Creek West Project

The coastal plain at Lethbridge Creek West is saline and for environmental reasons borefields for process water supply would be located within the Van Diemen Sandstone on the scarp, in areas where permeable sediments would be located. A future groundwater exploration programme will be required to locate prospective sites south of the coastal plain. Based on calibrated model results at Andranangoo Creek West, a conceptual groundwater model was constructed to determine the likely drawdown associated with borefield operation.

The model domain is 10km by 10km, with variable grid spacings between 200 m and 12.5 m. The model consists of two layers, representing an upper Van Diemen Sandstone sequence and a Lower Van Diemen Sandstone sequence. The top of the model is an arbitrary cut off above the water table and the bottom of the model is an arbitrary cut off in the lower Van Diemen Sandstone sequence. Constant head boundary conditions were assigned to the north and south boundaries of the model to simulate the water table within the upper Van Diemen sandstone sequence, such that the saturated thickness of the Upper Van Diemen Sandstone sequence is 10 m. No recharge was applied to the model domain.

Table 20 presents parameters assigned to the model.

Table 20
Lethbridge Creek West Model - Hydraulic Parameters

Layer	Kxy	Kz	Ss	Sy
Layer 1	20	0.005	1e-6	0.05
Layer 2	0.01	0.001	1e-6	0.05

5.4.1 Predictive Simulations

Simulations of the borefield operation were undertaken, based on the processing site mine water balance (Figure 40). Based on 90% returns from the dewatering cyclone and a net loss of 360 kL/day seepage from sand tailings return water, the required process bore groundwater supply is 840 kL/day.

Four production bores at a uniform spacing of 500 m, with abstraction rates of 200 kL/day per bore, were simulated from the Upper Van Diemen Sandstone. Abstraction for 365 days was simulated to determine predicted water table drawdown, although the mining operations are expected to last for only six months.

Figure 45 shows the extent of the drawdown, which is predicted to be 1.5 to 2 km from the borefield under the current modelled scenario. Groundwater level drawdown within 50 m of the production bores is likely to be between 0.9 and 1.6 m.

6.1 Andranangoo Creek West Project

6.1.1 Magnitude of Regional Drawdown

At the water table, the limit of drawdown at the end of dry season is located near the coast. As groundwater levels remain above sea level and a groundwater gradient occurs between the scarp and the coast, it is unlikely that this drawdown will cause seawater intrusion into the sediments.

A perennial waterhole is located 150 m to the east of monitoring bore MM2. The predicted drawdown at this location is less than 0.1 m. A reduction in groundwater level of 0.1 m may result in a decrease in the depth and extent of the waterhole earlier in the dry season, before being replenished during the following wet season when groundwater levels rise above ground surface.

6.1.2 Potential Impacts on Other Groundwater Users

Groundwater level lowering associated with groundwater abstraction can cause drawdown in groundwater supply bores (stock wells, private domestic supply bores and industrial supply bores) in the surrounding area, depending on distance from the borefield.

Based on current knowledge and a NT Government database search, other (non Matilda Minerals) groundwater bores in the mining area do not exist.

6.1.3 Potential Impacts to Groundwater Dependent Ecosystems

Groundwater dependent ecosystems (GDEs) are those parts of the environment, in regard to the species composition and natural ecological processes, that are determined by the permanent or temporary presence of groundwater resources. For the purposes of defining ecosystem dependence on groundwater, groundwater is defined as water that has been below ground and would be unavailable to plants or animals were it to be abstracted by pumping. Ecological water requirements are defined as the water regime needed to maintain ecological values of water dependent ecosystems.

After the end of the wet season, the waterhole (near MM2) becomes a GDE as it depends on groundwater to maintain water levels. The modelling results discussed in Section 5.3.1 indicate that a reduction in groundwater levels in unconfined aquifers can be expected to result in a decrease in the depth and extent of the waterhole earlier in the dry season, prior to it being replenished in the following wet season. The biological implications of this are reported in the EIS.

Near the production bores, groundwater level drawdown may reduce the availability of groundwater to vegetation, typically near the end of the dry season as groundwater levels are likely to be lower than historical levels. The biological implication of this are reported in the EIS.

6.2 Lethbridge Bay West Project

6.2.1 Magnitude of Regional Drawdown

A prospective location for process water supply is located on the scarp, south of the mining area. The extent of drawdown is likely to be between 1.5 and 2 km from the borefield. Groundwater level drawdown is predicted to be about 1 m at a distance of 50 m from the borefield.

Impacts associated with drawdown would need to be assessed, based on the location of the borefield. As groundwater levels are relatively deep on the scarp, impacts of reduced groundwater levels at the ground surface are not likely.

7.1.1 Groundwater and Environmental Monitoring Requirements

The current groundwater monitoring network will be used to meet environmental licensing guidelines associated with the borefield operation.

Requirements for groundwater monitoring could include:

- Monitoring fluctuations in groundwater levels,
- Monitoring of borefield abstraction,
- Monitoring of process water recovery rates, and
- Monitoring groundwater salinity variations between the coast and borefields.

8.1 Conclusions

- A groundwater drilling and testing program has been completed at the Andranangoo Creek West and Lethbridge Bay West deposits to elucidate the hydrogeology and assist in designing a predictive groundwater flow model to assess the potential environmental impacts of process water borefield operation. This program has also helped to determine the hydrogeological characteristics of alluvial aquifers underlying both deposits.
- The hydrogeology and groundwater occurrence away from the mining area is largely unknown. While the groundwater model has been designed to take account of the significant hydrogeological features in the mining area, regional groundwater flow and occurrence have been based only on regional geology.
- The groundwater model can be used to obtain order-of-magnitude estimates of groundwater level lowering resulting from borefield operation. Calibration of the model is based on three aquifer tests, each with one or two observation bores.
- At the Andranangoo Creek West deposit, the modelling results indicate that groundwater level drawdown associated with groundwater abstraction will reduce groundwater levels by up to 0.4 m, 100 m from production bores. Groundwater level drawdown is limited at the coast (less than 0.1 m) where groundwater levels at the water table remain above sea level at 0.5 m RL. Under all simulated groundwater abstraction scenarios, a groundwater gradient towards the coast still exists and the groundwater elevation remains above sea level at the coast. Therefore, seawater intrusion resulting from the simulated groundwater abstraction is unlikely.
- At the Andranangoo Creek West deposit, the modelling results also indicate a reduction of less than 0.1 m in groundwater levels under a perennial waterhole, located 150 m east of monitoring bore MM2. This magnitude of water table drawdown may result in a decrease in the depth and extent of the waterhole earlier in the dry season than would naturally occur.
- At Lethbridge Bay West, conceptual modelling results indicate a borefield comprising four bores at a spacing of 500 m located on the scarp would supply the process water requirements for the mine. Groundwater level drawdown is predicted to be about 1 m at a distance of 50 m from the borefield. The extent of drawdown to a drawdown level of 0.1 m is likely to be between 1.5 and 2 km from the borefield. There would be a rapid recovery following cessation of mining, which, at Lethbridge, is expected to be only approximately six months.
- Based on the preliminary modelling results, it appears that the groundwater-related impacts associated with mining will be minor and of short duration. Both proposed mining areas are underlain by a significant thickness of permeable sand deposits, which contain relatively large groundwater resources. Groundwater throughflow to the coast is significant and it appears that the proposed groundwater abstraction associated with mining will not change this.

-
- Significant GDEs do not appear to be common in the area. Simulated drawdown under a local waterhole is less than 0.1 m during the dry season and this will only impact the water level for a very short period at the end of the dry season.

8.2 Recommendations

- Preparation for the monitoring programs outlined in Section 7.1.1 should proceed.
- Groundwater monitoring at Andranangoo Creek West should continue before and during mining in order to quantify: (i) seasonal groundwater levels and fluctuations throughout the mine area ;and (ii) drawdown associated with borefield and mining operations.
- Groundwater salinity profiles in monitoring bores should be undertaken at regular intervals before and during mining to monitor groundwater quality and any changes in groundwater quality (especially near the coast) related to groundwater abstraction..
- During mining, the quality and quantity of the process water should be monitored regularly to determine any variations that may impact processing or indicate an environmental impact.
- As additional groundwater data become available, the groundwater model should be refined and re-calibrated and additional predictive scenarios completed.

KRUSEMAN, G.P., and De RIDDER, N.A., 1994, Analysis and Evaluation of Pumping Test data, Second Edition, Publication 47, International Institute for Land Reclamation and Improvement.

HAIG, T., KNAPTON, A. and MATSUYAMA, A., 2003, Water Resources of the Tiwi Islands: Main Report, Volume 1, Report number 26-2003D, Department of Infrastructure, Planning and Environment, Northern Territory Government, August 2003.

MATILDA MINERALS LTD, 2004, Mining Management Plan 2004/2005 for Tiwi Islands Exploration.

NATIONAL HEALTH AND WATER QUALITY RESERCH COUNCIL, 2004, Australian Drinking Water Guidelines, 2004.

URS AUSTRALIA PTY LTD, 2005, Tiwi Island Hydrogeological Review, Unpublished Report to Matilda Minerals Ltd, April 2005.

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Matilda Minerals Ltd and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 26 August 2005.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between 4 September 2005 and 20 December 2005 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

This report contains information obtained by inspection, sampling, testing or other means of investigation. This information is directly relevant only to the points in the ground where they were obtained at the time of the assessment. The borehole logs indicate the inferred ground conditions only at the specific locations tested. The precision with which conditions are indicated depends largely on the frequency and method of sampling, and the uniformity of conditions as constrained by the project budget limitations. The behaviour of groundwater and some aspects of contaminants in soil and groundwater are complex. Our conclusions are based upon the analytical data presented in this report and our experience. Future advances in regard to the understanding of chemicals and their behaviour, and changes in regulations affecting their management, could impact on our conclusions and recommendations regarding their potential presence on this site.

Where conditions encountered at the site are subsequently found to differ significantly from those anticipated in this report, URS must be notified of any such findings and be provided with an opportunity to review the recommendations of this report.

Whilst to the best of our knowledge information contained in this report is accurate at the date of issue, subsurface conditions, including groundwater levels can change in a limited time. Therefore this document and the information contained herein should only be regarded as valid at the time of the investigation unless otherwise explicitly stated in this report.

URS Australia**Andranangoo MM1b**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**

Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**

Date Started: **11-6-05** Orientation: **0 deg.**

Date Finished: **11-6-05**

Relative Level: **5.18 mRL**

Coordinates: **8743122.96 mN**
699215.36 mE

Permit No: **N/A**

Drill Type: **Air Core**

Drill Model:

Drill Fluid: **None**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- Dark grey/black, fine to medium grained, quartz, well sorted, sub angular to sub rounded

SAND- grey, medium grained, well sorted, sub angular

SAND- light grey, fine to medium grained, quartz, minor black mineral, sub angular to sub rounded

SAND- dark grey, medium to slightly coarse, sub angular to sub rounded, minor black mineral

SAND- red/brown, medium to slightly coarse, sub angular to sub rounded, minor black mineral

SAND- yellow/brown, fine to medium grained, slightly clayey, well sorted

SAND- yellow/grey, fine to medium quartz, sub angular to sub rounded, moderately sorted

SAND- pale grey, fine to medium quartz, minor black mineral, well sorted

SAND- pale white/grey, medium grained, sub angular, minor black mineral, becoming pale yellow, well sorted

SAND/CLAY- yellow/red, medium to fine coarse quartz, medium to poorly sorted

SILTY/CLAY - cream/white, fine to medium quartz, 20% clay

SAND/CLAY- white/yellow/purple, molted red quartz grains

SAND/CLAY- white/grey, medium grained quartz, sticky

SAND/CLAY- yellow, fine to medium quartz, silty clay

SAND/CLAY- white/grey/purple/brown, weather-bedded sand/clay, medium grained quartz, silty plastic clay

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete

SWL at 3.39

Hole 75mm 0-12m

Soil cutting used to backfill hole

UPVC Class 9 pipe 25mm

Bentonite

Gravel filterpack

Slotted interval 9.75-11.75m
Slotted UPVC Class 9 pipe

Hole backfilled

URS Australia**Andranangoo MM2**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**

Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**

Date Started: **10-6-05** Orientation: **0 deg.**

Date Finished: **13-6-05**

Relative Level: **4.68 mRL**

Coordinates: **8743042.37 mN**
699690.33 mE

Permit No: **N/A**

Drill Type: **Air Core**

Drill Model:

Drill Fluid: **None**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND/CLAY- green/grey, medium grained, minor tree roots, mottled clay, poorly sorted

SAND/CLAY- red/brown, medium grained, mottled

SAND/CLAY- cream/white, fine to medium grained, quartz, soft

SAND/CLAY- cream/pink/white/grey, medium grained, slight plasticity, dry, soft

SAND/CLAY- white, fine to medium grained, silty, soft

SAND- pale yellow, fine to medium grained, slightly clayey, moderately sorted

SAND/CLAY- pale yellow/red/brown, medium to coarse grained, hard laterite bed, moderately sorted

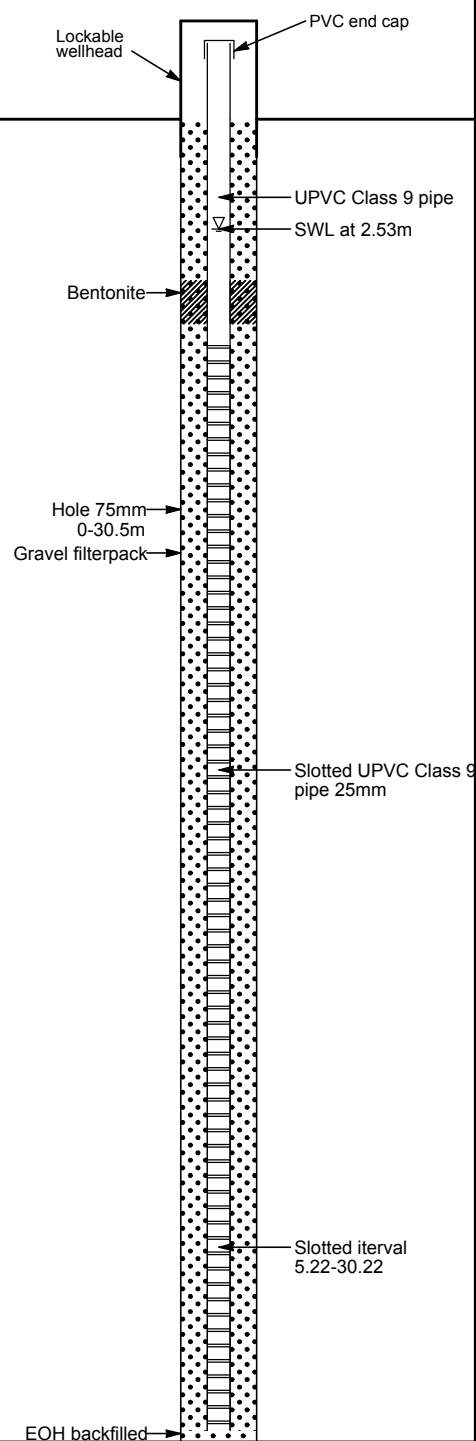
SAND/CLAY- pale pink/tan, fine to coarse grained, quartz, poorly sorted

CLAY/LATERITE- brown/red, high plasticity, clay, interbedded laterite beds

CLAY- grey/brown, high plasticity, silty, mottled

CLAY- dark grey, high plasticity, minor hard siltstone interbedded beds

SILTSTONE- grey, fine to medium grained, quartz, interbedded with carbonaceous clay, hard

WELL CONSTRUCTION DETAILS

URS Australia**Andranangoo MM3**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**

Relative Level: **3.81 mRL**

Drill Type: **Air Core**

Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**

Coordinates: **8743309.26 mN**

Drill Model:

Date Started: **13-6-05** Orientation: **0 deg.**

699693.39 mE

Drill Fluid: **None**

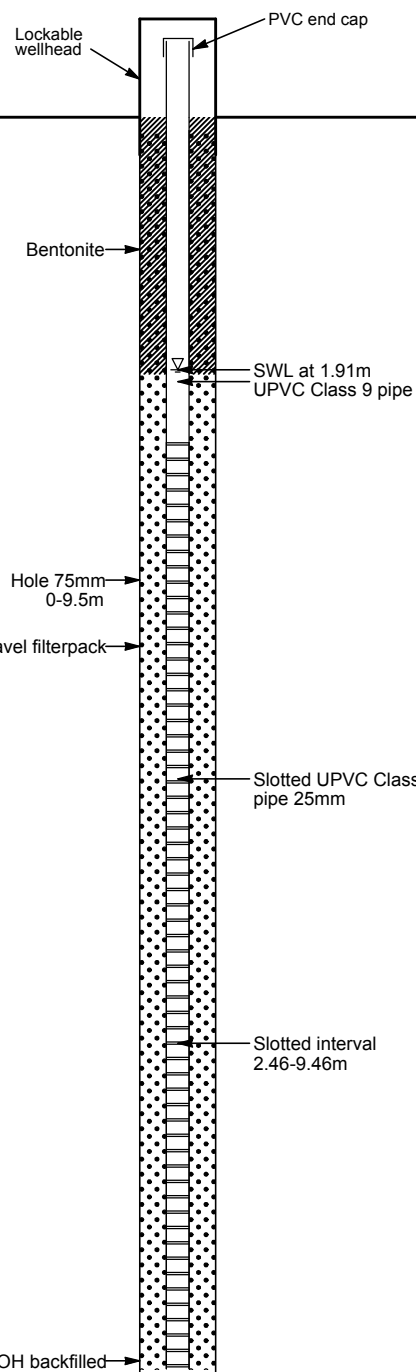
Date Finished: **13-6-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

SAND- dark grey/red, minor gravel, quartz, well sorted, minor organics

SAND- grey, medium grained, sub angular, well sorted

SAND- dark grey/brown, fine to medium grained, sub angular, moderately well sorted

SAND- dark orange/brown, medium grained, moderately well rounded, moderately well sorted

SAND- brown/grey, medium grained, moderately well sorted

SAND- dark blue/grey, medium grained, clayey

SAND- blue/grey, very fine to medium grained, silty, shell fragments, poorly sorted

SAND- blue/grey, medium grained, minor shell fragments, sub angular, moderately well sorted

SAND- grey, medium grained, 40% shell fragments, poorly sorted

SAND- grey/yellow, fine to medium grained, sub angular, poorly sorted

SAND/CLAY- white/grey/yellow, medium grained, silty, clay, soft

SAND/CLAY- white/grey, fine to medium grained, soft

EOH @ 9.5m- Extent of investigation

URS Australia**Andranangoo MM4**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**

Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**

Date Started: **12-6-05** Orientation: **0 deg.**

Date Finished: **12-6-05**

Relative Level: **3.86 mRL**

Coordinates: **8743190.77 mN**
700313.60 mE

Permit No: **N/A**

Drill Type: **Air Core**

Drill Model:

Drill Fluid: **None**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- dark grey/black, fine to medium grained, sub angular, moderately to well sorted

SAND- white/grey, fine to medium grained, sub angular, well sorted

SAND- yellow/brown, fine to coarse grained, sub angular, poorly sorted

SAND/GRAVEL- yellow/brown, fine to coarse sand, minor to moderate sandstone, poorly sorted

SAND/CLAY- white/grey, fine to medium grained sand

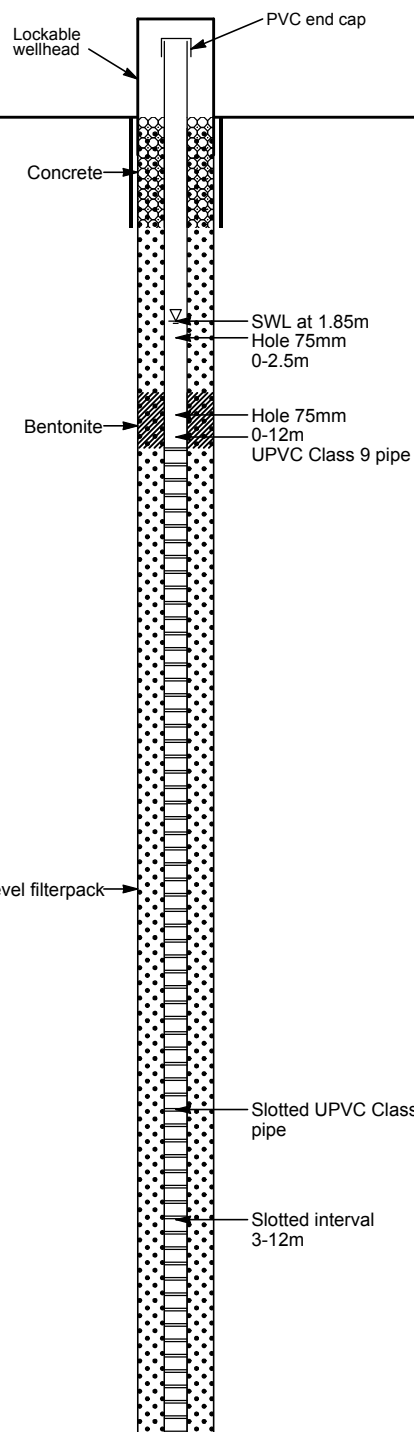
SAND- white/grey/cream, fine to medium grained, sub angular, silty, moderately sorted

CLAY- red/brown, silty, dry, soft

CLAY- red/brown/grey- slight plasticity

SAND/CLAY- red/brown/yellow, silty, soft, dry

SAND/CLAY- white/grey, fine to medium grained, sub angular, sand, soft, silty

WELL CONSTRUCTION DETAILS

URS Australia**Andranangoo MM5**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**

Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**

Date Started: **13-6-05** Orientation: **0 deg.**

Date Finished: **13-6-05**

Relative Level: **2.33 mRL**

Coordinates: **8743302.48 mN**
700998.14 mE

Permit No: **N/A**

Drill Type: **Air Core**

Drill Model:

Drill Fluid: **None**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND-dark grey, fine to medium grained, sub angular, moderately well sorted

SAND- dark brown/grey, fine to medium grained, sub rounded, moderately sorted

SAND- very dark brown, fine to medium grained, sub rounded, well sorted

SAND- brown, fine to medium grained, sub angular, minor shell fragments

SAND- light brown, fine to coarse grained, sub angular, moderately sorted

SAND- pale yellow/cream, fine to coarse grained, 20% shell fragments, sub angular, poorly sorted

SAND- yellow/tan, fine to medium grained, sub angular

SAND/CLAY- red/brown, fine to medium grained

SAND/CLAY- red/brown/white/grey, fine to coarse grained, silty clay

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Bentonite

UPVC Class 9 pipe

SWL at 1.85m

Hole 75mm
0-9m

Gravel filterpack

Slotted UPVC Class 9
pipe 25mm

Slotted interval
1.1-8.1m

EOH backfilled

URS Australia**Andranangoo MM6**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**

Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**

Date Started: **13-6-05** Orientation: **0 deg.**

Date Finished: **13-6-05**

Relative Level: **3.57 mRL**

Coordinates: **8743187.24 mN**
701494.37 mE

Permit No: **N/A**

Drill Type: **Air Core**

Drill Model:

Drill Fluid: **None**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Bentonite

UPVC Class 9 pipe

SWL at 2.19m

Hole 75mm
0-9m

Slotted UPVC Class 9
pipe 25mm

Gravel filterpack

EOH backfill

SAND- dark grey, fine to medium grained minor organics

SAND- grey, fine to medium grained, sub angular, well sorted

SAND- pale grey, fine to coarse grained, sub angular, poorly sorted

SAND- brown/grey, fine to medium grained, silty clay

SAND/GRAVEL- brown/grey, fine to medium grained sand, sub angular, moderately well sorted, minor clay

SAND/GRAVEL- orange/brown, laterite, gravel

SAND/CLAY- pale orange/brown, medium grained, sub angular, moderately well sorted

SAND/CLAY- pale cream/white, fine to medium grained, sub angular, minor clay nodules

CLAY/SAND/LATERITE- red/brown/grey/white, fine to medium grained sand, minor laterite gravel

CLAY/LATERITE- red/brown, ironstone, laterite, gravel, high plasticity clay

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Andranangoo MM7

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **13-6-05** Orientation: **0 deg.**
Date Finished: **13-6-05**

Relative Level: **2.94 mRL**
Coordinates: **8743197.49 mN**
701899.83 mE
Permit No: **N/A**

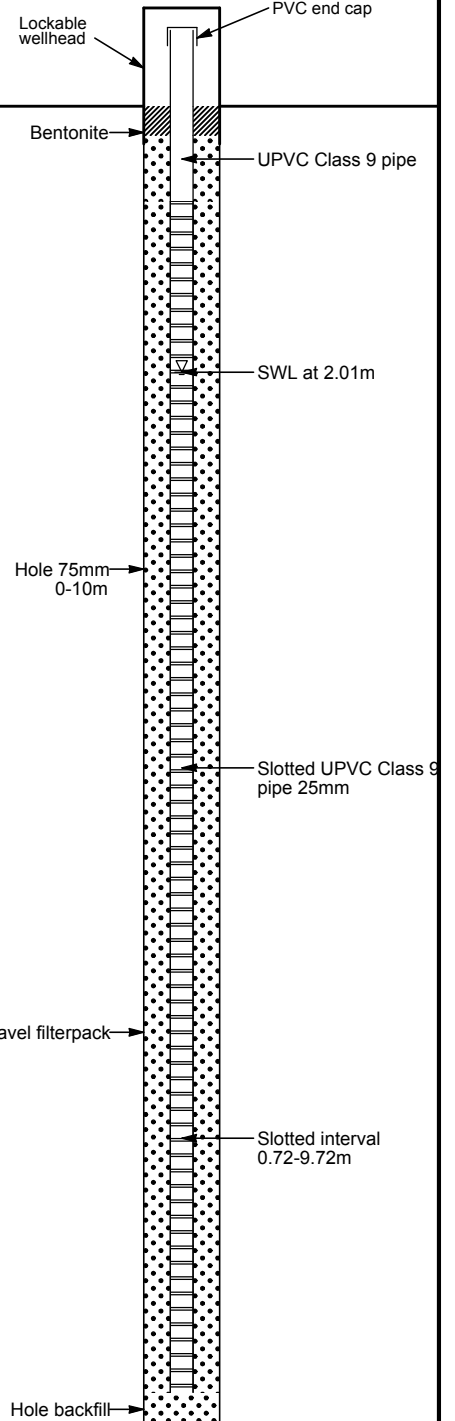
Drill Type: **Air Core**
Drill Model:
Drill Fluid: **None**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS



SAND-dark grey, fine to medium grained,sub angular,well sorted

SAND- dark brown, fine to medium grained

SAND- pale to dark brown, fine to medium grained,silty,sub angular,moderately sorted

SAND- grey/brown, fine to medium grained,sub angular,moderately sorted

SAND-pale grey, very fine to fine grained,sub angular,moderately well sorted

SAND-pale grey, very fine to fine grained,sub angular,moderately well sorted

SAND- grey/pale brown, fine to coarse sand,20% shell fragments,silty

SAND- pale yellow/brown,medium grained,sub angular,well sorted

SAND/LATERITE/CLAY- dark grey/red/brown, medium to coarse sand,sub angular,poorly sorted,laterite sandstone bond

CLAY- white/grey/red/brown, fine to medium grained sand

URS Australia

Andranangoo MM8

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **13-6-05** Orientation: **0 deg.**
Date Finished: **13-6-05**

Relative Level: **3.50 mRL**
Coordinates: **8742941.71 mN**
702493.72 mE
Permit No: **N/A**

Drill Type: **Air Core**
Drill Model:
Drill Fluid: **None**

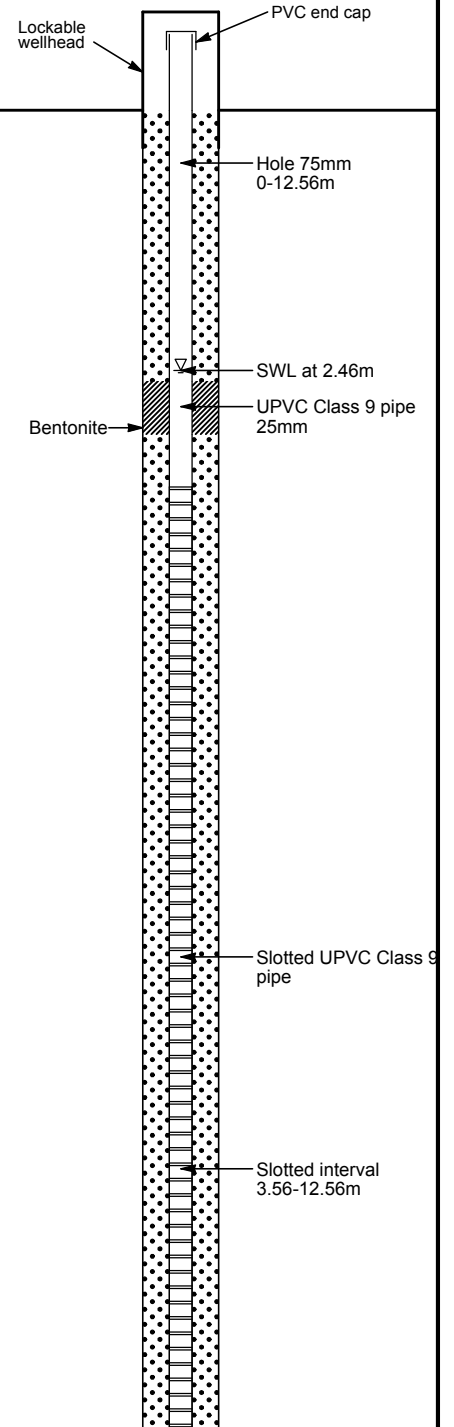
Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- dark grey, fine grained, minor organics
SAND- grey brown, fine to medium grained, sub angular, moderately sorted
SAND- dark brown/grey, fine to medium grained, sub angular
SAND- yellow brown, fine to coarse grained, sub angular, moderately sorted
SAND- pale tan/grey, fine to coarse grained, sub angular, moderately sorted
SAND- grey, fine to medium grained, silty clay, minor shell fragments
SAND- grey, shell grit, fine to medium grained, 20% shell fragments, poorly sorted
SAND- grey, fine to medium grained, sub angular, moderately well sorted
SAND- pale grey/white, medium grained, sub angular, well sorted, clean
End of Hole 12.5m

WELL CONSTRUCTION DETAILS



URS Australia**Andranangoo MM9**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**

Relative Level: **21.29 mRL**

Drill Type: **Air core**

Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**

Coordinates: **8742643.99 mN**

Drill Model:

Date Started: **14-6-05** Orientation: **0 deg.**

700397.97 mE

Drill Fluid: **None**

Date Finished: **14-6-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete

UPVC Class 9 pipe
25mm

Soil cuttings used to
backfill hole

Hole 75mm
0-42m

SWL at 17.76m

Bentonite

Slotted UPVC Class 9
pipe

EOH backfilled

SAND/GRAVEL- dark grey/brown, silty, laterite, gravel	0
CLAY- red/brown, medium grained, quartz, fragments of clay, laterite	1
	2
	3
SAND/CLAY- pale red/brown, fine to medium grained, sub angular, soft, dry	4
	5
	6
	7
SAND/CLAY- pale tan/brown, very fine grained, silty, sub angular poorly sorted	8
	9
	10
SAND/CLAY- pale tan/white, fine to medium grained, silty, moderate plasticity, dry	11
	12
	13
SAND/CLAY- grey/white, fine to medium grained, soft	14
	15
	16
	17
	18
	19
	20
CLAY- red/brown/purple, mottled	21
CLAY- grey/white, moderate plasticity	22
CLAY- grey/red/brown, mottled, moderate plasticity	23
	24
	25
	26
	27
	28
	29
	30
	31
	32
	33
CLAY- brown/grey, slight plasticity	34
	35
LATERITE/SANDSTONE- red/brown, fine to medium grained, hard	36
	37
SAND/CLAY- red/brown, fine to medium grained, sand interbedded with laterite/sandstone	38
	39
CLAY- dark green/grey, carbonaceous, high plasticity	40
	41

URS Australia

Andranangoo MM10

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Project No.: **42213700**
Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **11-6-05** Orientation: **0 deg.**
Date Finished: **11-6-05**

Relative Level: **3.22 mRL**
Coordinates: **8743377.40 mN**
702749.46 mE
Permit No: **N/A**

Drill Type: **Air Core**
Drill Model:
Drill Fluid: **None**

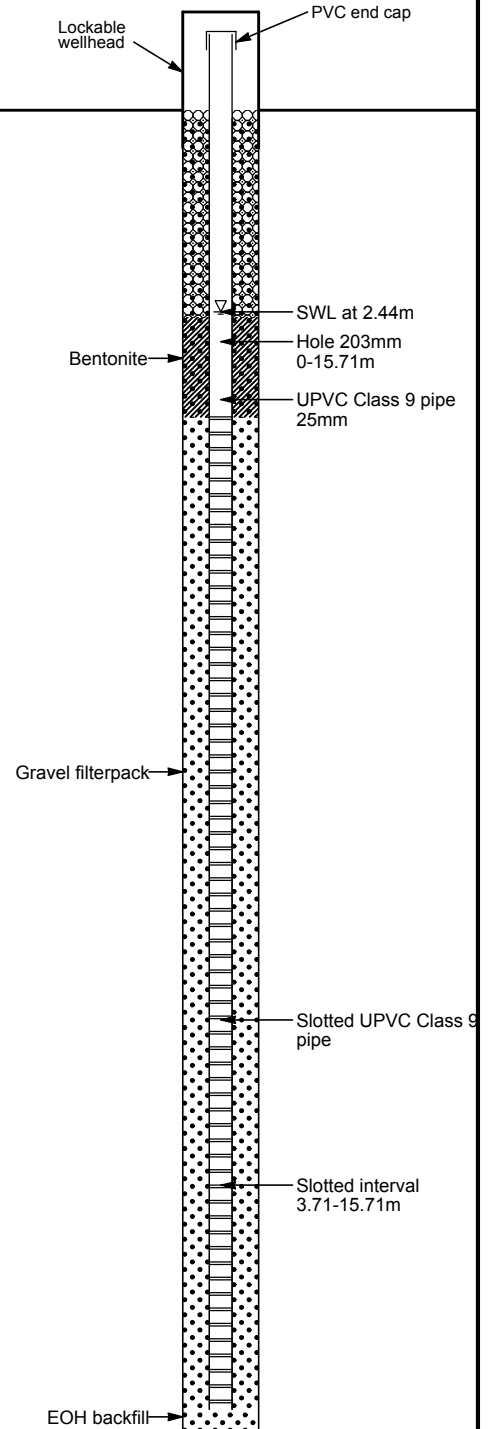
Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- medium to dark brown/grey, medium grained, poorly sorted
SAND- white/grey, fine to medium grained, sub angular
SAND- brown, fine to medium grained, sub angular, well sorted
SAND- white/cream, medium grained, sub angular well sorted
SAND- grey, fine to medium grained, sub angular, well sorted
SAND- grey, fine to medium grained, 10% shell fragments, poorly sorted
SAND- light grey, fine to medium grained, sub angular, moderately sorted
SAND- grey, medium grained, sub angular, moderately sorted
SAND- light grey, fine to medium, grained, sub angular, moderately well sorted

WELL CONSTRUCTION DETAILS



URS Australia**Andranangoo MM11**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **140 mm**

Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**

Date Started: **11-6-05** Orientation: **0 deg.**

Date Finished: **11-6-05**

Relative Level: **3.86 mRL**

Coordinates: **8743730.00 mN**
703186.00 mE

Permit No: **N/A**

Drill Type: **Air Core**

Drill Model:

Drill Fluid: **None**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- grey, medium grained, sub angular, medium to well sorted

SAND- white/grey, fine to medium grained, sub angular, moderately sorted

SAND- pale green/tan, fine to medium grained, sub angular, moderately sorted

SAND- grey, fine to medium grained, sub angular, well sorted

SAND/GRAVEL- dark grey, medium grained, well sorted, sub angular, 10% minor shell fragments

SAND/CLAY- grey, silty, medium grained, poorly sorted

SAND/CLAY- grey, fine to medium grained, silty clay

SAND/CLAY/GRAVEL- fine to medium grained, silty clay

SAND- light grey, medium grained, moderately well sorted

SAND- pale grey, medium grained, moderately well sorted

SAND- white/grey, medium grained, sub angular well sorted

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete inside steel casing

SWL at 1.84m

Bentonite

UPVC Class 9 pipe

Gravel filterpack

Slotted UPVC Class 9 pipe

Slotted interval 3.12-12.2m

EOH backfill

URS Australia**Andranangoo MM12**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Drilling Contractor: **Wallis Drilling** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **75 mm**

Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**

Date Started: **12-6-05** Orientation: **0 deg.**

Date Finished: **12-6-05**

Relative Level: **3.46 mRL**

Coordinates: **8743401.84 mN**
703575.71 mE

Permit No: **N/A**

Drill Type: **Air Core**

Drill Model:

Drill Fluid: **None**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- grey, fine grained, sub angular, well sorted

SAND- light grey, fine to medium grained, sub angular, moderately sorted

SAND- red brown, medium grained, sub angular, poorly sorted, silty

SAND- yellow/cream, fine to coarse grained, sub angular, moderate to poorly sorted

SAND- grey, fine to coarse grained, sub angular, poorly sorted

SAND- dark grey, fine to medium grained, sub angular, well sorted

SAND- grey, medium to coarse grained, sub angular, 20% shell fragments, poorly sorted

SAND- grey, fine to coarse grained, silty, clay in parts, minor shells, sub angular, well sorted

SAND- light grey, medium to coarse grained, moderately sorted

SAND- dark grey, fine to medium grained, sub angular, moderately well sorted

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

UPVC Class 9 pipe

SWL at 2.37m
Hole 75mm
0-12m

Bentonite

Gravel filterpack

Slotted interval
3-10.58m

Slotted UPVC Class 9
pipe 25mm

Hole backfill

URS Australia

Andranangoo Site 1 (P)

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **254 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **29-9-05** Orientation: **0 deg.**
Date Finished: **29-9-05**

Relative Level: **4.52 mRL**
Coordinates: **8743105.00 mN**
699211.00 mE
Permit No: **N/A**

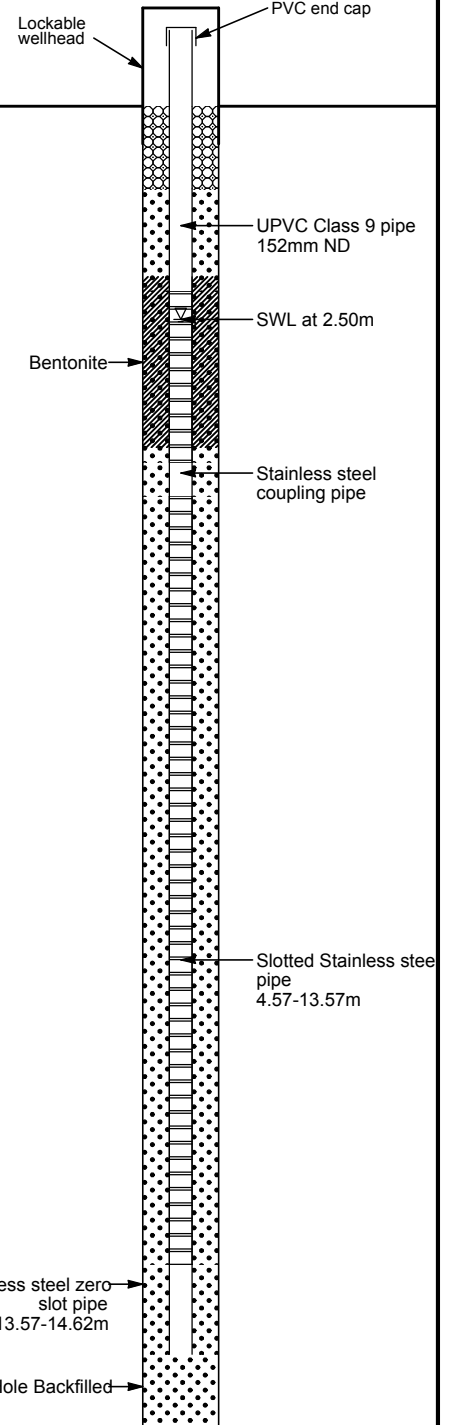
Drill Type: **Rotary**
Drill Model:
Drill Fluid: **Mud**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS



SAND- grey, fine to medium grained, quartz, sub angular to sub rounded, poorly sorted

SAND- pale yellow/brown, medium quartz, sub rounded, minor black mineral, well sorted

SAND- pale brown, fine to coarse grained, sub rounded, minor black mineral, poorly sorted

SAND/CLAY- white/brown, fine to medium grained, quartz, silty clay, minor ironstone nodules

CLAY- mottled white/purple/brown, slight plasticity

SAND/CLAY- white/grey, medium quartz in silty clay, sub angular to sub rounded

SAND/CLAY- tan/cream, medium quartz, silty clay, medium to coarse grained, sub angular to sub rounded

SAND/CLAY- white, fine to medium grained, silty clay, sub rounded, poorly sorted

SAND/CLAY- yellow/cream, fine to medium grained, sub angular to sub rounded

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Andranangoo Site 2

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **140 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **27-9-05** Orientation: **0 deg.**
Date Finished: **27-9-05**

Relative Level: **4.42 mRL**
Coordinates: **8743095.00 mN**
699209.00 mE
Permit No: **N/A**

Drill Type: **Rotary**
Drill Model:
Drill Fluid: **Mud**

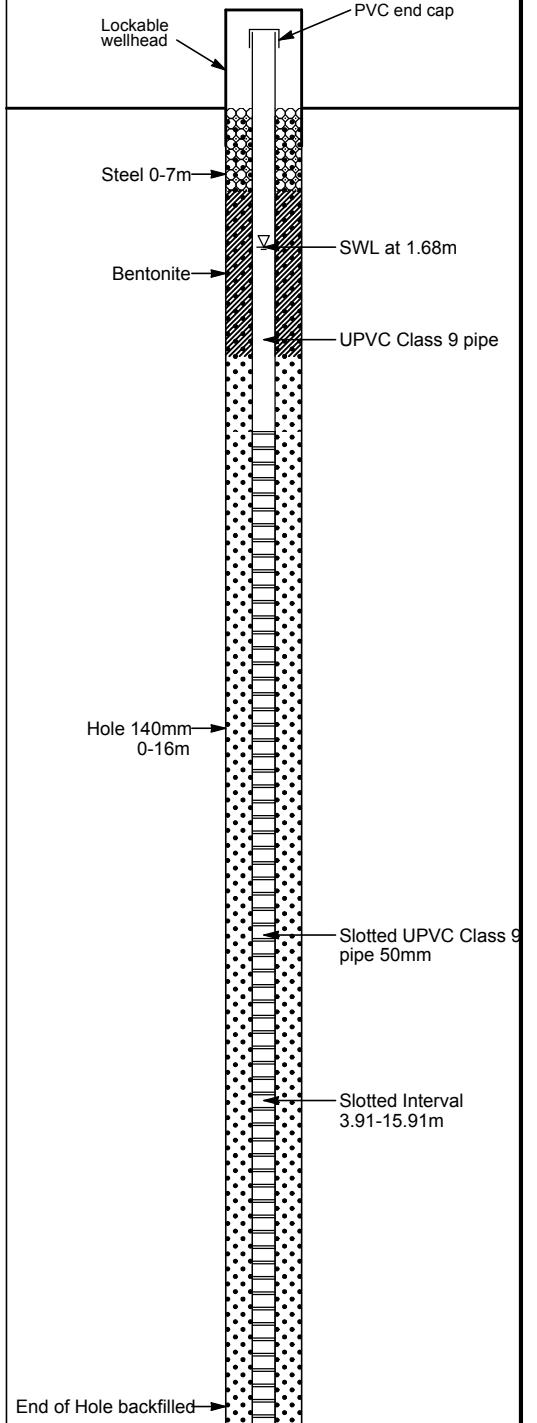
Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- pale grey, fine to medium grained, quartz, minor organics, sub angular to sub rounded, poorly sorted
SAND- pale yellow/brown, medium grained, quartz, sub rounded, minor black mineral, well sorted
SAND- pale brown, fine to coarse grained, sub rounded, minor black mineral, poorly sorted
SAND/CLAY- white/brown, fine to medium grained, quartz, silty, minor ironstone nodules
CLAY- white to purple/brown, mottled, slight plasticity
SAND/CLAY- white/grey, medium grained, quartz, silty, sub angular to sub rounded
SAND/CLAY- cream/tan, medium grained, quartz, silty, sub angular to sub rounded
SAND/CLAY- white, fine to medium grained, silty, sub rounded, poorly sorted
SAND/CLAY- yellow/cream, fine to medium grained, sub angular to sub rounded

WELL CONSTRUCTION DETAILS



URS Australia**Andranangoo Site 3**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **140 mm**

Relative Level: **4.96 mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **8743153.00 mN**

Drill Model:

Date Started: **28-9-05**

Orientation: **0 deg.**

698694.00 mE

Drill Fluid: **Mud**

Date Finished: **28-9-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- grey, fine to medium grained, quartz, minor organics, sub angular to sub rounded, poorly sorted
SAND- pale tan/brown, medium grained, quartz, sub angular to sub rounded, minor black mineral, well sorted

SAND- pale yellow/white, fine to coarse grained, quartz, sub rounded, minor gravel, poorly sorted

SAND/CLAY- pale yellow/brown, medium to coarse grained, silty, slight plasticity, minor gravel, pebbles

CLAY- white/grey to pale purple, slightly sandy, high plasticity, minor lateritic pebbles, nodules

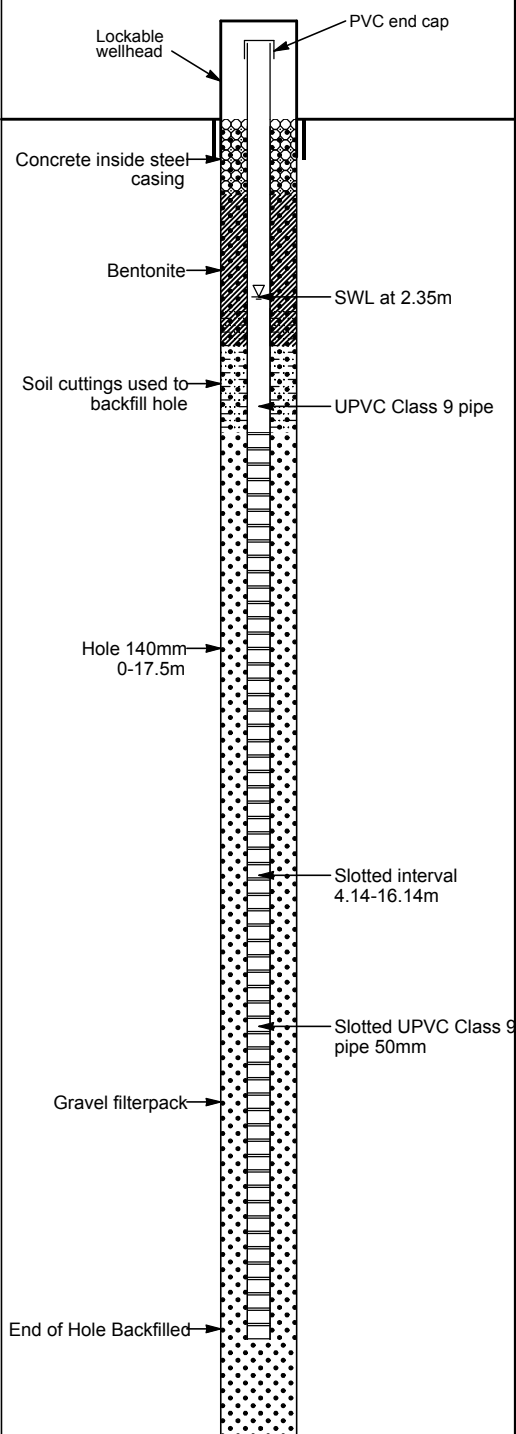
SAND/CLAY- white, fine to medium grained, quartz, silty, sub rounded, interbedded with clay, moderate plasticity

CLAY- purple/white, slight plasticity, noddled, minor sand

CLAY/SAND- purple/white, medium to coarse grained, quartz, sub rounded, moderately sorted

SAND/CLAY- pale tan, fine to medium grained, quartz, silty, sub rounded

CLAY- white/grey, slight plasticity

WELL CONSTRUCTION DETAILS

URS Australia

Andranangoo Site 4 (P)

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **140 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **28-9-05** Orientation: **0 deg.**
Date Finished: **28-9-05**

Relative Level: **4.86 mRL**
Coordinates: **8743048.00 mN**
698704.00 mE
Permit No: **N/A**

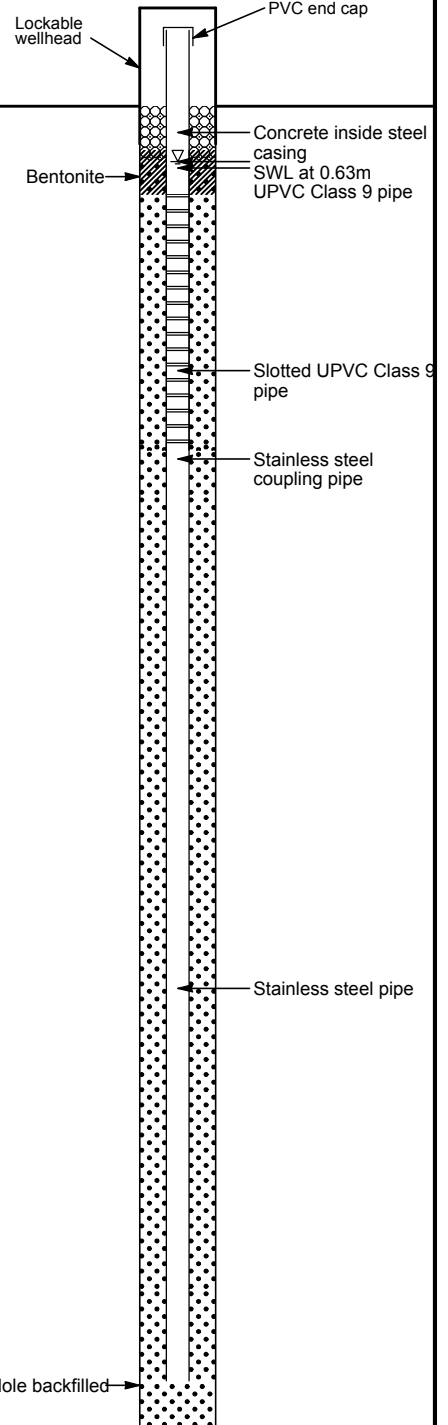
Drill Type: **Rotary**
Drill Model:
Drill Fluid: **Mud**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS



SAND- pale grey, fine to medium grained, quartz, minor organics, sub rounded to sub angular, poorly sorted

SAND- pale yellow/grey, medium grained, quartz, sub angular to sub rounded, minor black mineral organics, well sorted

SAND- pale brown, fine to coarse grained, quartz, sub rounded, poorly sorted

SAND/CLAY- light brown, fine to medium grained, silty clay, minor ironstone

CLAY- mottled white/purple/brown, slight plasticity

SAND/CLAY- pale grey, medium grained, quartz, silty clay, interbedded, sub angular to sub rounded

SAND/CLAY- white, fine to medium grained, sub angular to sub rounded, poorly sorted

SAND/CLAY, pale yellow/grey, fine to medium grained, quartz

URS Australia**Andranangoo Site 5**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **140 mm**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Date Started: **28-9-05**

Orientation: **0 deg.**

Date Finished: **28-9-05**

Relative Level: **5.21 mRL**

Coordinates: **8743038.00 mN**
698702.00 mE

Permit No: **N/A**

Drill Type: **Rotary**

Drill Model:

Drill Fluid: **Mud**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete

Bentonite

UPVC Class 9 pipe
50mm

SWL at 3.25m

Slotted interval
2.97-11.97m

Slotted UPVC Class 9
pipe 50mm

Gravel filterpack

End of Hole backfilled

SAND- pale grey, fine to medium
grained, quartz, minor organics, sub rounded to sub
angular, poorly sorted

SAND- pale yellow/grey, medium
grained, quartz, sub angular to sub rounded, minor
black mineral organics, well sorted

SAND- pale brown, fine to coarse
grained, quartz, sub rounded, poorly sorted

SAND/CLAY- light brown, fine to medium
grained, silty clay, minor ironstone

CLAY- mottled white/purple/brown, slight plasticity

SAND/CLAY- pale grey, medium
grained, quartz, silty clay, interbedded, sub angular to
sub rounded

SAND/CLAY- white, fine to medium grained, sub
angular to sub rounded, poorly sorted

SAND/CLAY, pale yellow/grey, fine to medium
grained, quartz

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Andranangoo Site 6

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **140 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **26-9-05** Orientation: **0 deg.**
Date Finished: **26-9-05**

Relative Level: **4.39 mRL**
Coordinates: **8743485.00 mN**
701204.00 mE
Permit No: **N/A**

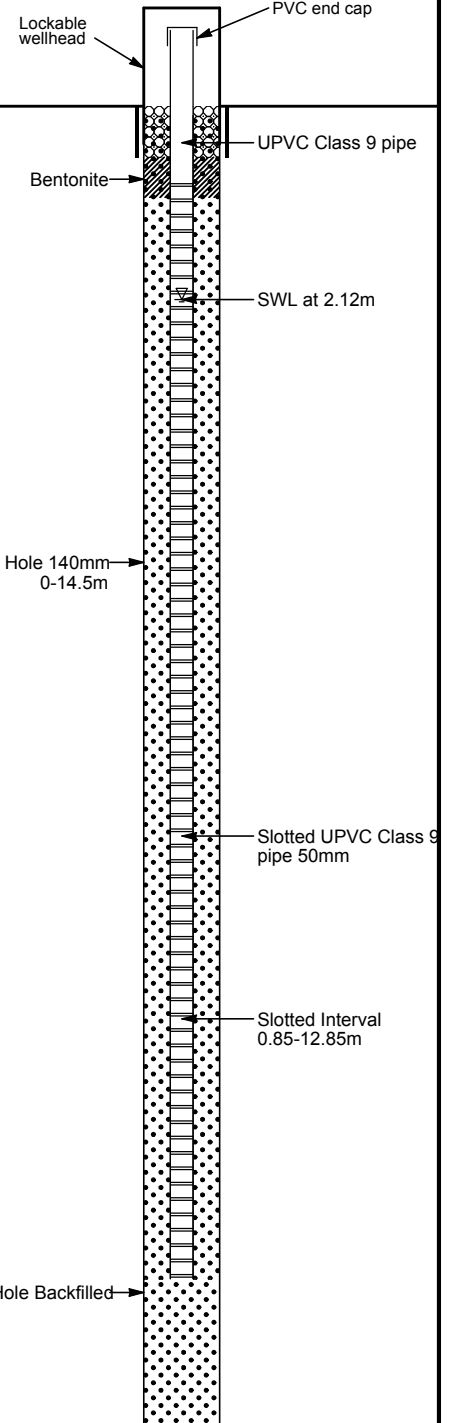
Drill Type: **Rotary**
Drill Model:
Drill Fluid: **Mud**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS



SAND- grey, fine to medium grained, quartz, sub angular, minor organics, dry

SAND- pale tan/brown, fine to medium grained, quartz, minor black mineral, sub angular to sub rounded, moderately well sorted

SAND- pale grey/white, fine to medium grained, quartz, sub angular to sub rounded, minor black mineral, well sorted

SAND/CLAY- pale grey to dark grey, fine to medium grained, quartz, sub angular, minor silty organic rich clay, minor shell fragments

SAND/CLAY- grey, very fine to medium grained, quartz, minor shell fragments, high organic matter

SAND/CLAY- pale green/grey, very fine to medium grained, silty, sub angular to sub rounded

CLAY/IRONSTONE- red/brown, clay with hard ironstone nodules interbedded

CLAY- red/brown/white/grey, medium grained, quartz, sand, slight plasticity, mottled

URS Australia**Andranangoo Site 7 (P)**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **254 mm**

Relative Level: **3.57 mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **8743353.00 mN**

Drill Model:

Date Started: **23-9-05**

Orientation: **0 deg.**

701206.00 mE

Drill Fluid: **Mud**

Date Finished: **24-9-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete inside steel casing
Bentonite

UPVC Class 9 pipe

SWL at 2.12m

Hole 254mm
0-15.5m

Stainless steel screens
152mm, 0.5mm aperture
1.01-10.01m

Slotted Stainless steel pipe

Stainless steel zeroslot 152mm
10.01-11.05

SAND- grey, fine to medium grained, minor organics, sub angular, dry

SAND- pale grey, fine to medium grained, minor gravel, minor black mineral, sub angular, moderately to poorly sorted

SAND- pale grey/brown, fine to medium grained, sub angular to sub rounded, minor black mineral, moderately well sorted

SAND- brown/yellow, very fine to coarse grained, quartz, sub angular to sub rounded, poorly sorted

SAND/CLAY- yellow/brown to dark grey, fine to medium grained, quartz, carbonaceous, moderately well sorted

SAND- pale yellow/tan, fine to medium grained, quartz, sub angular to sub rounded, moderately well sorted

SAND/CLAY- grey, fine to coarse grained, sub angular to sub rounded, minor laterite nodules, silty, moderately well sorted

LATERITE, dark purple/brown, minor coarse gravel, well rounded, hard

SAND/CLAY- red/brown, fine to medium grained, quartz, silty

SAND/CLAY- pale white/yellow, fine grained, quartz, mottled, silty, soft

URS Australia**Andranangoo Site 8**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **140 mm**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Date Started: **25-9-05**

Orientation: **0 deg.**

Date Finished: **25-9-05**

Relative Level: **4.45 mRL**

Coordinates: **8743345.00 mN**
701207.00 mE

Permit No: **N/A**

Drill Type: **Rotary**

Drill Model:

Drill Fluid: **Mud**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Gravel

Hole 140mm
0-14m

Gravel filterpack

Slotted UPVC Class 9
pipe 50mm

Slotted Interval
0.17-12.17m

End of Hole Backfilled

SAND- grey, fine to medium grained, minor organics, sub angular, dry

SAND- pale grey, fine to medium grained, minor gravel, minor black mineral, sub angular, moderately to poorly sorted

SAND- pale grey/brown, fine to medium grained, sub angular to sub rounded, minor black mineral, moderately well sorted

SAND- brown/yellow, very fine to coarse grained, quartz, sub angular to sub rounded, poorly sorted

SAND/CLAY- yellow/brown to dark grey, fine to medium grained, quartz, carbonaceous, moderately well sorted

SAND- pale yellow/tan, fine to medium grained, quartz, sub angular to sub rounded, moderately well sorted

SAND/CLAY- grey, fine to coarse grained, sub angular to sub rounded, minor laterite nodules, silty, moderately well sorted

LATERITE, dark purple/brown, minor coarse gravel, well rounded, hard

SAND/CLAY- red/brown, fine to medium grained, quartz, silty

SAND/CLAY- pale white/yellow, fine grained, quartz, mottled, silty, soft

URS Australia

Andranangoo Site 9

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Project No.: **42213700**
Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **140 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **26-10-05** Orientation: **0 deg.**
Date Finished: **27-10-05**

Relative Level: **4.21 mRL**
Coordinates: **718533.00 mN**
8743232.00 mE
Permit No: **N/A**

Drill Type: **Rotary**
Drill Model:
Drill Fluid: **Mud**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- grey, fine to medium grained, quartz, sub angular to sub rounded, poorly sorted

SAND- grey/yellow, fine to medium grained, quartz, sub angular, poorly sorted

SAND- grey, fine to medium grained, quartz, sub angular to sub rounded, shells present up to 2cm, some pebbles of laterized sandstone, poorly sorted

SAND- grey, fine to medium grained, pebbles, shells up to 2cm, iron oxide coating on pebbles, sub angular to sub rounded, very poorly sorted

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

UPVC Class 9 pipe

Bentonite

Slotted UPVC Class 9 pipe, 150mm

Slotted Interval 5.23-17.23m

URS Australia

Andranangoo Camp Bore

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **140 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **3-10-05** Orientation: **0 deg.**
Date Finished: **5-10-05**

Relative Level: **17.76 mRL**
Coordinates: **8742830.00 mN**
700398.00 mE
Permit No: **N/A**

Drill Type: **Rotary**
Drill Model:
Drill Fluid: **Mud**

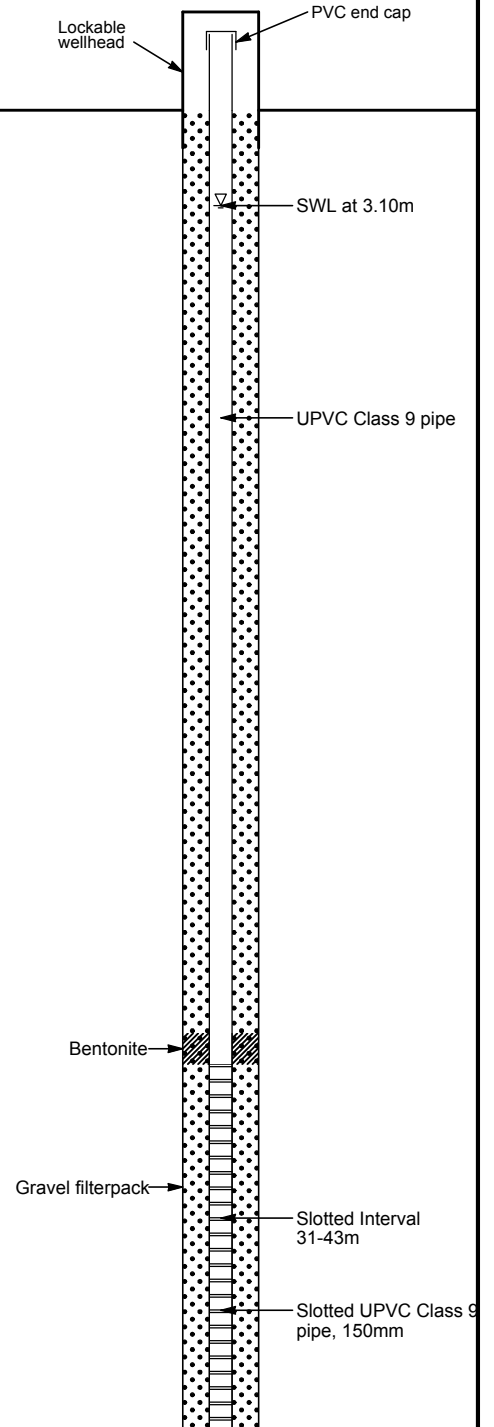
Legend

DESCRIPTION OF STRATA

Depth (m)

0	SAND- brown/grey, minor clay, fine to medium grained, minor organics
1	
2	
3	SAND- brown/grey, gravel present, fine grained, sub angular to sub rounded, poorly sorted
4	
5	SAND/CLAY- brown, feruginous zone, gravel, sub angular to sub rounded, very poorly sorted
6	
7	
8	
9	SAND- cream/brown, quartz, very fine to medium grained, sub angular to angular, moderately sorted
10	
11	
12	SAND/CLAY- white, fine grained, moderately sorted
13	
14	
15	
16	
17	
18	
19	
20	CLAY- white/purple, very fine to fine grained, minor sand, sub rounded, moderately sorted
21	
22	
23	SAND/CLAY- purple/tan, fine to medium grained
24	
25	
26	CLAY- purple/cream, very fine grained
27	
28	
29	
30	
31	
32	
33	
34	CLAY- dark brown, iron oxide layers
35	
36	
37	
38	
39	
40	
41	
42	CLAY- grey, very fine grained, soft

WELL CONSTRUCTION DETAILS



URS Australia**HR01**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **254 mm**

Relative Level: **61.31 mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **8732778.00 mN**

Drill Model:

Date Started: **5-10-05**

Orientation: **0 deg.**

701982.00 mE

Drill Fluid: **Mud**

Date Finished: **6-10-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND/CLAY- red/brown, very fine to fine grained, sub angular to sub rounded, poorly sorted

CLAY/GRAVEL- cream/brown, gravel up to 10mm, minor sand, rounded to sub rounded, very poorly sorted, soft

CLAY- cream/brown, minor purple zones, moderately sorted, soft

CLAY- dark brown, iron oxides, goethite, very hard

CLAY- white, very fine grained, moderately rounded, some zones of tan minor purple dominant, high plasticity, well sorted

CLAY/SAND- grey/yellow, some minor sand, high plasticity

CLAY- dark brown, iron band, ferruginous band

SAND/CLAY- light yellow/tan, poorly sorted, very soft

SAND- yellow, very fine to medium grained, quartz, moderately sorted

SAND/CLAY- yellow/orange, very fine to medium grained

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete inside steel casing

Soil cuttings used to backfill hole

Slotted interval 31.5-43.5m

UPVC Class 9 pipe, 150mm

Bentonite

Gravel filterpack

Slotted UPVC Class 9 pipe

End of Hole Backfilled

URS Australia

HR03

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Underdale Drillers** Fax 08 89413920

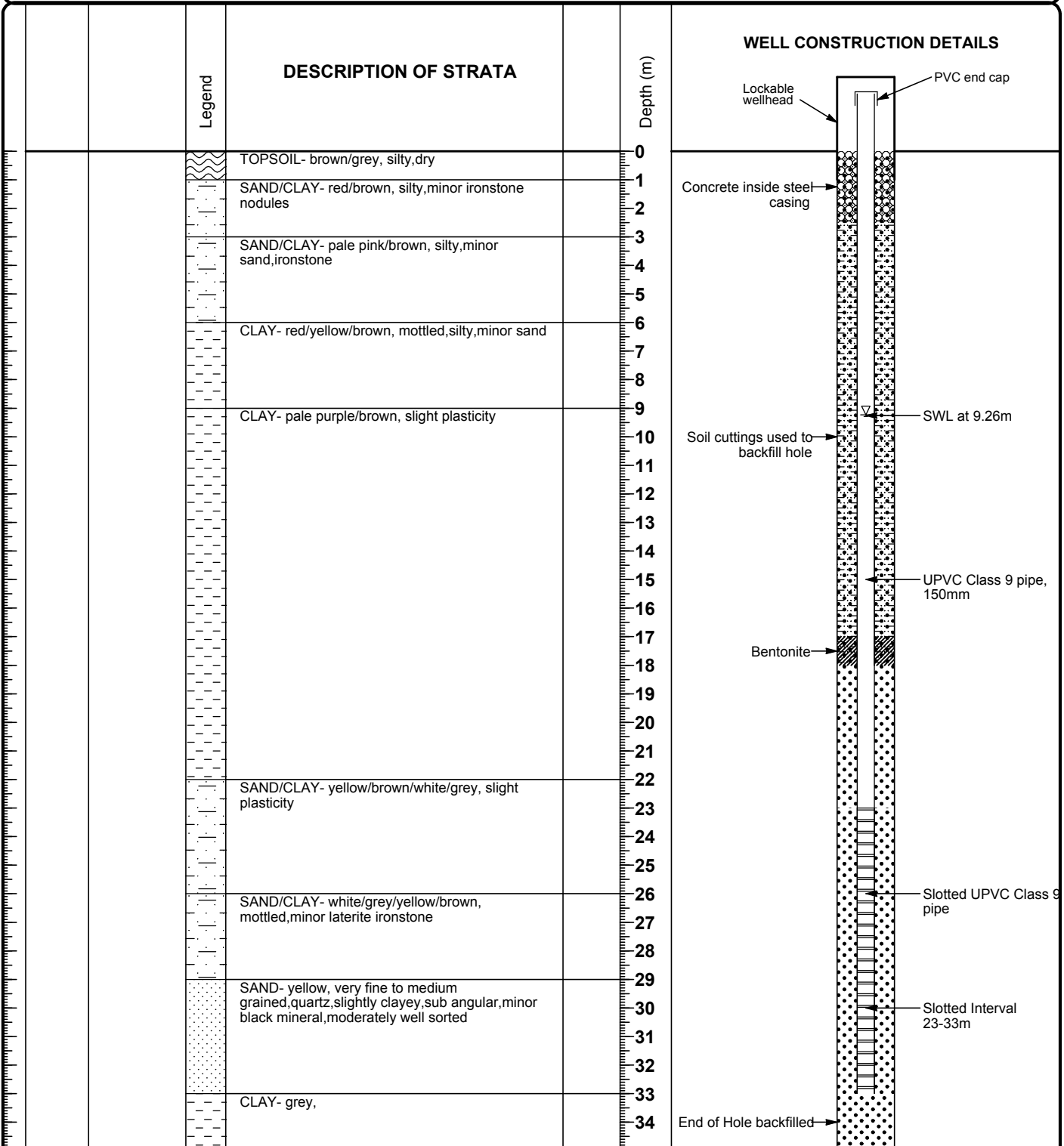
Project No.: **42213700**
Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **140 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **20-9-05** Orientation: **0 deg.**
Date Finished: **22-9-05**

Relative Level: **81.18 mRL**
Coordinates: **8705572.00 mN**
717418.00 mE
Permit No: **N/A**

Drill Type: **Rotary**
Drill Model:
Drill Fluid: **Mud**



URS Australia**Pines Bore**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **D. Lacey**

Bore Size: **140 mm**

Relative Level: **mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **8702992.00 mN**

Drill Model:

Date Started: **30-10-05**

Orientation: **0 deg.**

704079.00 mE

Drill Fluid: **Mud**

Date Finished: **1-11-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete

UPVC Class 9 pipe

SWL at 13.12m

Gravel filterpack

Slotted Interval
13.8-25.8m

Slotted UPVC Class 9
pipe

End of Hole backfilled

URS Australia		Garden Point (Pensyl Yard)	
URS Australia Pty. Ltd. Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900		Project No.: 42213700	Project Reference: Matilda Minerals Groundwater Investigation
Drilling Contractor: Underdale Drillers Fax 08 89413920		Location: Matilda Minerals	Client: Matilda Minerals
Logged By: G. Brophy	Bore Size: 254 mm	Relative Level: mRL	Drill Type: Rotary
Checked By: C.Mac Hunter	Hole Angle: 90 deg.	Coordinates: 8737122.00 mN	Drill Model:
Date Started: 5-11-05	Orientation: 0 deg.	655112.00 mE	Drill Fluid: Mud
Date Finished: 5-11-05		Permit No:	

		Legend	DESCRIPTION OF STRATA	Depth (m)	WELL CONSTRUCTION DETAILS		
			TOPSOIL- red/brown, clayey, silty sand	0			
			CLAY- red/green, silty	1			
			IRONSTONE/SAND- red/brown, silty	2			
				3			
				4			
				5			
				6			
			SAND/CLAY- pale grey/yellow, very fine to fine grained, sub rounded to rounded	7			
				8			
				9			
				10			
				11			
				12			
				13			
				14			
			CLAY- grey/yellow, minor silt and sand, ironstone bands	15			
				16			
				17			
				18			
				19			
				20			
				21			
				22			
				23			
				24			
			CLAY- pale grey/yellow	25			
				26			
			CLAY- grey	27			
			CLAY- yellow, silty sand, very fine to fine grained, rounded, well sorted	28			
				29			
				30			
				31			
				32			
			CLAY- grey	33			
				34			
				35			
				36			
				37			
				38			

WELL_MELB_BORELOGS.GPJ_WCC_AUS.GDT_21/12/05

URS Australia**Housing Commission Bore**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **140 mm**

Relative Level: **mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **8757484.00 mN**

Drill Model:

Date Started: **5-11-05**

Orientation: **0 deg.**

652161.00 mE

Drill Fluid: **Mud**

Date Finished: **5-11-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

SWL at 3.57m

UPVC Class 9 pipe

Bentonite

Gravel filterpack

Slotted UPVC Class 9 pipe

Slotted Interval 8.5-17.5m

End of Hole backfilled

SAND- dark brown, fine to coarse grained, poorly sorted

SAND- orange/yellow, as above

SAND- medium to coarse grained, minor gravel, sub rounded to rounded, poorly sorted

SAND- pale grey, slightly clayey, as above

SAND/GRAVEL- grey, minor clay, as above

CLAY- pale grey/yellow

SAND- pale grey, fine to medium grained, sub angular to sub rounded, well sorted

GRAVEL/IRONSTONE- pale grey, clay

SAND- pale grey/yellow, fine to medium grained, sub angular to sub rounded, moderately sorted

SAND/CLAY- pale yellow, fine to medium grained, sub rounded to rounded, well sorted

CLAY/SAND- pale yellow, as above

CLAY- pale yellow, as above

CLAY- pale grey/yellow/purple, as above

URS Australia**Garden Point 2**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **140 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **4-11-05** Orientation: **0 deg.**
Date Finished: **5-11-05**

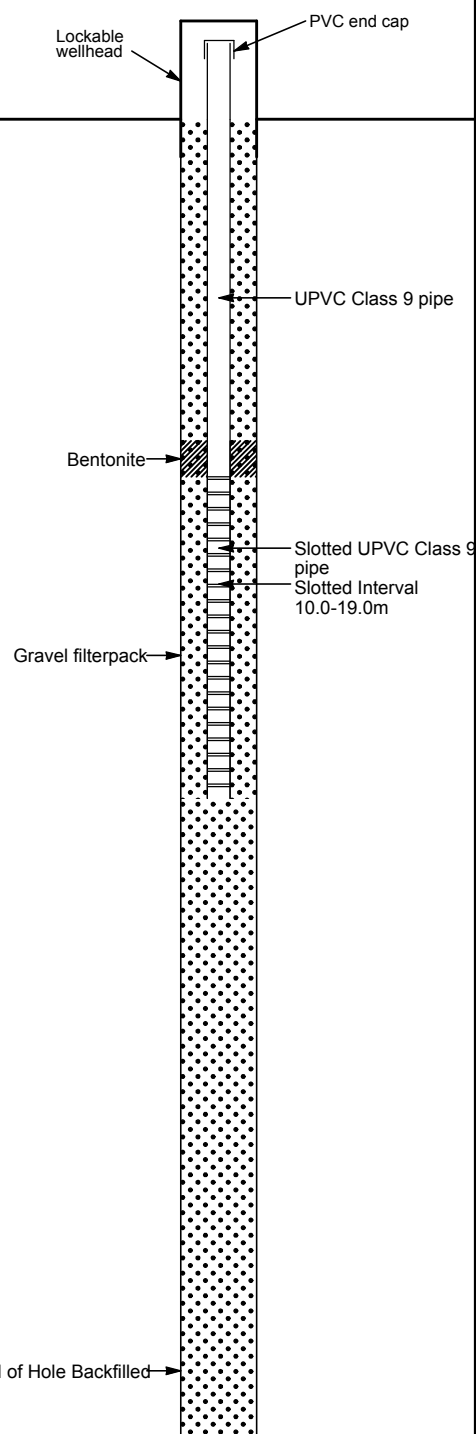
Relative Level: **mRL**
Coordinates: **8737124.00 mN**
655244.00 mE
Permit No: **N/A**

Drill Type: **Rotary**

Drill Model:

Drill Fluid: **Mud**

WELL_MELB_BORELOGS.GPJ WCC_AUS.GDT 21/12/05

WELL CONSTRUCTION DETAILS

Legend

DESCRIPTION OF STRATA

Depth (m)

0	TOPSOIL- red/green, clayey, silty, sand
1	CLAY- red/green, silty
2	
3	IRONSTONE- red/green, silty, sand
4	
5	
6	
7	SAND/CLAY- pale grey/yellow, very fine to fine grained, sub rounded to rounded, minor bands of silt and sand
8	
9	
10	
11	
12	
13	
14	
15	CLAY- minor silt
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	CLAY- pale grey/yellow
26	
27	CLAY- grey
28	
29	CLAY- yellow, very fine to fine grained, silty sand, sub rounded, well sorted
30	
31	
32	
33	CLAY- grey
34	
35	
36	

URS Australia

Lethbridge Site 1

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900
Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Project No.: **42213700**
Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **140 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **13-10-05** Orientation: **0 deg.**
Date Finished: **14-10-05**

Relative Level: **3.39 mRL**
Coordinates: **8743082.00 mN**
719168.00 mE
Permit No: **N/A**

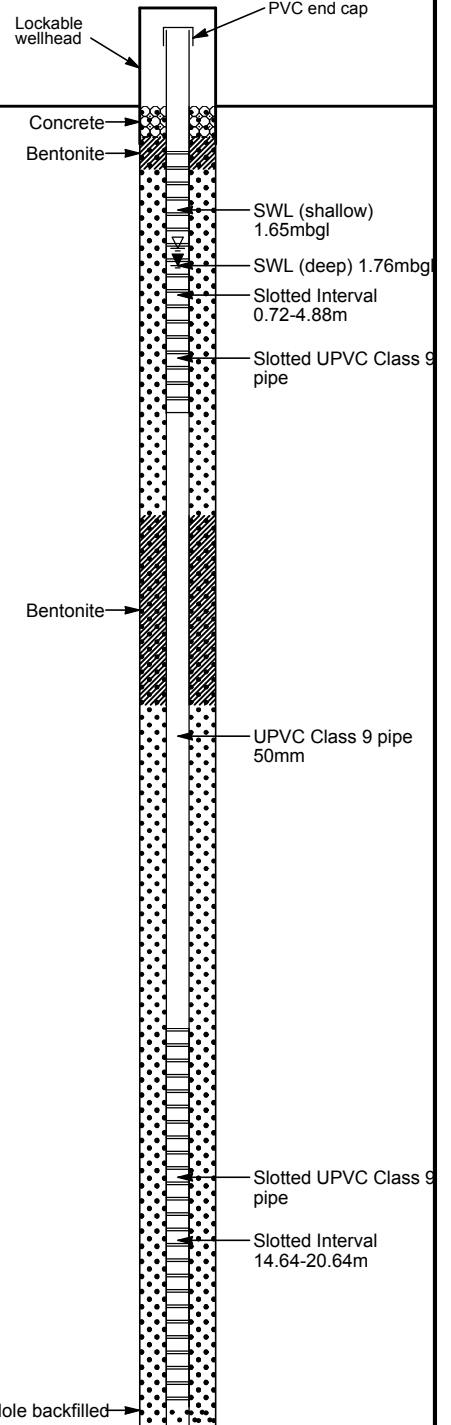
Drill Type: **Rotary**
Drill Model:
Drill Fluid: **Mud**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS



SAND- white, fine to medium grained, quartz, sub rounded, well sorted

SAND- pale yellow/grey, fine to medium grained, quartz, sub rounded, minor shells, well sorted

SAND- pale yellow/grey, fine to coarse grained, quartz, sub angular to sub rounded, 20% shell fragments

SAND- grey, medium grained, quartz, silty, sub angular to sub rounded, minor organics and shells, poorly sorted

CLAY- mottled red/brown/cream, minor sand bands, silty, soft

SAND/CLAY- purple/brown, very silty

SAND/CLAY- yellow/dark brown, fine to coarse grained, silty, iron oxide, sub angular to sub rounded

URS Australia**Lethbridge Site 2**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **140 mm**

Relative Level: **3.86 mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **8743041.00 mN**

Drill Model:

Date Started: **14-10-05**

Orientation: **0 deg.**

719551.00 mE

Drill Fluid: **Mud**

Date Finished: **15-10-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete

Bentonite

UPVC Class 9 pipe
50mm
SWL at 2.2m

Gravel filterpack

Slotted interval
2.67-11.67m

End of Hole backfilled

URS Australia**Lethbridge Site 3**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy** Bore Size: **140 mm**
Checked By: **C. Mac Hunter** Hole Angle: **90 deg.**
Date Started: **16-10-05** Orientation: **0 deg.**
Date Finished: **17-10-05**

Relative Level: **3.92 mRL**
Coordinates: **8743009.00 mN**
719990.00 mE
Permit No: **N/A**

Drill Type: **Rotary**

Drill Model:

Drill Fluid: **Mud**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- white, fine to medium grained, quartz, sub angular, 20% organics

SAND- pale grey, medium grained, quartz

SAND- pale grey

SAND- grey, shell fragments

SAND- pale grey

CLAY- dark grey

SAND/CLAY- grey, shell fragments

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

SWL at 0.87m

UPVC Class 9 pipe

Bentonite

Gravel filterpack

Slotted UPVC Class 9 pipe

Slotted Interval 2.7-11.7m

End of Hole backfilled

URS Australia**Lethbridge Site 4**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **140 mm**

Relative Level: **3.64 mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **8743575.00 mN**

Drill Model:

Date Started: **19-10-05**

Orientation: **0 deg.**

717903.00 mE

Drill Fluid: **Mud**

Date Finished: **19-10-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete

UPVC Class 9 pipe
50mm
SWL at 1.76

Bentonite

Slotted interval
2.78-11.78m

Gravel filterpack

Slotted UPVC Class 9
pipe

End of Hole backfilled

URS Australia**Leithbridge Site 5**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **140 mm**

Relative Level: **4.12 mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **8743429.00 mN**

Drill Model:

Date Started: **18-10-05**

Orientation: **0 deg.**

718571.00 mE

Drill Fluid: **Mud**

Date Finished: **18-10-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete

Bentonite

UPVC Class 9 pipe
50mm

SWL at 2.07m

Gravel filterpack

Slotted UPVC Class 9
pipe

Slotted interval
2.63-11.63m

End of Hole backfilled

SAND- white, medium to fine grained, quartz, sub angular to sub rounded, loose, dry, moderately sorted

SAND- dark grey, fine to coarse grained, quartz, minor black mineral, organics, minor clay

SAND- white/yellow, fine to medium grained, quartz, minor shells, moderately sorted

SAND/CLAY- grey, fine to medium grained, quartz, silty clay, minor organics, soft

CLAY- dark grey, silty clay, interbedded shell bands

SAND/CLAY- pale grey, silty, minor hard iron oxide bands

SAND/GRAVEL- white, fine to coarse grained, quartz, sub rounded, shell grit, minor pebbles

SAND- white, fine to coarse grained, quartz, sub rounded, poorly sorted

SAND- brown/tan, fine to coarse grained, quartz, sub rounded to sub angular, minor clay

CLAY- brown, tan, silty, minor shells, slight plasticity, mottled, soft

URS Australia**Lethbridge Site 6**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **140 mm**

Relative Level: **3.82 mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **719442.00 mN**

Drill Model:

Date Started: **15-10-05**

Orientation: **0 deg.**

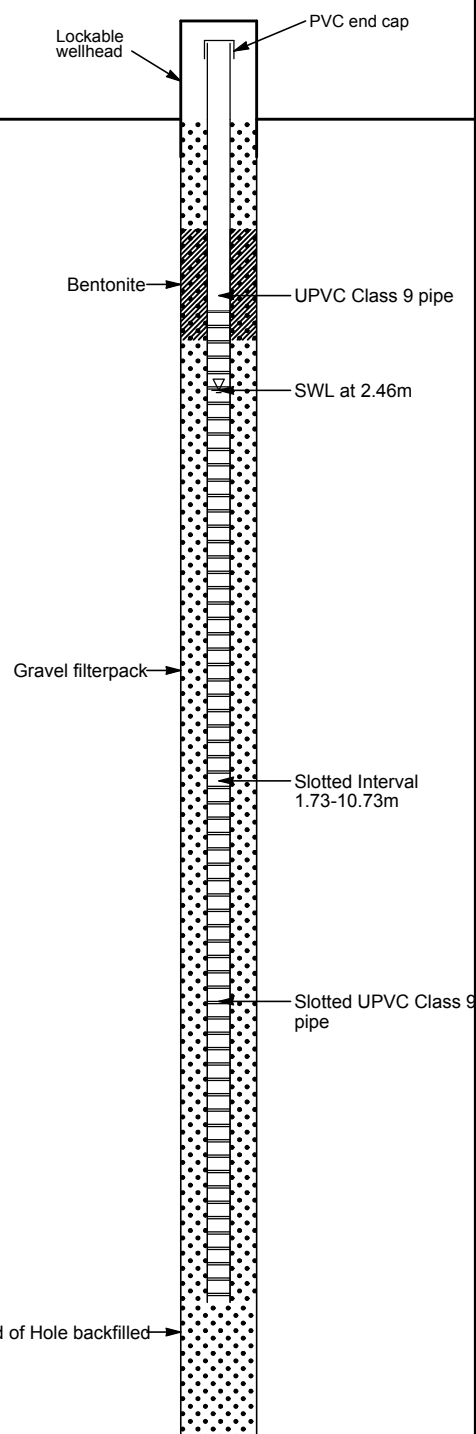
8743301.00 mE

Drill Fluid: **Mud**

Date Finished: **15-10-05**

Permit No: **N/A**

WELL_MELB_BORELOGS.GPJ WCC_AUS.GDT 21/12/05

WELL CONSTRUCTION DETAILS

Legend

DESCRIPTION OF STRATA

Depth (m)

0	SAND- pale yellow, fine to medium grained, quartz, sub rounded to sub rounded
1	
2	SAND- pale grey, fine to coarse grained, quartz, minor organics, minor mineral, minor shells
3	SAND- grey, fine to medium grained, quartz, minor organics matter
4	
5	SAND/CLAY- grey, fine to medium grained, quartz, interbedded silty clay, minor shells, organics
6	
7	
8	SAND/CLAY- medium to dark grey, fine to medium grained, silty clay, coarse shells, slight plasticity, soft
9	
10	SAND/CLAY- grey, fine to medium grained, silty clay, sub rounded to sub angular
11	SAND?CLAY- grey, fine to coarse grained, quartz, silty clay, minor shells

URS Australia**Lethbridge Site 8**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **140 mm**

Relative Level: **4.26 mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **8743236.00 mN**

Drill Model:

Date Started: **26-10-05**

Orientation: **0 deg.**

718532.00 mE

Drill Fluid: **Mud**

Date Finished: **26-10-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- mid grey, fine to coarse grained, quartz, sub rounded to sub angular, minor organics, poorly sorted

SAND- yellow/brown, medium to coarse grained, quartz, sub rounded to rounded, 20% shell fragments, moderately well sorted

GRAVEL- grey/pale yellow, shell fragments, fine to coarse grained, quartz, 30% shell fragments, some iron oxide, well sorted

SAND- mid grey, fine to coarse grained, quartz, sub rounded, minor black mineral, some minor clay nodules

SAND/CLAY- pale yellow/white/grey, fine to medium grained, quartz, silty

CLAY- grey/brown/red/grey, mottled, medium to coarse grained

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

Concrete

Bentonite

UPVC Class 9 pipe 50mm

SWL at 3.28m

Slotted UPVC Class 9 pipe

Gravel filterpack

Slotted interval 2.37-8.37m

End of Hole backfilled

URS Australia**Lethbridge Site 9 (P)**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Project No.: **42213700**

Location: **Matilda Minerals**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **254 mm**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Date Started: **27-10-05**

Orientation: **0 deg.**

Date Finished: **27-10-05**

Relative Level: **4.03 mRL**

Coordinates: **8742658.00 mN**
718367.00 mE

Permit No: **N/A**

Drill Type: **Rotary**

Drill Model:

Drill Fluid: **Mud**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- mid grey, fine to coarse grained, quartz, sub rounded to sub angular, minor organics, poorly sorted

SAND- yellow/brown, medium to coarse grained, quartz, sub rounded to rounded, 20% shell fragments, moderately well sorted

GRAVEL- grey/pale yellow, shell fragments, fine to coarse grained, quartz, 30% shell fragments, some iron oxide, well sorted

SAND- mid grey, fine to coarse grained, quartz, sub rounded, minor black mineral, some minor clay nodules

SAND/CLAY- pale yellow/white/grey, fine to medium grained, quartz, silty

CLAY- grey/brown/red/grey, mottled, medium to coarse grained

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

UPVC Class 9 pipe

Bentonite

Coupling

SWL at 2.46m

Gravel filterpack

Stainless Steel screens, 150mm

Slotted Interval 2-8m

URS Australia**Lethbridge Camp Bore**

URS Australia Pty. Ltd.
Level 3, 93 Mitchell St, Darwin NT 0800 Phone 08 89802900

Project No.: **42213700**

Project Reference: **Matilda Minerals Groundwater Investigation**
Client: **Matilda Minerals**

Drilling Contractor: **Underdale Drillers** Fax 08 89413920

Location: **Matilda Minerals**

Logged By: **G. Brophy**

Bore Size: **140 mm**

Relative Level: **19.35 mRL**

Drill Type: **Rotary**

Checked By: **C. Mac Hunter**

Hole Angle: **90 deg.**

Coordinates: **8742658.00 mN**

Drill Model:

Date Started: **20-10-05**

Orientation: **0 deg.**

718367.00 mE

Drill Fluid: **Mud**

Date Finished: **22-10-05**

Permit No: **N/A**

Legend

DESCRIPTION OF STRATA

Depth (m)

SAND- brown, silty, loam, minor organics
SAND- red/brown, fine to medium, quartz, silty, sub angular, moderately sorted
SAND/CLAY- red/brown, fine to medium grained, quartz, silty clay, sub rounded to sub angular, soft
SAND/CLAY- pale yellow/pink, fine to medium grained, sub angular
SAND/CLAY- pale pink/light grey, very fine to medium grained, quartz, sub angular, slight plasticity
CLAY- pale grey, very fine grained, silty, slight plasticity
CLAY- mottled brown/pale grey/pale pink, slight plasticity
CLAY- pale grey/dark brown
CLAY- pale grey, very fine grained, silty
SAND/CLAY- pale grey/pale yellow, fine grained, silty, quartz, sub rounded to sub angular, soft

WELL CONSTRUCTION DETAILS

Lockable wellhead

PVC end cap

UPVC Class 9 pipe

SWL at 15.62

Bentonite

Gravel filterpack

Slotted UPVC Class 9 pipe

Slotted Interval 27.1-39.1m

End of Hole backfilled

Page Number : 7 of 8
 Client : URS AUSTRALIA PTY LTD
 Work Order : EB0510679



Analytical Results

Client Sample ID :				MW4 - 2.25 - 2.50	Site 7 - 2.75 - 3.0	Goose Lake 1.75 - 2.0	Prod 1 - 2.25 - 2.5	Prod 4 - 2.75 - 2.5
Sample Matrix Type / Description :				SOLID	SOLID	SOLID	SOLID	SOLID
Sample Date / Time :				(11 Nov 2005) (15:00)	(11 Nov 2005) (15:00)	(11 Nov 2005) (15:00)	(11 Nov 2005) (15:00)	(11 Nov 2005) (15:00)
Laboratory Sample ID :				EB0510679-011	EB0510679-012	EB0510679-013	EB0510679-014	EB0510679-015
Analyte	CAS number	LOR	Units					
EA029-A: pH Measurements								
pH KCl (23A)		0.1	pH Unit	5.5	5.6	5.9	5.7	5.8
pH OX (23B)		0.1	pH Unit	5.2	5.4	5.6	5.3	5.5
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)		2	mole H+ / t	4	2	<2	<2	<2
Titratable Peroxide Acidity (23G)		2	mole H+ / t	7	<2	<2	<2	<2
Titratable Sulfidic Acidity (23H)		2	mole H+ / t	3	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)		0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)		0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Peroxide Sulfur (23De)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Peroxide Oxidisable Sulfur (23E)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Peroxide Oxidisable Sulfur (a-23E)		10	mole H+ / t	<10	<10	<10	<10	<10
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)		0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
Peroxide Calcium (23Wh)		0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
Acid Reacted Calcium (23X)		0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)		10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)		0.02	% Mg	<0.02	<0.02	<0.02	<0.02	<0.02
Peroxide Magnesium (23Tm)		0.02	% Mg	<0.02	<0.02	<0.02	<0.02	<0.02
Acid Reacted Magnesium (23U)		0.02	% Mg	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Magnesium (a-23U)		10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-H: Acid Base Accounting								
ANC Fineness Factor		0.5		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)		10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate		1	kg CaCO3/t	<1	<1	<1	<1	<1