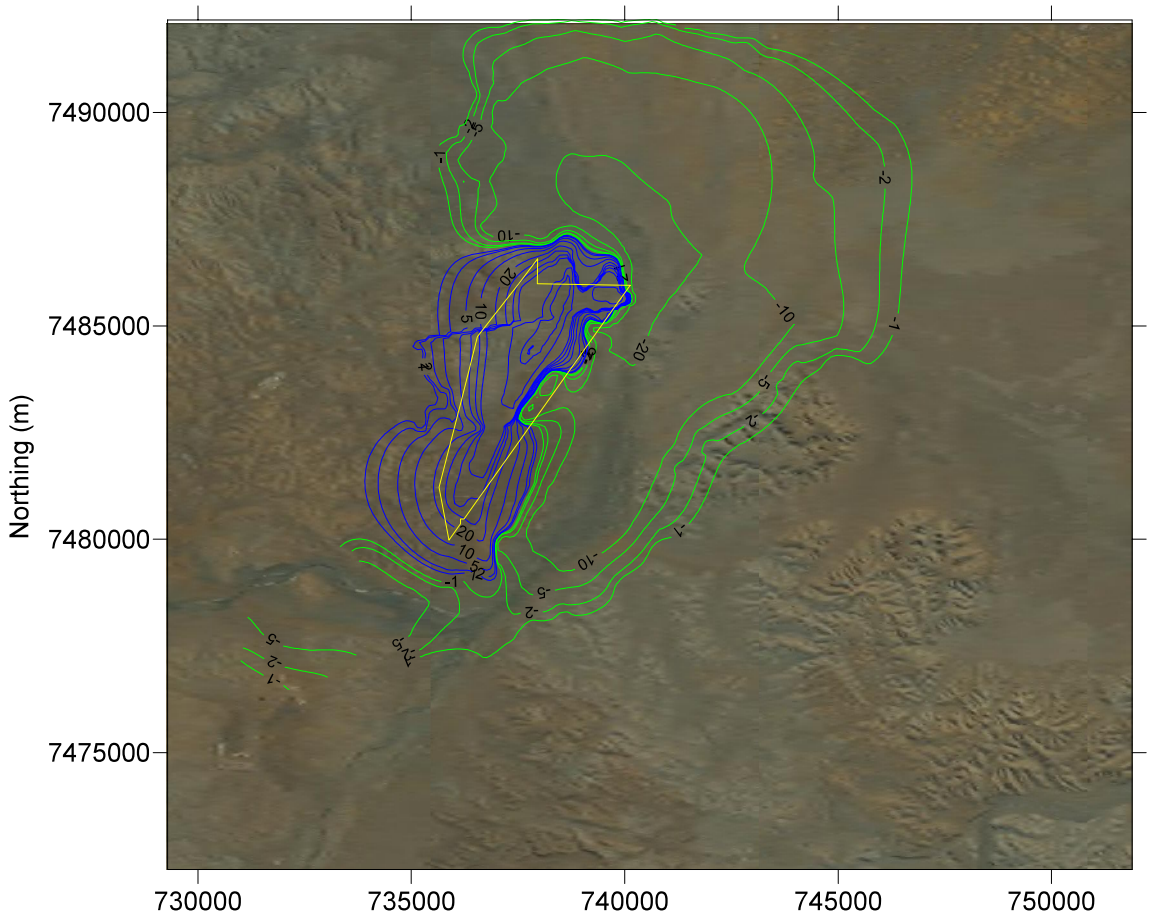


LOCATION MAP

LEGEND

Predicted Water Level Decrease (m)

Predicted Water Level Increase (m)

Project Area

Positive drawdown represents a water level decrease while a negative drawdown represents a water level increase.

Contours shown at -20m, -10m, -5m, -2m, -1m, 1m, 2m, 5m, 10m, 20m, 30m, 40m, 50m, 100m, 150m and 200m.

AUTHOR: KR
DRAWN: KR
DATE: 5 Jan 2015

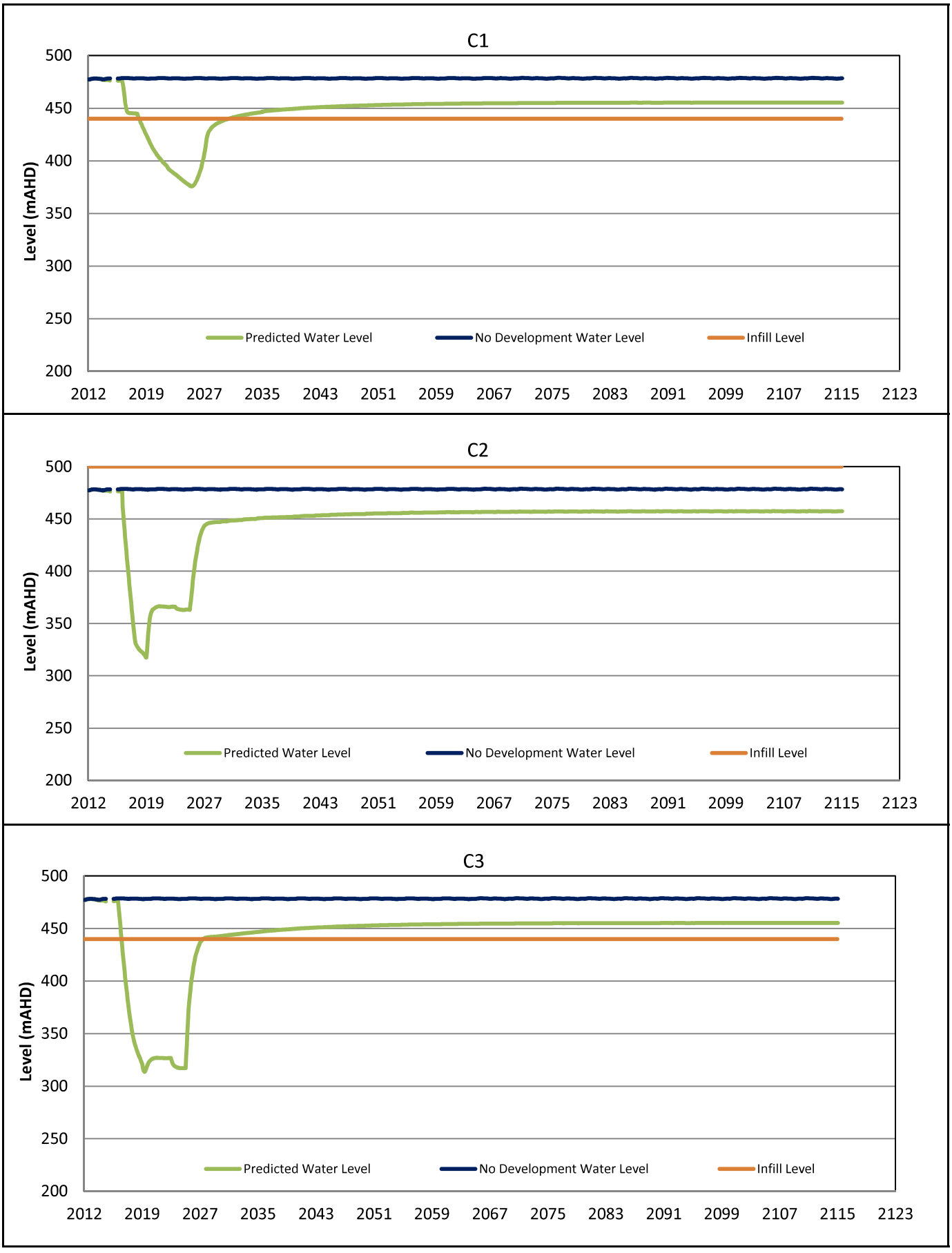
REPORT NO: 062a
REVISION: A
JOB NO: 013B

GDA94 Zone 50
SCALE: 1:175,000 (at A4)

f:/013b/GIS/Modelling Figures/Figures/062a Figure 4.43 revb.srf

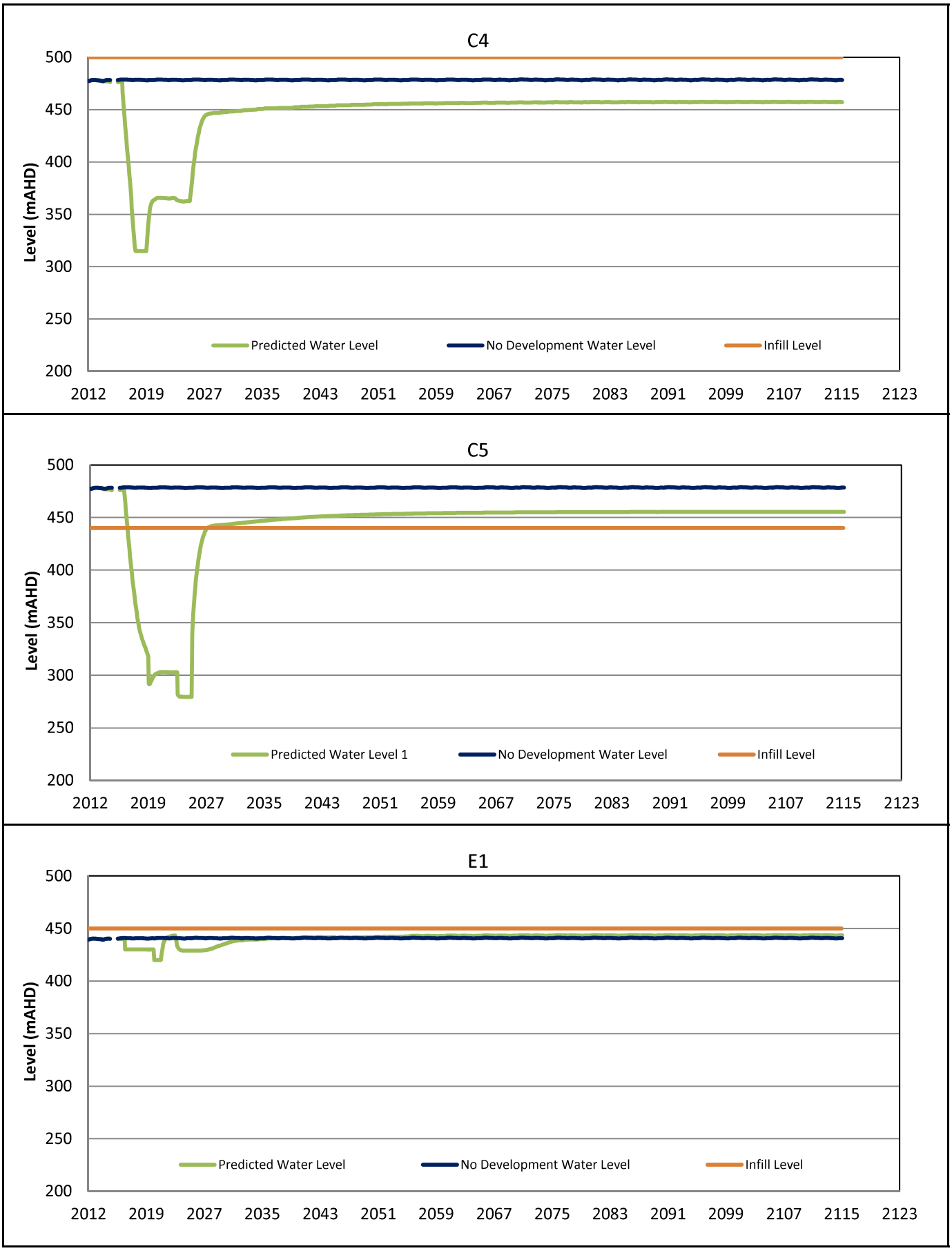
AQ2

FIGURE 4.43
CONTOURS OF PREDICTED DRAWDOWN END OF 2025 RTIO SURPLUS DISPOSAL CASE



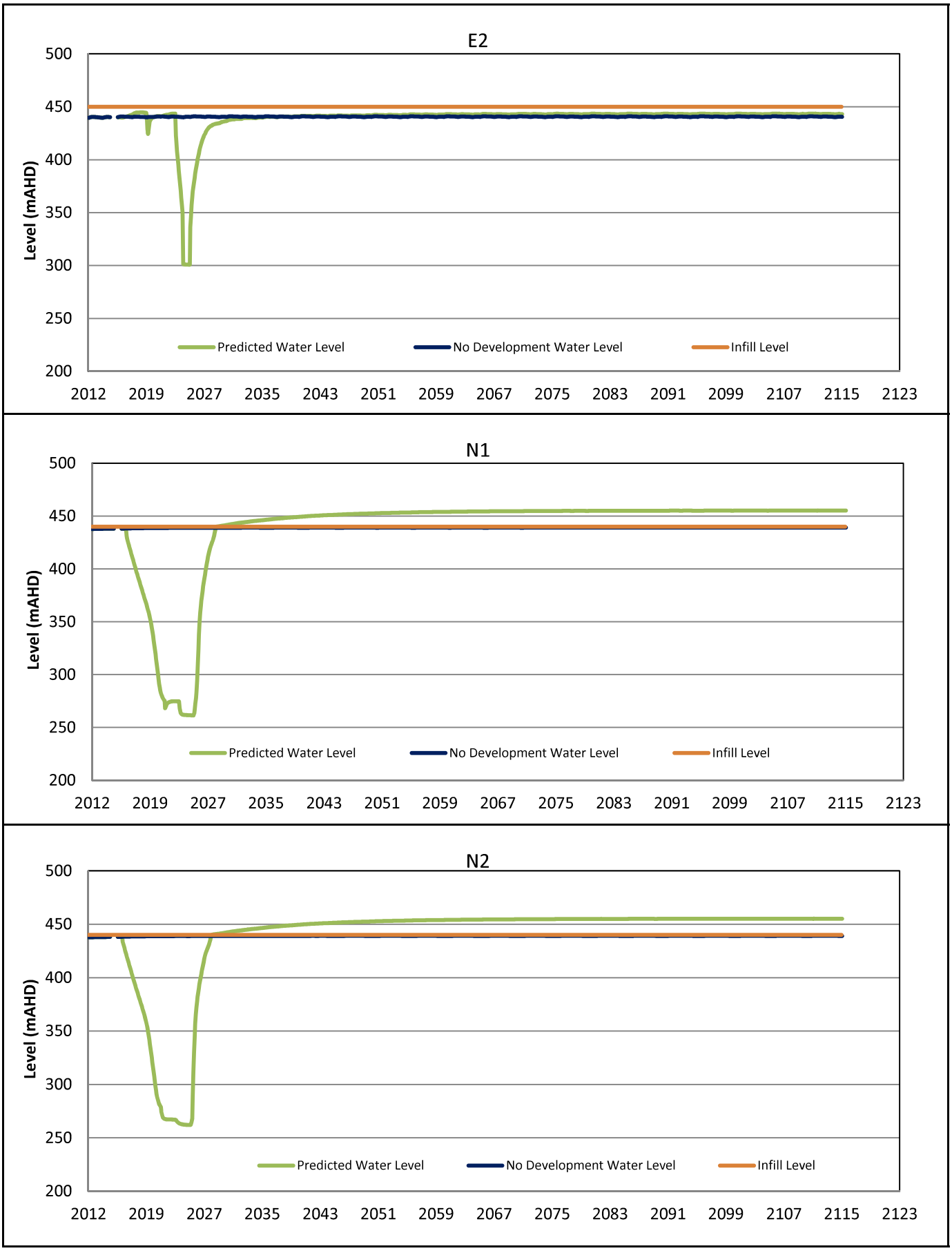
PREDICTED WATER LEVELS FIGURE 4.44

J:\013B\2 TECH\Modelling\AQ2 Model\Prediction\[CL10A.xlsx]Figure 4.44



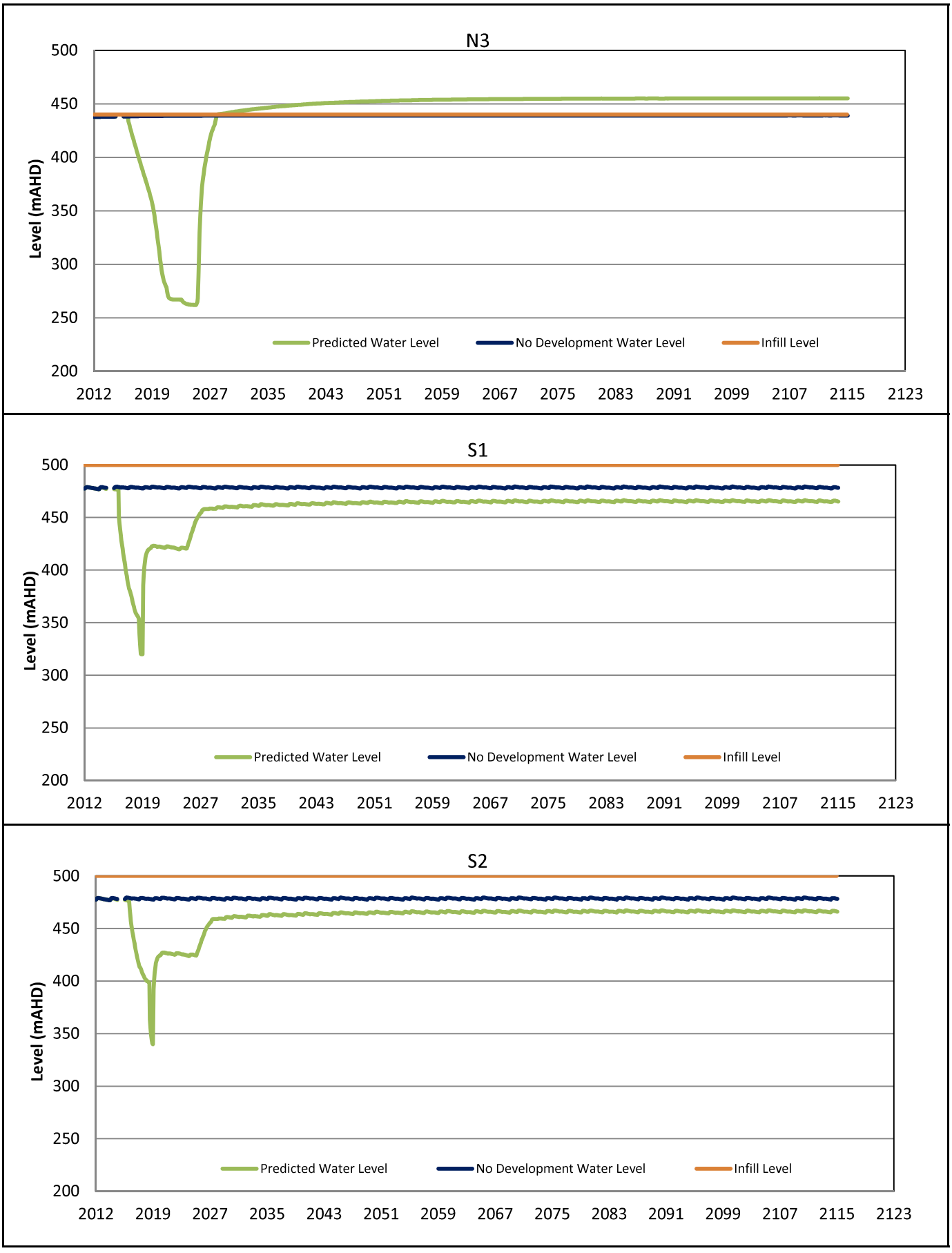
PREDICTED WATER LEVELS FIGURE 4.45

J:\013B\2 TECH\Modelling\AQ2 Model\Prediction\[CL10A.xlsx]Figure 4.45



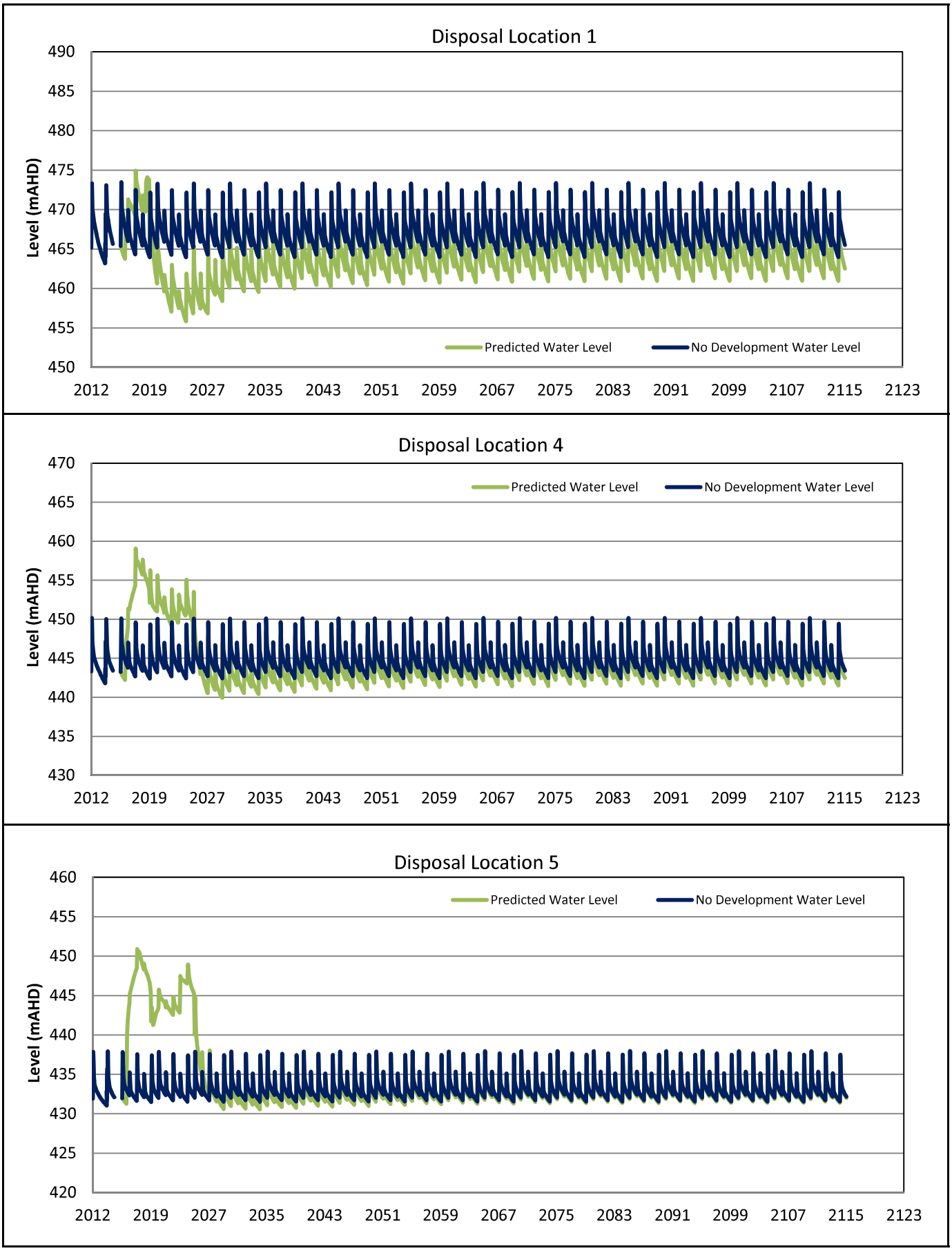
PREDICTED WATER LEVELS FIGURE 4.46

J:\013B\2 TECH\Modelling\AQ2 Model\Prediction\[CL10A.xlsx]Figure 4.46



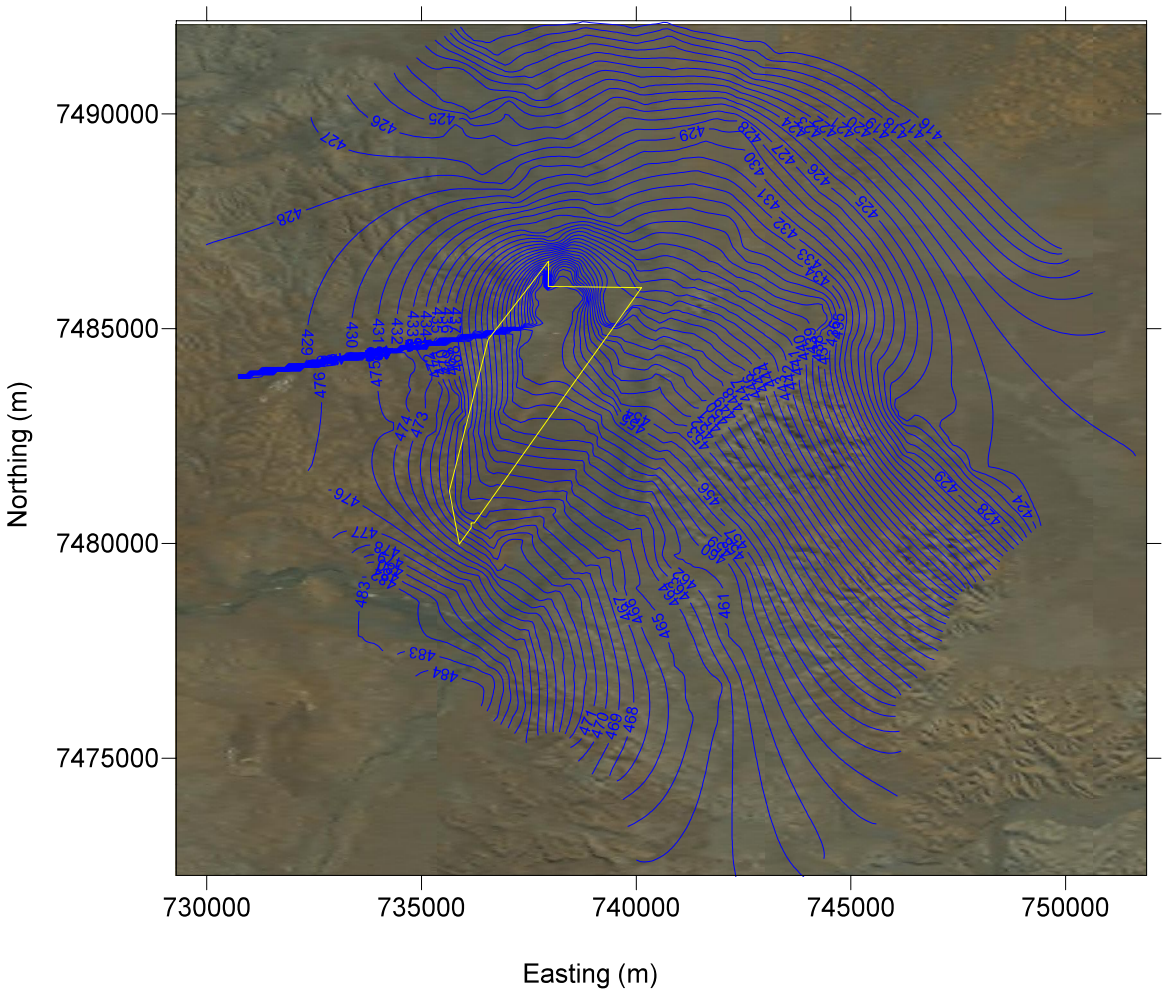
PREDICTED WATER LEVELS FIGURE 4.47

J:\013B\2 TECH\Modelling\AQ2 Model\Prediction\[CL10A.xlsx]Figure 4.47



PREDICTED WATER LEVELS FIGURE 4.48

J:\013B\2 TECH\Modelling\AQ2 Model\Prediction\[CL10A.xlsx]Figure 4.48



LOCATION MAP

LEGEND

Contour of Predicted Water Level (mAHD)

Contours shown at 1m interval to show predicted groundwater flow patterns around mine void areas.

AUTHOR: KR
DRAWN: KR
DATE: 14 Jan 2015

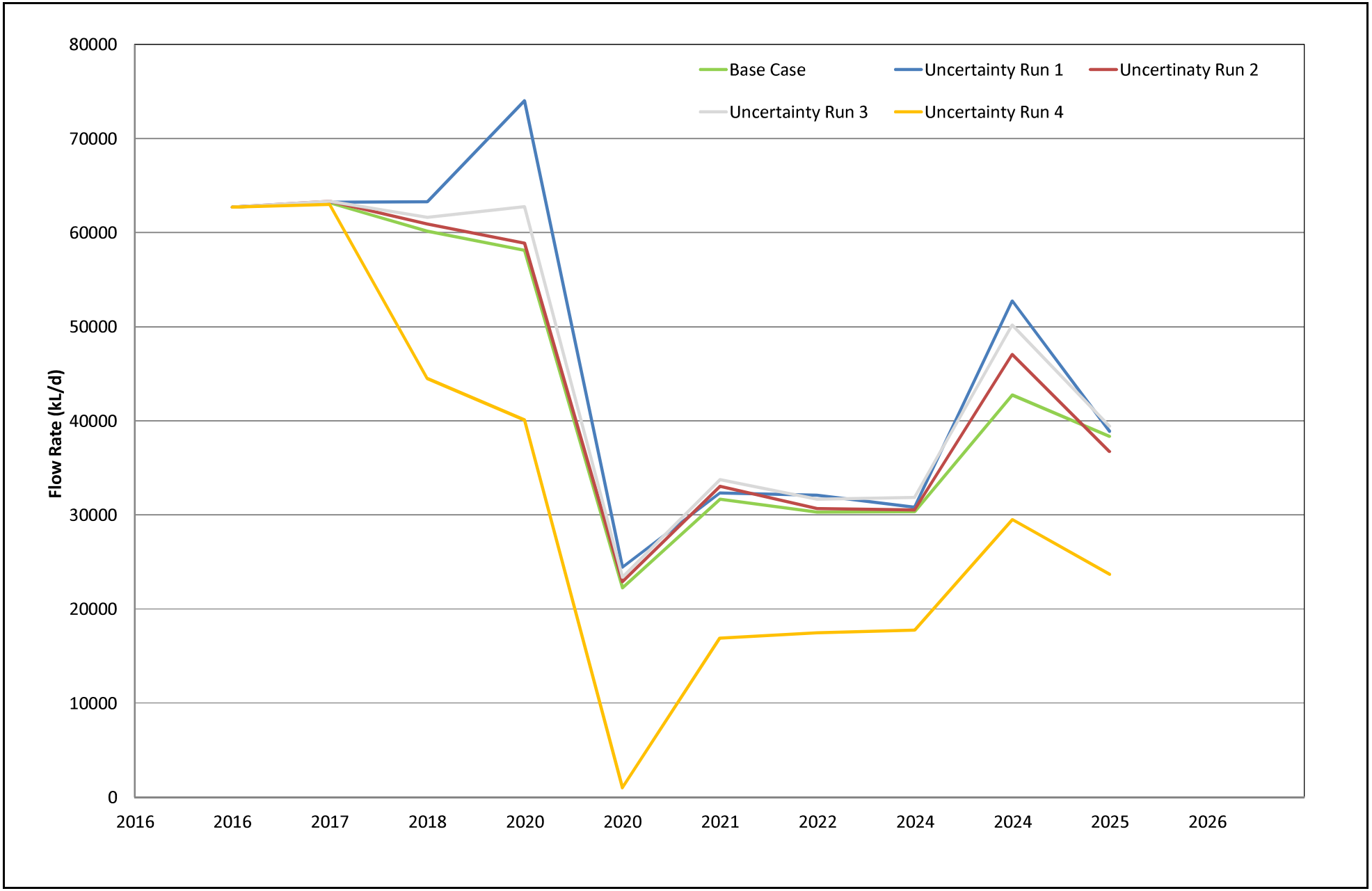
REPORT NO: 062b
REVISION: B
JOB NO: 013B

GDA94 Zone 50
SCALE: 1:175,000 (at A4)

f:/013b/GIS/Modelling Figures/Figures/062a Figure 4.49revc.srf

AQ2

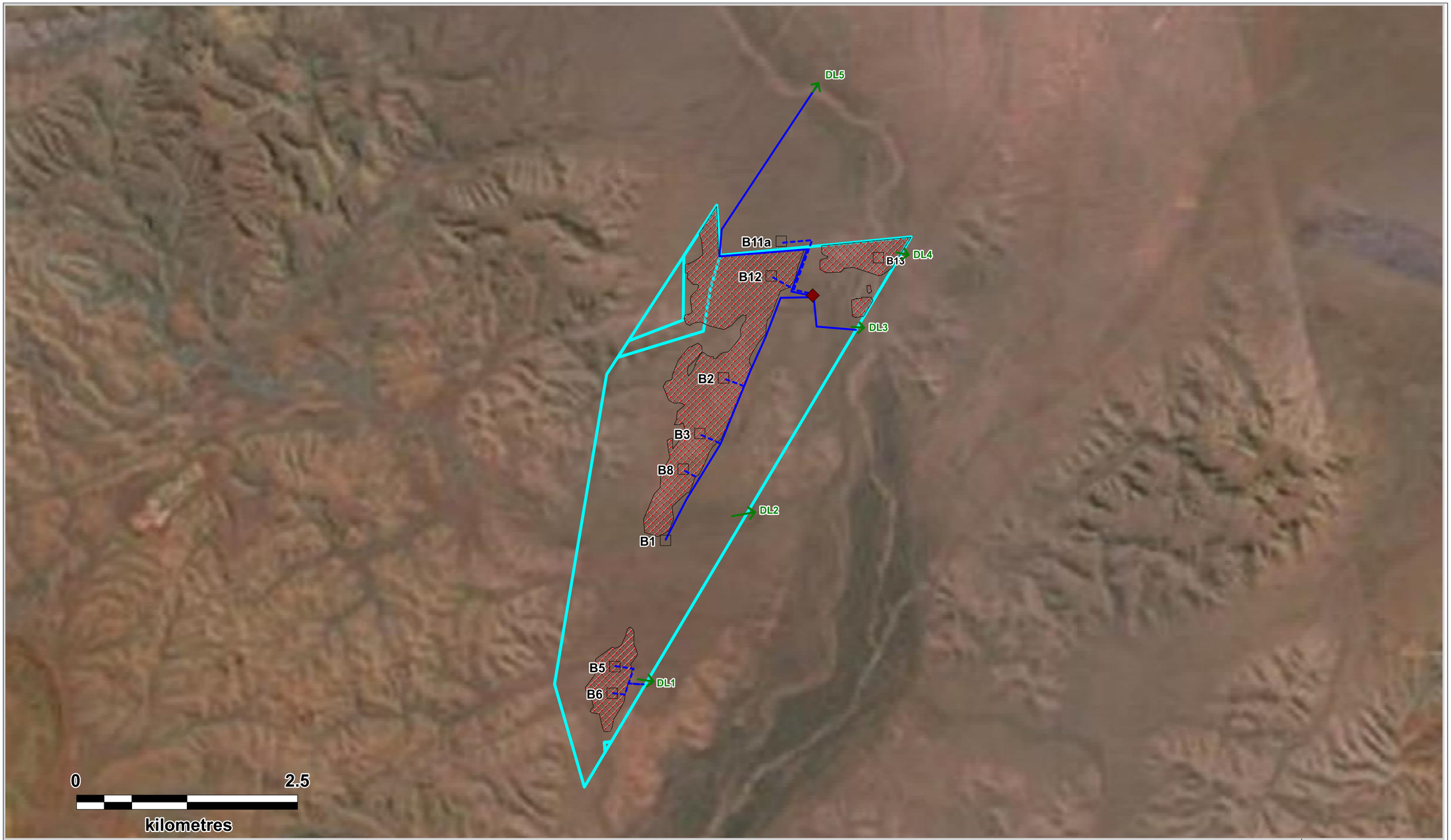
FIGURE 4.49
CONTOURS OF PREDICTED WATER LEVELS END OF 2115



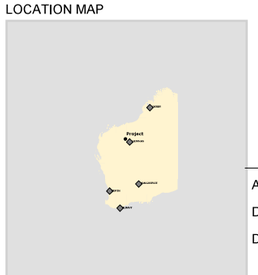
UNCERTAINTY ANALYSIS PREDICTED DEWATERING FIGURE 4.50

AQ2

F:\013B\2 TECH\Modelling\AQ2 Model\Prediction\[Uncertainty Summary.xlsx]Figure 450



LOCATION MAP



Location: XXXX

Key

- Mine Water Turkeys Nest
- Potential Creel Discharge Locations
- Bore Spur Pipeline
- Dewatering Discharge Trunk Pipeline
- Pit Outline
- Tenement
- Dewatering Pumping Area

AUTHOR: ATS
DRAWN: ATS
DATE: 05/01/2016

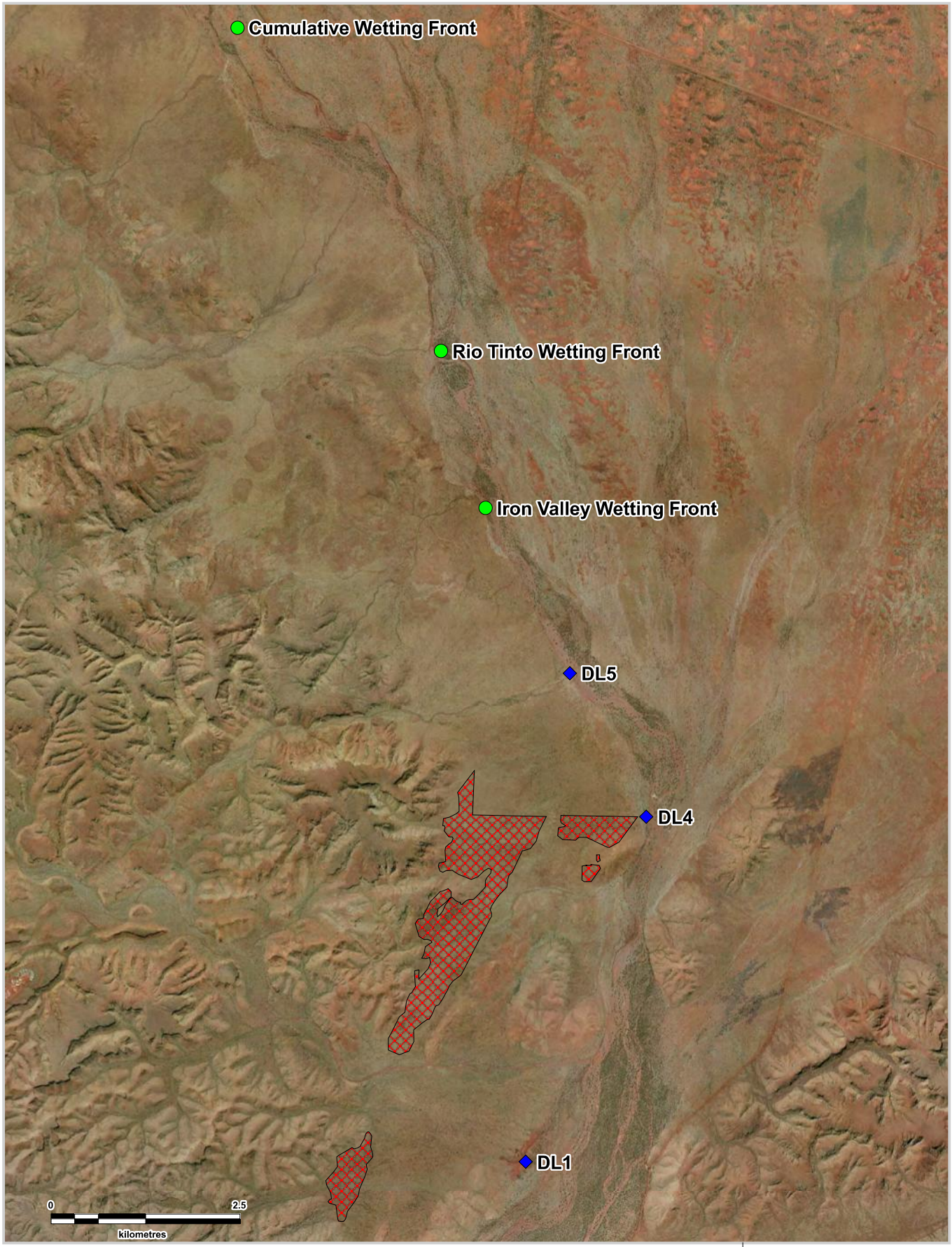
REPORT NO: 059A
REVISION: A
JOB NO: 13b

NOTES & DATA SOURCES:
PIT OUTLINE AND TENEMENT BOUNDARY PROVIDED BY BC IRON

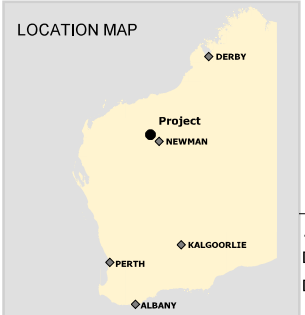
AQ2

FIGURE 5.1

CONCEPTUAL DEWATERING SYSTEM



LOCATION MAP



KEY

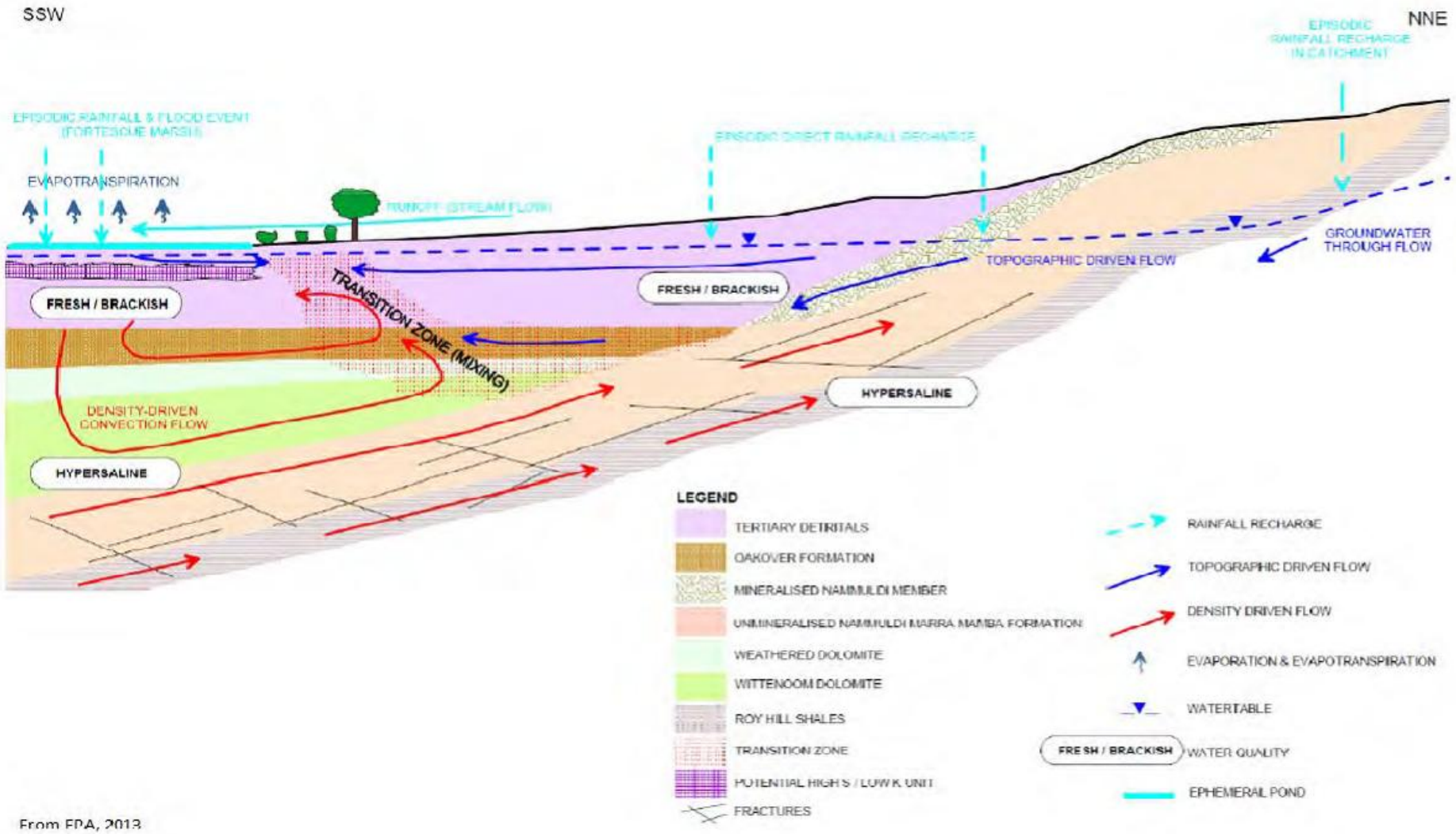
- Iron Valley Disposal Locations
- Location of Wetting Fronts
- Pit Outline

AUTHOR: ATS DRAWN: ATS DATE: 14/01/2016	REPORT NO: 083A REVISION: B JOB NO: 13B	NOTES & DATA SOURCES: MGA Zone 50 (GDA 94)

AQ2

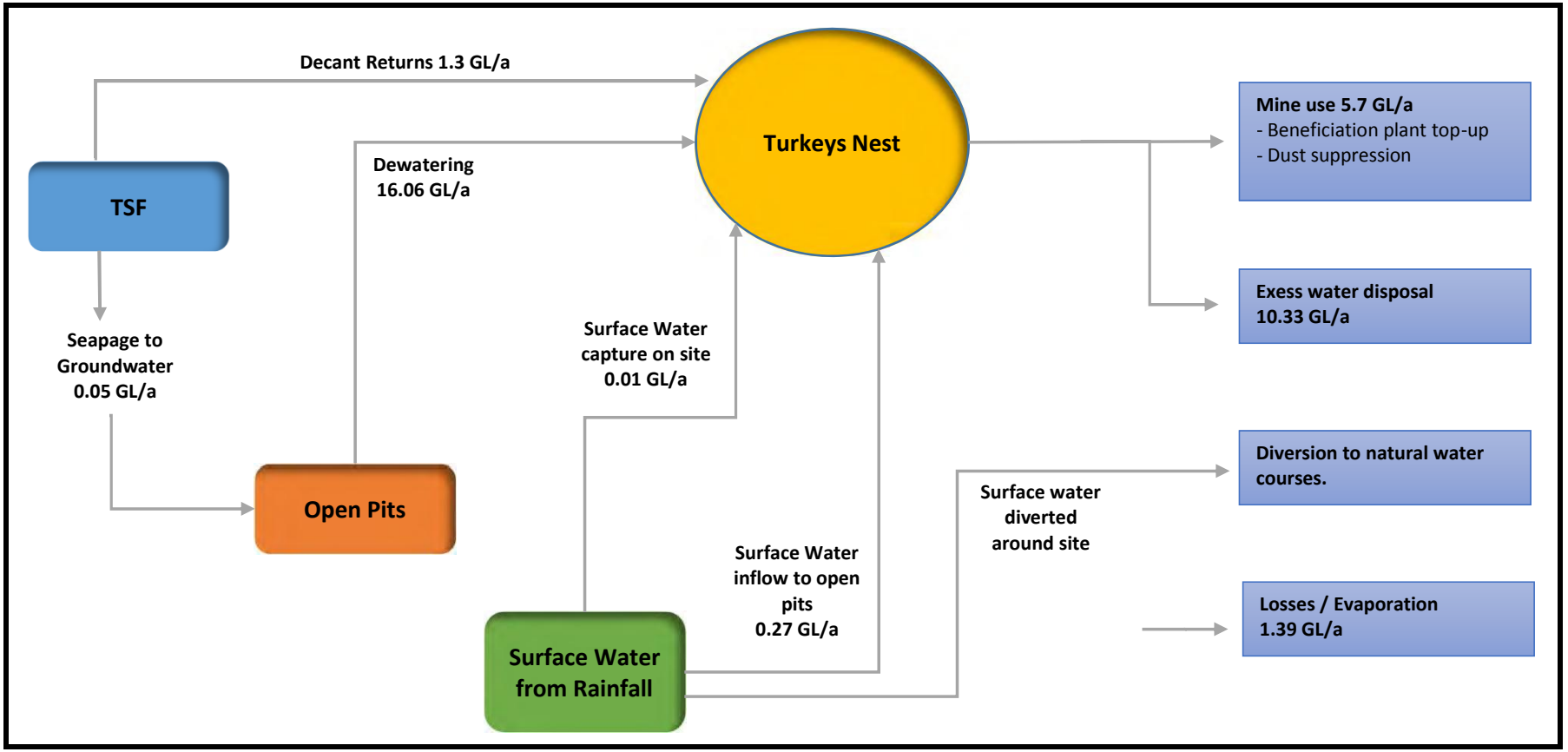
FIGURE 8.1

EXTENT OF WETTING FRONTS

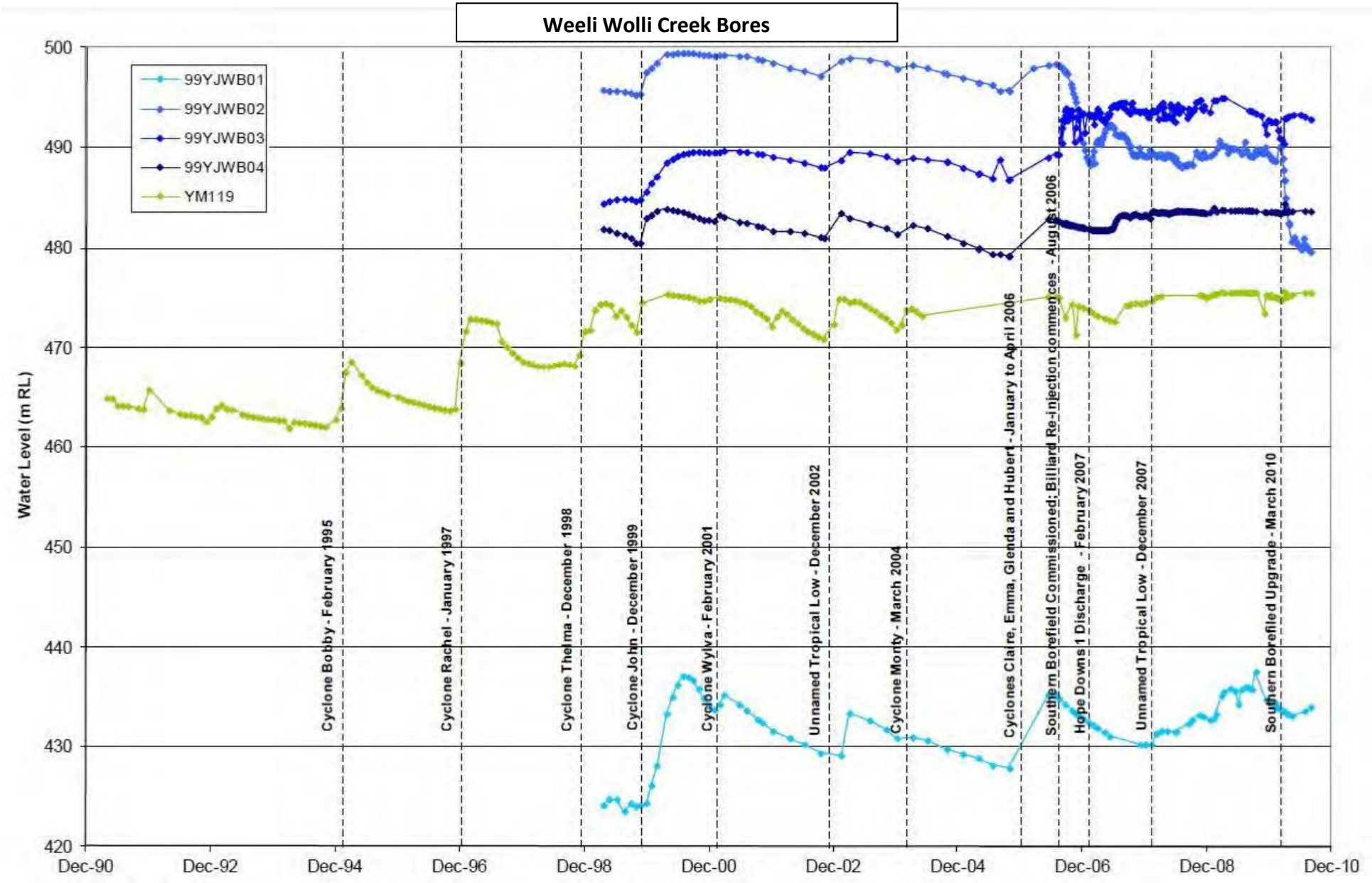


AQ2

Groundwater Flow Patterns below the Fortescue Valley FIGURE 9.1



Mine Site Water Balance - Annual Average FIGURE 10.1



From Rio Tinto, 2012

AQ2

Water Levels – Bore YM119 FIGURE 11.1

APPENDIX A

Fieldwork Report

IRON VALLEY

Fieldwork undertaken for the Below Water Table Mining Groundwater Study

January 2016

AQ2 Pty Ltd
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East Perth 6004

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1 BACKGROUND

BC Iron (BCI) have already assessed the option of mining the existing ore body lying above the water table at Iron Valley and have received Ministerial approval to proceed. BCI would now like to assess the option of mining below the water table and AQ2 were asked to help assess the potential impacts that mining could have on the surface and groundwater systems, as well as the measures that would need to be introduced to reduce any impacts.

The Iron Valley deposit is located in the central Pilbara, adjacent to the Weeli Wolli Creek and upstream of the Fortescue Marsh system (Figure 1). Both of these surface water systems are sensitive, requiring careful management of adjacent water resources. These surface water systems are linked to the adjacent groundwater systems, so any changes to the groundwater are likely to have an impact on the adjacent surface water. With the ore body known to be a major aquifer, dewatering at moderate to high pumping rates is expected, while the cone of dewatering may extend as far as the adjacent Weeli Wolli Creek and into the Fortescue River valley (where saline groundwater is known to occur). It is clear then, that water management at the site will be an important part of any approvals assessment.

1.1 Key Issues

AQ2 believes that the key issues related to assessing the hydrogeology and hydrology and in gaining approval to mine below the water table are:

- The volume of dewatering necessary to allow mining below the water table;
- Impacts of dewatering on the Weeli Wolli Creek;
- Excess water disposal and impacts of disposal plans proposed (on flow volumes and water chemistry);
- Potential changes in groundwater quality due to intrusion of saline water associated with the Fortescue Marsh;
- Potential impacts of dewatering on groundwater dependent ecosystems (GDEs) including vegetation, and stygofauna;
- Diversion of intercepted upstream surface water flow paths;
- Management of stormwater runoff generated on the mine site;
- Acceptable water resources management after mine closure.

1.2 Scope of Work

Prior to assessment of the above listed key issues, it was necessary to collect site specific data. A fieldwork programme was carried out and is reported on in this report.

2 FIELDWORK UNDERTAKEN

The fieldwork programme was based on a review of all available data and work undertaken during the earlier above water table mining study. Historical groundwater related fieldwork (see References for list of previous URS studies) has covered the installation of ten monitoring bores and two test bores (Table 1). However, aquifer parameter information was only obtained from packer tests of two geotechnical bores. As a result, it was still necessary to collect site specific groundwater data to:

- obtain data on the permeability of the orebody aquifer and adjacent bedrock material;
- better understand the extension of the orebody aquifer system, especially to the north, where it could potentially be in direct contact with the saturated alluvium of the Weeli Wolli Creek;
- assess the permeability of the river alluvium along the southern end of the main pit and possible connections to the underlying orebody aquifer.

The work undertaken to collect the data required was:

- Installation of 50mm pvc casing into 2 existing, open RC mineral exploration bores to north of the dyke and permeability testing of these bores.
- Installation of 50mm casing into four selected open mineral exploration bores that pass through the pit walls and permeability testing of these bores, to ascertain the pit wall hydraulic properties.
- Permeability testing of all monitoring bores installed previously.
- Sampling of all the monitoring bores tested (same time as permeability testing).
- Logging of the saltwater transition in bores to the north and north-east of the mine site, where access is possible. Down the hole conductivity profiling to take place (undertaken by AQ2 staff), to identify the transition from fresh to saline water.
- Aquifer tests on the two existing production bores, to determine hydrogeological properties of the aquifer.

Table 1: Details of Existing Bores

Bore	Type	Easting (m)	Northing (m)	Completion Date	Total Depth (mbgl)	Screen Depth (mbgl)
MBA	Monitoring bore	739780.392	7485810.512	24-Feb-12	86	49-86
MBC	Monitoring bore	738371.000	7485400.000	5-Dec-11	162	54-162
MBD	Monitoring bore	738398.529	7485251.231	29-Nov-11	146	54-144
MBE	Monitoring bore	738045.000	7484794.000	10-Nov-11	136.5	39-136
MBF	Monitoring bore	737627.000	7484196.000	9-Dec-11	130	40-124
MBG	Monitoring bore	737899.977	7484191.235	11-Dec-11	128	44-122
MBH	Monitoring bore	738617.946	7485601.365	24-Feb-12	104	34-104
MBJ	Monitoring bore	736443.981	7481199.218	26-Feb-12	140	10-64
MBK	Monitoring bore	739240.607	7484895.366	9-Feb-12	128	90-128
MBL	Monitoring bore	737326.000	7482593.000	24-Feb-12	113	53-113
PB01	Production bore	738127.483	7485006.600	25-Nov-11	142.5	58-142.5
PB02	Production bore	737704.000	7484194.000	29-Jan-12	170	58.5-154.5

3 MONITORING BORE INSTALLATION

3.1 Work Undertaken

During May 2015, six existing exploration holes were converted to monitoring bores, by re-entering and cleaning the holes and equipping with 50mm PVC casing, gravel-packs and bentonite seals. An R/C drill-rig equipped with a downhole hammer and 5½" bit was employed to clean, and where necessary, to open up collapsed exploration holes.

Table 2 details the chosen exploration holes, while locations of existing monitoring bores and the new monitoring bores, are shown in Figure 2. Of the six sites chosen, three were successfully re-entered and bores constructed as planned. In two cases, the existing holes were open to such depths that backfilling to the planned "base of casing" proved impractical and new bores were drilled and completed adjacent to the exploration holes. In one instance, environmental approvals required that a new bore be drilled some 50m away from the planned position.

Existing monitor bores in and around the Iron Valley mine site have been numbered from MBA –MBL and the new bores were numbered MBM – MBR. Detailed logs showing geology, construction and static water levels (SWLs) are presented in Appendix A.

Table 2: Details of New Monitor bores Constructed

Monitor Bore ID	Exploration Hole ID	Collar East	Collar North	Exploration Hole Type	Exploration Hole Diameter	Casing installed	Slotted casing depths (m bgl)	SWL (m bgl) on 15 Mar 2015
MBM	IV233 / IV234	736,900	748,2550	RC	140mm	0-46m x 50mm uPVC	13-25	12.89
MBN	IV228	737,457	748,3593	RCD	140mm	0-124m x 50mm uPVC	18-116	17.11
MBO	IV227	737,590	748,3803	RCD	140mm	0-124m x 50mm uPVC	12–120	14.14
MBP	IV357	737,695	748,4100	RCD	unknown	0-64m x 50mm uPVC	12-60	12.13
MBQ	IV379	737,848	748,5398	RCD	unknown	0-64m x 50mm uPVC	54-100	54.36
MBR	IV196	738,309	748,5399	RC	140mm	0-100m x 50mm uPVC	54-100	46.41

Details on the drilling of each hole are provided below:

- Initially two sites were selected for MBM, viz. mineral exploration bores IV233 and IV234. However as, environmental clearance was unavailable for either site, MBM was drilled at a new position in the alluvium some 50m south of IV233 and IV234.
- MBN was designed to be constructed to 116m in existing exploration hole IV228 which was originally drilled to 278m. The hole was cleared by re-drilling to 124m (limit of drill-rods) where caving and collapse effectively backfilled the lower part of the hole. Construction was completed as planned.

- MBO was constructed in IV227 with the base of the PVC casing planned at 120m. The hole was open to this depth but an additional 4m was drilled using the hammer to ensure the remainder of the hole was blocked by caving and collapse. Construction was as planned.
- MBP was planned to be constructed to 64m in IV357 which was tagged and found to be to open to 120m. Attempts to backfill from 120 – 64m were unsuccessful with the backfill (low-grade fines) continually bridging off near the surface. A decision was made to drill a new bore close to IV357 on the same drill-pad.
- MBQ was constructed in IV379 with the base of the PVC casing at 100m. Originally drilled to 144m, IV379 was tagged at 102.5m after the re-drill with caving and collapse effectively backfilling the lower part of the hole. Construction was as planned.
- MBR was planned for IV196 where tagging showed the hole to be open to at least 200m. In light of the experience at MBP it was decided against backfilling to the required depth of 100m and a new bore was drilled on the same pad.

4 AIRLIFT PERMEABILITY TESTING

4.1 Work Undertaken

Airlift permeability testing was completed in all of the monitoring bores at Iron Valley (Table 3), to gain some understanding of the aquifer permeability in each of the bores. The bores testing included the original 10 bores MBA to MBL (excluding MBB and MBI which don't exist), as well as the six new bores (MBM to MBR) which were re-drilled and equipped during this programme (Figure 2).

At all sites, the testing was undertaken by the Resource Water Group(RWG), covering the provision and operation of the trailer-mounted compressor, installation of the airline and pressure transducers, construction of the V-Notch and undertaking of the test. Programming of the pressure transducer loggers and measurement of flows over the V-Notch was the responsibility of the supervising hydrogeologist from AQ2. The setup utilized for airlifting is shown in Figure 3.

At most sites, a single airlift was completed over a nominal period of 1 hour. In the case of MBC and MBD, two airlifts were completed, with the airline at different depths while at MBF, four airlifts were completed with the airline at different depths. In most case the logger was suspended 15 or 20m below the airline. Exceptions to this occurred during some of the tests which had the airline at different depths. Where airlifting could not be carried out due to submergence issues (bore MBM), a slug test was undertaken to assess the permeability.

Airlift yields from the narrow diameter bore casing was low, (< 0.45L/s). Water quality measurements (EC and pH) were collected at each bore and will be discussed in more detail in the Water Quality section. Test details summarised in Table 3, while the airlift data is provided in Appendix B.

4.2 Results

4.2.1 Aquifer permeability

The data from the airlift testing exercise was subjected to analysis. Generally, the drawdown data was unsuitable for analysis, but the recovery data allowed analysis, essentially by the Theis Recovery Method. The exception was MBM where, a slug-test was completed and the results analysed by the Bower-Rice method. Results are presented in Table 4.

Table 3: Monitoring bores – Airlift Details

Bore ID	No of Airlifts	Airlift Duration (hrs:mins)	Reading frequency (sec)	Airlift depths (mbgl)	Logger depths (mbgl)	V Notch (L/sec)	pH	EC (uS/cm)	Comments
MBA	1	1:16	1	50	70	0.05	8.1	807	
MBC	2	1:10	1	100, 80	120, 120	0.01	8.13	950	
MBD	2	0:51	30	80, 70	120, 120	0.45	7.55	934	Test terminated early due to excessive back pressure
MBE	1	1:00	30	70	90	0.45	7.81	911	Extended recovery time due to clearing the area close to the ramp
MBF	4	2:08	30	104, 90, 70,70	111, 111, 111, 111	0.31	7.83	995	
MBG	1	1:00	30	70	80	0.45	8.02	981	
MBH	1	1:00	1	70	90	0.05	8.25	621	
MBJ	1	0:42	30	40	55	0.03	7.92	390	Logger malfunction, retested
MBJ Retest	1	0:17	30	40	55	0.03	7.92	390	Shorter recovery as known from last test recovery is fast
MBK	1	1:02	30	70	90	0.15	7.93	1141	
MBL	1	1:00	30	70	90	0.37	7.92	955	
MBM	Slug test	0:00	1						20L added at 07:00
MBN	1	1:00	30	70	90	0.19	8.13	1006	Extended recovery time due to slow recovery on others
MBO	1	1:00	1	70	90	0.11	8.03	915	
MBP	2	2:20	30	50, 50	57, 57	0.15	8.08	925	Airlift blew logger up hole on both tries
MBQ	1	1:07	30	70	90	0.02	8.31	824	
MBR	1	1:00	30	80	90	0.08	8.17	873	

Table 4: Results of Permeability Testing of Monitor Bores

Bore ID	Pumping Test Type	Screened in Formation	Transmissivity (m2/d)	K (m/d)	Analysis	Comments
MBA	Airlift	Mineralised Weeli Wolli	19	0.2	Theis Recovery	
MBC	Airlift	Mineralised Weeli Wolli (possibly BRK at the base)	0.06	0.0002	Theis Recovery	Screens from 54-72, 84-90. 114-120, 126-132 & 144-162.
MBD	Airlift	Mineralised Weeli Wolli (possibly BRK at the base)	18	0.13	Theis Recovery	Screens from 54-60, 66-72, 78-84, 90-96, 102-108, 114-120, 126-132 & 138-144
MBE	Airlift	Mineralised Brockman	134	1.03	Theis Recovery	
MBF	Airlift	Mineralised Brockman	6.4	0.06	Theis Recovery	Screens from 40-52, 58-64, 70-76, 82-88, 94-100, 106-112 & 118-124
MBG	Airlift	Mineralised Weeli Wolli	10.6	0.07	Theis Recovery	Screens from 44-56, 62-74, 80-86, 92-98, 104-110 & 116-122m.
MBH	Airlift	Mineralised Weeli Wolli	13.6	0.10	Theis Recovery	
MBJ	Airlift	Mineralised Weeli Wolli	0.1	0.002	Theis Recovery	
MBK	Airlift	Mineralised Weeli Wolli	18	0.16	Theis Recovery	Only smaller drilled diameter has been used (0-90m = 0.25m and 90-128m = 0.165)
MBL	Airlift	Mineralised Weeli Wolli	84	0.80	Theis Recovery	
MBM	Airlift	Alluvium	20	0.80	Theis Recovery	SWL below top of screen - Low confidence of slug test analysis
MBN	Airlift	Mineralised Weeli Wolli	6.5	0.05	Theis Recovery	SWL below top of screen
MBO	Airlift	Mineralised Weeli Wolli	5.5	0.05	Theis Recovery	SWL below top of screen
MBP	Airlift					Test not completed - 2 failed attempts
MBQ	Airlift	Detrital/Ore (Ore = Joffre)	14	0.20	Theis Recovery	Poor Analysis
MBR	Airlift	Mineralised Brockman (Joffre)	5.1	0.04	Theis Recovery	

Analysis of the airlift data (Appendix B) shows a range in permeabilities between $2x10^{-4}$ and 1 m/day. These permeabilities are lower that would have been expected, with the suggestion that the diamond drilling (without any consequent bore development), has resulted in the clogging of the aquifers.

5 AQUIFER TESTING

The two production bores used at the mine site (PB1 and PB2) were subjected to full aquifer testing (step, constant rate and recovery analysis).

5.1 Work Undertaken

In order to complete the step rate tests and constant rate tests (SRT and CRT) in production bores PB1 and PB2 (see Figure 2), the existing pump infrastructure was removed/disconnected by RWG. This included the submersible pump, the generator and switchbox, the electrical cabling and all the pipework. RWG utilized their own equipment, comprising a 300kVA generator, a submersible pump capable of delivering 10 – 50 L/sec water, a 4" riser and 6" lay-flat hosing.

5.1.1 Bore PB1

At PB1, the bore depth is 140m with continuous screens installed from 58-140m. The pump inlet was set at 117mbgl. Three existing exploration holes were utilized as monitor bores. One of these was confirmed as IV369 while the other two were not numbered and were named MB Mike and MB Steve. Details are provided in Table 5 below. The lay-flat discharged water at a point 450m from the wellhead.

Table 5: Production and Monitor Bore Details for PB1

Bore ID	Easting	Northing	Distance from PB (m)	SWL (mbtoc)
PB1	738128	7485007	0.00	7.93
MB Mike	738126	7484941	56.04	6.60
MB Steve	738072	7484949	80.62	9.58
IV369	738102	7485102	98.49	8.55

5.1.1.1 Step Rate Test

Details of the SRT at PB1 are summarised in Table 6, with the water level response to pumping illustrated graphically in Figure 4. Full results are presented in Appendix C.

The bore is moderately high yielding, delivering 50 L/s, with a drawdown of ~3.6m at an efficiency of above 63%.

Table 6: Step Test Details for PB1

Step No.	Flow rate (L/sec)	Duration (mins)	Maximum Drawdown (m)
1	22	60	1.02
2	30	60	1.76
3	40	60	2.63
4	50	60	3.62

5.1.1.2 Constant Rate Test

Based on the results of the SRT and the pump's ability, the pumping rate for the CRT was set at 40L/sec for a duration of 48 hours. Over this period the drawdown reached 3.03m. The results of

the CRT are presented in Figure 5. In the monitoring bores the maximum drawdowns were logged at 1.054 in IV369, 0.820 in MB Steve and 0.591 in MB Mike.

Recovery in PB1 was measured over a period of 23 hours at which time the bore had recovered to 8.10m, only 0.17m from the original SWL. Results are illustrated in Figure 6.

5.1.2 Bore PB2

PB2 was drilled to 170m with screens installed between 58.5 and 154.5m. The test pump was installed to a depth of 115m bgl. An existing monitoring bore (MBF) and an old exploration hole (IV391) were utilized as monitor bores. Details are provided in Table 7 below. The lay-flat discharged water at a point 600m from the wellhead. The SWL in PB2 was measured at 13.34mbrp.

Table 7: Production and Monitor Bore Details for PB2

Bore ID	Easting	Northing	Distance from PB2 (m)	SWL (m btoc)	Available Drawdown (m)
PB2	737704	7484194	0.00	13.34	102m
MBF	737627	7484196	77.03	13.40	117m
IV391	737752	7484298	114.54	10.69	>50m

5.1.2.1 Step Rate Test (SRT)

Details of the SRT at PB2 are summarised in Table 8, while the water level response to pumping is illustrated graphically in Figure 7. Full results are presented in Appendix C.

The bore is moderately high yielding, delivering a maximum of 27 L/s, with a drawdown of ~54m at an efficiency of above 76%.

Table 8: Step Test Details for PB2

Step No.	Flow rate (L/sec)	Duration (mins)	Maximum Drawdown (m)
1	10	60	16.14
2	15	60	24.85
3	20	60	35.57
4	27	60	54.02

5.1.2.2 Constant Rate Test

Based on the results of the SRT, the pumping rate for the CRT was set at 25L/sec for a duration of 48 hours. Over the pumping period the drawdown reached 48.76m and a total of 4.4ML was discharged. In monitor Bore MBF the drawdown after 48 hours was 0.558m and in IV391it was 0.565. The results are presented graphically in Figure 8. In PB2 recovery to 13.75m was achieved after 110mins and in Monitor bore MBF recovery to 13.54 (SWL = 13.40) was reached in 120mins. Recovery was not measured in IV391.

5.2 Results of Aquifer Test Analysis

5.2.1 Aquifer Permeability

Various methods were used to analyse the aquifer test data from PB1 and PB2, as well as from the adjacent monitor bores. A summary of the results is presented in Table 9. Detailed results can be found in Appendix C.

The analysis shows the orebody aquifer to have variable permeability between 2-20 m/day, depending on the degree of fracturing and weathering, with a storativity between $1x10^{-3}$ - $1x10^{-4}$

Table 9: Aquifer permeability results from the Step and Constant Rate Tests at PB1 and PB2

Test Bore	Monitoring Bore	Bore Type	Pumping Test Type	Length of screen	Screened Formation	Transmissivity (m^2/d	K (m/d)	S	Analysis	Comments
PB1	PB1	Prod.	CRT	82	Mineralised Brockman	2701	21		Theis	Screens from 59 - 141
	PB1	Prod.	REC	82	Mineralised Brockman	2679	21		Theis Recovery	
	MB Steve	Mon.	CRT			2986		0.001	Theis	
	MB Mike	Mon.	CRT			3615		0.004	Theis	
	IV369	Mon.	CRT			2250		0.0005	Theis	
PB2	PB2	Prod.	CRT	61	Mineralised Brockman	80-280	0.5 - 1.75		Theis (unconfined and confined)	Screens from 58-61, 70-73, 81-84, 92-122 & 130-152.
	PB2	Prod.	REC	61	Mineralised Brockman	255 - 316	1.6 - 2.4		Theis Recovery	
	MBF	Mon.	CRT	40	Mineralised Brockman	3400		0.0001 - 0.00006	CJ Confined, Theis Confined, P/C Confined	Screens from 40-52m, 58-64, 70-76, 82-88, 94-100, 106-112 & 118-124.
	IV391	Mon.	CRT			1450	11.6	0.002	Theis Confined	

6 WATER SAMPLING

6.1 Airlift sample collection

Samples were collected from each of the monitor bores during the permeability testing programme, with the exception of MBM, which did not yield any water. Detailed water chemistry results are presented in Appendix D.

The following chemical parameters were measured:

- pH in water
- Conductivity and TDS by calculation in water @ 25°C
- Alkalinity: Total Alkalinity as CaCO3,
  Carbonate Alkalinity as CO3
  Bicarbonate Alkalinity as HCO3
- Chloride (Cl)
- Sulphate (SO4)
- Ca, K, Mg, Na,
- Total Iron
- As, Cd, Cr, Cu, Ni, Pb, Se, Zn, Mn, Al
- Mercury (Hg)

The following broad conclusions for the 15 monitor bores tested were reached:

- The pH is alkaline, with a narrow range from 8.2 – 8.6.
- The electrical conductivity (EC) lies in a range from 720 -1000µS/cm, except for bore MBJ which is much lower at 340µS/cm (top of the screens are in river alluvium of adjacent creek bed). As expected, the TDS follows a similar trend, ranging from 420 – 590mg/L, except for MBJ which measured 290mg/L.
- The ICPMS trace element results illustrate a few anomalies:
  - Total Iron varies from below detection (5µg/L) to 13µg/L in all but four samples which gave significantly higher results (20µg/L in MBJ, 34µg/L in MBK, 74µg/L in MBC and a highly anomalous 400µg/L in MBH.
  - As is elevated in MBL
  - Cd, Cr, Cu, Ni, Pb, Se and Hg are at or below detection in all bores.
  - Zn and Al are elevated in MBC and MBH
  - Mn ranges from below detection (1mg/L) to a maximum of 60mg/L in all bores except MBQ where it is strongly elevated at 210mg/L.

6.2 Aquifer test sample collection

PB1 and PB2 were both sampled at the end of the CR tests. Results are presented in Table 10. Hydrochemically, the two production bores are very similar and the water quality is that expected during the dewatering programme expected in the future. The main difference is Total Fe where PB1 (120µg/L) is far higher than PB2 (18µg/L) and is, in fact higher than all the monitor bores with the exception of MBH (see earlier discussion in section 4.2.2). Although most dissolved trace metals are below detection limit it is noteworthy that PB2 has significantly higher levels of Zn and Mn (37µg/L and 26µg/L) than PB1 (<5µg/L and 9µG/L).

Table 10: Hydrochemistry of production bores PB1 and PB2

		PB1	PB2
Analyte Name	**Units**	**Result**	**Result**
pH**	pH Units	8.3	8.2
Conductivity @ 25 C	µS/cm	830	850
Total Dissolved Solids Dried at 175-185°C	mg/L	480	490
Total Alkalinity as CaCO3	mg/L	270	280
Carbonate Alkalinity as CO3	mg/L	<1	<1
Bicarbonate Alkalinity as HCO3	mg/L	330	340
Chloride, Cl	mg/L	87	86
Sulphate, SO4	mg/L	51	53
Calcium, Ca	mg/L	44	45
Potassium, K	mg/L	8.5	7.9
Magnesium, Mg	mg/L	44	45
Sodium, Na	mg/L	53	54
Total Iron	µg/L	120	18
Arsenic, As	µg/L	<1	<1
Cadmium, Cd	µg/L	<0.1	<0.1
Chromium, Cr	µg/L	<1	<1
Copper, Cu	µg/L	<1	<1
Nickel, Ni	µg/L	<1	<1
Lead, Pb	µg/L	<1	<1
Selenium, Se	µg/L	<1	<1
Zinc, Zn	µg/L	<5	37
Manganese, Mn	µg/L	9	26
Aluminium, Al	µg/L	<5	<5
Mercury	mg/L	<0.00005	<0.00005

7 ASSESSMENT OF FORTESCUE MARSH SALINE WEDGE

7.1 Work Undertaken

In order to refine the position and geometry of the Fortescue Marsh Saline Wedge, permission was obtained from the Fortescue Metals Group (FMG) to access nine monitor bores drilled on their Nyidinghu property, located directly to the north of the Iron Valley tenement, to measure SWL's and to conduct EC profiling measurements. All of these bores contain nested piezometers targeting deep, intermediate and shallow aquifers. Details of these bores are provided in Table 11 and a map of the bore locations is provided in Figure 9.

Table 11: Nyidinghu Monitoring Bore Details

Bore ID	Piezometer ID	Easting [m]	Northing [m]	Surface Elevation [mAHD]	Top of Screen [m bgl]	Base of screen (m bgl)	Casing Type
NMB1001	NMB1001_D	741702	7487160	456.28	195.5	243.5	50 mm PN18 uPVC
	NMB1001_I	741702	7487160	456.28	82	172	50 mm PN18 uPVC
	NMB1001_S	741702	7487160	456.28	34.5	64.5	50 mm PN18 uPVC
NMB1002	NMB1002_D	739797	7487024	457.75	250	256	50 mm PN18 uPVC
	NMB1002_I	739797	7487024	457.75	77	137	50 mm PN18 uPVC
	NMB1002_S	739797	7487024	457.75	46.6	64.6	50 mm PN18 uPVC
	NMB1002_WT	739797	7487024	457.75	14.5	32.5	50 mm PN18 uPVC
NMB1003	NMB1003_D	739096	7486580	459.9	93.3	99.3	50 mm PN18 uPVC
	NMB1003_I	739096	7486580	459.9	63.1	87.1	50 mm PN18 uPVC
	NMB1003_S	739096	7486580	459.9	18.6	54.6	50 mm PN18 uPVC
NMB1004	NMB1004_D	738684	7486156	468.6	121	177.5	50 mm PN18 uPVC
	NMB1004_I	738684	7486156	468.6	68	104	50 mm PN18 uPVC
	NMB1004_S	738684	7486156	468.6	34	58	50 mm PN18 uPVC
NMB1005	NMB1005_D	739981	7486157	461.12	199	247	50 mm PN18 uPVC
	NMB1005_I	739981	7486157	461.12	65	137	50 mm PN18 uPVC
	NMB1005_S	739981	7486157	461.12	25.3	43.3	50 mm PN18 uPVC
NMB1007	NMB1007_D	740130	7490200	449.96	152	164	50 mm PN18 uPVC
	NMB1007_I	740130	7490200	449.96	108	144	50 mm PN18 uPVC
	NMB1007_S	740130	7490200	449.96	64	94	50 mm PN18 uPVC
NMB1009	NMB1009_D	744593	7491209	444.44	218.2	226.2	50 mm PN18 uPVC
	NMB1009_I	744593	7491209	444.44	162.2	204.2	50 mm PN18 uPVC
	NMB1009_S	744593	7491209	444.44	73	151	50 mm PN18 uPVC
	NMB1009_WT	744593	7491209	444.44	26	50	50 mm PN18 uPVC
NMB1013A	NMB1013A_S	741101	7487394	462	45	57	50 mm PN18 uPVC
	NMB1013A_WTS	741101	7487394	462	24.2	36.2	50 mm PN18 uPVC
NMB1003B	NMB1013B_D	741113	7487395	462	114	176	50 mm PN18 uPVC
	NMB1013B_I	741113	7487395	461	66	96	50 mm PN18 uPVC

During the period 5 – 9 June 2015, AQ2 personnel measured SWL's in every piezometer and completed EC profiling. Previous SWL measurements had been recorded by FMG during 14 – 15 April 2015. A Heron EC dipper was used to measure the EC at intervals from static water level, either to the base of the bore or to the 150m limit of the dipper. In some bores the EC meter did not work effectively (possibly due to flotsam in the bore) and a full set of measurement could not be obtained. All the data from this exercise is attached as Appendix E.

7.2 Water Quality Profiles

Downhole profiles for all the Nyidinghu monitoring bores are attached in Appendix E. A summary of the results is presented in Table 12 (with the bores listed in order of their location away from the Iron Valley mine site), and a brief description of the characteristics of each bore follows:

Table 12: Summary of Nyidinghu Downhole EC Profiles

Bore ID	Water Type	Electrical Conductivity Range (µS/cm)
NMB1004S	Fresh	684 – 711
NMB1004I	Fresh	702 - 1059
NMB1004D	Fresh	1394 - 1477
NMB1003S	Fresh	669 - 730
NMB1003I	Fresh	556 – 631
NMB1003D	Fresh	774 - 862
NMB1005S	Fresh	405 – 418
NMB1005I	Fresh	401 - 484
NMB1005D	Fresh	463 – 526
NMB1002S	Fresh	431 – 439
NMB1002I	Fresh	441 – 506
NMB1002D	Saline	18,720 – 19,939
NMB1002WT	Blocked at 13.3m	Blocked at 13.3m
NMB1013AS	Fresh	376 – 377
NMB1013AWT	Fresh	435 - 474
NMB1013BD	Fresh	459 – 490
NMB1013BI	Fresh	485 – 497
NMB1001S	Fresh	520 - 599
NMB1001I	Fresh	601 - 622
NMB1001D	Fresh	490 - 498
NMB1007S	Fresh	417 – 431
NMB1007I	Fresh	323 – 338
NMB1007D	Fresh	557 - 572
NMB1009S	Brackish to Hypersaline	7,793 – 16,516
NMB1009I	Hypersaline	31,261 – 48,987
NMB1009D	Brackish to Hypersaline	6,736 – 112,963
NMB1009WTS	Brackish	2,967 – 3,134

Review of the data collected allows the following comments:

- Water quality generally decreases to the north-east of the Weeli Wolli Creek
- The shallow aquifers generally have a better quality than the deeper bedrock aquifers.
- Although all the water from NMB1004 is classified as fresh, the quality from the deep piezo is markedly more saline than the shallow and intermediate. The profile for the intermediate piezo shows a marked inflection at around 70m from 700µS/cm to >1,000µS/cm
- NMB1003 was fresh in all 3 piezos with a range of 556-862µS/cm
- NMB1005 is all fresh ranging from 401 - 526µS/cm

- NMB1002 returned saline results (>18,000µS/cm) from the deep piezo while those from the shallow and intermediate piezos were fresh. The deep piezo quality is anomalous, being higher than the bedrock quality in bores further to the north-east, into the Fortescue valley.
- NMB1013 comprises two adjacent bores (NMB013A and B) which together contain 4 piezos. All returned EC values consistent with fresh water.
- NMB1001 shows virtually no difference in EC with depth or between the 3 piezos at different depths. All results are in the range 490-622µS/cm, signifying fresh water.
- NMB1007 is all fresh ranging from 323 - 572µS/cm
- NMB1009 is complex. There are 4 piezos nested in this bore with the two shallowest returning EC values in the brackish range while the intermediate piezo is hypersaline. The deep piezo showed a rapid deterioration in water quality over 5m, with the EC increasing from 6,736µS/cm at 37m to 11,1919µS/cm at 42m (see Figure 10).

7.3 DoW Data

Data available from the Department of Water (DoW) database was utilized to assess the water quality further to the north-east of the FMG tenement. The DoW data distinguishes between the shallow, Tertiary aquifers and a deeper bedrock aquifer dominated by the Wittenoom Formation.

7.4 Location of Saline Wedge

The recently acquired FMG data, combined with that from the DoW was used in defining the position of the saline wedge to the north-east of Iron Valley.

The Tertiary aquifer exhibits fresh to slightly brackish water quality with the quality decreasing in a northerly direction away from the Hamersley Ranges, which represents the recharge zone. Typical TDS values range from <1,000mg/L (~1500 µS/cm) near the ranges to 6,000mg/l (8960 µS/cm) some 15km to the north (Figure 11).

The basement aquifer shows a significantly steeper saline gradient. Although water quality is similar in the south (<1,000mg/L TDS, salinity is in excess of 70,000mg/l TDS (104,500 µS/cm) less than 10km further north.

The water sampled from the two production bores at the Iron Valley site is in the range of 830-850 µS/cm (480-490 mg/L TDS). As a result, the majority of groundwater between the mine site and the Weeli Wolli Creek (which could be drawn in towards the areas of dewatering), is of a fresher water quality. The saline wedge (as is evident in bore NMB1009) is at least 7kms to the north-east.

8 REFERENCES

URS, 2010. Final Report, Iron Valley Preliminary Water Balance Report, 26 August 2010.

URS, 2011a. Report - Pre-Feasibility Phase 1 Surplus Groundwater Disposal Options, 11 August 2011.

URS, 2011b. Summary Report, Iron Valley Project Pre-Feasibility Phase 1, Environment and Water Studies, 5 August 2011.

URS, 2011c. Iron Valley Iron Ore Project Phase 1 Pre-Feasibility Groundwater Assessment (Modelling) (August 2011).

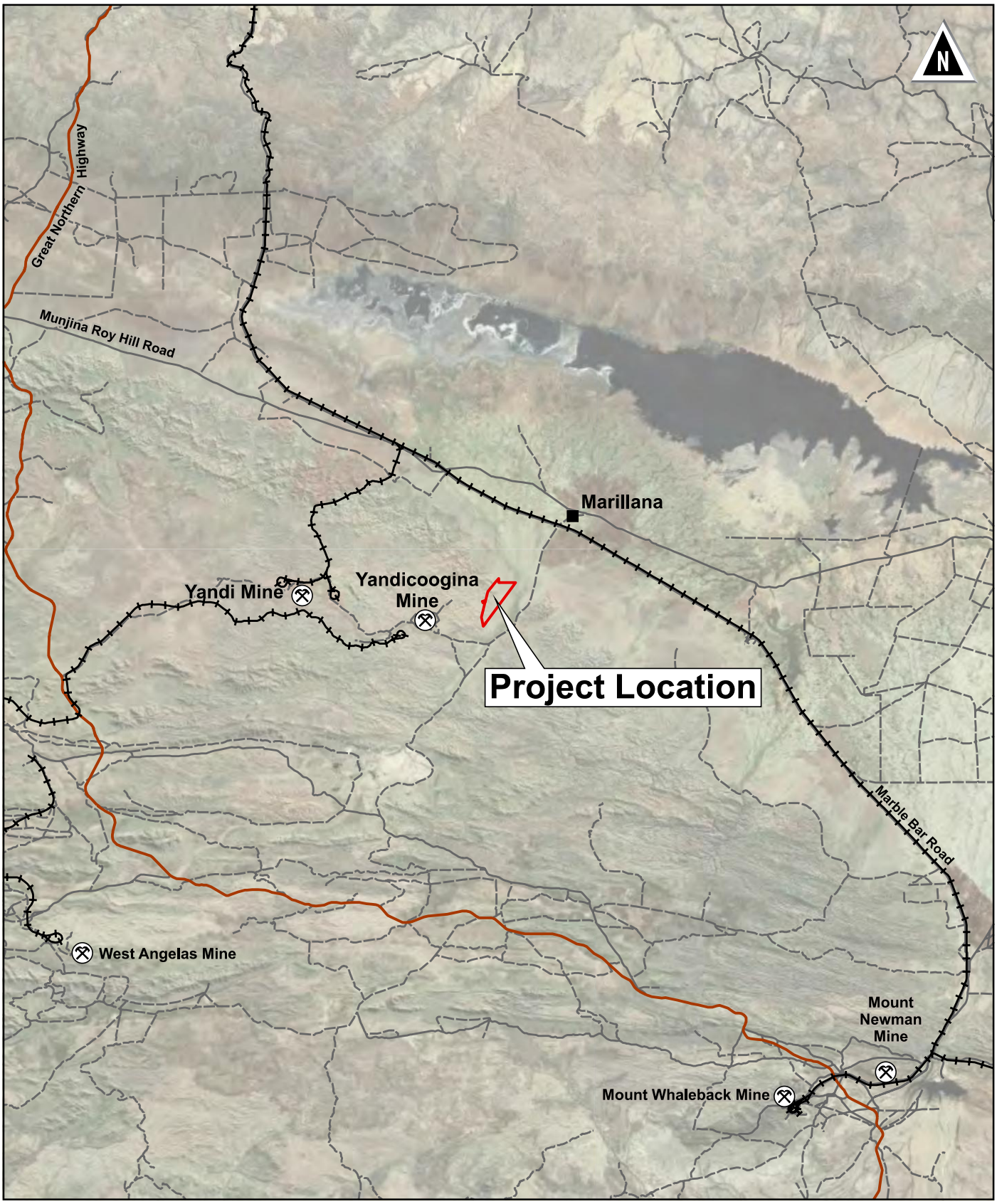
URS, 2012a. Iron Valley Groundwater Assessment, Memo J:\Jobs\42908158\5 Works\Chapters and Templates\Appendix B Water\Groundwater\Iron Valley Groundwater Assessment (Memorandum 18 September 2012).docx, Perth.

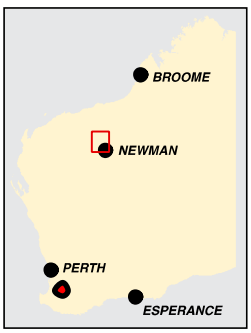
URS, 2012b. Assessment on Proponent Information, Iron Valley Above Water Table Mining Project, 30 November 2012, Report 42908158/01/C, Perth.

URS, 2012c. Iron Valley Groundwater Assessment, Memo J:\Jobs\42908158\5 Works\Chapters and Templates\Appendix B Water\Groundwater\Iron Valley Groundwater Assessment (Memorandum 18 September 2012).docx, Perth.

URS, 2012d. Report - Iron Valley Project, Surface Water Study, document 42907456/W0693.781/A, 13 August 2012, Perth.

FIGURES





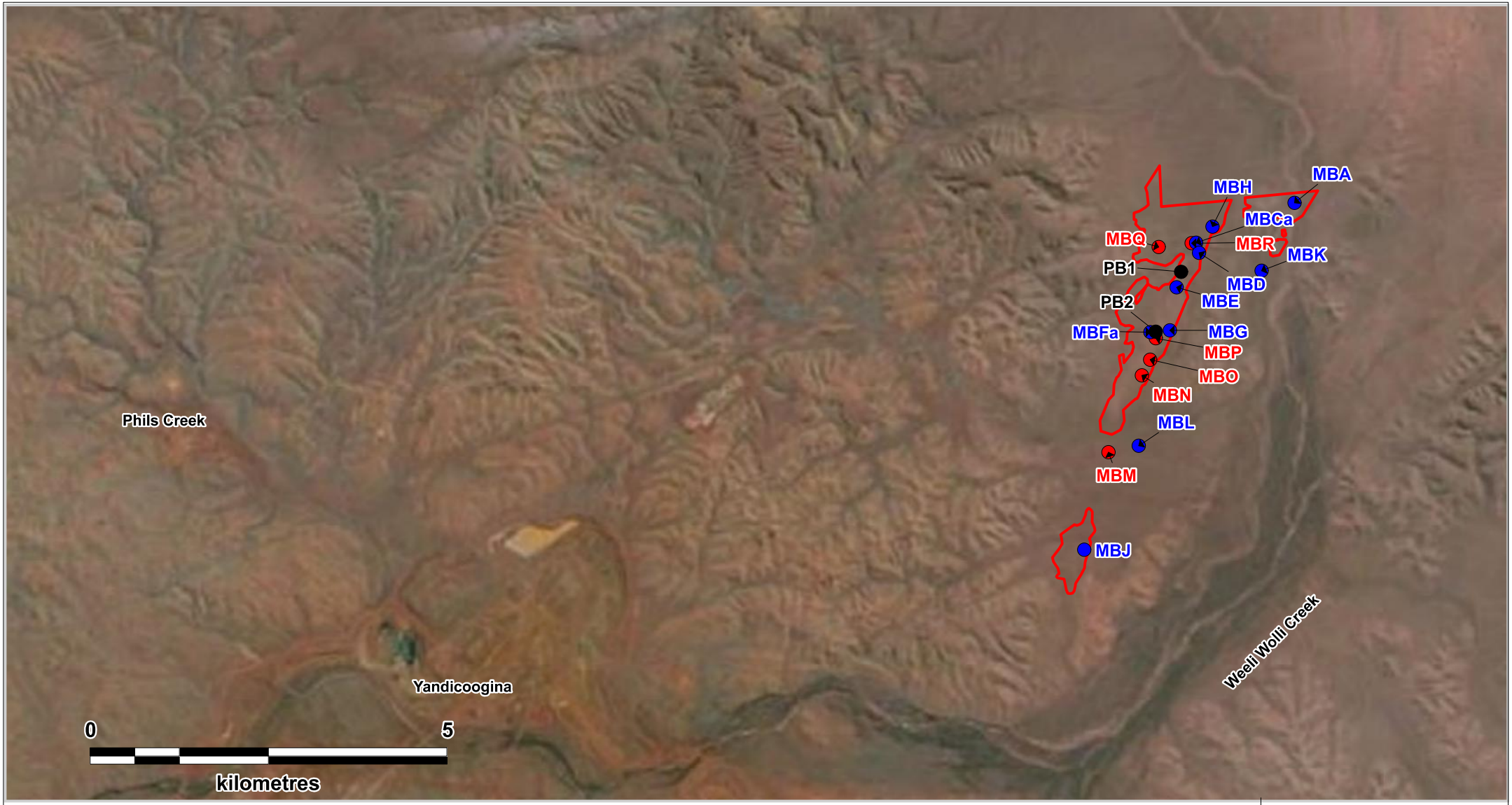
LEGEND

- Mine Locations
- Homesteads
- Project Location
- Railways
- Major Road
- Minor Road
- Track

0 5 10 20
kilometres

AUTHOR: JJ	REPORT NO: 013b	**NOTES & DATA SOURCES:**
DRAWN: RC	REVISION: a	MGA Zone 50 (GDA94)
DATE: 06/01/2015	JOB NO: 030b	

FIGURE 1
IRON VALLEY PROJECT
REGIONAL LOCATION



LOCATION MAP

Location: XXXX

KEY

- Production Bores
- Old Monitoring Bores
- New Monitoring Bores

AUTHOR: ATS
DRAWN: ATS
DATE: 05/01/2016

REPORT NO: 059A
REVISION: A
JOB NO: 13b

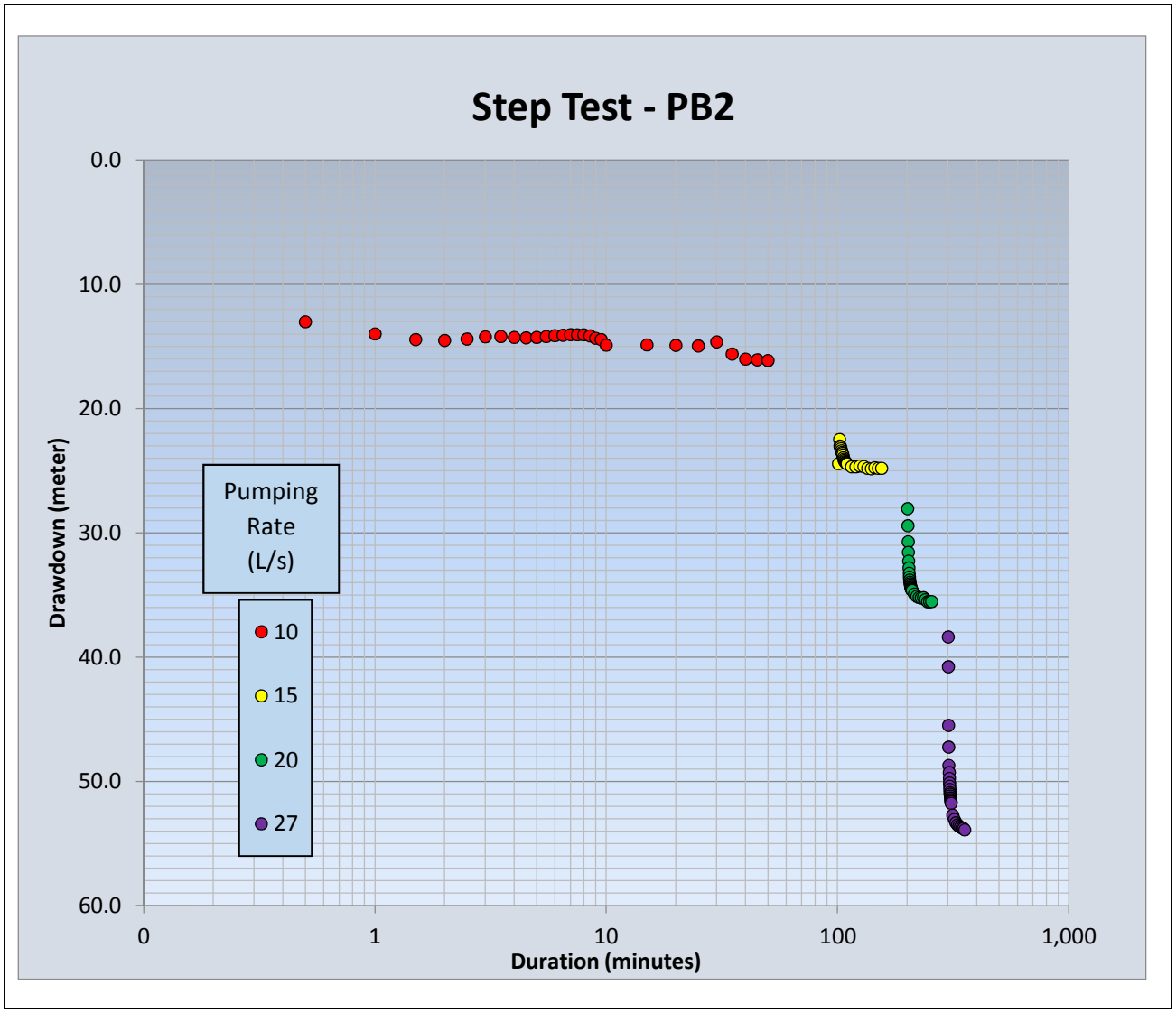
NOTES & DATA SOURCES:

AQ2

FIGURE 2
LOCATION OF BORES

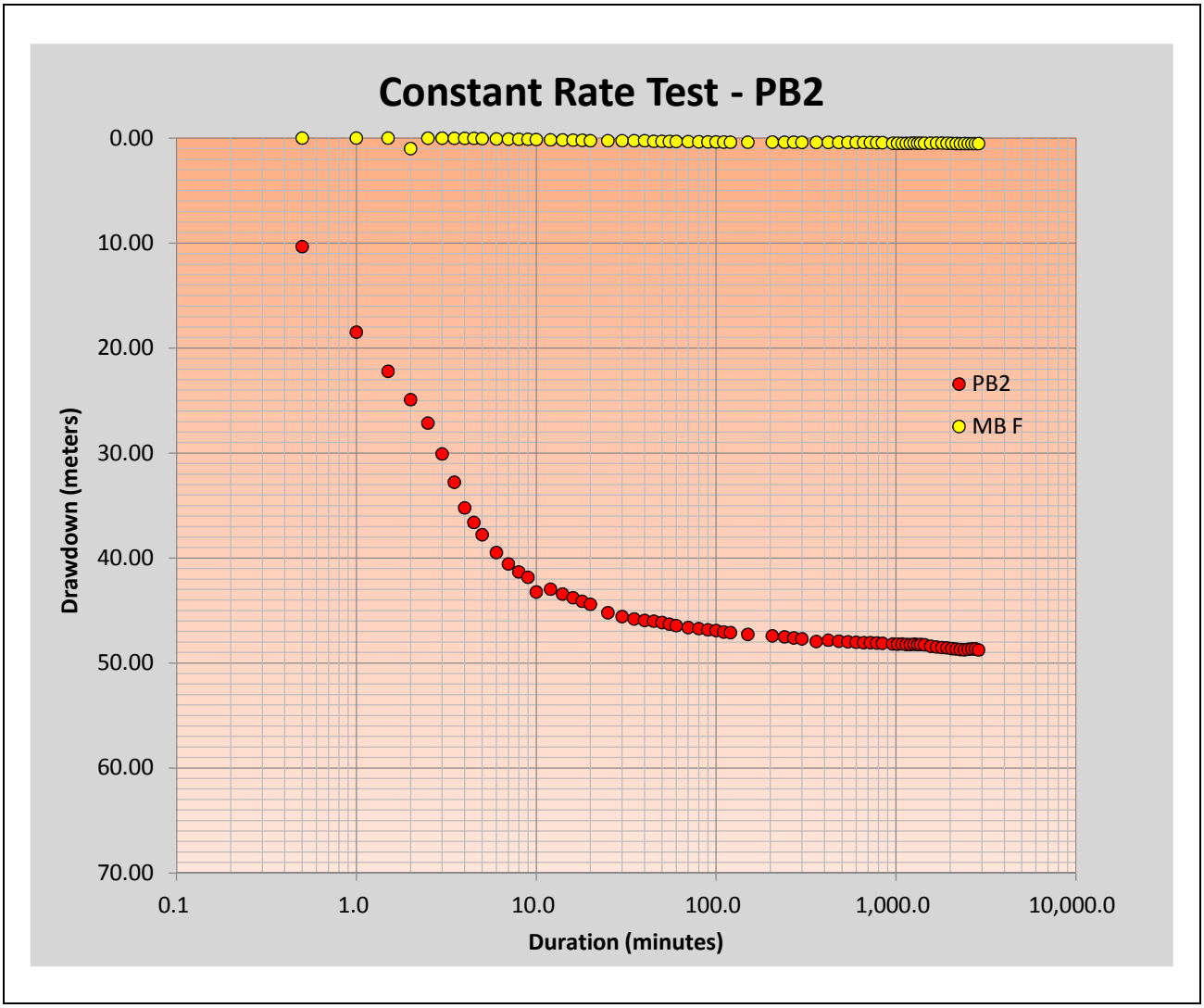
AQ2

FIGURE 3: Airlift Set-up



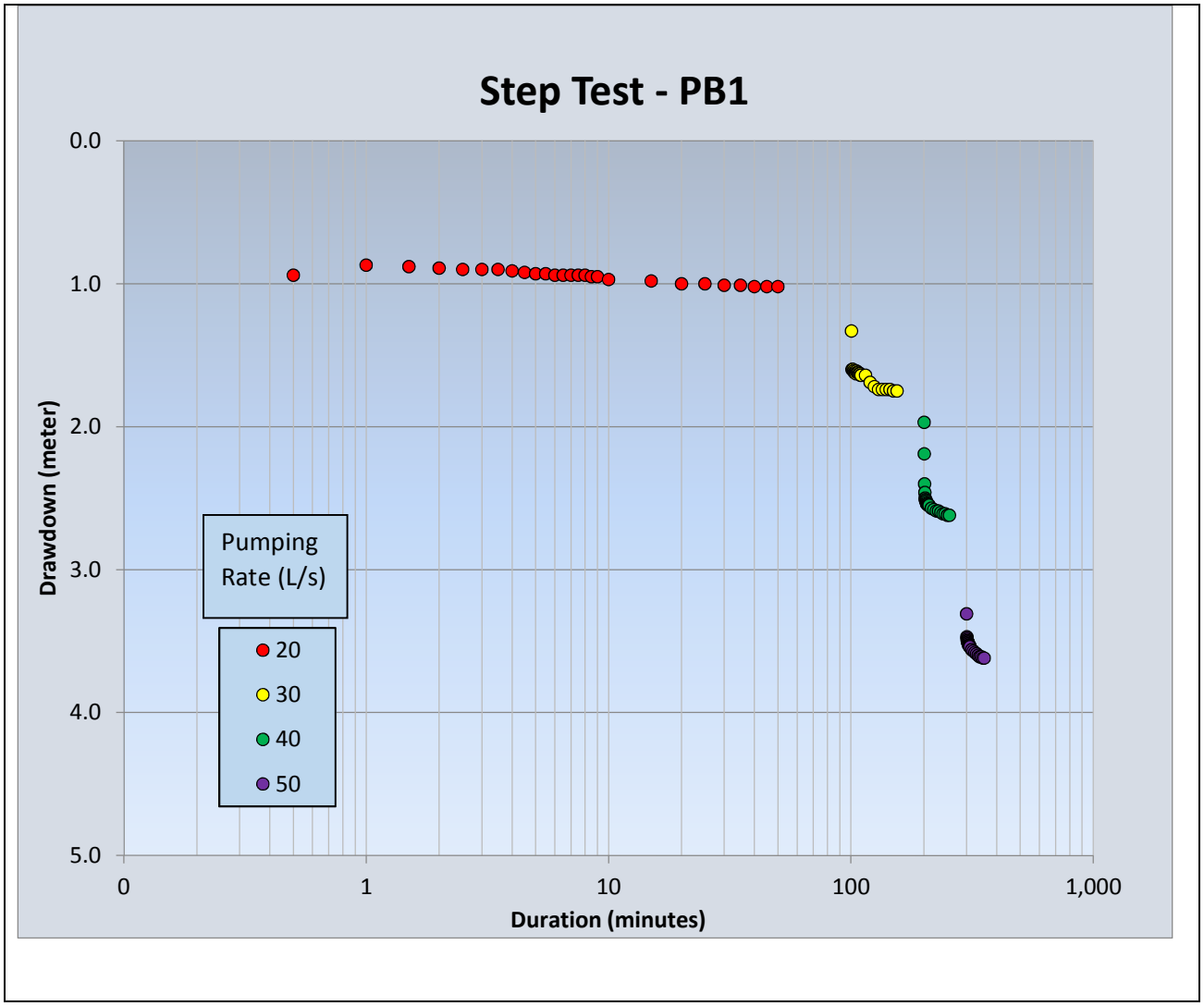
AQ2

FIGURE 4: PB2 – Step Test Drawdown



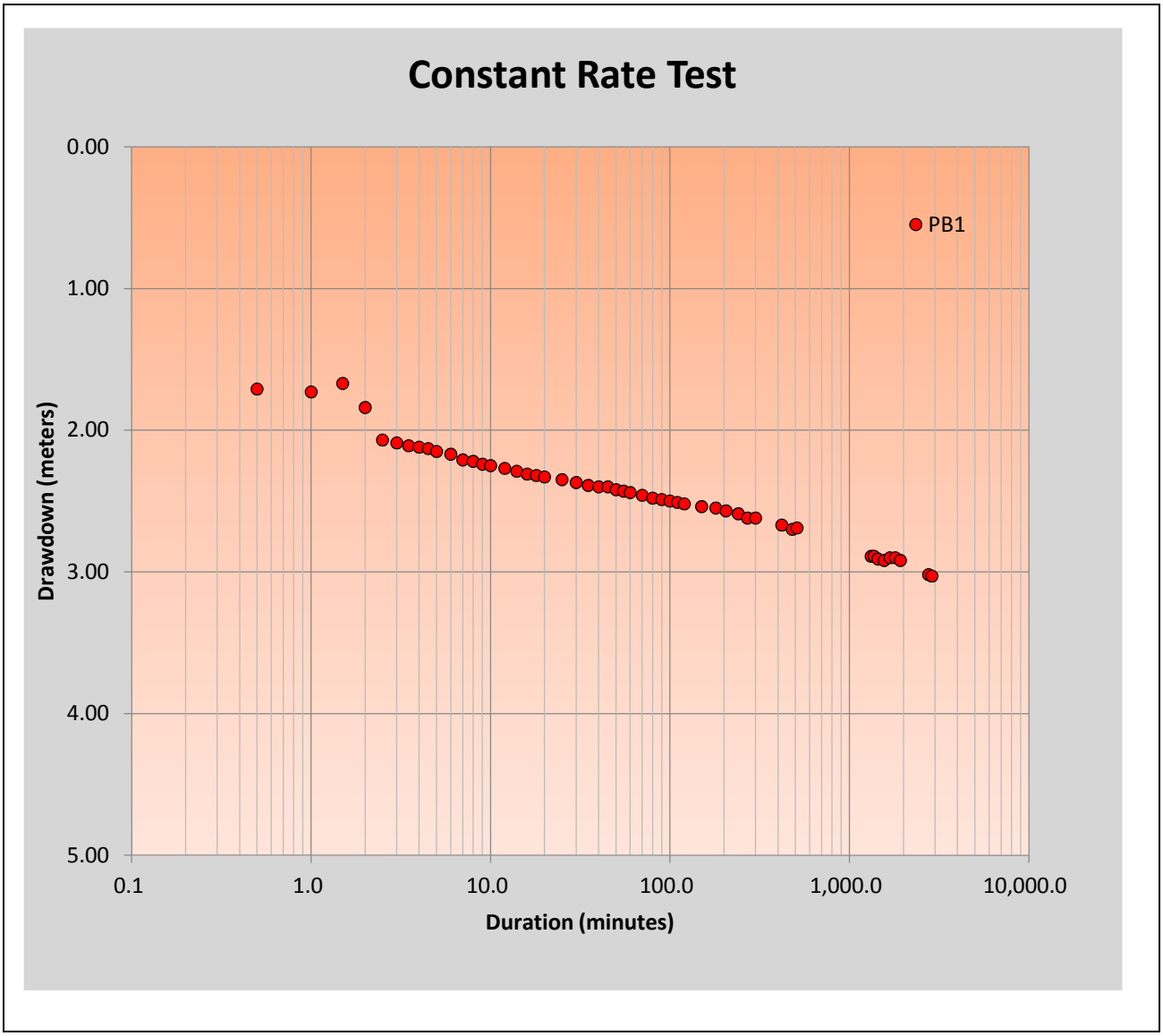
AQ2

FIGURE 5: PB2 – Constant Rate Drawdown



AQ2

FIGURE 6: PB1 – Step Test Drawdown



AQ2

FIGURE 7: PB1 – Constant Rate Drawdown

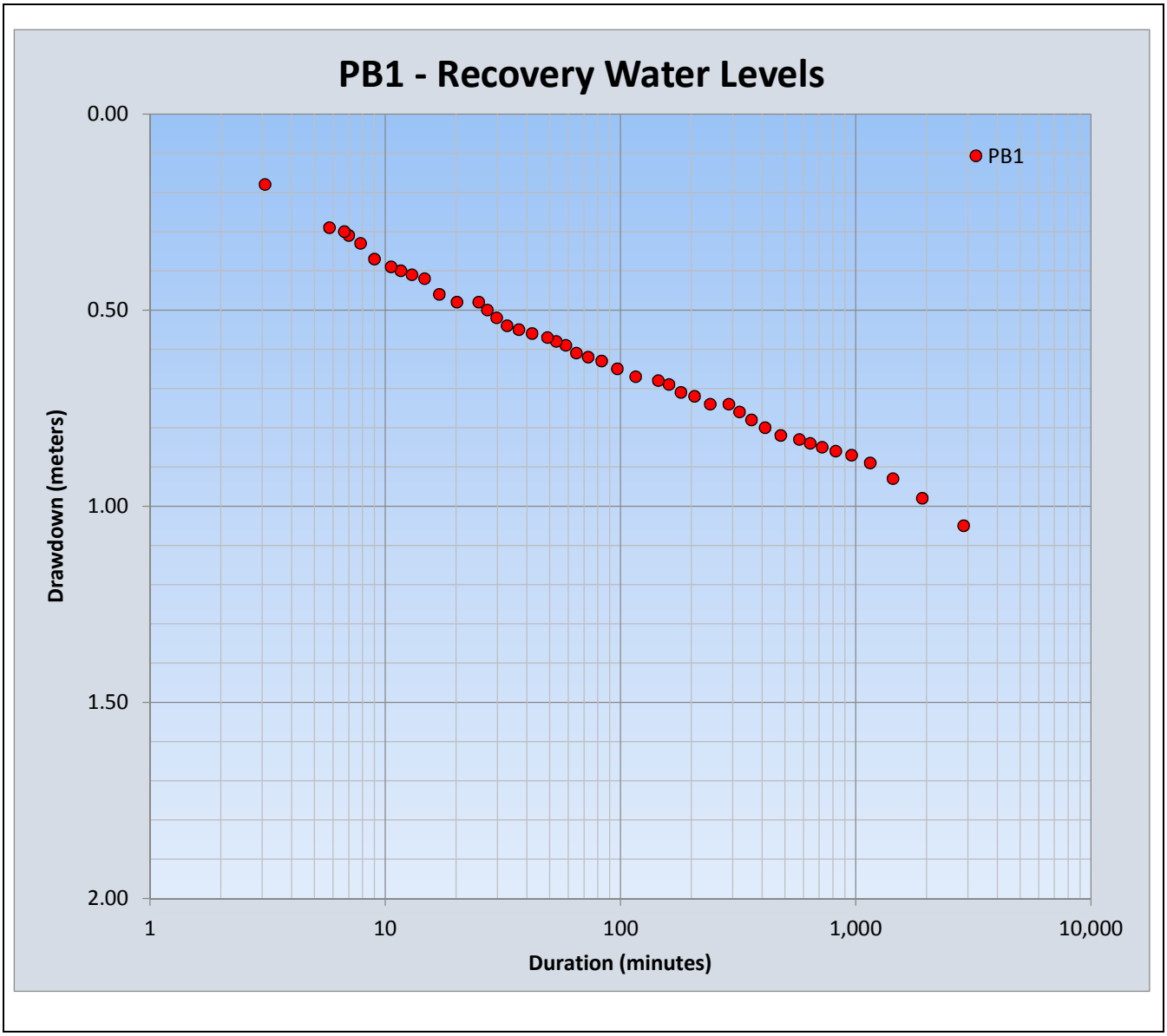
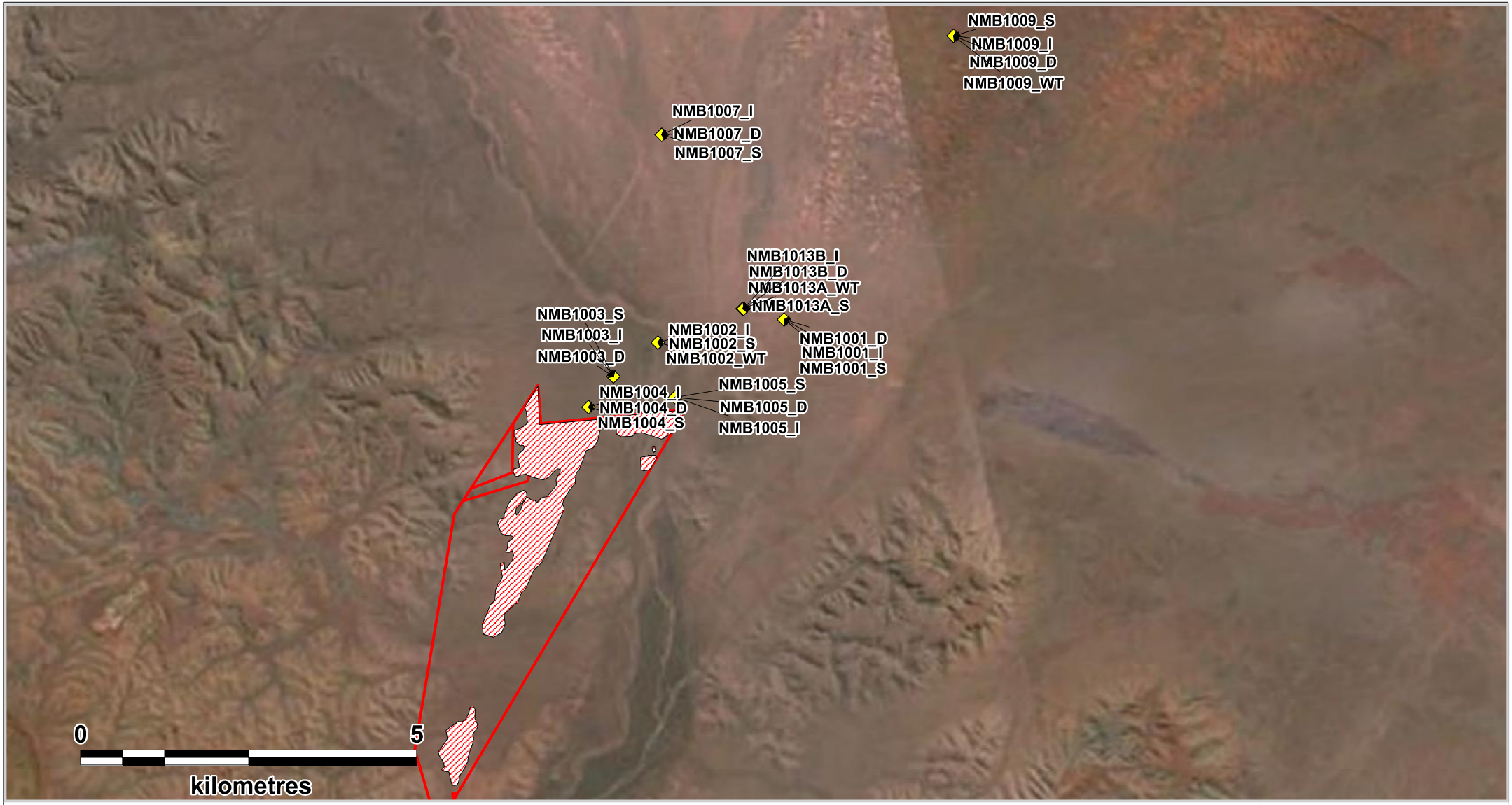


FIGURE 8: PB1 – Constant Rate Recovery



LOCATION MAP

Location: XXXX

KEY

Bores with EC Monitoring

Tenement

AUTHOR: ATS
DRAWN: ATS
DATE: ATS

REPORT NO: 059A
REVISION: A
JOB NO: 13b

NOTES & DATA SOURCES:

FIGURE 9
LOCATION OF EC PROFILES

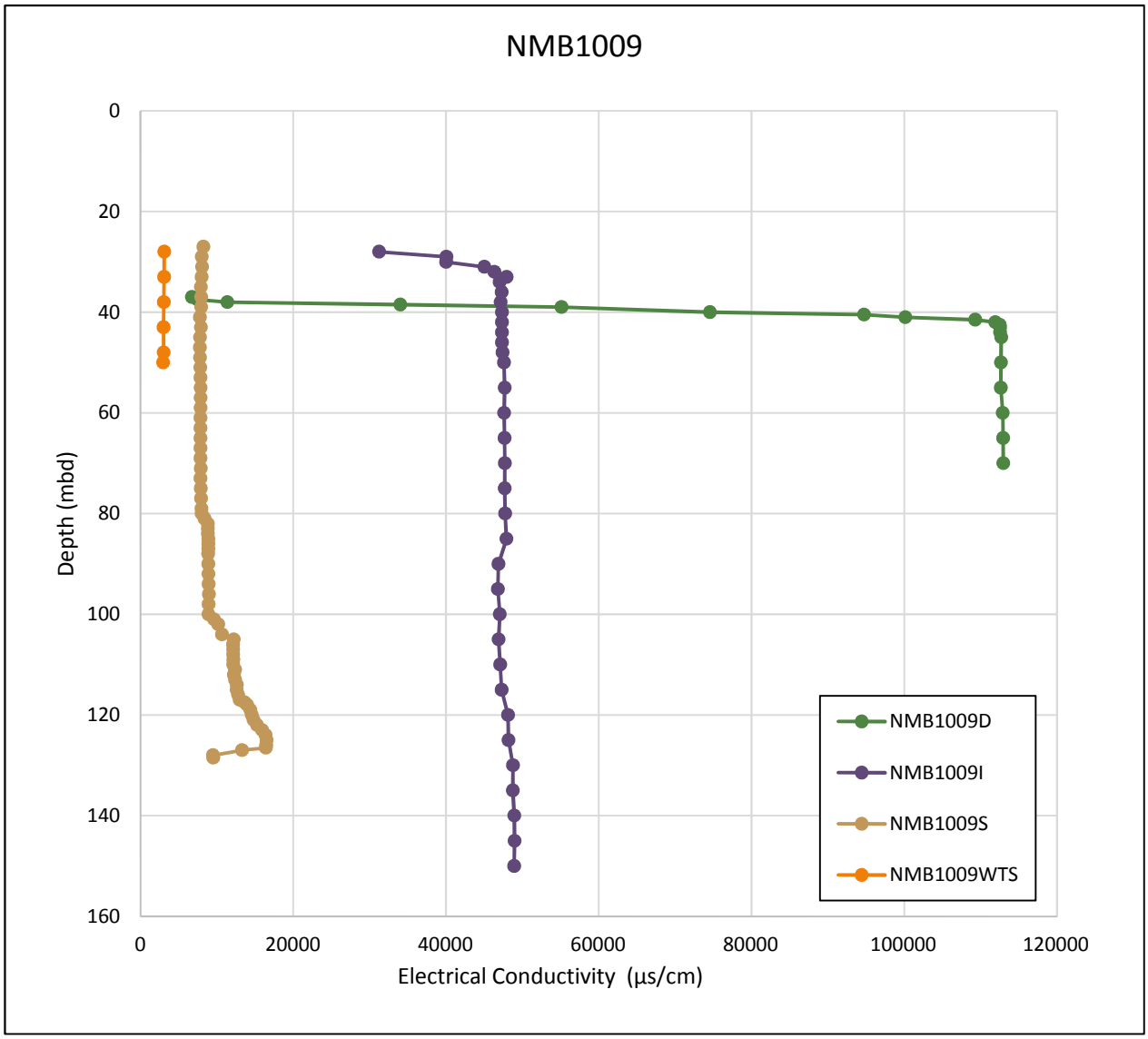
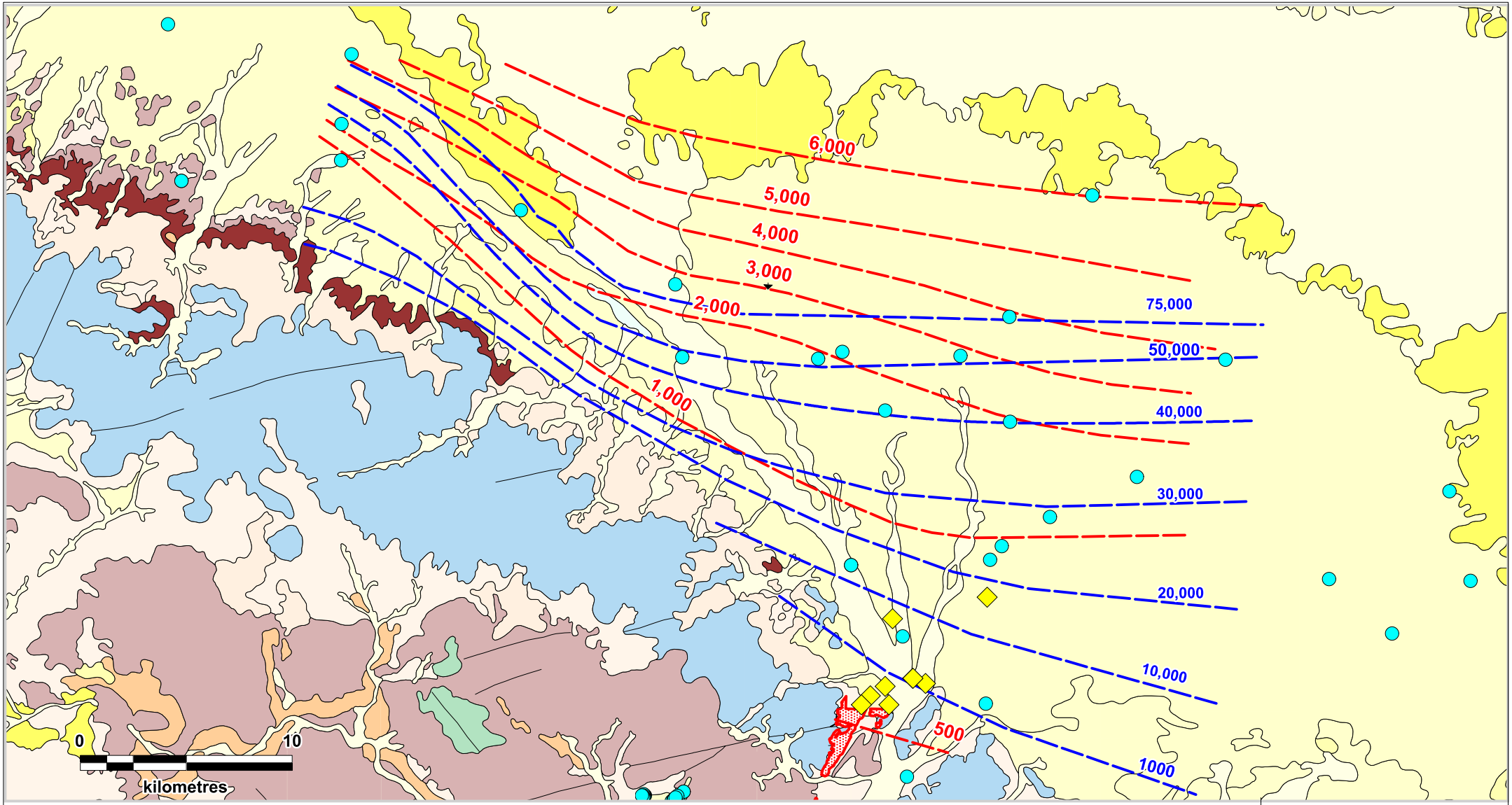


FIGURE 10: EC Profiles through NMB1009 bores



LOCATION MAP

Location: XXXX

KEY

- DOW Data
- FMG Bores
- Shallow Aquifer Water Quality (mg/L TDS)
- Bedrock Water Quality (mg/L TDS)

AUTHOR: ATS
DRAWN: ATS
DATE: 05/01/2016

REPORT NO: 083A
REVISION: A
JOB NO: 13b

NOTES & DATA SOURCES:
Catagraphic Scale= 1:250,000

AQ2

Figure 11

GROUNDWATER QUALITY NORTH OF IRON VALLEY TENEMENT, WITHIN FORTESCUE VALLEY

APPENDIX A

Bore Logs

AQ2
2 Brook St
East Perth
WA 6004
Australia
t: +61 (8) 9323 8821
e: aq2general@aq2.com.au

COMPOSITE WELL LOG

Well No: MBM

Client: BC Iron **Project:** Iron Valley BWT

Commenced: 20/05/2015
Completed: 21/05/2015
Drilled: Easton Wells
Logged By: TV

Method: RC (0-46m)
Fluid: Air (0-46m)
Bit Record: 5 5/8 (0-46m)

Area: Iron Valley
Elevation: 490.242 mRL
Easting: 736900
Northing: 7482550

Static Water Level: 11 mbgl **Date:** 28/05/2015 **Remarks:**

Depth (mbgl)	Graphic Log	Lithological Description	Field Notes	Well Completion Diagram	Well Completion Notes
0		Sand: sand with gravel		Gravel Pack (-6.4/+3.2mm) 0-11.5m 50mm CL12 PVC blank casing -0.7-13m Bentonite Seal 11.5-12m	
10					
20				Gravel Pack (-6.4/+3.2mm) 12-25m 50mm CL12 PVC slotted casing 13-25m	
30		Clay: clay with chert		Bentonite Seal 25-25.5m Gravel Pack (-6.4/+3.2mm) 25.5-27.5m	
40		BIF: BIF with chert	EOH.	Backfill 27.5-46m	
50					

2 Brook St
East Perth
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Australia
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e: aq2general@aq2.com.au

COMPOSITE WELL LOG

Well No: MBN

Client: BC Iron **Project:** Iron Valley BWT

Commenced: 22/05/2015
Completed: 23/05/2015
Drilled: Easton Wells
Logged By: TV

Method: RC
Fluid: Air (0-124m)
Bit Record: 5 5/8 (0-124m)

Area: Iron Valley
Elevation: 491.055mRL
Easting: 7483593.309
Northing: 737457.102

Static Water Level: 17.11 mbgl **Date:** 28/05/2015 **Remarks:**

Depth (mbgl)	Graphic Log	Lithological Description	Field Notes	Well Completion: Diagram	Well Completion: Notes
0		Sand: with gravel		Backfill 0-14.2mm	
10		Shale: with BIF		50mm CL12 PVC blank casing -0.7-18m	
20				Bentonite Seal 14.2-15m	
30					
40					
50					
60					
70				Gravel Pack (-6.4/+3.2mm) 15-117m	
80				50mm CL12 PVC slotted casing 18-116m	
90					
100					
110					
120		Dolerite		Backfill 117-124m	
130			EOH.		

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COMPOSITE WELL LOG

Well No: MBO

Client: BC Iron **Project:** Iron Valley BWT

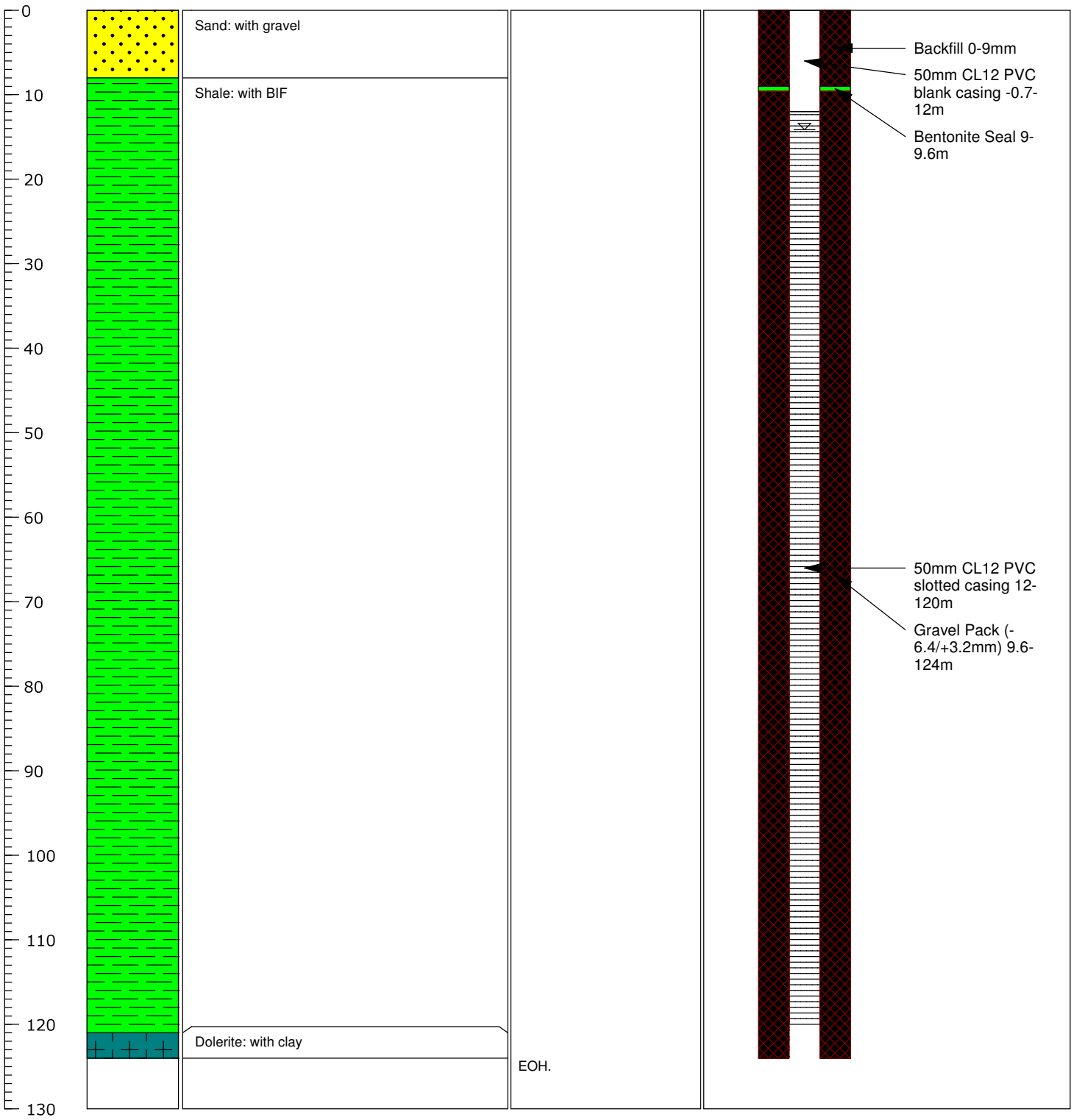
Commenced: 23/05/2015
Completed: 25/05/2015
Drilled: Easton Wells
Logged By: TV

Method: RC
Fluid: Air (0-124m)
Bit Record: 5 5/8 (0-124m)

Area: Iron Valley
Elevation: 489.186
Easting: 7483803.404
Northing: 737589.657

Static Water Level: 14.14 mbgl **Date:** 28/05/2015 **Remarks:**

Depth (mbgl)	Graphic Log	Lithological Description	Field Notes	Well Completion Diagram	Well Completion Notes



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e: aq2general@aq2.com.au

COMPOSITE WELL LOG

Well No: MBP

Client: BC Iron **Project:** Iron Valley BWT

Commenced: 25/05/2015
Completed: 26/05/2015
Drilled: Easton Wells
Logged By: TV

Method: RC
Fluid: Air (0-64m)
Bit Record: 5 5/8 (0-64m)

Area: Iron Valley
Elevation: 488.666mRL
Easting: 7484100.012
Northing: 737695.593

Static Water Level: 12.13 mbgl **Date:** 28/05/2015 **Remarks:**

Depth (mbgl)	Graphic Log	Lithological Description	Field Notes	Well Completion Diagram	Well Completion Notes
0 – 12		Sand: with gravel		Gravel Pack (-6.4/+3.2mm) 0-8.5m; 50mm CL12 PVC blank casing -0.65-12m; Bentonite Seal 8.5-9.5m	
12 – 20		Clay			
20 – 50		Shale: with BIF			
50 – 55		Goethite: with shale		50mm CL12 PVC slotted casing 12-60m; Gravel Pack (-6.4/+3.2mm) 9.5-64m	
55 – 64		BIF: with shale			
64 – 70			EOH.		

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COMPOSITE WELL LOG

Well No: MBQ

Client: BC Iron **Project:** Iron Valley BWT

Commenced: 26/05/2015
Completed: 27/05/2015
Drilled: Easton Wells
Logged By: TV

Method: RC (0-102.5m)
Fluid: Air (0-102.5m)
Bit Record: 5 5/8

Area: Iron Valley
Elevation: 486.563mRL
Easting: 7485397.653
Northing: 737847.590

Static Water Level: 54.36 mbgl **Date:** 28/05/2015 **Remarks:**

Depth (mbgl)	Graphic Log	Lithological Description	Field Notes	Well Completion Diagram	Well Completion Notes
0 – 54		Sand: with gravel Clay: with pisolites		Gravel Pack (-6.4/+3.2mm) 0-46m 50mm CL12 PVC blank casing -0.6-54m	
54 – 57		BIF		Bentonite Seal 46-48m	
57 – 60		Clay: with pisolites			
60 – 78		Canga			
78 – 102.5		Goethite: with haemetite		Gravel Pack (-6.4/+3.2mm) 48-102.5m 50mm CL12 PVC slotted casing 54-100m	
102.5			EOH.		

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COMPOSITE WELL LOG

Well No: MBR

Client: BC Iron **Project:** Iron Valley BWT

Commenced: 27/05/2015
Completed: 28/05/2015
Drilled: Easton Wells
Logged By: TV

Method: RC (0-100.5m)
Fluid: Air (0-100.5m)
Bit Record: 5 5/8 (0-110.5m)

Area: Iron Valley
Elevation: 479.041mRL
Easting: 7585398.636
Northing: 738309.056

Static Water Level: 46.41 mbgl **Date:** 28/05/2015 **Remarks:**

Depth (mbgl)	Graphic Log	Lithological Description	Field Notes	Well Completion Diagram	Well Completion Notes
0		Sand: with gravel		Gravel Pack (-6.4/+3.2mm) 0-49m	
10					
20		Clay: with shale			
		Shale: with clay			
30		Clay: with shale		50mm CL12 PVC blank casing -0.6-54m	
40					
50		BIF		Bentonite Seal 49-52m	
60					
70					
80				Gravel Pack (-6.4/+3.2mm) 52-100.5m	
90				50mm CL12 PVC slotted casing 54-100m	
100			EOH.		

BORE COMPLETION REPORT

PB01

Grid System			Drilling Contractor:	Connector Drilling	Drilling Rig: IR T65
Coordinates:	738127 mE	7485007 mN	Drilling Method:	Air Hammer	Geophysical Company:
Ground Elevation:			Hole Diameter:	500 mm 0 - 24 mbgl	
Logged By:	F.Carosone			375 mm 24 - 144 mbgl	
Start Date:	08.11.2011 Compl. Date: 21.11.2011				
Purpose of Bore:	Production Bore		Total Depth:	144 mbgl	
Static Water Level:			Casing - Blank:	0 - 58 mbgl	
Water Level Date:			Casing - Slotted:	58 - 144 mbgl	

DEPTH (mbgl)	STRATIGRAPHY	LITHOLOGY	BORE CONSTRUCTION	GAMMA LOG (cps) 0 200	RESISTIVITY (OHM-Metres) SHORT (16") LONG (64") 0 10	CALIPER (mm) 0 300
0	Alluvium	Red-brown alluvium, large chip size.				
10	BIF	Red-brown-orange banded iron formation with dark grey flat chips. Water cut at about 8 m.				
		Grey-black banded iron formation with yellow/orange shale.				
20		Dark grey-black banded iron formation chips with yellow-orange shale.				
		Grey-black banded iron formation with orange chips.				
30	BIF and Shale	Light brown-orange banded iron formation with fine shale bands.				
		Dark grey-black banded iron formation with cream-brown-grey microbanded shale.				
40						
50	BIF	Dark grey-black banded iron formation with large microbanded chips.				

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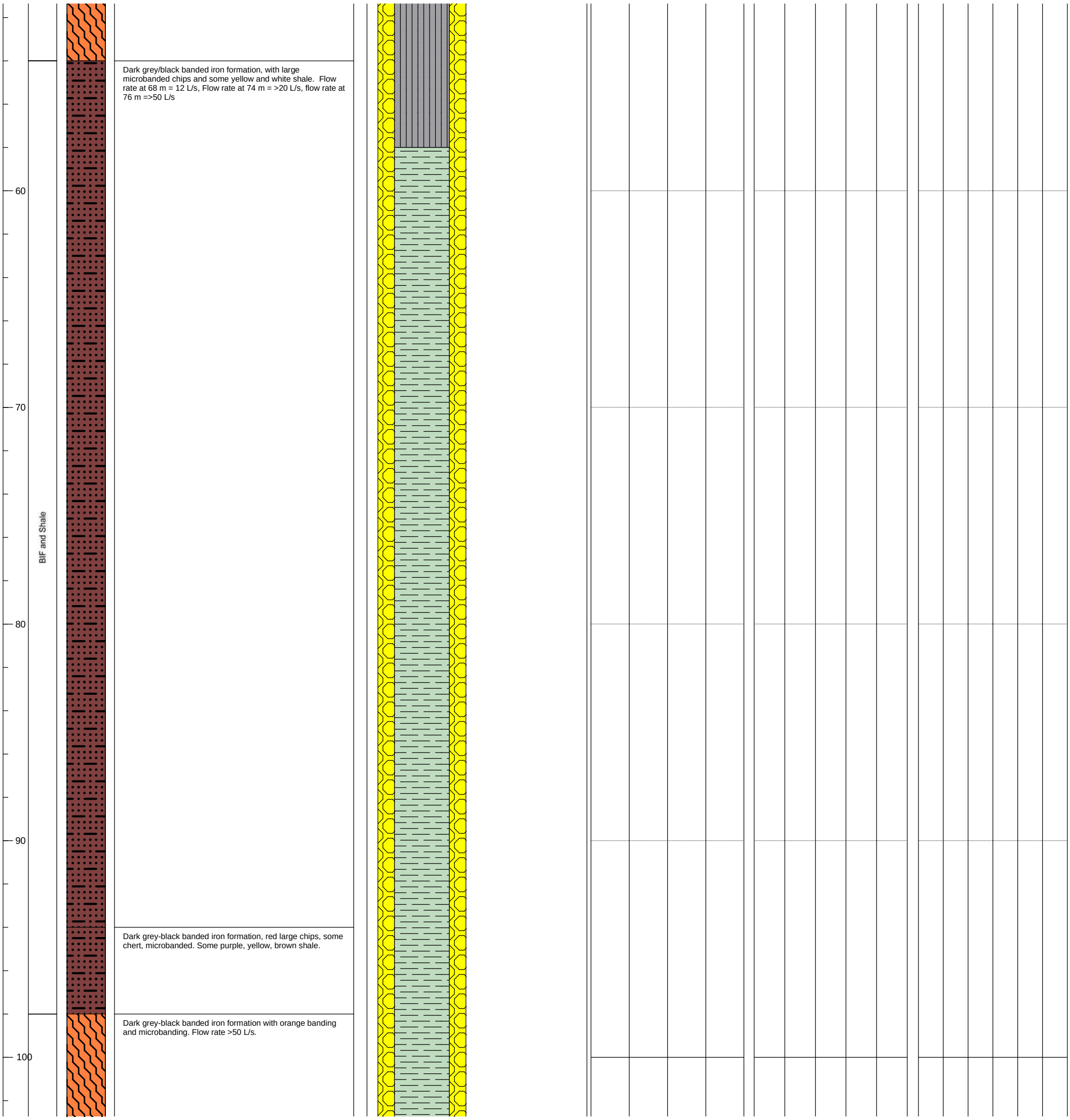
File No: 42908246-GW-01.dat Drawn: CL Approved: IS Date: 27/02/2013 Rev: A A3

BORE COMPLETION REPORT

PB01

Grid System			Drilling Contractor:	Connector Drilling	Drilling Rig: IR T65
Coordinates:	738127 mE	7485007 mN	Drilling Method:	Air Hammer	Geophysical Company:
Ground Elevation:			Hole Diameter:	500 mm 0 - 24 mbgl	
Logged By:	F.Carosone			375 mm 24 - 144 mbgl	
Start Date:	08.11.2011 Compl. Date: 21.11.2011				
Purpose of Bore:	Production Bore		Total Depth:	144 mbgl	
Static Water Level:			Casing - Blank:	0 - 58 mbgl	
Water Level Date:			Casing - Slotted:	58 - 144 mbgl	



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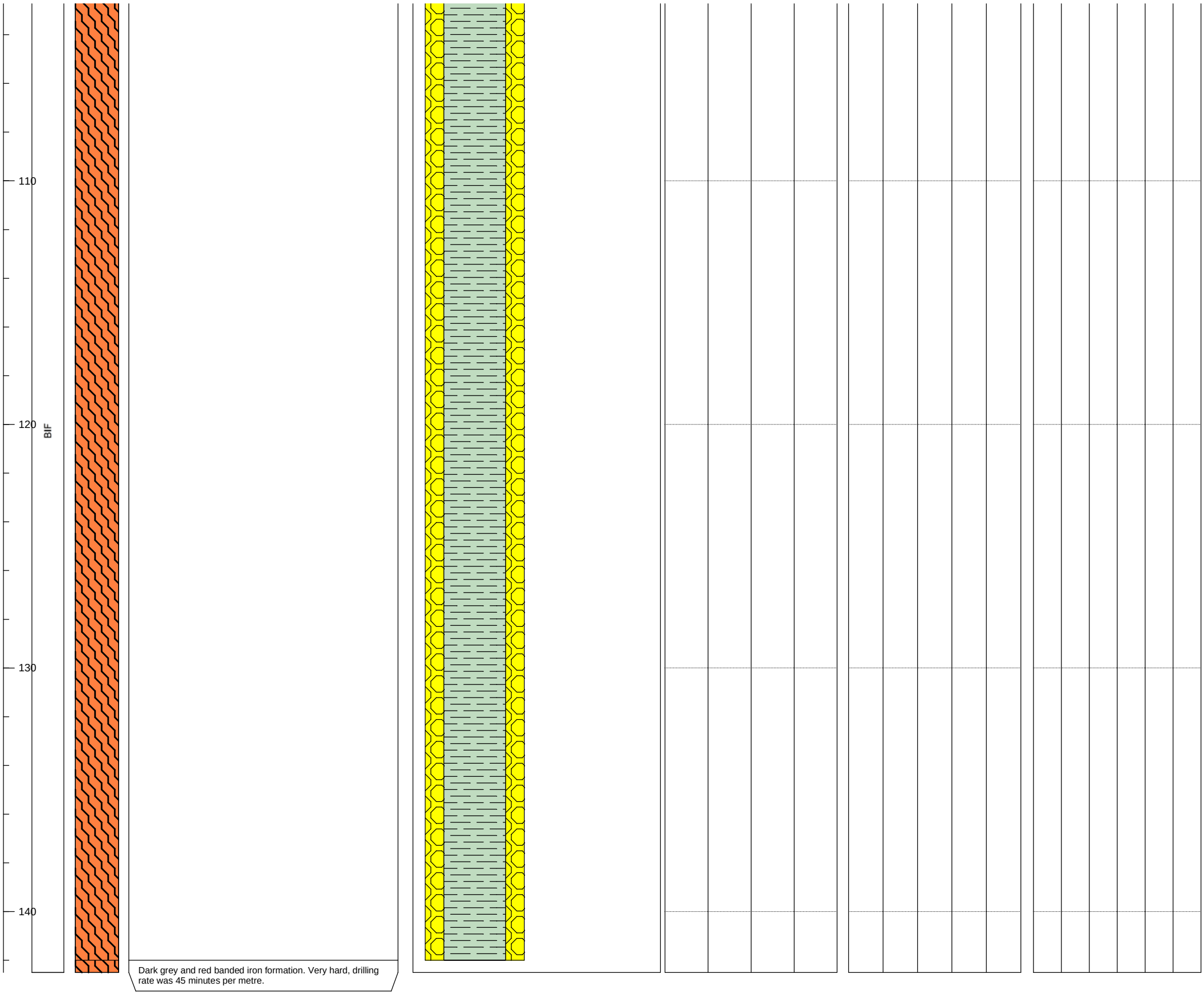
File No: 42908246-GW-01.dat Drawn: CL Approved: IS Date: 27/02/2013 | Rev: A | A3

BORE COMPLETION REPORT

PB01

Grid System			Drilling Contractor:	Connector Drilling	Drilling Rig: IR T65
Coordinates:	738127 mE	7485007 mN	Drilling Method:	Air Hammer	Geophysical Company:
Ground Elevation:			Hole Diameter:	500 mm 0 - 24 mbgl	
Logged By:	F.Carosone			375 mm 24 - 144 mbgl	
Start Date:	08.11.2011 Compl. Date: 21.11.2011				
Purpose of Bore:	Production Bore		Total Depth:	144 mbgl	
Static Water Level:			Casing - Blank:	0 - 58 mbgl	
Water Level Date:			Casing - Slotted:	58 - 144 mbgl	



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File No: 42908246-GW-01.dat Drawn: CL Approved: IS Date: 27/02/2013 Rev: A A3

BORE COMPLETION REPORT

PB02

Grid System			Drilling Contractor:	Connector Drilling	Drilling Rig: IR T65
Coordinates:	737704 mE	7484194 mN	Drilling Method:	Air Hammer	Geophysical Company:
Ground Elevation:			Hole Diameter:	430 mm 0 - 43 mbgl	
Logged By:	F.Carosone			368 mm 43 - 170 mbgl	
Start Date:	13.12.2011 Compl. Date: 29.01.2012				
Purpose of Bore:	Production Bore		Total Depth:	144 mbgl	
Static Water Level:			Casing - Blank:	0 - 58.5 mbgl	
Water Level Date:			Casing - Slotted:	58.5 - 170 mbgl	

DEPTH (mbgl)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	BORE CONSTRUCTION	GAMMA LOG (cps) 0 – 200	RESISTIVITY (OHM-Metres) SHORT (16") LONG (64") 0 – 10	CALIPER (mm) 0 – 300
0 – 10			Red-brown, light brown, clayey.				
10 – 20			Light brown, with green shale bands.				
20 – 30			Grey, white and dark grey chips. Some yellow clay. Cavities were encountered at 18-20 m.				
30 – 50			Red and yellow, clayey.				

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File No: 42908246-GW-02.dat Drawn: CL Approved: IS Date: 28/02/2013

Figure: x Rev: A A3

BORE COMPLETION REPORT

PB02

Grid System			Drilling Contractor:	Connector Drilling	Drilling Rig: IR T65
Coordinates:	737704 mE	7484194 mN	Drilling Method:	Air Hammer	Geophysical Company:
Ground Elevation:			Hole Diameter:	430 mm 0 - 43 mbgl	
Logged By:	F.Carosone			368 mm 43 - 170 mbgl	
Start Date:	13.12.2011 Compl. Date: 29.01.2012				
Purpose of Bore:	Production Bore		Total Depth:	144 mbgl	
Static Water Level:			Casing - Blank:	0 - 58.5 mbgl	
Water Level Date:			Casing - Slotted:	58.5 - 170 mbgl	

DEPTH (mbgl) | STRATIGRAPHY | GRAPHIC LOG | LITHOLOGY | BORE CONSTRUCTION | GAMMA LOG (cps) 0 200 | RESISTIVITY (OHM-Metres) SHORT (16") LONG (64") 0 10 | CALIPER (mm) 0 300

60
70
80
90
100

BIF

Red and yellow, clayey, with progressively increasing white shale

Grey-black, with minor microbanding. Some chert chips throughout. At 153-160 m yellow orange chips, at 164-168 m some yellow orange chips.

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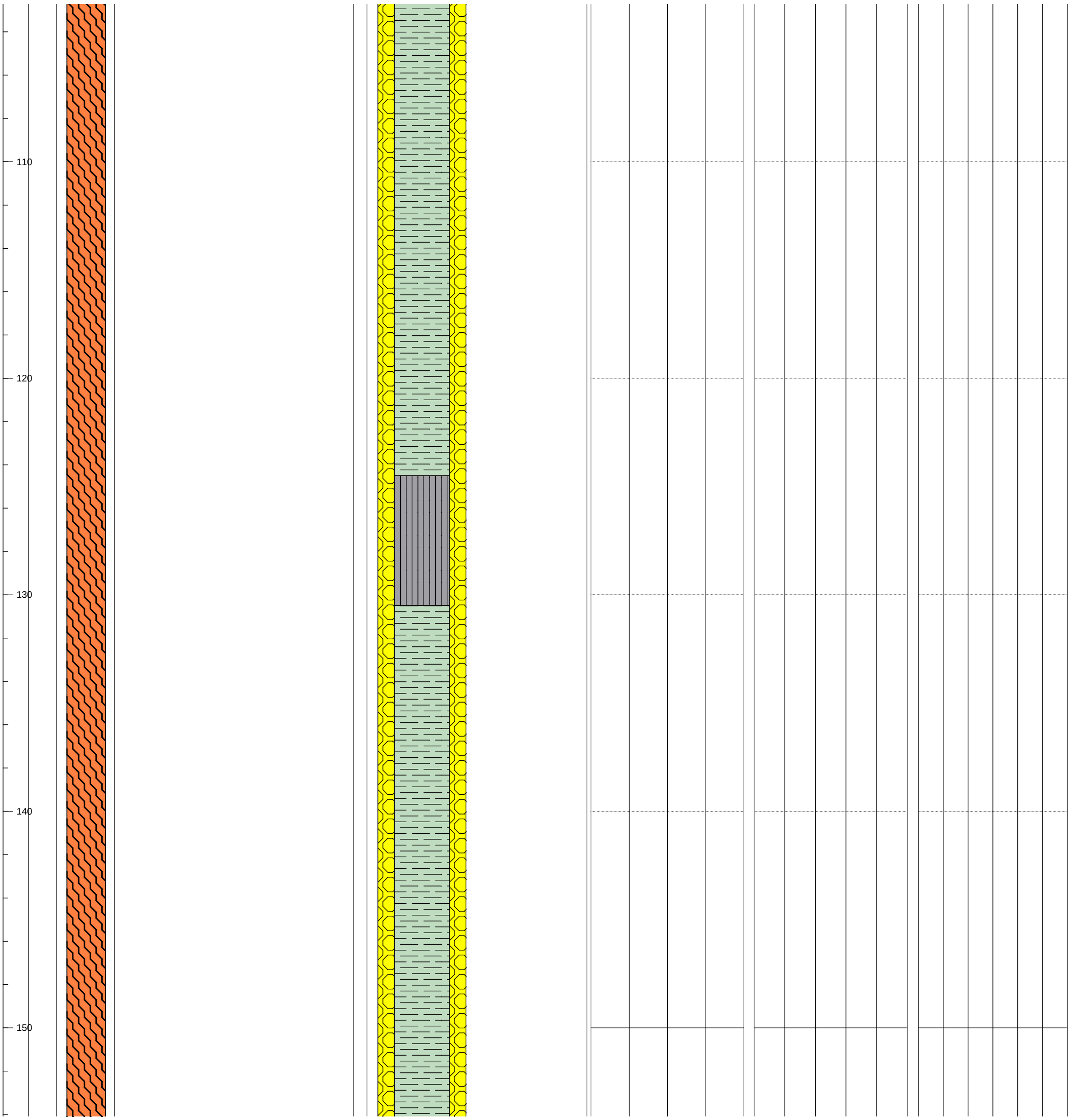
File No: 42908246-GW-02.dat Drawn: CL Approved: IS Date: 28/02/2013 Rev: A A3

BORE COMPLETION REPORT

PB02

Grid System			Drilling Contractor:	Connector Drilling	Drilling Rig: IR T65
Coordinates:	737704 mE	7484194 mN	Drilling Method:	Air Hammer	Geophysical Company:
Ground Elevation:			Hole Diameter:	430 mm 0 - 43 mbgl	
Logged By:	F.Carosone			368 mm 43 - 170 mbgl	
Start Date:	13.12.2011 Compl. Date: 29.01.2012				
Purpose of Bore:	Production Bore		Total Depth:	144 mbgl	
Static Water Level:			Casing - Blank:	0 - 58.5 mbgl	
Water Level Date:			Casing - Slotted:	58.5 - 170 mbgl	

DEPTH (mbgl) | STRATIGRAPHY | GRAPHIC LOG | LITHOLOGY | BORE CONSTRUCTION | GAMMA LOG (cps) 0 200 | RESISTIVITY (OHM-Metres) SHORT (16") LONG (64") 0 10 | CALIPER (mm) 0 300



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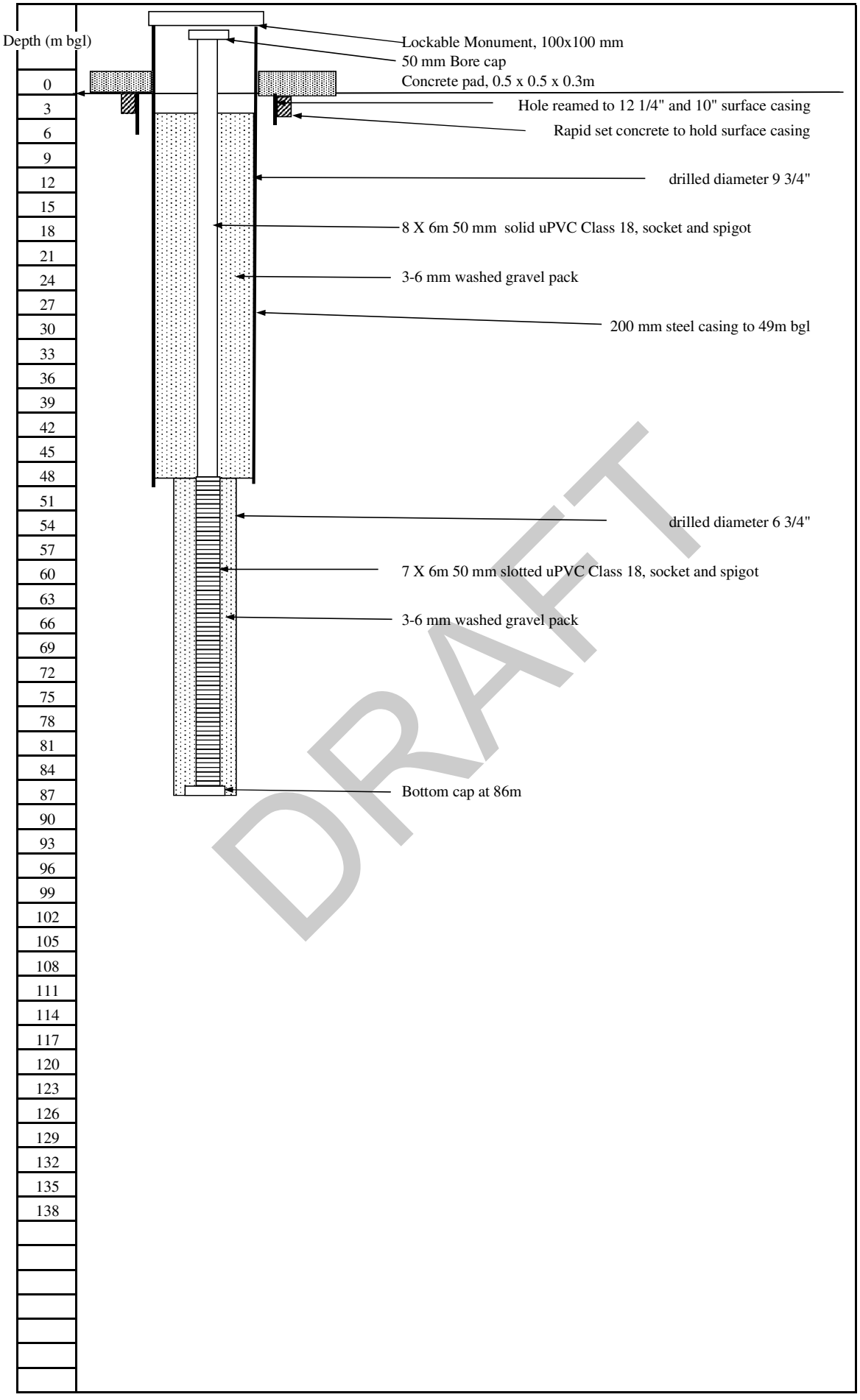
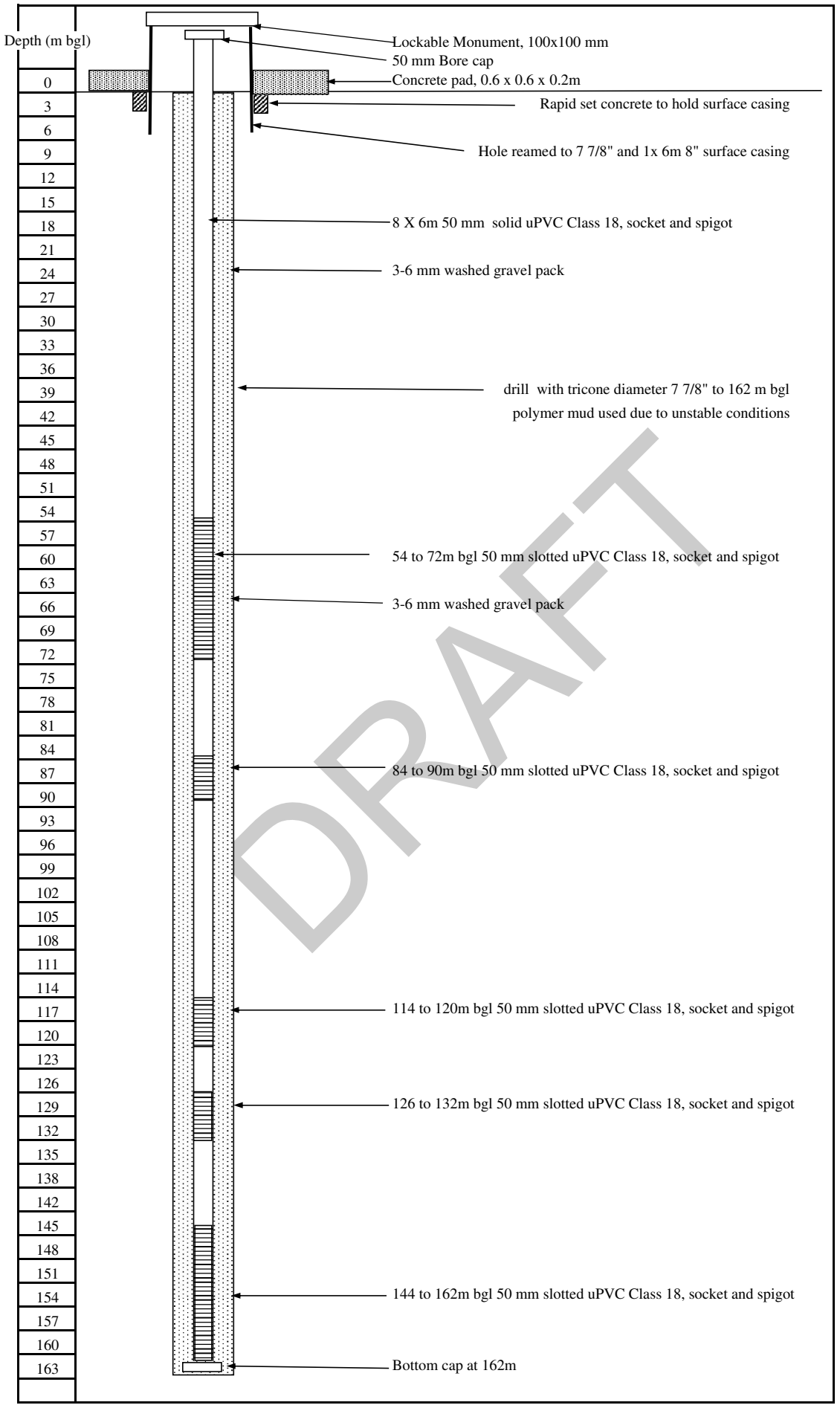
File No: 42908246-GW-02.dat Drawn: CL Approved: IS Date: 28/02/2013 | Rev: A | A3

MBA MONITORING BORE CONSTRUCTION



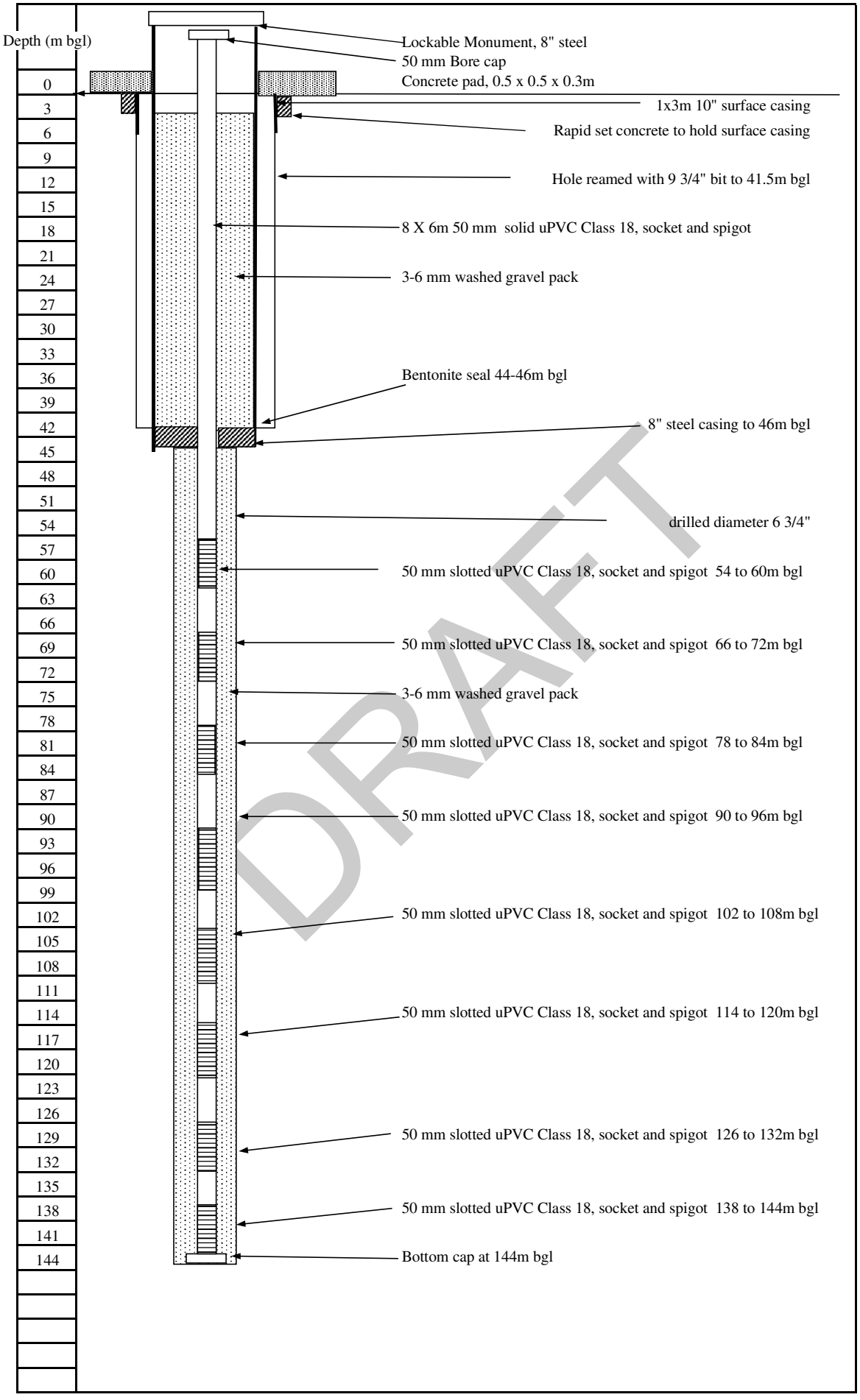
Prepared By:.....
Checked By:.....

MBCa MONITORING BORE CONSTRUCTION



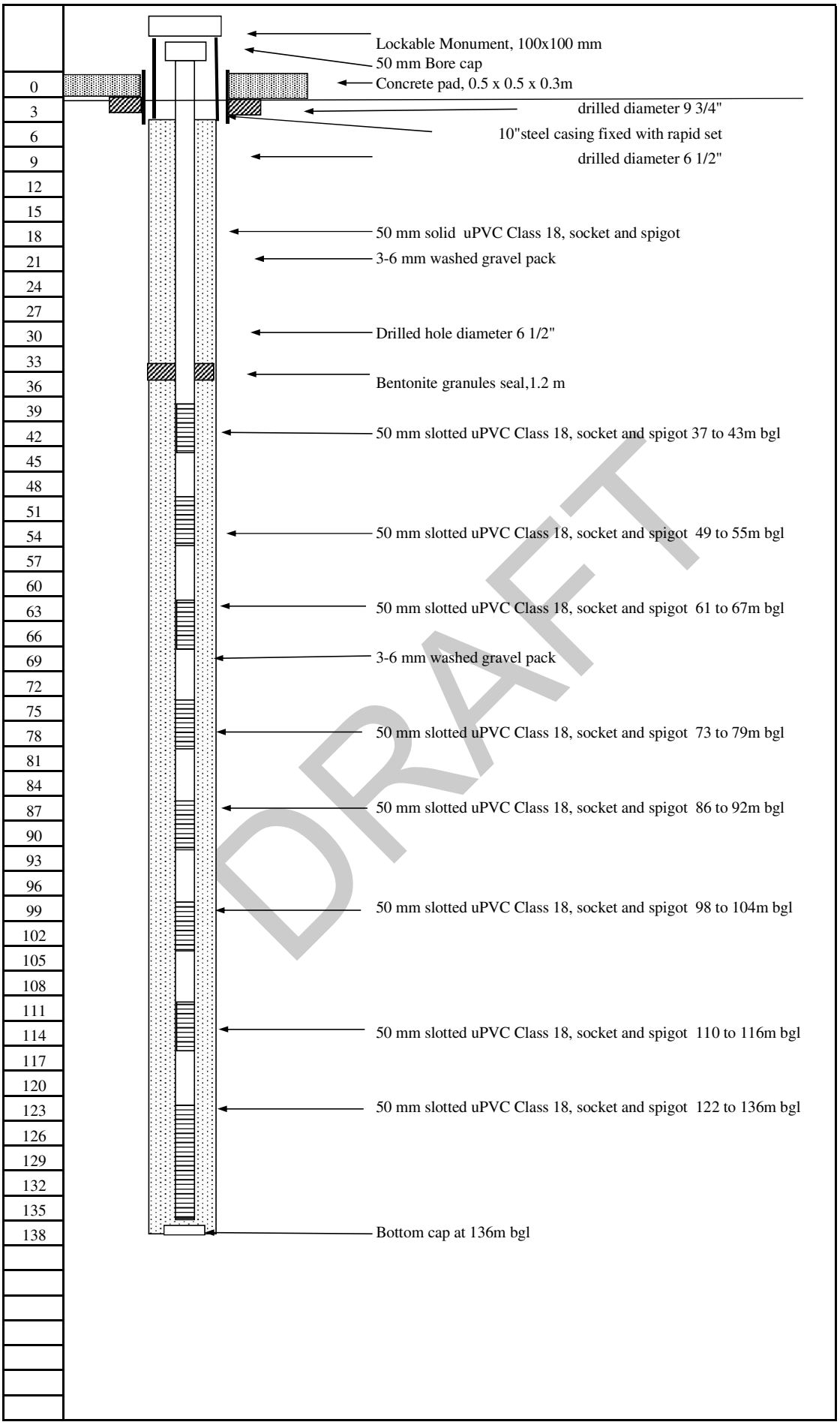
Prepared By:.....
Checked By:.....

MBD MONITORING BORE CONSTRUCTION



Prepared By:.....
Checked By:.....

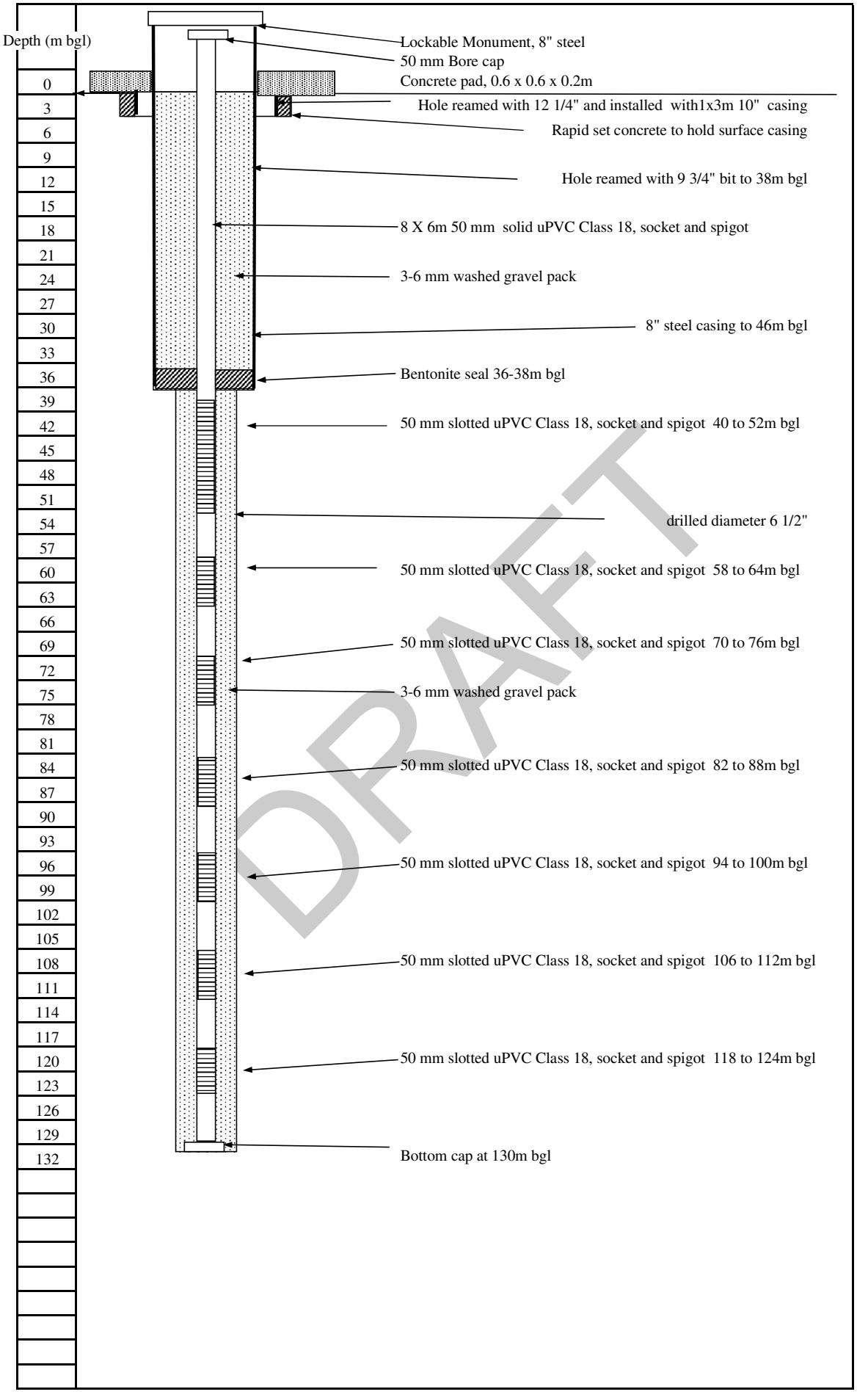
MBE MONITORING BORE CONSTRUCTION



Prepared By:.....

Checked By:.....

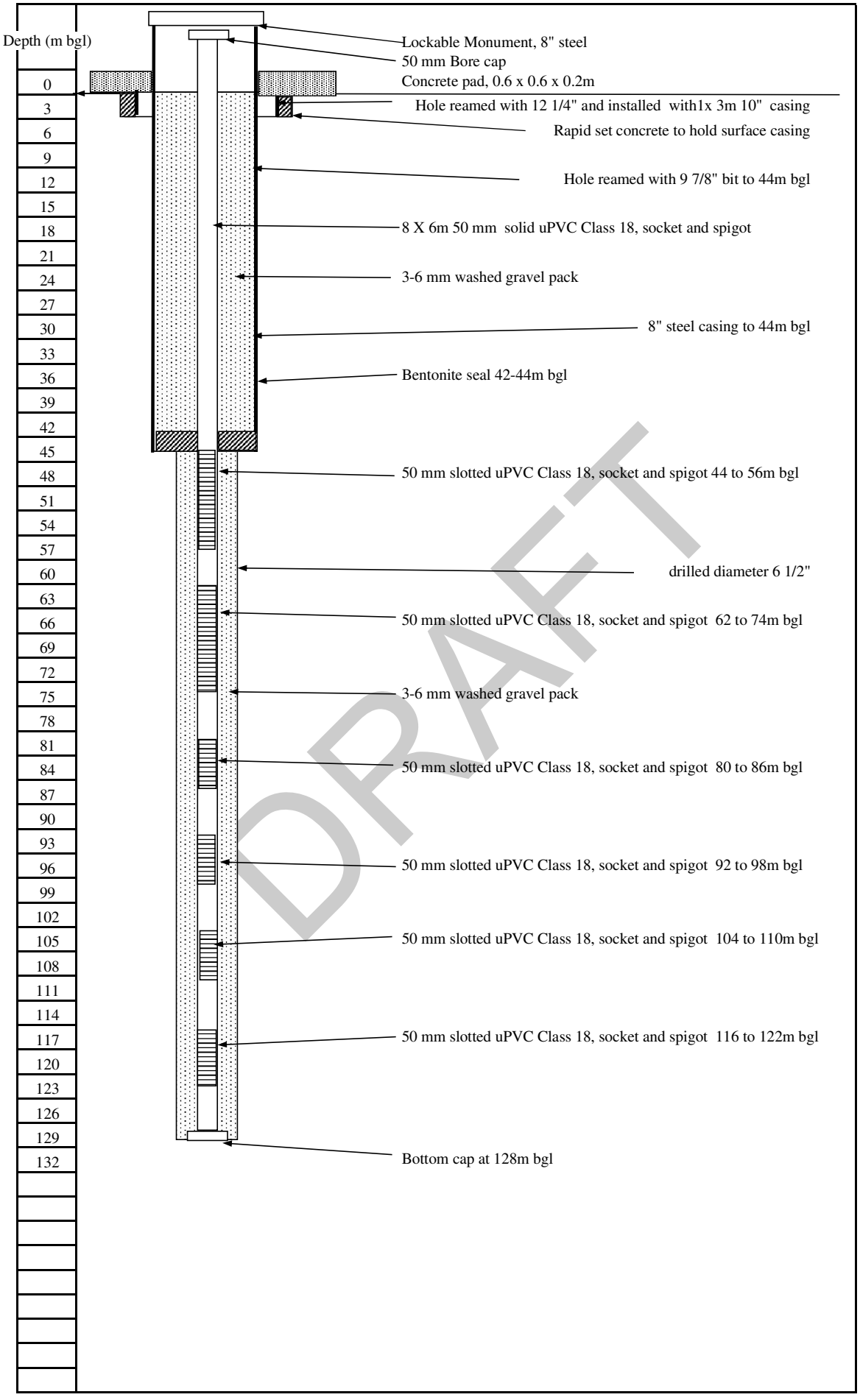
MBFa MONITORING BORE CONSTRUCTION



Prepared By:.....

Checked By:.....

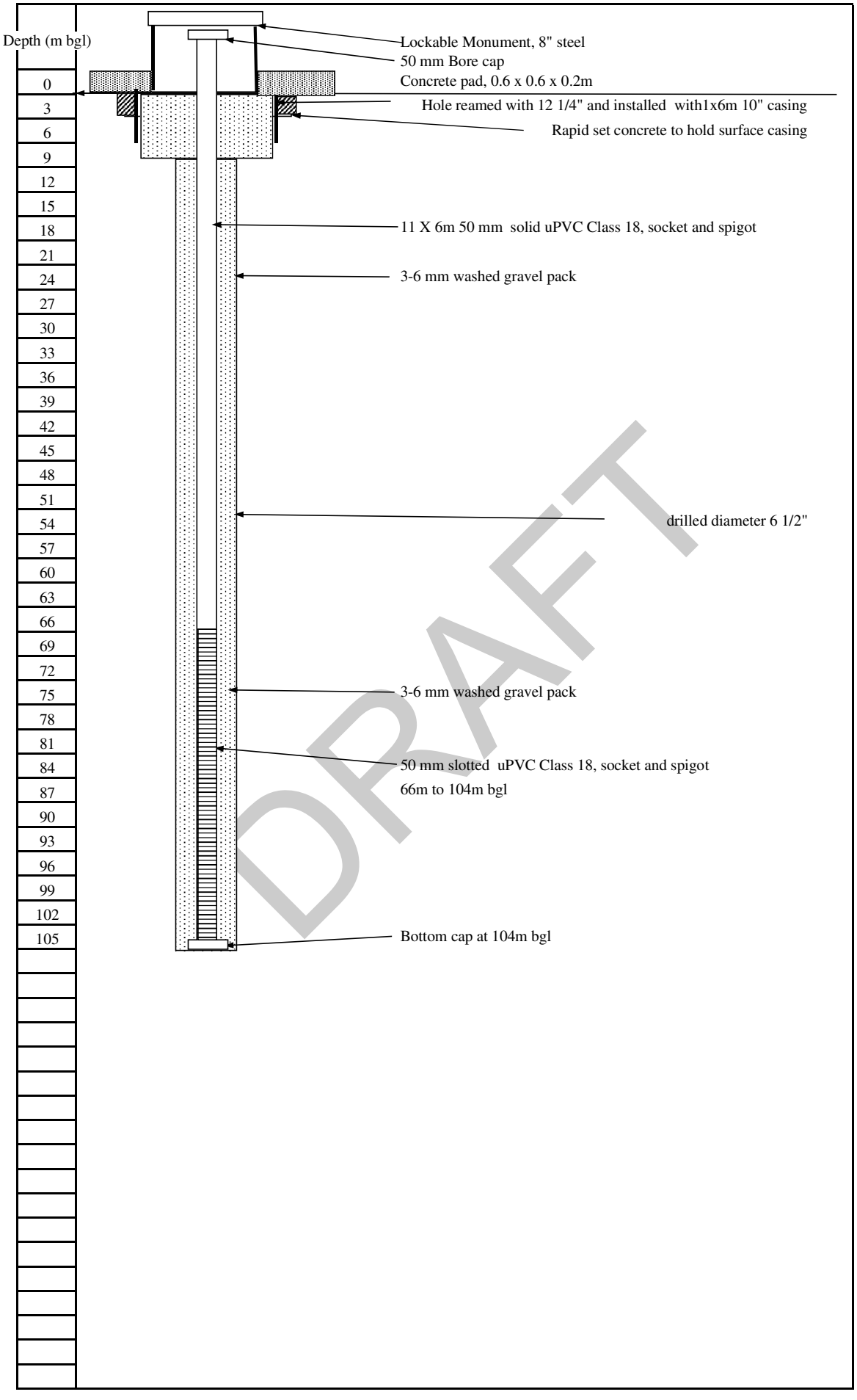
MBG MONITORING BORE CONSTRUCTION



Prepared By:.....

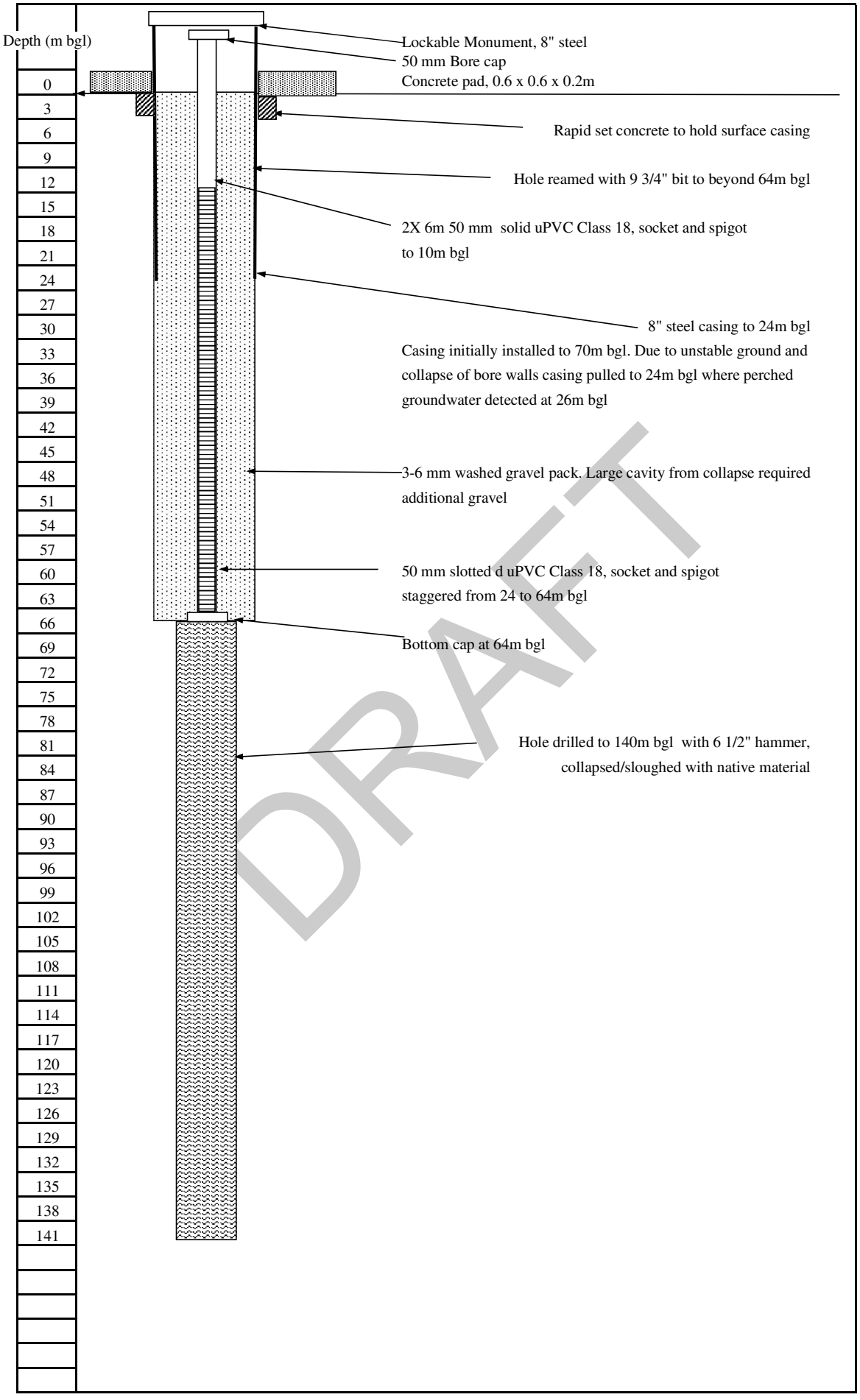
Checked By:.....

MBH MONITORING BORE CONSTRUCTION



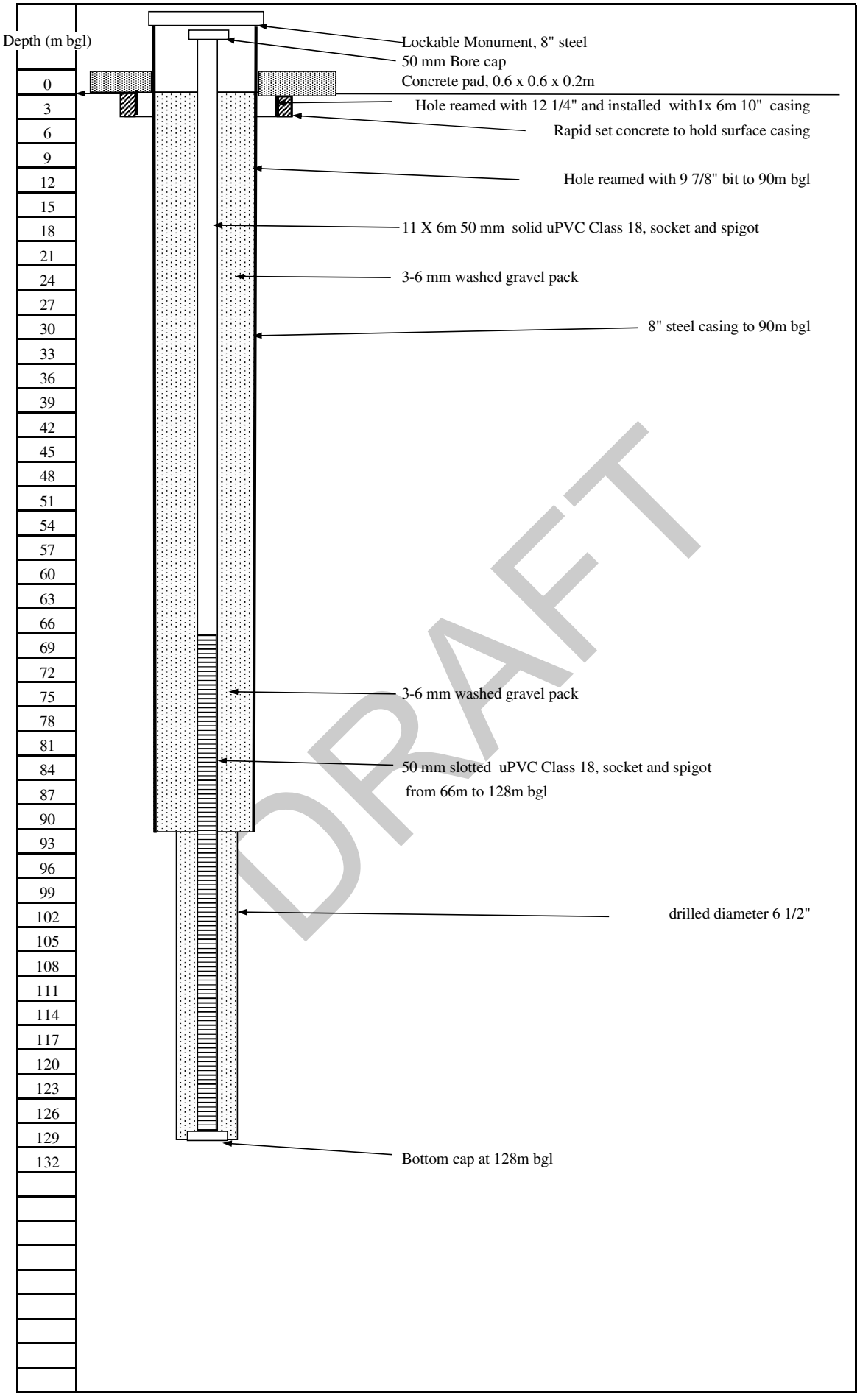
Prepared By:.....
Checked By:.....

MBJ MONITORING BORE CONSTRUCTION



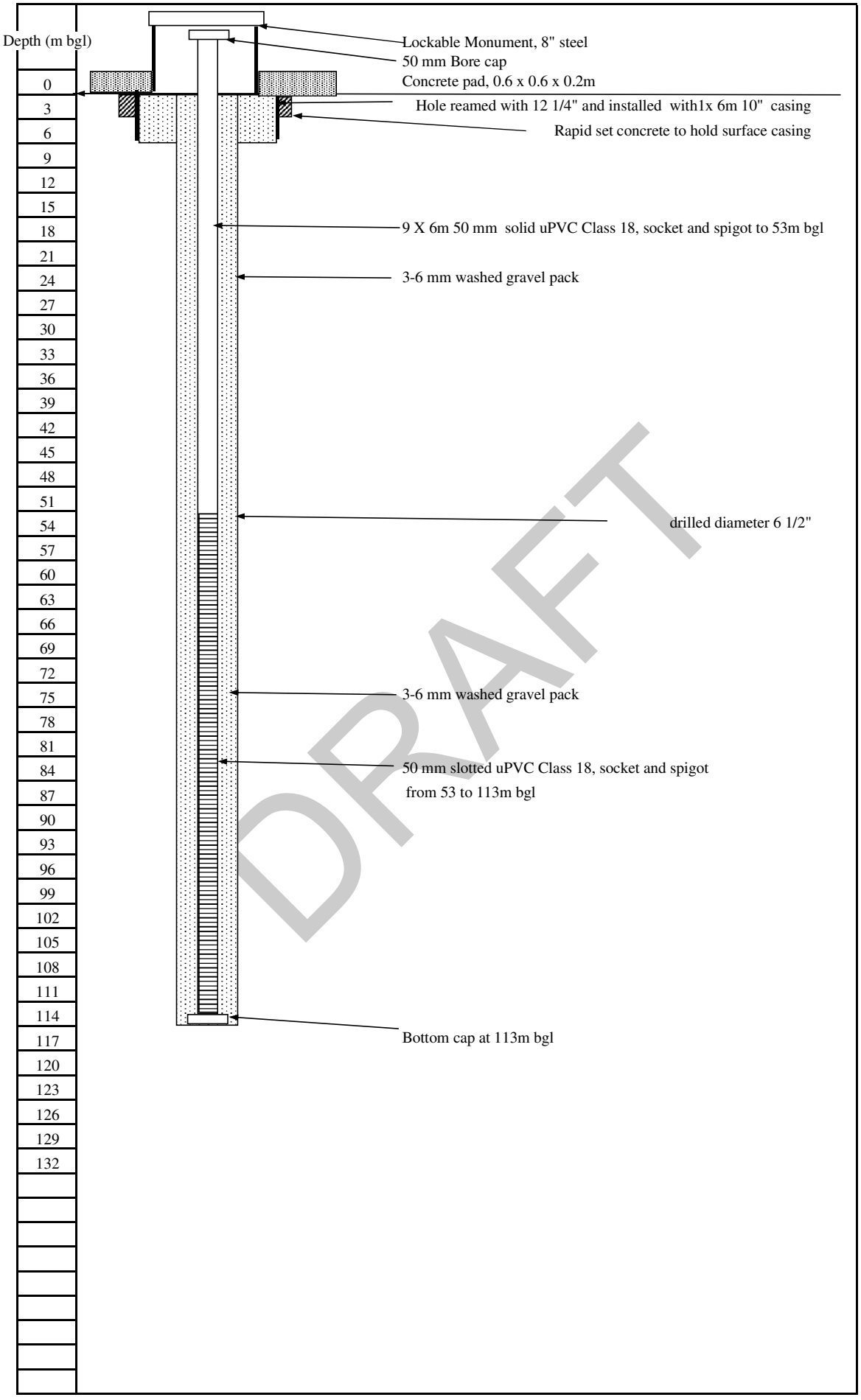
Prepared By:.....
Checked By:.....

MBK MONITORING BORE CONSTRUCTION



Prepared By:.....
Checked By:.....

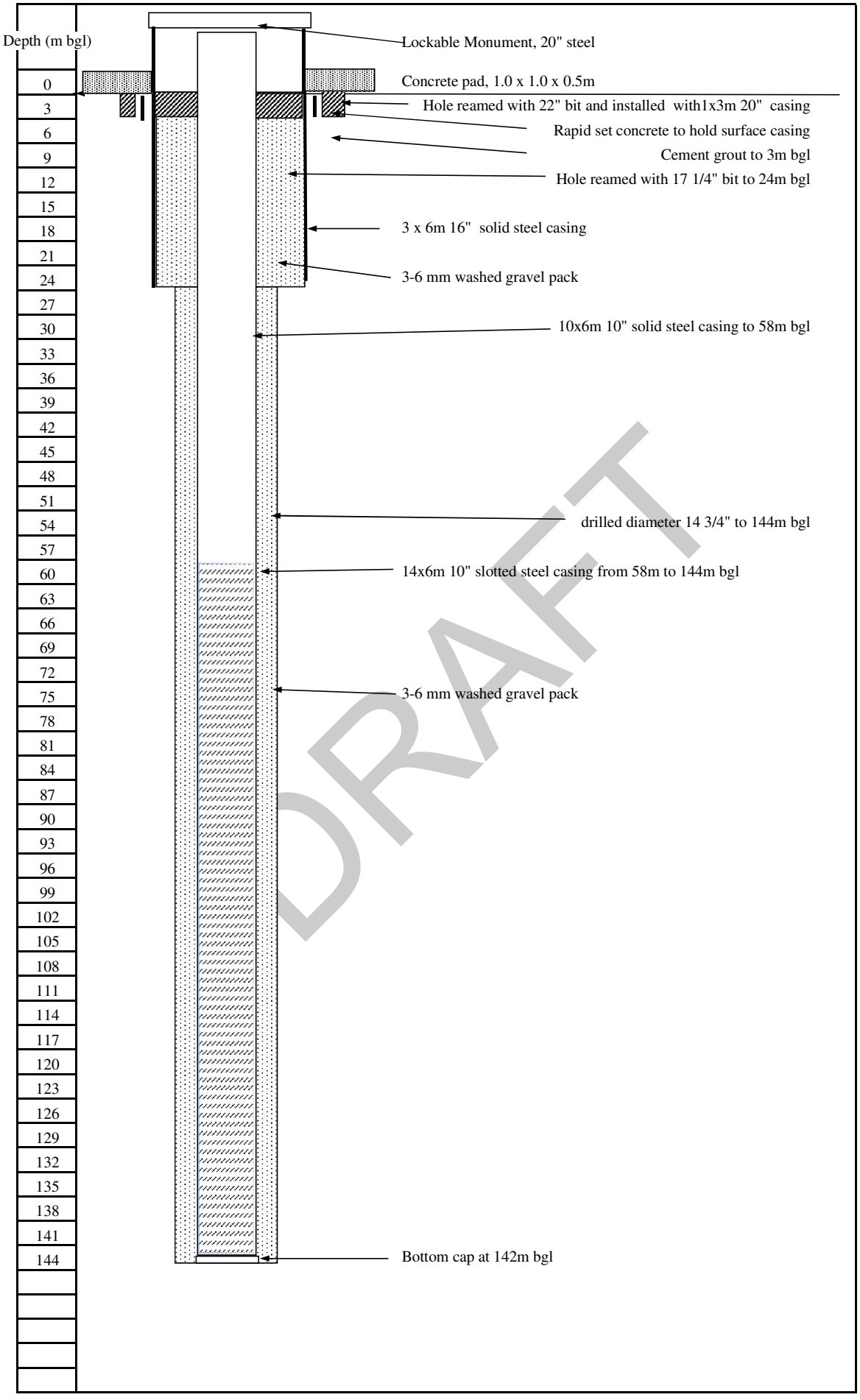
MBL MONITORING BORE CONSTRUCTION



Prepared By:.....

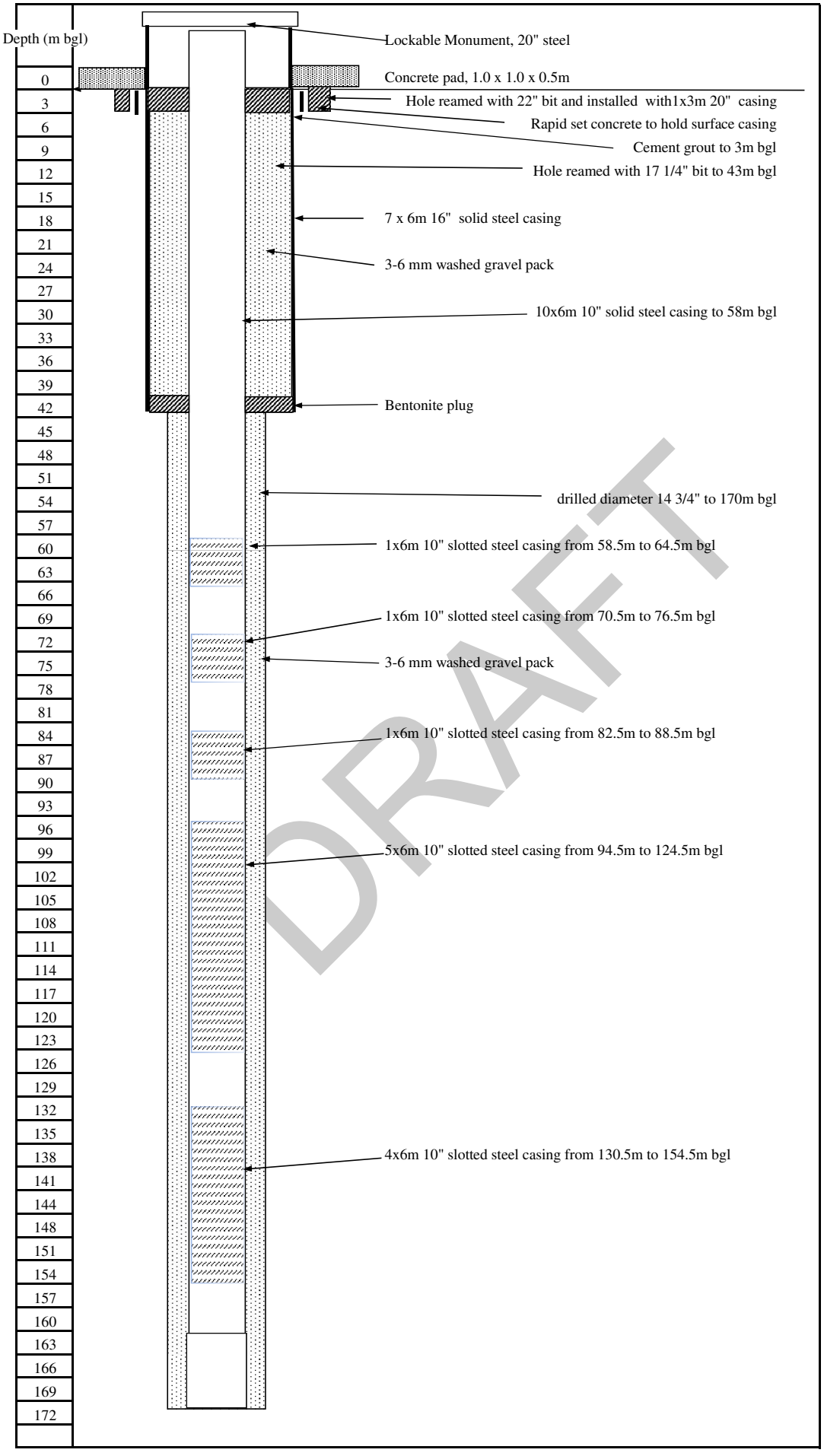
Checked By:.....

PB01 PRODUCTION BORE CONSTRUCTION



Prepared By:.....
Checked By:.....

PB02 PRODUCTION BORE CONSTRUCTION

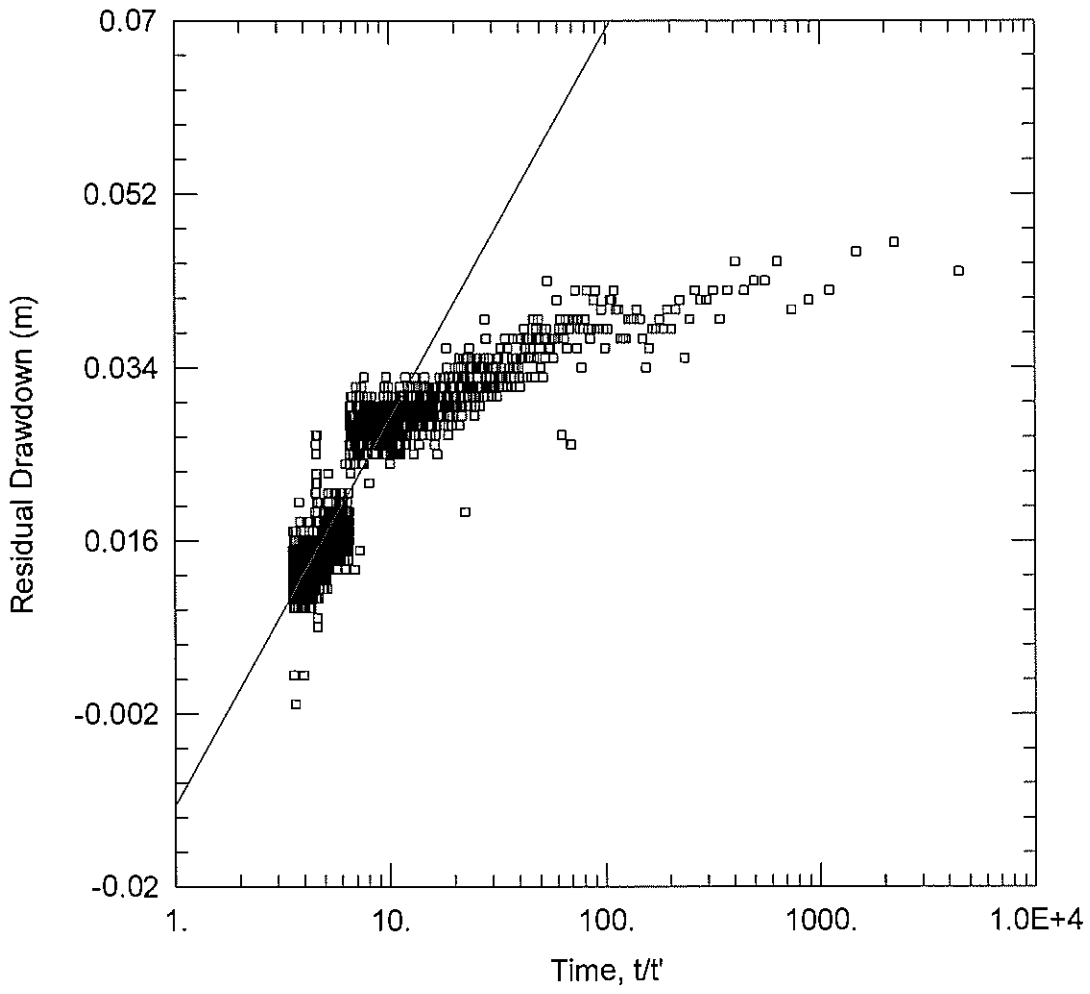


Prepared By:.....

Checked By:.....

APPENDIX B

Airlift Permeability Test Data



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBA_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:09:37

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBA
Test Date: 16/06/2015

AQUIFER DATA

Saturated Thickness: 61. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBA	0	0

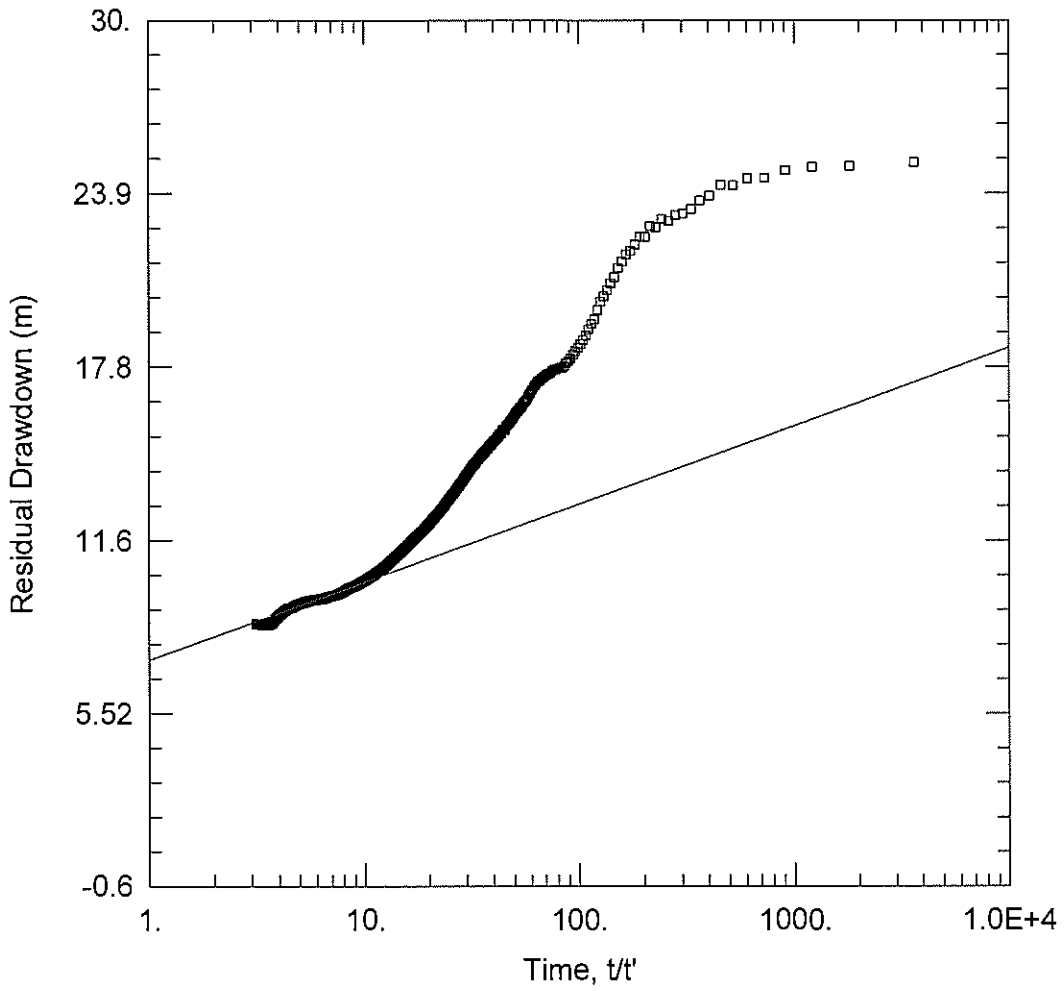
Observation Wells

Well Name	X (m)	Y (m)
MBA	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 19.69 m^2/day S/S' = 1.937



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBCa_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:10:00

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBCa

AQUIFER DATA

Saturated Thickness: 125. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBCa	0	0

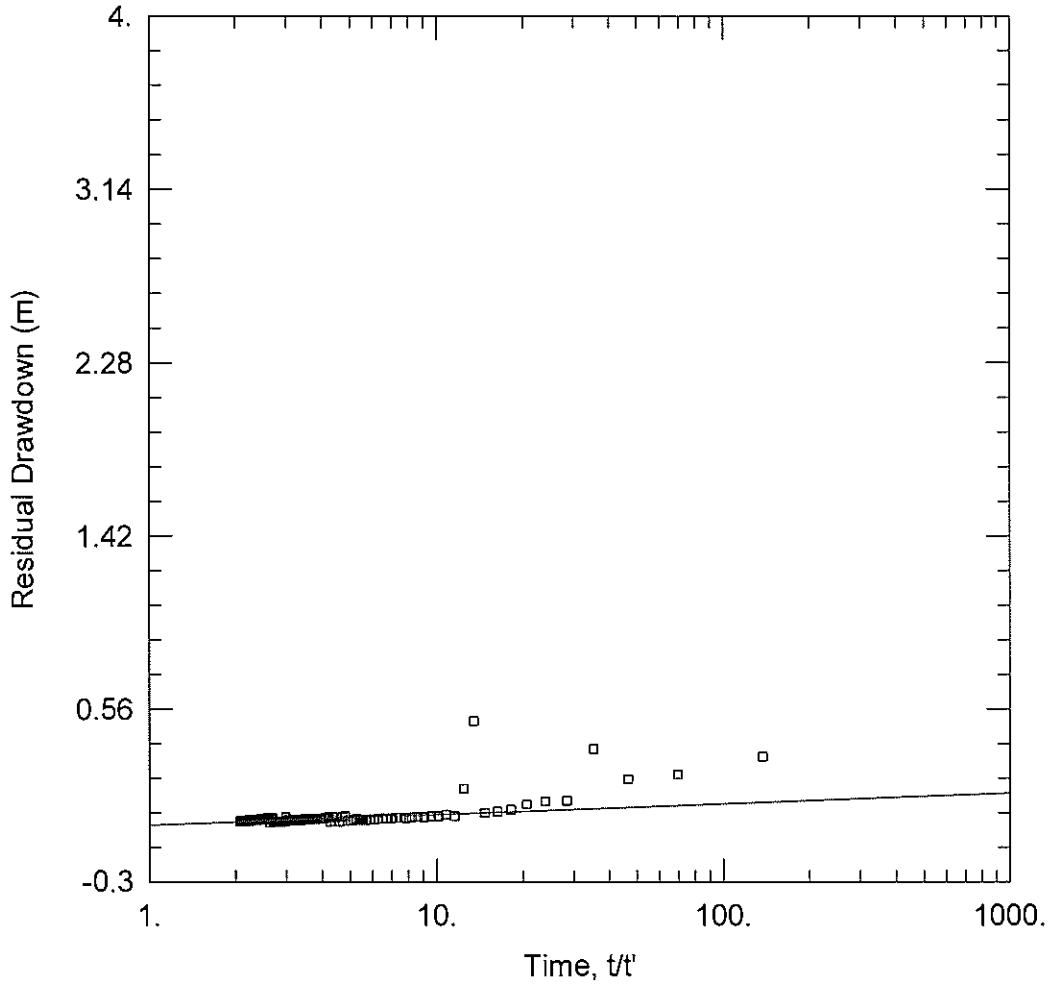
Observation Wells

Well Name	X (m)	Y (m)
▫ MBCa	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 0.0574 m^2/day S/S' = 0.002073



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBE_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:14:58

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBE
Test Date: 18/06/2015

AQUIFER DATA

Saturated Thickness: 130. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBE	0	0

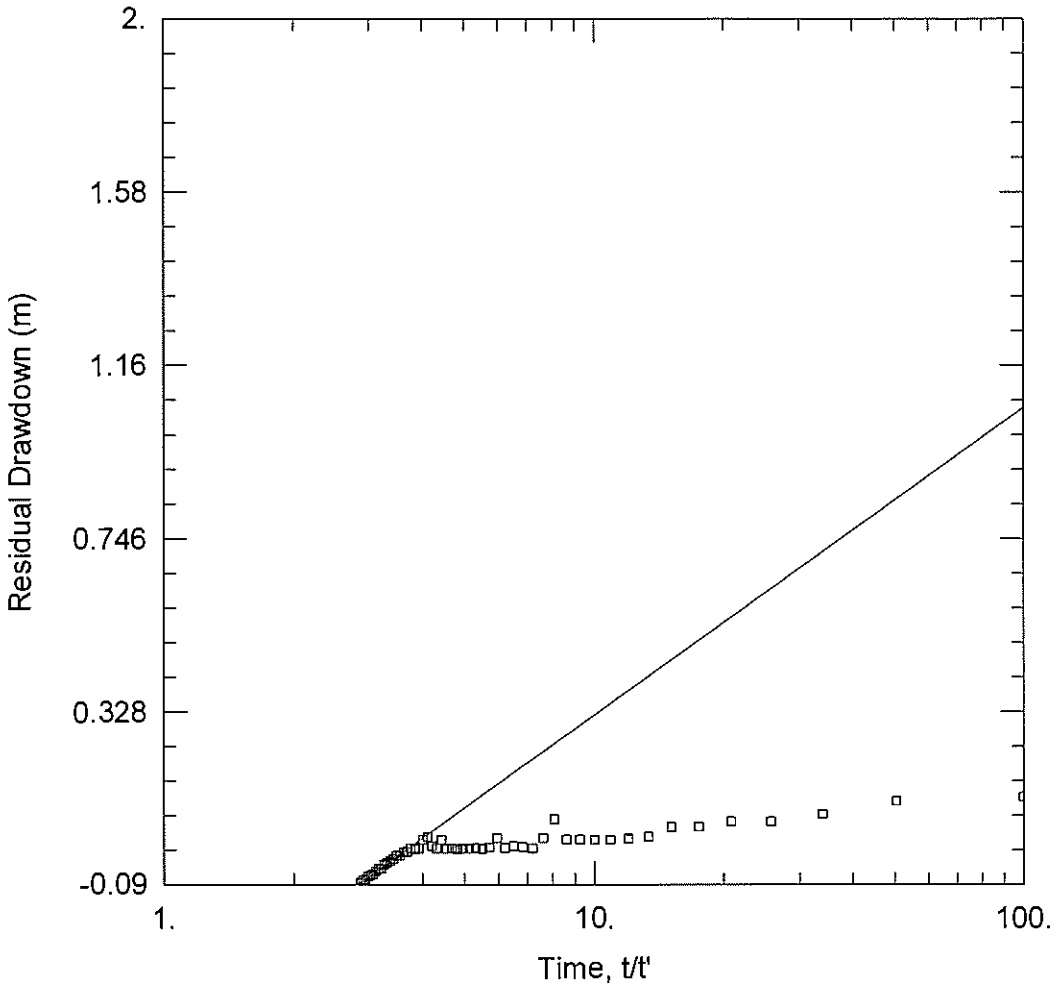
Observation Wells

Well Name	X (m)	Y (m)
MBE	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 133.8 m^2/day S/S' = 2.212



WELL TEST ANALYSIS

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Date: 01/06/16 Time: 16:15:50

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBFa
Test Date: 14/06/2015

AQUIFER DATA

Saturated Thickness: 115. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBFa	0	0

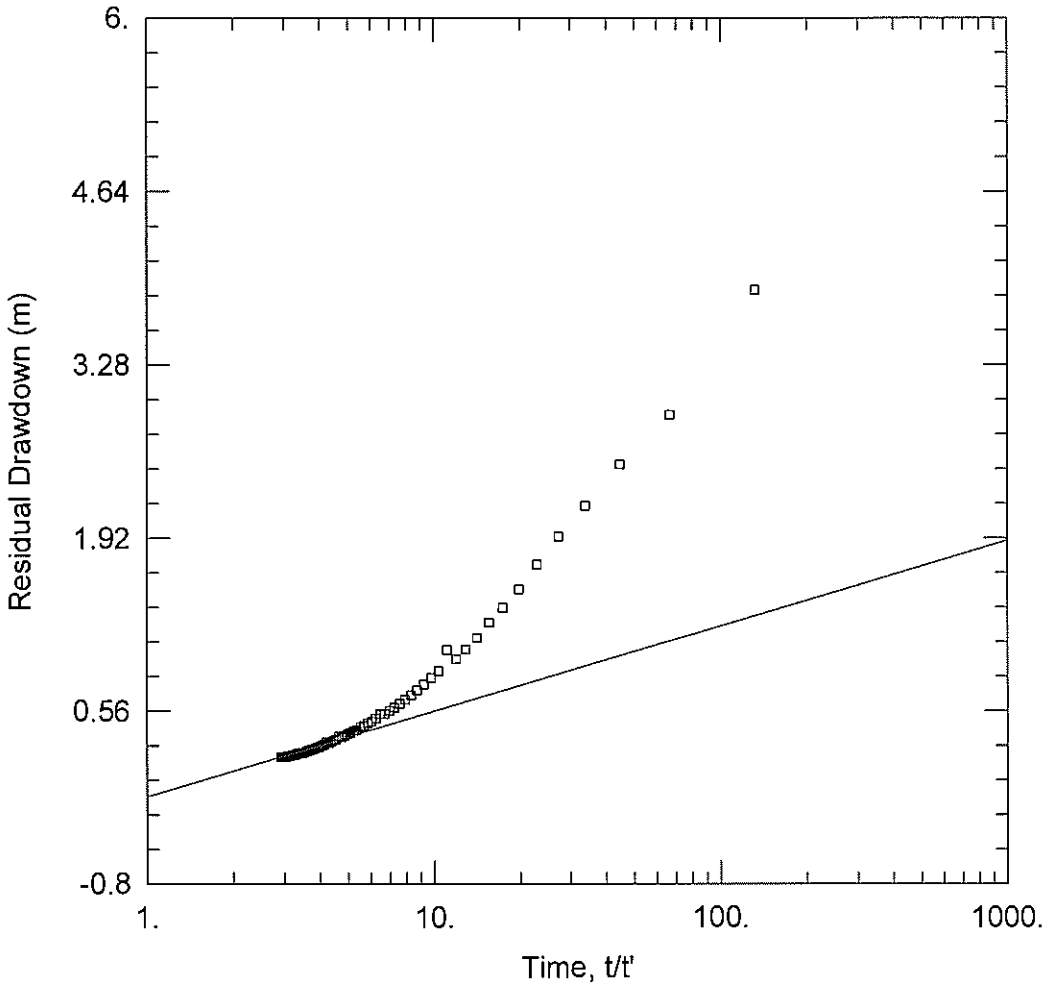
Observation Wells

Well Name	X (m)	Y (m)
▫ MBFa	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 6.398 m^2/day S/S' = 3.714



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBG_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:16:20

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBG
Test Date: 14/06/2015

AQUIFER DATA

Saturated Thickness: 125. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBG	0	0

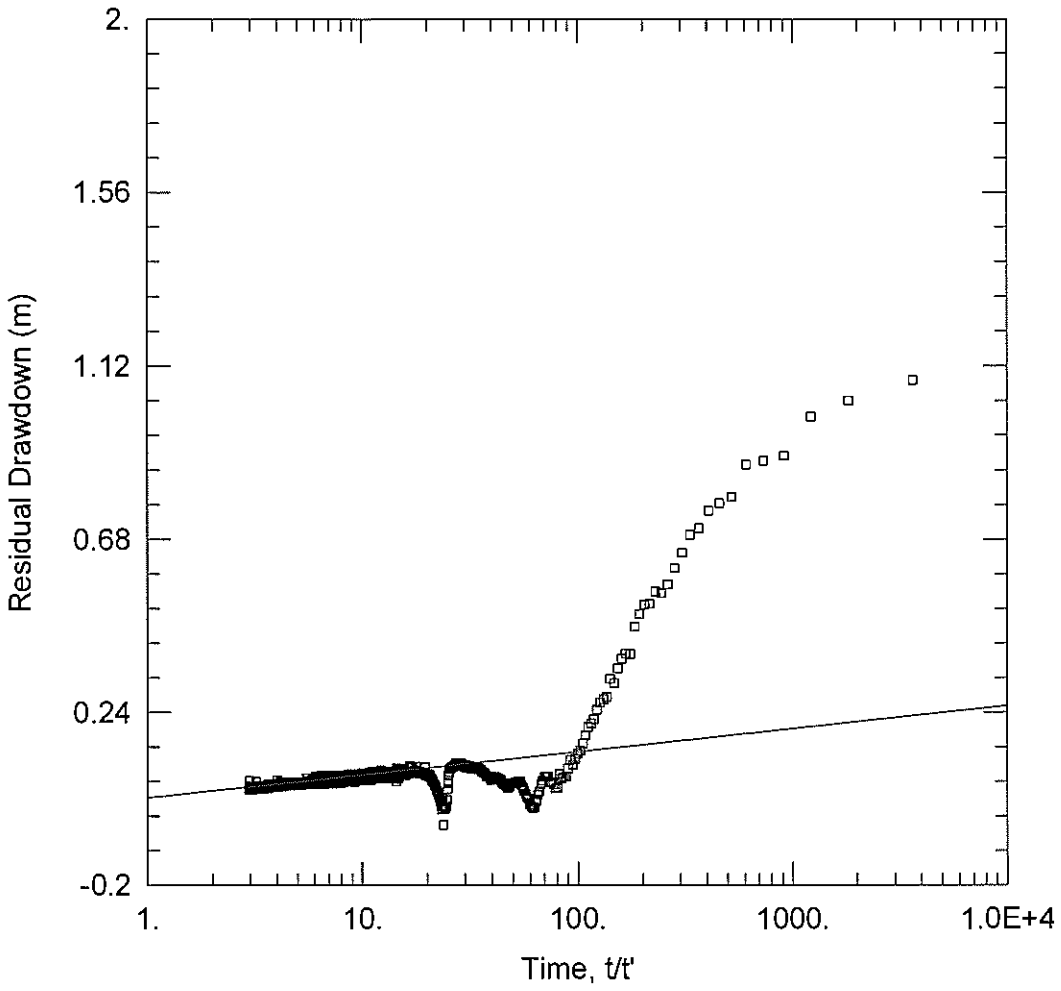
Observation Wells

Well Name	X (m)	Y (m)
MBG	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 10.62 m^2/day S/S' = 1.477



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBH_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:17:12

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBH
Test Date: 16/06/2015

AQUIFER DATA

Saturated Thickness: 150. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBH	0	0

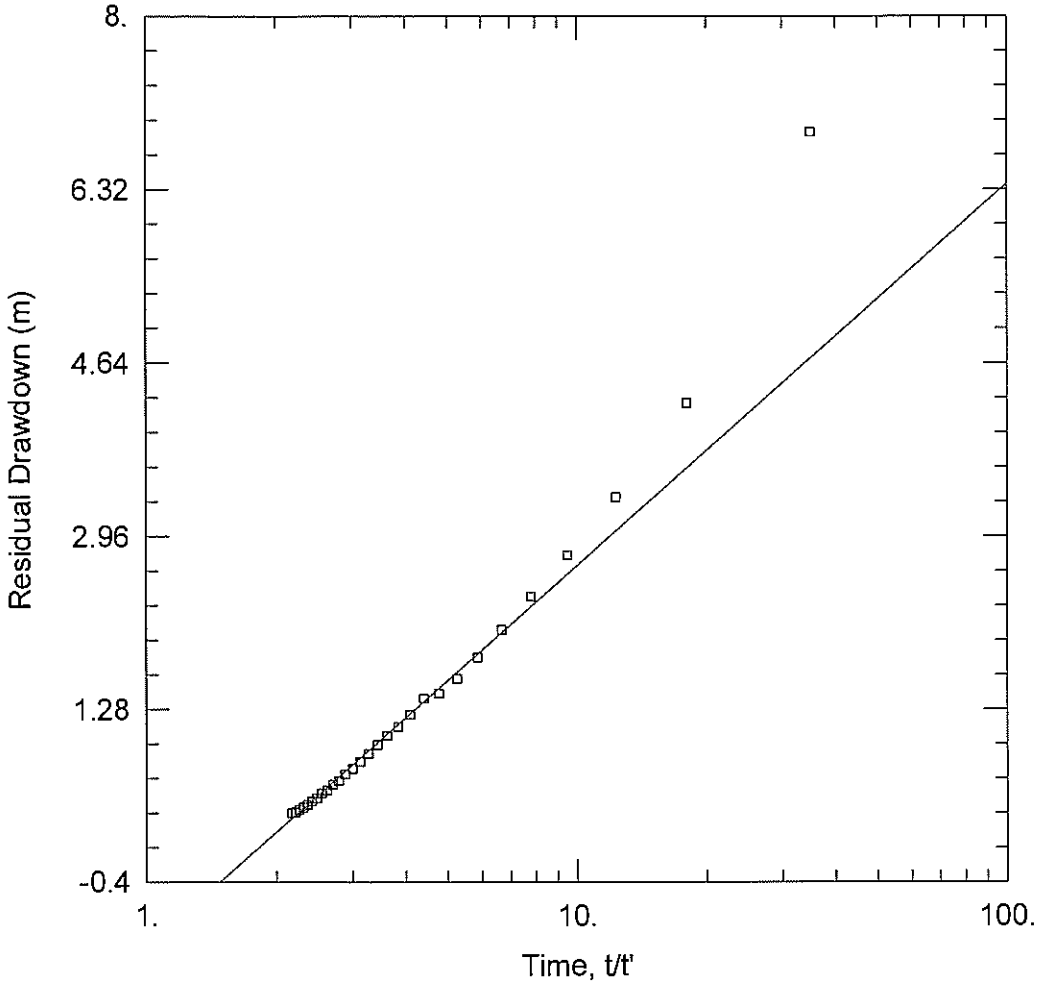
Observation Wells

Well Name	X (m)	Y (m)
MBH	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 13.55 m^2/day S/S' = 0.4158



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBJ_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:18:18

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBJ
Test Date: 17/06/2015

AQUIFER DATA

Saturated Thickness: 150. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBJ	0	0

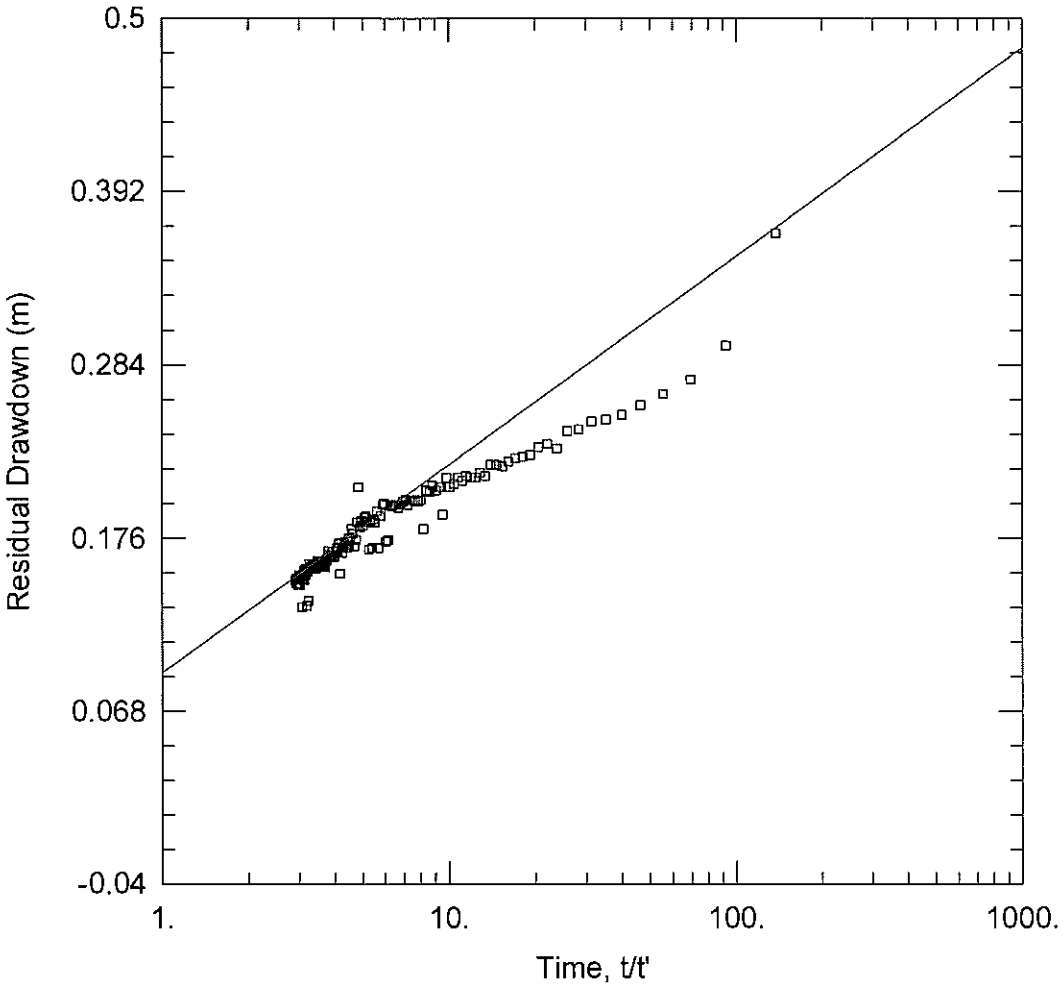
Observation Wells

Well Name	X (m)	Y (m)
MBJ	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 0.1285 m^2/day S/S' = 1.893



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBK_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:18:54

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBK
Test Date: 18/06/2015

AQUIFER DATA

Saturated Thickness: 115. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBK	0	0

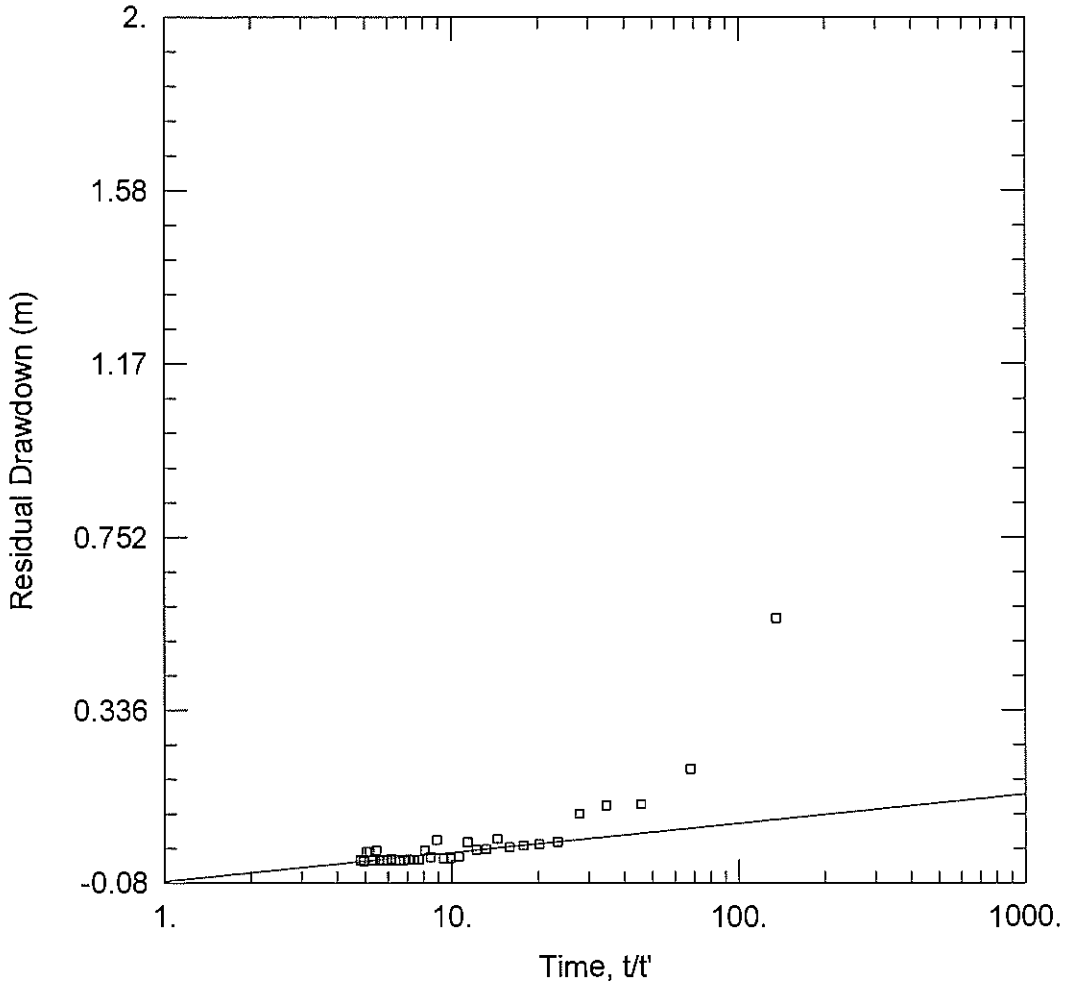
Observation Wells

Well Name	X (m)	Y (m)
MBK	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 18.31 m^2/day S/S' = 0.1956



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBL_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:19:33

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBL
Test Date: 17/06/2015

AQUIFER DATA

Saturated Thickness: 150. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBL	0	0

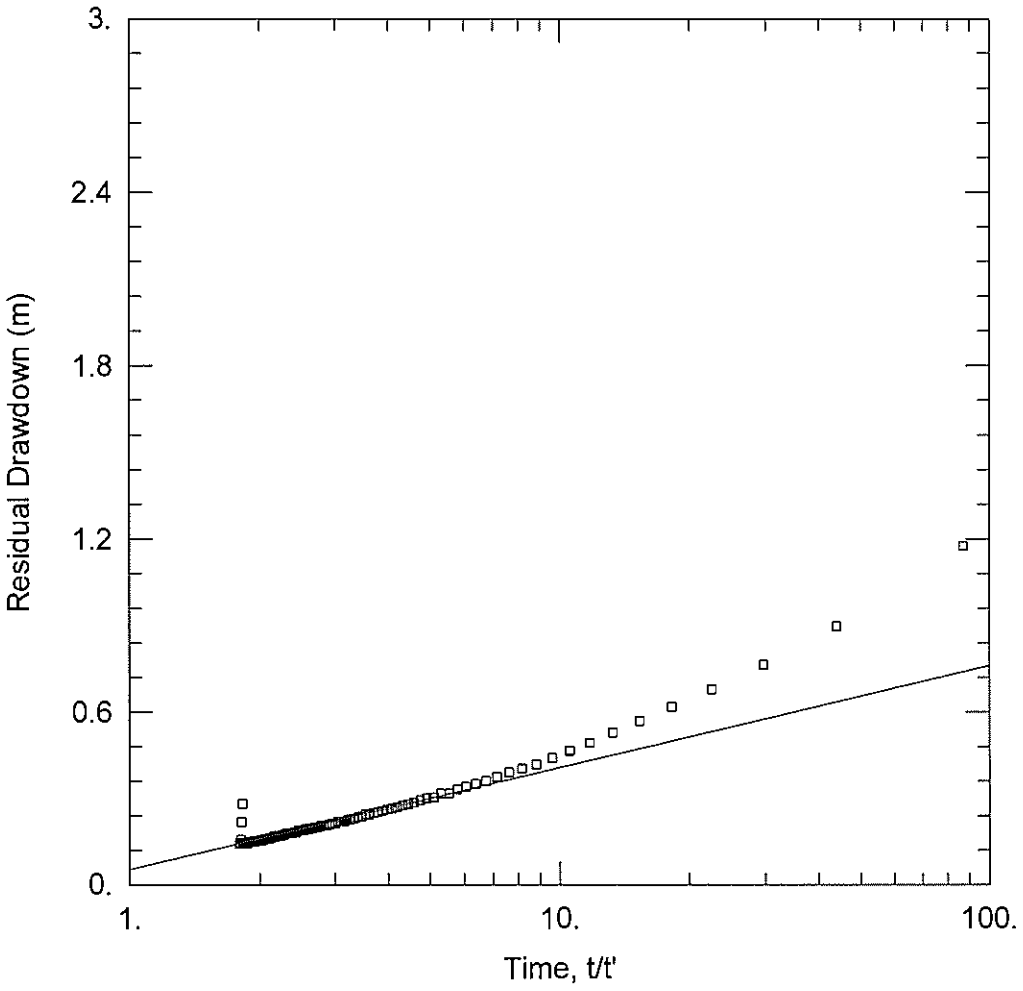
Observation Wells

Well Name	X (m)	Y (m)
▫ MBL	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 84.03 m^2/day S/S' = 12.37



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBD_rec_13.07.15.aqt
Date: 01/06/16 Time: 16:14:05

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBM
Test Date: 18/06/2015

AQUIFER DATA

Saturated Thickness: 150. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBD	0	0

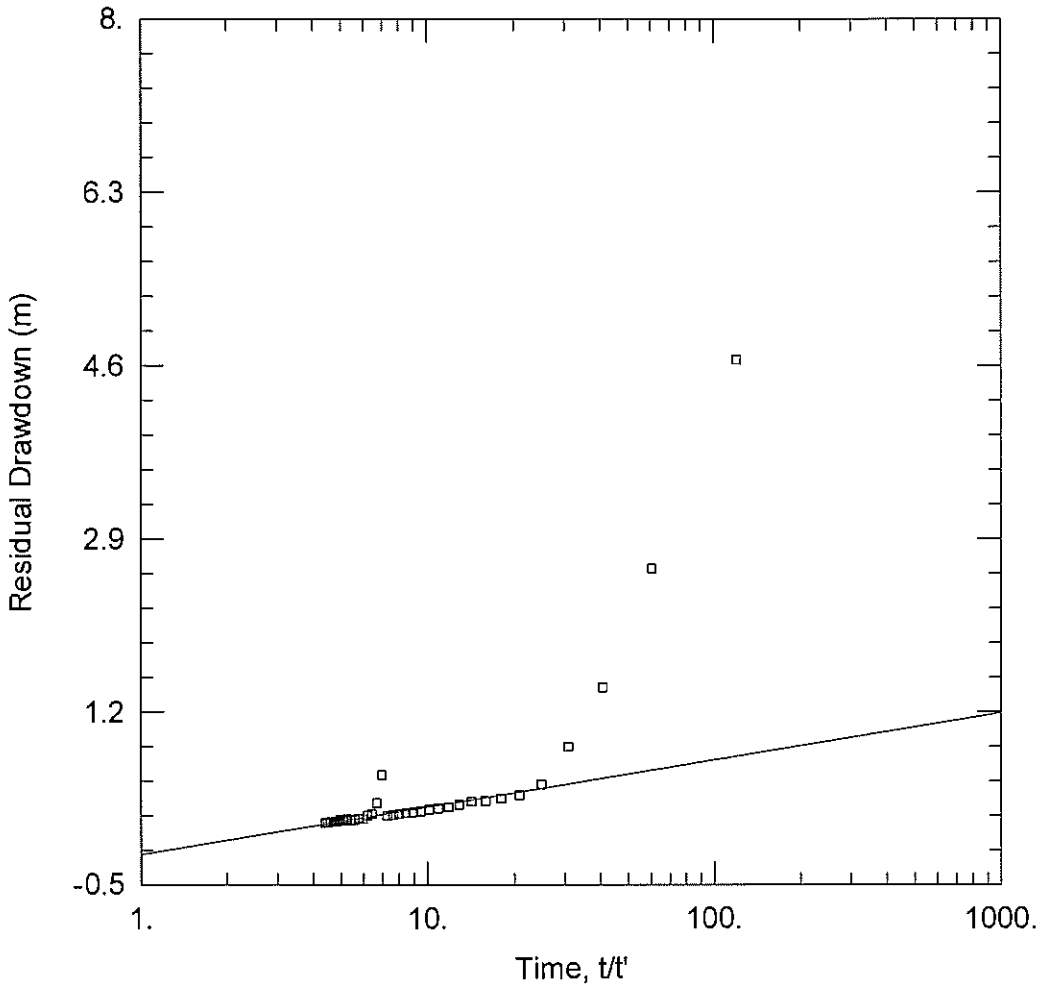
Observation Wells

Well Name	X (m)	Y (m)
MBD	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 20.17 m^2/day S/S' = 0.7062



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBN_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:21:58

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBN
Test Date: 17/06/2015

AQUIFER DATA

Saturated Thickness: 150. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBN	0	0

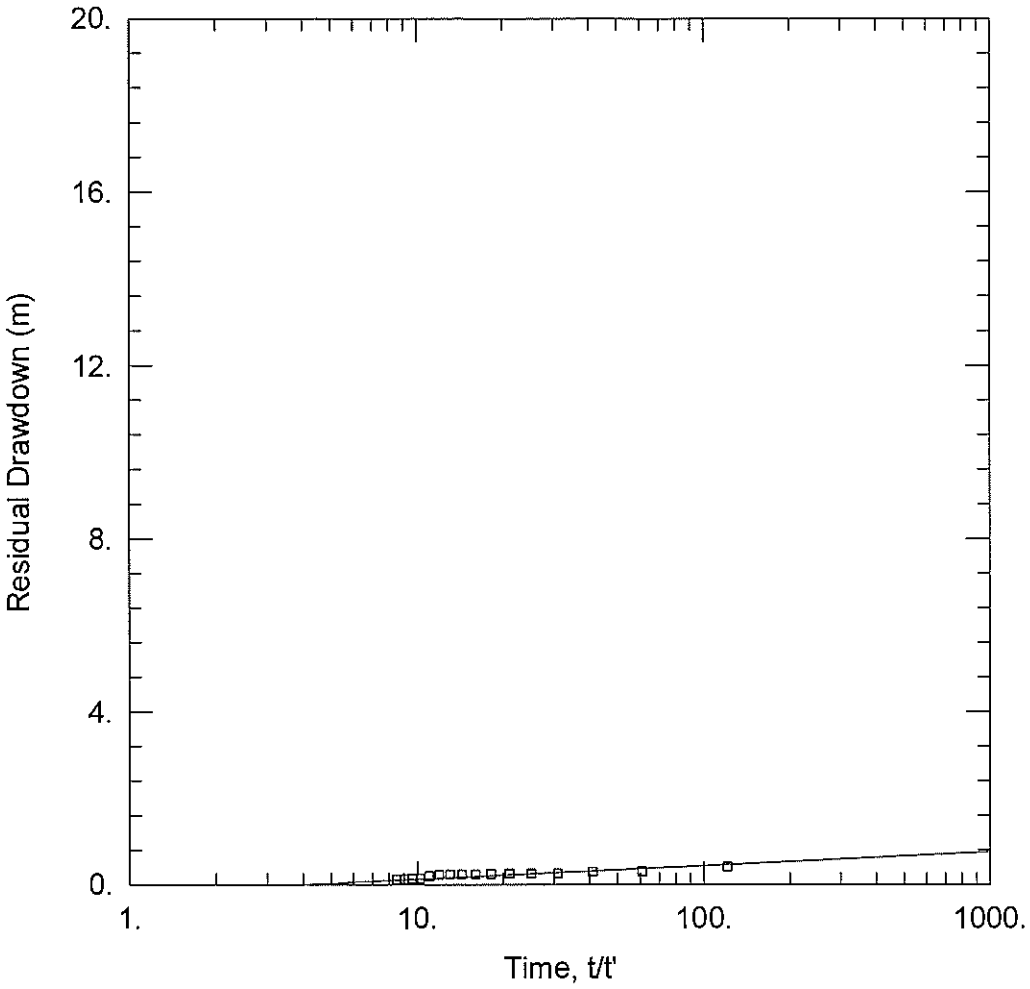
Observation Wells

Well Name	X (m)	Y (m)
MBN	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 6.485 m^2/day S/S' = 2.727



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBO_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:22:23

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBO
Test Date: 16/06/2015

AQUIFER DATA

Saturated Thickness: 150. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBO	0	0

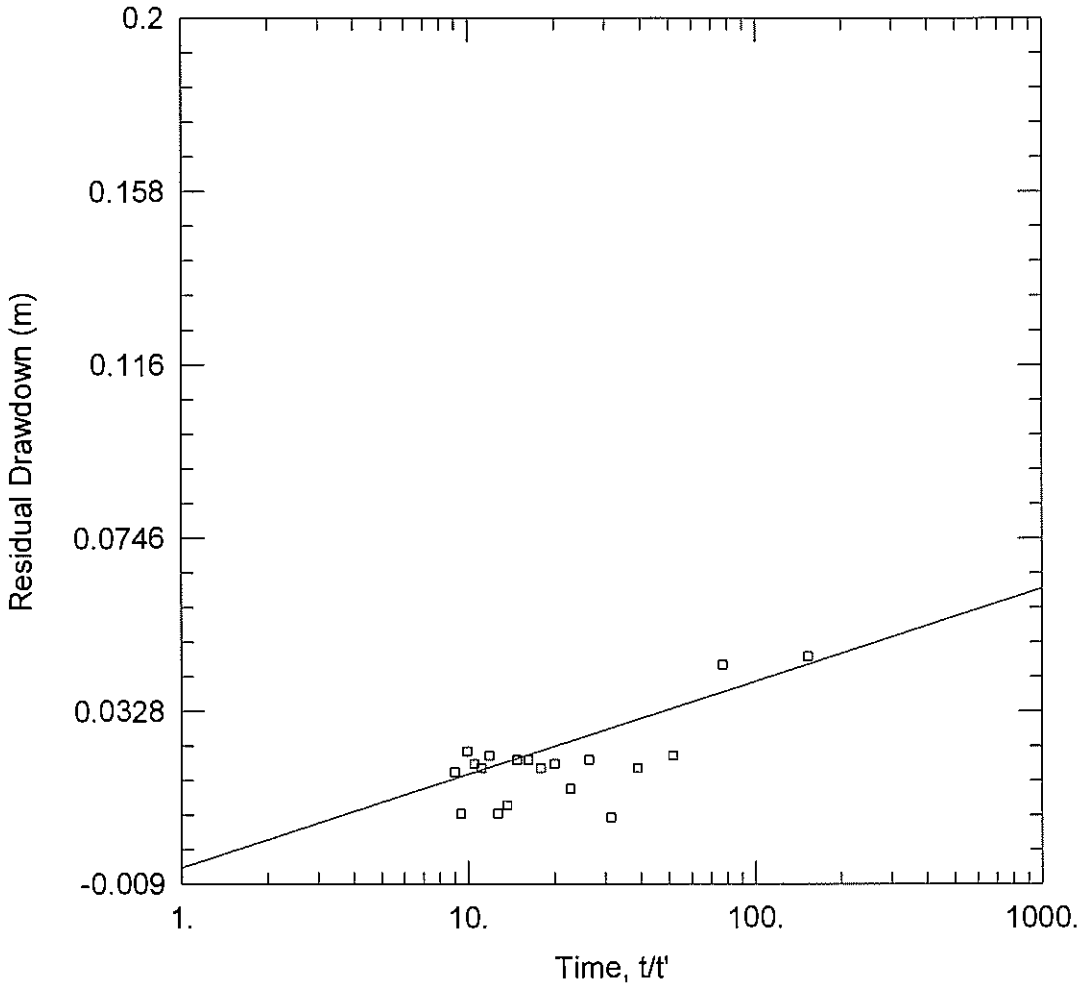
Observation Wells

Well Name	X (m)	Y (m)
▫ MBO	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 5.53 m^2/day S/S' = 4.077



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBQ_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:23:15

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBQ
Test Date: 15/06/2015

AQUIFER DATA

Saturated Thickness: 150. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBQ	0	0

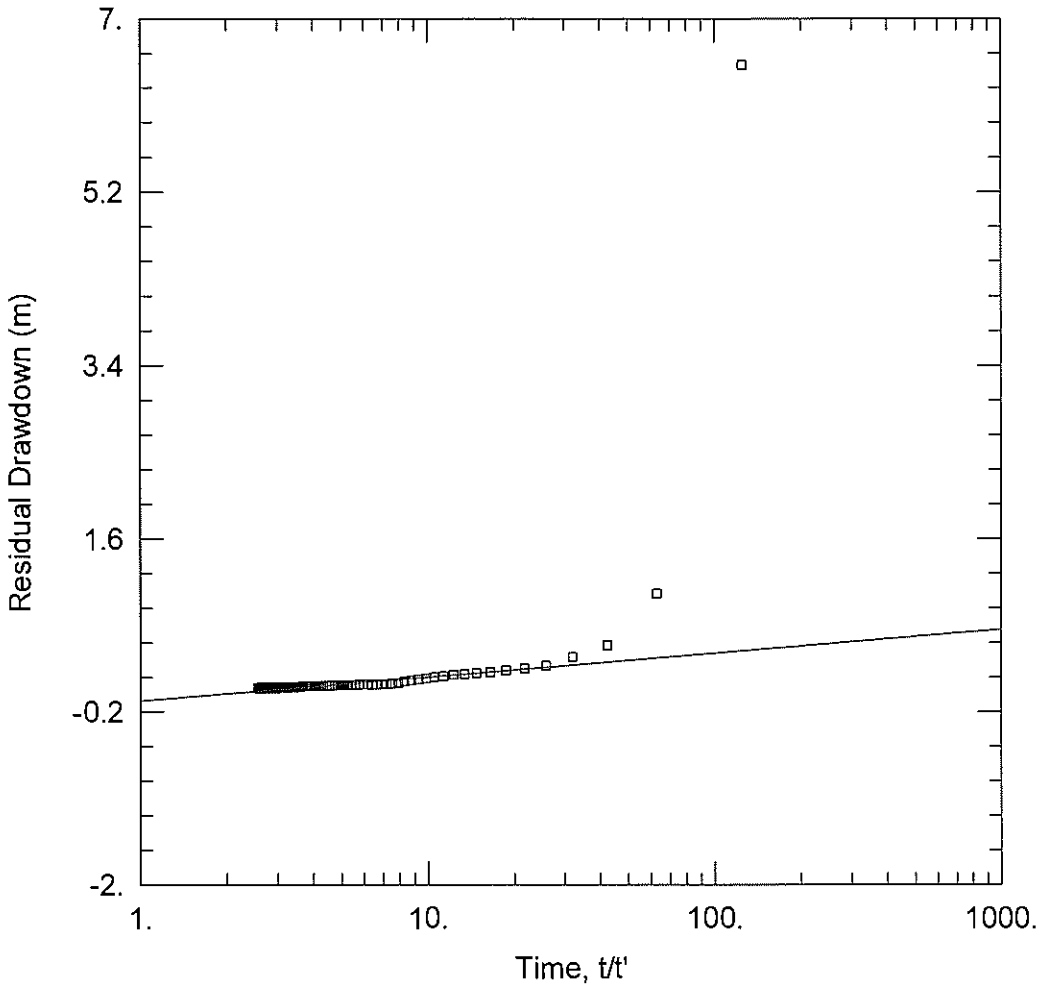
Observation Wells

Well Name	X (m)	Y (m)
MBQ	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 14.09 m^2/day S/S' = 1.672



WELL TEST ANALYSIS

Data Set: F:\013B\2 TECH\Aquifer testing\AQTESOLVE\Airlift Tests\MBR_rec_14.07.15.aqt
Date: 01/06/16 Time: 16:23:32

PROJECT INFORMATION

Company: AQ2
Client: BC Iron
Project: 013B
Location: Iron Valley
Test Well: MBR
Test Date: 15/06/2015

AQUIFER DATA

Saturated Thickness: 150. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
MBR	0	0

Observation Wells

Well Name	X (m)	Y (m)
MBR	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 5.115 m^2/day S/S' = 2.262