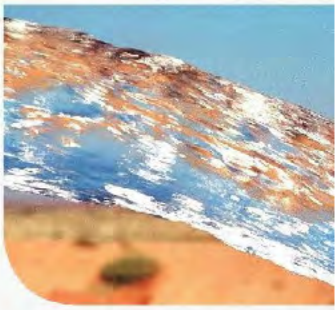

EUNDYNIE GOLD DEPOSIT

RESULTS OF PERMEABILITY TESTS AND GROUNDWATER MODELLING

REPORT FOR

RNC MINERALS

JULY 2019

Report No. 497.1/19/04

Rockwater
HYDROGEOLOGICAL AND ENVIRONMENTAL CONSULTANTS

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1 INTRODUCTION

RNC Minerals (RNC) owns and operates the Higginsville Gold Mine, located adjacent to the Coolgardie to Esperance Highway, about 30 km south of Widgiemooltha (Fig. 1). Gold ore from nearby open-cut mines at Lake Cowan, and from the Mt Henry Gold Project at Norseman, is processed at Higginsville using a 1.3 Mtpa CIP mill that was constructed in 2008 when the mine was owned by Avoca Resources.

RNC is planning to mine three small pits within the Eundynie gold deposit, located about 10 km south-east of the Higginsville mill (Fig. 1). The largest of the pits, termed Hidden Secret Pit, will be mined to a depth of about 70 m (242 mAHD); the second largest pit, termed Mouse Hollow Pit, will be mined to a depth of about 45 m (250 mAHD); and the smallest pit, termed Hidden Secret South Pit, will be mined to a depth of about 10 m (295 mAHD) (Fig. 2).

The standing water level (SWL) of groundwater at Eundynie lies at about 270 mAHD. Mining of the Hidden Secret and Mouse Hollow pits will therefore require lowering of the water table by about 28 and 18 m, respectively, and Hidden Secret South will not be deep enough to require dewatering. By analogy to the Vine and Fairplay pits, located in similar bedrock closer the Higginsville mill (Fig. 1), it is likely that very little water will be produced by dewatering of the pits at Eundynie.

To assist with obtaining regulatory approvals for mining of the Eundynie Deposit, RNC commissioned Rockwater to perform a hydrogeological assessment of the Hidden Secret and Mouse Hollow pits involving the permeability-testing of eight mineral exploration holes, followed by the construction of a groundwater model to predict the rates of dewatering and radial extent of drawdown that will be produced during mining. The results of the permeability-testing and modelling investigations are presented below.

2 PHYSICAL SETTING

2.1 LOCATION

The proposed Eundynie pits are located at the eastern end of Eundynie Rd, within a large peninsula of bedrock at the western margin of Lake Cowan (Fig. 1). The pits occur within tenements M15/507 and M15/597, which are held by Avoca Mining, a subsidiary of RNC.

Abandoned pits at Higginsville include the Poseidon, Two Boys, Fairplay and Vine pits, which were mined into mafic bedrock;, and the Graveyard, Aphrodite, Mitchell and Challenge pits, which were mined into Tertiary palaeovalley (palaeochannel) sediments. As noted, the bedrock pits in particular required only minor dewatering.

2.2 CLIMATE

The Higginsville area has a semi-arid climate with an irregular rainfall influenced by both southern temperate and northern tropical systems. Long-term climatic data recorded at Norseman indicate that the area has an average annual rainfall of about 300 mm, with the highest rainfalls generally occurring during January to March and November (Table 1). Long-term average potential evaporation at Kalgoorlie is about 2,630 mm, with evaporation greatly exceeding rainfall during every month of the year (Table 1).

Table 1: Rainfall and Evaporation Data

A. Long-term Average Monthly Rainfall at Norseman

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
38.4	28.1	29.5	24.3	19.2	16.9	22.4	22.8	22.3	21.2	29.6	21.1	299.8

Source: Bureau of Meteorology, 1999-2018

B. Long-term Average Monthly Evaporation at Kalgoorlie

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
387.5	302.4	266.6	174	111.6	78	86.8	117.8	174	260.4	309	372	2628

Source: Bureau of Meteorology, 1966-2016

2.3 LANDFORMS AND DRAINAGE

The Eundynie pits occur in hilly, rocky terrain in the central part of the peninsula, where the land-surface elevation is about 60 m higher than at Lake Cowan. There are no nearby drainage lines that could cause flooding of the project area.

2.4 GEOLOGY AND HYDROGEOLOGY

Higginsville lies to the west of the Zulieka Shear, at the southern end of the Norseman to Wiluna Greenstone Belt. The regional bedrock comprises a north-northwest-trending sequence of fault-bounded and thrust-repeated basalt, komatiite and interflow clastic sediment, which has been metamorphosed to upper greenschist facies and intruded by dolerite and gabbro dykes.

Eundynie occurs within the western limb of a southerly-plunging syncline and comprises basalt, gabbro and komatiite, with minor granodiorite and other felsic intrusives (Fig. 2). Gold mineralisation at Hidden Secret and Mouse Hollow is associated with quartz veins that transgress the rock units and dip to the east at about 30-60^{o} (Fig. 3) (Fieldgate 2018a, b).

The bedrock at Hidden Secret and Mouse Hollow is fairly massive and impermeable, and appears to lack structures, such as faults or shears, that could form major sources of groundwater inflow during mining. However, some enhanced permeability is likely to result from brittle-fracturing of the mineralised quartz veins, and possibly also from the felsic intrusions. For the purposes of dewatering modelling, a central zone of slightly higher permeability was therefore placed along the pit axes (Fig. 3).

The water table elevations at Hidden Secret and Mouse Hollow are about 270 and 269 m AHD, respectively (Fig. 4). The slightly lower water table elevation at Mouse Hollow, which is situated lower in the landscape, provides further evidence for the low permeability of bedrock in the area. The groundwater quality at Eundynie is unknown but, by analogy to the existing pits at Higginsville, is likely to be hypersaline.

Table 2: Results of Permeability Tests

Bore	mE	mN	Collar RL (mAHD)	Dip (deg)	Drill depth (m)	Open depth (m)	SWL (mbgl)	SWL (mAHD)	Sat. thick. (m)	Bouwer & Rice K (m/d)	Lithology
HIDDEN SECRET HOLES											
ESRC33	387,843	6,483,362	306.21	-60	65	60	41	270.70	17	0.018	0-65 Abv (f)
EUP56	387,764	6,483,252	309.98	-60	80	78	45	271.01	29	0.005	2-80 Aog (f)
EUP54	387,756	6,483,210	310.14	-60	80	78	46	270.48	28	0.009	2-80 Aog (f)
HDSR0035	387,838	6,483,259	313.90	-59	120	120	52	269.33	58	0.0012	2-81 Abm(f), 81-84 Avnqt, 84-120 Aog(f); sheared at 81-85 m
MOUSE HOLLOW HOLES											
MOHR0046	388,358	6,482,958	293.07	-59	163	163	28	268.64	116	v. high	1-33 Aog(w); 33-134 Aog(f), 134-135 Avnqt, 135-148 Aog, 148-162 Auu
MOHR0049	388,398	6,482,879	292.20	-61	240	240	26	269.14	187	0.006	1-18 Abv(w), 18-33 Abv(f), 33-100 Aog, 100-118 Abm, 118-148 Auu, 148-214 Abv, 214-236 Auu, 236-237 Avnqt, 237-240 Auu
MOHR0033	388,271	6,482,882	294.07	-59	150	150	30	268.73	103	v. high	0-29 Abv(w), 29-76 Aog, 76-85 Avn/Aog, 85-1-102, Aog, 102-138 Auu, 138-150 Aog
MOHR003	388,138	6,482,837	296.00	-61	72	70	31	268.98	34	0.04	0-7 Aog(w), 7-61 Aog, 61-72 Aod

SWL=standing water level; Sat. thick=saturated thickness (vertical); K=hydraulic conductivity; mbgl=m below ground level
Lithology: A=Archaean; bv=basalt; bm=high Mg basalt; og=gabbro; od=dolerite; vnqt=quartz vein; (w)=weathered; (f)=fresh; depths in m.

3 PERMEABILITY TESTING PROGRAMME

To provide initial estimates of permeability for the groundwater model, a field visit was performed by Rockwater on 24-25 June 2019 to conduct falling-head tests in eight RC holes that were still open to a sufficient depth below the water table (Table 2). At Hidden Secret, the RC holes were located within the proposed pit shell, but at Mouse Hollow they were spread more widely owing to collapse of most holes in the proposed pit area (Fig. 4).

The permeability tests were conducted by rapidly pouring 20 L of water down the RC hole and measuring the recovery (drop) in water level at one-second intervals using a vented pressure transducer. Known as a "slug test", this method of permeability testing provides a simple and cost-effective alternative to a pumping test, which requires a production bore to be installed and pumped for one or more days. However, unlike pumping tests, slug tests sample only a narrow zone of aquifer around the hole and measure only the early-time response of the aquifer. Furthermore, slug tests normally provide lower values of permeability than those obtained from pumping tests.

Analysis of the slug test data was performed using the method of Bouwer-Rice for a confined aquifer. Plots of the Bouwer-Rice analyses are provided in Appendix I and details of tests are summarised in Table 2.

The results of the slug tests indicate that the bedrock has an average (geometric mean) permeability of 0.008 m/d, which is very low. Oscillating (underdamped) water level responses, indicative of a very high permeability, occurred in holes MOHR0046 and MOHR033. It is likely that the high permeability in both these holes is associated with quartz veins. By contrast, hole HDSR0035 intersected quartz veins without producing a high permeability.

4 NUMERICAL MODELLING OF PIT DEWATERING

Using the results of the slug tests, and lithological logs and cross-sections supplied by RNC, a simple groundwater model was constructed to predict the rates of dewatering that will be required when the Hidden Secret Pit is mined to 242 mAHD and the Mouse Hollow Pit is mined to 250 mAHD.

It should be noted that the hydraulic parameters used in the model are estimates only. The drilling and testing of one or two production bores would provide much more accurate values of permeability, but is not warranted given the apparent absence of major permeable bedrock structures, the shallow depth of the pits and the short duration of mining below the water table.

4.1 MODEL DESCRIPTION

The groundwater modelling software used was Processing Modflow Pro version 10, which incorporates Modflow, the industry-standard finite-difference groundwater modelling software designed by the U.S. Geological Survey (McDonald and Harbaugh 1988).

The model domain comprises a 2.5 x 2.5 km square, subdivided into 126 rows and 118 columns, with the columns aligned in a northerly direction, roughly parallel to the strike of the pits and mineralisation. A grid cell size of 10 x 10 m was used in the pit areas, increasing to 50 x 50 m at the grid periphery. One horizontal, unconfined, model layer was used to simulate flow through the bedrock, and two spatial zones were defined for the assignment of aquifer parameters, the locations of which are shown in Figure 4 and details of which are provided in Table 3.

Table 3: Model Zones and Parameters

Parameter	Mineralisation	Country Rock
Top of Layer (mAHD)	290	290
Bottom of Layer (mAHD)	200	200
Initial Water Level (mAHD)	270	270
Zone Width (m)	30-40	model width
Hydraulic Conductivity (m/d)	0.25	0.01
Horizontal Anisotropy	1	1
Specific Yield	0.05	0.005
Drain Elevation (mAHD)	242 (Hidden Secret) 250 (Mouse Hollow)	-

4.2 DEWATERING RATE PREDICTION

Dewatering was simulated by placing 'drain' cells in the area of the pit floor. A drain cell can be manipulated to remove as much water as necessary from that model cell in order to lower the water table to the elevation specified, and is therefore simulates pumping from a sump at that position.

The drain cells were varied in location and elevation according to a provisional mining schedule provided by RNC. During the first stage of mining below the water table, lasting 4-6 weeks, the Hidden Secret Pit will be mined to 242 mAHD. There will then be a hiatus in mining below the water table for 4 weeks, after which the Mouse Hollow Pit will be mined below the water table for a further 4-6 weeks, thereby requiring three model stress periods.

The results of the model indicate that about 6 and 2 L/s will be produced during mining of the Hidden Secret and Mouse Hollow pits, respectively. If anything, these rates should be regarded as over-estimates because the model assumes that dewatering takes place from the final pit floor elevation for the entire 6 week period of mining below the below the water table, whereas in reality the pit floor is lowered progressively.

4.3 DRAWDOWN PREDICTION

Contour plots of modelled water level elevations at the end of mining of the Hidden Secret and Mouse Hollow pits are shown in Figures 5 and 6, respectively. The radial extent of drawdown expands with time, but remains limited to <400 m, based on the position of the 269 mAHD (one metre drawdown) contour.

There are no other groundwater users in the Eundynie area that could be affected by dewatering of the proposed pits, and, owing to the very low permeability of the mafic country rock, it is likely that the pit will act as a groundwater sink following the completion of mining. This has been observed to occur at the Fairplay East and Vine pits, where the pit water levels have more or less stabilised at about 7-10 m below the surrounding groundwater level.

5 SUMMARY AND CONCLUSIONS

RNC is planning to mine three small pits within the Eundynie gold deposit, located about 10 km south-east of the Higginsville mill. The largest of the pits, termed Hidden Secret Pit, will be mined to a depth of about 70 m (242 mAHD); the second largest pit, termed Mouse Hollow Pit, will be mined to a depth of about 45 m (250 mAHD); and the smallest pit, termed Hidden Secret South Pit, will be mined to a depth of about 10 m (295 mAHD). As the standing groundwater level lies at about 270 mAHD, mining of the Hidden Secret and Mouse Hollow pits will require about 28 and 18 m of dewatering, respectively.

Eundynie occurs within the western limb of a southerly-plunging syncline and comprises basalt, gabbro and komatiite, with minor granodiorite and other felsic intrusives. Gold mineralisation is associated with quartz veins that dip at a moderate angle to the east. The bedrock is massive and impermeable, and there are no known structures, such as faults or shears, that could form major sources of groundwater inflow during mining. However, some enhanced permeability is likely to result from brittle-fracturing of the mineralised quartz veins, and possibly also from the felsic intrusions.

Using the results of eight slug tests, and lithological logs and cross-sections supplied by RNC, a simple groundwater model was constructed to predict the rates of dewatering that will be required when the Hidden Secret Pit is mined to 242 mAHD and the Mouse Hollow Pit is mined to 250 mAHD.

The results of the model indicate that about 6 and 2 L/s will be produced during mining of the Hidden Secret and Mouse Hollow pits, respectively. If anything, these rates should be regarded as over-estimates because the model assumes that dewatering takes place from the final pit floor for the entire duration of mining below the below the water table, whereas in reality the pit flow is lowered progressively.

The radial extent of drawdown expands with time, but remains limited to <400 m, based on the position of the 269 mAHD (one metre drawdown) contour. There are no other groundwater users in the Eundynie area that could be affected by dewatering of the proposed pits, and, owing to the very low permeability of the mafic country rock, it is likely that the pit will act as a groundwater sink following the completion of mining. This has been observed to occur at the Fairplay East and Vine pits, where the pit water levels have more or less stabilised at about 7-10 m below the surrounding groundwater level.

DATED: **16 July 2019**

[redacted]

REFERENCES

Fieldgate, S., 2018a. Mouse Hollow model. Unpublished report for Westgold Resources Ltd, October 2018.

Fieldgate, S., 2018b. Hidden Sectret and Eundynie identified mineral resource estimate. Unpublished report for Westgold Resources Ltd, May 2018.

McDonald, M.G., and W.A. Harbaugh, 1988, MODFLOW, A Modular Three-Dimensional Finite-Difference Ground-Water Flow Model. U.S. Geological Survey, Washington, DC. (A:3980), open file report 83–875, Chapter A1.

FIGURES

CLIENT: RNC Minerals
PROJECT: Eundynie Dewatering
DATE: July 2019
Dwg No: 497.1/19/4-1

LOCATION AND REGIONAL GEOLOGY

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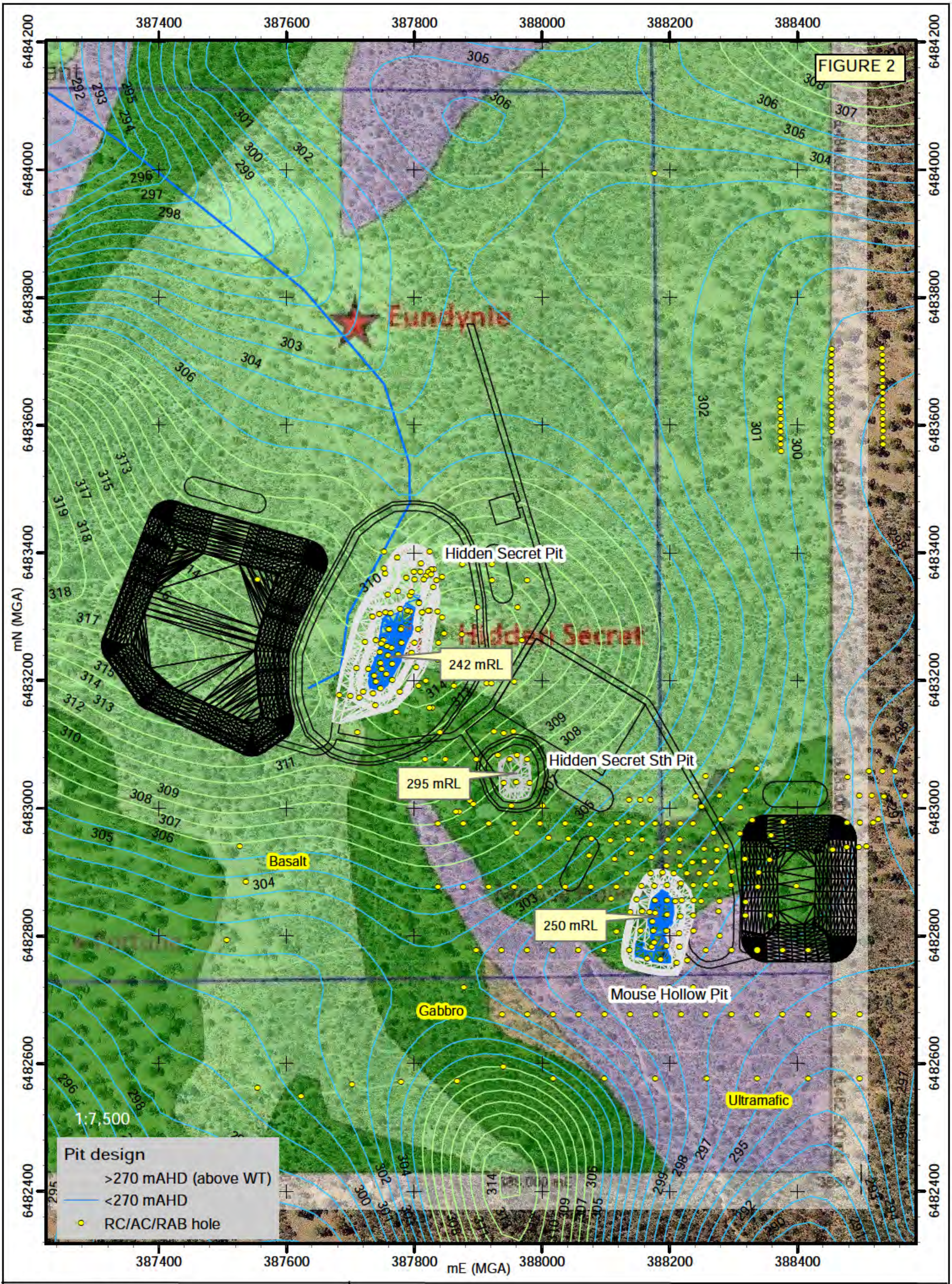

CLIENT: RNC Minerals
PROJECT: Eundynie Dewatering
DATE: July 2019
Dwg No: 497.1/19/4-2

PIT DESIGNS AND LOCAL GEOLOGY

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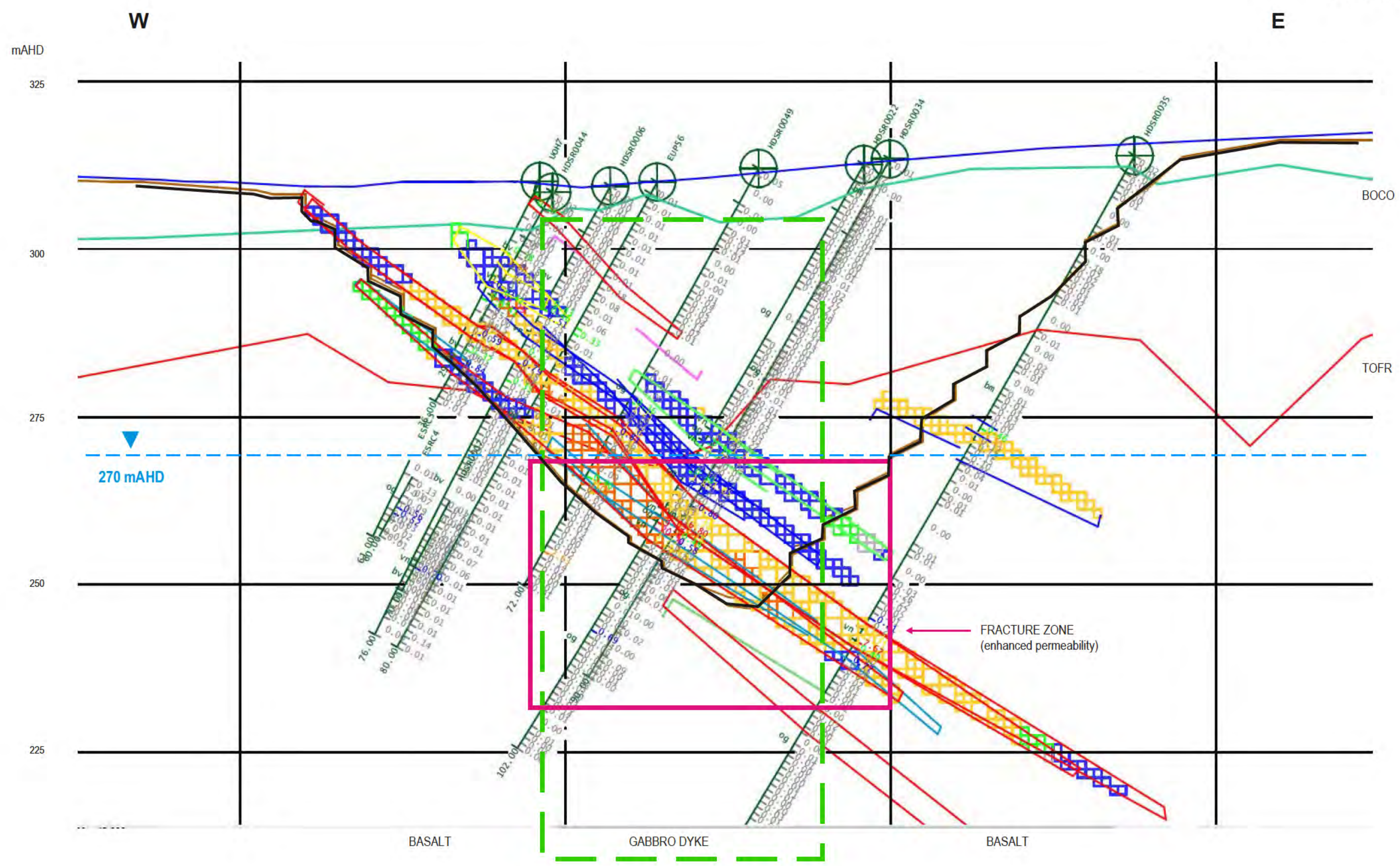
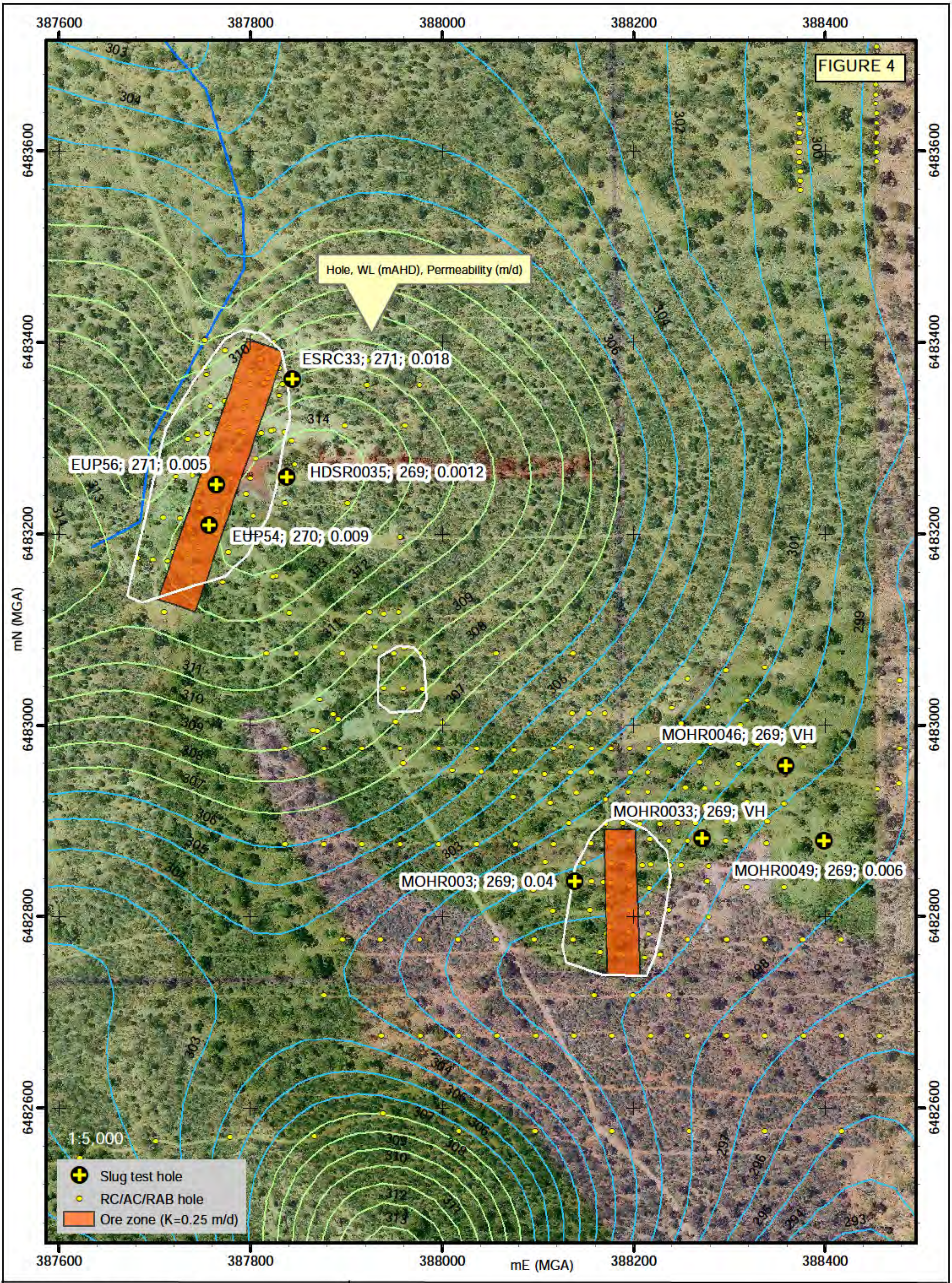
FIGURE 3



Client:	RNC Minerals
Project:	Eundynie Dewatering
Date:	July 2019
Dwg No:	497-1/19/4-3

SCHEMATIC CROSS-SECTION, HIDDEN SECRET DEPOSIT

Rockwater Pty Ltd



CLIENT:	RNC Minerals
PROJECT:	Eundynie Dewatering
DATE:	July 2019
Dwg No:	497.1/19/4-4

RESULTS OF PERMEABILITY TESTS AND MODEL ZONES

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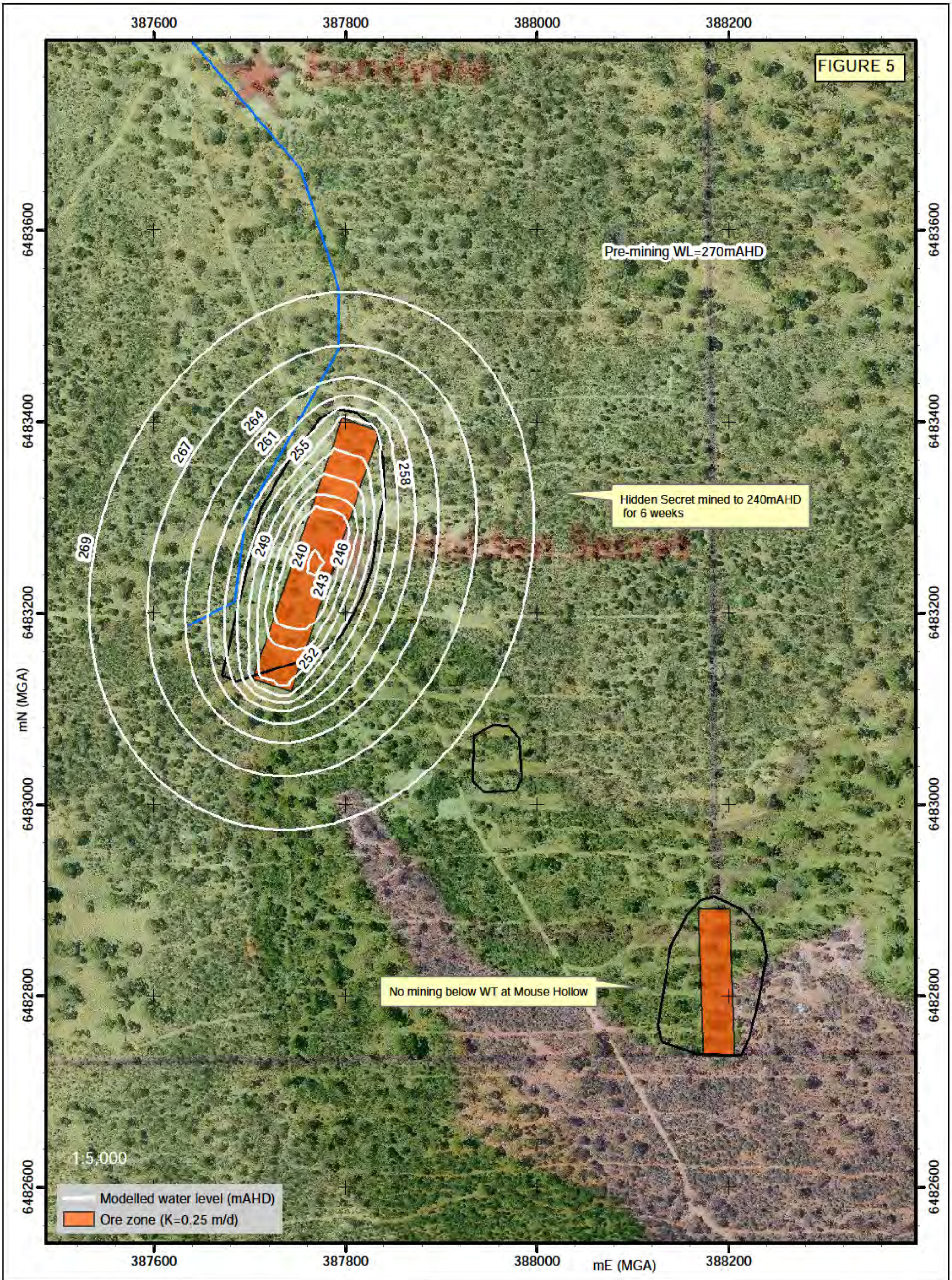

CLIENT: RNC Minerals
PROJECT: Eundynie Dewatering
DATE: July 2019
Dwg No: 497.1/19/4-5

MODELLED WATER LEVEL AT END
MINING OF HIDDEN SECRET PIT

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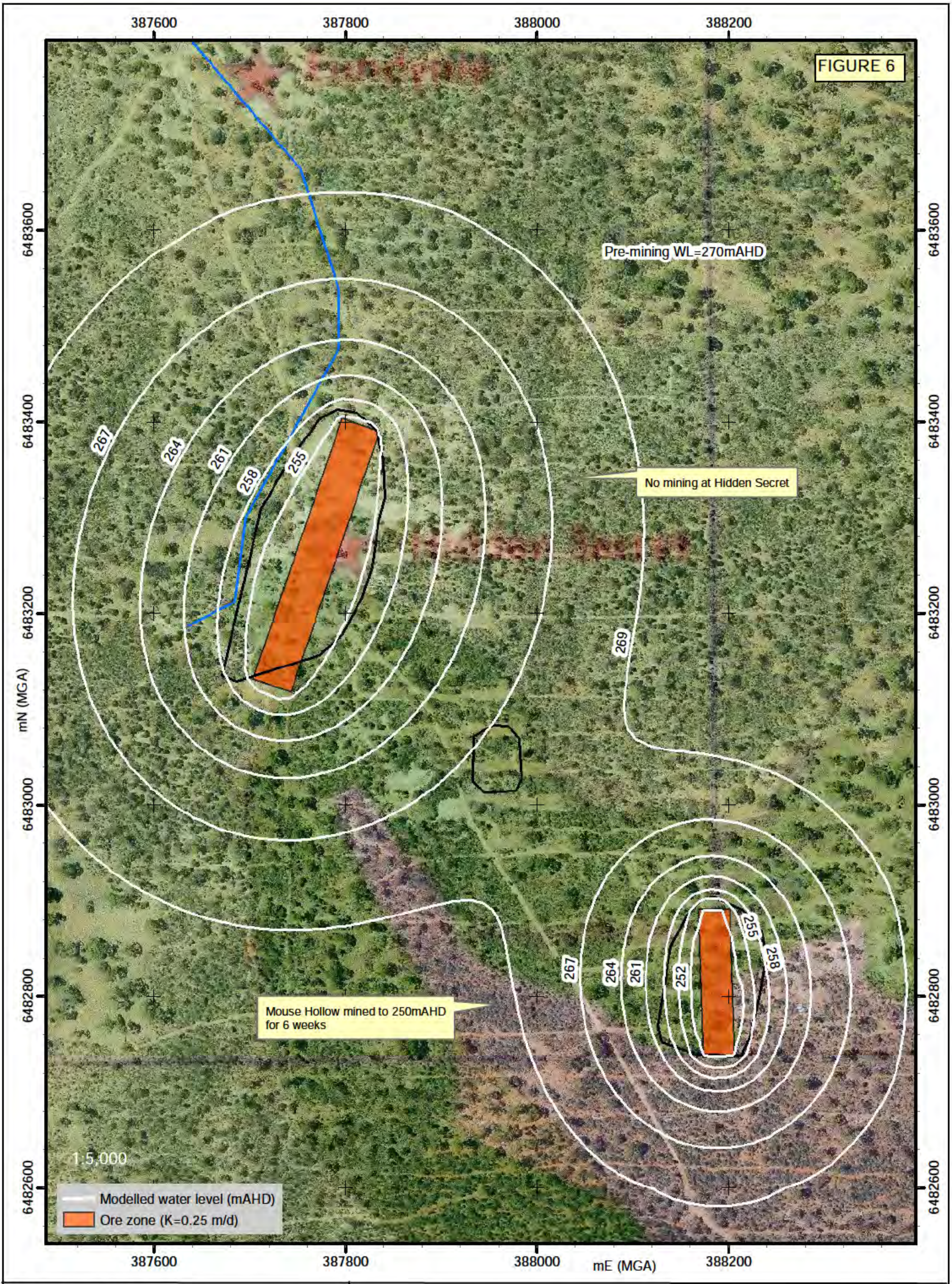


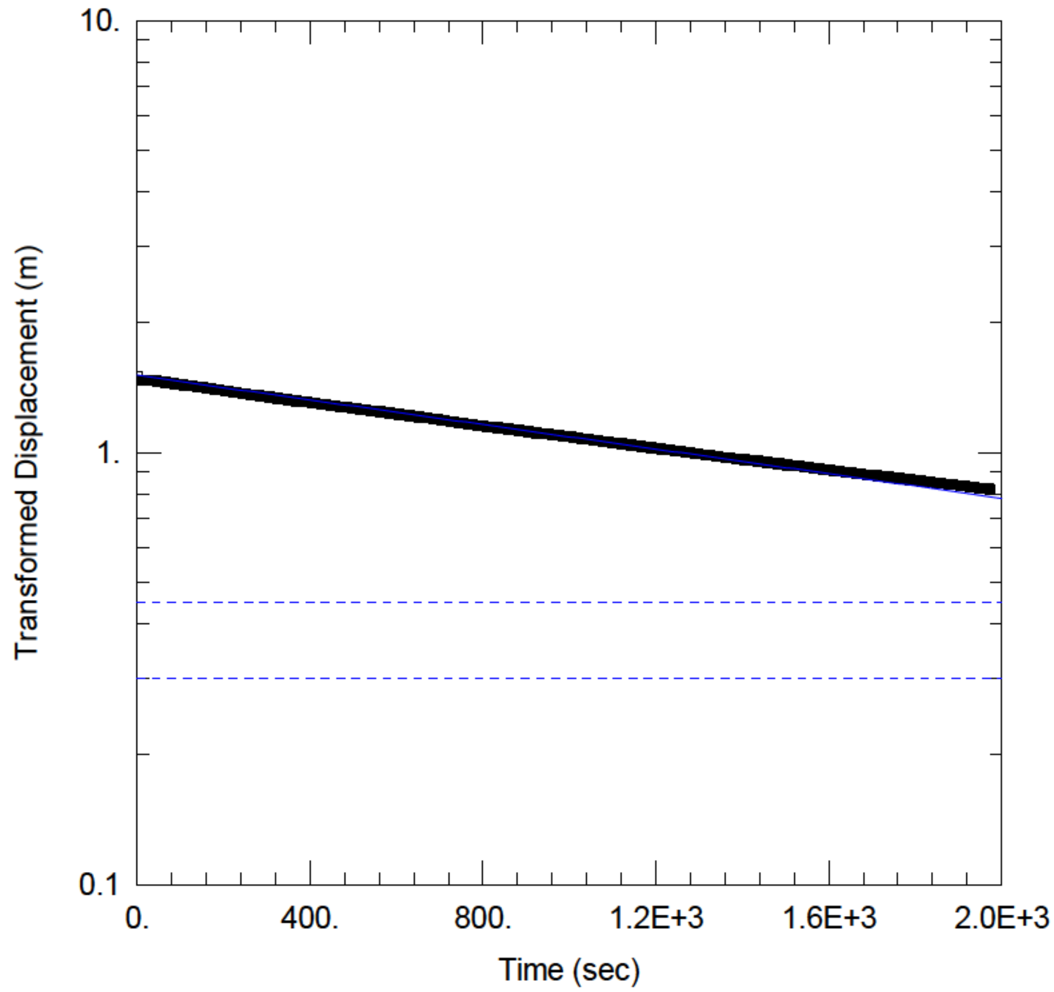
CLIENT: RNC Minerals
PROJECT: Eundynie Dewatering
DATE: July 2019
Dwg No: 497.1/19/4-6

MODELLED WATER LEVEL AT END
MINING OF MOUSE HOLLOW PIT

Rockwater Pty Ltd

APPENDIX I

SLUG TEST DATA



WELL TEST ANALYSIS

Data Set: I:\497-1\Slug tests\4. Eundynie pits\1. ESRC33\ESRC33 (Bouwer-Rice, confined).aqt
Date: 07/15/19 Time: 13:59:20

AQUIFER DATA

Saturated Thickness: 17. m Anisotropy Ratio (Kz/Kr): 1.

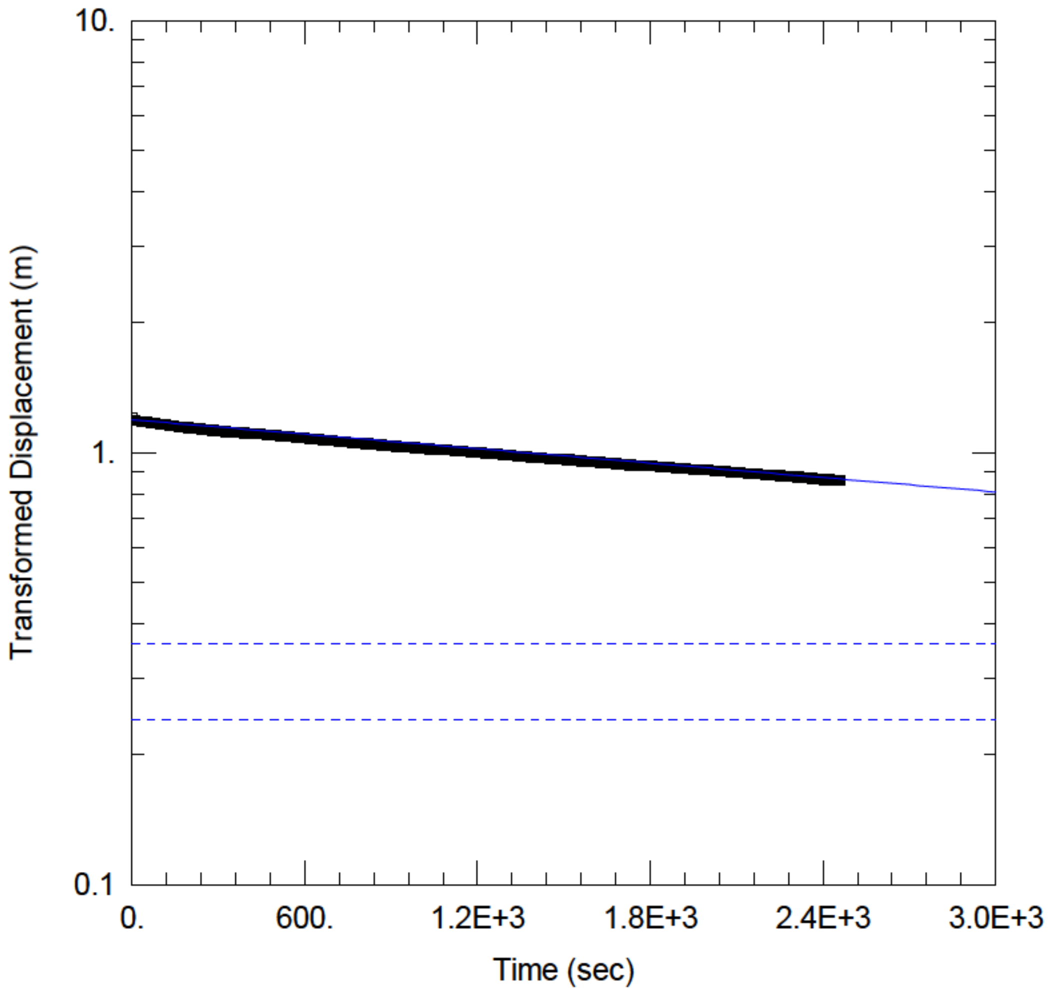
WELL DATA (ESRC33)

Initial Displacement: 1.5 m
Total Well Penetration Depth: 17. m
Casing Radius: 0.07 m
Static Water Column Height: 17. m
Screen Length: 17. m
Well Radius: 0.07 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.01758 m/day y0 = 1.506 m



WELL TEST ANALYSIS

Data Set: I:\497-1\Slug tests\4. Eundynie pits\2. EUP56\EUP56 (Bouwer-Rice, confined).aqt
Date: 07/15/19 Time: 14:00:29

AQUIFER DATA

Saturated Thickness: 29. m Anisotropy Ratio (Kz/Kr): 1.

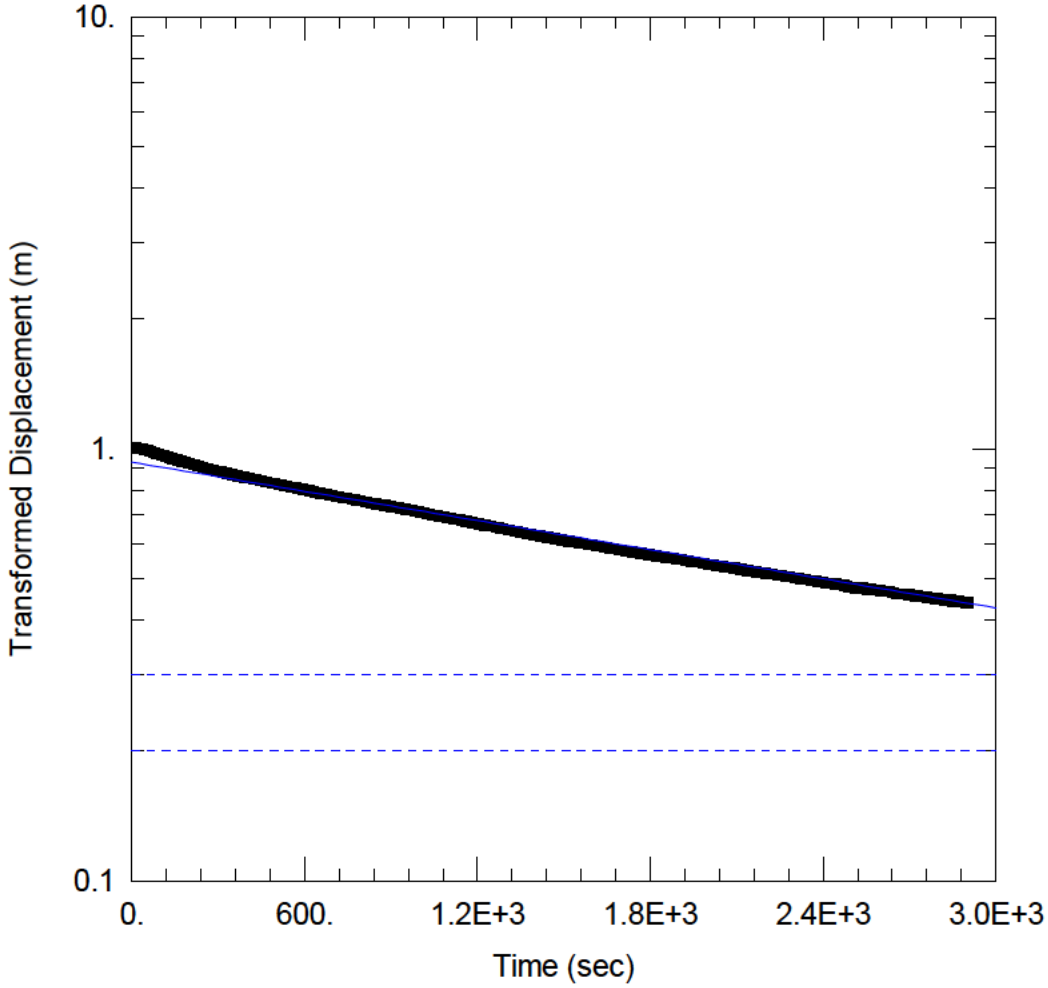
WELL DATA (EUP56)

Initial Displacement: 1.2 m
Total Well Penetration Depth: 29. m
Casing Radius: 0.07 m
Static Water Column Height: 29. m
Screen Length: 29. m
Well Radius: 0.07 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.004536 m/day y0 = 1.188 m



WELL TEST ANALYSIS

Data Set: I:\497-1\Slug tests\4. Eundynie pits\3. EUP54\EUP54 (Bouwer-Rice, confined).aqt
Date: 07/15/19 Time: 14:01:11

AQUIFER DATA

Saturated Thickness: 28. m Anisotropy Ratio (Kz/Kr): 1.

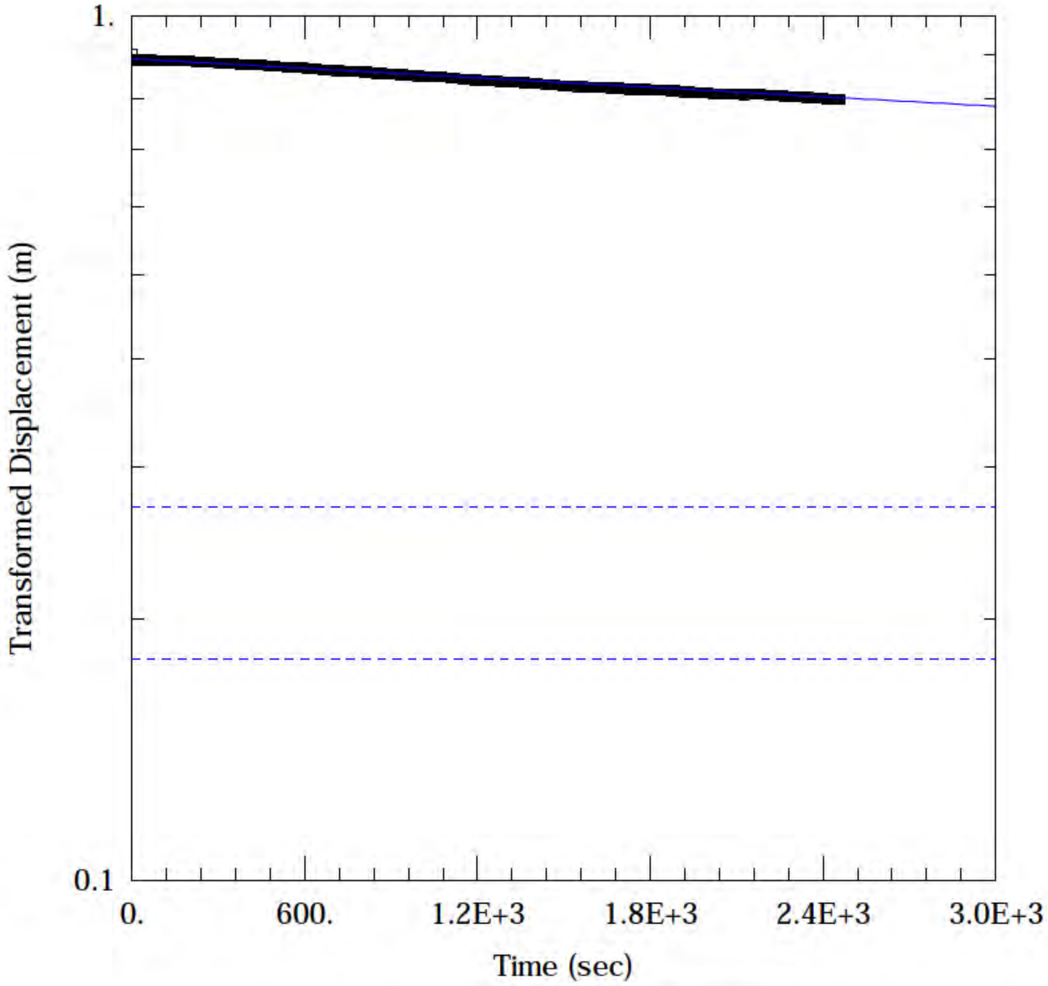
WELL DATA (EUP54)

Initial Displacement: 1. m
Total Well Penetration Depth: 28. m
Casing Radius: 0.07 m
Static Water Column Height: 28. m
Screen Length: 28. m
Well Radius: 0.07 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.009412 m/day y0 = 0.9294 m



WELL TEST ANALYSIS

Data Set: I:\497-1\Slug tests\4. Eundynie pits\4. HDSR0035\HDSR0035 (Bouwer-Rice, confined).aqt
Date: 07/15/19 Time: 14:02:48

AQUIFER DATA

Saturated Thickness: 58. m Anisotropy Ratio (Kz/Kr): 1.

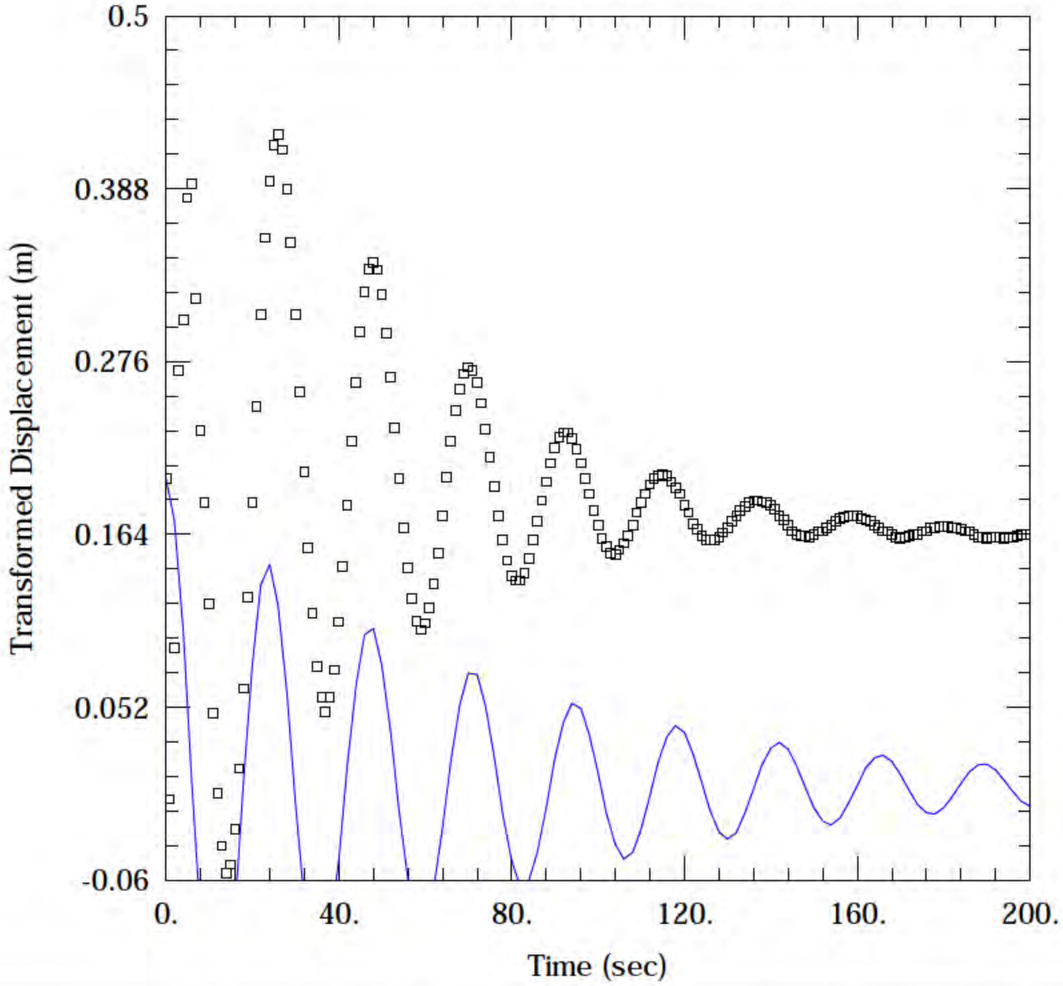
WELL DATA (HDSR0035)

Initial Displacement: 0.9 m
Total Well Penetration Depth: 58. m
Casing Radius: 0.07 m
Static Water Column Height: 58. m
Screen Length: 58. m
Well Radius: 0.07 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.001249 m/day y0 = 0.8903 m



WELL TEST ANALYSIS

Data Set: I:\497-1\Slug tests\4. Eundynie pits\5. MOHR0046\A_HDSR0046 (Butler, confined).aqt
Date: 07/15/19 Time: 14:03:41

PROJECT INFORMATION

Test Well: GSRC0732

AQUIFER DATA

Saturated Thickness: 116. m Anisotropy Ratio (Kz/Kr): 1.

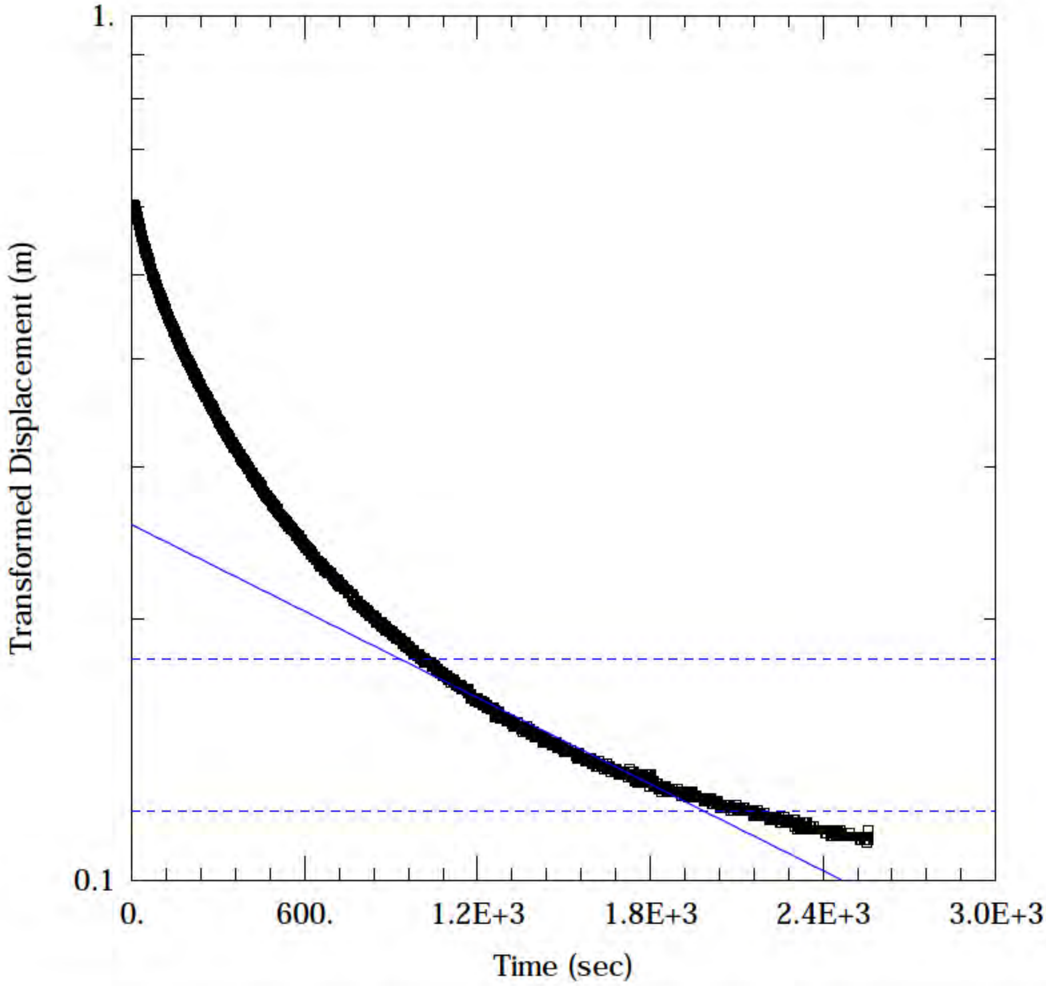
WELL DATA (MOHR0046)

Initial Displacement: 0.2 m Static Water Column Height: 116. m
Total Well Penetration Depth: 116. m Screen Length: 116. m
Casing Radius: 0.07 m Well Radius: 0.07 m

SOLUTION

Aquifer Model: Confined Solution Method: Butler

K = 25.06 m/day Le = 138.5 m



WELL TEST ANALYSIS

Data Set: I:\497-1\Slug tests\4. Eundynie pits\6. MOHR0049\MOHR0049 (Bouwer-Rice, confined).aqt
Date: 07/15/19 Time: 14:04:31

AQUIFER DATA

Saturated Thickness: 187. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (HDSR0035)

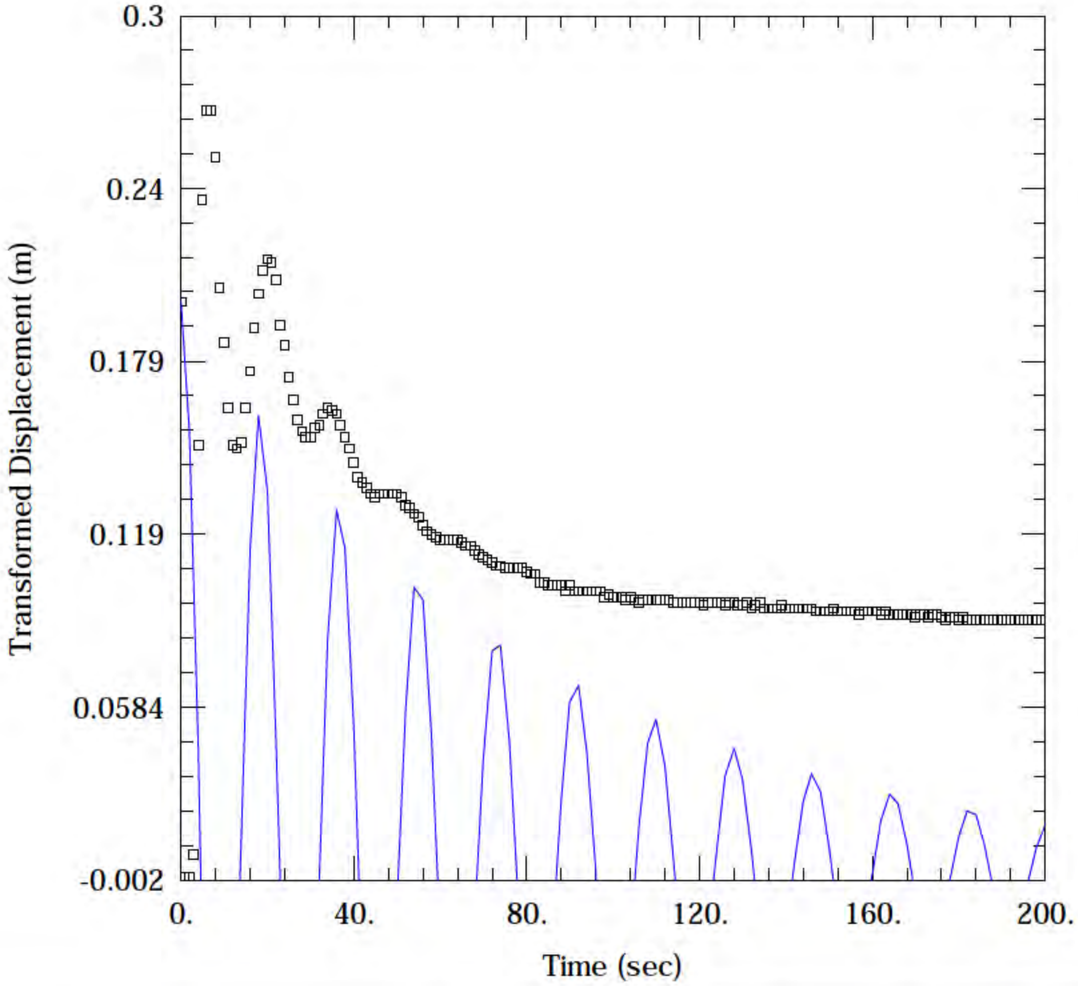
Initial Displacement: 0.6 m
Total Well Penetration Depth: 187. m
Casing Radius: 0.07 m

Static Water Column Height: 187. m
Screen Length: 187. m
Well Radius: 0.07 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.006523 m/day y0 = 0.2573 m



WELL TEST ANALYSIS

Data Set: I:\497-1\Slug tests\4. Eundynie pits\7. MOHR0033\MOHR0033 (Butler, confined).aqt
Date: 07/15/19 Time: 14:06:13

PROJECT INFORMATION

Test Well: GSRC0732

AQUIFER DATA

Saturated Thickness: 103. m Anisotropy Ratio (Kz/Kr): 1.

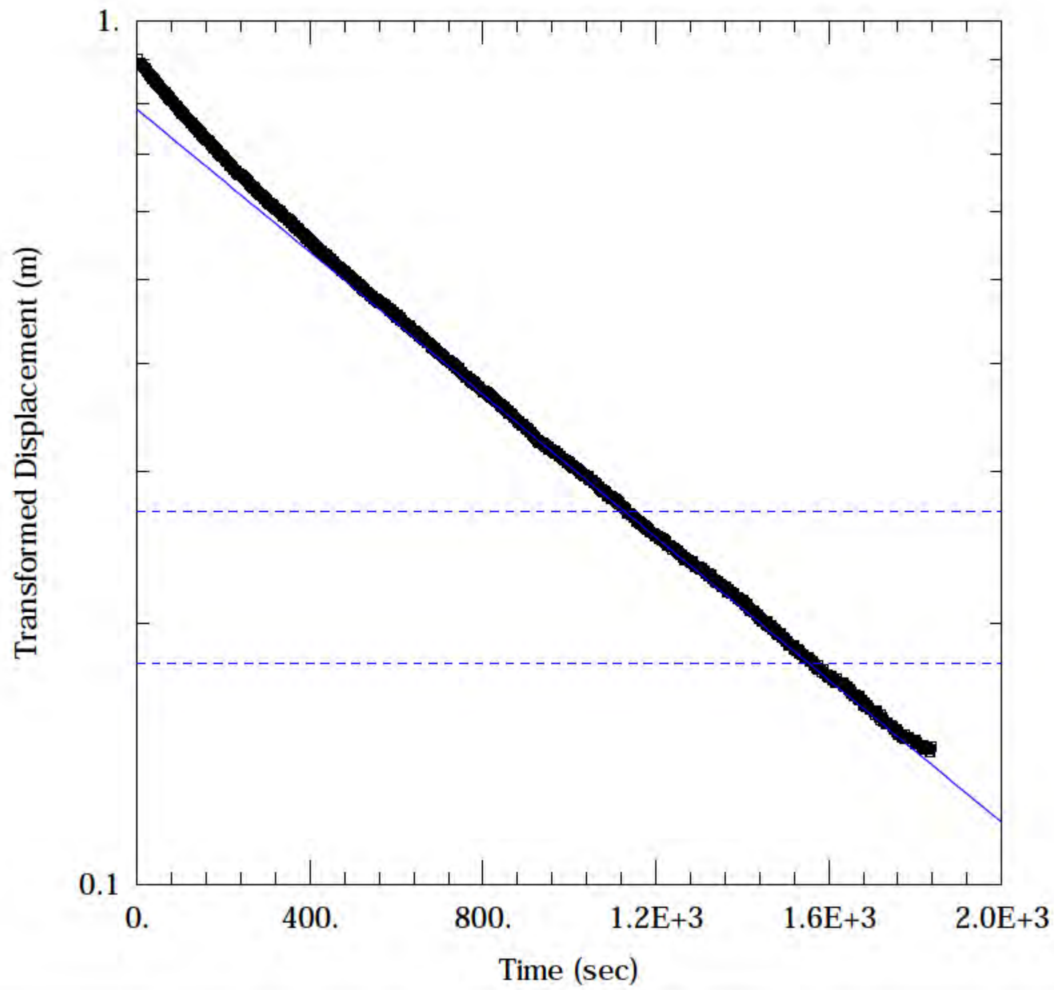
WELL DATA (MOHR0046)

Initial Displacement: 0.2 m Static Water Column Height: 103. m
Total Well Penetration Depth: 103. m Screen Length: 103. m
Casing Radius: 0.07 m Well Radius: 0.07 m

SOLUTION

Aquifer Model: Confined Solution Method: Butler

K = 54.22 m/day Le = 82.86 m



WELL TEST ANALYSIS

Data Set: I:\497-1\Slug tests\4. Eundynie pits\8. MOHR003\MOHR003 (Bouwer-Rice, confined).aqt
Date: 07/15/19 Time: 14:05:16

AQUIFER DATA

Saturated Thickness: 34. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MOHR003)

Initial Displacement: 0.9 m
Total Well Penetration Depth: 34. m
Casing Radius: 0.07 m

Static Water Column Height: 34. m
Screen Length: 34. m
Well Radius: 0.07 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.04285 m/day y0 = 0.7882 m