



Regional Monitoring Committee

Latrobe Valley Regional Groundwater and Land Level
Monitoring Report
Annual Report July 2018 to June 2019

December 2019

Executive summary

AGL Loy Yang and Energy Australia operate open cut brown coal mines in the Latrobe Valley to supply coal to their respective power generation stations. ENGIE owns the Hazelwood mine that supplied coal to the Hazelwood power station until its closure in 2017 – the Hazelwood mine is currently undergoing a closure process. GHD has been engaged by each of the mines to complete the 2018/19 Annual Report, providing details of the groundwater and land surface monitoring activities for the period July 2018 to June 2019. Each of the businesses has obtained a Groundwater Extraction Licence for the operation and management of their respective depressurisation systems. This annual report is prepared in accordance with the requirements as outlined in clauses 22 and 23 of Attachment A to the groundwater extraction licences. Annual and monthly extraction volumes by aquifer system at each mine were below licenced allocations (Table 1) for the following:

- Hazelwood Mine M1 and M2 Aquifers
- Loy Yang Mine Morwell Formation and Traralgon Formation Aquifers
- Yallourn Mine Haunted Hill and Morwell Formation Aquifers

Table 1 Groundwater Extraction Summary

July 2018 to June 2019	Extraction Volume (ML)	Licensed Volume (ML)	Unused Licence (ML)	% Licensed Volume Unused
Hazelwood	11,930.9	22,484.0	10,553.1	46.9%
Loy Yang	10,614.0	19,995.3	9,381.3	46.9%
Yallourn	1,283.8	2,737.6	1,453.8	53.1%
Total	23,828.7	45,216.9	21,388.2	47.3%

Total groundwater extraction continues to be less than currently licenced with 47.3% of the allocation unused due to improved efficiency of mine depressurisations systems, a better understanding of aquifer interactions at the mines and adoption of a risk-based approach in determining drawdown requirements.

Monitoring Activities

Clause 23a of Attachment A to the groundwater extraction licences requires the annual report to include details of the monitoring activities undertaken in the review period. The groundwater extraction details are provided above and the groundwater level and land level monitoring activities included:

- Monitoring of the regional observation bore network is completed biannually with a summer and winter monitoring round. The regional groundwater monitoring undertaken in the review period comprised 31 bores monitoring the Morwell Formation Aquifer System (MFAS) and 56 bores monitoring the M2/Traralgon Formation Aquifer System (M2/TFAS). Two bores monitor groundwater levels in the underlying basement rock and one bore monitors the Gippsland Limestone. Six bores monitored groundwater levels in the Shallow Aquifer System (SAS). Five MFAS and twelve M2/TFAS bore were unable to be monitored due to access and bore condition issues.
- No land level monitoring was required in the reporting period. A specification for land level surveying scheduled for 2019/20 was completed and the contractor engaged in July 2019 for the western section of the monitoring network.

Monitoring Assessment

Clause 23c of Attachment A to the groundwater extraction licences requires the annual report to detail any issues arising from the monitoring results and significant variations to predicted trends. The 2018/19 monitoring results indicates:

- Groundwater levels for the M2/TFAS are generally in line with the 2020 predictions and continue to show steady declines in groundwater levels across the Latrobe Valley. The Pressures trends are steady at 10942 and 110034 located to the northwest and northeast of Traralgon respectively. Pressures at 23607 west of Hazelwood have shown a minor increase.
- M2/TFAS bore 180177 shows levels below the 2020 predictions as the pre 2015 data was relatively more variable and has since stabilised resulting in the 2020 prediction being too high. Similarly, MFAS bore hydrograph 570011 shows the 2020 estimate is likely to be too high for similar reasons.
- The MFAS trends are generally more variable particularly at bores distant to the mines, whereas the rate of decline for the M2/TFAS continues to typically be greater and more uniform, and these observations are consistent with trends recorded over a long period in the Latrobe Valley. Increasing trends were observed in the MFAS uppermost piezometer at 52809 and at bore 130165.
- MFAS monitoring bores near Hazelwood West Field and Yallourn Maryvale Field developments, where pump bores have been commissioned, locally show an increase in the rate of depressurisation. As a result, the 2020 estimates at bores 13190 v05 and 23263 based on historical trends, are likely to be exceeded. Future predictions will be reforecast based on the expanded pumping.
- The Gippsland Limestone bore shows stable water trend consistent with the low permeability of this formation and poor connection to the underlying M2/TFAS.
- Impacts to the overlying SAS are typically limited by the low permeability of the overlying coals and clays, and water level trends show only minimal rates of decline.

Monitoring Bore Issues

M2/TFAS

- There are 10 key bores monitoring the M2/TFAS. Three key bores require rehabilitation:
 - 210051 due the standing water level being greater than 200 m depth,
 - bent headworks at 190054, and
 - 920007 has been damaged by vandalism.
- Key bore 180177 was not read in the 2019 summer run due to the bushfires but was monitored in the winter run.
- The six key bores monitored in the review period show consistent long term trends and in conjunction with the full network monitoring data, are considered sufficient to assess the impact of mine aquifer depressurisation.
- In addition to these three key M2/TFAS monitoring bores not monitored, nine other M2/TFAS bores were unable to be monitored due to: landowner access restrictions; failure of the GI casing due to corrosion; or headworks damage.
- Twenty M2/TFAS bores were not monitored in the 2018/19 period with eight of these due to bushfire access restrictions in the Holey Plains State Park in early 2019.
- The 2018/19 bore rehabilitation program included assessment of the vibrating wire terminal box at M2/TFAS bore 80489 to determine the status of the downhole instruments.

- Rehabilitation of M2/TFAS bore 90343 was unsuccessful due to corroded casing allowing the formation to collapse locking in the drill rods and preventing VWP installation. The bore was sealed and decommissioned.
- Two M2/TFAS bores 13282v01 and 90343s01 are no longer part of the M2/TFAS monitoring network.

MFAS

- Of the nine MFAS key bores, eight were monitored, and in conjunction with the full network monitoring data, are considered sufficient to assess the impact of mine aquifer depressurisation to this aquifer. Headworks damage at key bore 52810 requires repair, and assessment of bore condition at 440056 is required as the 2019 data obtained after access was re-established following highway duplication, is not consistent with previous data.
- Three MFAS bores were not monitored due to landowner access restriction or headworks damage.
- The 2018/19 bore rehabilitation program included assessment of the vibrating wire terminal box at MFAS bore 13282 which is now assessable after discussion with the landowner.
- Inspection of MFAS standpipe bore 31694 was also performed and found to operational and the trend consistent with previous readings.

SAS

- Access to SAS bore 13282v10 was re-established and is being supplemented by additional SAS monitoring data from bore 26091 close to the eastern boundary of the Yallourn mining licence.
- Of the two SAS key bores, bore 80493 was not accessible as the surrounding private pine plantation has been logged and the gate locked.

Clause 23b requires the annual report to detail amendments to the monitoring network. No formal monitoring network amendments have been adopted by the RMC in the review period. Proposed network amendments include deletion of bores never monitored by the RMC, and removal of bores which have been subsequently sealed, and instruments where individual vibrating wire piezometers have failed.

Recommendations

The following work is recommended for annual reporting requirements as outlined in clause 23 of Attachment A to the groundwater extraction licences:

- Implement the bore rehabilitation program as outlined in Section 7.2 of this report with the focus on the key bores in order to maintain the extent of the observation bore network.
- RMC to consider amending the list of regional monitoring bores to address the fact that the original list contained in Attachment A did not reflect the program as originally implemented, and other modifications since adopted.
- Continue to determine the status of bores with long term access issues. This information can then be considered for future bore rehabilitation priorities and monitoring network amendments.
- Continue groundwater monitoring at a six monthly frequency with summer and winter monitoring rounds, as review of the data has shown it to be appropriate for monitoring changes in aquifer pressures and for asset management to indicate potential problems in individual bore performance.

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Appendices

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1. Introduction

AGL Loy Yang and Energy Australia operate open cut brown coal mines in the Latrobe Valley to supply coal to their respective power generation stations. ENGIE owns the Hazelwood mine that supplied coal to the Hazelwood power station until its closure in 2017 – the Hazelwood mine is currently undergoing a closure process. To maintain stable geotechnical conditions it is necessary to depressurise the major aquifers that lie beneath each of these mines. Intermittent overburden dewatering may also be required to improve material handling. Under Section 51 of the Water Act (1989), each of the businesses has obtained a Groundwater Extraction Licence for the operation and management of their respective depressurisation systems. The licences refer to the regional monitoring requirements as detailed in Attachment A. Under the terms of the regional monitoring program the businesses are required to report annually on groundwater extractions, monitoring and bore rehabilitation activities, and five yearly on subsidence and groundwater modelling to assess the impact of mine depressurisation on the regional aquifer system and land levels. The five year groundwater and land level monitoring and groundwater modelling work program is shown in Appendix A, which also contains the relevant section of the Groundwater Licence and Attachment A that further details the reporting requirements.

As the depressurisation activities at each mine are inter-related, regional monitoring, modelling and data storage is jointly managed. GHD was engaged by each of the mines to complete this 2018/19 Annual Report. This Annual Report is reviewed by the Latrobe Valley Regional Monitoring Committee prior to issue. Clause 20 of Attachment A to the groundwater extraction licences states the committee is comprised of representatives from each mine, Southern Rural Water as the delegate from the Minister responsible for the Water Act and the Department of Jobs, Precincts and Regions (DJPR). Department of Environment, Land, Water and Planning (DELWP) has observer status.

A regional groundwater monitoring network has been established for many years to observe the impact of aquifer depressurisation associated with the Latrobe Valley mining operations. The purpose of the network is to provide an indication of the groundwater levels in the major regional aquifers, the annual rate of change in the groundwater levels and the extent of aquifer depressurisation impacts. A network of regional land level survey markers has also been established to enable monitoring of ground surface levels. The purpose of this network is to provide an indication of the response of ground surface elevations to aquifer depressurisation.

The purpose of this Annual Report is to provide the details of regional groundwater and land level monitoring activities for the period July 2018 to June 2019 to address the requirements as outlined in clause 23 of Attachment A to the groundwater extraction licences. The monitoring program requirements are presented in Table 2 along with the corresponding section of this report where addressed.

Table 2 Monitoring program requirements and report sections

Extraction Licence Attachment A Clause 23 Requirements	Report Section
Monitoring activities undertaken in the past year <ul style="list-style-type: none"> • Groundwater extractions • Groundwater level monitoring • Land level monitoring 	Section 3 Section 4.2 Section 5
Any amendment to the monitoring network	Section 4.3 and Section 7
Any issues arising from the monitoring results and significant variations to predicted trends	Section 4.2 and Section 9

1.1 Limitations

This **Latrobe Valley Regional Groundwater and Land Level Monitoring Report, July 2018 to June 2019** (“Report”) has been prepared by GHD for AGL Loy Yang, ENGIE and Energy Australia and may be used and relied on by AGL Loy Yang, ENGIE and Energy Australia for the purpose agreed between GHD and AGL Loy Yang, ENGIE and Energy Australia as set out in Section 1 of this Report.

GHD otherwise disclaims responsibility to any person other than AGL Loy Yang, ENGIE and Energy Australia arising in connection with this Report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in the Report and are subject to the scope limitations set out in the Report.

The opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the date of preparation of the Report. GHD has no responsibility or obligation to update this Report to account for events or changes occurring subsequent to the date that the Report was prepared.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD described in this Report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Regional Hydrogeology

The Latrobe Valley occurs at the western end of the onshore part of the Gippsland Basin. Three main lignite bearing sequences occur in the Latrobe Valley, and are the Traralgon, Morwell and Yallourn Formations. A succession of marine limestones and marls, accumulated as a facies equivalent to the Latrobe Valley coal measures, extends over of the near coastal onshore and offshore parts of the Gippsland basin. Figure 1 shows the transitional sand facies, and the Balook Formation, which forms the boundary between the mostly non-marine lignites and interseams to the west and marine carbonates to the east.

Non-coal material between lignite seams is termed interseam and is comprised of sand, silt and clay. The interseam lithology can change rapidly due to the mode of deposition and can contain local and regional scale aquifers depending on the extent and hydraulic properties of the sand units. Some aquifers extend over large areas, and, partly through complex structures, into the offshore part of the Gippsland Basin. Other aquifers are only of local extent.

Two major Tertiary age aquifer systems occur in the Latrobe Valley separated by less permeable zones (aquitards) consisting of coal, clay and silt. These systems are interbedded with coal, clay, silt and weathered basalt units of variable thickness. A group of generally unconfined to semi-confined aquifers of Pliocene to Recent age can be considered as representing a third, shallow regional aquifer system. The qualifying word "system" is used to describe the aquifer sequence, as rarely does one aquifer exist; rather, numerous sand, gravel and basalt aquifers of varying thickness, lateral extent and interconnection occur. Furthermore, within individual sand beds, there is a high degree of heterogeneity and anisotropy.

For the purpose of this report, three regional aquifer systems are defined. These aquifers represent the Shallow, Morwell Formation and Traralgon Formation Aquifer Systems in the western part of the Gippsland Basin. Figure 2 shows a schematic hydrogeological cross-section from the Yallourn East Field Mine through Hazelwood Mine and eastward to the Loy Yang Mine defining the major aquifers within the Latrobe Valley Mining area.

Shallow Aquifer System (SAS)

This system consists of unconfined to semi-confined aquifers within the Haunted Hill Formation, recent alluvial deposits, and sediments between the Yallourn (Y) and Morwell (M1) coal seams (i.e. the Yallourn Interseam). The SAS occurs throughout most of the Gippsland Basin and in many areas provides low yields for domestic and agricultural purposes. To the east of the Latrobe Valley, the Boisdale Formation is interpreted as belonging to this regional Shallow Aquifer System. Dewatering of the Shallow Aquifer System has only been required intermittently at Yallourn Mine.

Morwell Formation Aquifer System (MFAS)

In the western part of the basin this generally confined aquifer system consists of interbedded sands (the M1, M1A, M1B, M2A, M2B and M2C Aquifers) and clays, between coal seams and, minor fractured basalts of the Morwell Formation. The MFAS extends eastward to the barrier sand sequence of the Balook Formation near Kilmany. To the east of the Balook Formation, lies the Gippsland Limestone.

Groundwater is extracted from the MFAS because of mining operations at Yallourn, Hazelwood and Loy Yang mines, and for domestic and agricultural activities in the eastern Latrobe Valley. Aquifers belonging to this system generally occur between 100 and 500 m beneath the present surface, apart from over structural highs where they may subcrop at shallower depth beneath the younger SAS. The MFAS in the Latrobe Valley falls within the Rosedale Groundwater Management Area (GMA) – Zone 1 and Stratford GMA – Zone 1 depending on bore depth.

M2/Traralgon Formation Aquifer System (M2/TFAS)

This system extends across the entire Gippsland Basin, and onshore consists of interbedded sands, clays, coals and basalts (M2, Traralgon Aquifers), and offshore consists of interbedded sandstones, mudstone, coals, and basalts (Latrobe Group Aquifers). Onshore, groundwater is extracted from this aquifer system as part of mining operations at Loy Yang and Hazelwood Mines, for agricultural and industrial supplies in the southern Gippsland Basin, and offshore for oil and gas production activities. Apart from structural highs on the basin margins where these sediments may be exposed, aquifers belonging to this system occur between 150 and 1500 m beneath the present surface. The groundwater extractions from the TFAS at Loy Yang mine and M2 extractions at Hazelwood Mine are from the Stratford GMA – Zone 1.

A summary of recent hydrogeological reports, which could further the understanding of the hydrogeological processes in the Latrobe Valley and available data are shown in Appendix B.

Figure 1 Onshore Gippsland Basin Schematic Section

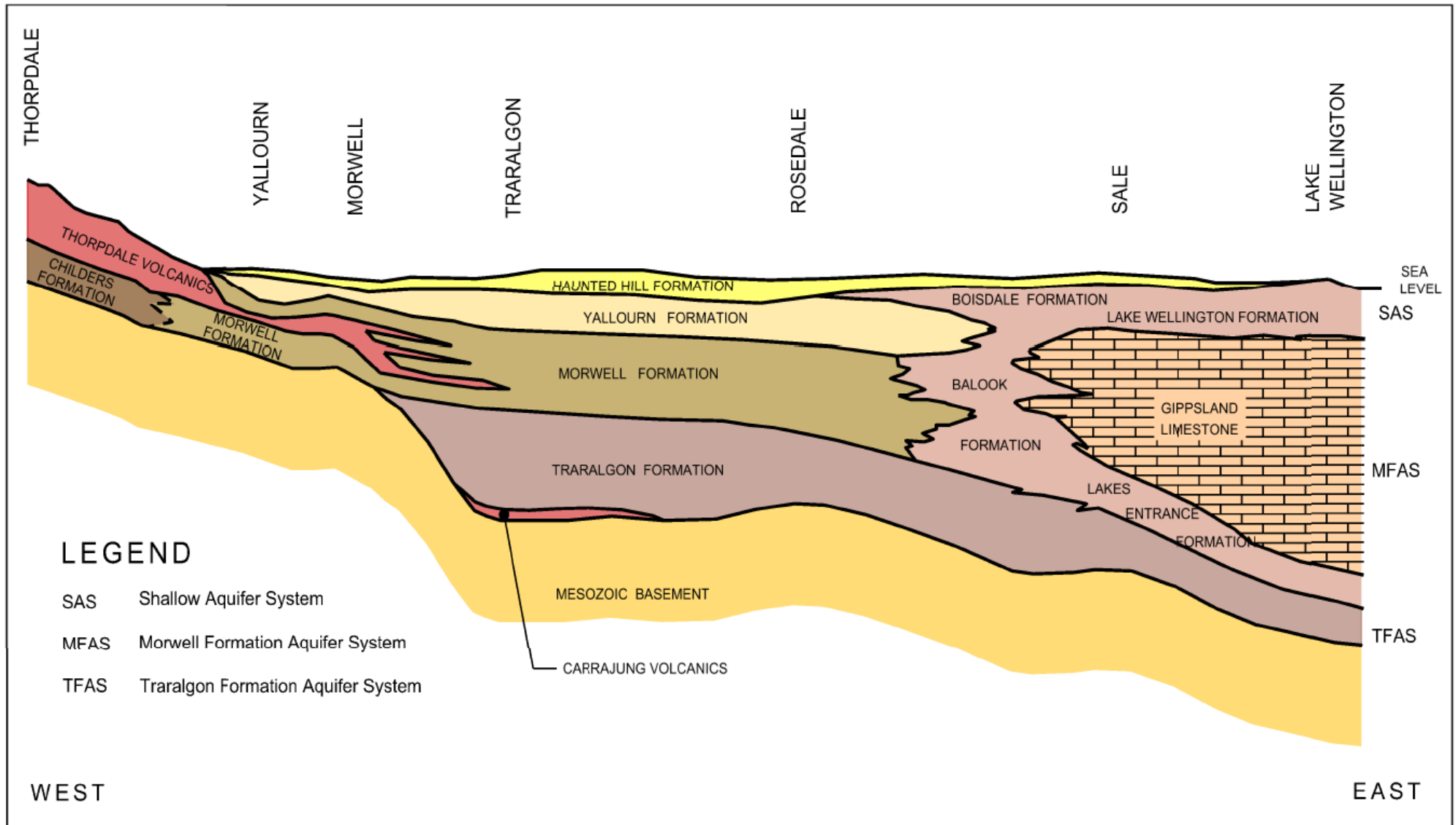
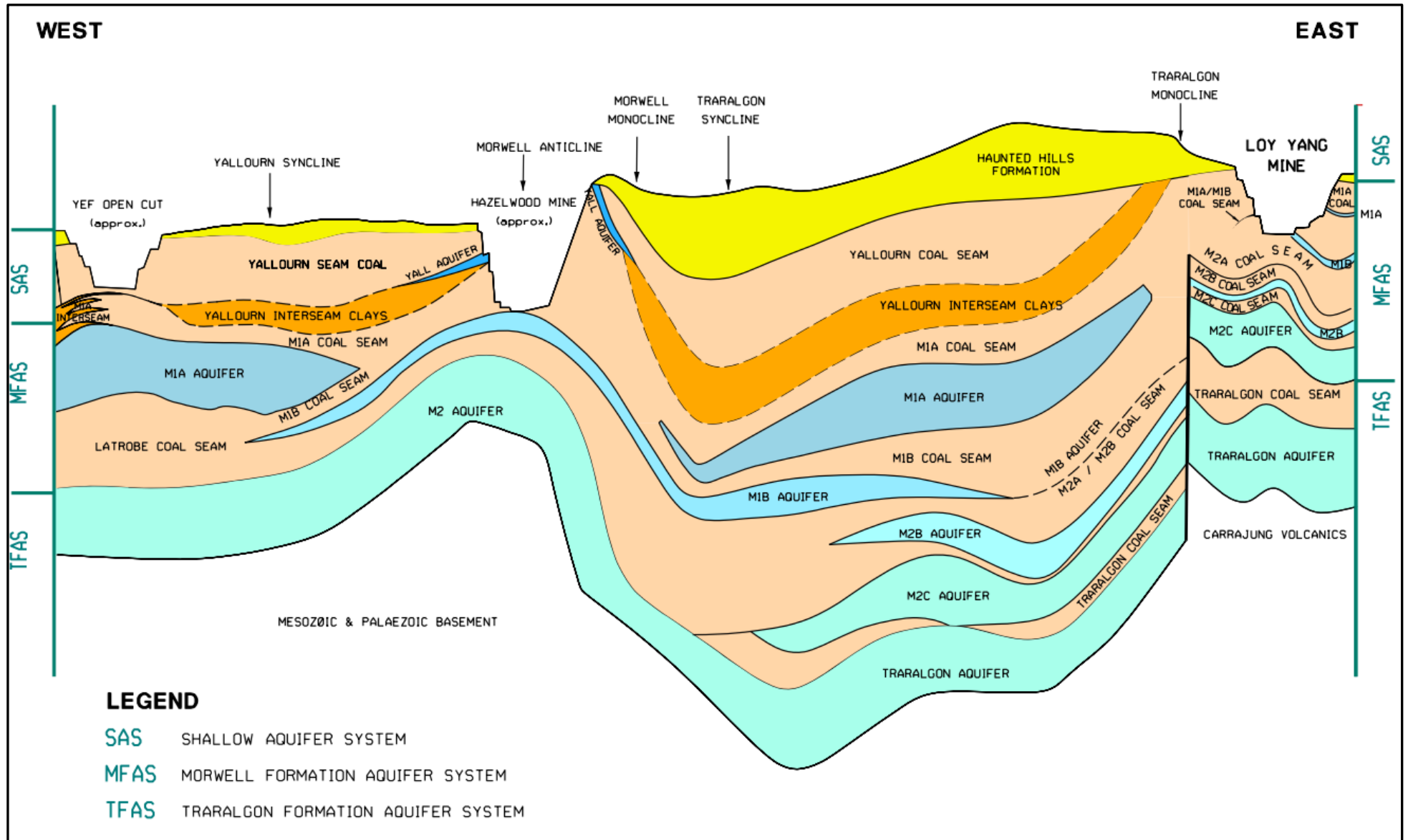


Figure 2 Yallourn East Field – Hazelwood – Loy Yang Schematic Hydrogeological Section



3. Groundwater Extractions

3.1 Groundwater Extractions 2018/19

Conditions 8 and 9 of the mines' groundwater licences issued under Section 51 of the Water Act, require the mines to keep an accurate record of the quantity of groundwater extractions. To comply with these requirements each mine provides the groundwater extraction volume in the 2018/19 period for individual bores, and this data is compiled and reported monthly and annually by aquifer system.

The method for determining groundwater extraction volumes varies at each mine and was summarised in the 2010 to 2015 Five Year Review (GHD 2016a). Southern Rural Water (SRW) completed audits of the metering practises at each mine in 2013 and again in 2018. All pumped bores are metered either at the bore headworks, as in the case of Hazelwood and Yallourn Maryvale mine bores and majority of Loy Yang bores, or collectively as for several Morwell Formation bores at Loy Yang. For these bores, the total discharge is metered and the flow is assigned to each bore based on the individual bore flow rates and pump hours recorded at each bore. The artesian flow from Loy Yang bore LY3443 was monitored by flow measurements at a V notch weir or from the Tee piece at the bore headworks. The Yallourn North Open Cut M1A pump bores are metered collectively due to the low flows as noted in Appendix C.

The total groundwater extracted within the mines from the regional aquifers over the July 2018 to June 2019 period is 23,828.7 ML. Table 3 summarises the number of operational bores at each mine and extracted volumes for each aquifer system. Appendix C contains details of annual flow volumes and bore locations for individual bores and total annual flows for each aquifer from July 2018 to June 2019 at each of the mines, along with a brief summary of the development of aquifer depressurisation systems in the region.

The groundwater licences granted to each mine show the monthly and annual licenced extraction volumes for the M2/TFAS, MFAS and Haunted Hill Aquifer. Table 3 provides a comparison between the actual extraction for the period July 2018 to June 2019 and the licenced volumes. The percentage of unused extraction allocations were 46.9%, 46.9% and 53.1% for Hazelwood, Loy Yang and Yallourn mines respectively. The total volume of unused allocation for the 2018/19 period was 21,388.2 ML, which represents 47.3% of the total licenced extraction volume of 45,216.9 ML. Total groundwater extraction continues to be less than licenced due to improved efficiency of mine depressurisations systems, a better understanding of aquifer interactions at the mines and adoption of a risk based approach in determining drawdown requirements. There was no Haunted Hill Aquifer extraction at Yallourn Mine in the review period.

The monthly flows were below the licenced monthly volumes for each aquifer at each mine as shown in Table 4. Groundwater extractions comply with the licences issued for each mine with the annual and monthly extractions below licenced volumes in all aquifers.

The Latrobe Valley mines fall within the Rosedale Zone 1 and Stratford Zone 1 GMAs. Bores are assigned to a GMA based on screen depth below pre-mine natural surface, which is shown for each pump bore in Appendix C.

Table 3 Latrobe Valley Mines Licensed & Actual Groundwater Extraction 2018/19

Mine	Licensed Aquifer	Regional Aquifer System	No. of Pump Bores	Volume Extracted (ML)	Licensed Volume (ML)	Volume Unused (ML)	Percentage Unused %
Hazelwood	Haunted Hill	SAS	0	0	0	0	-
	Morwell (M1)	MFAS	9	965.0	3,212	2,247.0	70.0%
	Morwell (M2)	M2/TFAS	6	10,965.9	19,272	8,306.1	43.1%
Loy Yang	Haunted Hill	SAS	0	0	0	0	-
	Morwell (M1B, M2B M2C)	MFAS	12	2,823.7	3,650.5	826.8	22.6%
	Traralgon Fm	M2/TFAS	5*	7,790.3	16,344.8	8,554.5	52.3%
Yallourn	Haunted Hill	SAS	0	0	730.0	730.0	100%
	Morwell	MFAS	2**	1,283.8	2,007.5	723.7	36.1%
	Morwell (M2)	M2/TFAS	0	0	0	0	-
Totals							
	Haunted Hill	SAS		0	730.0	730.0	100%
	Morwell	MFAS	23	5,072.5	8,870.1	3,797.6	42.8%
	M2/Traralgon	M2/TFAS	11	18,756.2	35,616.8	16,860.6	47.3%
	TOTAL	TOTAL		23,828.7	45,216.9	21,388.2	47.3 %

* estimates for flowing bore included.

** Yallourn Mine pump bores only; excludes YNOC pump bores - see Appendix C for details

Table 4 Latrobe Valley Mines Licensed & Actual Monthly Groundwater Extraction 2018/19

Month	Yallourn Actual MFAS ML/Month	Yallourn Licenced MFAS ML/Month
July	106.9	167.3
August	106.1	167.3
September	103.4	167.3
October	104.6	167.3
November	107.3	167.3
December	110.7	167.3
January	110.4	167.3
February	101.5	167.3
March	109.0	167.3
April	108.5	167.3
May	110.6	167.3
June	104.8	167.3

Month	Hazelwood Actual MFAS ML/Month	Hazelwood Licenced MFAS ML/Month*	Hazelwood Actual M2/TFAS ML/Month	Hazelwood Licenced M2/TFAS ML/Month
July	74.4	267.7	967.1	1,606
August	82.3	267.7	857.1	1,606
September	79.5	267.7	927.1	1,606
October	99.9	267.7	1,057.6	1,606
November	57.8	267.7	700.5	1,606
December	104.3	267.7	1,235.9	1,606
January	75.5	267.7	923.1	1,606
February	70.0	267.7	870.0	1,606
March	76.9	267.7	935.1	1,606
April	82.0	267.7	904.6	1,606
May	80.7	267.7	776.4	1,606
June	81.7	267.7	811.4	1,606

Month	Loy Yang Actual MFAS ML/Month	Loy Yang Licenced MFAS ML/Month	Loy Yang Actual M2/TFAS ML/Month	Loy Yang Licenced M2/TFAS ML/Month
July	248.3	289	752.3	1,377
August	176.7	289	752.4	1,377
September	200.0	289	632.5	1,377
October	265.2	289	665.6	1,377
November	240.0	289	614.7	1,377
December	252.6	289	835.8	1,377
January	231.0	289	794.9	1,377
February	163.7	289	512.5	1,377
March	254.5	289	588.0	1,377
April	275.2	289	659.8	1,377
May	280.4	289	564.2	1,377
June*	236.1	471.5	417.6	1,195

*updated groundwater licence implemented

4. Regional Groundwater Levels

4.1 Monitoring Network

Details of the monitoring activities undertaken during the review period are required by Attachment A (clause 23a) to the groundwater extraction licences, and this section summarises the groundwater level monitoring undertaken in the 2018/19 period.

The licenced monitoring boundary as specified in Attachment A extends from Moe to east of Sale. Figure 3 and Figure 4 show the locations of the Latrobe Valley (LV) monitoring bores for the Morwell Formation and M2/Traralgon Formations respectively monitored as part of the regional program. Figure 5 shows the locations of bores monitoring the LV basement, Gippsland Limestone and SAS. The location of additional monitoring bores which may provide water level data to supplement the regional network when compiling the Five Year Review are also shown for information only in these figures, along with the approximate boundary of the Gippsland Basin. The additional bores are primarily State Observation Bore Network (SOBN) or labelled as “other monitoring bores” drilled for various hydrogeological assessments and are not part of the regional monitoring network as listed in Attachment A to the groundwater extraction licences.

The majority of bores comprising the regional groundwater monitoring network were constructed to monitor groundwater levels in the major regional aquifers of the MFAS and M2/TFAS as these aquifers are the focus of the mine depressurisation programs. As part of the last Five Year Review, the stratigraphy of the monitored formations of all bores was confirmed. Where the Traralgon Coal is present, bores and piezometers monitoring intervals above the uppermost Traralgon coal are assigned as MFAS and those below as M2/TFAS. In the western Latrobe Valley where the Traralgon Coal is absent, bores and piezometers monitoring intervals above the uppermost M2 coal are assigned as MFAS and those below assigned as M2/TFAS. This resulted in several bores reassigned to the M2/TFAS resulting in greater consistency in the potentiometric surface and groundwater trends for both aquifers.

Individual bores may be standpipes screening one aquifer, single aquifer piezometers with vibrating wire piezometers monitoring different intervals in the one aquifer system or multi aquifer piezometers with vibrating wire piezometers monitoring different aquifer systems in the one installation. It should be noted that the interval monitored might include coal seams and interseam splits within coal seams, as well as regionally extensive interseam aquifers.

Monitoring of the regional observation bore network is completed biannually with a summer and winter monitoring round allowing sufficient time to complete the annual report as specified in the Attachment A. The six monthly monitoring interval has been appropriate for both monitoring trends in the systems and for asset management to indicate potential problems in individual bore performances. Details for each bore monitored in the 2018/19 program including location, surface level, monitored depth intervals, formation monitored, date last monitored, licenced (as per Table A Attachment A to the groundwater extraction licence), status of bore and the recorded groundwater levels relative to Australian Height Datum (m AHD) are contained in Appendix D.

Table 5 indicates the number of bores, discrete installations and number of installations in each formation. In the review period, 91 of the 116 bores were monitored which included 134 of the 177 installed monitoring intervals. The bores not monitored are shown underlined in Figures 3 to 5. Eight M2/TFAS bores in the Holey Plains area were not monitored in the 2018/19 summer round due to bushfire access restrictions and were subsequently monitored in the winter round. Three MFAS and one SAS bores were not monitored for various reasons as discussed further

in Section 4.3. Two bores (13282 and 90343) were removed from the M2/TFAS monitoring network and one MFAS bore (31694) recovered as detailed in Section 7.1

Table 5 Latrobe Valley Regional Bore Network Monitoring Installations

Formation	Bores	Bores Monitored FY 2018/19	Installed Monitoring Intervals	Intervals Monitored FY 2018/19
Haunted Hill Formation (SAS)	4	3	6	4
Hazelwood Formation (SAS)	1	0	2	0
Yallourn Formation (SAS)	5	5	9	9
Morwell Formation Aquifer System	35	32	68	54
M2/Traralgon Formation Aquifer System	68	48	88	63
Gippsland Limestone	1	1	1	1
Mesozoic Basement (Strzelecki Gp)	2	2	3	3

There were no external third party bore access requests in the review period. The procedure for obtaining third party access for monitoring or sampling of the bores is to circulate any requests to the Committee for approval. A register of access agreements and works undertaken is also maintained.

4.2 Groundwater Monitoring Results

Discussion of issues arising from the monitoring results relative to the predicted trends is required by Attachment A to the groundwater extraction licences (clause 23c). This section reviews monitoring results and trends against the 2020 predictions. To assist in the assessment of changes in groundwater levels in the regional aquifers, a series of key observation bores has been selected and their locations shown in Figure 3 to Figure 5. The key bores are comprised of ten standpipes and twelve vibrating wire piezometers (VWP) type bores, of which six are successfully rehabilitated standpipes with VWPs installed. These bores were selected on length of record and location and are considered to provide representative groundwater level trends in the major aquifer systems across the Latrobe Valley. For bores with multiple VWPs, the instrument monitoring the regional aquifer sand unit consistent with the surrounding bores was selected where possible, rather than instruments monitoring the coal or other interseam material. Table 6 lists the key regional groundwater observation bores, the aquifer system monitored, and if it was monitored in the review period. Hydrographs for each of the key observation bores are contained in Appendix E. Due to bushfires in the region in early 2019, the summer groundwater monitoring was deferred until March-April, and the second monitoring run subsequently delayed and completed in September -October.

The “Latrobe Valley Regional Groundwater and Land Level Monitoring Report - Five Year Review” (June 2016) contained a prediction of water level at the key bores in 2020 based on the observed hydrograph trend, and these are plotted on the bore hydrographs in Appendix E.

M2/Traralgon Formation Aquifer System Trends 2018/19

The 2018/19 monitoring data shows the groundwater levels for the M2/TFAS bores typically continue to show steady declines in groundwater levels across the Latrobe Valley in line with the 2020 projections. Exceptions to this include:

- Bore 10942 s01 is assumed to be screening higher M2 sands compared to the v02 VWP. Both however show similar stable trends with minor fluctuations. This bore located approximately 10 km to the northeast and northwest of Hazelwood and Loy Yang mines respectively, and the stabilisation trend may reflect the decreasing M2 extractions at Hazelwood since 2012 and TFAS extractions at Loy Yang since 2015.
- Bore 110034 located over 15 km north of Loy Yang, also shows a stable trend since 2017 with minor fluctuations. Given the distance of this bore from the mines, other factors such as local licenced extractors may also be contributing to the observed trend, in additions to the decreasing mines extractions.
- Bore 180177 current water level is below the 2020 predictions. This prediction was based on the variable trend prior to 2015 which has since become more consistent and the 2020 prediction was therefore underestimated.

Morwell Formation Aquifer System Trends 2018/19

MFAS key bore trends typically show a gradual decline in water levels in line with 2020 predictions with the exception of the following:

- Bore 13190 v05 monitors the M1B coal and showed a decrease in mid-2016 with current pressures below the 2020 prediction. Bore 13190 v08 monitors the M1A interseam and shows an increased rate of decline since mid-2015 corresponding to the commissioning of M1A pump bore 26899 at Yallourn Mine at approximately 25 L/s. The v08 trend is in line with 2020 prediction.
- Bore 23263 (M1 interseam) shows a steeper declining trend in pressures since mid-2014 and then stabilisation over the 2018/19 period. Current pressures are marginally below the 2020 prediction. This increased rate of decline is due to the commissioning of M1 aquifer pump bores required for Hazelwood Mines West Field development (H2721 in March 2014 and H3293 in late 2016) resulting in the 2020 prediction based on observed trend being too high.
- Bore 90324 shows a small increase followed by a steady decline with current pressure above the 2020 prediction. Similar minor fluctuations have occurred periodically.
- MFAS key bores which show increasing trends include 52809 v10 and 130165 which monitor the M1A and M2B interseams respectively. Further monitoring is required to confirm if these increases represent a longer term reversal of the established declining trend.
- The declining trend at bore 570011 continues as current pressures are below the 2020 prediction which was based on the more variable data to 2015 and therefore high.

Typically the MFAS shows an increasing rate of aquifer pressure decline with depth. Bore 52809 is an example of this and continues to show a greater rate of decline in the deeper MFAS piezometer (v04 M1B aquifer) relative to the shallow MFAS piezometer (v10 M1A aquifer) which increased in 2019. These trends are consistent with downwards vertical drainage through the MFAS sequence being restricted by the presence of thick M1 coal seams acting as aquitards and limiting the connection of the shallow sands to the underlying depressurised sand aquifers. The importance of the local stratigraphy is shown by bores 52810 and 80445 which show similar declining trends and levels in adjacent piezometers. Bore 52810 v09 and v10 shows similar levels and trends, consistent with the instruments only being 22 m apart and monitoring the same M2B aquifer. Similarly v09 and v10 at 80445 monitoring the M1B coal and M1B aquifer respectively, show similar levels and trends consistent with the close proximity of the instruments (28 m) in the borehole.

Shallow Aquifer System Trends 2018/19

The SAS water level trends at 52883 show minimal rates of decline. Access to bore 80493 was restricted when the surrounding private pine plantation was logged and remains inaccessible. Previous data at 80493 shows higher pressures in the Haunted Hill Aquifer relative to the underlying Yallourn Formation and similar rates of decline. Impacts to the uppermost formations are typically limited by the low permeability of the underlying coals and clays.

Long-term changes in the hydrographic records are likely influenced by: climatic trends; additional pumping by other groundwater users; and depending on location, the impact of vertical drainage to the underlying formations and mine voids.

Gippsland Limestone Trends 2018/19

The Gippsland Limestone bore shows stable water levels consistent with the previous trend of a minimal rate of decline since 2012, consistent with the low permeability of this formation which limits connection to the underlying pumped aquifer M2/TFAS.

Summary

The key bores confirm that the rate of decline for the M2/TFAS continues to be greater and more uniform across the region relative to the MFAS which shows more variable trends. This reflects the generally reduced hydraulic connection between the various MFAS sands. Detailed spatial and vertical assessment of the rates of decline within the sequence is completed as part of the Five Year Review next due in 2020.

Table 6 Key Regional Groundwater Observation Bores

Bore Number	Aquifer System	Monitored 2018/19	Comments
52883	SAS	Yes	VWP - no performance assessment required, steady trend
80493	SAS	No	VWP- landowner access issues
13190	MFAS	Yes	VWP - no performance assessment required, v05 influenced by N6899 startup
23263	MFAS	Yes	Bore rehabilitated in Dec 2011. Increased rate of decline since mid-2014 due to H2721 and H3293 startups, steady from 2018
52809	MFAS	Yes	VWPs - v04 declining trend, V10 minor increase from 2018
52810	MFAS	No	VWPs - Headworks damaged restricting access to cables.
80445	MFAS	Yes	VWPs - declining trends
90324	MFAS	Yes	Standpipe performance checked 1998, declining trend some fluctuations
130165	MFAS	Yes	Bore Rehabilitated 2002 VW Piezometer installed
440056	MFAS	Yes	Access re-established after highway duplications work. March and October readings anomalous, requires assessment.
570011	MFAS	Yes	Standpipe performance checked 1997, declining trend
10942	M2/TFAS	Yes	Bore rehabilitated 2011, VW Piezometers installed. Minor fluctuations.
23607	M2/TFAS	Yes	Bore rehabilitated 2011 VW Piezometers installed and bore grouted

Bore Number	Aquifer System	Monitored 2018/19	Comments
100093	M2/TFAS	No	No access due to bushfires. Bore rehabilitated 2011 VW Piezometers installed and bore grouted.
110034	M2/TFAS	Yes	Bore rehabilitated 2013, VW piezometers installed, reclassified as M2/TFAS (see GHD, 2013). Steady since 2017
130167	M2/TFAS	Yes	Bore Rehabilitated 2006 VW Piezometers installed, steady trend
180177	M2/TFAS	No	No access due to bushfires. Jan 2015 data anomalous assumed reading error and omitted.
190054	M2/TFAS	Yes	Damage to surface casing – requires rehabilitation
210051	M2/TFAS	No	Standpipe performance checked 1998 – water level too deep to be monitored installation of VWP's required
440341	M2/TFAS	Yes	Standpipe performance checked 1997 - 2018/19 readings on long term trend. Aug 2015 data reading anomalous
920007	M2/TFAS	No	Standpipe blocked - bore assessment/ rehabilitation required
190066	Gippsland Limestone	Yes	Standpipe performance checked 1997

4.3 Monitoring Network Issues

Issues that arose from the review of the monitoring network and monitoring data primarily relate to: access to bores in the Holey Plains State Park due to bushfires in early 2019 and inaccessible bores located on private land; and failed GI standpipe bores. As shown in Table 5, twenty of the M2/TFAS bores and three MFAS bores were not monitored in the review period. The bore access and bore condition issues are discussed in sections 4.3.1 and 4.3.2. Clause 23b of Attachment A to the groundwater extraction licences requires any amendments to the monitoring network to be detailed and these are discussed in section 4.3.3 and in section 7 in relation to bore rehabilitation.

As noted in section 4.2, the summer groundwater monitoring was deferred until March-April due to the bushfires, and the winter monitoring run subsequently delayed and completed in September –October. The planned summer and winter monitoring schedule is expected to return to normal for 2020.

4.3.1 Bore Access

Bores with access issues include:

- Bushfires damage restricted access to the following eight M2/TFAS bores located in the Holey Plains State Park: 90323, 100093, 100096, 180177, 180188, 180196, 180207, 180220. Access and bore condition has subsequently been confirmed in the following monitoring round.
- Two M2/TFAS bores (80495 and 110042) were not accessible due to private landowner access issues.
- Two M2/TFAS bores (210051 and 100097) are located in the pine forest are difficult to access. The tracks are not suitable for rig access, and would require significant work for bore rehabilitation to be completed.

- MFAS bore 440056 was temporarily inaccessible in 2018 due to the highway duplication but has now been re-established. The bore requires assessment as the recent data is not consistent with the previous trend.
- MFAS bore 240047 is inaccessible due to private landowner access issues.
- SAS bore 80493 is inaccessible due to private landowner access issues.

It is recommended that the status of bores with long term access issues be resolved in the coming work program and their current status is included in Appendix D. This information can then be considered for future bore rehabilitation priorities.

4.3.2 Bore Condition

Bores which are unable to be monitored due to casing or headworks issues include:

- The water level at M2/TFAS bore 120122 has dropped below 200 m and requires installation of a VWP to enable ongoing monitoring.
- GI standpipe casing at M2/TFAS bores 51967, 61726, and 180220 is considered to have failed and headworks were damaged at bores 100094 and 190054.
- M2/TFAS bore 920007 was damaged by vandalism.
- M2/TFAS bores 80495 and 80496 were covered by dumped rubbish which was cleared by the council, however the bore/VWP headworks were damaged during the clean up. Bores to be surveyed and instruments assessed.
- Pressure gauge readings cannot be obtained from artesian M2/TFAS bore 23788 in the Moe area as the valve is seized and requires replacement.
- The headworks at TFAS/MFAS bore 52810 was damaged resulting in the VWP cables being inaccessible. Repair and replacement of the headworks is required.
- MFAS bore 13054 was damaged by roadworks and requires rehabilitation.

Clauses 8 to 11 of Attachment A to the groundwater extraction licences refers to the groundwater monitoring bore maintenance and decommission requirements. The actions required to address the bore conditions issues noted are further discussed in section 7.

4.3.3 Monitoring Amendments

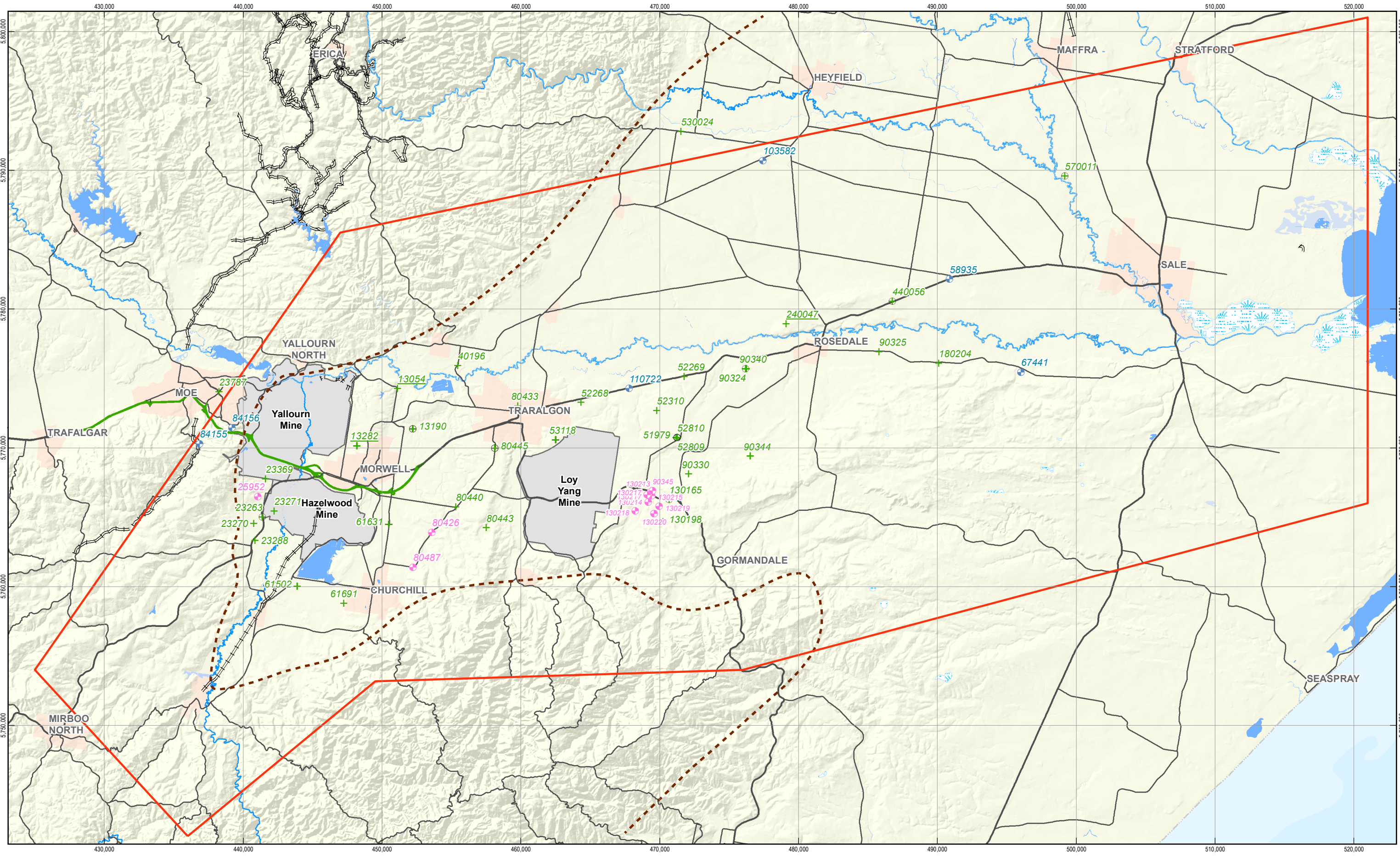
Access issues for the SAS bore 13282 to the east of Yallourn have been resolved with the landowner and monitoring re-established. Bore 80493 located on private land remains inaccessible. SAS data is being supplemented by additional HHF monitoring data from bore 26091 close to the eastern boundary of the Yallourn mining licence.

The Regional Monitoring Committee considered the status of “other” bores as shown on the bore location plans and concluded that these would not be included in the regional monitoring network but would continue to be monitored as part of the six monthly program where accessible and the data useful in supplementing the mines’ network, particularly for the 5 Year Review.

It is understood the status and potential decommissioning of the Monash Energy bores at Flynn is being reviewed by Anglo-Coal, and with the landowner permission, three bores would be retained for ongoing monitored to supplement the regional data.

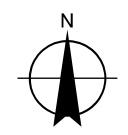
A review of the regional monitoring bore program has been completed for the RMC to address the fact that the original list of regional monitoring bores contained in Table A Attachment A to the groundwater extraction licences did not reflect the program implemented and other amendments adopted. Appendix D shows that of the original listed bores, eighteen have never

been monitored by the RMC and eight bores have been subsequently sealed without VWPs installed. The bores currently monitored are shaded blue in Appendix D and include three bores currently monitored by Engie and ten monitored as part of the Loy Yang Annual monitoring run. Proposed amendments to the list of monitoring bores include deletion of bores never monitored by the RMC, and removal of sealed bores and instruments where individual vibrating wire piezometers have failed. Inclusion of new instruments installed in bore rehabilitation works is also recommended.



Paper Size A3
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 Metres

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



- LEGEND**
- Licenced Monitoring Boundary
 - + LV Monitoring Bore (underlined not monitored)
 - + LV Key Bore
 - SOBN
 - Other Monitoring Bores
 - - - Gippsland Basin
 - Freeway
 - Highway
 - Arterial
 - Watercourse
 - Flat
 - ▭ Pondage
 - ▭ Lake
 - ▭ Swamp
 - River
 - Stream
 - Channel
 - Drain/Channel/Other
 - Railway
 - ▭ Mines
 - ▭ Township boundary

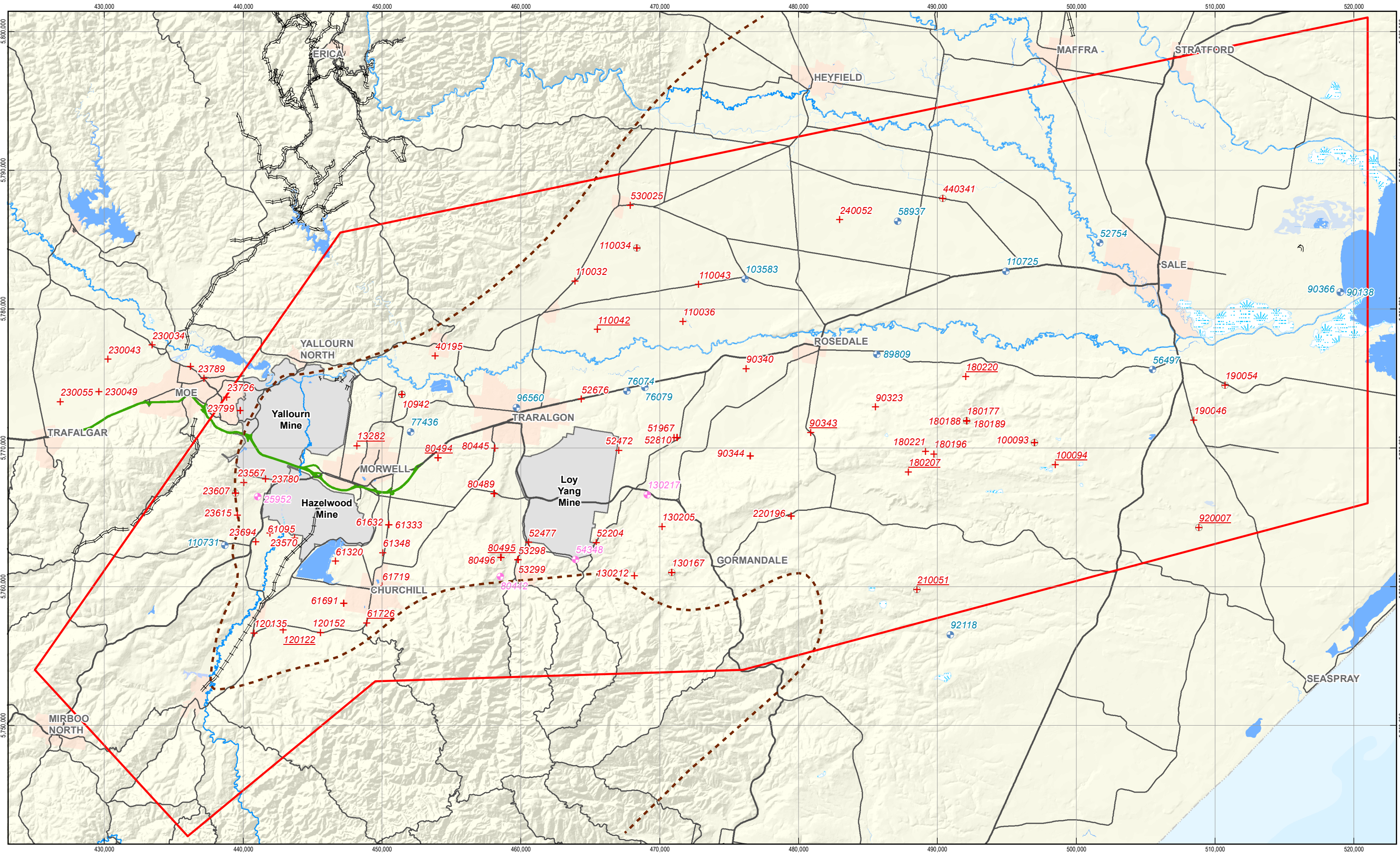


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**Morwell Formation
 Aquifer System Bores**

Job Number 31-1237620
 Revision 0
 Date 5 Dec 2019

Figure 3



Paper Size A3
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 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



- LEGEND**
- Licenced Monitoring Boundary
 - + LV Monitoring Bore (underlined not monitored)
 - ⊕ LV Key Bore
 - SOBN
 - Other Monitoring Bores
 - - - Gippsland Basin
 - Freeway
 - Highway
 - Arterial
 - Watercourse
 - Flat
 - ▭ Pondage
 - ▭ Lake
 - ▭ Swamp
 - River
 - Stream
 - Channel
 - Drain/Channel/Other
 - Railway
 - ▭ Mines
 - Township boundary

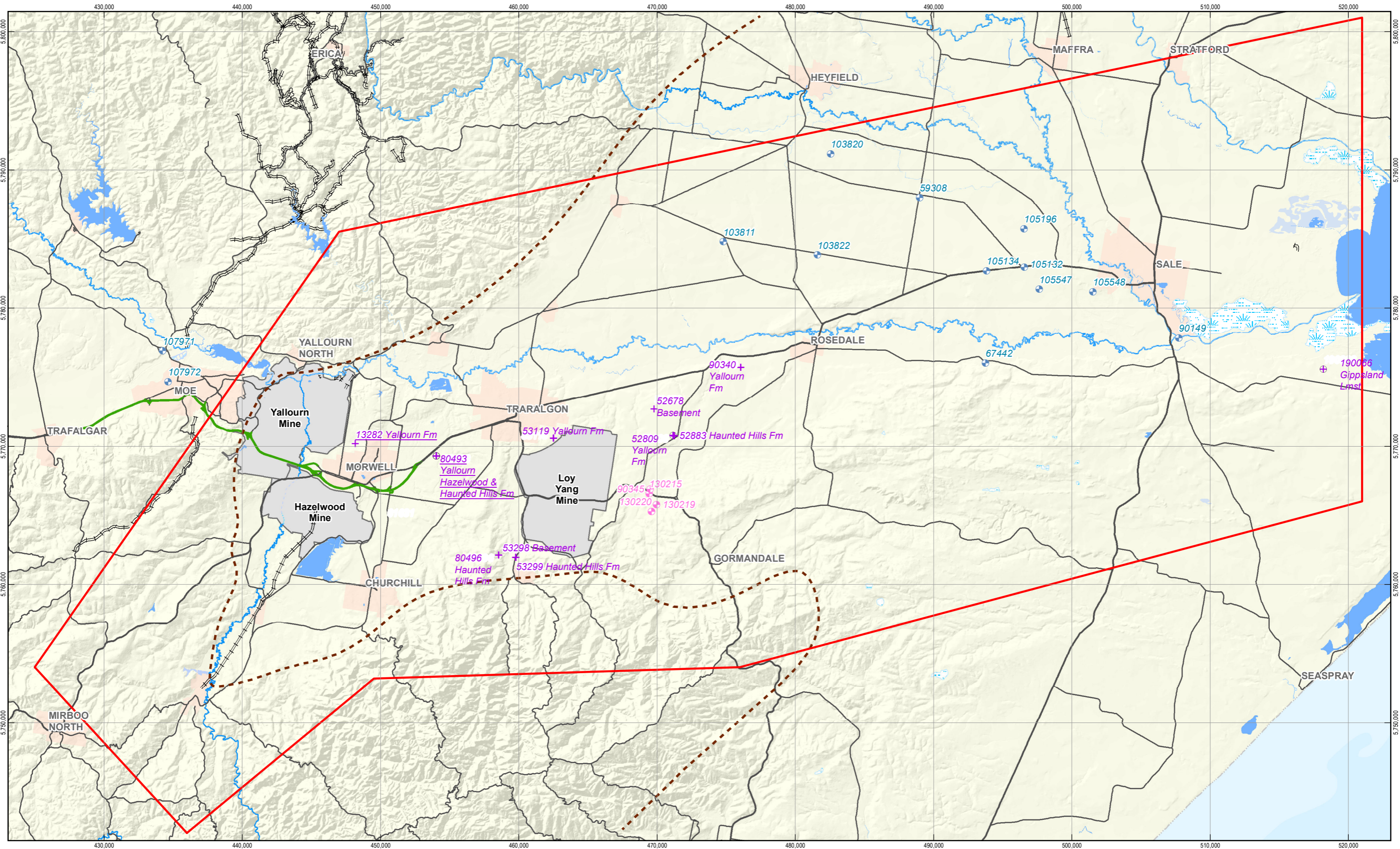


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**M2/Traralgon Formation
 Aquifer System Bores**

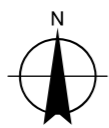
Job Number 31-1237620
 Revision 0
 Date 5 Dec 2019

Figure 4



Paper Size A3
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 Metres

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



- LEGEND**
- + Monitoring Bore (underlined not monitored)
 - ⊕ Key Bore
 - ⊕ SOBN Bores
 - ⊕ Other Monitoring Bores
 - Licenced Monitoring Boundary
 - - - Gippsland Basin
 - Freeway
 - Highway
 - Arterial
 - Watercourse
 - Flat
 - Pondage
 - Lake
 - Swamp
 - River
 - Stream
 - Channel
 - Drain/Channel/Other
 - Railway
 - Mines
 - Township boundary



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Job Number | 31-1237620
 Revision | 0
 Date | 5 Dec 2019

Basement, Yallourn, Haunted Hill & Gippsland Limestone Bores Figure 5

G:\3111237617\GIS\Maps\Working\31_1237617_003_OthersBoreLocationPlan_Rev0.mxd

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Data source: Vicmap (2012), DSE GMS (2013), Regional Groundwater Database (2016). Created by:bsmyth

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5. Land Level Monitoring

Land level surveying of the region is required by Attachment A to the groundwater extraction licences (clause 16) to determine the extent of land subsidence associated with mine depressurisation. Clause 17 requires the land level survey is conducted at no greater than 5 year intervals and more frequently where significant subsidence is being recorded. To meet this requirement, the field surveying component is completed every five years as shown in Appendix A. Previous surveys were completed in 2014 and 2015 and survey results are contained in the report “Latrobe Valley Regional Groundwater and Land Level Monitoring Report, Five Year Review” (GHD, 2016a).

In the review period, the regional surveying program was scoped, tenders reviewed and a contactor engaged. The land level survey has commenced in July 2019 with completion of the markers east of Traralgon Creek. Surveying of the markers west of Traralgon Creek is to be completed in early 2020 and the results presented in the next Five Year Review.

Representatives for the mines periodically review the requirements and outputs of remote survey methods including Interferometric Synthetic Aperture Radar (InSAR) and their possible future application to the regional surveying program. The 2019/20 program is being completed using the GPS based survey methods as in previous surveys.

6. Groundwater and Subsidence Modelling

6.1 Groundwater Level Modelling

Clauses 25 and 26 of Attachment A to the groundwater extraction licences requires a comprehensive groundwater assessment to be completed at 5 yearly intervals and include groundwater modelling. The purpose of the modelling is described in clause 14 and states “groundwater modelling of the region shall be performed to assist in predicting the effects of the mine depressurisation on regional groundwater levels”.

Regional groundwater modelling was completed as part of the 2015/16 work program and provided aquifer pressure trend predictions for the periods 2015 to 2020, and 2015 to 2025. The results of the 2015/16 modelling are contained in the report “Latrobe Valley Regional Groundwater and Land Level Monitoring Report, Five Year Review” (GHD, 2016a). To support this Five Year Review, a separate groundwater modelling report was completed providing comprehensive documentation on the Latrobe Valley regional groundwater model configuration, calibration and predictive modelling (GHD 2016b).

Groundwater modelling is next scheduled in the 2020/21 work program as shown in Appendix A.

6.2 Regional Subsidence Modelling

Subsidence modelling of the region is required under Attachment A to the groundwater extraction licences (Clause 19) to assist in predicting the effects of groundwater depressurisation on land subsidence. Clause 26 requires that the results from the land level modelling be included in the comprehensive groundwater assessment.

Previous subsidence modelling was completed in 1987 and 1994 using the code COMPAC which is a one-dimensional model used to predict land level changes at discrete sites. A summary of the past COMPAC modelling, detailing the predictions, can be found in the 2000 Five Year Review (Geo-Eng, 2000). In 2010 further work was completed to simulate subsidence using the Latrobe Valley Regional groundwater model and the MODFLOW Subsidence and Aquifer Compaction (SUB) Package.

Subsidence modelling was completed in the 2015/16 work program. The model was calibrated against the extensive network of land level survey markers and the results are contained in the report “Latrobe Valley Regional Groundwater and Land Level Monitoring Report, Five Year Review” (GHD, 2016a).

Subsidence modelling was not required in the 2018/19 work program as shown in Appendix A and will be completed in conjunction with the groundwater modelling scheduled in the 2020/21 work program.

7. Monitoring Network Asset Maintenance

Monitoring Network Asset management is conducted in accordance with the Regional Monitoring Management Plan (GHD 2013). The objectives of the regional management plan are to manage the observation bore network and land level survey assets to provide reliable aquifer level and land level data for the assessment of mine depressurisation environmental impacts.

Groundwater level monitoring data is reviewed to determine bore performance and provide input to the bore maintenance program. Appendix E summarises the tasks that are completed annually for network asset maintenance, monitoring and reporting. To prolong the life of existing bores a method to install vibrating wire piezometers into failed GI standpipes has been successfully implemented in the bore rehabilitation program.

7.1 2018/19 Bore Maintenance and Rehabilitation

Maintenance, rehabilitation and decommissioning of the monitoring bores is required by Attachment A to the groundwater extraction licences clauses 8 to 12. This section discusses bore rehabilitation activities completed in the review period. One bore 90343 was decommissioned during the review period as the bore could not be rehabilitated. The dummy probe and cable blocking the casing was successfully pushed down into the sump and VWP installation was planned. However when the drill rods were being removed it was found the formation was collapsing locking in the drill rods at around 154 m. The rods were not able to be removed and clay removed from the hole suggesting the casing was corroded or parted at around this depth. A bore decommissioning licence was obtained and the bore grouted and sealed.

Bore 31694 in the Tanjil East area screens the MFAS and was last monitored in 2000. Monitoring is understood to have ceased as it was not listed as part of monitoring network in Table A Attachment A despite the good trend. In September 2018 bore was located, assessed and found to be operational and added to monitoring network to provide additional data in the area.

The bore maintenance program contains key bores that were assigned a high priority in order to provide continuity of monitoring at important sites. Bore rehabilitation has focussed on the assessment of vibrating wire terminal boxes to determine the status of the downhole instruments. The headworks and cables were checked to determine if downhole instrument failure or corrosion in the terminal boxes was responsible for the decline in number of operational piezometers. The terminal boxes were repaired where possible or installation of replacement boxes included in the rehabilitation work program. Access to bore 13282 was re-established after discussion with the landowners and the VWPs assessed. Of the six VWPs last read in 2003, two monitoring the Morwell Formation (M1A coal) and SAS (Yallourn interseam) were functioning and the data consistent with previous trends. Landowner access was also confirmed for bore 80445. The instruments at bore 80489 were also assessed as shown in Table 7.

Table 7 2018/19 Bore Maintenance Program

Bore Number	Completed Work	Current Status
13282	Inspection - VWPs assessed	VWP v09 and v10 operational.
80489	Inspection - VWPs assessed	v02, v05 & v06 operational, v03 failed, v04 data anomalous
31694	Standpipe located/inspection	Bore s01 assessed trend good, operational.
90343	VWP installation not possible due to casing failures.	Bore Sealed

7.2 2019/20 Bore Rehabilitation Work Program

The work program for the 2019/20 period will focus on the bores previously programmed in 2019/20, which was delayed due to requirements of the surveying and 90343 rehabilitation. Ongoing review of the groundwater monitoring network taking into account bore type, age, condition and location (private or public land) is complete and the results used to develop the long term bore maintenance program.

The key M2/TFAS and MFAS bores as shown in Table 8, which are noted as requiring maintenance or showing anomalous trends, are the focus of the bore rehabilitation program. There are three key M2/TFAS bores that require rehabilitation (bores 190054, 210051 and 920097) and one MFAS bore 52810. Several other bores are identified for inspection and assessment including 440056 as the recent reading was anomalous, and the possibly bushfire impacted bores.

Due to the age and poor casing material used for the standpipe bores which were predominately installed using 63 mm GI pipe, assessment is currently limited to running dummy probes or small diameter drill rods. Airlifting of the bores is not recommended. If a standpipe is open to the screen interval, two VWPs will be grouted in the screened interval to rehabilitate the bore.

It is noted that the priorities of the rehabilitation program may be altered if: a bore failure occurs, particularly in a key area; if it is artesian; or a bore failure on private land where there may be access constraints. Therefore, not all bores identified for rehabilitation in a nominated year may be completed due to altered priorities or budget or access constraints.

In addition to the rehabilitation program outlined above, GHD is currently assessing decommission options for several groundwater bores installed in the Flynns Creek area, as part of a separate work package. Whilst the works are still preliminary in nature, it is proposed that three boreholes in the area are retained for monitoring as part of the regional program, two 130214 and 130220 are on roadside reserve and currently monitored and one 130217 is on private land. Ownership of the bores is understood to return to the landowner and bores would be fully grouted with VWPs installed and therefore not require any future decommissioning. With landowner and client approval, the proposed works would provide additional data to the regional program.

Table 8 Proposed 2019/20 Bore Maintenance and Rehabilitation Program

Bore Number	Maintenance / Rehabilitation / Decommission
52810, 80495, 80496,	Surveying, replace terminal boxes.
190054, 920007, 210051	Key Bore standpipe rehabilitation, piezometer installation or sealing
440056, 180177, 110093, 110096	Inspection and assessment of bushfire impacted areas.
130214, 130217, 130220*	Piezometer installation and completion of grouting.

*not part of regional rehabilitation program

8. Data Management

All regional aquifer pressure information is stored in a Borehole Database as required by clause 3 of Attachment A to the groundwater extraction licences. The acquisition of field aquifer pressure data is carried out under standard procedures as documented in the Latrobe Valley Regional Monitoring Management Plan (GHD 2013) and required by clause 5 of Attachment A.

Prior to entry in the database, a Quality Assurance procedure is followed to verify the data as required by clause 6 of the Attachment A. The aquifer pressure data is verified by comparison with previous readings to determine significant variations that may indicate changes in bore performance or aquifer conditions. Comparison of aquifer pressure readings with other bores in the same area provides an additional check on reading accuracy. All field records are retained on file. Bore data from a failed bore is flagged with a failed status in the database until the bore is sealed or rehabilitated.

Records of water levels, construction details, bore status and maintenance are kept and reviewed to assist in the casing condition assessment and hydrograph analysis.

Transfer of the regional monitoring data and bore installation details to DJPR is completed annually as part of the established Latrobe Valley borehole database transfers.

9. Conclusions

Clause 23a requires the annual report to include details of the monitoring activities undertaken in the review period. The groundwater extraction, groundwater level and land level monitoring activities included:

- Groundwater extractions comply with the licences issued for each mine; the annual and monthly extractions were below licenced volumes in all aquifers. The total groundwater extracted within the mines over the review period was 23,828.7 ML. The total volume of unused allocation was 21,388.2 ML, which is 47.3% of the total licenced extraction volume of 45,216.9 ML. Total groundwater extraction continues to be less than licenced due to: improved efficiency of mine depressurisations systems; a better understanding of aquifer interactions at the mines; and adoption of a risk based approach in determining drawdown requirements.
- Monitoring of the regional observation bore network is completed biannually with summer and winter monitoring rounds as required by clause 12 of the groundwater extraction licences and clause 4 of Attachment A to the groundwater extraction licences. The FY19 summer round was delayed to March 2019 due to bushfires in the region and the winter monitoring round subsequently also delayed until September. In the review period, 91 of the 116 bores were monitored which included 134 of the 177 installed monitoring intervals. Of the 68 M2/TFAS bores 48 were monitored, and 32 of the 35 MFAS bores monitored. Two bores monitor groundwater levels in the underlying basement rock and one bore the Gippsland Limestone. Eight bores monitor groundwater levels in the SAS.
- No land level monitoring was required in the reporting period. Specifications for the FY20 subsidence monitoring have been prepared and issued, tenders reviewed and a surveyor contractor engaged.

Clause 23c requires the annual report to detail any issues arising from the monitoring results and significant variations to predicted trends. The 2018/19 monitoring results indicate:

- Groundwater levels for the M2/TFAS are generally in line with the 2020 predictions and continue to show steady declines in groundwater levels across the Latrobe Valley. The Pressures trends are steady at 10942 and 110034 located to the northwest and northeast of Traralgon respectively. Pressures at 23607 west of Hazelwood have shown a minor increase.
- M2/TFAS bore 180177 shows levels below the 2020 predictions as the pre 2015 data was relatively more variable and has since stabilised resulting in 2020 prediction being too high. Similarly, MFAS bores hydrographs 570011 show the 2020 estimate is likely to be too high for similar reasons.
- The MFAS trends are generally more variable particularly at bores distant to the mines whereas the rate of decline for the M2/TFAS continues to typically be greater and more uniform, and these observations are consistent with trends recorded over a long period in the Latrobe Valley. Increasing trends were observed in the MFAS uppermost piezometer at 52809 and at bore 130165.
- MFAS monitoring bores near Hazelwood West Field and Yallourn Maryvale Field developments, where pump bores have been commissioned, locally show an increase in the rate of depressurisation. As a result, the 2020 estimates at bores 13190 v05 and 23263 based on historical trends, are likely to be exceeded. Future predictions will be reforecast based on the expanded pumping.

- The Gippsland Limestone bore shows stable water trend consistent with the low permeability of this formation and poor connection to the underlying M2/TFAS.
- Impacts to the overlying SAS are typically limited by the low permeability of the overlying coals and clays, and water level trends show only minimal rates of decline.

Clause 23b requires the annual report to detail amendments to the monitoring network. No formal monitoring network amendments have been adopted by the RMC in the review period. Proposed network amendments include deletion of bores never monitored by the RMC, and removal of bores which have been subsequently sealed, and instruments where individual vibrating wire piezometers have failed.

M2/TFAS groundwater monitoring bore issues include:

- There are 10 key bores monitoring the M2/TFAS. Three key bores require rehabilitation:
 - 210051 due the standing water level being greater than 200 m depth,
 - bent headworks at 190054, and
 - 920007 has been damaged by vandalism.
- Key bore 180177 was not read in the 2019 summer run due to the bushfires but was monitored in the winter run.
- The six key bores monitored in the review period show consistent long term trends and in conjunction with the full network monitoring data, are considered sufficient to assess the impact of mine aquifer depressurisation.
- In addition to these three key M2/TFAS monitoring bores not monitored, nine other M2/TFAS bores were unable to be monitored due to: landowner access restrictions; failure of the GI casing due to corrosion; or headworks damage.
- Twenty M2/TFAS bores were not monitored in the 2018/19 period with eight of these due to bushfire access restrictions in the Holey Plains State Park in early 2019.
- The 2018/19 bore rehabilitation program included assessment of the vibrating wire terminal box at M2/TFAS bore 80489 to determine the status of the downhole instruments.
- Rehabilitation of M2/TFAS bore 90343 was unsuccessful due to corroded casing allowing the formation to collapse locking in the drill rods and preventing VWP installation. The bore was sealed and decommissioned.
- Two M2/TFAS bores 13282v01 and 90343s01 are no longer part of the M2/TFAS monitoring network.

MFAS groundwater monitoring bore issues include:

- Of the nine MFAS key bores, eight were monitored, and in conjunction with the full network monitoring data, are considered sufficient to assess the impact of mine aquifer depressurisation to this aquifer. Headworks damage at key bore 52810 requires repair, and assessment of bore condition at 440056 is required as the 2019 data obtained after access was re-established following highway duplication, is not consistent with previous data.
- Three MFAS bores were not monitored due to landowner access restriction or headworks damage.
- The 2018/19 bore rehabilitation program included assessment of the vibrating wire terminal box at MFAS bore 13282 which is now assessable after discussion with the landowner.
- Inspection of MFAS standpipe bore 31694 was also performed and found to be operational and the trend consistent with previous readings.

SAS groundwater monitoring bore issues include:

- Access to SAS bore 13282v10 was re-established and is being supplemented by additional SAS monitoring data from bore 26091 close to the eastern boundary of the Yallourn mining licence.
- Of the two SAS key bores, bore 80493 was not accessible as the surrounding private pine plantation has been logged and the gate locked.

9.1 Recommendations

The following work is recommended to address annual reporting requirements as outlined in clause 23 of Attachment A to the groundwater extraction licences:

- Implement the bore rehabilitation program as outlined in Section 7.2 of this report in order to maintain the extent of the observation bore network.
- RMC to consider amended regional monitoring bore program to address the fact that the original list of regional monitoring bores contained in Attachment A of the groundwater extraction licences did not reflect the program as originally implemented and other modifications since adopted.
- Continue to determine the status of bores with long term access issues. This information can then be considered for future bore rehabilitation priorities and monitoring network amendments.
- Continue groundwater monitoring at a six monthly frequency with summer and winter monitoring rounds, as review of the data has shown it to be appropriate for monitoring changes in aquifer pressures, and for asset management to indicate potential problems in individual bore performance.

Other recommendations to further the hydrogeological understanding and monitoring in the Latrobe Valley include:

- Continue to use the supplementary groundwater data in addition to the Latrobe Valley regional groundwater data in assessing groundwater trends.
- Consider transition to remote land subsidence monitoring. This would require trialling of the remote method in conjunction with GPS based surveying to prove the technology has the required accuracy.
- Continue to assess opportunities to develop an InSAR research project to support the subsidence monitoring program.
- Review and incorporate the results from the Latrobe Valley Regional Rehabilitation Strategy (LVRRS) reports to improve the understanding of the hydrogeological processes in the Latrobe Valley.

10. References

Geo-Eng, 2000, Latrobe Valley Regional Groundwater and Land Level Surface Monitoring Report – Five Year Review, Report Ref 1000/8505/99, September 2000.

GHD, 2013, Latrobe Valley Regional Monitoring Management Plan, Report Ref 31/12376/13/217051, September 2013.

GHD 2016a Latrobe Valley Regional Groundwater and Land Level Monitoring Five Year Review, Draft Report Ref 31/12376/16/245587_Rev A, June 2016.

GHD 2016b Regional Groundwater Model Review 2015 Update. Report Ref 31/12376/16/251990, September 2016.

Appendices

Appendix A – Latrobe Valley Regional Monitoring Program

Five Year Work Program

Reporting Year	Groundwater Monitoring and Bore Rehabilitation	Land Level Monitoring	Groundwater Modelling	Reporting Requirements
1 July 2019 to 30 June 2020	Six monthly monitoring Bore Rehabilitation	Late 2019 Survey Eastern Section Early 2020 Survey Western Section	Not required	Annual Report
1 July 2020 to 30 June 2021	Six monthly monitoring	Not required	Complete Groundwater and Subsidence Modelling	Annual Report Five Year Review
1 July 2021 to 30 June 2022	Six monthly monitoring Bore Rehabilitation	Not required	Not required	Annual Report
1 July 2022 to 30 June 2023	Six monthly monitoring Bore Rehabilitation	Not required	Not required	Annual Report
1 July 2023 to 30 June 2024	Six monthly monitoring Bore Rehabilitation	Complete Scope and Tender for Subsidence Monitoring	Not required	Annual Report

WATER ACT 1989

Section 51

GROUNDWATER LICENCE No....
(Licence to take and use groundwater)

Objective

The objective of this licence is to allow the efficient depressurising of the open cut mine whilst minimising adverse impacts on the Gippsland Groundwater Basin.

Definitions

In this Licence

"Mining Licence" means a mining, licence issued under the provisions of the Electricity Industry Act 1993

"Approved work plan" means the mining licence work plan applicable to Mining Licence No 5003

"Regional monitoring program" means the monitoring program described in Part B of the approved work plan

"Rehabilitation plan" means a rehabilitation plan approved under the provisions of the electricity Industry Act 1993.

Preamble

The extraction of groundwater for the purpose of achieving safe and stable conditions in the mine is authorised under this Groundwater Licence issued by the Minister responsible for the Water Act, 1989, The administration of the licence may be delegated by the Minister to the Gippsland and Southern Rural Water Authority

The extraction of groundwater at mine sites in the Latrobe Valley results in a regional cone of depression of the groundwater and in ground subsidence.

The monitoring and reporting of regional groundwater and land level trends is to be carried out by the licensee as part of the approved work plan under the Mining Licence.

The Minister or his delegate may set annual charges under this licence to recover the cost incurred in

- ensuring compliance with licence conditions;
- assessing and reviewing the regional monitoring program; and
- managing and administering the licence.

Licence Authorisation

..... is authorised to take and use groundwater subject to the following conditions;

WATER ACT 1989

Section 51

1. This licence is valid for a period of thirty years from 1 September 1995.
2. The licensee is authorised to take and use groundwater to facilitate mining for coal and generation of electrical energy and purposes incidental thereto.
3. The licensee is authorised to extract groundwater from the aquifers at quantities and during the times specified in the First Schedule or on application by the licensee such other quantities and during such other times as from time to time approved by the Minister or his delegate.
4. The licensee may vary the maximum monthly rate of extraction from any particular aquifer or the maximum annual volume to be extracted from any particular aquifer provided that the total monthly rate of extraction and the total annual volume from all aquifers is not exceeded and shall report at monthly intervals such variations as they occur to the Minister or his delegate.
5. The licensee may only take and use groundwater under this licence on the land with respect to which the licensee holds a mining licence for themine.
6. Annual fee at date of issue \$......
7. The licensee shall pay annual charges for the forthcoming year due under the licence in quarterly installments or on an annual basis as agreed between the licensee and the Minister or his delegate.
8. The licensee shall meter all groundwater extractions and shall keep an accurate record of the quantity of groundwater taken or used under this Licence and allow the Minister or his delegate to inspect this record during normal business hours and to provide a copy of such record to the Minister or his delegate within seven days of a notice given by post to the licensee at the address contained in this licence.
9. The licensee shall provide to the Minister or his delegate annually details of the location of each bore from which groundwater is extracted under this licence.
10. By the issue of this licence the Minister or his delegate in no way accepts any liability for injury to any party arising as a consequence of any adverse effects that may be deemed to have been caused by the extraction of groundwater under the licence.
11. The licensee shall compensate any person where existing authorised use of water is adversely and materially affected by the taking of water under this licence. The compensation may be either financial or may be constituted by the making available of or granting access to water. If the licensee is unable to or unwilling to make compensation by the making available of or granting access to water in the quantities previously enjoyed by the person so affected then the amount of financial compensation payable be that as determined by a Valuer nominated by the president of the Victorian Division of the Australian Institute of Valuers and Land Economists (Inc).

WATER ACT 1989

Section 51

12. The licensee shall undertake a regional Monitoring program of the nature scope and extent as that previously undertaken by the State Electricity Commission of Victoria as detailed in the approved work plan and the information is to be provided on request to the Minister or his delegate and as required under the work plan.
13. All information obtained from the regional monitoring program belongs to the generation companies, the State Electricity Commission of Victoria and the Minister jointly.
14. The licensee must maintain the existing data bases, and undertake additional work that may be required from time to time by the Minister or his delegate to maintain the effectiveness of the regional monitoring program.
15. If the licensee fails to provide the information required under condition 12 the Minister or his delegate may undertake any necessary work to obtain the information and recover the costs of such work from the licensee.
16. The regional monitoring program and any remedial measures must be incorporated in the approved work plan and the rehabilitation plan to the satisfaction of the Minister or his delegate.
17. The licensee shall comply with the provisions in its mining licence, approved work plan and the rehabilitation plan dealing with the regional monitoring program and remedial action.



GEOFF COLEMAN
MINISTER FOR NATURAL RESOURCES

**REGIONAL MONITORING PROGRAM
LATROBE VALLEY OPEN CUT COAL
MINES**

PREAMBLE

These requirements are to form part of the Approved Work Plan for each of the three open cut coal mines at Morwell, Yallourn and Loy Yang under the provisions of the Mineral Resources Development Act 1990. They outline the obligations and requirements in respect to monitoring and predicting changes in regional groundwater levels and land levels associated with groundwater extraction from the mines.

Over the past 20 or so years the former SECV has undertaken an extensive range of groundwater studies and investigations in the Latrobe Valley. Most importantly the work includes a regional groundwater monitoring network, regional land level surveys, and modelling to predict future changes in both groundwater levels and land levels as a result of mining operations. These programs continue to be carried out by Yallourn Energy Ltd., Hazelwood Power Corporation Ltd. and AGL Loy Yang Mine. The purpose of this attachment is to ensure the continuation of these regional monitoring and assessment programs.

The requirement specified in this attachment are directed at:

- maintaining an appropriate regional monitoring and assessment program;
- providing a mechanism to cooperatively adjust and refine the regional program to take account of:
 - results generated by the program;
 - changes in mining and depressurizing activity;
 - emerging regional issues associated with depressurizing activities;
 - advances in technology; and
- maintaining a cost effective program.

REGIONAL MONITORING PROGRAMS

1. A regional monitoring will be undertaken to record and ascertain the changes in groundwater levels and land levels. The programs shall include:-
 - Groundwater Monitoring;
 - Groundwater Modelling;
 - Land Level Surveying; and
 - Land Level Modelling.

2. For the purposes of this attachment, the region that shall be observed comprises the area bounded by the coordinates (AMG 436000E, 5742000N and 4250000E, 5754000N and 447000E5785500N and 521000E, 5801000N and 521000E, 5766000N and 476000E, 5754000N and 450000E, 5753000N) as shown on the attached plan.

Groundwater Monitoring

3. A groundwater monitoring network will be maintained in the region. Sufficient data will be collected to reliably monitor and predict regional groundwater levels and trends. Databases will be maintained to store and retrieve data related to those activities.
4. The bores included in the regional groundwater monitoring network together with the monitoring frequency are listed Table A.
5. Standing water levels shall be measured according to standard operating procedures.
6. All data shall be verified before submitting for storage. Measurements shall be checked against previous measurements for that bore to detect anomalies such as:
 - incorrect recording of data;
 - the casing has collapsed or become perforated;
 - the screen or slots have become blocked.
7. The occurrence and cause of data anomalies shall be recorded and procedures instituted to prevent their recurrence.
8. Preventative maintenance shall be carried out to all surface fittings, bores shall be kept secure from illegal use, vandalism or contamination.
9. The structural condition of the bores shall be verified to ascertain if:-
 - the casing has collapsed or become perforated;
 - the screen or slots have become blocked.
10. All damaged or malfunctioning bores shall be repaired substituted or replaced,
11. All unwanted damaged or failed bores shall be decommissioned.
12. Bore condition and the works carried out to repair and replace bores shall be reported.
13. The regional potentiometric surface levels for the main aquifers shall be reported as contour maps.

Groundwater Modelling

14. Groundwater modelling of the region shall be performed to assist in predicting the effects of mine depressurising on regional groundwater levels.

15. Reports and results of modelling runs shall contain the predictions, previous predictions and actual values for groundwater extractions and potentiometric levels of groundwater.

Land Level Surveying

16. Land Level Surveys of the region shall be undertaken to determine the extent of land subsidence associated with mine depressurising.
17. Survey intervals and reports of survey results shall be carried out at no greater than 5 year intervals and more frequently where significant subsidence is being recorded. The next program will be completed by the year 2019/2020
18. Surveys shall be undertaken to not less than third order accuracy.

Land Level Modelling

19. Land level modelling of the region shall be performed to assist in predicting the effects of groundwater depressurisation on land subsidence.

ARRANGEMENTS FOR MANAGING THE PROGRAM

20. The conduct of the monitoring, modelling and reporting is to be reviewed by the Regional Monitoring Committee having representatives of mine operators, (Energy Australia, Engie and AGL Loy Yang), The Department of Economic Development, Jobs, Transport & Resources and the Minister responsible for the *Water Act 1989* or his delegate. The Committee may make recommendations to the Minister responsible for the *Water Act 1989* or his delegate to amend the regional program in order to:
 - a. maintain and/or enhance the regional monitoring and assessment program; and
 - b. to adjust and refine the regional program to take account of:
 - results generated by the program;
 - changes in mining and depressurizing activity;
 - emerging regional issues associated with depressurizing activities;
 - advances in technology; and
 - c. maintaining a cost effective program.
21. The program shall be consistent with the programs previously carried out by the State Electricity Commission of Victoria to determine the impacts of dewatering/depressurisation both on site and regionally and must be maintained to the satisfaction of the Director of Compliance, Earth Resources Regulation and the Minister responsible for the *Water Act 1989* or his delegate.

REPORTING

22. The licensee shall ensure that results of the regional monitoring program are reported to the Minister responsible for the *Water Act* 1989 or his delegate and the Environmental Review Committee annually and at any other times as required under the Groundwater Licence.
23. An annual report shall be prepared each September detailing:
 - a. the monitoring activity undertaken in the past year;
 - b. any amendments to the monitoring network;
 - c. any issues arising from the monitoring results including significant variations to predicted trends.
24. The annual report shall be made available to members of the public on request.
25. A comprehensive review shall occur at not less than at 5 yearly intervals, or more frequently if circumstances change or as deemed necessary by the Regional Monitoring Committee.
26. The comprehensive review shall include:
 - a. detailed analysis of measured regional groundwater levels and trends;
 - b. detailed analysis of measured regional land subsidence and trends;
 - c. contour maps of regional potentiometric surface levels for the main aquifers;
 - d. contour maps of regional land subsidence;
 - e. results from groundwater and land subsidence models;
 - f. based on the modelling, detailed predictions of future regional groundwater levels and land level trends;
 - g. any issues arising from the monitoring results including significant variations to previously predicted trends;
 - h. recommendations to amend and enhance the regional monitoring program;
 1. where necessary, recommendations to manage regional issues resulting from mine depressurisation.
27. The licensee shall ensure that results of the comprehensive review are reported to the Minister responsible for the *Water Act* 1989 or his delegate.
28. The next review will be completed in 2022/2021

TABLE A

SEC	Inter	Seam-id	Aquifer	Easting	Northing	Transducer	Monitored Interval	Readings
Bore_id	Seam-id					(m)	from	per
							Screen	year
							To (m)	
51967	s01		Traralgon	470938	5770583		569.5	3
51979	s01		Traralgon	471063	5770578			3
52179	s02	bst	Basalt	459746	5760120		204	6
52204	s01	s219	Traralgon	465327	5762997		357	3
52310	s01		Morwell	469683	5772517		320	3
52472	s01		Morwell	466958	5769637		466.1	3
52477	s01		Traralgon	460442	5763006		171	3
52594	s01	s207	Traralgon	462932	5760496		110.7	3
52676	s01	s207	Traralgon	464241	5773325		672.5	3
52678	s01	s000	Basement	469681	5772509		694	3
52809	v01		Morwell	471137	5770563	449.8		3
52809	v02		Morwell	471137	5770563	430		3
52809	v03		Morwell	471137	5770563	405.3		3
52809	v04		Morwell	471137	5770563	392.6		3
52809	v05		Morwell	471137	5770563	350.1		3
52809	v06		Morwell	471137	5770563	319.9		3
52809	v07		Morwell	471137	5770563	289.7		3
52809	v08		Morwell	471137	5770563	255.7		3
52809	v09		Morwell	471137	5770563	245		3
52809	v10		Morwell	471137	5770563	230.8		3
52809	v11		Morwell	471137	5770563	205.1		3
52809	v12		Morwell	471137	5770563	180.1		3
52809	v13		Morwell	471137	5770563	149.9		3
52809	v14		Morwell	471137	5770563	125.2		3
52810	v04		Morwell	471153	5770560	595.3		3
52810	v05		Morwell	471153	5770560	587.3		3
52810	v06		Morwell	471153	5770560	580.3		3
52810	v07		Morwell	471153	5770560	543.8		3
52810	v08		Morwell	471153	5770560	507.8		3
52810	v09		Morwell	471153	5770560	480.3		3
52810	v10		Morwell	471153	5770560	458.3		3
52883	v01	s1000	Overburden	471070	5770575	69.8		3
52883	v02	s1000	Overburden	471070	5770575	36		3
52984	s01	s207	Traralgon	466677	5767549		350	3
52985	s01	s602	Morwell	466670	5767552		98	3
53038	s03	s304	Morwell	462234	5769287		327.2	3
53038	v01	s219	Traralgon	462234	5769287	414		3
53038	v02	s301s	Morwell	462234	5769287	387		3
53055	s01	s304	Morwell				384.5	3
53075	v01	s304	Morwell	463193	5768355	227.8		3
53075	v02	s408	Morwell	463193	5768355	177.8		3
53118	v01	s214	Traralgon	462399	5770406	542.6		3
53118	v02	s219	Traralgon	462399	5770406	523		3
53118	v03	s219	Traralgon	462399	5770406	508.7		3
53118	v04	s219	Traralgon	462399	5770406	499		3
53118	v05	s304	Morwell	462399	5770406	438.2		3
53118	v06	s306	Morwell	462399	5770406	454.4		3
53118	v07	s306	Morwell	462399	5770406	429.6		3
53118	v08	s402	Morwell	462399	5770406	413.3		3
53118	v09	s407	Morwell	462399	5770406	407.1		3
53118	v10	s500	Morwell	462399	5770406	399.6		3
53118	v11	s501	Morwell	462399	5770406	378.8		3
53118	v12	s600u	Morwell	462399	5770406	348.4		3
53118	v13	s700	Morwell	462399	5770406	336.7		3
53118	v14	s700	Morwell	462399	5770406	329		3
53118	v15	s700	Morwell	462399	5770406	303.2		3
53118	v16	s700	Morwell	462399	5770406	289		3
53118	v17	s701	Morwell	462399	5770406	263.1		3
53118	v18	s701	Morwell	462399	5770406	229.2		3
53118	v19	s800	Morwell	462399	5770406	208.4		3
53118	v20	s800	Morwell	462399	5770406	179		3
53119	v01	s801	Morwell	462411	5770403	136		3
53119	v02	s801	Morwell	462411	5770403	121.6		3

TABLE A

SEC	Inter	Seam-id	Aquifer	Easting	Northing	Transducer	Monitored Interval	Readings	
Bore_id	Seam-id					(m)	from	Screen To (m)	per year
53119	v03	s900	Morwell	462411	5770403	118.4			3
53119	v04	s900i	Morwell	462411	5770403	110.7			3
53119	v05	s900	Morwell	462411	5770403	90			3
53298	v01	s000	Basement	459683	5761763	224.8			3
53298	v02	s000	Basement	459683	5761763	184.4			3
53298	v03	s120	Basalt	459683	5761763	170.1			3
53298	v04	s120	Basalt	459683	5761763	138.2			3
53299	v01	s120	Basalt	459684	5761767	110			3
53299	v02	s207	Traralgon	459684	5761767	79.7			3
53299	v03	s207	Traralgon	459684	5761767	52.3			3
53299	v04	s1000	Overburden	459684	5761767	27.5			3
53352	v01	s000	Basement	460222	5764647	417.5			3
53352	v02	s000	Basement	460222	5764647	382.5			3
53353	s09	s500	Morwell	460216	5764636		40.2	43.2	3
53353	v01	s120	Basalt	460216	5764636	317.9			3
53353	v02	s120	Basalt	460216	5764636	280			3
53353	v03	s213	Traralgon	460216	5764636	236			3
53353	v04	s219	Traralgon	460216	5764636	213.7			3
53353	v05	s301s	Morwell	460216	5764636	181.4			3
53353	v06	s304	Morwell	460216	5764636	138.2			3
53353	v07	s306	Morwell	460216	5764636	87.2			3
53353	v08	s403	Morwell	460216	5764636	70			3
80445	v01	s304	Morwell	458006	5769795	579.9			3
80445	v02	s408	Morwell	458006	5769795	549.7			3
80445	v03	s500	Morwell	458006	5769795	525			3
80489	t01	s214	Traralgon	457978	5766531	589.5			3
80489	v02	s214	Traralgon	457978	5766531	589.5			3
80489	v03	s216	Traralgon	457978	5766531	576.6			3
80489	v04	s219	Traralgon	457978	5766531	568			3
80489	v05	s301s	Morwell	457978	5766531	532			3
80489	v06	s301s	Morwell	457978	5766531	517.7			3
80490	t02	s216	Traralgon	458524	5766257	329.7			3
80490	v01	s214	Traralgon	458524	5766257	341.4			3
80490	v03	s216	Traralgon	458524	5766257	329.7			3
80490	v04	s219	Traralgon	458524	5766257	320.9			3
80490	v05	s301s	Morwell	458524	5766257	287.1			3
80490	v06	s303s	Morwell	458524	5766257	256.6			3
80490	v07	s306	Morwell	458524	5766257	229.3			3
80490	v08	s306	Morwell	458524	5766257	214.6			3
80490	v09	s413	Morwell	458524	5766257	189.2			3
80491	t01	s207	Traralgon	460202	5768587	524.4			3
80491	v02	s207	Traralgon	460202	5768587	524.4			3
80491	v03	s214	Traralgon	460202	5768587	500.6			3
80491	v04	s215	Traralgon	460202	5768587	484.3			3
80491	v05	s219	Traralgon	460202	5768587	470			3
80491	v06	s306	Morwell	460202	5768587	416.5			3
80491	v07	s409	Morwell	460202	5768587	399.2			3
80491	v08	s501	Morwell	460202	5768587	365.3			3
80491	v09	s601	Morwell	460202	5768587	311.8			3
80491	v10	s701	Morwell	460202	5768587	225.6			3
80491	v11	s801	Morwell	460202	5768587	124.3			3
80491	v12	s900	Morwell	460202	5768587	81.8			3
80491	v12	s900	Morwell	460202	5768587	81.8			3
80495	s01	s120	Basalt	458455	5761927		236	239	3
80496	s06	s1000	Overburden	458455	5761927		4.5	6	3
80496	v01	s207	Traralgon	458455	5761927	132.8			3
80496	v02	s219	Traralgon	458455	5761927	110			3
80496	v03	s301s	Morwell	458455	5761927	82.6			3
80496	v04	s1000	Overburden	458455	5761927	52.1			3
80496	v05	s1000	Overburden	458455	5761927	26.5			3
90323	s01	m2	Morwell	485442	5772772		211	214	6
90324	s01	m1b	Morwell	476082	5775537		377	384	6
90325	s01	m1b	Morwell	485681	5776745		344.5	351	6
90330	s01	m2c	Morwell	471964	5767940		478	481	6
90335	s01	m1b	Morwell	480370	5775990		398	401	6
90335	s02	m1b	Morwell	480370	5775990		385	388	6
90339	s01	l2	Traralgon	475590	5772706		632.5	652	6

TABLE A

SEC	Inter	Seam-id	Aquifer	Easting	Northing	Transducer	Monitored Interval		Readings
Ref_id	Seam-id					(m)	from	To (m)	per year
90340	v01	m2bco	Morwell	476111	5775526	545.4			6
90340	v03	m2c	Morwell	476111	5775526	496.4			6
90340	v04	m2s	Morwell	476111	5775526	475.7			6
90340	v05	m2co	Morwell	476111	5775526	451			6
90340	v06	m2co	Morwell	476111	5775526	443.3			6
90340	v07	m2co	Morwell	476111	5775526	429.1			6
90340	v08	m2co	Morwell	476111	5775526	405.4			6
90340	v09	m1bco	Morwell	476111	5775526	365			6
90340	v10	m1bintr	Morwell	476111	5775526	350.8			6
90340	v11	m1bintr	Morwell	476111	5775526	336.6			6
90340	v12	m1bco	Morwell	476111	5775526	300.3			6
90340	v13	m1a	Morwell	476111	5775526	275.6			6
90340	v14	m1aco	Morwell	476111	5775526	245.4			6
90340	v16	m1aco	Morwell	476111	5775526	184.4			6
90340	v17	yco	Yallourn	476111	5775526	144.1			6
90340	v18	yco	Yallourn	476111	5775526	129.9			6
90343	s01	m2	Morwell	480772	5770910		322	325	6
100093	s01	t2	Traralgon	496899	5770187		116	122.5	6
100094	s01	t2	Traralgon	498392	5768601		210.5	211.5	6
100094	s02	t2	Traralgon	498392	5768601		196.5	197.5	6
100096	s01	t2	Traralgon	498379	5768515		196.5	202.5	6
100097	s01	t2	Traralgon	496354	5766284		228	234	6
110032	s01	m1b	Morwell	463793	5781840		413	419	6
110034	s01	m2c	Morwell	468243	5784230		398	404.5	6
110036	s01	t2	Traralgon	471558	5778928		724.3	727.6	6
110037	s01	m2	Morwell	457565	5776816		574.5	578	6
110037	s02	m2	Morwell	457565	5776816		559	564.2	6
110038	s01	m2	Morwell	462310	5778090		529.5	533	6
110038	s02	m2c	Morwell	462310	5778090		500	506.5	6
110040	s01	m1b	Morwell	460886	5777315		317	323.5	6
110042	s01	t2	Traralgon	465399	5778355		585.5	595	6
110043	s01	hhf	Overburden	472688	5781606		604	617	6
130165	s01	m2a	Morwell	470581	5766114		254.2	257.2	6
130167	s01	t2	Traralgon	470769	5760829		172	173.9	6
130176	s01	t2	Traralgon	470515	5766073		516	517	6
130176	s02	t1	Traralgon	470515	5766073		502.5	503.5	6
130183	s01	t2	Traralgon	467810	5763371		457.5	463.5	6
130183	s02	t1	Traralgon	467810	5763371		420	423	6
130198	s01	m2c	Morwell	470132	5764486		70	73	6
130205	s01	t1	Traralgon	470056	5764145		158.5	170.5	6
130212	s01	t2	Traralgon	468075	5760566		157	163	6
180177	s01	t2	Traralgon	492005	5771760		172.5	179	6
180188	s01	t2	Traralgon	492016	5771729		196.9	199.1	6
180189	s01	t2	Traralgon	492019	5771710		196	202	6
180196	s01	t2	Traralgon	489766	5769550		312.5	319	6
180204	s01	m1a	Morwell	489982	5775902		298	304.5	6
180207	s01	t2	Traralgon	487808	5768055		351.4	354.5	6
180220	s01	t2	Traralgon	491927	5774950		218	301.5	6
180221	s01	t2	Traralgon	489043	5769555		301	311	6
190046	s01	t2	Traralgon	508376	5771796		190.2	196.2	6
210051	s01	t2	Traralgon	488413	5759579	329.4	335.2	6	
220196	s01	t2	Traralgon	479470	5765095		349.5	369.4	6
220197	s01	t2	Traralgon	479488	5765101		352	355	6
220197	s02	t2	Traralgon	479488	5765101		339	340.5	6
220197	s03	t2	Traralgon	479488	5765101		330.5	332.5	6
220197	s04	t2	Traralgon	479488	5765101		326	327.5	6
220197	s05	t2	Traralgon	479488	5765101		321	323.5	6
240047	s01	m1bintr	Morwell	478998	5778765		426	439	6
240052	s01	m2s	Morwell	482842	5786326		568.8	577.8	6
440056	s01	m1bs	Morwell	486646	5780346		398	401.5	6
440056	s02	m1bs	Morwell	486646	5780346		392	395	6
440058	s01	m2cs	Morwell	484085	5779315		526	535	6
440341	s01	t1	Traralgon	490285	5787763		660	666	6
530024	s01	m2co	Morwell	471409	5792603		234	240	6
530025	s01	m2d	Morwell	467784	5787307		407	413	6
920007	s01	t2	Traralgon	508727	5764044		725	737	6

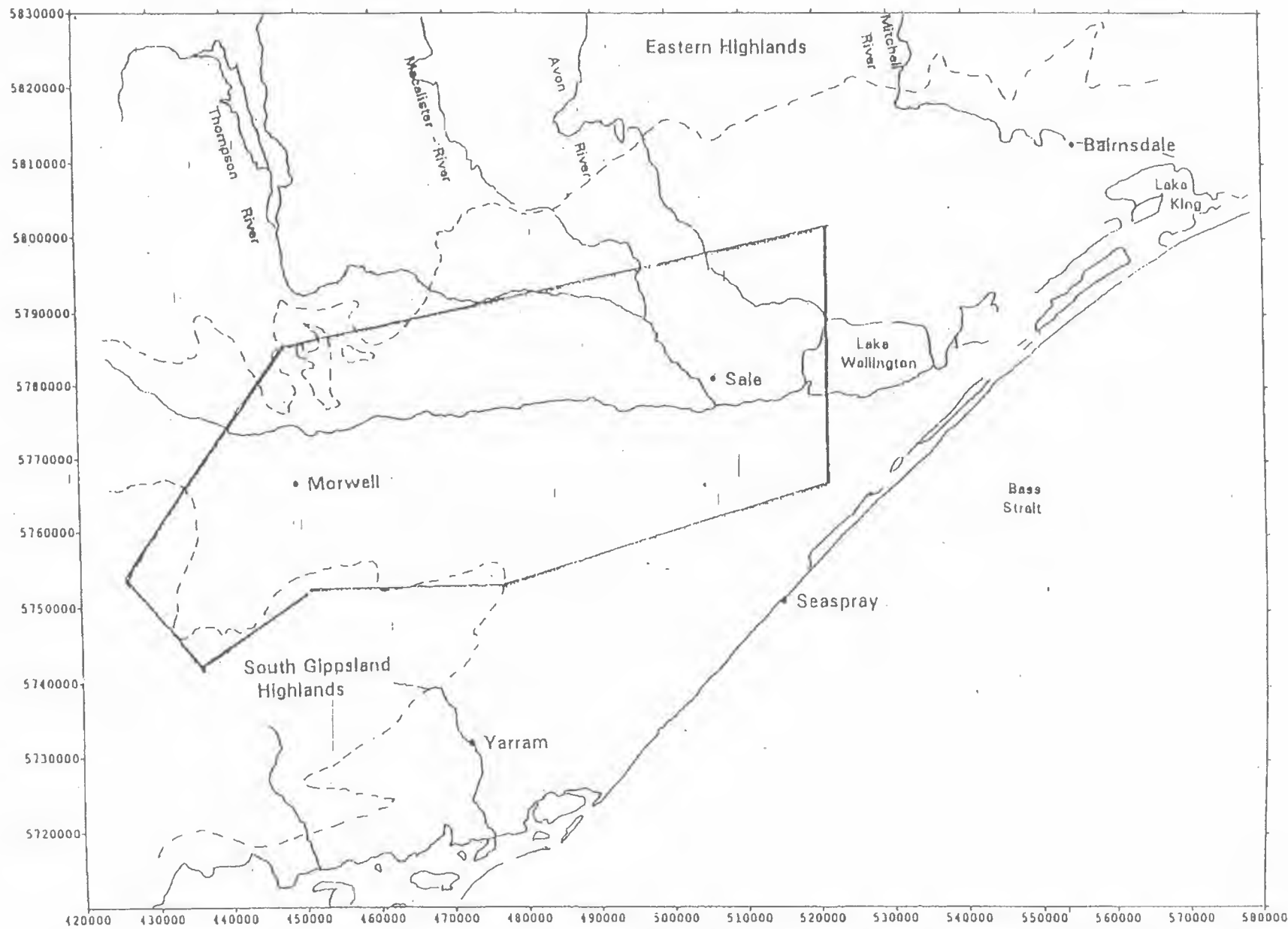
TABLE A

SEC	Inter	Seam-id	Aquifer	Easting	Northing	Transducer	Monitored Interval	Readings	
Bore_id	Seam-id					(m)	from	Screen To (m)	per year
40195	s01	m2s	Morwell	453719	5776453		456		12
40195	s02	m2s	Morwell	453719	5776453		449.5	452.5	12
40196	s01	m1b	Morwell	455344	5775761		331	334	12
40196	s02	m1b	Morwell	455344	5775761		309	315	12
10942	s01	m2	Morwell	451332	5773687				12
12034	s01	m2	Morwell	444974	5767679		297	301.9	3
12758	s01	m1b	Morwell	445713	5769485		250.5	263.5	12
13054	s01	m1b	Morwell	451007	5774117		324.5	344	12
13101	s01	m1s	Morwell	450630	5767792		606	613	12
13190	v01	m1b	Morwell	452103	5771191	460.4			12
13190	v02	m1b	Morwell	452103	5771191	439.6			12
13190	v03	m1b	Morwell	452103	5771191	412.3			12
13190	v04	m1a	Morwell	452103	5771191	385			12
13190	v05	m1aco	Morwell	452103	5771191	370.8			12
13190	v06	m1aco	Morwell	452103	5771191	358.2			12
13190	v07	m1aint	Morwell	452103	5771191	345.5			12
13190	v08	m1aint	Morwell	452103	5771191	327.2			12
13190	v09	m1aco	Morwell	452103	5771191	310			12
13282	v01	m1b	Morwell	448077	5769985	248.7			12
13282	v02	m1b	Morwell	448077	5769985	244.2			12
13282	v03	m1b	Morwell	448077	5769985	225.2			12
13282	v04	m1bco	Morwell	448077	5769985	210.2			12
13282	v05	m1bco	Morwell	448077	5769985	180.7			12
13282	v06		Morwell	448077	5769985	166.2			12
13282	v07	m1a	Morwell	448077	5769985	151.7			12
13282	v08		Morwell	448077	5769985	130.8			12
13282	v09	m1aco	Morwell	448077	5769985	109.7			12
13282	v10	yc	Yallourn	448077	5769985	84.7			12
22491	s01	m1s	Morwell	442511	5764494		87.5	89	12
23263	s01	m1a3	Morwell	441274	5764838		94.2	93.9	12
23263	s02	m1a2	Morwell	441274	5764838		91.1	91.4	12
23263	s03	m1a1	Morwell	441274	5764838		84.6	85.6	12
23270	s01	m1a3	Morwell	440655	5764395		45.7	46.3	12
23288	s01	m1a1	Morwell	440736	5763142		46.9	48.5	12
23369	s01	m1a1	Morwell	441501	5767590		143	144	12
23567	s01	a	Morwell	439942	5767338		124	130	12
23570	s01	bas	Basement	441817	5763673		181	187	12
23607	s01	m2a	Morwell	439335	5766552		83.6	90.1	12
23615	s01	a	Morwell	439463	5764961		59.1	66.1	12
23694	s01	m2a	Morwell	440805	5763059		65.6	66.6	12
23780	s01	m2a	Morwell	441500	5767578		187.5	194	12
24558	s01	m1a	Morwell	441178	5768165		164	170	12
24651	s01	b	Morwell	441440	5767969		170	173	12
24652	s01	a	Morwell	441526	5768866		192.5	195.5	12
61095	s01	m2	Morwell	443589	5763301		99.6	100.8	12
61320	s01	e	Morwell	446532	5761657		427.9	434	12
61333	s01	tl	Traralgon	450387	5764284		587.3	593.6	12
61348	s01	tl	Traralgon	449953	5762271		550.4	557.4	12
61502	s01	m1a	Morwell	443795	5759833		339	345	12
61502	s02	m1a	Morwell	443795	5759833		339	340.4	12
61631	v01	m1bco	Morwell	450379	5764307	294.4			12
61631	v02	m1bco	Morwell	450379	5764307	281.7			12
61631	v03	m1a	Morwell	450379	5764307	272.4			12
61631	v04	m1a	Morwell	450379	5764307	262.2			12
61631	v05	m1a	Morwell	450379	5764307	252			12
61631	v06	m1aco	Morwell	450379	5764307	234.8			12
61632	s01	t	Traralgon	450378	5764292		635.5	647.5	12
61691	v02		Morwell	447142	5758626	386.4			12
61691	v03		Morwell	447142	5758626	361.7			12
61691	v04	m1	Morwell	447142	5758626	301.6			12
61691	v05		Overburden	447142	5758626	222.1			12
61719	s01	m2s	Morwell	449912	5759871		309	306	12
61726	s01	m2s	Morwell	448784	5757198		321	347	12
120122	s01	m2A	Morwell	442762	5756708		291	297.5	12
120122	s02	m2A	Morwell	442762	5756708		280	287	12
120135	s01	m2A	Morwell	440668	5756479		320	323	12



TABLE A

SEC Bore_id	Inter Seam-id	Seam-id	Aquifer	Easting	Northing	Transducer (m)	Monitored Interval from	Screen To (m)	Readings per year
120141	p01	ob	Overburden	442169	5756799				12
120141	p02	ys	Yallourn	442169	5756799				12
120141	p03	ys	Yallourn	442169	5756799				12
120141	p04	m1bco	Morwell	442169	5756799				12
120141	p05	m1bco	Morwell	442169	5756799				12
120141	p06	m1a	Morwell	442169	5756799				12
120152	s01		Traralgon	000000			32.4	638.4	12
23726	s01	m2	Morwell	438701	5773468		85	194	12
23787	s01	m1a3	Morwell	438151	5773869		09.1	215.1	12
23788	s01	m2	Morwell	436100	5775669		96.5	98	12
23789	s01	m2	Morwell	437084	5774827		158.5	164.5	12
23799	s01	a	Morwell	439674	5772504		211.5	214.5	12
230034	s01	m2	Morwell	433329	5777233		52	55	12
230043	s01	m2	Morwell	430147	5776203		144	156	12
230049	s01	m2	Morwell				210	219	12
230055	s01	m2	Morwell				176	180	12

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Regional Monitoring Requirements
 Latrobe Valley Open Cut Coal Mines
 Boundary of Regional Programs

 Boundary of Gippsland Groundwater basin
 Boundary of regional programs

Appendix B – Recent Gippsland Basin Hydrogeological Reports

Recent work with reference to the hydrogeology of the Gippsland Basin and Latrobe Valley has been completed as part of the Bioregional Assessment and Latrobe Valley Regional Rehabilitation Strategy (LVRRS). The Gippsland Basin Bioregional Assessment is a Commonwealth project that provides information and scientific advice for the Independent Expert Scientific Committee (IESC) on Coal Seam Gas and Large Coal Mining Development on the impact that coal seam gas and large coal mining development may have on Australia's water resources. Five Gippsland Basin reports were published in December 2018 as part of the bioregional assessment.

- Current Water Accounts for the Gippsland Basin bioregional – Product 1.5 from the Gippsland Basin Bioregional Assessment. 2018.
- Observation analysis, statistical analysis and interpolations for the Gippsland Basin bioregion – Product 2.1 – 2.2 from the Gippsland Basin Bioregional Assessment 2018.
- Conceptual Modelling for the Gippsland Basin bioregion – Product 2.3 from the Gippsland Basin Bioregional Assessment. 2018.
- Water balance assessment for the Gippsland bioregion – Product 2.5 from the Gippsland Basin Regional Assessment 2018.
- Groundwater Numerical Modelling for the Gippsland Basin bioregion – Product 2.6.2 from the Gippsland Basin Bioregional Assessment 2018.

The Victorian Government has commenced preparation of a Regional Rehabilitation Strategy as part of its response to the 2015/16 Hazelwood Mine Fire Inquiry. The preparation of the Strategy will involve extensive geotechnical, groundwater and surface water studies, the assessment of potential regional impacts on the environment, and the evaluation of future land use options and be completed by Jun 2020. The Victorian Government has appointed Professor Rae Mackay to be the Latrobe Valley Mine Rehabilitation Commissioner to lead and coordinate planning and improvements to mine rehabilitation in the Latrobe Valley.

Appendix C – Annual Groundwater Extractions

Summary of Aquifer Depressurisation Development in the Latrobe Valley

Extractor	Regional Aquifer System	Start of Extraction	End of Extraction
Hazelwood	Shallow	no extraction	no extraction
	Morwell	1961	current
	Traralgon	1970	current
Loy Yang	Shallow	no extraction	no extraction
	Morwell	1986	current
	Traralgon	1989	current
Yallourn	Shallow	1993	Intermittent (1993-2007)
	Morwell	1994	current
	Traralgon	no extraction	no extraction
Maryvale Mill (APM)	Traralgon	1945	1975

HAZELWOOD, LOY YANG AND YALLOURN MINES

Location	Bore Number	Formation	Premine collar	Base of screen below pre-mine surface	Groundwater Management Area	GDA94 Easting	GDA94 Northing	Annual Flow (ML)	Total Flow (ML)	
Hazelwood										
	13705	Morwell (M1)	52.4	168.7	Stratford Zone 1	444456.1	5766322.1	30.1		
	13708	Morwell (M1)	55.8	169.7	Stratford Zone 1	444648.2	5766358.4	28.6		
	61902	Morwell (M1)	60.0	159.7	Stratford Zone 1	445671.4	5766610.8	289.3		
	62300	Morwell (M1)	50.3	138.0	Rosedale Zone 1	443953.9	5765499.2	19.2		
	62301	Morwell (M1)	49.4	149.7	Rosedale Zone 1	443870.8	5766168.1	34.9		
	62520	Morwell (M1)	49.4	119.4	Rosedale Zone 1	444173.0	5766280.7	140.3		
	62554	Morwell (M1)	55.5	151.9	Stratford Zone 1	445464.2	5766671.8	163.6		
	62721	Morwell (M1)	56.4	137.9	Rosedale Zone 1	443482.9	5765589.5	70.6		
	63293	Morwell (M1)	56.5	129.8	Rosedale Zone 1	442981.6	5765357.9	188.4	965.0	
	13274	Morwell (M2)	63.1	225.1	Stratford Zone 1	445825.5	5765921.0	1360.2		
	13333	Morwell (M2)	55.5	246.0	Stratford Zone 1	445357.8	5766490.7	2454.1		
	13395	Morwell (M2)	58.5	231.0	Stratford Zone 1	445467.3	5766209.1	2517.0		
	62210	Morwell (M2)	55.5	185.5	Stratford Zone 1	445544.9	5766027.9	1124.2		
	62161	Morwell (M2)	50.4	269.6	Stratford Zone 1	444105.7	5766253.0	447.7		
	62326	Morwell (M2)	59.9	238.1	Stratford Zone 1	445620.2	5766042.4	3062.7	10,965.9	
		Hazelwood Total Annual Flow								11,930.9
Loy Yang										
	53912	Morwell (M2C)	67.5	203.8	Stratford Zone 1	461111.9	5767853.6	411.1		
	53993	Morwell (M2C)	72.0	243.3	Stratford Zone 1	461724.5	5768497.0	286.2		
	54336	Morwell (M2C)	69.0	231.2	Stratford Zone 1	462969.7	5767990.0	21.3		
	54346	Morwell (M2C)	72.5	247.6	Stratford Zone 1	462174.8	5768825.0	65.6		
	54421	Morwell (M2C)	69.5	241.3	Stratford Zone 1	462927.9	5768788.0	345.2		
	54461	Morwell (M2C)	71.5	247.1	Stratford Zone 1	462831.3	5769027.4	63.6		
	54462	Morwell (M2C)	67.0	234.9	Stratford Zone 1	463053.8	5768500.4	328.3		
	54551	Morwell (M2C)	72.5	242.6	Stratford Zone 1	462557.2	5769080.4	78.9		
	54667	Morwell (M2C)	77.0	250.7	Stratford Zone 1	461254.0	5768454.2	376.1		
	54808	Morwell (M2C)	70.5	257.6	Stratford Zone 1	462921.2	5769460.5	280.3		
	54665	Morwell (M2C)	70.5	257.6	Stratford Zone 1	462978.1	5769646.5	547.8		
	54985*	Morwell (M2C)	70.5	257.6	Stratford Zone 1	463332.8	5769433.4	19.3	2,823.7	
	53752	Traralgon Fm	78.8	319.1	Stratford Zone 1	460941.2	5768218.6	1603.6		
	53980	Traralgon Fm	72.0	309.9	Stratford Zone 1	461874.5	5768559.4	2655.0		
	54184	Traralgon Fm	71.0	316.1	Stratford Zone 1	461458.8	5768384.8	2341.1		
	54395	Traralgon Fm	82.0	302.5	Stratford Zone 1	462452.9	5767783.8	784.1		
	53443*	Traralgon Fm	-	-	Stratford Zone 1	462623.5	5768653.7	406.5	7,790.3	
		Loy Yang Total Annual Flow (ML)								10,614.0
Yallourn										
	25056	Morwell (M1A)	35.6	145.5	Rosedale Zone 1	445128.3	5773114.5	385.0		
	26899	Morwell (M1A)	39.0	192.9	Stratford Zone 1	445008.0	5772825.6	853.6		
	YNOC	Morwell (M1A)			Rosedale Zone 1	see YNOC Table		45.2		
		Yallourn Total Annual Flow (ML)								1,283.8
	TOTAL ANNUAL EXTRACTION 2018/2019 (ML)								23,828.7	

*See page

Table of Yallourn North Open Cut (YNOC) M1B pumping bore locations collectively metered.

Parish Code	Bore Number	MGA East	MGA North	SEC East	SEC North
TE	1941	445336.9	5776109.3	398759.7	269519.3
TE	1940	445297.8	5776094.1	398720.4	269504.5
TE	1939	TBA	TBA	398680.0	269490.0
TE	1938	445217.3	5776073.8	398639.7	269485.0
TE	1937	445176.5	5776067.2	398598.7	269478.8
TE	1936	445138.5	5776060.7	398560.7	269472.8
TE	1935	445099.2	5776056.4	398521.4	269468.9
TE	1963	444773.8	5775872.0	398193.9	269288.0
TE	1959	444750.0	5775785.6	398169.1	269201.8
TE	1957	444739.0	5775749.7	398157.7	269166.0
TE	1997	444762.2	5775828.6	398181.7	269244.7
TE	1986	444902.2	5775631.5	398319.7	269046.0
TE	1980	444691.6	5775576.2	398108.4	268993.0
TE	1979	444649.2	5775530.4	398065.5	268947.6
TE	1985	444863.4	5775641.7	398281.0	269056.6
TE	1984	444830.3	5775646.7	398247.9	269062.0
TE	1983	444793.5	5775653.7	398211.2	269069.4
TE	1982	444753.7	5775660.0	398171.4	269076.1
TE	2025	444580.1	5775461.2	397995.6	268879.1

Appendix D – Latrobe Valley Groundwater Monitoring Bore Details

LocCode	MGA E	MGA N	Install No	RL collar (mAHD)	Screen from (m)	Screen to (m)	VWP RL (mAHD)	Monitoring Unit	RWL (mAHD)	RWL date	Comments	Original Licence	Monitored	Key Bore
100093	497011.0	5770396.8	s01	129.5	116	122.5		Traralgon Fm	17.60	07-Jan-10	Standpipe sealed with VWPs	Y	Sealed	Y
100093	497011.0	5770396.8	v01	129.5			7	Traralgon Fm	9.70	01-Oct-19	Not read due to fire access issues	Y	East Run	y
100093	497011.0	5770396.8	v02	129.5			9.5	Traralgon Fm	10.47	01-Oct-19	Not read due to fire access issues	Y	East Run	Y
100094	498503.5	5768810.4	s01	142	196.5	211.5		Traralgon Fm	16.30	23-Jul-08	Same site as 100096	Y	East Run	
100096	498489.7	5768824.9	s01	143.7	196.5	202.5		Traralgon Fm	4.25	01-Oct-19	Not read due to fire access issues	Y	East Run	
100097	496466.3	5766494.2	s01	119.8	228	234		Traralgon Fm	54.33	21-Aug-13	Track Access Issue	Y	East Run	
10942	451444.5	5773871.4	s01	39				Traralgon Fm	-51.19	01-May-19	APM - VWP installed 2011	Y	Morwell Run	Y
10942	451444.5	5773871.4	v01	39			-455	M2/TFAS	-65.27	01-May-19	APM- assumed fully slotted standpipe	Y	Morwell Run	
10942	451444.5	5773871.4	v02	39			-445	Traralgon Fm	-81.28	01-May-19	APM- assumed fully slotted standpipe	Y	Morwell Run	Y
110032	463905.4	5782024.7	s01		413	419		Morwell Fm	36.89	01-Oct-19		Y	East Run	
110034	468355.4	5784414.3	s01	52.1	398	404.5		Traralgon Fm	30.10	07-Jan-10	Standpipe sealed with VWPs 2012	Y	Sealed	Y
110034	468355.4	5784414.3	v01	52.1			-347.9	Traralgon Fm	-40.27	01-Oct-19	Reclassified TR Fm 2013	Y	East Run	
110034	468355.4	5784414.3	v02	52.1			-350.9	Traralgon Fm	-28.29	01-Oct-19	Reclassified TR Fm 2013	Y	East Run	Y
110036	471670.9	5779112.6	s01	24.5	701.3	704.3		Traralgon Fm	-18.43	01-Oct-19		Y	East Run	
110037	457677.3	5777000.9	s01	36.7	564.5	578		Traralgon Fm	28.00	21-Aug-12	Sealed 2013	Y	Sealed	
110038	462421.7	5778300.2	s01	31.4	529.5	533		Traralgon Fm	32.20	20-Jun-06	Sealed	Y	Sealed	
110040	460998.3	5777499.3	s01	28.2	317	323.5		Morwell Fm	26.70	08-Dec-99	Sealed	Y	Sealed	
110042	465511.3	5778539.9	s01	32.1	585.5	595		Traralgon Fm	21.70	05-Jan-11	Private property - not accessible	Y	East Run	
110043	472800.4	5781790.5	s01	29	604	617		Traralgon Fm	25.84	01-Oct-19		Y	East Run	
120141	442281.4	5756983.2	p01	69			-189.3	Morwell Fm	67.20	24-Nov-93	Never monitored by RMC	Y	Not monitored	
120141	442281.4	5756983.2	p02	69			-143.8	Morwell Fm	66.60	14-Jun-94	Never monitored by RMC	Y	Not monitored	
120141	442281.4	5756983.2	p03	69			-105	Morwell Fm	63.90	24-Nov-93	Never monitored by RMC	Y	Not monitored	
120141	442281.4	5756983.2	p04	69			-7.5	Morwell Fm	66.00	24-Oct-94	Never monitored by RMC	Y	Not monitored	
120141	442281.4	5756983.2	p05	69			12	Morwell Fm	68.00	24-Oct-94	Never monitored by RMC	Y	Not monitored	
120141	442281.4	5756983.2	p06	69			31.5	Morwell Fm	68.20	24-Oct-94	Never monitored by RMC	Y	Not monitored	
120122	442874.1	5756892.9	s01	70.5	280	299.5		Traralgon Fm	3.38	04-Jul-13	SWL > 100m VWP to be installed	Y	Morwell Run	
120135	440780.3	5756663.4	s01	70.6	320	323		Traralgon Fm	50.38	25-Sep-19	Re-classified to Tr Fm 2013	Y	Morwell Run	
120152	445568.4	5756682.7	s01	93.5	632.4	638.4		Traralgon Fm	38.06	25-Sep-19		Y	Morwell Run	
12034	445085.9	5767863.0	s01	54.3	297	301.9		Morwell Fm	-50.9	27-Jun-79	Never monitored by RMC	Y	Not monitored	
12390	452215.4	5771375.9	v04	44.7	556	561		Morwell Fm	-30.1	30-Nov-88	Never monitored by RMC	Y	Not monitored	
12758	445825.7	5769669.5	s01	66.8	250.5	263.5		Morwell Fm	-11.00	21-Aug-89	Never monitored by RMC	Y	Not monitored	
130165	470693.0	5766298.2	s01	113.5	254.2	257.2		Morwell Fm	67.60	21-Jun-02	Standpipe sealed with VWPs 2003	Y	Sealed	Y
130165	470693.0	5766298.2	v01	113.5			31.5	Morwell Fm	2.67	01-Oct-19		Y	East Run	Y
130167	470881.5	5761012.9	s01	216.1	173.5	175.4		Traralgon Fm	77.70	08-Dec-03	Standpipe sealed with VWPs 2005	Y	Sealed	Y
130167	470881.5	5761012.9	v01	216.1			31.5	Traralgon Fm	65.08	01-Oct-19		Y	East Run	Y
130167	470881.5	5761012.9	v02	216.1			31.5	Traralgon Fm	66.40	01-Oct-19		Y	East Run	
130176	470627.8	5766257.6	s01	113.8	516	517		Traralgon Fm	35.70	15-Jun-04	Sealed 2004	Y	Sealed	
130183	467922.8	5763555.1	s01	126.7	420	423		Traralgon Fm	27.5	02-Dec-95	Never monitored by RMC Sealed 1995	Y	Not monitored	
130198	470244.8	5764670.2	s01	156.6	70	73		Morwell Fm	84.32	01-Oct-19		Y	East Run	
130205	470168.9	5764329.7	s01	158.5	158.5	170.5		Traralgon Fm	90.65	01-Oct-19		Y	East Run	
130212	468186.6	5760775.6	s01	172.3	157	163		Traralgon Fm	131.15	01-Oct-19		Y	East Run	

130213	469298.9	5766777.0	s01	82.42	16	18		Morwell Fm	76.68	01-Oct-19	Flynn Bore Road Reserve	N	East Run	
130214	469183.9	5766777.0	v01	94.99			-20.11	Morwell Fm	67.16	01-Oct-19	Flynn Bore Road Reserve	N	East Run	
130215	469436.6	5766570.7	s01	88.35	6	13		Haunted Hills Fm			Flynn Bore private property	N	East Run	
130217	469106.7	5766623.3	v01	83.41			-315.59	Traralgon Fm			Flynn Bore private property	N	East Run	
130217	469106.7	5766623.3	v02	83.41			-176.59	Morwell Fm			Flynn Bore private property	N	East Run	
130218	468246.2	5765483.7	v01	92.11			-25.89	Morwell Fm			Flynn Bore private property	N	East Run	
130219	469971.3	5765798.0	s01	111.76	21	27		Haunted Hills Fm	96.56	01-Oct-19	Flynn Bore private property	N	East Run	
130220	469599.7	5765283.3	s01	110.42	19	21		Haunted Hills Fm	97.30	01-Oct-19	Flynn Bore Road Reserve	N	East Run	
130220	469599.7	5765283.3	v01	110.42			-120.58	Morwell Fm	failed	01-Oct-19	Flynn Bore Road Reserve	N	East Run	
130220	469599.7	5765283.3	v02	110.42			-14.58	Morwell Fm	86.23	01-Oct-19	Flynn Bore Road Reserve	N	East Run	
130220	469599.7	5765283.3	v03	110.42			45.42	Yallourn Fm	96.04	01-Oct-19	Flynn Bore Road Reserve	N	East Run	
13054	451119.4	5774301.1	s01	50.3	324.5	344		Morwell Fm	11.51	13-Feb-13	Headworks damaged required rehab	Y	Morwell Run	
13101	450742.9	5767976.3	s01	63	606	613		Traralgon Fm	49.50	05-Jul-02	Sealed 2014	Y	Sealed	
13190	452215.4	5771375.9	v04	44.7			-340.3	Morwell Fm	-26.13	16-Jun-10	instrument failed	Y	Morwell Run	
13190	452215.4	5771375.9	v05	44.7			-326.1	Morwell Fm	-48.14	25-Sep-19		Y	Morwell Run	Y
13190	452215.4	5771375.9	v06	44.7			-313.5	Morwell Fm	-3.92	26-Dec-01	instrument failed	Y	Morwell Run	
13190	452215.4	5771375.9	v07	44.7			-300.8	Morwell Fm	-25.19	08-Jan-09	instrument failed	Y	Morwell Run	
13190	452215.4	5771375.9	v08	44.7			-282.5	Morwell Fm	-28.45	25-Sep-19		Y	Morwell Run	Y
13190	452215.4	5771375.9	v09	44.7			-265.3	Morwell Fm	-33.93	25-Sep-19		Y	Morwell Run	
13282	448189.9	5770169.3	v02	75.3			-168.9	Morwell Fm	-27.62	21-Jun-03	instrument failed	Y	Morwell Run	
13282	448189.9	5770169.3	v04	75.3			-134.9	Morwell Fm	-29.17	25-Sep-19		Y	Morwell Run	
13282	448189.9	5770169.3	v05	75.3			-105.4	Morwell Fm	-12.16	21-Jun-03	instrument failed	Y	Morwell Run	
13282	448189.9	5770169.3	v07	75.3			-76.4	Morwell Fm	-25.46	25-Sep-19	instrument failed	Y	Morwell Run	
13282	448189.9	5770169.3	v09	75.3			-34.4	Morwell Fm	7.05	25-Sep-19		Y	Morwell Run	
13282	448189.9	5770169.3	v10	75.3			-9.4	Yallourn Fm	11.51	25-Sep-19		Y	Morwell Run	
180177	492116.9	5771969.3	s01	137.5	172.5	179		Traralgon Fm	16.66	01-Oct-19		Y	East Run	Y
180188	492128.1	5771938.6	s01	138.6	196.9	199.1		Traralgon Fm	16.70	01-Oct-19		Y	East Run	
180189	492131.4	5771919.8	s01	139	196	202		Traralgon Fm	16.75	01-Oct-19		Y	East Run	
180196	489765.4	5769576.1	s01	165.9	312.5	319		Traralgon Fm	89.96	01-Oct-19		Y	East Run	
180204	490094.0	5776111.6	s01	16	298	304.5		Morwell Fm	15.38	01-Oct-19		Y	East Run	
180207	487919.4	5768264.2	s01	164	351.4	354.5		Traralgon Fm	94.24	01-Oct-19		Y	East Run	
180220	492038.8	5775159.9	s01	37.4	218	301.5		Traralgon Fm	22.14	01-Oct-19		Y	East Run	
180221	489155.2	5769764.7	s01	160.1	301	311		Traralgon Fm	88.99	01-Oct-19		Y	East Run	
190046	508487.9	5772005.6	s01	62.7	190.2	196.2		Traralgon Fm	23.55	01-Oct-19		Y	East Run	
190054	510717.2	5774505.0	s01	49.6	205	211.5		Traralgon Fm	19.90	01-Oct-19	Headworks damaged requires rehab	N	East Run	Y
190066	518206.8	5775571.2	s01	5.2	634	801		Gippsland Lst	5.28	01-Oct-19		N	East Run	Y
210051	488524.7	5759788.3	s01	194.2	329.4	335.2		Traralgon Fm	11.11	29-Aug-11	Access issues SWL>200 m required VWP	Y	East Run	Y
220196	479470.1	5765095.9	s01	133.8	349.6	369.4		Traralgon Fm	52.20	14-Dec-01	Sealed May 2013 VWP installed	Y	Sealed	
220196	479470.1	5765095.9	v01	133.8			-229.2	Traralgon Fm	43.95	01-Oct-19		Y	East Run	
220196	479470.1	5765095.9	v02	133.8			-221.2	Traralgon Fm	21.87	01-Oct-19		Y	East Run	
220197	479600.4	5765285.3	s01	133.7	339	340.5		Traralgon Fm	111.70	21-Aug-12	Sealed in 2013 same site as 220196	Y	Sealed	
22491	442623.8	5764678.1	s01	58.2	87.5	89		Morwell Fm	26.20	20-Jan-11	In mine batters removed from network	Y	Engie to seal	
230034	433441.0	5777417.5	s01	67.4	52	55		Traralgon Fm	56.82	25-Sep-19		Y	Morwell Run	
230043	430259.2	5776387.4	s01	67.3	144	156		Traralgon Fm	69.93	25-Sep-19		Y	Morwell Run	

230049	429607.6	5774059.8	s01	56.3	210	219		Traralgon Fm	74.73	25-Sep-19		Y	Morwell Run	
230055	426835.7	5773342.0	s01	58	176	180		Traralgon Fm	69.62	25-Sep-19		Y	Morwell Run	
23263	441386.9	5765022.4	s01	70.73	84.6	91.5		Morwell Fm	12.20	25-Sep-19		Y	Morwell Run	Y
23270	440767.3	5764580.0	s01	65.8	45.7	46.3		Morwell Fm	54.37	25-Sep-19		N	Morwell Run	
23271	442220.9	5765473.3	s01	61	112.5	113.1		Morwell Fm	42.94	11-Sep-19	Assessed as blocked, not replaced inside mining lease & not a licenced bore. Engie to seal	N	Engie	
23288	440848.0	5763326.0	s01	69.8	46.9	48.5		Morwell Fm	45.01	25-Sep-19		Y	Morwell Run	
23369	441613.4	5767774.1	S01	78.2	143	144		Morwell Fm	2.80	15-Jun-94	Sealed 2002 VWP installed	Y	Sealed	
23369	441613.4	5767774.1	v01	78.2			-58.8	Morwell Fm	-5.57	25-Sep-19		Y	Morwell Run	
23567	440054.7	5767522.5	s01	138.9	124	130		M2/TFAS	89.80	25-Sep-19		Y	Morwell Run	
23570	441929.4	5763857.5	s01	59.8	181	187		M2/TFAS	-20.78	25-Sep-19	Monitored by Engie	Y	Engie	
23607	439447.4	5766736.9	s01	135.5	83.6	90.1		M2/TFAS	54.24	16-Jun-10	Sealed 2011 VWPs installed	Y	Sealed	Y
23607	439447.4	5766736.9	v01	135.5			43.5	M2/TFAS	45.36	25-Sep-19		Y	Morwell Run	
23607	439447.4	5766736.9	v02	135.5			47.5	M2/TFAS	47.32	25-Sep-19		Y	Morwell Run	Y
23615	439575.6	5765145.0	s01	89.4	59.1	66.1		M2/TFAS	64.35	25-Sep-19		Y	Morwell Run	
23694	440917.3	5763243.8	s01	69.9	65.6	66.6		M2/TFAS	59.00	25-Sep-19		Y	Morwell Run	
23726	438813.6	5773652.1	s01	92.7	185	194		Traralgon Fm	94.52	25-Sep-19		Y	Morwell Run	
23780	441612.2	5767762.3	s01	78.2	187.5	194		M2/TFAS	55.20	06-Jan-98	Sealed 2002 VWPs installed	Y	Sealed	
23780	441612.2	5767762.3	v01	78.2			-95.8	M2/TFAS	-7.48	25-Sep-19		Y	Morwell Run	
23787	438263.2	5774053.7	s01	81.8	209	215		Morwell Fm	84.75	25-Sep-19		Y	Morwell Run	
23788	436212.4	5775853.2	s01	55.4	96.5	98		Traralgon Fm	56.20	07-May-07	Valve siezed cant read pressure	Y	Morwell Run	
23789	437196.5	5775011.0	s01	72	158.5	164.5		Traralgon Fm	81.46	25-Sep-19		Y	Morwell Run	
23799	439786.3	5772688.9	s01	155.1	211.5	214.5		Traralgon Fm	85.64	08-Jan-08	Sealed 2008 VWPs installed	Y	Sealed	
23799	439786.3	5772688.9	v01	155.1			-56.9	Traralgon Fm	81.66	25-Sep-19		Y	Morwell Run	
23799	439786.3	5772688.9	v02	155.1			-57.9	Traralgon Fm	84.52	25-Sep-19		Y	Morwell Run	
240047	479110.7	5778949.4	s01	44.1	426	439		Morwell Fm	29.50	05-Jan-11	Access issues	Y	East Run	
240051	474520.0	5779237.0	s01	18.8	655.6	675.2		Traralgon Fm			Never monitored by RMC	N	Not monitored	
240052	482955.2	5786445.5	s01	25.4	568.8	577.8		Traralgon Fm	-2.55	01-Oct-19	Aug 2011 reading high jump	Y	East Run	
24558	441290.8	5768349.6	s01	79.2	164	170		Morwell Fm	47.00	11-Dec-90	Never monitored by RMC	Y	Not monitored	
24651	441552.4	5768153.6	s01	74.5	170	173		Morwell Fm	44.40	06-Jan-98	Never monitored by RMC	Y	Not monitored	
24652	441638.8	5769050.8	s01	80.2	192.5	195.5		Morwell Fm	45.60	19-May-92	Never monitored by RMC	Y	Not monitored	
25952	441054.3	5766503.8	v01	91.15			-41.85	Morwell Fm	need approval	16-Apr-19	Exergen bore Roadside reserve,	N	Morwell Run	
25952	441054.3	5766503.8	v02	91.15			-16.45	Morwell Fm	need approval	16-Apr-19	Exergen bore Roadside reserve	N	Morwell Run	
31694	448305.2	5775545.2	s01	36.2	217.1	220.1		Morwell Fm	7.73	25-Sep-19	Bore assessed 2018	N	Morwell Run	
40195	453831.3	5776637.3	s01	41.1	449.5	452.5		Traralgon Fm	7.55	01-Oct-19		Y	East Run	
40196	455456.5	5775945.0	s01	35	331	334		Morwell Fm	32.03	01-Oct-19		Y	East Run	
440056	486758.4	5780556.0	s01	40.2	392	401.5		Morwell Fm	21.40	01-Oct-19	2018 access issues resolved	Y	East Run	Y
440058	484197.4	5779524.9	s01	26.5	526	535		M2/TFAS	8.84	21-Jan-13	Sealed 2013 on new highway alignment	Y	Sealed	
440341	490397.2	5787973.0	s01	23	660	666		Traralgon Fm	-1.51	01-Oct-19		Y	East Run	Y
51967	471050.7	5770767.4	s01	71.1	569.5	591.5		Traralgon Fm	42.56	19-Feb-18	Blocked requires rehab.	Y	East Run	
51979	471175.2	5770762.1	s01	70.5	374	380.5		Morwell Fm	48.14	01-Oct-19		Y	East Run	

52179	459858.2	5760304.2	s02	101.4	214	230		Basement			Never monitored by RMC	Y	Not monitored	
52204	465439.7	5763181.5	s01	172.8	357	360		Traralgon Fm	132.30	02-Sep-19	Monitored by Loy Yang (annual run)	Y	Loy Yang	
52268	464326.4	5773271.2	s01	46.9	428.9	431.9		Morwell Fm	27.31	01-Oct-19		N	East Run	
52269	471767.9	5775143.3	s01	39.1	367.3	376.8		Morwell Fm	32.30	01-Oct-19		N	East Run	
52310	469795.1	5772701.9	s01	61.4	320	333		Morwell Fm	34.00	01-Oct-19		Y	East Run	
52472	467070.0	5769821.5	s01	56.4	466.1	479		Traralgon Fm	39.94	01-Oct-19	Reclassifies TR intraseam not MFAS 2013	Y	East Run	
52477	460554.2	5763190.8	s01	87.1	171	177		Traralgon Fm	11.78	02-Sep-19	Monitored by Loy Yang (annual run)	Y	Loy Yang	
52594	463044.0	5760680.9	s01	194.3	110.7	123.8		Traralgon Fm	116.80	25-Sep-95	Sealed, never read by RMC	Y	Previously LY	
52676	464353.9	5773509.6	s01	44.9	672.5	692		Traralgon Fm	24.09	01-Oct-19		Y	East Run	
52678	469793.5	5772693.0	s01	61.6	694	694		Basement	11.44	01-Oct-19		Y	East Run	
52809	471249.1	5770747.5	v02	70.4				Morwell Fm	-9.37	01-Oct-19		Y	East Run	
52809	471249.1	5770747.5	v03	70.4				Morwell Fm	-2.96	01-Oct-19		Y	East Run	
52809	471249.1	5770747.5	v04	70.4				Morwell Fm	-14.37	01-Oct-19		Y	East Run	Y
52809	471249.1	5770747.5	v06	70.4				Morwell Fm	13.97	01-Oct-19		Y	East Run	
52809	471249.1	5770747.5	v07	70.4				Morwell Fm	3.55	25-Jun-10	Instrument failure	Y	East Run	
52809	471249.1	5770747.5	v08	70.4				Morwell Fm	19.43	01-Oct-19		Y	East Run	
52809	471249.1	5770747.5	v09	70.4				Morwell Fm	24.77	01-Oct-19		Y	East Run	
52809	471249.1	5770747.5	v10	70.4				Morwell Fm	21.25	01-Oct-19		Y	East Run	Y
52809	471249.1	5770747.5	v12	70.4				Yallourn Fm	34.37	01-Oct-19		Y	East Run	
52809	471249.1	5770747.5	v13	70.4				Yallourn Fm	34.96	01-Oct-19		Y	East Run	
52809	471249.1	5770747.5	v14	70.4				Yallourn Fm	38.42	01-Oct-19		Y	East Run	
52810	471265.2	5770744.6	v04	70.4				Traralgon Fm	-107.51	09-Aug-17	Headworks damage required rehab	Y	East Run	
52810	471265.2	5770744.6	v05	70.4				Traralgon Fm	-99.53	29-Dec-08	Instrument failure	Y	East Run	
52810	471265.2	5770744.6	v07	70.4				Traralgon Fm	-93.35	11-Aug-16	Headworks damage required rehab	Y	East Run	
52810	471265.2	5770744.6	v09	70.4				Morwell Fm	-36.28	09-Aug-17	Headworks damage required rehab	Y	East Run	Y
52810	471265.2	5770744.6	v10	70.4				Morwell Fm	-37.59	09-Aug-17	Headworks damage required rehab	Y	East Run	Y
52883	471182.1	5770759.2	v01	70.6				Haunted Hills Fm	46.65	01-Oct-19		Y	East Run	Y
52883	471182.1	5770759.2	v02	70.6				Haunted Hills Fm	48.63	01-Oct-19		Y	East Run	
52984	466789.0	5767733.2	s01	84.3	350	353		Traralgon Fm	35.10	27-Mar-96	Never monitored by RMC	Y	Previously LY	
52985	466782.4	5767736.5	s01	84.4	98	101		Morwell Fm	66.50	27-Mar-96	Never monitored by RMC	Y	Previously LY	
530024	471521.0	5792812.6	s01	60.2	234	240		Morwell Fm	14.46	01-Oct-19		Y	East Run	
530025	467896.9	5787491.0	s01	68	407.2	413		Traralgon Fm	-33.79	01-Oct-19	Re-classified to TFAS 2013	Y	East Run	
53038	462346.2	5769471.2	s01	74.6				Morwell Fm	33.60	27-Oct-96	Never monitored by RMC	Y	Not monitored	
53055	459791.9	5768182.4	s01	54.2	384.5	387.5		Morwell Fm	-36.10	27-Aug-04	Previously monitored by Loy Yang	Y	Previously LY	
53075	463305.9	5768539.9	v01	66.6				Morwell Fm	-26.80	07-Jan-02	Previously monitored by Loy Yang	Y	Previously LY	
53075	463305.9	5768539.9	v02	66.6				Morwell Fm	10.20	07-Aug-00	Previously monitored by Loy Yang	Y	Previously LY	
53118	462511.7	5770590.3	v01	85.8				Traralgon Fm	-30.90	25-Sep-95	Instrument failure	Y	Not monitored	
53118	462511.7	5770590.3	v05	85.8				Morwell Fm	-0.40	01-Oct-98	Instrument failure	Y	Not monitored	
53118	462511.7	5770590.3	v09	85.8				Morwell Fm	-31.90	01-Oct-19		Y	East Run	
53118	462511.7	5770590.3	v13	85.8				Morwell Fm	-250.9	01-Oct-19		Y	East Run	
53118	462511.7	5770590.3	v14	85.8				Morwell Fm	28.45	22-Aug-18	Instrument failure	Y	East Run	
53118	462511.7	5770590.3	v15	85.8				Morwell Fm	-24.86	04-Feb-16	Instrument failure	Y	East Run	
53118	462511.7	5770590.3	v16	85.8				Morwell Fm	-10.51	01-Oct-19		Y	East Run	
53118	462511.7	5770590.3	v17	85.8				Morwell Fm	31.42	01-Oct-19		Y	East Run	

53118	462511.7	5770590.3	v19	85.8			-122.6	Morwell Fm	51.91	27-Mar-19		Y	East Run	
53118	462511.7	5770590.3	v20	85.8			-93.2	Morwell Fm	-1.63	01-Oct-19		Y	East Run	
53119	462523.1	5770587.5	v02	85.8			-35.8	Yallourn Fm	40.88	01-Oct-19		Y	East Run	
53119	462523.1	5770587.5	v03	85.8			-32.6	Yallourn Fm	41.70	01-Oct-19		Y	East Run	
53119	462523.1	5770587.5	v04	85.8			-24.9	Yallourn Fm	44.14	01-Oct-19		Y	East Run	
53298	459795.1	5761947.1	v01	83.8			-141	Basement	62.46	02-Sep-19	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53298	459795.1	5761947.1	v02	83.8			-100.6	Basement	63.36	02-Sep-19	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53298	459795.1	5761947.1	v03	83.8			-86.3	Traralgon Fm	64.95	02-Sep-19	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53298	459795.1	5761947.1	v04	83.8			-54.4	Traralgon Fm	72.85	02-Sep-19	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53299	459796.7	5761951.1	v01	83.8			-26.2	Traralgon Fm	68.40	02-Sep-19	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53299	459796.7	5761951.1	v02	83.8			4.1	Traralgon Fm	71.73	02-Sep-19	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53299	459796.7	5761951.1	v03	83.8			31.5	Traralgon Fm	74.10	02-Sep-19	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53299	459796.7	5761951.1	v04	83.8			56.3	Haunted Hills Fm	76.00	02-Sep-19	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53352	460334.1	5764856.4	v01	69.3			-348.2	Basement	-5.70	13-Oct-16		Y	Previously LY	
53352	460334.1	5764856.4	v02	69.3			-313.2	Basement	-10.40	13-Oct-16		y	Previously LY	
53353	460327.5	5764845.3	v01	69.3			-248.6	Traralgon Fm Volc	-31.83	29-Jun-18	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53353	460327.5	5764845.3	v02	69.3			-210.7	Traralgon Fm Volc	-34.87	29-Jun-18	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53353	460327.5	5764845.3	v03	69.3			-166.7	Traralgon Fm	6.05	29-Jun-18	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53353	460327.5	5764845.3	v04	69.3			-144.4	Traralgon Fm	9.82	29-Jun-18	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53353	460327.5	5764845.3	v05	69.3			-112.1	Traralgon Fm	10.10	29-Jun-18	Monitored by Loy Yang (annual run)	Y	Loy Yang	
53353	460327.5	5764845.3	v06	69.3			-68.9	Morwell Fm	23.00	29-Jun-18	Monitored by Loy Yang (annual run)	Y	Loy Yang	
54348	463942.8	5761977.0	s01	218.49			49	Traralgon Fm	55.57	02-Sep-19	Monitored by Loy Yang (annual run)	N	East Run	
570011	499185.7	5789589.7	s01	12.4	642	648		Morwell Fm	-0.80	01-Oct-19		N	East Run	Y
61095	443701.4	5763485.8	s01	59.79	99.6	100.8		Traralgon Fm	2.05	10-Sep-19	Monitored by Engie	Y	Engie	
61320	446644.6	5761841.5	s01	83.9	427.9	434		Traralgon Fm	67.30	25-Sep-19		Y	Morwell Run	
61333	450499.9	5764468.2	s01	81	587.3	593.6		Traralgon Fm	38.17	25-Sep-19	Trend anomalous required rehab	Y	Morwell Run	
61348	450065.1	5762455.6	s01	105.4	550.4	557.4		Traralgon Fm	41.15	25-Sep-19	Trend anomalous required rehab	Y	Morwell Run	
61502	443906.9	5760017.2	s01	73.6	339	340.4		Morwell Fm	67.25	06-Jan-15	Sealed May 2015 VWPs installed	Y	Morwell Run	
61502	443906.9	5760017.2	v01	73.6			-265.4	Morwell Fm	-29.32	16-Apr-19		Y	Morwell Run	
61502	443906.9	5760017.2	v02	73.6			-266.1	Morwell Fm	-33.92	16-Apr-19		Y	Morwell Run	
61631	450491.8	5764491.9	v01	80.7			-213.7	Morwell Fm	22.00	08-Jan-97	Instrument failed not monitored by RMC	Y	Morwell Run	
61631	450491.8	5764491.9	v02	80.7			-201	Morwell Fm	18.34	25-Sep-19		Y	Morwell Run	
61631	450491.8	5764491.9	v03	80.7			-191.7	Morwell Fm	13.00	21-Dec-11	Instrument failure	Y	Morwell Run	
61631	450491.8	5764491.9	v04	80.7			-181.5	Morwell Fm	14.09	25-Sep-19		Y	Morwell Run	
61631	450491.8	5764491.9	v05	80.7			-171.3			16-Apr-19	Instrument failure reading unreliable		Morwell Run	
61631	450491.8	5764491.9	v06	80.7			-154.1			16-Apr-19	Instrument failure reading unreliable		Morwell Run	
61632	450490.0	5764476.7	s01	81	635.5	647.5		Traralgon Fm	52.62	25-Sep-19		Y	Morwell Run	
61691	447254.1	5758810.8	v02	96.8			-289.6	Traralgon Fm	-64.00	25-Sep-19		Y	Morwell Run	
61691	447254.1	5758810.8	v03	96.8			-264.9	Traralgon Fm	-59.33	25-Sep-19		Y	Morwell Run	
61691	447254.1	5758810.8	v04	96.8			-204.8	Morwell Fm	-24.49	16-Feb-17	Instrument failure	Y	Morwell Run	
61719	450024.6	5760055.4	s01	105.7	306	309		Traralgon Fm	71.30	25-Sep-19		Y	Morwell Run	
61726	448896.5	5757382.5	s01	155.5	321	347		Traralgon Fm	17.20	05-Aug-12	requires rehab	Y	Morwell Run	
62894			v02	58.43			-56.06	Morwell Fm	-38.81	22-Sep-19	Monitored by Engie 23271 replacement	N	Engie	
80256	456778.7	5763769.3	s01	161.1	382	383		Traralgon Fm	66.30	23-Jul-01	Sealed	N	Sealed	

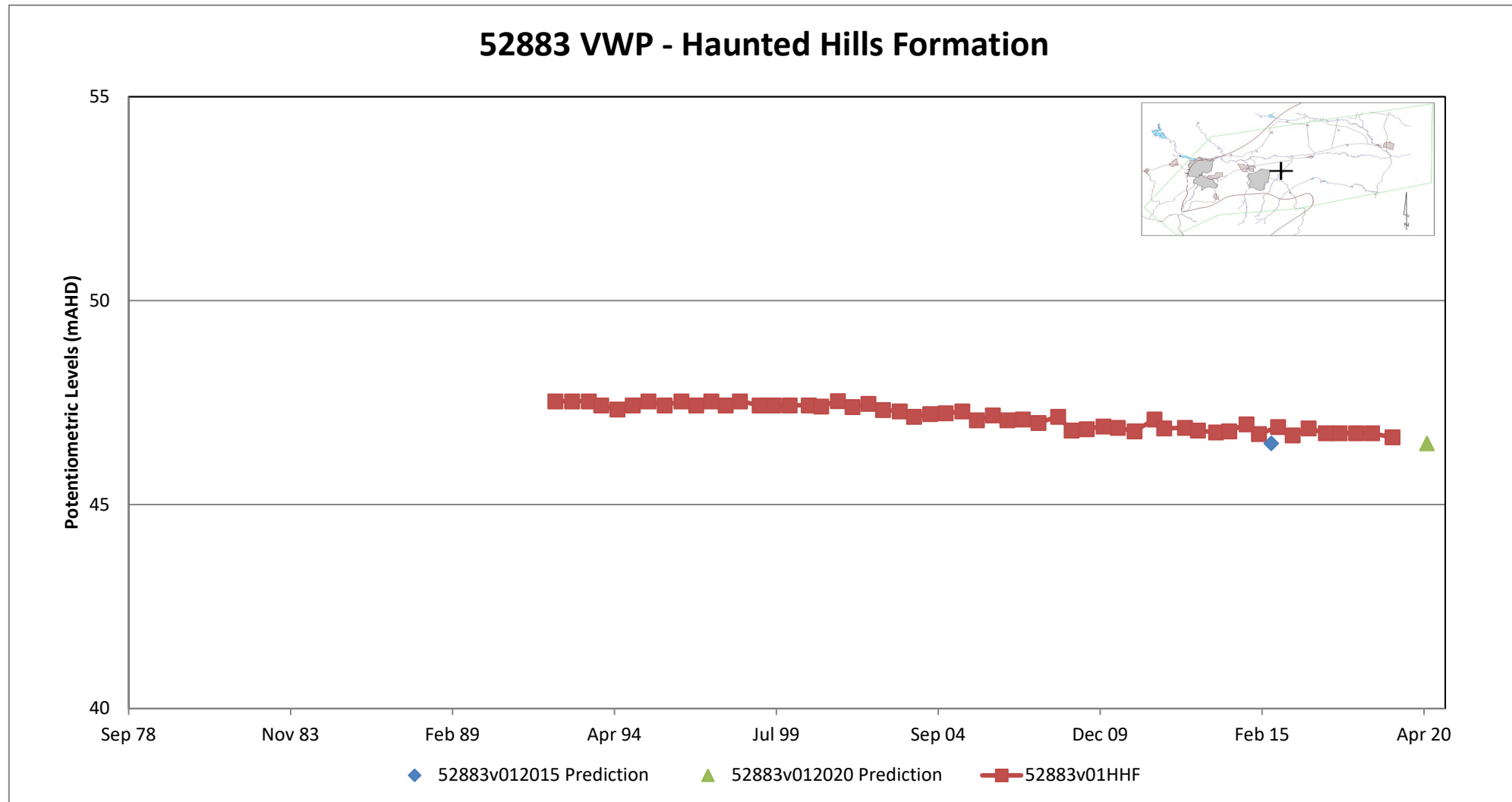
80426	453595.2	5763924.2	s01	102.6	154	157		Morwell Fm	72.76	29-Jun-18	Monitored by Loy Yang (annual run)	N	Loy Yang	
80433	459785.8	5773043.8	s01	34.5	340	343		Morwell Fm	25.53	01-Oct-19		N	East Run	
80440	455303.3	5765748.0	s01	97.5	164.5	170.5		Morwell Fm	77.00	01-Oct-19		N	East Run	
80442	458533.5	5760753.6	s01	129.2	142.5	149		Traralgon Fm	112.38	29-Jun-18	Monitored by Loy Yang (annual run)	N	Loy Yang	
80445	458118.8	5769979.4	v03	84.4			-440.6	Traralgon Fm	-57.33	01-Oct-19		Y	East Run	
80445	458118.8	5769979.4	v04	84.4			-415.9	Traralgon Fm	-119.63	21-Jan-14	Instrument failed	Y	East Run	
80445	458118.8	5769979.4	v05	84.4			-395.2	Morwell Fm	-75.03	05-Jan-15	Instrument failed	Y	East Run	
80445	458118.8	5769979.4	v06	84.4			579.9	Morwell Fm	-85.64	07-Jan-10	Instrument failed	Y	East Run	
80445	458118.8	5769979.4	v08	84.4			-309.6	Morwell Fm	-30.14	05-Jan-11	Instrument failed	Y	East Run	
80445	458118.8	5769979.4	v09	84.4			-266.4	Morwell Fm	-18.08	01-Oct-19		Y	East Run	Y
80445	458118.8	5769979.4	v10	84.4			-239.2	Morwell Fm	-16.85	01-Oct-19		Y	East Run	Y
80454	455281.7	5765750.2	s01	96.7	551	557.5		Traralgon Fm	74.50	15-Dec-05	Sealed	N	Sealed	
80466	458165.1	5770368.5	s01	78.4	696	702		Traralgon Fm	-14.50	19-Jun-98	Never monitored by RMC	N	Not monitored	
80485	457613.5	5773973.1	s01	46.8	614	617		Traralgon Fm	-35.20	15-Jun-04	Sealed 2004 - house built on land	N	Sealed	
80487	452231.7	5761418.1	s01	129	280	286		Morwell Fm	95.50	29-Jun-18	Monitored by Loy Yang (annual run)	N	Loy Yang	
80489	458090.1	5766715.2	v02	124			-465.5	Traralgon Fm	-71.60	01-Oct-19		Y	East Run	
80489	458090.1	5766715.2	v03	124			-452.6	Traralgon Fm	-78.50	05-Jan-15	Instrument failed	Y	East Run	
80489	458090.1	5766715.2	v04	124			-444	Traralgon Fm		27-Mar-19	Instrument failed data unreliable	Y	East Run	
80489	458090.1	5766715.2	v05	124			-408	Traralgon Fm	-79.89	01-Oct-19		Y	East Run	
80489	458090.1	5766715.2	v06	124			-393.7	Traralgon Fm	-72.66	01-Oct-19		Y	East Run	
80490	458637.0	5766441.2	v01	80.2			-261.2	Traralgon Fm			Never monitored by RMC	Y	Previously LY	
80490	458637.0	5766441.2	v03	80.2			-249.5	Traralgon Fm			Never monitored by RMC	Y	Previously LY	
80490	458637.0	5766441.2	v04	80.2			-240.7	Traralgon Fm			Never monitored by RMC	Y	Previously LY	
80490	458637.0	5766441.2	v05	80.2			-206.9	Morwell Fm			Never monitored by RMC	Y	Previously LY	
80490	458637.0	5766441.2	v06	80.2			-176.4	Morwell Fm			Never monitored by RMC	Y	Previously LY	
80490	458637.0	5766441.2	v07	80.2			-149.1	Morwell Fm			Never monitored by RMC	Y	Previously LY	
80490	458637.0	5766441.2	v08	80.2			-134.4	Morwell Fm			Never monitored by RMC	Y	Previously LY	
80490	458637.0	5766441.2	v09	80.2			-109	Morwell Fm			Never monitored by RMC	Y	Previously LY	
80491	460315.0	5768771.6	v02	49.5			-474.9	Traralgon Fm	-51.40	04-Jan-01	Instrument failed	Y	Not monitored	
80491	460315.0	5768771.6	v06	49.5			-367	Morwell Fm	-30.20	13-Oct-03	Instrument failed / access	Y	Not monitored	
80491	460315.0	5768771.6	v07	49.5			-349.7	Morwell Fm	13.80	27-Sep-01	Instrument failed	Y	Not monitored	
80491	460315.0	5768771.6	v08	49.5			-315.8	Morwell Fm	-19.50	27-Sep-01	Instrument failed	Y	Not monitored	
80491	460315.0	5768771.6	v09	49.5			-262.3	Morwell Fm	13.70	13-Oct-03	Instrument failed / access	Y	Not monitored	
80491	460315.0	5768771.6	v11	49.5			-74.8	Yallourn Fm	43.80	13-Oct-03	Instrument failed / access	Y	Not monitored	
80491	460315.0	5768771.6	v12	49.5			-32.3	Yallourn Fm	40.00	13-Oct-03	Instrument failed / access	Y	Not monitored	
80493	454046.4	5769293.1	v01	59			-167.8	TFAS	37.00	05-Jan-11	Check Access	N	East Run	
80493	454046.4	5769293.1	v02	59			-53	Yallourn Fm	36.25	05-Jan-11	Check Access	N	East Run	
80493	454046.4	5769293.1	v03	59			-21.1	Yallourn Fm	40.16	05-Jan-11	Check Access	N	East Run	Y
80493	454046.4	5769293.1	v04	59			12.8	HHF	48.78	05-Jan-11	Check Access	N	East Run	Y
80494	454046.4	5769293.1	v04	59			-576.4	Traralgon Fm	-57.70	19-Dec-95	Instrument failed	N	Not monitored	
80494	454046.4	5769293.1	v05	59			-564.6	Traralgon Fm	-68.50	07-Apr-95	Instrument failed	N	Not monitored	
80494	454046.4	5769293.1	v06	59			-536.6	Traralgon Fm	-68.90	19-Dec-95	Instrument failed	N	Not monitored	
80494	454046.4	5769293.1	v07	59			-500.3	Morwell Fm	-53.60	07-Apr-95	Instrument failed	N	Not monitored	
80494	454046.4	5769293.1	v08	59			-460	Morwell Fm	-72.00	02-Oct-00	Instrument failed	N	East Run	
80494	454046.4	5769293.1	v09	59			-405	Morwell Fm	-59.69	05-Dec-07	Check Access	N	East Run	

80494	454046.4	5769293.1	v11	59			-276	Morwell Fm	19.84	23-Jul-01	Instrument failed	N	East Run	
80495	458566.9	5762110.4	s01	113.4	236	239		Traralgon Fm	65.80	03-Jun-04	damaged terminal box to be surveyed	Y	Loy Yang	
80496	458567.3	5762111.9	v01	113.3			-19.5	Traralgon Fm	69.80	13-Oct-16	damaged terminal box to be surveyed	Y	Loy Yang	
80496	458567.3	5762111.9	v02	113.3			3.3	Traralgon Fm	68.70	13-Oct-16	damaged terminal box to be surveyed	Y	Loy Yang	
80496	458567.3	5762111.9	v03	113.3			30.7	Traralgon Fm	70.70	13-Oct-16	damaged terminal box to be surveyed	Y	Loy Yang	
80496	458567.3	5762111.9	v04	113.3			61.2	Haunted Hills Fm	66.90	13-Oct-16	damaged terminal box to be surveyed	Y	Loy Yang	
80496	458567.3	5762111.9	v05	113.3			86.8	Haunted Hills Fm	84.10	13-Oct-16	damaged terminal box to be surveyed	Y	Loy Yang	
90323	485554.2	5772956.5	s01	113.2	211	214		Traralgon Fm	39.84	01-Oct-19		Y	East Run	
90324	476194.2	5775721.6	s01	31.4	377	384		Morwell Fm	16.62	01-Oct-19		Y	East Run	Y
90325	485793.3	5776929.8	s01	13.5	344.5	351		Morwell Fm	11.00	01-Oct-19		Y	East Run	
90330	472076.8	5768124.5	s01	74.3	478	481		Morwell Fm	9.55	01-Oct-19		Y	East Run	
90335	480482.3	5776174.6	s01	19.7	385	388		Morwell Fm	28	27-Jun-93	Never monitored by RMC	Y	Not monitored	
90339	475702.3	5772890.4	s01	38.6	632.5	652		Traralgon Fm	30.8	03-Jun-97	Never monitored by RMC	Y	Not monitored	
90340	476223.3	5775710.2	v01	31.3			-514.1	Traralgon Fm	-34.04	21-Jan-14	Instrument failed	Y	East Run	
90340	476223.3	5775710.2	v03	31.3			-465.1	Morwell Fm	-10.11	05-Jan-15	Instrument failed	Y	East Run	
90340	476223.3	5775710.2	v04	31.3			-444.4	Morwell Fm	-31.71	01-Oct-19		Y	East Run	
90340	476223.3	5775710.2	v05	31.3			-419.7	Morwell Fm	-22.87	01-Oct-19		Y	East Run	
90340	476223.3	5775710.2	v06	31.3			-412	Morwell Fm	-24.77	21-Aug-13	Instrument failed	Y	East Run	
90340	476223.3	5775710.2	v07	31.3			-397.8	Morwell Fm	-0.23	15-Dec-05	Instrument failed	Y	East Run	
90340	476223.3	5775710.2	v08	31.3			-374.1	Morwell Fm	4.70	14-Dec-00	Instrument failed	Y	East Run	
90340	476223.3	5775710.2	v09	31.3			-333.7	Morwell Fm	3.40	20-Jul-00	Instrument failed	Y	East Run	
90340	476223.3	5775710.2	v10	31.3			-319.5	Morwell Fm	1.30	20-Jul-00	Instrument failed	Y	East Run	
90340	476223.3	5775710.2	v11	31.3			-305.3	Morwell Fm	-4.73	15-Jun-04	Instrument failed	Y	East Run	
90340	476223.3	5775710.2	v12	31.3			-269	Morwell Fm	-12.36	01-Oct-19		Y	East Run	
90340	476223.3	5775710.2	v13	31.3			-244.3	Morwell Fm	9.50	06-Dec-96	Instrument failed	Y	East Run	
90340	476223.3	5775710.2	v14	31.3			-214.1	Morwell Fm	-1.94	01-Oct-19		Y	East Run	
90340	476223.3	5775710.2	v16	31.3			-153.1	Morwell Fm	-4.44	01-Oct-19		Y	East Run	
90340	476223.3	5775710.2	v17	31.3			-112.8	Yallourn Fm	-25.11	01-Oct-19		Y	East Run	
90340	476223.3	5775710.2	v18	31.3			-98.6	Yallourn Fm	-20.89	01-Oct-19		Y	East Run	
90343	480883.6	5771120.1	s01	74.7	322	325		Traralgon Fm	32.31	04-Feb-16	Sealed 2019 Re-classified TFAS 2013	Y	East Run	
90344	476518.6	5769420.1	v01	61			-371.4	Traralgon Fm	32.86	01-Oct-19		N	East Run	
90344	476518.6	5769420.1	v02	61			-369.4	Traralgon Fm	33.88	01-Oct-19		N	East Run	
90344	476518.6	5769420.1	v03	61			-222.7	Morwell Fm	3.19	01-Oct-19		N	East Run	
90344	476518.6	5769420.1	v04	61			-113.3	Morwell Fm	10.03	19-Feb-18	Instrument failed	N	East Run	
90345	469501.6	5766920.1	s01	83.57	6	11		Haunted Hills Fm			Flynn Bores private property	N	Not monitored	
90345	469501.6	5766920.1	v01	83.57			-64.83	Morwell Fm			Flynn Bores private property	N	Not monitored	
920007	508838.5	5764253.6	s01	50.1	725	737		Traralgon Fm	5.60	05-Jan-11	Vandalised - required rehab	Y	East Run	Y

Appendix E – Key Bore Hydrographs



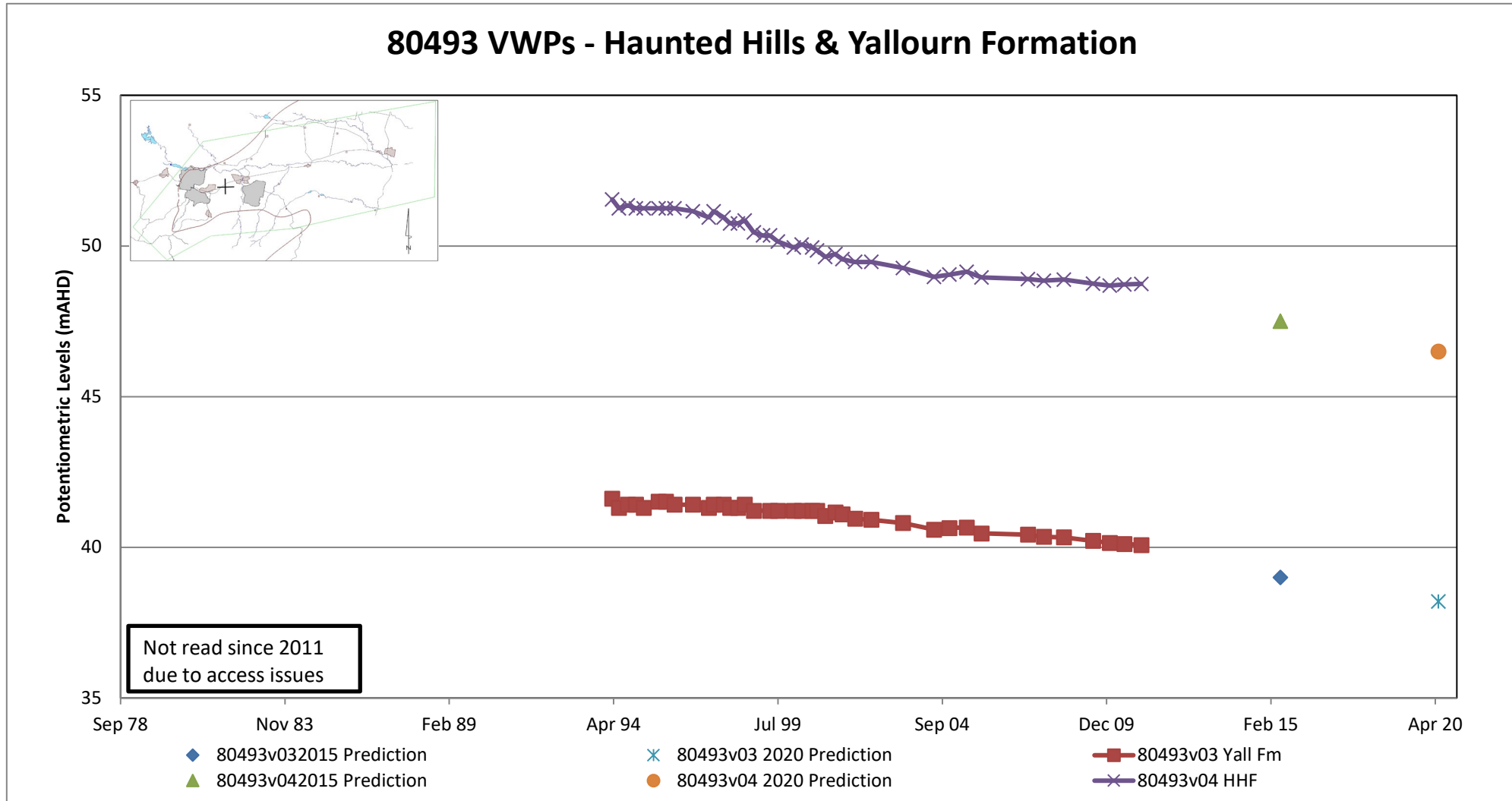
**Appendix E
Key Bore Hydrographs**





Appendix E Key Bore Hydrographs

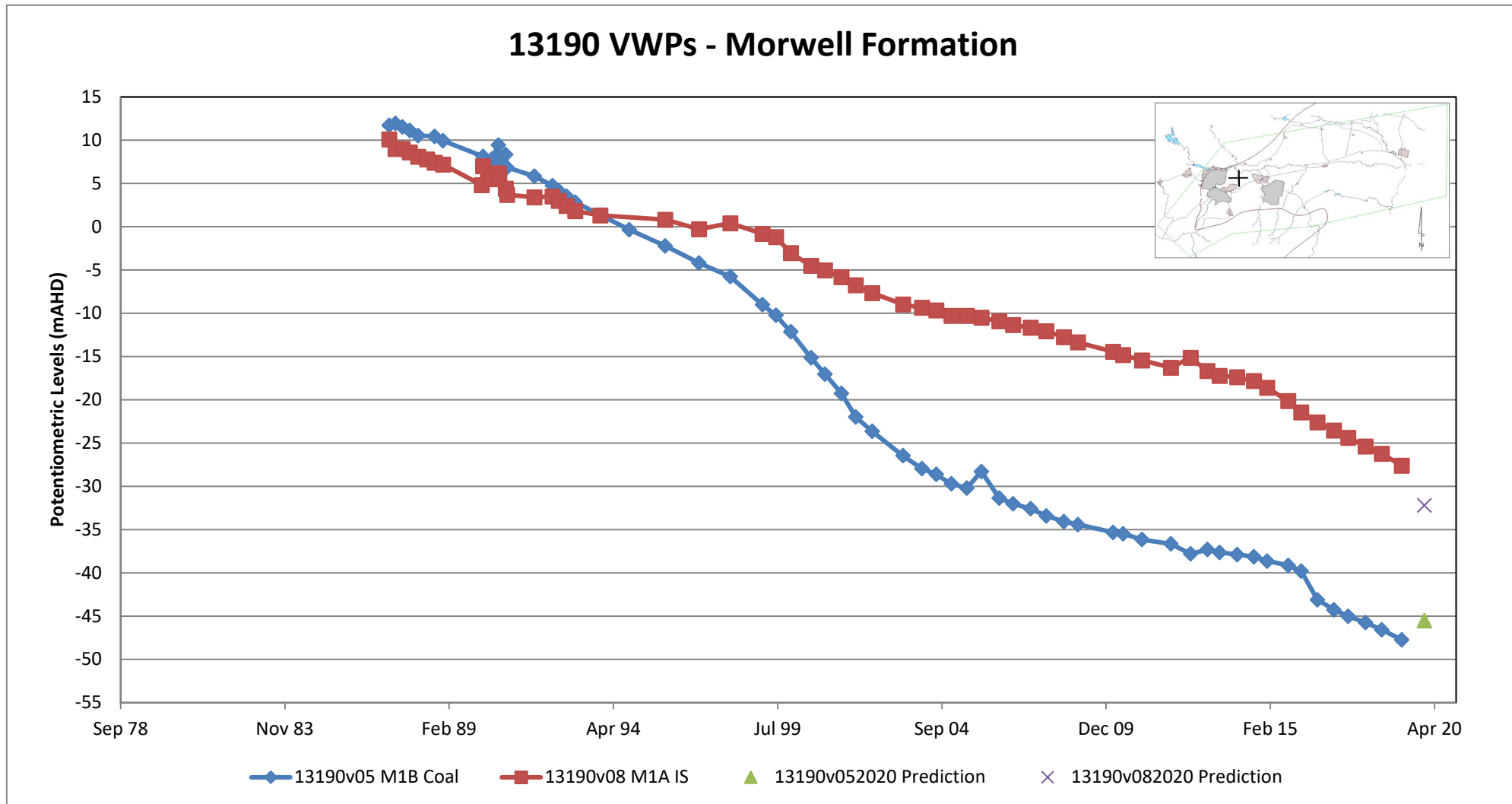
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Appendix E Key Bore Hydrographs

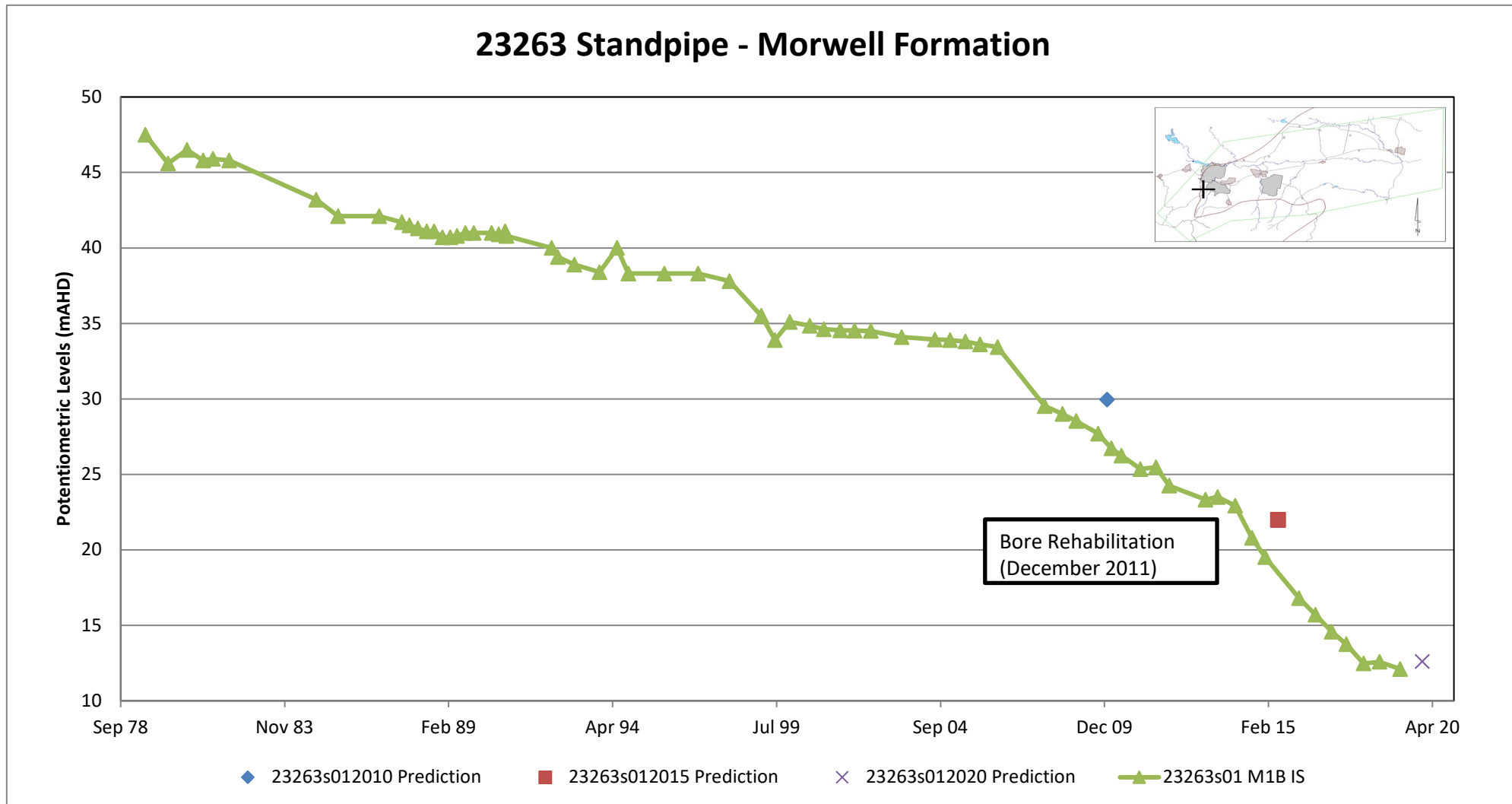
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Latrobe Valley
Groundwater and Land Level Monitoring





Appendix E Key Bore Hydrographs

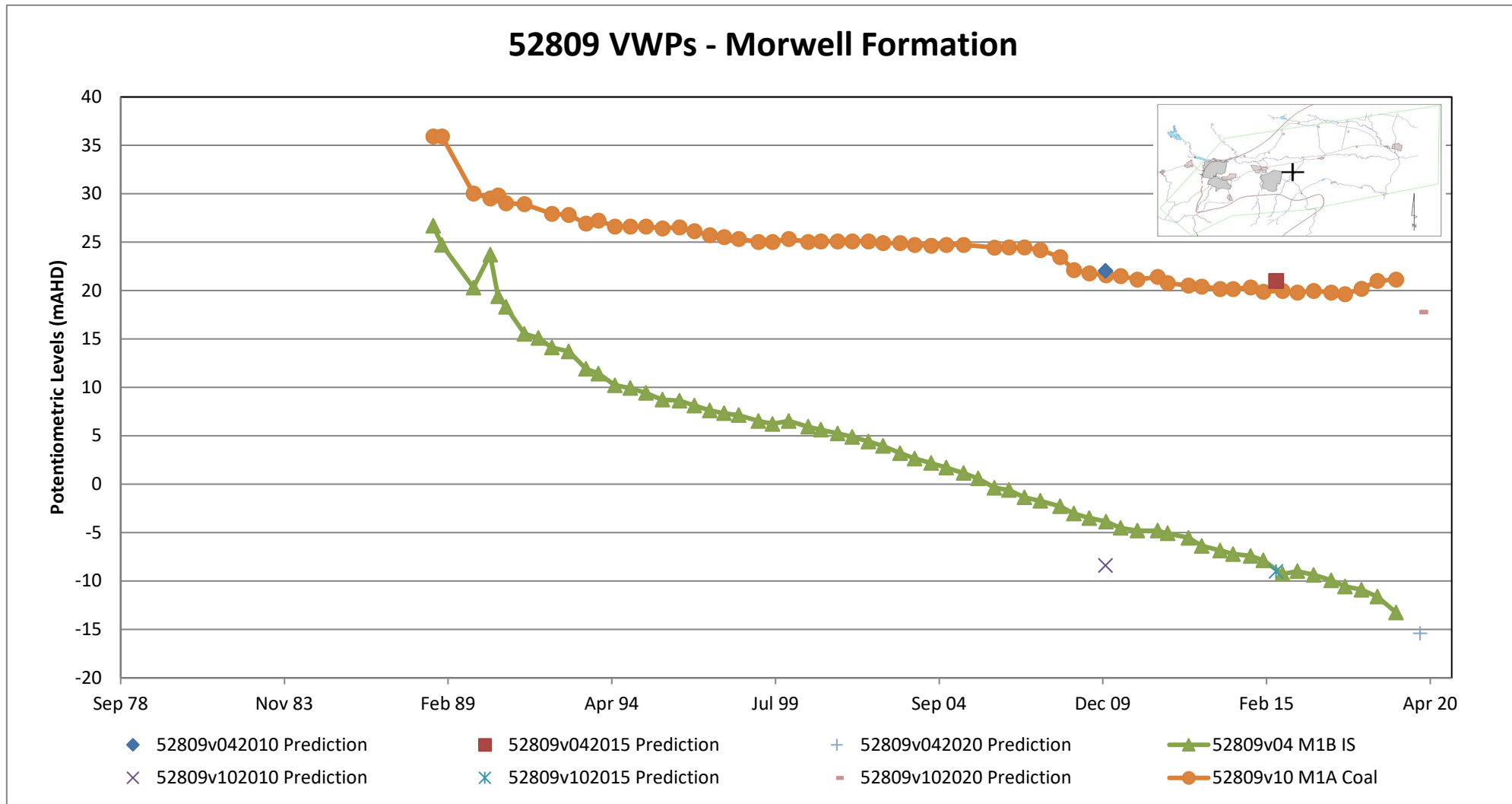
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Appendix E Key Bore Hydrographs

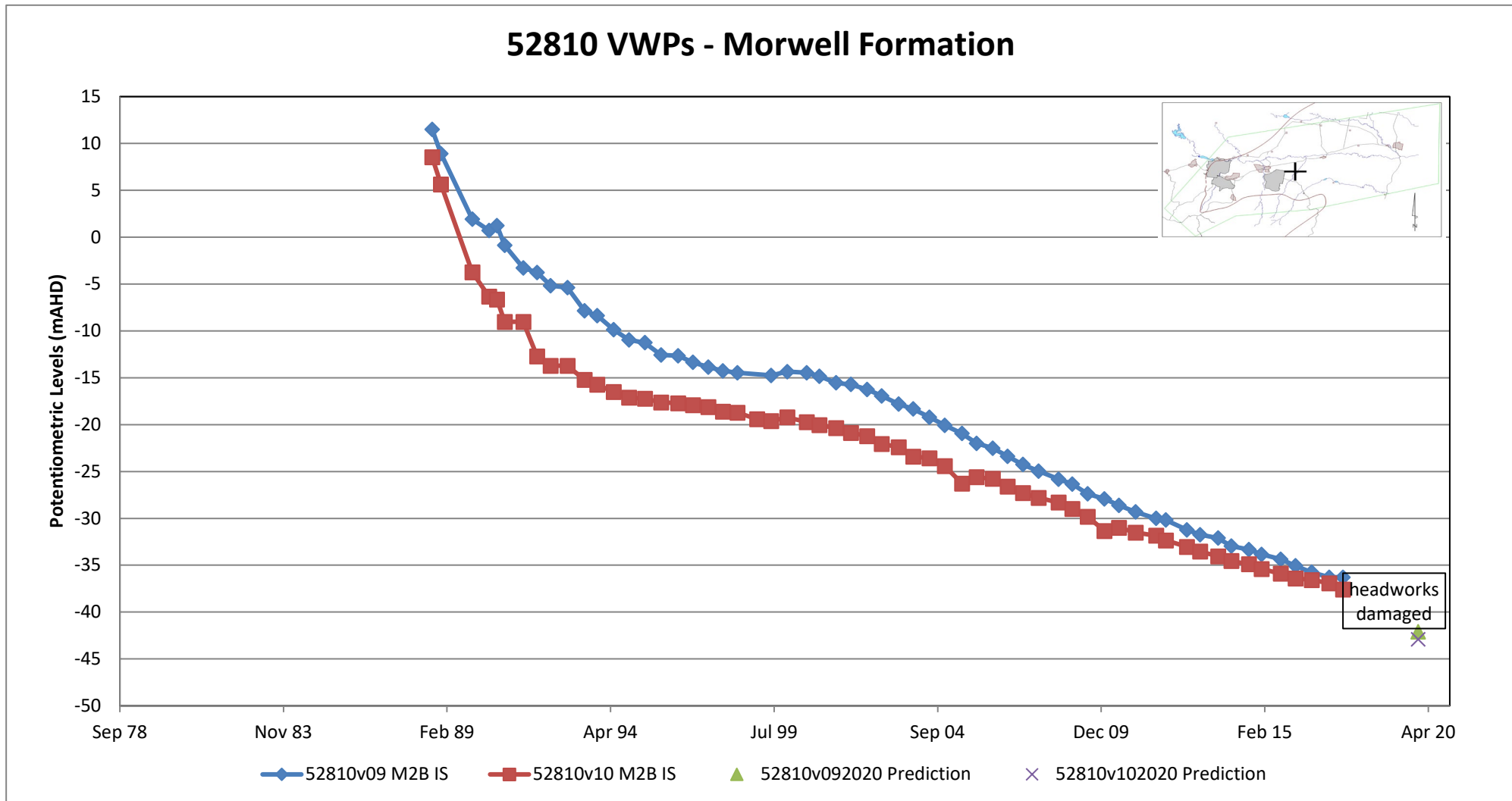
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Appendix E Key Bore Hydrographs

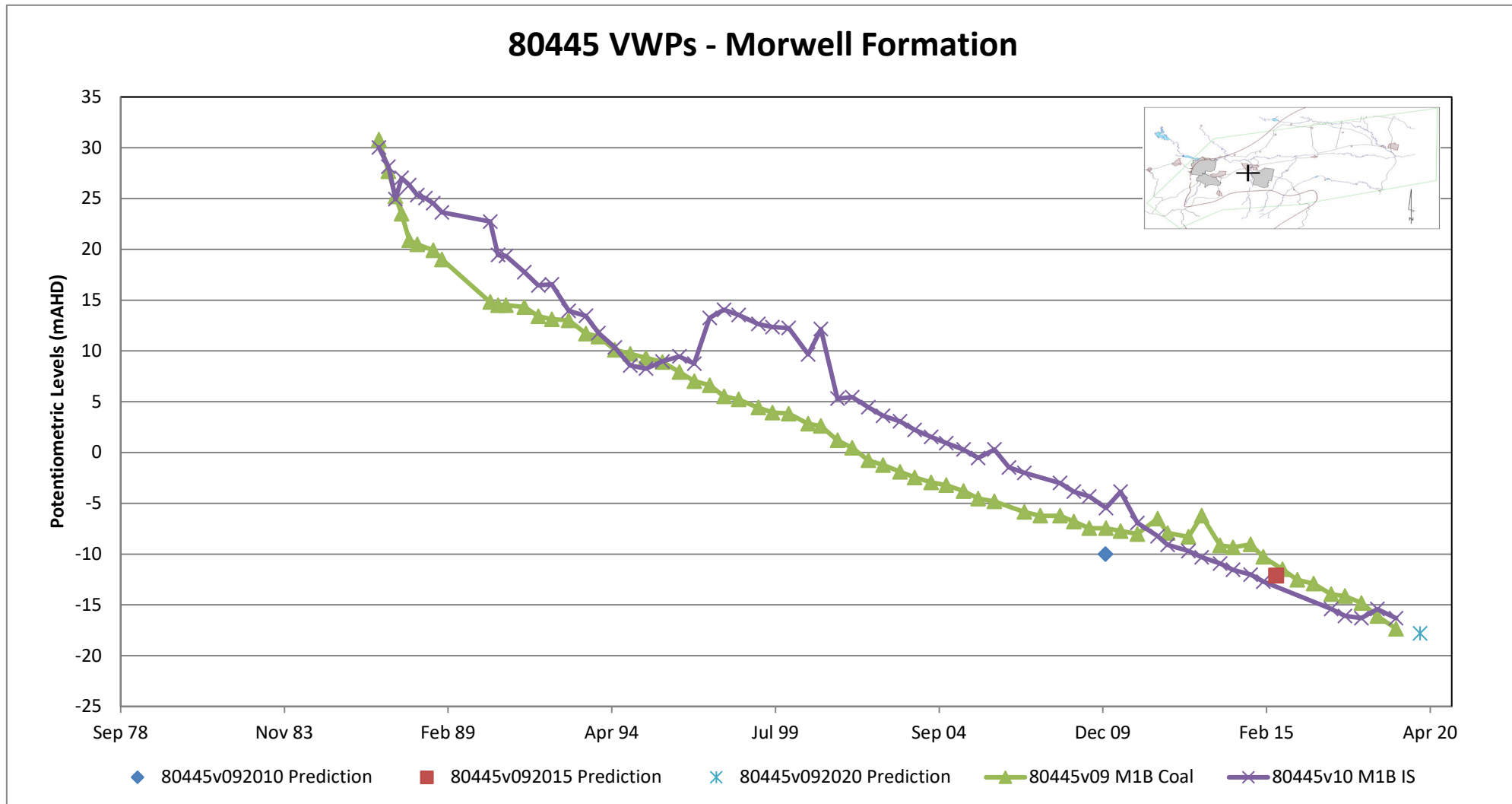
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Appendix E Key Bore Hydrographs

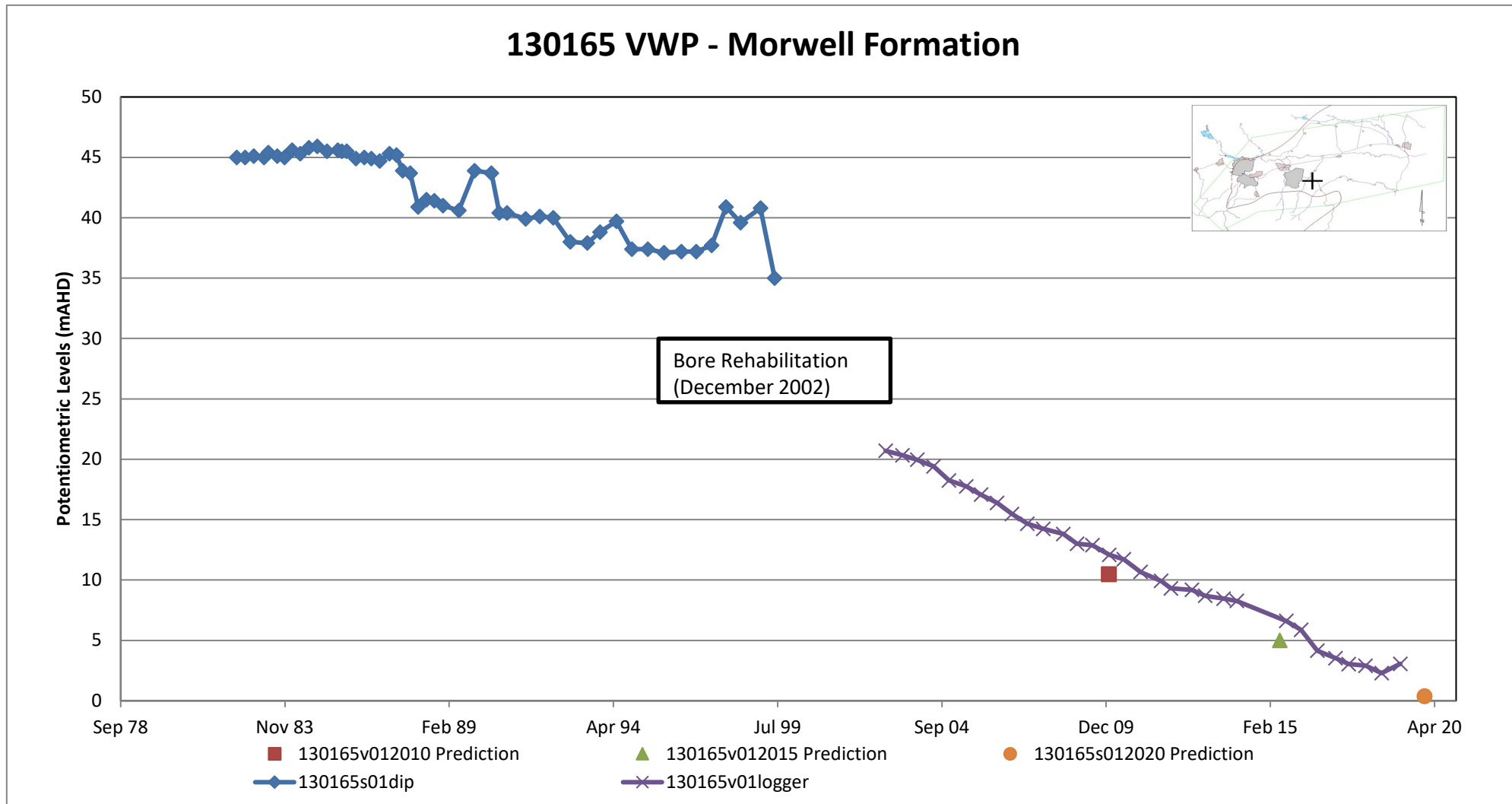
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Appendix E Key Bore Hydrographs

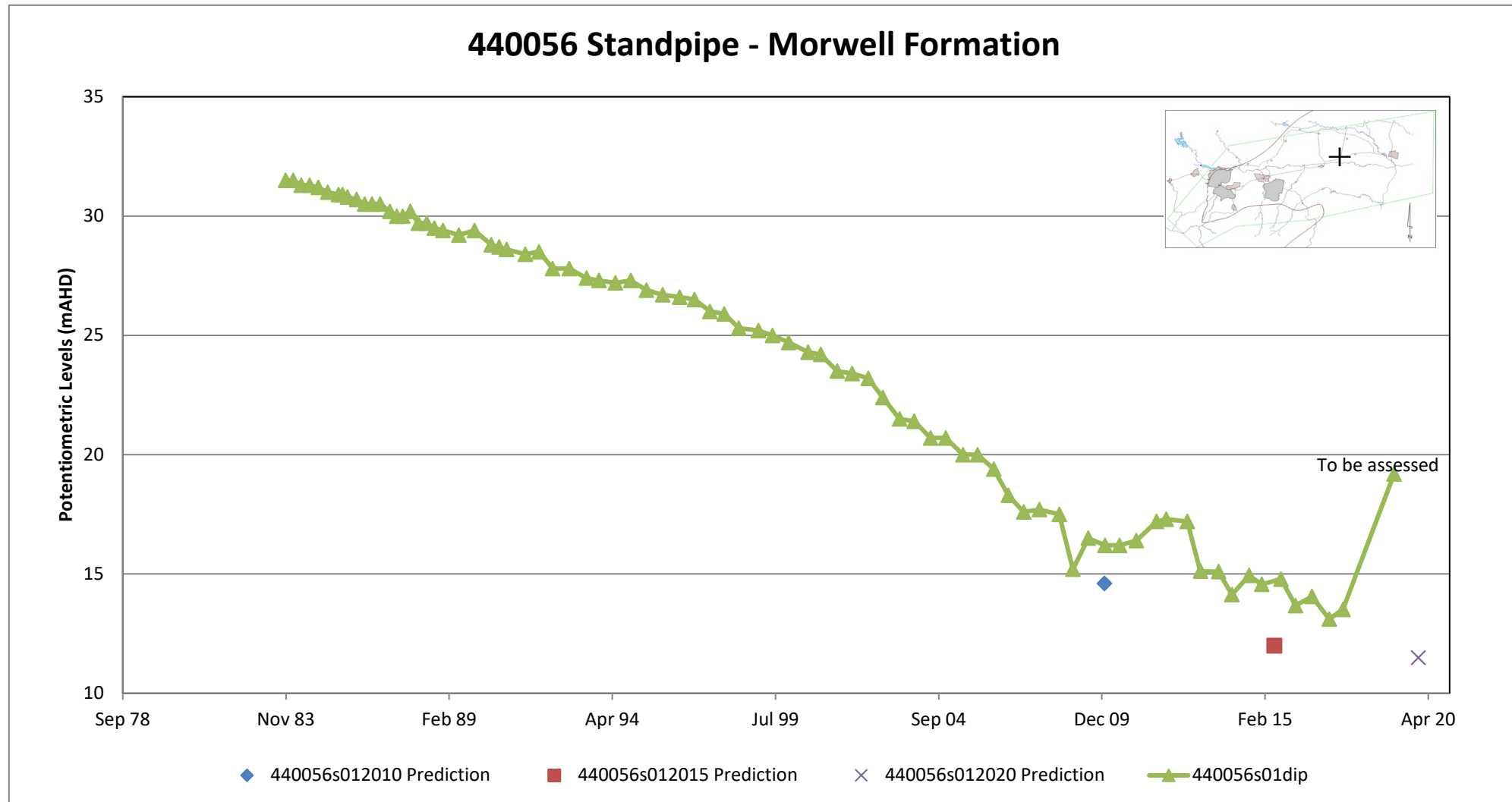
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Appendix E Key Bore Hydrographs

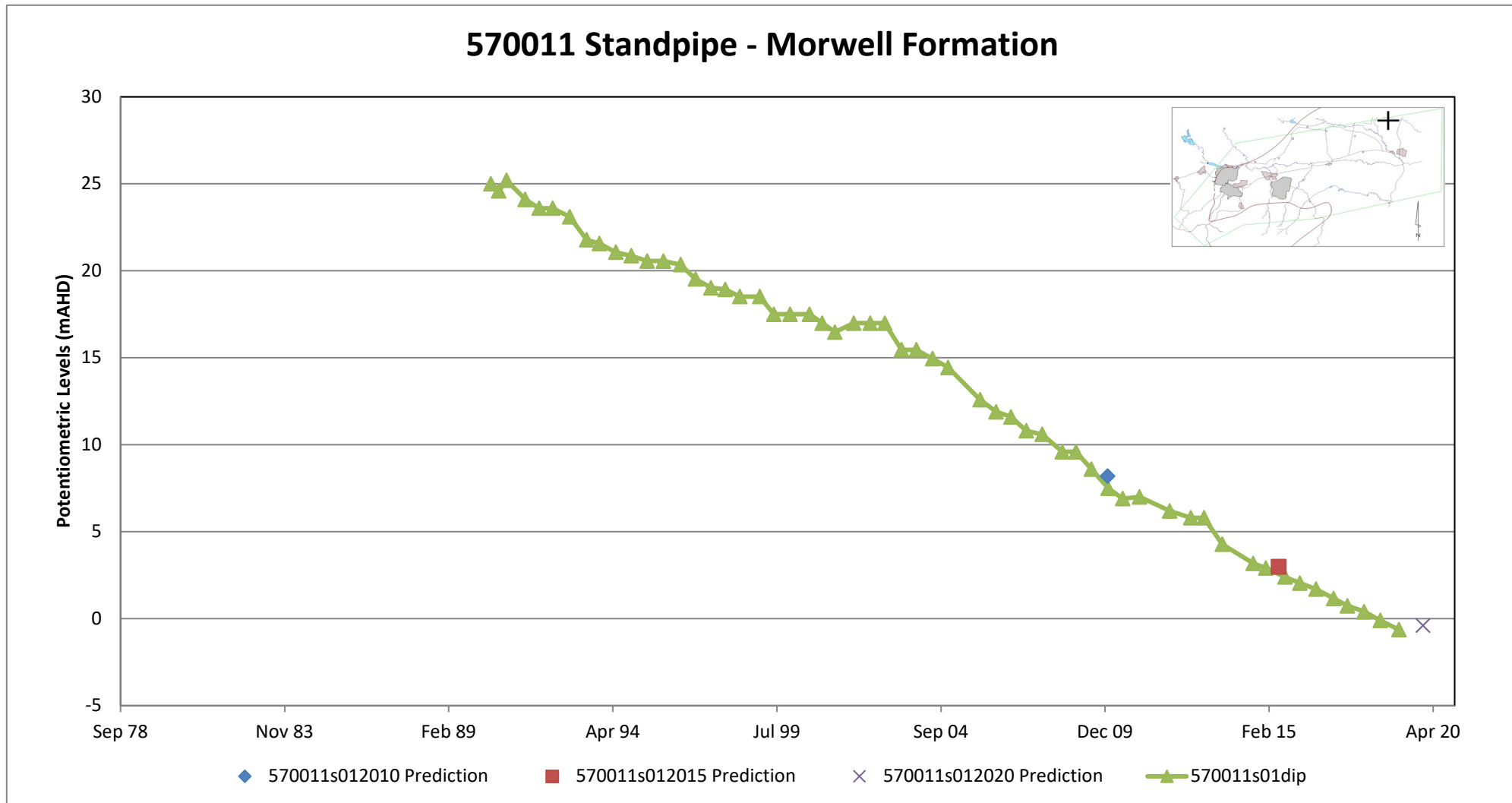
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Appendix E Key Bore Hydrographs

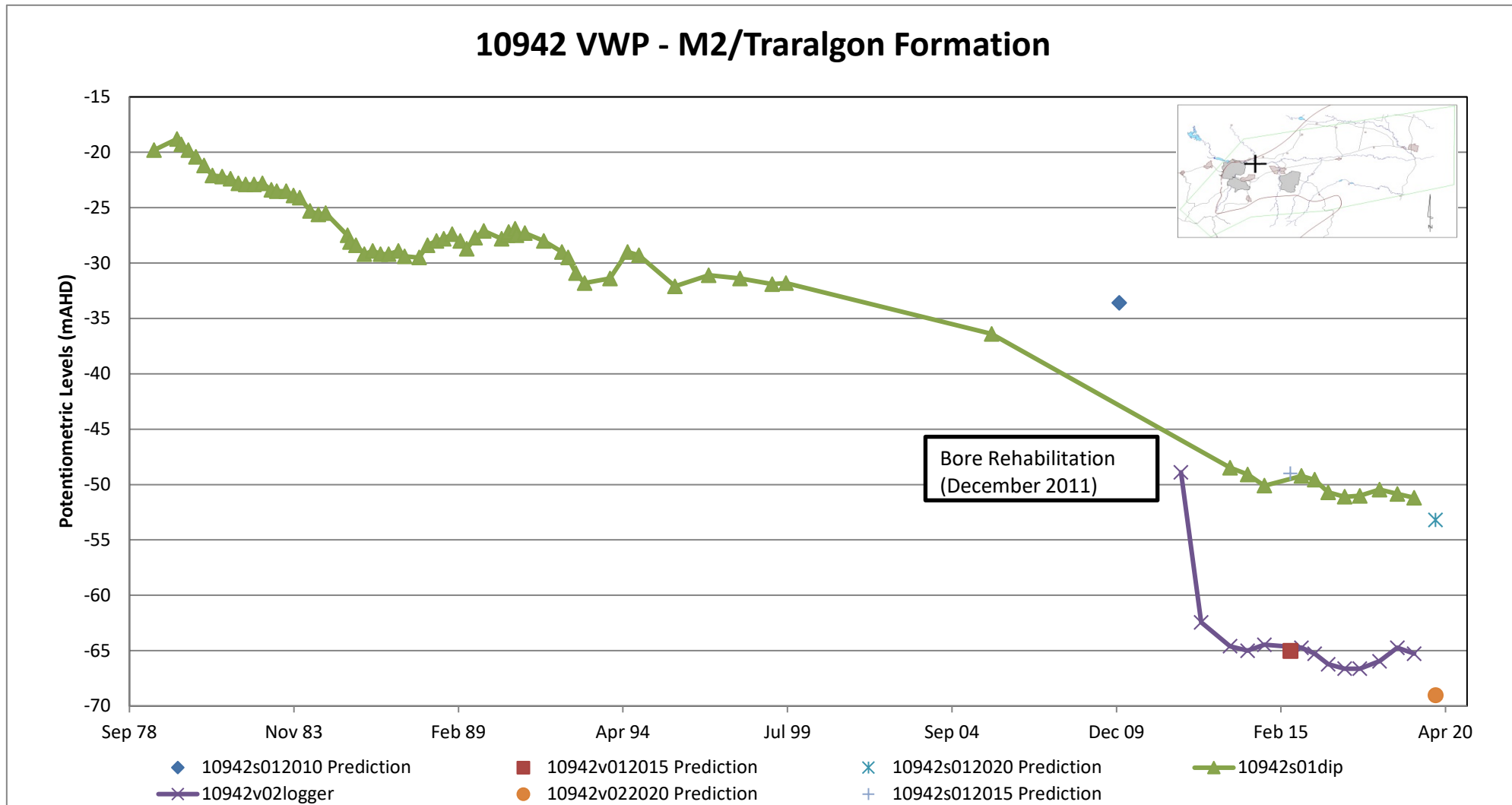
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Appendix E Key Bore Hydrographs

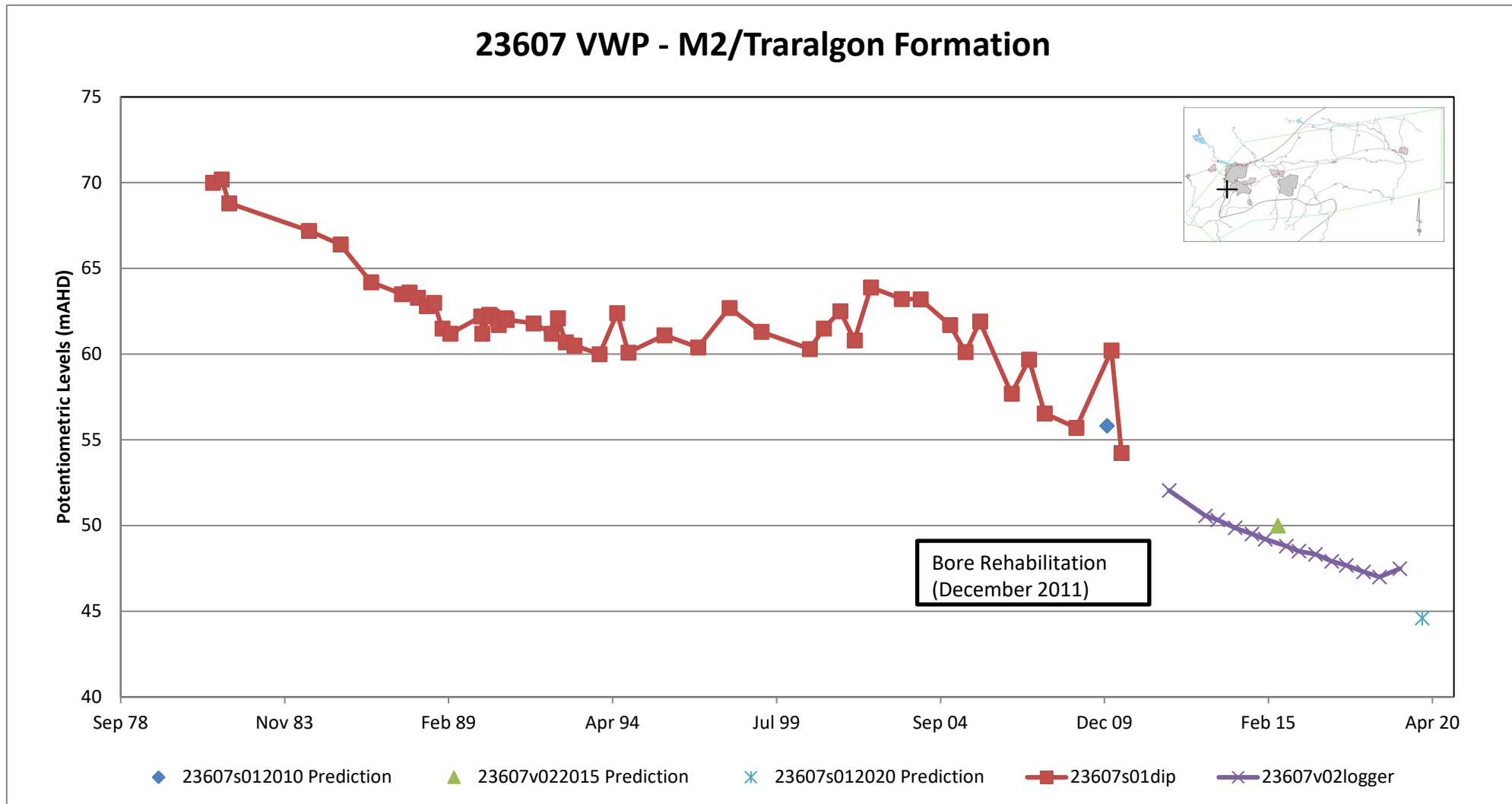
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Appendix E Key Bore Hydrographs

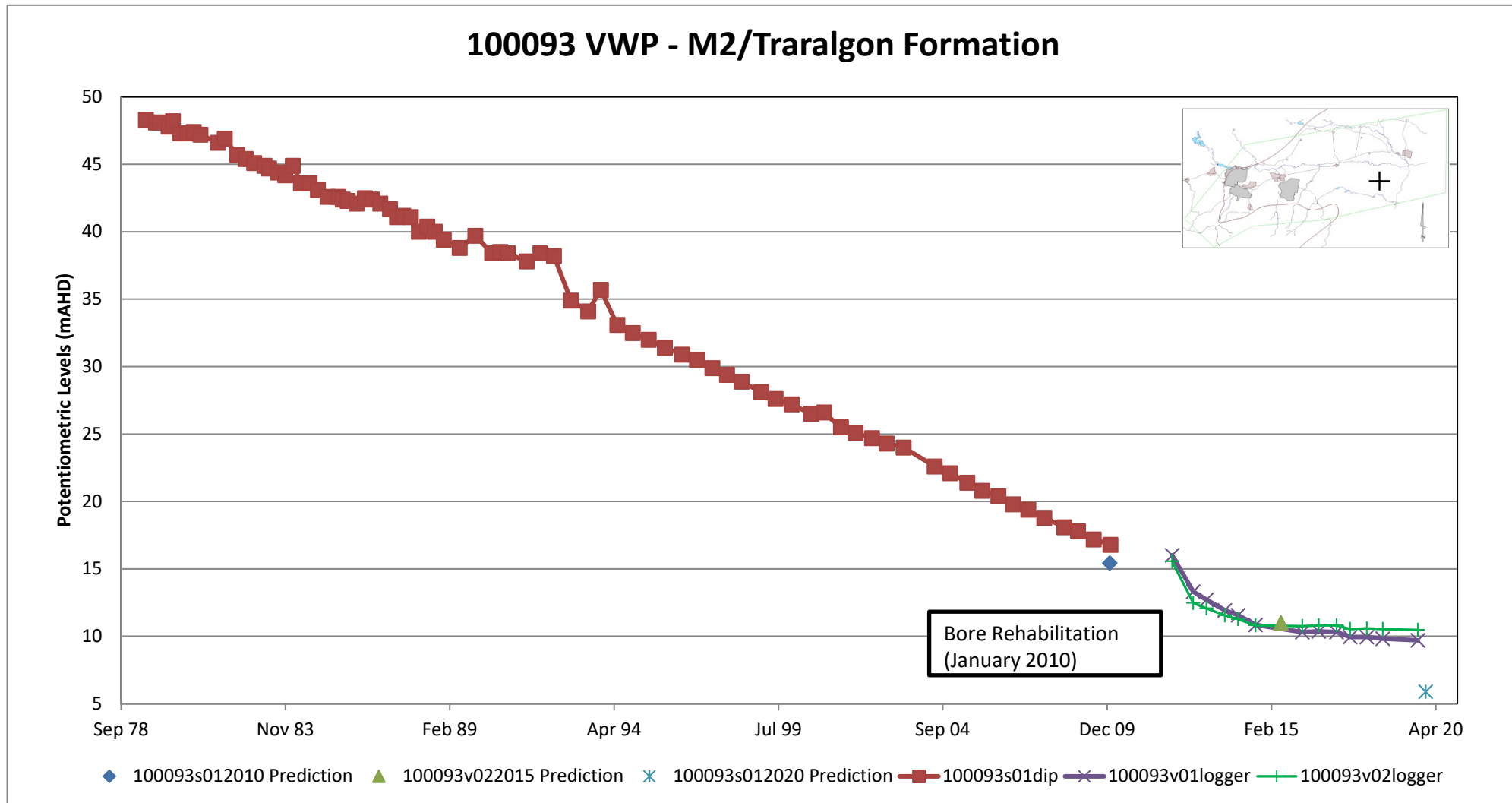
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Appendix E Key Bore Hydrographs

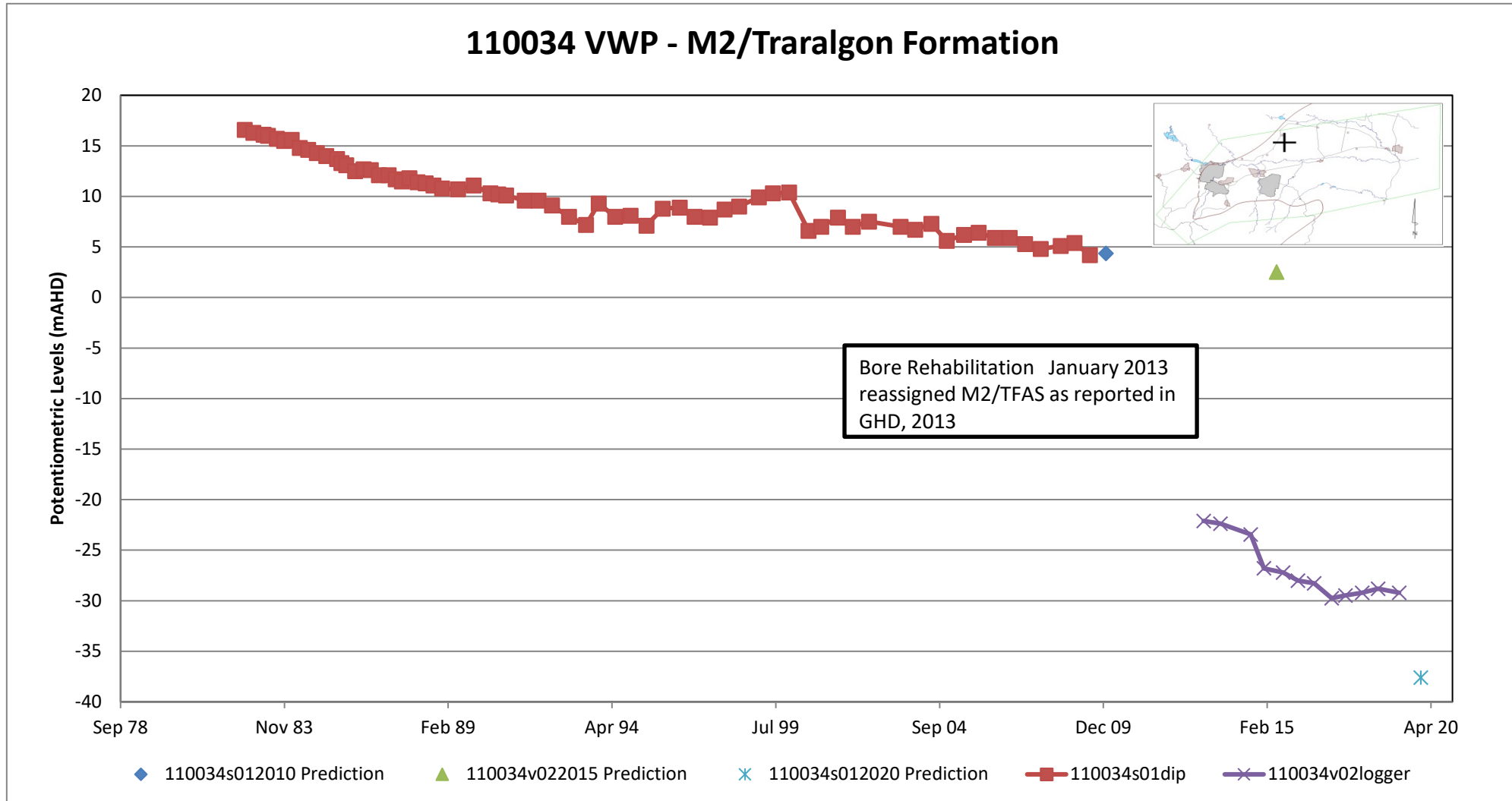
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Appendix E Key Bore Hydrographs

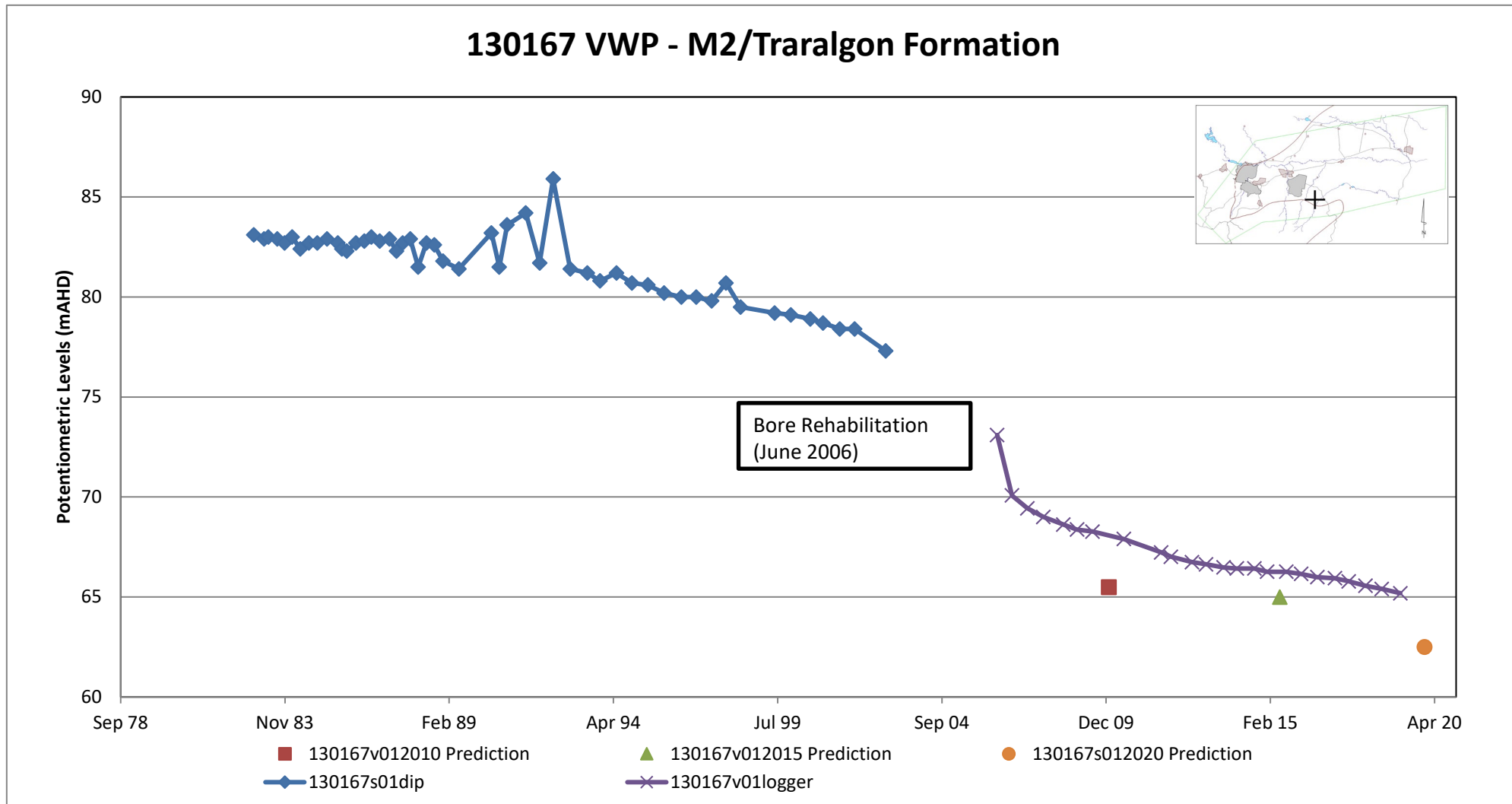
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Appendix E Key Bore Hydrographs

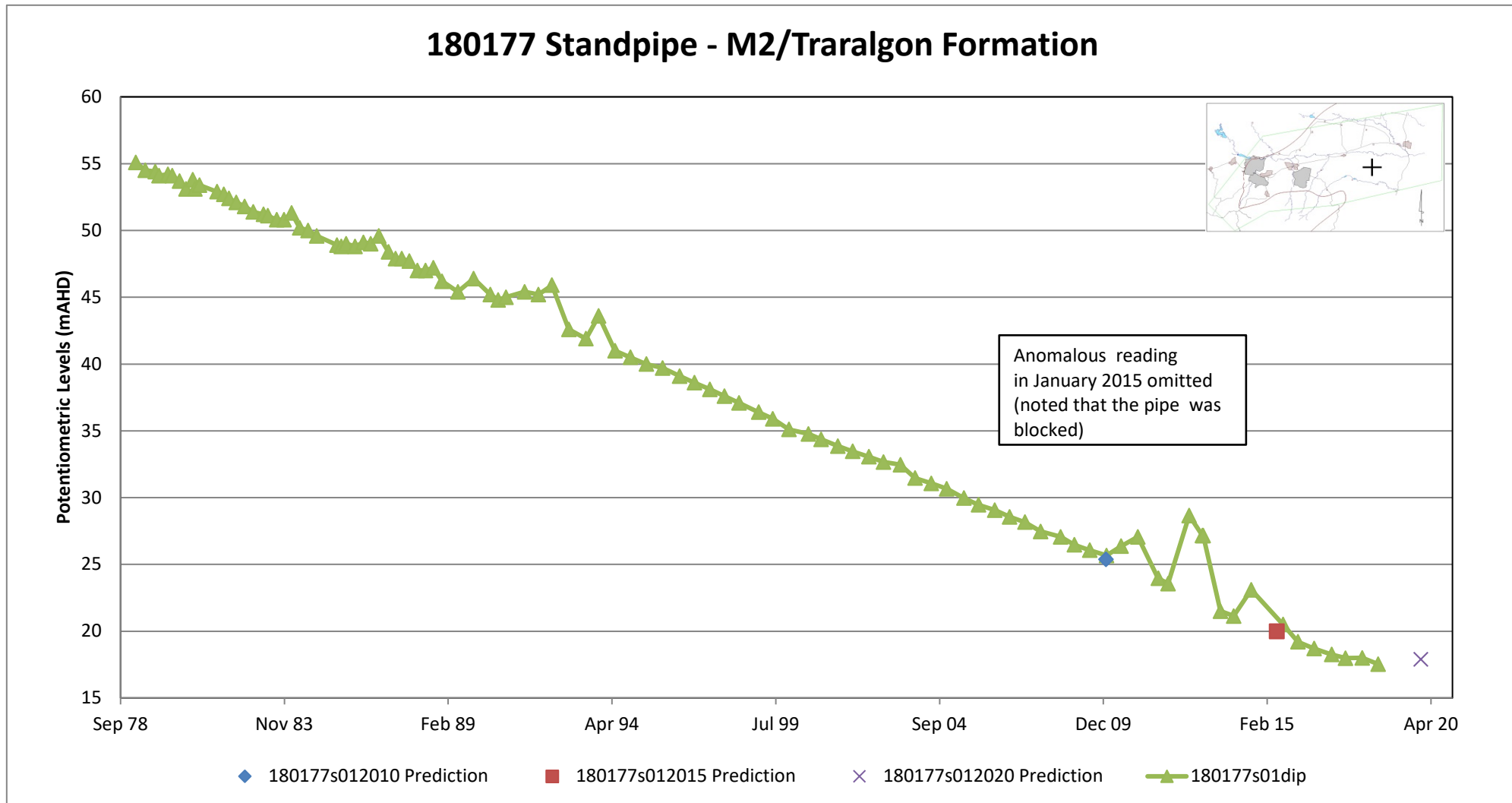
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Appendix E Key Bore Hydrographs

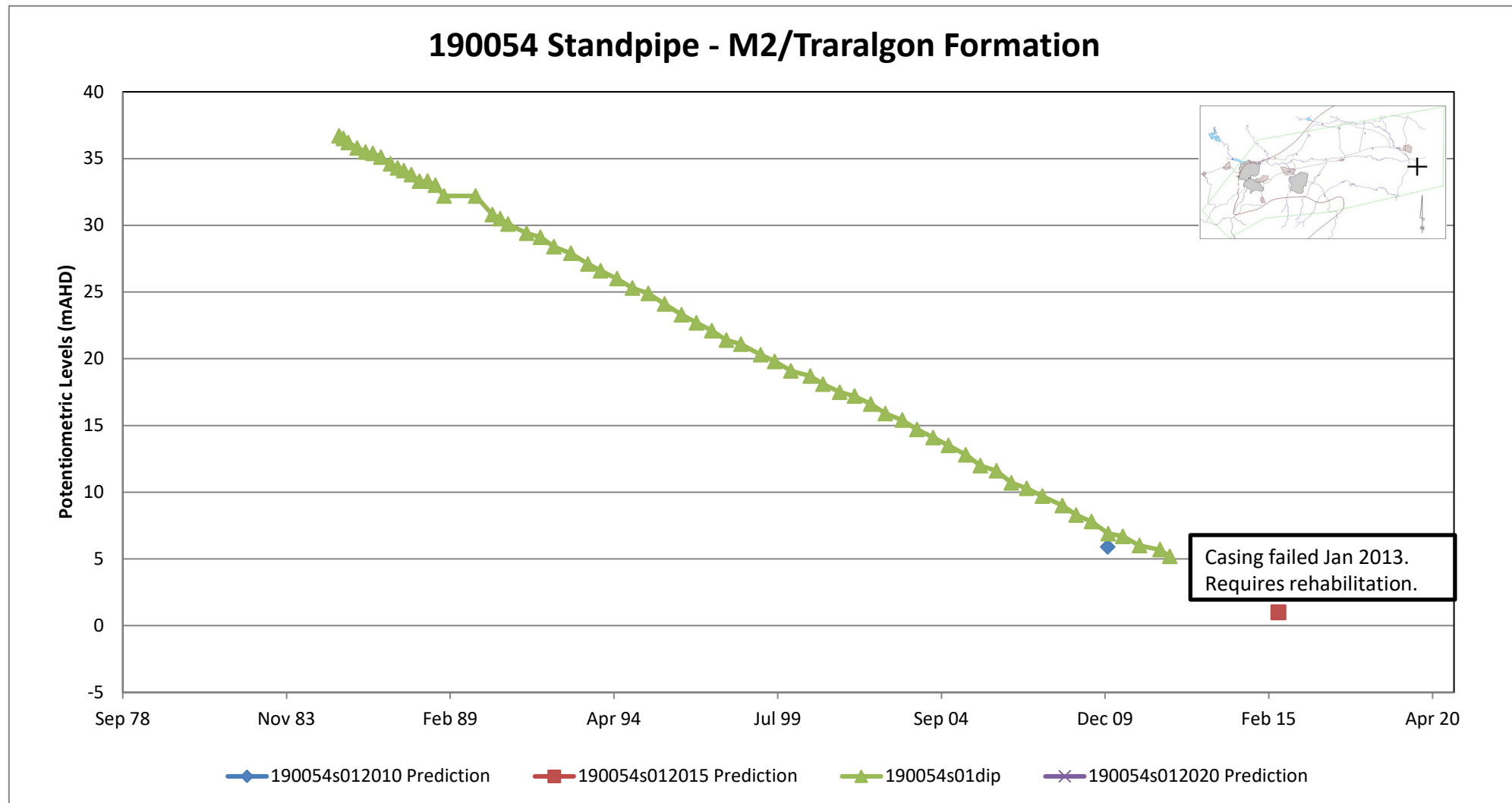
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Appendix E Key Bore Hydrographs

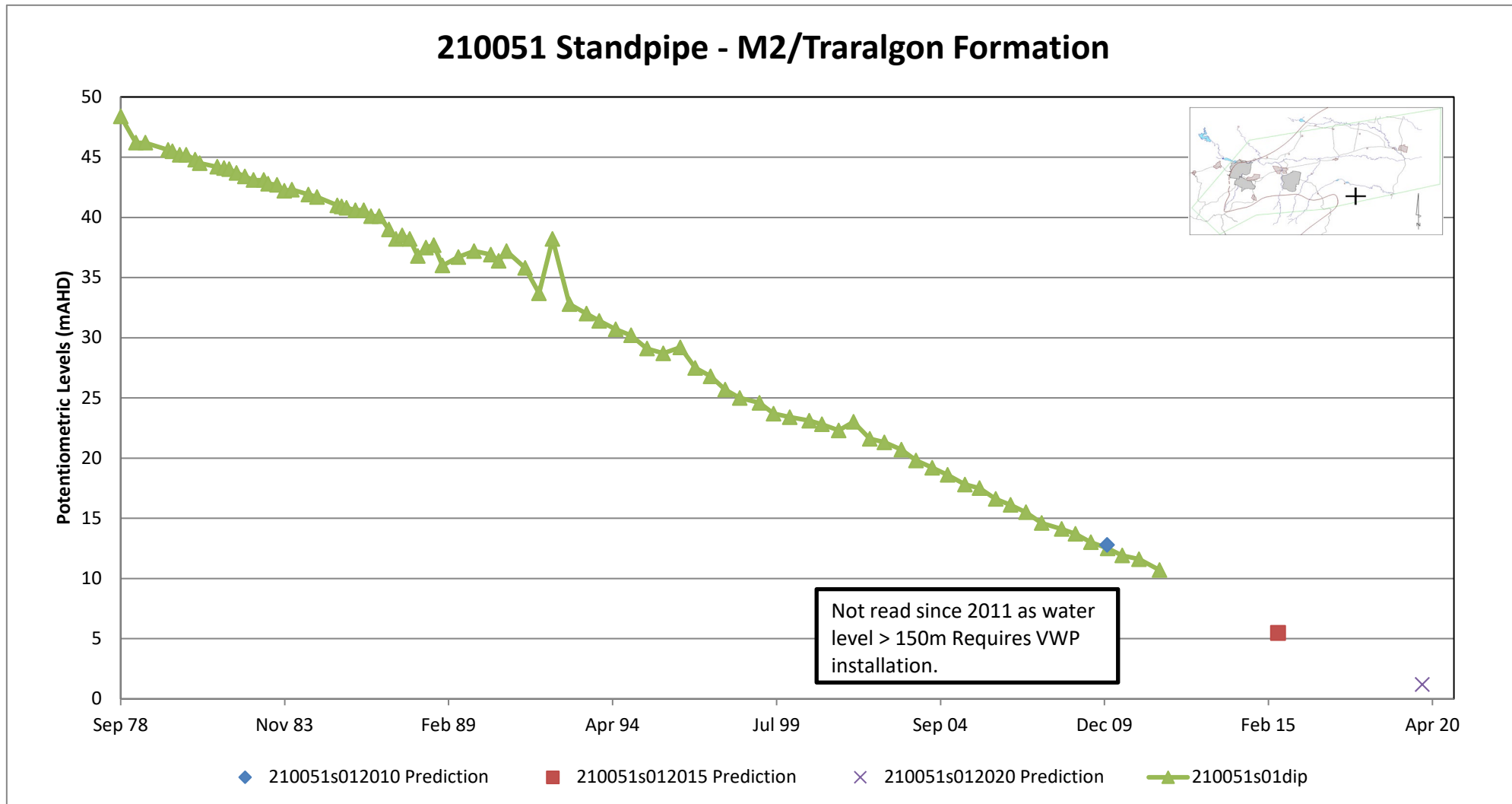
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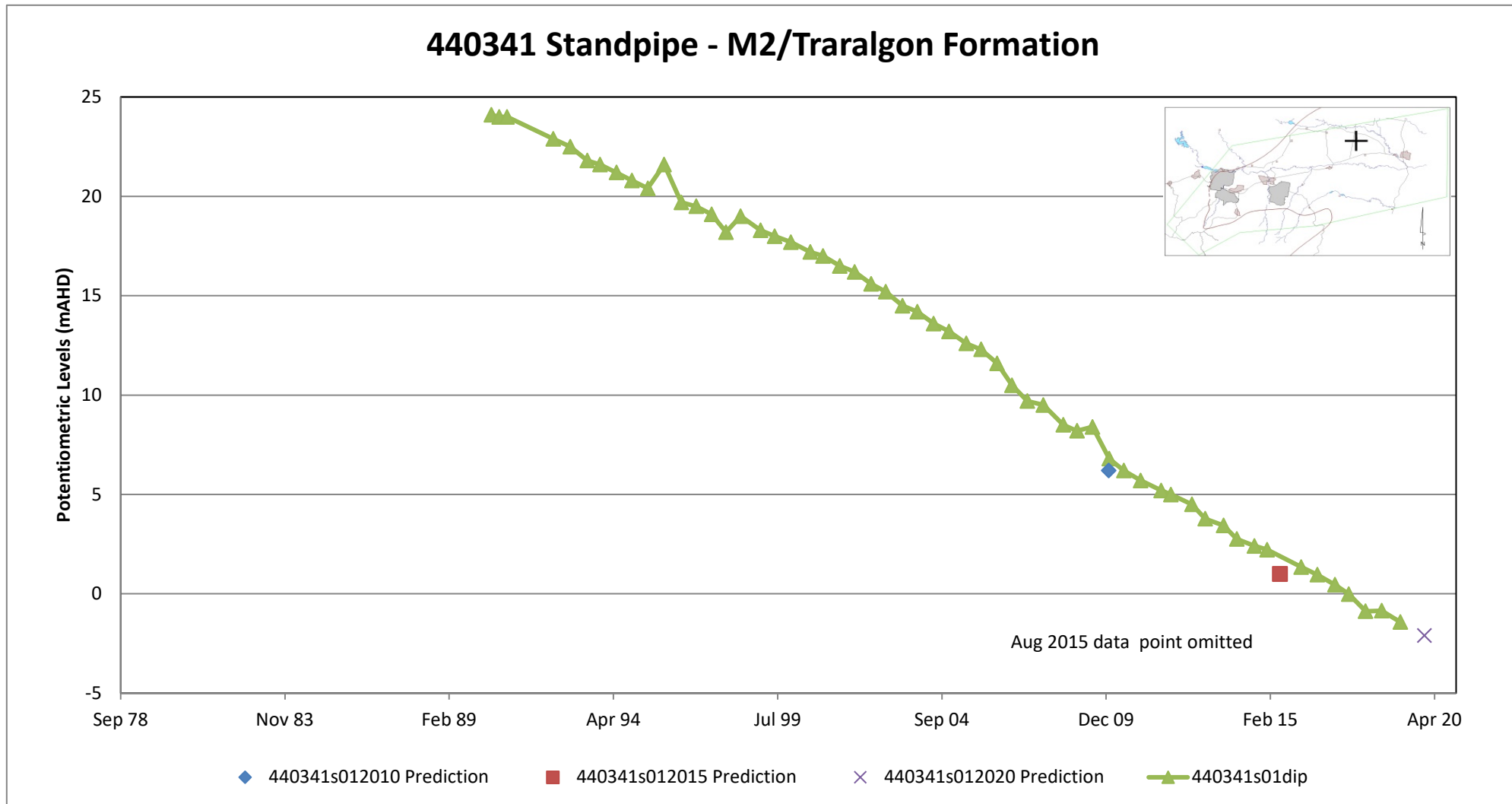
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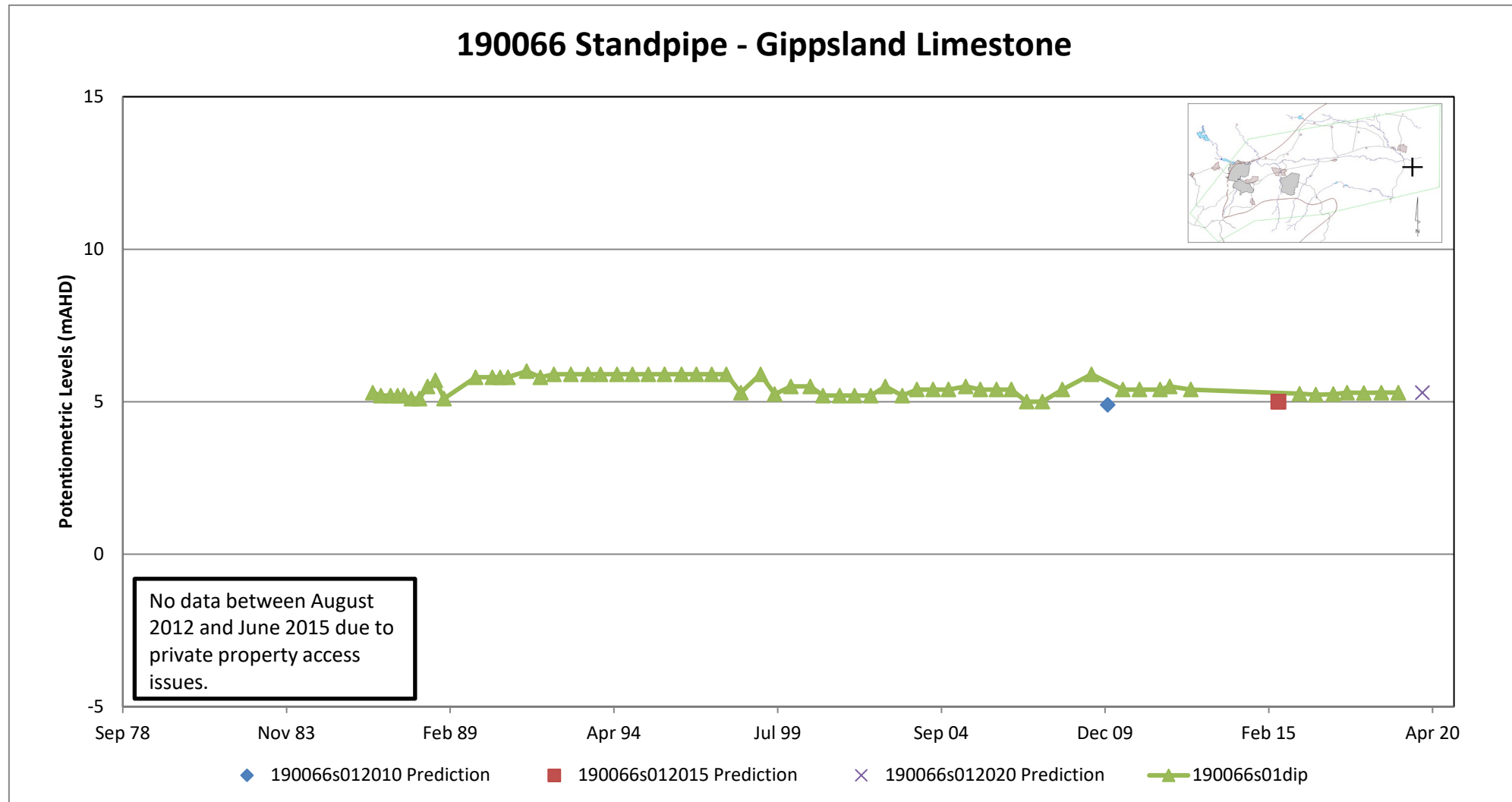
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Appendix E Key Bore Hydrographs

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Appendix F – Annual Asset Maintenance & Reporting Program

The following tasks are included in the annual work program for aquifer pressure monitoring.

Regional Network Management

1. Review bore hydrographs and other bore information to determine bores which may not be recording accurate aquifer pressures;
2. Confirm bore construction and identify possible causes of reading errors;
3. Priorities the bore rehabilitation work program to rectify identified bore performance problems including specification for bore testing / rehabilitation;
4. Determine bores which are no longer suitable for monitoring;
5. Maintain records of work completed;
6. Review and action as required to ensure overall network performance meets regional monitoring objectives.

Bore Testing / Rehabilitation / Maintenance

1. Undertake a field program to test bores to determine bore performance / integrity and determine required rehabilitation work;
2. Conduct rehabilitation work;
3. Conduct regular work on bore access, bore surface fittings and general maintenance.

Groundwater Level Monitoring

1. Complete aquifer pressure monitoring at scheduled intervals;
2. Report / record maintenance and other work required;
3. Verify and enter data to regional groundwater database and update bore plans and records.

Annual Report

1. Prepare information for annual Latrobe Valley Regional Groundwater and Land Surface Monitoring Report;
2. Compile report.

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19649/https://projects.ghd.com/oc/Victoria3/regionalnetworkmgmtm/Delivery/Documents/311237620_Rev0_RMC_FY19_Annual_Report.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	Genevieve Foley	John Bohan		Ben Jansen		5/12/19
				James Faithful		7/12/19
				Jon Missen		06/12/19
				Lance Wallace		9/12/19

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