

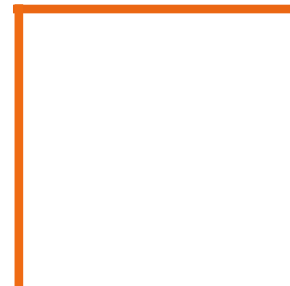
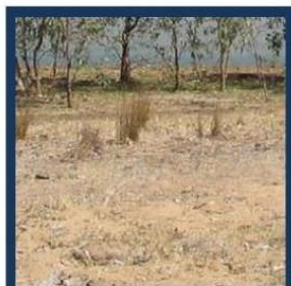
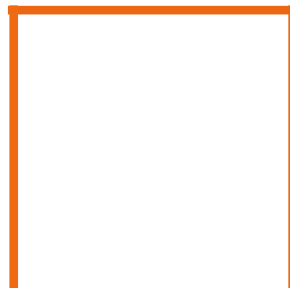


Hanson

ABN: 90 009 679 734

Wagga Wagga Quarry

WATER MANAGEMENT PLAN



Hanson Construction Materials Pty Ltd



Water Management Plan: Wagga Wagga Quarry Extension

P1203330JR01V09
August 2017

ENVIRONMENTAL



WATER



WASTEWATER



GEOTECHNICAL



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PROJECT
MANAGEMENT



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All enquiries regarding this project are to be directed to the Project Manager.

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1 Introduction

1.1 Overview

This water management plan (WMP) has been prepared as a requirement of the Project Approval (PA) 07_0069 issued by the NSW Department of Planning and Environment (DoPE) on November 22, 2011 for the approved extension of Wagga Wagga Quarry, Roach Road, Wagga Wagga, NSW (the site).

1.2 Scope

This document has been prepared in order to satisfy Condition 14 of Schedule 3 by preparing a WMP that includes:

- Site water balance.
- Erosion and sediment control plan (ESCP).
- Surface water management plan.
- Flood management plan.
- Contingency measures in the event that significant surface or groundwater resources impacts occur.

1.3 Approved Development

The proponent proposes to extend extraction operations at the Site through quarrying sand and gravel from 5 individual extraction cells (to be developed in a series of stages). Extraction is expected to provide 25 years of quarrying operations. The Environmental Assessment Report (EA) (Hanson, 2010) provides further details regarding the proposed development.

The approved site plan is provided in Attachment A.

1.4 Subject Site

The Site is located approximately 5 km west of Wagga Wagga Town Centre and is identified by title as Lot 2 of DP610795 and Lot B of DP 381991. The site is bordered by the Murrumbidgee River to the north, east and west, rural land to the south west and south east and Pomingalama Park to the south. Roach Road provides access to the Site and also traverses the Site between Lot 2 DP610795 and Lot B

DP381991. Approximately 51.6 ha of the 200 ha site is approved to accommodate the subject extension.

Further details regarding Site and surrounding conditions are provided in the EA (Hanson Construction Materials, 2010).

1.5 Agency Consultation

Consultation with the following agencies was undertaken in preparation of this document:

- NSW Department of Primary Industries - Water (DPI Water).
- NSW Office of Environment and Heritage (OEH).

Details of correspondence are provided in Attachment F.

1.6 Water Management System

The water management system will be implemented generally as detailed in 'Option 1' in Evans and Peck (2013) Water Management Review, prepared to address requirements of Clause 8 and 9 of Schedule 3 of the PA. In summary the system involves:

- Extraction of material from the active cell (known as Cells 1 – 5) with dewatering redirecting groundwater to Process Plant Basin.
- The Process Plant Basin shall supply the process plant with water.
- Waste (process) water from the process plant shall be either:
 - Discharged to the Process Plant Basin for recycling; or
 - Be used in the hydrocyclone sand processing plant then discharged to the wetland west of the process plant or if wetlands are 'full', redirected to the Process Plant Basin for recycling.
- Process water directed to the Process Plant Basin shall be treated by settling and used for operation of the plant. Excess water shall discharge to Pit 2 via the existing open drain which will be extended.
- Pit 2 is to be used as a settling pond and storage for supply of the Process Plant Basin, when required.
- Surplus water from Pit 2 shall be transferred to Pit 1 then, subject to Environmental Protection License 2433 (EPL) water quality criteria being achieved, discharged to the Murrumbidgee River.

- Open voids (such as the active cell) capture direct rainfall which then forms part of the above system.
- Water extraction from the Murrumbidgee shall generally not be required; however, periodic use may occur if water quality in Pit 2 is inadequate for plant operating purposes.

Overburden from active cells to be is used to backfill Cell 1 to a level above the local groundwater table.

A schematic of the proposed water management system is provided in Figure D1 (Attachment D).

2 Site Water Balance

2.1 Outline

This water balance has been prepared in accordance with Condition 14(a) of Schedule 3 of the PA and provides details on:

- Water supply sources, security and licensing.
- Water demands.
- Water management and balance.
- Off-site water transfers.

It has been prepared based on information provided in Evans and Peck (2013) Water Management Review and adopts water supply and usage rates for conclusion of quarry operations (i.e. when Cell 5 is active, Cell 1 is backfilled and Cells 2-4 are offline), when net take has been calculated to be at its highest (Evans and Peck, 2013).

2.2 Water Supply Sources

2.2.1 Groundwater

The proponent currently holds water licenses for groundwater extraction of 360 ML/year (WAL 33474, bore license 40BL190719 and 40BL190720).

2.2.2 River Extraction

The proponent currently holds water access licenses (WALs) (WAL 3661 & WAL 3788) and their associated Water Supply Works Approvals to pump 100 ML/year from the Murrumbidgee River.

2.2.3 Surface Water Capture

Open voids including the active cell, and Pit 1 (discharge pit) and Pit 2 (settling pond) will capture direct rainfall which will then be available for reuse and form part of the site surface water management regime. According to Table 3 and Table 4 of Evans and Peck (2013), open water areas will capture between 136 ML (Stage 1) and 221 ML (Stage 5) of direct rainfall.

Consultation with NSW DPI Water (Attachment F) confirms that direct rainfall onto the open voids that do not have a catchment is exempt

from harvestable rights calculations under the Farm Dams Policy (NSW Government Gazette 40; 31 March, 2006 pg. 1628 - 1631) and does not require a license under the Water Management Act (2000).

2.2.4 Recycled Process Water

Water discharged from the processing plant (i.e. process water) will either be recycled through the Process Plant Basin or drained back to Pit 2, which will act as a settling pond and storage for water used in the processing plant. Table 4 of Evans and Peck (2013) states 310 ML/yr of process water will be recycled via this system during Stage 5 of operations.

2.3 Water Demands

2.3.1 Process Water Usage

At the conclusion of operations process water usage is calculated to be 2.81 KL/t (Evans and Peck, 2013). Based on an annual production rate of 150,000 t, process water usage demand is 422 ML/year. It is anticipated that this be satisfied by water from the Process Plant Basin (recycled from Pit 2 and topped-up using dewatering from the active cell) as part of the closed circuit process water recycling system.

2.3.2 Evaporation

Evaporation loss is expected from the site's open water bodies as well as drainage features (such as the site wetland). This value will vary for each stage of development. Where evaporation is from a lake connected to the local groundwater system, this evaporation must be considered when assessing for Water Access License (WAL) requirements for groundwater. An annual assessment of levels of the lake's beds compared to local groundwater table levels is to be completed to confirm which lake's evaporation loss forms a part of the site groundwater balance.

Water levels will be surveyed each year by a registered surveyor as part of the site's annual fly-over (aerial survey), or, if available, more up to date site measurements. Local groundwater levels shall be determined from a review of the year prior's groundwater levels in monitoring bore (s) near each pit. Assessment results shall be documented annually and presented in the Annual Review.

Evaporative losses will vary based on the area of groundwater connected lake during any given period. The volume lost through evaporation can be estimated based on the average annual Wagga Wagga evaporation rate (1,800 mm/year), pan conversion factor (0.93) and lake area.

At the time of writing, Pit 2 is the only open water body believed to be connected to groundwater; evaporative losses from the groundwater sump in the active pit are likely to be minor compared to Pit 2 losses. Evaporative loss is estimated using Attachment E to be 107 ML.

2.3.3 Dust Suppression and Process Loss

A loss of 16 ML/year is anticipated from the process plant through use in dust suppression activities, this loss shall be to evaporation, infiltration and retention in product.

2.3.4 Wetland Conservation and Groundwater Seepage

Approximately 70 ML/year shall be transferred from the process plant to maintain this ecosystem. Approximately 25 ML/year of this is lost from the wetland to groundwater seepage.

2.3.5 River Discharge

Surplus water from Pit 1 will be discharged to the Murrumbidgee River when water quality complying with site EPL is achieved (total suspended solids < 50 mg/L).

2.4 Water Management and Balance

An annual water balance is required to ensure the Site continues to operate with appropriate licenses. The balance will change each year (stage) of operation depending on:

- Total groundwater 'take' from:
 - Evaporative loss from the surface of water filled voids.
 - The volume of groundwater dewatering from the active pit.
- 'Gains' that offset evaporation loss:
 - Direct rainfall onto open voids is stored and, given it is fresh water, sits as the top layer of water and is preferentially evaporated instead of groundwater. Discussion with NSW DPI Water (Attachment F) confirms that direct rainfall to voids offsets evaporative loss of groundwater requiring licensing.

The licensable 'take' of groundwater required will therefore change annually. Attachment E provides the recommended process for annual

water balance calculations, this also determines the additional license volume required (i.e. if groundwater 'take' exceeds 360 ML/year).

Given groundwater extraction is required to be licensed prior to it taking place, Hanson will be required to make an estimate of the future year's total 'take' and license requirements based on the former year's requirements. The water balance shall be reviewed quarterly. In the event that take is assessed as exceeding the prorated allocation, then water balance accounting is to be increased to monthly for the balance of the monitoring year or until take is reduced to below the prorated level.

In the event that allocation is likely to be exceeded, additional allocation is to be sought.

2.5 Offsite Transfers

Off-site water transfers include:

- Seepage to groundwater: 25 ML/year.
- Discharge to Murrumbidgee River: approximately 267 ML/year.
- Water losses including evaporation from groundwater connected lakes (estimated 107 ML of groundwater from Pit 2 using 2015 rainfall rate); dust suppression and process inefficiencies and water loss in product (16 ML).

3 Erosion and Sediment Control Plan

3.1 Overview

This ESCP has been prepared in accordance with Condition 14(b) of Schedule 3 of the PA and details erosion control measures to be implemented as part of the approved development to ensure downstream receiving environments are not impacted by quarry activities.

This plan has been developed in accordance with Volume 2E, *Mines and Quarries*, of the Managing Urban Stormwater: Soils and Construction guidelines (DECC, 2008). It has been separated into establishment phase, operational phase and rehabilitation phase. A plan locating sediment and erosion control features is provided in Figure D2 (Attachment D).

3.2 Establishment Phase

During the establishment phase of each cell, before a self-draining pit is created, site clearing and initial excavation will generate sediment which requires appropriate management to mitigate sedimentation impacts in the Murrumbidgee River. During the initial activation of an extraction cell, the following sediment and erosion control measures shall be implemented where required:

- Earth bunds constructed around each approved cell area prior to commencing excavation and extraction works commence. Flood mitigation levees (see Section 5.2) can fulfil this function.
- Where not less than 50m of undisturbed grassed land separates the bund from a water way a sedimentation fence is to be installed on the outside of the earth bund to capture any sediment in runoff from the bund.
- Any soil stripping and stockpiling outside active cell areas will be regularly watered down using dust suppression techniques. A sediment fence shall also be installed on the downslope side of these areas if inadequate vegetated buffer does not exist.

Sediment fence and earth bund installation and maintenance shall be completed in accordance with Volume 1 of the Managing Urban Stormwater guidelines (Landcom, 2004).

3.3 Operational Phase

During the operational phase, Pit 2 will act as a settling pond for water extracted from the active cell and process water from the process plant. This pond will detain and manage (initially) sediment-laden water prior to reuse in the process plant or its discharge into Pit 1. According to Evans and Peck (2008) *Surface Water Management Report* a deep water pond with a minimum surface area of 3400 m² is required to remove TSS to a quality of < 50 mg/L in accordance with Landcom (2004). This area is easily accommodated within Pit 2 (approximately 11 ha) and shall be maintained throughout the life of the project.

Pit 1 will be used as a hold point for surplus water where water is further treated through sedimentation and tested to ensure quality is suitable (i.e. TSS < 50 mg/L) for discharge to the Murrumbidgee River. In the event that water contains too high a concentration of TSS it would be retained until a suitable quality is achieved.

During the operational phase flood management measures shall be integrated to further manage sediment and erosion control. Flood management is discussed further in Section 5.

3.4 Rehabilitation Phase

According to the project EA, the proponent's rehabilitation plan aims to have the pits regraded, revegetated and filled with overburden or water once the resource is exhausted and operations are complete. This will reduce the potential for ongoing erosion and degradation of the Site and subsequent impacts on the Murrumbidgee River.

Where any major earthworks are approved as part of Site regrading, sediment and erosion control measures including sediment fencing and straw bales should be installed where there is a risk of offsite migration of sediment laden runoff. These measures shall be installed and managed in accordance with Landcom (2004) guidelines.

3.5 Sediment Control Structures

The function and capacity of sediment control structures are summarised in Table 1. The location of Pit 1 and 2 are shown in Figure D2, the water recycling pond is displayed in Figure D3.

Table 1: Location, capacity and function of sediment control structures.

Structure	Function	Capacity
Pit 2	Settling pond for water in excess of recycling pond demands	Approximately 11 ha and 550 ML
Process Plant Basin	Separates sediment from groundwater dewatered from active cell GW and process water from plant.	Approximately 60 x 60 m and 7 ML
Pit 1	Discharge pond	Approximately 6 ha and 120 ML
Cell 1 flood mitigation levee	Contain potential sediment contaminated runoff from Cell 1 operations	Constructed around Cell 1 perimeter to approximately 177 mAHD (1 in 20 yr level)

Each structure is to be regularly inspected by Hanson with the following maintenance actions as and when required:

1. Removal of sediment from Process Plant Basin when accumulated sediment reduces operating depth to less than 1.0 m. Sediment to be removed using site excavator and reused onsite.
2. Pit 1 and 2 and flood levees shall require no maintenance other than following flood events. Following a flood which leaves the Murrumbidgee channel all Site levees shall be inspected for damage and repairs completed as required.

4 Surface Water Management Plan

4.1 Existing Surface Water Conditions

4.1.1 Drainage Features

Key drainage features at the site are:

- Drainage depression south of the quarry entrance.
- Drainage depression at the western boundary.
- Operational drainage features including slimes gravity drainage channel, Pit 1 and Pit 2.
- Wetland (created by historic water discharge from the processing plant) in the south near the site entrance. A drainage depression, previously used for slimes management, extends from this wetland north to the western drainage depression and into the Murrumbidgee River.

The ultimate destination for the majority of Site run-off is to the Murrumbidgee River which flanks the northern, eastern and western boundaries of the site.

Figure D3 (Attachment D) locates drainage features at the quarry site.

4.1.2 Existing Water Quality Conditions

Hanson advises that it currently monitors the following water quality parameters within the existing settling pond (Pit 1) and the Murrumbidgee River (upstream of Pit 1):

- pH.
- Conductivity.
- TSS.

Monitoring is currently completed on a monthly basis and analysed by Charles Sturt University. Baseline water quality conditions (during period July 2013 – December 2014) are summarised in Table 2.

Table 2: Summary of Hanson's baseline water quality data (data provided by proponent).

Date	Pit 1			Murrumbidgee River		
	pH	Conductivity (µS/cm)	TSS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)
July, 2013	7.2	231	26	7.7	209	16
August, 2013	7.5	200	10	8.0	214	58
September, 2013	8.0	217	13	8.1	95	20
October, 2013	7.8	223	8	7.8	95	31
November, 2013	7.5	65	15	8.0	228	7
December, 2013	7.6	237	5	7.2	53	22
January, 2014	8.1	250	12	7.7	89	24
February, 2014	8.4	253	8	7.4	59	19
March, 2014	8.2	262	25	7.6	96	38
April, 2014	7.8	220	24	8.0	251	4
May, 2014	7.7	245	4	8.1	199	11
June, 2014	7.4	247	8	7.9	187	46
August, 2014	7.6	102	23	7.5	251	4
October, 2014	7.8	253	3	7.6	114	29
October, 2014	8.0	259	4	7.8	100	27
November, 2014	8.1	261	3	8.0	79	16
December, 2014	8.2	256	<2	7.8	87	19
Average	7.8	222	12	7.8	142	23
Range	7.2 – 8.4	65 - 262	<2 - 26	7.2 – 8.1	79 - 251	4 - 58
ANZECC Trigger Values ¹				6.5 - 8.0	125 - 2200	NA

Note:

¹ Taken from Table 3.3.2 and 3.3.3 of Chapter 3 (Aquatic Ecosystems) of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality Guidelines (ANZECC, 2000). Values for lowland rivers of south-eastern Australia. No value for TSS provided.

Baseline water quality data indicates that:

- Average pH values within Pit 1 are generally consistent with values in the Murrumbidgee River. pH values are generally within the ANZECC trigger criteria.
- Average conductivity is higher for Pit 1 than the Murrumbidgee River. Values for both the pond and river are within ANZECC criteria ranges.
- TSS is generally higher in the Murrumbidgee River than Pit 1, on average values at both locations are less than site EPL

requirements (see Section 4.2) and Pit 1 TSS is less than EPL at all times.

Baseline water quality monitoring confirms the Site is not currently resulting in water pollution of the Murrumbidgee River and that the Pit 1 (existing settling pond) is suitably treating process waste water prior to discharge into the River.

4.2 Monitoring and Trigger Values

The Site surface water quality trigger values (Table 3) are developed based on baseline data and to achieve compliance with EPL requirements.

- Discharge to the river shall only be permitted at 'Point 1' (Figure D4, Attachment D) adjacent to Pit 1.
- Prior to discharge, TSS is not to exceed 50 mg/L (100 percentile concentration limit).

Table 3: Site surface water quality trigger values.

	Pit 1			Murrumbidgee River		
	pH	Conductivity (µS/cm)	TSS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)
EPL discharge limit^{1, 2}	NA	NA	50	NA	NA	NA
Adopted Project Trigger Value²	8.5	287	50	NA	NA	NA

Note:

¹ EPL = Environmental Protection License. See Section 4.2.

² No trigger values are set for the upstream Murrumbidgee River's water quality.

Where surface water quality in the pond exceeds trigger values, discharge to the river shall not occur until subsequent monitoring confirms compliance.

4.3 Surface Water Management

4.3.1 Management Measures

As part of the approved development, surface water management will be modified and upgraded to minimise Site water demand, reduce water loss during transmission, manage sediment and erosion control and protect site drainage features and the Murrumbidgee River.

Surface water management throughout the production process shall be as follows:

- During excavation of the active cell, the area will be surrounded by flood levees (Section 5) and be internally draining. It will therefore capture sediment-laden runoff which will then be pumped to the Settling Pond (Pit 2) as part of the dewatering process.
- Clean runoff from the remainder of the Site will continue to be captured within the Site's natural drainage features and flow to the Murrumbidgee River. Any direct rainfall onto open voids will be captured and either be evaporated or be managed through the Site's water management system.
- Process water shall be supplied from the Process Plant Basin which receives water from the Active Cell or Pit 2 and treats and recycles plant wastewater.
- Excess process waste water from the Process Plant Basin will discharge via an open drain to Pit 2 for treatment and reuse in the plant.
- Excess water in the Pit 2 shall be pumped to Pit 1.
- Water from Pit 1 shall be discharged to the Murrumbidgee when required provided compliance with Site EPL requirements are achieved; being:
 - TSS < 50 mg/L.
 - Discharge volume not to exceed 350 kL/hr.

Water quality sampling of water within Pit 1 is to be undertaken prior to any discharge to the river to ensure EPL compliance.

4.3.2 Water Abstractions and Licensing

As discussed in Section 2.4, groundwater extraction will vary year to year based on climatic conditions and site operations. The groundwater licensing conditions shall therefore be reviewed and amended as required, annually.

Although no extraction from the Murrumbidgee is anticipated to be required, the Site shall maintain a 100 ML/year WAL to allow Murrumbidgee River extraction, if required.

A Water Monitoring Plan (Martens and Associates, 2017) has been prepared to outline site monitoring regime including monitoring of water quality, dewatering volumes, water transfers and processing and water discharged into the Murrumbidgee River and the existing wetland. This plan, together with the site water balance and surface water management regime will ensure that quarrying activities operate strictly within license entitlements.

4.3.3 Water Reuse and Recycling

As per PA requirements, the site surface water management regime maximises the recycling and reuse of process water. Currently, process water demands are satisfied by extracting water from the Murrumbidgee River, the proposed regime aims to cease river extraction and source all water required for processing from: wastewater recycling; active cell dewatering; and from the Settling Pond (Pit 2). Process waste water will be treated in the Process Plant Basin before reuse. Surplus water will be either treated and discharged to the wetland or discharged to Pit 2 where it will be available for later reuse via the Process Plant Basin if required.

5 Flood Management Plan

5.1 Existing Site Conditions and Flood Management

The Site is located on the inside of a large meander bend on the Murrumbidgee River's floodplain and therefore the site is flood liable and requires management to mitigate possible impacts of floods.

Existing flood management measures include:

- Maintenance of an 'open' flood flowpath across the former fines settling area south of Pit 2.
- Levees around current and future pits are to be constructed to an elevation that excludes floods up to the 1 in 20 year ARI event (plan detailing existing levee levels is provided as Figure B1, Attachment B).
- A scour protection inlet spillway will be constructed at each pit at a level lower than the crest of the levee, designed to allow floodwaters to enter the pit in a controlled manner.

Existing flood levee survey details are provided in Attachment B.

Flooding damage in December 2010 confirmed the need for improved flood mitigation measures to be established as part of the approved development.

5.2 Proposed Flood Mitigation Measures

5.2.1 Mitigation Measures

Proposed flood mitigation measures, as detailed in Evans and Peck (2013) and the EA (2010) are summarised as follows:

- Proposed extraction cells and water quality control basins (active and inactive) are to be designed to the 1 in 20 year ARI event by way of a levee constructed to this level.
- Inlet spillway for each cell is to be constructed with a fuse plug arranged to operate by the 20 year ARI flood level. Fuse plug is to be on the downstream side of the active cell to allow cells to fill by backwater flooding and minimise the potential for embankments to overtop and scouring to occur.

- Extraction areas are located a minimum 100m from the river to mitigate risks of river impacts resulting from scour during flood events.

5.2.2 Levees

Attachment C (Figure C1 – C5) provides survey plans showing levee bank locations and heights. According to the EA, the levee crest for Stage 1 – 5 extraction cells is to be constructed to 177 mAHD, which was determined based on the 1 in 20 year level for Stage 3 of the approved works (i.e. cell 3 is active) as this stage was found to result in the most significant change in flood behaviour.

5.2.3 Fuse Plugs

Fuse plugs are proposed to allow backwater flooding prior to levee overtopping. This minimises the potential for scour when the upstream embankment is overtopped by floodwater.

Typical fuse plug design, as included in the EA, is provided in Attachment C (Figure C6). Fuse plug locations and heights are shown in Figures C1 – C5.

5.2.4 Levee and Fuse Plug Level

Table 4 provides a summary of levee and fuse plug levels for each stage of extraction.

Table 4: Levee and fuse plug levels.

Stage	Levee Crest Level (mAHD)	Fuse Plug Level (mAHD)
1	179.00	178.00
2 ¹	177.00	177.00
3 ¹	177.00	177.00
4 ¹	177.00	176.00
5 ¹	177.00	176.00

Note:

¹ Stages 2 – 5 have not been constructed at the time of reporting. Levee and Fuse Plug levels are indicative only and shall be refined during construction. This report and Table 4 shall be updated accordingly.

5.2.5 Inspection and Certification

The following flooding inspection and certification program is recommended to ensure flood mitigation measures are appropriately implemented:

1. Prior to construction, detailed design of fuse plug and levee banks are to be completed.
2. Design is to be provided to NSW Department of Planning and Environment (DoPE). A copy is to be retained onsite.
3. Following construction, flood mitigation infrastructure is to be inspected by an independent hydrological specialist and certification provided to DoPE and Council. Given the development is to be completed in stages, inspection and certification is required for each stage. Copies of each certification are to be retained onsite and made available upon request.
4. Levee banks and fuse plugs are to be routinely inspected and certified on a 5 year basis in accordance with Schedule 3, Clause 14 (d) of the PA. Certification is to be provided to DoPE and Council, with a copy retained onsite at all times.

5.2.6 Levee Decommissioning

Following completion of extraction from a cell, the flood levees may be removed provided the void is not to operate as a sedimentation basin. During decommissioning regrading works, sufficient bunds are to be retained to prevent surface runoff entering the void until such time as backfilling above the local groundwater levels are achieved.

5.3 Flood Contingency

In the event of a flood that, despite proposed management measures, results in the inundation of an active cell or other ponds the following contingency plan is to be implemented:

- Extraction onsite to cease until active cell, Process Plant Basin and Pit 2 are dewatered sufficiently.
- Where sufficient pre-flood notice allows, plant and equipment is to be relocated from the site or to higher ground.
- Following recession of flood waters, the Site manager will complete a Site walkover to survey damage and identify any significant impacts on surface or groundwater resources or

elements of the management and monitoring infrastructure (ponds, groundwater wells, etc.).

- The active cell and Process Plant Basin are to be dewatered to Pit 2 and then, if required, to Pit 1 for discharge as required.
- Excess water retained within Pit 1 is to be discharged to the Murrumbidgee River following monitoring and discharge procedures in accordance with EPL.
- Return to normal operation.

6 Contingency Plan

It is unlikely that the approved development will result in significant impacts on surface water or groundwater resources provided the water management plan outlined in this document is implemented.

In the event that any significant impact does occur on either surface water or groundwater resources, the following contingency plan shall be implemented immediately:

1. All discharge to the Murrumbidgee River shall cease where non-compliance relates to Pit 1 water quality.
2. Where non-compliance relates to excessive groundwater draw down or inadequate capacity in Pit 2 (unlikely except in floods), all dewatering is to cease. This is likely to also result in a temporary disruption in process plant operations.
3. DoPE, Council and relevant authorities (NSW OEH, Fisheries, NSW DPI Water) are to be notified of the details of the event and any immediate apparent environmental impacts.
4. Any remedial actions as identified by Hanson or required by agencies are to be implemented by the proponent to mitigate any further impact.
5. A relevant specialist is to investigate the cause of the event and its impacts and complete water quality sampling as required.
6. Once the cause of the non-compliance event has been identified and rectified, Site operations may recommence. Murrumbidgee River discharge shall only be permitted once EPL requirements are achieved.
7. An incident report is to be prepared by the proponent and provided to DoPE and Council within 7 days of the date of the incident (as per Condition 6 of Schedule 5 of PA 07_0069). This document is to include:
 - a. Details of the event/source of the impact.
 - b. Timeline and summary of actions taken.
 - c. Remediation and rehabilitation works completed.

- d. Water sampling results and outline of likely short and long term impacts as provided by relevant specialist.
- e. Measures to be implemented to preclude event from reoccurring and a timeline for their implementation.

Continued or repeated events may indicate a need to review the site water management system. Any modifications to the system shall require updates to this WMP.

7 References

Evans and Peck (2008) *Surface Water Management Report*

Evans and Peck (2013) *Wagga Wagga Quarry Extension Project: Water Management Review*.

Hanson Construction Materials (2010) *Environmental Assessment Report: Sand and Gravel Quarry Extension, Wagga Wagga NSW*.

Landcom (2004) *Managing Urban Stormwater: Soils and Construction Handbook*.

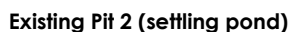
Landcom (2008) *Managing Urban Stormwater: Soils and Construction Volume 2e: Mines and Quarries*.

Martens and Associates (2009) *Surface and Groundwater Assessment: Roach Road, Wagga Wagga Quarry, NSW*.

Martens and Associates (2017) *Water Monitoring Program, Wagga Wagga Quarry Extension, NSW*.

Project Approval (07_0069) issued by NSW DoPE on November 22, 2011

8 Attachment A –Site Plan



Existing Pit 1 (surplus and discharge pit)

Pit 1

Existing slimes drain

**Pit
(Settling
Pond)**

Fines settling area

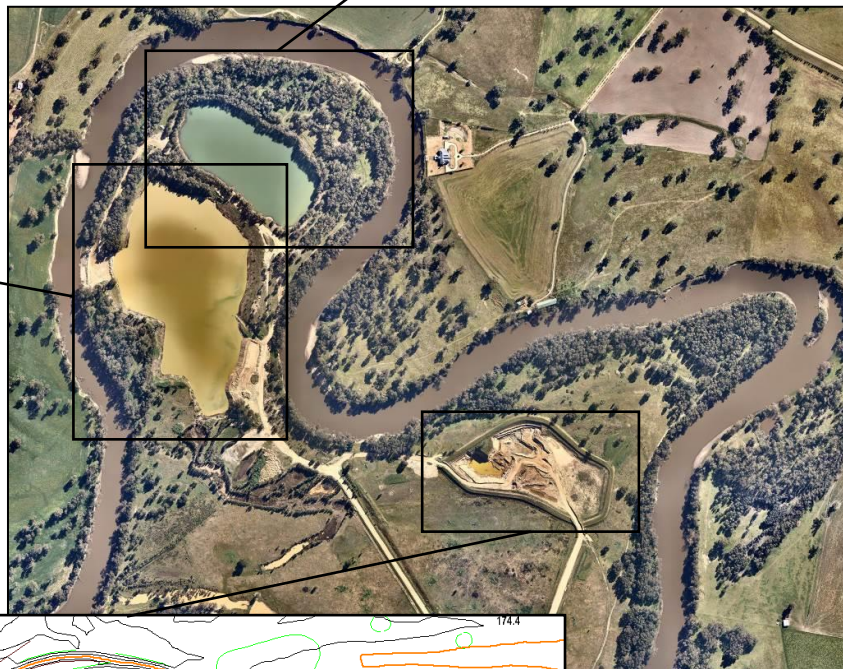
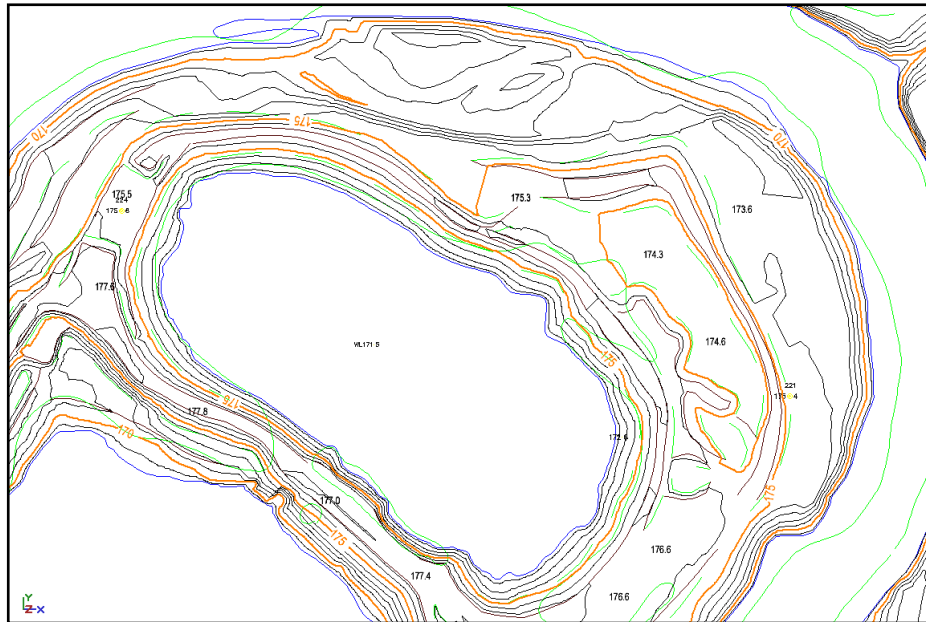
Wetland area and plant location

Existing plant area
and recycle ponds

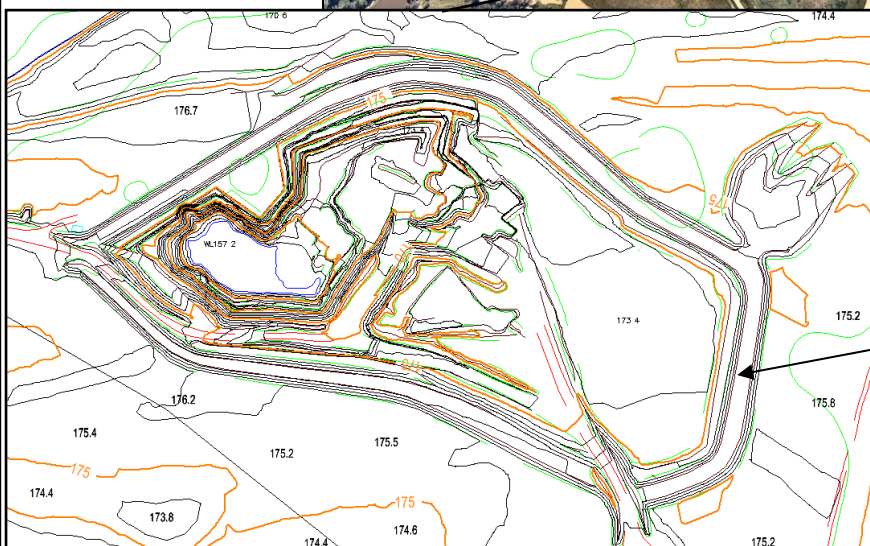
Stage / Cell

Martens & Associates Pty Ltd ABN 85 070 240 890		Environment Water Wastewater Geotechnical Civil Management	
Drawn:	MLK	Site Aerial and Extension Layout (Hanson, 2010)	ATTACHMENT A
Approved:	AN		
Date:	18.02.2015		
Scale:	NA		Job No: P1203330

9 Attachment B – Existing Flood Management Levee Heights

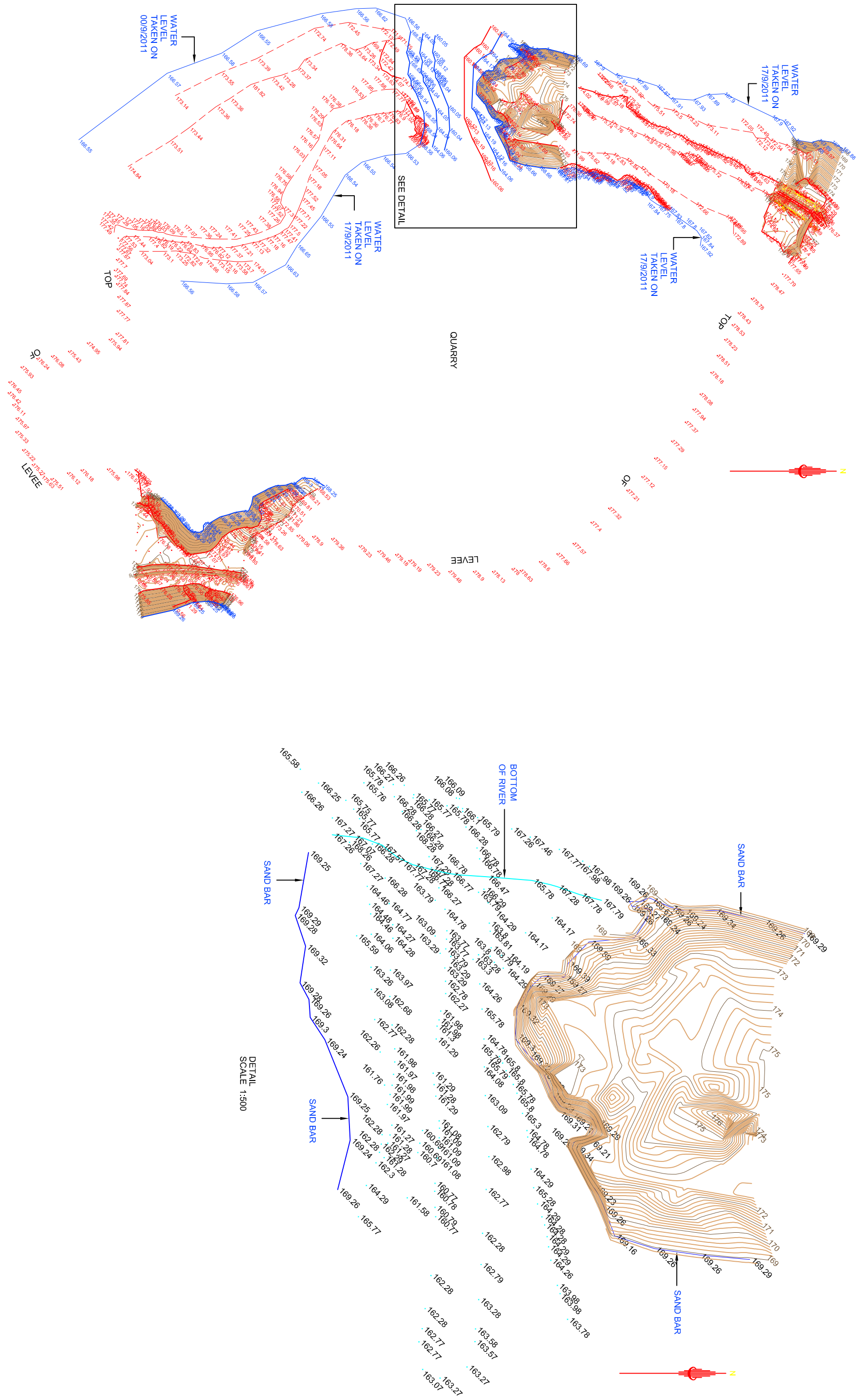


See Sheet 2



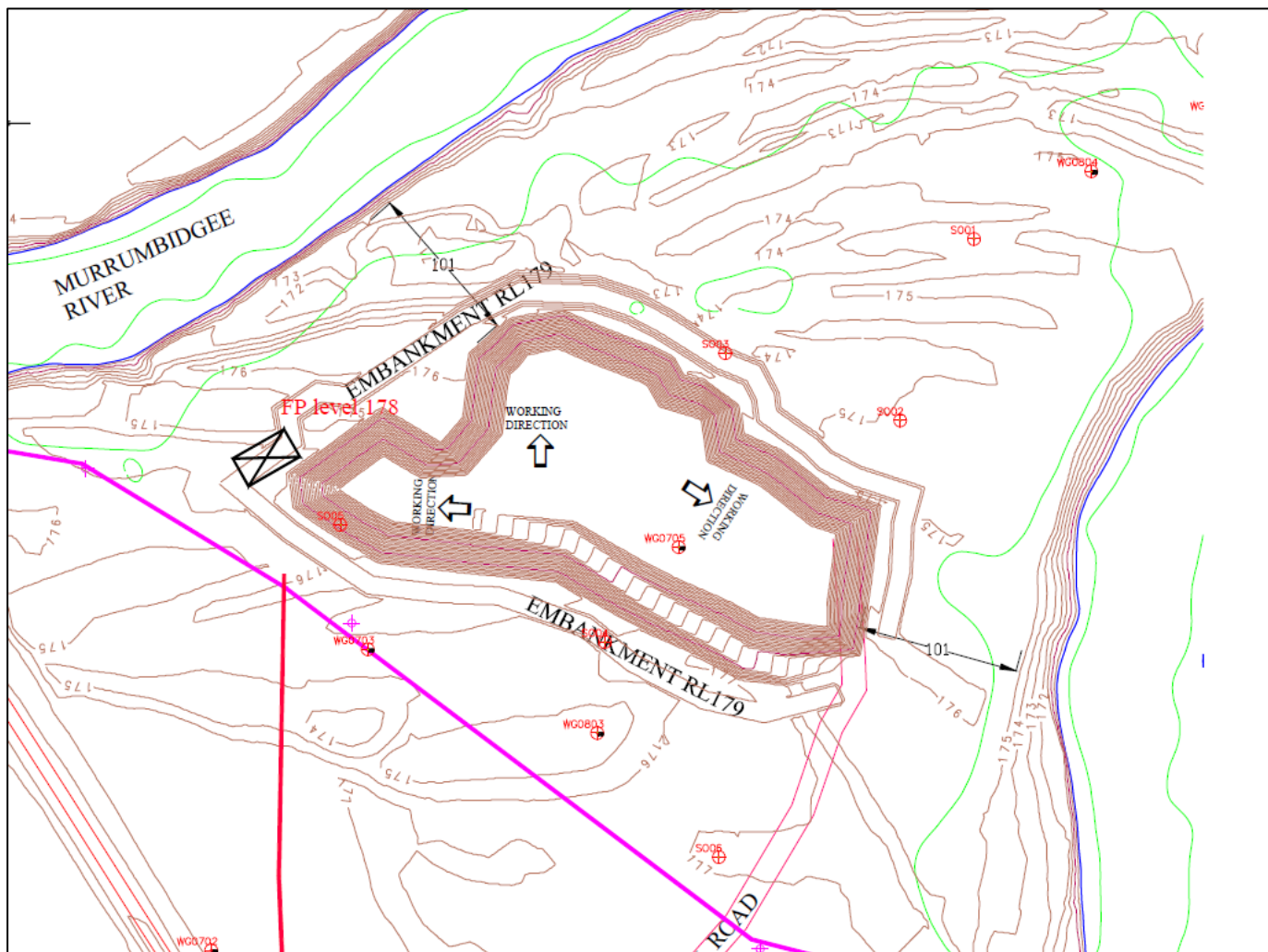
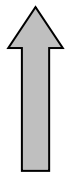
Top of Levee
177 mAHD

Martens & Associates Pty Ltd ABN 85 070 240 890		Environment Water Wastewater Geotechnical Civil Management	
Drawn:	MLK	Existing Flood Levee Heights (Hanson, 2014)	FIGURE B1
Approved:	AN		
Date:	17.02.2015		
Scale:	NA		Job No: P1203330



Locality: WAGGA WAGGA	Scale: 1:1500 (A1)	DETAIL SURVEY OF HANSONS QUARRY, ROADCH ROAD, WAGGA WAGGA	
Date: 27th October 2011	Datum: A.H.D. Origin: R.L.I.		
LES R. YOUNG PTY LTD CONSULTING SURVEYOR		Reference: SD/927	Surveyors Signature:

10 **Attachment C – Flood Management Figures**



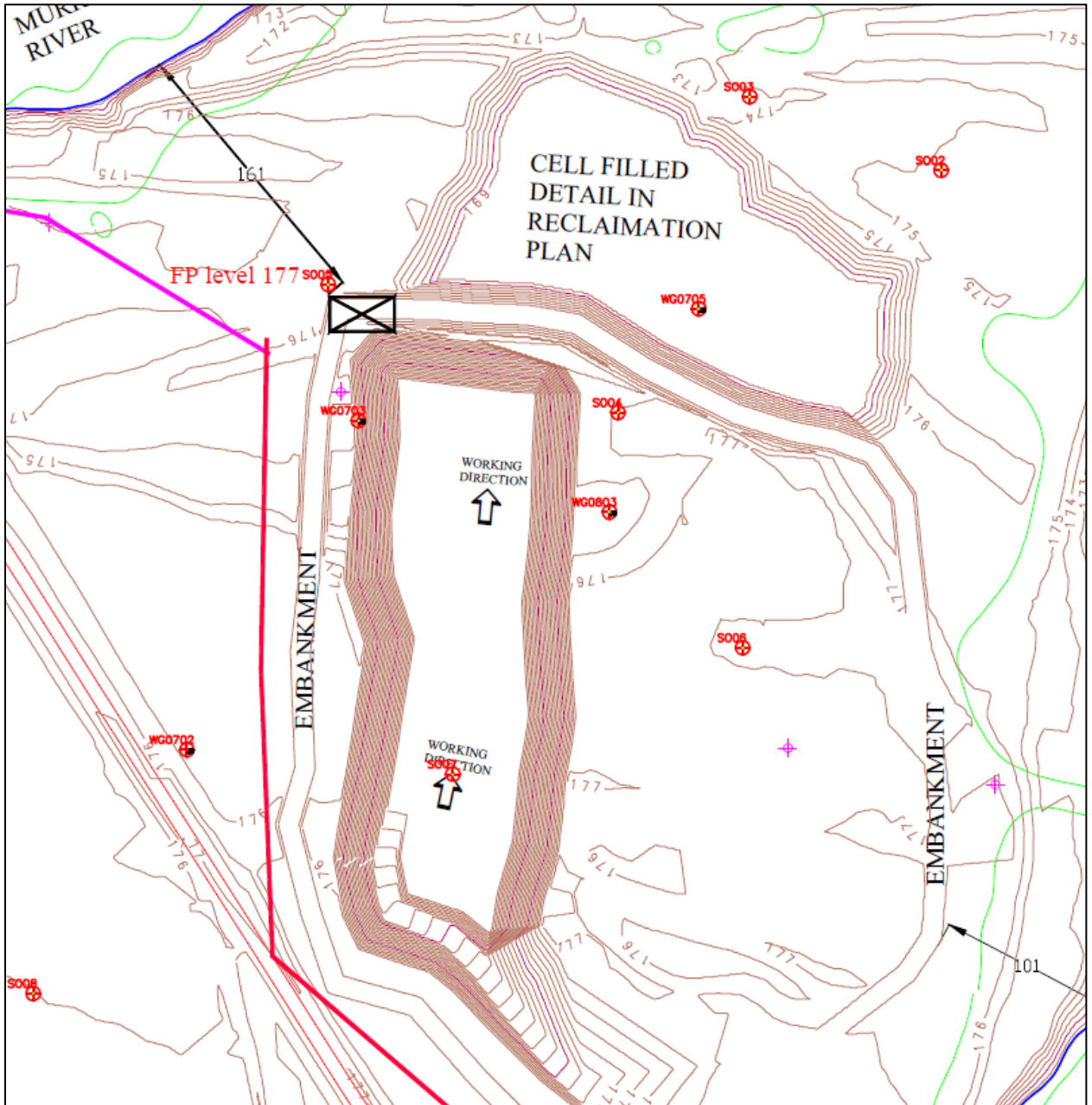
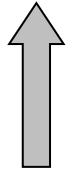
Fuse Plug

Note:

FP = Fuse Plug

Contours at 1m spacing

Martens & Associates Pty Ltd ABN 85 070 240 890		Environment Water Wastewater Geotechnical Civil Management	
Drawn:	MLK	Stage 1 Levee and Fuse Plug Details (provided by Hanson, 2017)	FIGURE C1
Approved:	AN		
Date:	08.03.2017		
Scale:	NA		Job No: P1203330



Note:

FP = Fuse Plug

Contours at 1m spacing



Fuse Plug

Martens & Associates Pty Ltd

ABN 85 070 240 890

Environment | Water | Wastewater | Geotechnical | Civil | Management

Drawn: MLK

Approved: AN

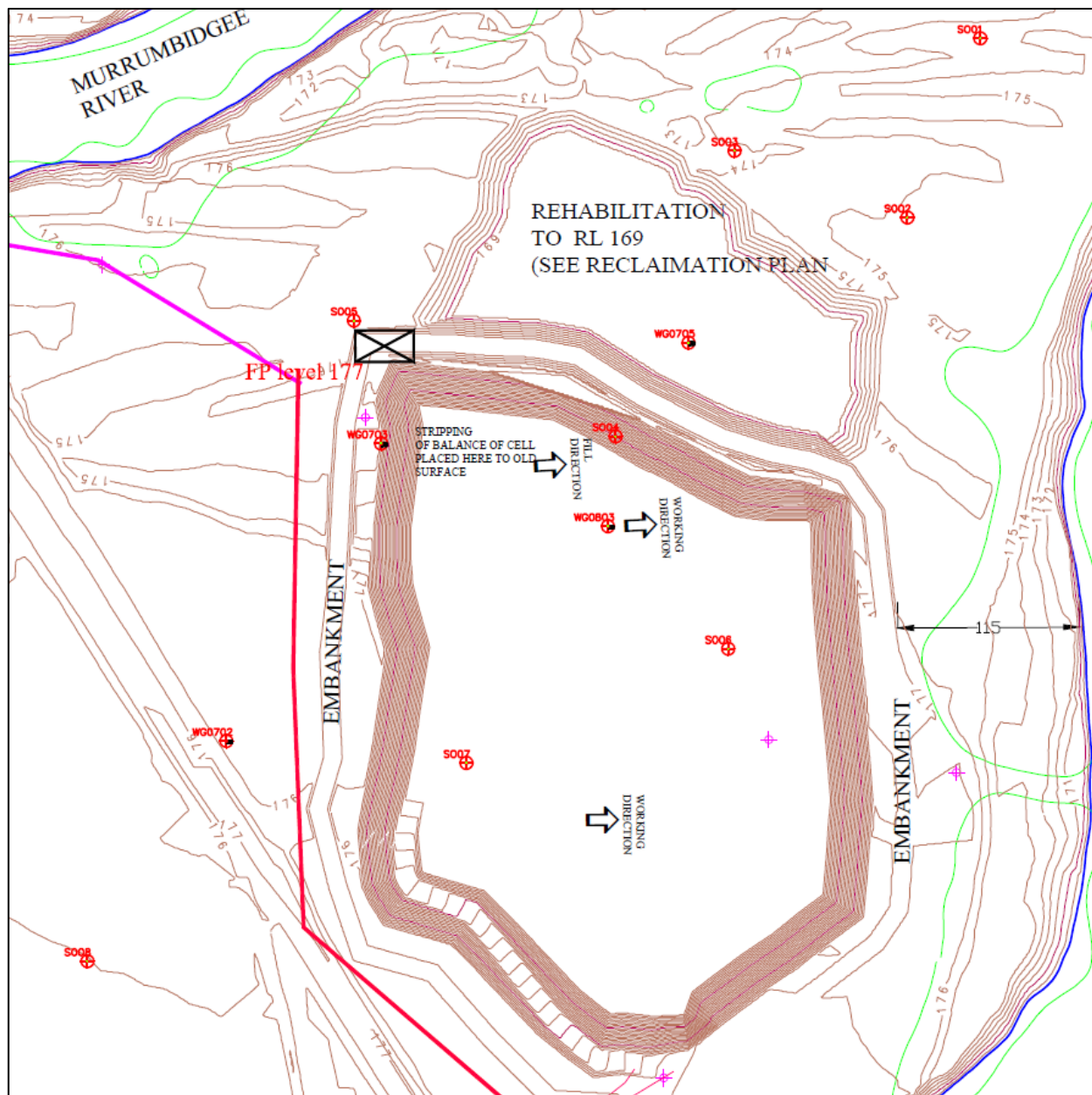
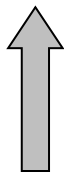
Date: 08.03.2017

Scale: NA

Stage 2 Levee and Fuse Plug Details
(provided by Hanson, 2017)

FIGURE C2

Job No: P1203330



Note:

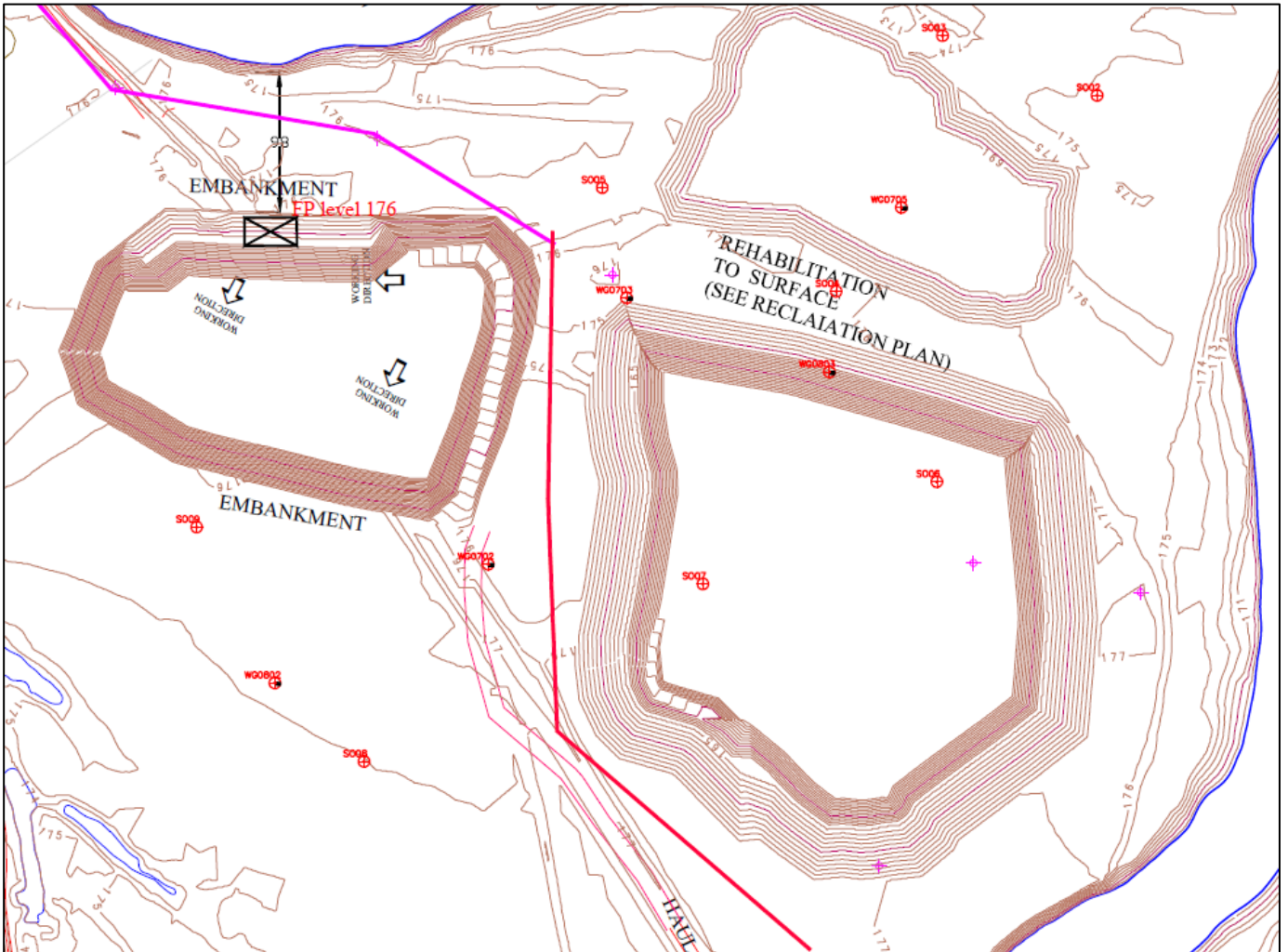
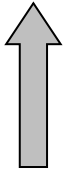
FP = Fuse Plug

Contours at 1m spacing



Fuse Plug

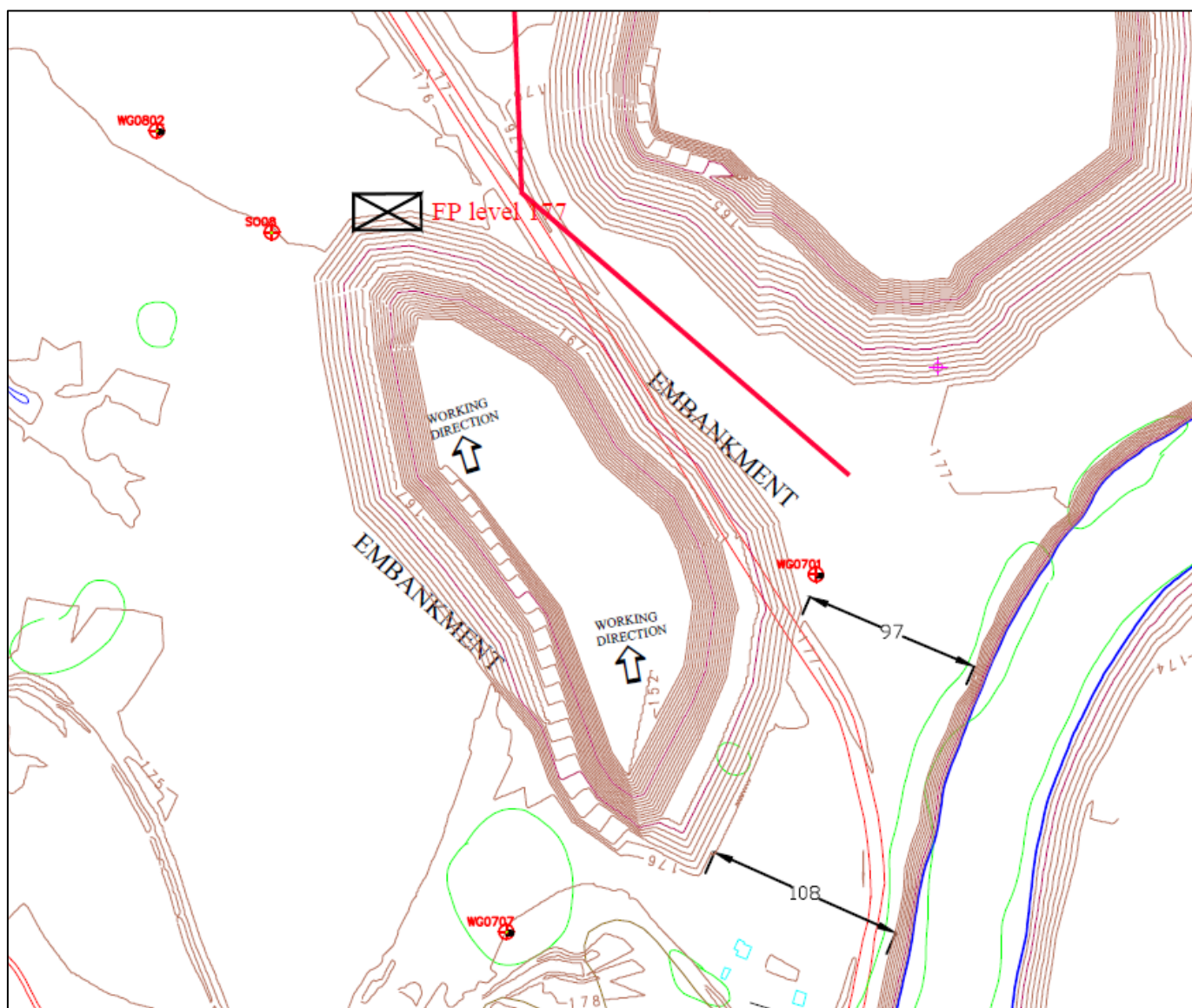
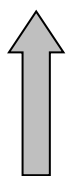
Martens & Associates Pty Ltd ABN 85 070 240 890		Environment Water Wastewater Geotechnical Civil Management	
Drawn:	MLK	Stage 3 Levee and Fuse Plug Details (provided by Hanson, 2017)	FIGURE C3
Approved:	AN		
Date:	08.03.2017		
Scale:	NA		Job No: P1203330



Fuse Plug

Note:
 FP = Fuse Plug
 Contours at 1m spacing

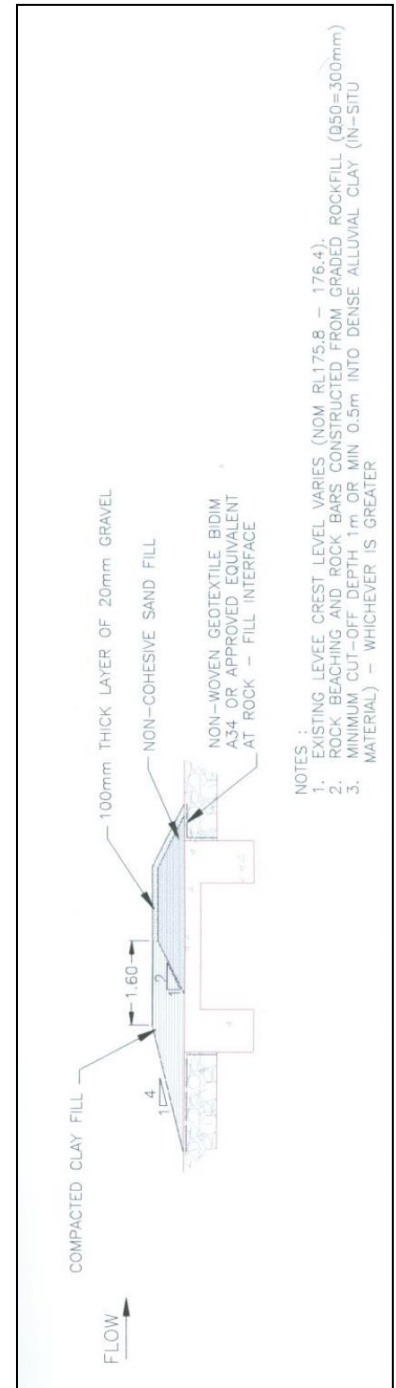
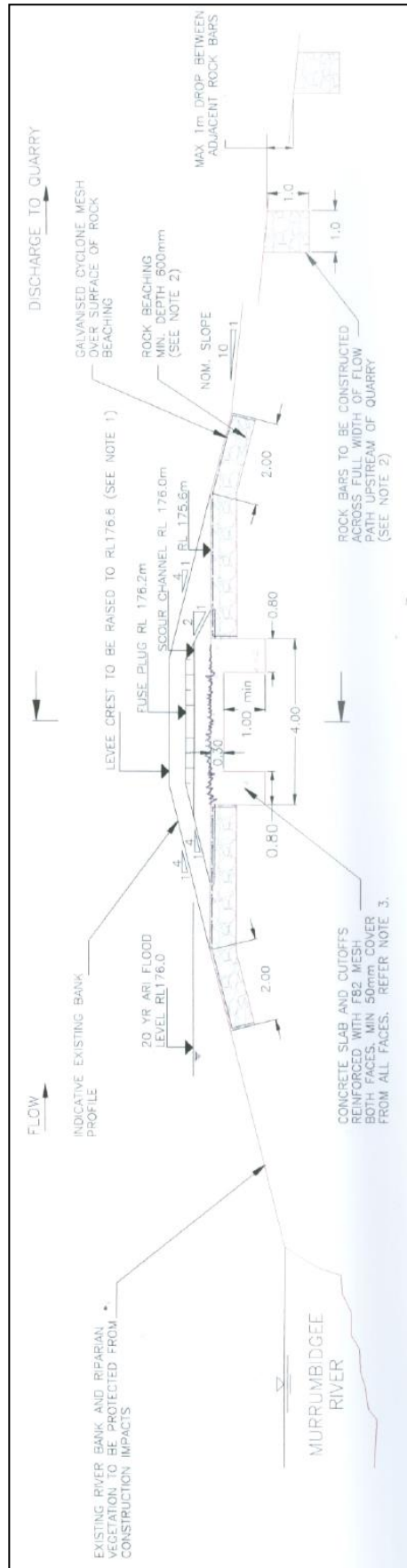
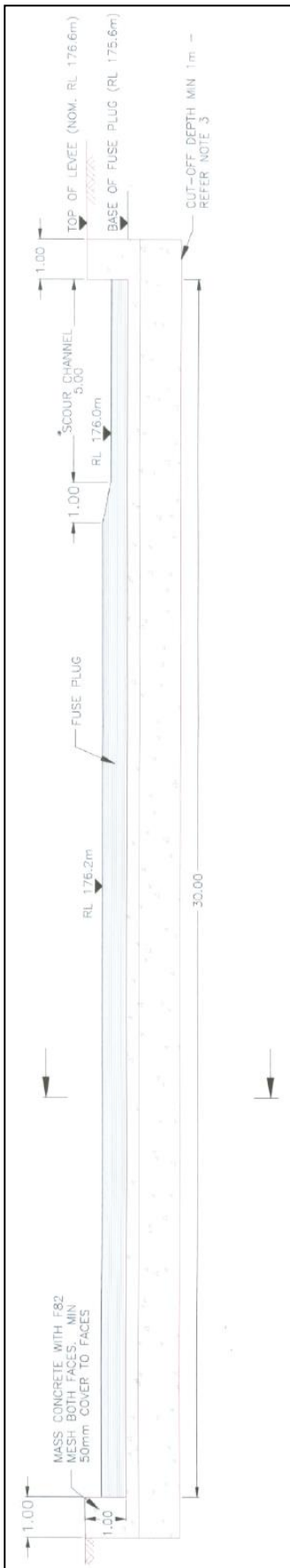
Martens & Associates Pty Ltd ABN 85 070 240 890		Environment Water Wastewater Geotechnical Civil Management	
Drawn:	MLK	Stage 4 Levee and Fuse Plug Details (provided by Hanson, 2017)	FIGURE C4
Approved:	AN		
Date:	08.03.2017		Job No: P1203330
Scale:	NA		



Note:
 FP = Fuse Plug
 Contours at 1m spacing



Martens & Associates Pty Ltd ABN 85 070 240 890		Environment Water Wastewater Geotechnical Civil Management	
Drawn:	MLK	Stage 5 Levee and Fuse Plug Details (provided by Hanson, 2017)	FIGURE C5
Approved:	AN		
Date:	08.03.2017		
Scale:	NA		Job No: P1203330



- NOTES :
1. EXISTING LEVEE CREST LEVEL VARIES (NOM RL175.8 - 176.4).
 2. ROCK BEACHING AND ROCK BARS CONSTRUCTED FROM GRADED ROCKFILL (Q50=300mm).
 3. MINIMUM CUT-OFF DEPTH 1m OR MIN 0.5m INTO DENSE ALLUVIAL CLAY (IN-SITU MATERIAL) - WHICHEVER IS GREATER.

Note: Fuse plug levels are indicative only and will vary for each stage and based on final construction.

Martens & Associates Pty Ltd ABN 85 070 240 890

Environment | Water | Wastewater | Geotechnical | Civil | Management

Drawn: MLK

Approved: AN

Date: 18.02.2015

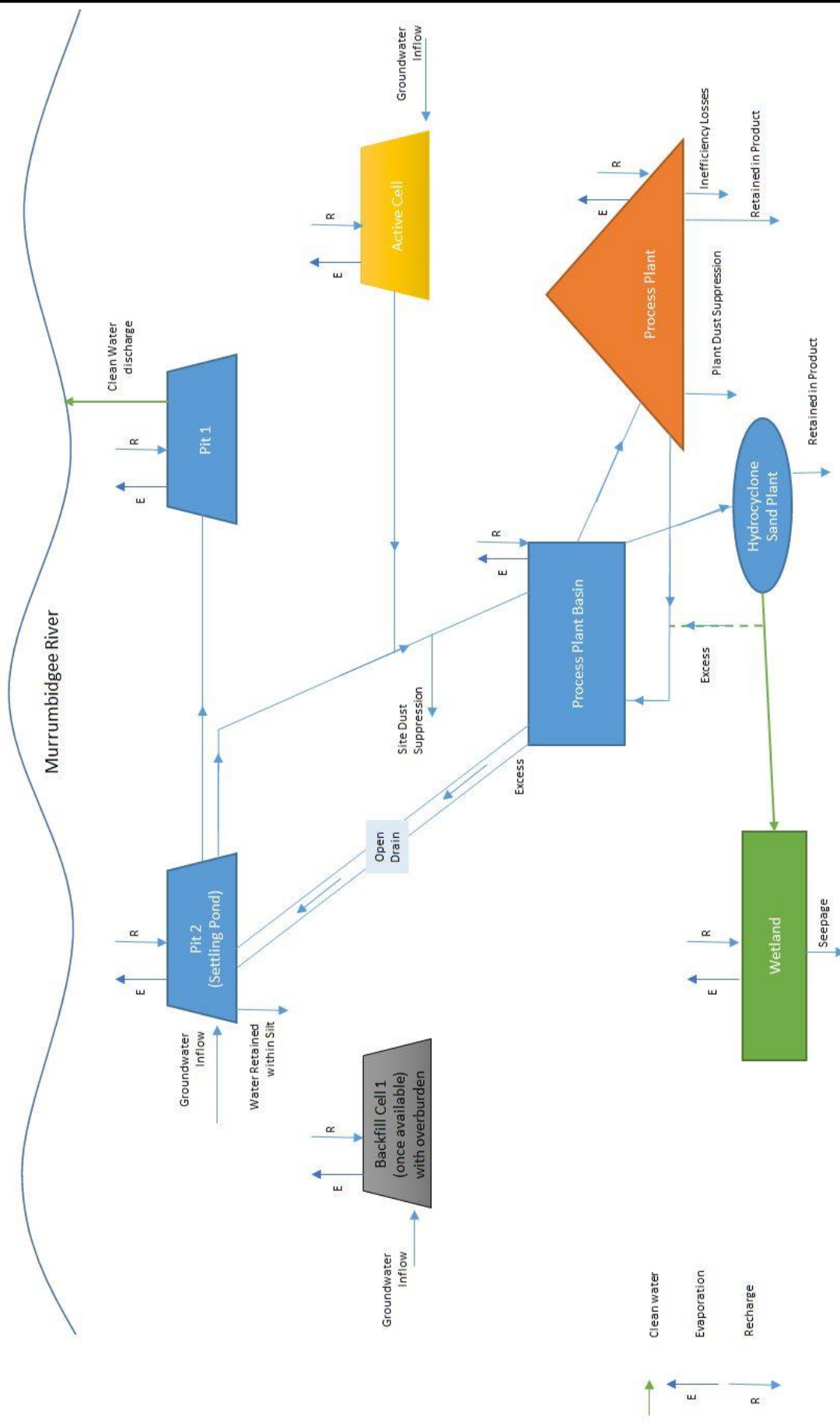
Scale: NA

**Indicative Fuse Plug Design
(Hanson, 2010)**

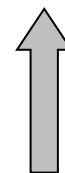
FIGURE C6

Job No: P1203330

11 **Attachment D – Surface Water Management Figures**

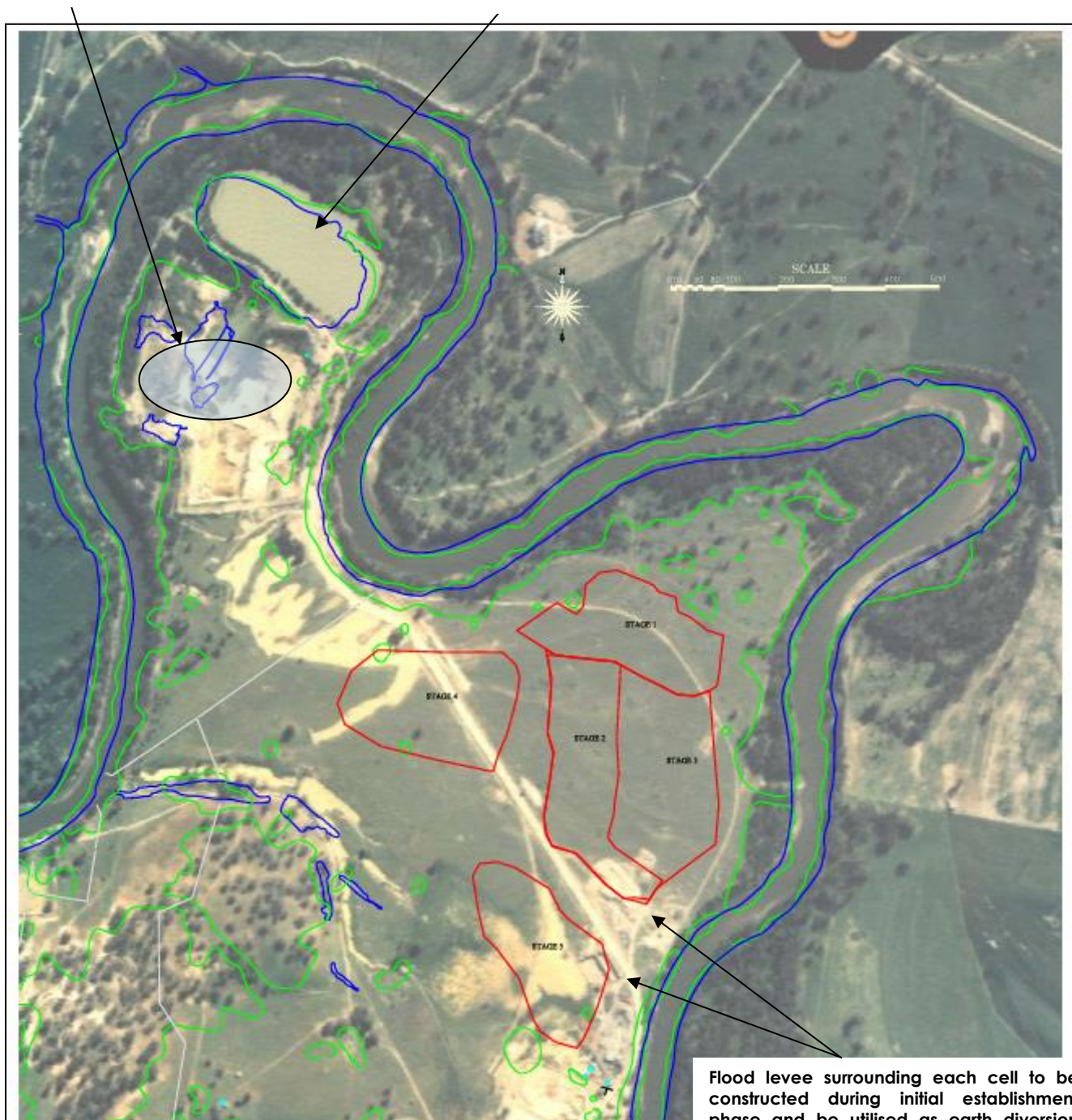


Martens & Associates Pty Ltd ABN 85 070 240 890		Environment Water Wastewater Geotechnical Civil Management	
Drawn:	MLK	Schematic of Proposed Water Management System (adapted from Evans and Peck, 2013)	FIGURE D1
Approved:	AN		
Date:	02/08/2016		
Scale:	NA		Job No: P1203330



Pit 2 to be utilised as Settling Pond during operational phase.

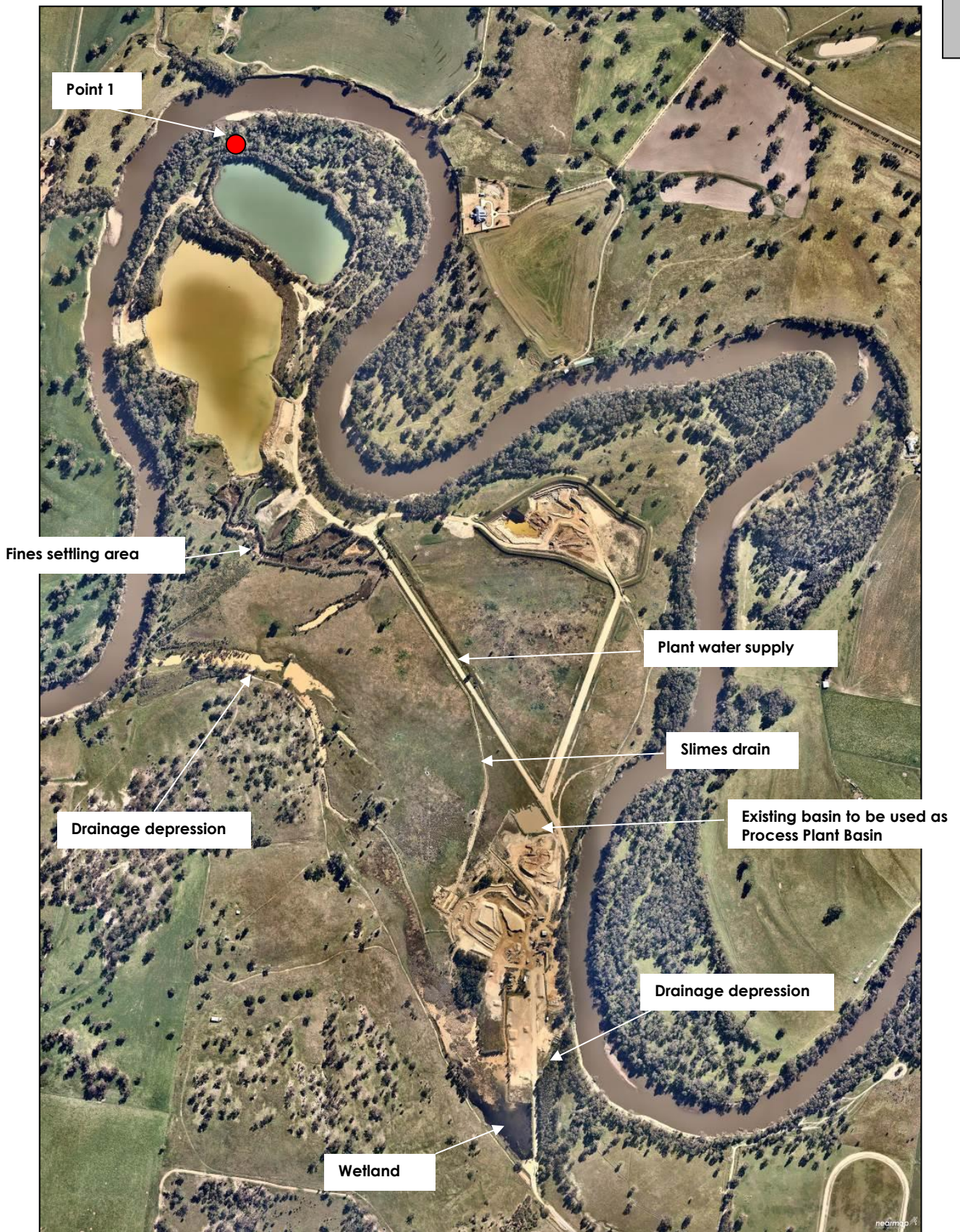
Pit 1 to be utilised to store surplus water during operational phase and discharge to Murrumbidgee River when suitable water quality is achieved.



Flood levee surrounding each cell to be constructed during initial establishment phase and be utilised as earth diversion bund.

Sediment fence is to be installed on the downslope side of each levee.

Martens & Associates Pty Ltd ABN 85 070 240 890		Environment Water Wastewater Geotechnical Civil Management	
Drawn:	MLK	Sediment and Erosion Control (Plan Source: Hanson 2010)	FIGURE D2
Approved:	AN		
Date:	18.02.2015		Job No: P1203330
Scale:	NA		



Martens & Associates Pty Ltd ABN 85 070 240 890		Environment Water Wastewater Geotechnical Civil Management	
Drawn:	MLK	Site Drainage Features (Source: Nearmaps, aerial from 2014)	FIGURE D3
Approved:	AN		
Date:	10.06.2015		Job No: P1203330
Scale:	NA		

12 Attachment E – Annual Groundwater Balance

		Pit 1	Pit 2	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	
Groundwater Connected		Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	
Only proceed with calculation where groundwater connection is confirmed									
Annual Pan A Evaporation (PAN EVAP)	BOM (Wagga Wagga Agricultural Institute) mm / 1000								____ m (a)
Lake Surface Area (SA)	Site measured based on a typical lake extents through year								____ m ² (b)
Lake Catchment (CATCH)	Site measured to crest of levee (excludes lake surface)								____ m ² (c)
Pan A	Factor to determine open water evaporation from Pan A evaporation data (Wagga Wagga AMO)	0.93							(d)
EVAP	(PAN EVAP x SA x Pan A) / 1000								____ ML (e) (e) = (a) x (b) x (d)/1000
Pit 2 Volume Change (V)	Change in retained volume in void (calculated based on change in water level over monitoring period and surveyed stage storage relationship)								____ ML (f)
REUSE	Difference between Process Plant Basin inflows and outflows – see calculation '4' in Figure 1 of Water Monitoring Plan (Martens, 2017).								____ ML (g)
Annual Dewatering (USE) 1, 2	Meter readings for dewatering (see Figure 1 of Water Monitoring Plan)	M1 + V	M3 + M6 + V	M2 + V	TBC + V	TBC + V	TBC + V	TBC + V	____ ML (h)
Mean Annual Rainfall (RAIN) 1, 2	BOM (Wagga Wagga Agricultural Institute) mm / 1000 or site monitoring								____ m (i)
Volume RAIN captured (GAIN)	Volume of direct rainfall onto open voids and runoff from batter								____ ML (j) (j) = (b + c x 0.3 ³) x (i) /1000
Net Evaporation loss (EVAP _{LOSS})	EVAP - GAIN								____ ML (k) (k) = (e) – (j)
Groundwater take (TAKE)	Net evaporation loss + dewatering volume - REUSE								____ ML (l) (l) = (k) + (h) – (g)

Total TAKE ⁵	Total groundwater TAKE from all pits		_____ML (l _{TOTAL})
Current groundwater license allocation (LICENSE) ⁴	Current licensed groundwater allocation	360 ML/yr	(m)
Additional allocation requirements (LICENSE _{REQ}) ⁶	Additional license allocation requirements to extract anticipated TAKE (k)		_____ML (n) (n) = (m) - (l _{TOTAL})

Note:

1. When using to make an estimate for following year, USE from previous year's operation is to be used and PAN EVAP and RAIN for Wagga to be used.
2. When using to determine years water balance at end of year USE to be determined for meter and average PAN EVAP and RAIN to be obtained from BOM for year.
3. 0.3 factor to account for batter runoff coefficients.
4. LICENSE is to be updated each year depending on how licensing conditions was amended for the following year's operational requirements. 360 ML available in 2014.
5. Total TAKE to be the sum of TAKE of each pit/void for each stage to give a total site groundwater take.
6. LICENSE_{REQ} for the future year's operation will therefore be an estimate based on the former year's operation. Water balance auditing is to be completed 3-monthly and, if required, additional license allocation sought.

13 **Attachment F – Agency Consultation**



**Department of
Primary Industries
Water**

Contact: Tim Baker
Phone: 02 6841 7403
Mobile: 0428 162 097
Fax: 02 6884 0096
Email: tim.baker@dpi.nsw.gov.au

Megan Kovelis
Martens & Associates Pty Ltd
Suite 201, 20 George Street
HORNSBY NSW 2077

Our ref: OUT17/33483

15 August 2017

Dear Megan

**Wagga Wagga Quarry – Amended Water Management Plan and
Water Monitoring Program**

I refer to your emails dated 11th July 2017 providing DPI Water an opportunity to comment on the Wagga Wagga Quarry Amended Water Management Plan and Amended Water Monitoring Program. This request follows previous advice provided by DPI Water in a letter dated 24th January 2017 and an email dated 15th March 2017. DPI Water has reviewed the amended documents and considers the issues raised previously in regards to the Water Management Plan have been adequately addressed. In regards to the Water Monitoring Program DPI Water acknowledges the inclusion of two additional monitoring bores near existing Pit 1 and 2. If practically possible DPI Water requests monitoring bore WG078 be located closer to the pit than the river to aid in interpretation of the monitoring results. No further comment is required.

Should you have any further queries in relation to this submission please do not hesitate to contact Tim Baker on (02) 6841 7403.

Yours sincerely

Guy Ohandja
A/Manager, Regional Water Regulation
Department of Primary Industries Water

Megan Kovelis

From: Tim Baker <tim.baker@dpi.nsw.gov.au>
Sent: Tuesday, 15 August 2017 3:17 PM
To: Megan Kovelis
Cc: Water Referrals
Subject: DPI Water response - Wagga Wagga Quarry - updated Water Management Review
Attachments: DPI Water Comments - Wagga Wagga Quarry - Updated WMP & Water Monitoring Program.pdf

Hi Megan,

Please see attached DPI Water's response. If you need to discuss please give me a call.

Regards

Tim

Tim Baker | Senior Water Regulation Officer
NSW Department of Primary Industries | Water
209 Cobra St | Dubbo NSW 2830 | PO Box 717, Dubbo NSW 2830
T: 02 6841 7403 | F: 02 6884 0096 | M: 0428 162 097 | E: Tim.Baker@dpi.nsw.gov.au
W: www.water.nsw.gov.au | www.dpi.nsw.gov.au

On 11 July 2017 at 11:56, Megan Kovelis <mkovelis@martens.com.au> wrote:

Morning Tim,

Email 2 of 2. Find attached the Monitoring Program.

Kind Regards,

Martens & Associates Pty Ltd

Megan Kovelis

Environmental Scientist

BEnvSc (Hons1)

Office Hours: Tues - Thurs



Martens & Associates Pty Ltd

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www.martens.com.au

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From: Megan Kovelis
Sent: Tuesday, 11 July 2017 11:56 AM
To: Tim Baker (tim.baker@dpi.nsw.gov.au); 'lauren.evans@planning.nsw.gov.au'
Cc: Nicholas Warren (nick@rwcorkery.com) (nick@rwcorkery.com); Driver, Andrew (Parramatta) AU
<Andrew.Driver@hanson.com.au> (Andrew.Driver@hanson.com.au); Andrew Norris
Subject: 3330; OUT17/3204 Wagga Wagga Quarry - Water Management Review

Good morning Tim,

Please find attached the amended Water Management Plan for your review. This now incorporates all recent comments/feedback provided from DPI Water as discussed throughout our consultation. The Water Monitoring Program will follow in a subsequent email.

Can you please review and confirm that we have now satisfied DPI Water's concerns in relation to this project. As I am sure you are aware, DPE is awaiting DPI Water 'sign off' before progressing the application. As such we would appreciate you completing your review asap. Can you please provide me with a timeframe within which this will be done, so that I can inform DPE?

Thanks again,

Kind Regards,

Martens & Associates Pty Ltd

Megan Kovelis

Environmental Scientist

BEnvSc (Hons1)

Office Hours: Tues - Thurs



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Megan Kovelis

From: Tim Baker <tim.baker@dpi.nsw.gov.au>
Sent: Wednesday, 5 April 2017 2:31 PM
To: Megan Kovelis
Cc: Andrew Norris; lauren.evans@planning.nsw.gov.au; Water Referrals
Subject: Re: 4420; OUT17/3204 Wagga Wagga Quarry - Water Management Review

Hi Megan,

Please see the below comments for further consideration.

- DPI Water understands the initial groundwater level interpretation across the site was based on the existing monitoring bores which are not in close proximity to Pit 1 and 2. There was therefore an element of uncertainty of the actual groundwater level in relation to Pit 1 and 2.
- DPI Water provides specific advice on groundwater monitoring requirements during review of Water Management Plans, rather than during the project application. This enables consideration of the final approved project and its impacts, and enables consideration of the conditions of the project approval.
- The information in the EA that supported the latest project approval was carried forward into the Water Management Review (2012). I understand no further bores were installed to verify the groundwater levels in relation to Pit 1 and 2.
- DPI Water advised on review of the Water Management Review (2012) that the adequacy of the groundwater monitoring network would need to be considered by the former NOW as part of a complete review of the information prepared for the Water Management and Water Monitoring. The WMP is considered to be that opportunity.
- DPI Water maintains the original recommendation to have monitoring bores to enable verification of groundwater levels in relation to all pits at the site. This is to enable confirmation of licensing requirements and impacts, and to meet the groundwater monitoring requirements of the project approval.

It is recommended further consultation with Department of Planning and Environment if concerns remain with the above comments and recommendations.

Regards

Tim

Tim Baker | Senior Water Regulation Officer
NSW Department of Primary Industries | Water
209 Cobra St | Dubbo NSW 2830 | PO Box 717, Dubbo NSW 2830
T: 02 6841 7403 | F: 02 6884 0096 | M: 0428 162 097 | E: Tim.Baker@dpi.nsw.gov.au
W: www.water.nsw.gov.au | www.dpi.nsw.gov.au

On 29 March 2017 at 08:09, Megan Kovelis <mkovelis@martens.com.au> wrote:

Morning Tim,

Following on from our conversation yesterday, I have spoken with the Proponent on DPI Water's concerns raised in relation to understanding the relationship between groundwater and individual pits and request for additional groundwater monitoring in the vicinity of Pit 1 and Pit 2.

The Proponent questions the need for additional bores in the vicinity of Pit 1 and 2 for a number of reasons:

1. During preparation of the EAR and its subsequent approval, there was no request made for additional groundwater monitoring bores.
2. Post approval there was a further requirement for the proponent to undertake a comprehensive Water Audit and Improvement Assessment. This was conducted by Evans & Peck in consultation with NOW/DPI Water.
3. The groundwater conditions at the site are well understood as a result of numerous studies, assessment and monitoring having been completed. The Proponent has also committed to ongoing monitoring and assessment in the future as part of the Water Monitoring Plan.
4. Studies completed as a condition of the Project Approval (Evans and Peck 2012 Water Management Review) have concluded that Pit 1 is not connected to groundwater. Pit 2 is connected to groundwater. The existing groundwater bore network is therefore considered sufficient.
5. Installation and ongoing monitoring of these additional 2 bores will incur a cost that is not feasible and not practical for a small sand quarry such as that at Wagga Wagga.

We ask that DPI Water considers the above and reviews their request for additional monitoring bores near Pit 1 and 2.

Kind Regards,

Martens & Associates Pty Ltd

Megan Kovelis

Environmental Scientist

BEnvSc (Hons1)

Office Hours: Tues - Thurs

Megan Kovelis

From: Tim Baker <tim.baker@dpi.nsw.gov.au>
Sent: Wednesday, 15 March 2017 4:49 PM
To: Megan Kovelis
Subject: Re: 4420; OUT17/3204 Wagga Wagga Quarry - Water Management Review

Hi Megan,

Please see the comments below in response to your email below in same numbers.

WMP

1. DPI Water accepts the proposal. Onus is on the operator to ensure compliance with water entitlements.
2. DPI Water's concern is that due to variations in the relationship between groundwater level and water level/base in the pits across the site (due to water stored in pits, pit depth or pit location) they will need to be considered individually, and this relationship may change during operations. To be able to justify this and to confirm changes during operations additional monitoring bores near the pits is required.
3. Revised water accounting is noted.
4. Removal of reference is noted.
5. Proposed amendments to figures and text is noted.

Water Monitoring Program

1. DPI Water considers additional groundwater level monitoring is required to confidently define the groundwater levels in the vicinity of the pits now and during operations and to meet the groundwater monitoring requirements of the project approval.
2. DPI Water accepts the proposal. Onus is on the operator to ensure compliance with water entitlements.
3. The table of construction details would be appreciated.
4. Additional groundwater monitoring is still requested to confirm groundwater levels to enable justification of water take requirements and to satisfy the requirement of the groundwater monitoring requirements of the project approval.
5. DPI Water accepts proposal.
6. Trigger related to groundwater quality and levels are noted. In regards to the water level trigger its recommended to use a trigger set less than the predicted maximum to give an opportunity to review the drawdown trend and the potential for exceedance of maximum predictions and the need to consider mitigating measures.
7. Monitoring program to commence immediately once WMP is endorsed is noted.
8. DPI Water accepts proposal.
9. WAL detail to be included is noted.

10. Amended figure to be provided is noted.

Regards

Tim

Tim Baker | Senior Water Regulation Officer
NSW Department of Primary Industries | Water
209 Cobra St | Dubbo NSW 2830 | PO Box 717, Dubbo NSW 2830
T: 02 6841 7403 | F: 02 6884 0096 | M: 0428 162 097 | E: Tim.Baker@dpi.nsw.gov.au
W: www.water.nsw.gov.au | www.dpi.nsw.gov.au

On 8 March 2017 at 15:58, Megan Kovelis <mkovelis@martens.com.au> wrote:

Afternoon Tim,

Thanks for speaking with me this morning. As requested, we have summarised comments and queries in relation to DPI Water's most recent review (January 24, 2017) below. Our comments following the same numbering system as DPI Water's.

Water Management Plan

1. We are concerned that increasing water accounting frequency from quarterly to monthly will be overly onerous on the operator, but understand DPI Water's desire to ensure groundwater 'take' does not exceed the license allocation. We propose accounting be completed quarterly unless the take is assessed as exceeding the prorated allocation. If take exceeds allocation, then accounting is to be increased to monthly for the balance of the year or until take is reduced to below prorated level. Please confirm if DPI accept this solution.
2. We are unsure what DPI Water seeks to achieve by this change. The water accounting will result in the same figure regardless of whether the surface area in each pit and active cell is used in calculation individually and then aggregated, or if areas are aggregated then used. Can you please provide further clarification of DPI Water's concern.
3. We will revise our water accounting (Attachment E) to include inflows and outflows to Pit 1 and Pit 2 as follows:
 - Inflows into Pit 2 from the PPB are to be calculated as described in the Water Monitoring Plan (see '4' in Figure 1, Attachment B).
 - Change in water level in Pit 2 over the period and a stage-storage relationship based on survey of the pit will be used to calculate changes in volume in the retained pit.
 - Transfers from Pit 2 into Pit 1 will be metered.
 - Pit 1 outflows (into the River) are already metered.

- Transfers from Pit 2 to PPB are already proposed to be monitored (Figure 1, Attachment B of report).

Please confirm the above is acceptable.

4. We will remove the reference as requested.
5. The fuse plug figures are being amended to reflect the levee heights and fuse plug locations. The text in the report will be updated to be consistent.

Water Monitoring Plan

1. As part of our water accounting calculations, we assume that Pit 2 is connected to groundwater, this is based on site knowledge regarding historic inflows when the pit was active. We do not believe additional groundwater analysis is required.

With regards to Pit 1, documentation from Evans and Peck confirm that the pit is not connected to the groundwater table, and so it is disregarded from calculation. We can provide this is required. Please confirm.

2. Assuming quarterly water accounting the groundwater take 'trigger volume' shall be $n/4$ of the annual estimate (e.g. 360 ML is annual allowable take, after 1 quarter trigger is 90 ML after two it is 180 ML). If take exceeds trigger volume further investigations will be required and dewatering shall cease until additional take is secured or until take falls below trigger.
3. A table of construction details shall be provided.
4. If DPI Water support our findings of Point 1 (comparison of groundwater level to bed level of Pit 1 and Pit 2), then additional groundwater monitoring in the vicinity of Pit 1 and 2 is not required.
5. We will include major ions to groundwater water quality sampling regime.
6. The 10% variation trigger applies to groundwater quality only (the text in the report will be adjusted for clarity). For groundwater levels, we will use predicted maximum drawdown for each cell and each stage. Currently, modelling for only Stage 1 is available as the model has been updated since the EA. We will amend the WMP to include draw down levels for Stage 1. WMP with require additional groundwater modelling to provide drawdown for subsequent stages prior to excavation intercepting groundwater in each subsequent cell. The WMP will include a table of trigger levels for each well for each stage.
7. A section in the report will be included to require that, once the WMP is endorsed, the monitoring program immediately commence.
8. We propose the following methodology for selection of replacement groundwater monitoring sites:
 - a) A new location shall be proposed to DPI Water in writing with justification based on location of damaged/destroyed well and historic groundwater observation.
 - b) DPI Water to confirm the revised location is acceptable. Consultation to continue until a mutually acceptable solution is achieved.

c) New groundwater monitoring well be constructed.

d) A data logger is to be installed in the new well.

9. The WAL detail will be included as requested.

10. An amended figure will be provided combining details as requested.

As we discussed, we are working to a tight timeframe with the Department, so if I can get comments/feedback on each point this week it would be appreciated.

Kind Regards,

Martens & Associates Pty Ltd

Megan Kovelis

Environmental Scientist

BEnvSc (Hons1)

Office Hours: Tues - Thurs



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Megan Kovelis

From: Tim Baker <tim.baker@dpi.nsw.gov.au>
Sent: Wednesday, 25 January 2017 11:43 AM
To: Megan Kovelis
Cc: Water Referrals
Subject: Re: 3330: Wagga Quarry Letter - water management review
Attachments: OUT17 3204 DPI Water Response - Wagga Quarry Water Management Plan & Water Monitoring Program.pdf

Hi Megan,

Please see attached DPI Water's response on the revised documents. If you need to discuss please give me a call.

Regards

Tim

Tim Baker | Senior Water Regulation Officer
NSW Department of Primary Industries | Water
209 Cobra St | Dubbo NSW 2830 | PO Box 2830, Dubbo NSW 2830
T: 02 6841 7403 | F: 02 6884 0096 | M: 0428 162 097 | E: Tim.Baker@dpi.nsw.gov.au
W: www.water.nsw.gov.au | www.dpi.nsw.gov.au

On 15 November 2016 at 10:50, Megan Kovelis <MeganKovelis@martens.com.au> wrote:

Morning Tim,

In relation to the above site and project and following from email consultation below, please find attached revised reporting for your review and comment.

Kind Regards,

Martens & Associates Pty Ltd

Megan Kovelis

Environmental Scientist

BEnvSc (Hons1)

Office Hours: Tues - Thurs



Contact: Tim Baker
Phone: 02 6841 7403
Mobile: 0428 162 097
Fax: 02 6884 0096
Email: tim.baker@dpi.nsw.gov.au

Megan Kovelis
Martens & Associates Pty Ltd
Suite 201, 20 George Street
HORNSBY NSW 2077

Our ref: OUT17/3204

24 January 2017

Dear Megan

Wagga Wagga Quarry – Water Management Review

I refer to your email dated 15th November 2016 requesting comments on the revised Water Management Plan (WMP) and Water Monitoring Program for the Wagga Wagga Quarry. DPI Water has reviewed the submitted documentation and provides key comments and recommendations below.

1. Comments

- DPI Water's previous review of the Water Management Audit identified significant concerns with the method used to estimate inflows into the extractive cells and the numerical modelling. These aspects have not been addressed in the revised WMP or the Water Monitoring Program.
- The proposed methodology for the calculation of the site water balance is generally robust however a number of recommendations have been made below to improve the reliability of the assessment.
- Numerous references are included in the WMP for water discharged into the river to be credited against licensed surface water take. DPI Water advises there is currently no regulatory mechanism to enable re-crediting of water returned to a water source. Further comments on this issue were detailed in a response dated 12 September 2014 to Hanson Construction during a review of the Water Management Review for this site.
- The proposed water monitoring program provides limited baseline data, which could be enhanced by providing additional information, such as; bore construction information, groundwater level hydrographs and analysis of groundwater quality data.
- Additional information is required on the trigger values and the actions to be implemented if they are exceeded.

2. Recommendations

Water Management Plan

1. Uncertainty in the estimates of inflows to the cells requires the water accounting of take and evaporative loss to be completed monthly rather than quarterly to ensure that take does not exceed the available allocation.

2. The surface area of the water in each pit and active cell to be calculated individually and not as a total. This is due to the groundwater level potentially not being uniform across the site, especially in the vicinity of the active extraction cell(s) where there is active dewatering.
3. The water balance accounting to include inflows into Pit 1 and Pit 2 from the Process Plant Basin in addition to outflows. This will assist in completing the water balance and verifying the volume of evaporation minus rainfall.
4. References to "*water discharged into the River is to be credited against licensed surface water take*" need to be removed. Implications of not being able to re-credit entitlement need to be considered for water licensing requirements at the site.
5. Review the location of the fuse plugs in Figures C1-C5. The figures indicate a fuse plug on both the upstream and downstream sides of the cells rather than just on the downstream side as proposed in Section 5.2.3.

Water Monitoring Program

1. The analysis of any significant variations in the groundwater levels during the year and their influence on extractive cells and pit 1 and pit 2 water levels.
2. Establishment of a trigger volume that is assessed monthly to account for take and evaporative loss from the pits and active cell, due to concerns about the reliability of the method used to estimate inflows into the extractive cells.
3. A table on the construction details of the monitoring bores.
4. Identification of additional groundwater level monitoring sites(s) in the vicinity of pits 1 and 2 to enable the monitoring of the groundwater level in the pits.
5. Inclusion of major ions in the groundwater quality sampling as this may assist in the identification of any impacts.
6. Clarify if the 10% variation trigger applies to groundwater levels and/or water quality. Further information is also required on when and what actions will be taken if the 10% variation is exceeded, if there is a level of impact that operations would cease and viable mitigating/management measures.
7. Commencing the proposed monitoring program as soon as possible once endorsed, as the development was approved in 2011. Data collected prior to the current date will be important in reviewing the ongoing monitoring results.
8. A methodology for the selection of replacement groundwater monitoring sites if an existing site is damaged or destroyed.
9. Identify the relevant Water Access Licence (WAL) in addition to the bore licence.
10. Provide extractive cell locations in the GMB network diagram (Figure 2). This will assist in identifying the proximity of these sites to the cells and the potential for the groundwater level at these sites to be influenced by the dewatering of the active cell.

Should you have any further queries in relation to this submission please do not hesitate to contact Tim Baker on (02) 6841 7403.

Yours sincerely



Patrick Pahlow
A/Manager, Regional Water Regulation

Department of Primary Industries Water

Megan Kovelis

From: Tim Baker <tim.baker@dpi.nsw.gov.au>
Sent: Monday, 16 February 2015 12:41 PM
To: Megan Kovelis
Subject: Re: 3330: Wagga Quarry Letter - water management review

Hi Megan,

In response to your email below dated 30 January 2015 I can provide the following comments to your three queries.

1. As detailed in NOW's letter dated 12 September 2014 regarding the Water Management Review, the volume of the pit/cells bounded by a levee that is minimised to the area of extraction do not need to be considered under harvestable rights.
2. Where groundwater is intercepted within pits the accounting for groundwater take is generally based on the volume of GW inflow induced through evaporation. Hence this is generally the difference between the rainfall and runoff versus evaporation rates where evaporation is higher. In situations where excavated material is removed which holds water and/or there is direct water extraction this would be an additional take to be considered in the water balance and final accounting.
3. The adequacy of the groundwater monitoring network would need to be considered by NOW as part of a complete review of the information prepared for the Water Management and Water Monitoring.

If you need to discuss further please give me a call and a formal response to the complete information prepared will be provided by NOW once submitted.

Regards

Tim

Tim Baker | Senior Water Regulation Officer
Department of Primary Industries | Office of Water
209 Cobra St | P O Box 717
Dubbo NSW 2830
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E: Tim.Baker@dpi.nsw.gov.au
W: www.water.nsw.gov.au

On 30 January 2015 at 09:42, Megan Kovelis <mkovelis@martens.com.au> wrote:

Hi Tim,

Good to speak with you last week and thank you for forwarding that documentation. As discussed, we have been engaged by Hanson to satisfy requirements of the Project Approval relating to Water Management and Water Monitoring – and so most comments made within NOW's feedback you provided will be addressed within our documentation. Others, particularly related to post-operation management of the site, will be dealt with at a later date by Hanson. As requested we provide the following summary of the points raised in NOW's feedback and how they are addressed within the Management and Monitoring Plans.

1. Harvestable Rights

- Surface water licensing and application of Harvestable Rights will be addressed.
- Note 'dirty' water sources will be from the Process Plant (process waste water) and the active cell. Water from both of these locations shall be directed to the Settling Pond and either reused in the Plant or discharged into the Murrumbidgee when water quality meets the site's EPL requirements (i.e. < 50 ppm TSS).

2. Flooding

- The Water Management Plan shall include a Flood Management Plan including:
 - a) Levee design, location and height information.
 - b) Fuse plug design specifications.
 - c) Flood contingency plan in the event damage occurs to the site during a flood event.
- Flood management infrastructure requirements following the completion of site quarrying operations will be addressed separately by Hanson

3. Groundwater Modelling

- As I mentioned on the phone, the Water Management Plan shall include a Water Balance and provide approximate values for site water 'take' and 'losses'. However, the nature of the operation means that accurate annual volumes of 'take' from groundwater shall be assessed on an ongoing basis to ensure values are correct.
- To ensure this is appropriately undertaken; our water balance assessment outlines a process for estimating groundwater take for future years operation based on the previous year. The calculations account for rainfall, evaporation and metered readings of dewatering.
- The total anticipated 'take' shall be calculated and additional groundwater license allocation obtained should anticipated take exceed the site's current WAL of 360 ML.
- The water balance shall be reviewed at 3-monthly intervals to ensure actual take is consistent with estimates. In the event that allocation requirements has been under-estimated, additional WALs shall be obtained prior to the operation exceeding the annual allocation.

4. Groundwater Assessment Limitations

- Shall be addressed by the above.

5. Water Licensing

- As per above, operational Harvestable Rights licensing requirements shall be addressed. Post-operational requirement shall be addressed separately by Hanson.
- On closure, the site shall maintain a groundwater license for ongoing groundwater 'take' via evaporative loss.
- A plan shall be provided detailing the water management scheme (including dirty and clean water management and cycling).

In addition to the above, we have a number of queries in relation to water management and monitoring that we seek comment on:

1. The proposed extraction cells shall be leveed and so will not have a catchment (i.e. will effectively operate as a turkeys nest dam) and will only capture direct rainfall. Does NOW agree that this volume does not contribute to the site's harvestable rights dam volume calculation.

2. Any rainfall captured within the active cell, the Settling Pond (existing Pit 2) and the Discharge Pond (existing Pit 1) will sit as the top layer of water within these water bodies due to water quality differences with groundwater. Rainwater will therefore be preferentially evaporated rather than groundwater.

We believe that direct rainfall captured within these cells should therefore offset evaporative loss and thus the calculated groundwater 'take' when considering WAL requirements. Does NOW support this methodological approach?

3. In relation to groundwater monitoring, the site has an existing network of 7 groundwater monitoring bores from which sampling is already undertaken. We propose to continue monitoring groundwater height from these wells using data loggers and propose groundwater quality sampling on an 'event' basis (e.g. pollution event) as general site operations are not anticipated to impact groundwater quality – does NOW agree that this is suitable?

Your feedback on the above is much appreciated.

Kind Regards,

Martens & Associates Pty Ltd

Megan Kovelis

Environmental Scientist

BEnvSc (Hons1)



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From: Tim Baker [mailto:tim.baker@dpi.nsw.gov.au]
Sent: Friday, 23 January 2015 4:29 PM
To: Megan Kovelis
Subject: Wagga Quarry Letter - water management review

Hi Megan,

Further to your phone call today please see attached letter from NSW Office of Water to Hanson regarding the Wagga Quarry water management review.

If you need to discuss further please give me a call.

Regards

Tim

Tim Baker | Senior Water Regulation Officer

Department of Primary Industries | Office of Water

209 Cobra St | P O Box 717
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Megan Kovelis

From: Amanda Baldwin <Amanda.Baldwin@epa.nsw.gov.au>
Sent: Wednesday, 21 January 2015 1:51 PM
To: Megan Kovelis
Subject: RE: 3330; Hanson Wagga Wagga Expansion - OEH Consultation

Hi Megan,

Thank you for your email. Just confirming and adding to your email below:

The **EPA** require the Water Management Plan and the Water Monitoring Plan to acknowledge the requirements issued under Hanson's Environment Protection Licence (EPL No. 2433). In relation to water management, these requirements include:

- Discharge volume into the Murrumbidgee River not to exceed 350 KL/hr
- Discharge pollutant concentration not to exceed 50 mg/L of Total Suspended Solids

The proponent is also required to demonstrate compliance with the above pollutant concentration and volume limits. The EPA view a monthly monitoring regime to be satisfactory in demonstrating compliance, noting that this is only required when the proponent is actually discharging to the Murrumbidgee River.

I believe that is all that needs to be included with regards to water management specifically. Please let me know if you need clarification with any of the above or further confirmation.

Thank you,
Amanda

Amanda Baldwin

Regional Operations Officer, Albury Unit | **NSW Environment Protection Authority** |

☎: (02) 6932 9123 | Mobile ☎: 0417 203 094 | 📠: (02) 6932 9110 | ✉: Amanda.baldwin@epa.nsw.gov.au

From: Megan Kovelis [<mailto:mkovelis@martens.com.au>]
Sent: Wednesday, 21 January 2015 10:54 AM
To: Baldwin Amanda
Cc: Andrew Norris
Subject: 3330; Hanson Wagga Wagga Expansion - OEH Consultation

Morning Amanda,

Thank you for your time this morning. Just to summarise the outcomes of our discussion, OEH require the Water Management Plan and Water Monitoring Plan to both require the proponent to comply with EPL requirements. Specifically (and in relation to water management):

- Discharge volume into the Murrumbidgee River not to exceed 350 KL/hr
- TSS of water discharged is to be < 50 ppm

I also note that, although not related to water management or monitoring, you mentioned it is also important for the site to comply with extraction volume limits or update the EPL to reflect proposed extraction volumes.

Can you please confirm that I have understood our conversation correctly. Feel free to add any further comments if required.

Kind Regards,

Martens & Associates Pty Ltd

Megan Kovelis
Environmental Scientist
BEnvSc (Hons1)



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