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Soil and Water Management Plan

Jandra Quarry

Holcim Australia Pty. Ltd.

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GLOSSARY / ABBREVIATIONS

ANZECC	The Australian and New Zealand Environment Conservation Council
BoM	Australian Bureau of Meteorology
Compliance audit	Verification of how implementation is proceeding with respect to a construction environmental management plan (EMS) (which incorporates the relevant approval conditions).
CoA	Conditions of Approval for Modification Application No. DA-231-10-99 MOD 5.
Department, the	NSW Department of Planning and Environment.
DPI	NSW Department of Primary Industries (Fishing and Aquaculture)
DP&E	NSW Department of Planning and Environment
EA	Environmental Assessment
Ecological sustainable development	Using, conserving and enhancing the community's resources so that the ecological processes on which life depends are maintained and the total quality of life now and in the future, can be increased (Council of Australian Governments, 1992).
ECP	Environmental Compliance Planner (Guideline 4.1 Permits, Licences and Approvals, Attachment 4.1E, Issue Date: February 2014).
EEC	Endangered Ecological Community
EMS	Environmental management strategy
Environmental aspect	Defined by AS/NZS ISO 14001:2004 as an element of an organisation's activities, products or services that can interact with the environment.
Environmental impact	Defined by AS/NZS ISO 14001:2004 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.
Environmental incident	A set of circumstances that causes, or threatens to cause, material harm to the environment; and/or breaches or exceeds the limits or performance measures/criteria in the Conditions of Approval.
Environmental objective	Defined by AS/NZS ISO 14001:2004 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve.
Environmental policy	Statement by an organisation of its intention and principles for environmental performance.
Environmental target	Defined by AS/NZS ISO 14001:2004 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EPA	NSW Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environment Protection Licence
ERSED	Erosion and sediment
Feasible	Feasible relates to engineering considerations and what is practical to build or carry out.
FM Act	Fisheries Management Act 1994

LEP	Local Environmental Plan
ML	Megalitre = 1,000,000 litres
MHRDC	Maximum Harvestable Right Dam Capacity
Minister, the	Minister for Planning and Environment, or delegate.
MOD 5	Modification Application No. DA 231-10-99 MOD 5.
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
Non-compliance	Failure to comply with the requirements of the Project approval or any applicable license, permit or legal requirements.
Non-conformance	Failure to conform to the requirements of Project system documentation or supporting documentation.
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage
PESCP	Progressive Erosion and Sediment Control Plans
POEO Act	Protection of the Environment Operations Act 1997
Quarrying operations	The extraction, processing and transportation of extractive materials on the site and the associated removal of vegetation, topsoil and overburden.
Quarry products	Includes all saleable quarry products, but excludes tailings and other wastes
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Rehabilitation	The restoration of land disturbed by the development to a good condition, ensuring it is safe, stable, non-polluting environment and appropriately vegetated.
RL	Reduced level
Secretary, the	Secretary of the NSW Department of Planning and Environment (or delegate).
Water Act	Water Act 1912

DOCUMENT CONTROL

Revision	Date	Description	By	Review	Approved
A		Draft report	D. Green	16/07/15	19/08/15
B		Draft report with Holcim review	D. Lidbetter & I. Shenton	20/08/15	25/08/15
Final draft		Final draft report	D. Green	31/08/15	31/08/15

1 INTRODUCTION

1.1 Context

A Soil and Water Management Plan was developed for Jandra Quarry following the Environmental Impact Statement (EIS) and subsequent development consent issued on 30 March 2000 (DA-231-10-99). The Soil & Water Management Plan was developed to:

- ensure adequate water supplies under most climatic conditions; and
- safeguard the integrity of downstream watercourses.

This Soil and Water Management Plan (SWMP or Plan) forms part of the Environmental Management Strategy (EMS) for the Jandra Quarry. This SWMP has been prepared to meet the requirements of the Minister's Conditions of Approval (CoA) for the Jandra Quarry Intensification in Production Modification (DA-231-10-99 MOD 5) and supersedes all previous versions.

This SWMP has been prepared to address the CoA, the mitigation measures listed in the Jandra Quarry Intensification in Production Environmental Assessment (EA) and all applicable legislation.

1.2 Background

The intensification in production will increase the demand for process water. A surface water management assessment was undertaken in the EA to review the existing stormwater management system at Jandra Quarry and its capacity to meet future process water demands and attenuate stormwater runoff and sediment.

The EA concluded that the site storage is capable of satisfying the quarry's current water demands. During Stages 1 to 3 of Quarry Development described in Section 2.3 of the Environmental Management Strategy (EMS), water shortages may occur in extreme dry conditions (5^{th} percentile year) for up to a month, if maximum production and water use is maintained. Modelled water shortages are predicted to occur when both the Main Dam and Pit Dam fall below 5% storage capacity. An estimated volume of 4ML is available in the clean water dam in the northern part of the site. This back up water source falls within the Maximum Harvestable Right Dam Capacity (MHRDC), and will provide sufficient water to meet the bulk of the expected deficit in non-potable water required during drought conditions. In the lead up to extended and extreme dry periods, water efficiency measures would be implemented to prevent any restriction on production due to water shortages.

The surface water management assessment considered the relevant provisions of the *Water Act 1912* (Water Act).and *Water Management Act 2000* (WM Act) as they relate to controlled activity approvals and water extraction license requirements. The assessment concluded that the modification would not require further approvals or licences under these respective Acts as long as the extraction of water from the clean water dam does not exceed the MHRDC per annum.

1.3 Environmental Management Document System

The environmental management document system for the Jandra Quarry is described in Section 5.1 of the EMS. This SWMP forms part of the Jandra Quarry EMS and the environmental management document system for the site.

In accordance with the requirements of CoA 19 of Schedule 3, this SWMP has been developed in consultation with the NSW Office of Water (NOW) and Greater Taree City

Council (Council). Further details of consultation with relevant stakeholders are provided in **Section 4** of this SWMP.

Management measures identified in this SWMP will be incorporated into relevant Work Method Statements (WMS) and site environmental procedures (i.e. – SHE Schedule, Monthly Environmental Inspections).

WMS are approved by the Quarry Manager. Operational personnel are required to undertake works in accordance with the safeguards identified in WMS.

The review, auditing and document control processes for this SWMP are described in Sections 9, 10 & 11 of the EMS.

1.4 SWMP approval

This SWMP must be endorsed by the Holcim Quarry General Manager and Planning & Environmental Manager prior to submission to the Secretary of the Department of Planning & Environment (DP&E).

The SWMP is required to be submitted to the Secretary of the DP&E for approval no later than 31 August 2015..

2 PURPOSE AND OBJECTIVES

2.1 Purpose

The purpose of this SWMP is to describe how Holcim proposes to manage and protect soil and water quality during the operational lifetime of Jandra Quarry.

2.2 Objectives

The key objective of the SWMP is to ensure that impacts on soil and water quality during operations are minimised and within the scope permitted by the development consent.

To achieve this objective, Holcim will undertake the following:

- ensure feasible and reasonable controls and procedures are implemented during operational activities to maximise water use efficiency and avoid or minimise potential erosion and sedimentation;
- ensure appropriate measures are implemented to address the relevant CoA outlined in **Table 1**; and
- ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in **Section 3.1** of this SWMP.

2.3 Targets

The following targets have been established for the management of soil and water impacts during the operational lifetime of Jandra Quarry:

- ensure full compliance with the relevant legislative requirements and CoA;
- meet Environment Protection Licence (EPL) water quality discharge parameters for all planned discharges; and
- ensure training on soil and water management is provided to all relevant personnel through site inductions.

3 ENVIRONMENTAL REQUIREMENTS

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Legislation relevant to soil and water management includes:

- Protection of the Environment Operations Act 1997 (POEO Act);
- Water Management Act 2000 (WM Act);
- Fisheries Management Act 1994 (FM Act); and
- Water Act 1912 (Water Act).

Relevant provisions of the above legislation are explained in the register of legal and other requirements included in Appendix A1 of the EMS.

3.1.2 Guidelines and standards

The main guidelines, specifications and policy documents relevant to this SWMP include:

- *Managing Urban Stormwater: Soils and Construction, Volume 2C Unsealed Roads* (DECCW 2008);
- *Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries* (DECCW 2008);
- *AS 1940:2004 The Storage and Handling of Flammable and Combustible Liquids*;
- *NSW Department of Primary Industries, Office of Water, Guidelines for Controlled Activities*;
- *Department of Environment and Conservation, Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales* (DEC, 2004a);
- *Draft NSW MUSIC Modelling Guidelines* (Sydney Metropolitan Catchment Management Authority, August 2010);
- *Holcim Guideline 4.11 Water Management (Aggregates)* (May, 2014); and
- *Holcim Water Efficiency Policy* (October, 2011).

3.2 Minister's Conditions of Approval

The CoA relevant to this SWMP are listed **Table 1**. A cross reference is also included to indicate where the condition is addressed in this SWMP or other environmental management documents.

Table 1 Conditions of Approval relevant to the SWMP

CoA No.	Requirement	Reference
Schedule 3, Condition 17	The Applicant shall ensure it has sufficient water for all stages of the development, and if necessary, adjust the scale of quarrying operations to match the available water supply.	Section 6.3
Schedule 3, Condition 18	The Applicant shall ensure that all surface water discharges from the site comply with the discharge limits in any EPL which regulates water discharges from the site, or with section 120 of the	Section 8

CoA No.	Requirement	Reference
	POEO Act.	
Schedule 3, Condition 19	The Applicant shall prepare and implement a Soil and Water Management Plan for the development to the satisfaction of the Secretary. This plan must be prepared in consultation with the Council and NOW, by suitably qualified and experience person/s whose appointment has been approved by the Secretary, and be submitted to the Secretary for approval by 31 August 2015. In addition to the standard requirements for management plans (see condition 3 of Schedule 5) this plan must include:	This Plan Section 1
	(a) Site Water Balance that includes details of: ▪ sources and security of water supply, including contingency planning to ensure demand will be met under all climatic conditions; ▪ the site water storage capacity and licensing requirements for all stages of the development; ▪ water use and management on site;	Section 6.2 Section 6.3 Section 6.1
	(b) Surface Water Management Plan that includes: ▪ a detailed description of the surface water management system for the development, including the: – clean water diversion system; – erosion and sediment controls; – the water storages required for each stage of the development; ▪ identification of all reasonable and feasible measures to improve the quality of surface water on the site, particularly those measures required to improve the water quality in the Main Dam, and a timeframe for the implementation of any identified improvements; ▪ the measures that would be implemented to minimise water use on site; ▪ surface water impact assessment criteria; ▪ a program to monitor surface water quality; ▪ a plan to respond to any exceedances of the performance criteria, and mitigate any adverse surface water impacts of the development; and ▪ reporting procedures.	Section 5.1 Section 6.2.5 Section 8 Section 8 Section 7.2 Section 9 & 10 Section 9.5
Schedule 5, Condition 3	The Applicant shall ensure that the Management Plans required under this consent are prepared in accordance with any relevant guidelines, and include: (a) detailed baseline data; (b) a description of: ▪ the relevant statutory requirements (including any relevant approval, licence or lease conditions); ▪ any relevant limits or performance measures/criteria; and ▪ the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures; (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria; (d) a program to monitor and report on the: ▪ impacts and environmental performance of the development; and ▪ effectiveness of any management measures (see (c) above);	Section 5 & 6 Section 3 Section 9.3 Section 8 Section 9

CoA No.	Requirement	Reference
	(e) a contingency plan to manage any unpredicted impacts and their consequences;	Section 10
	(f) a program to investigate and implement ways to improve the environmental performance of the development over time;	Section 9 & 10
	(g) a protocol for managing and reporting any: ▪ incidents; ▪ complaints; ▪ non-compliances with statutory requirements; and ▪ exceedances of the impact assessment criteria and/or performance criteria; and	Section 9.5 & 10
	(h) a protocol for periodic review of the plan.	Section 9 & 10

4 CONSULTATION

As outlined in Condition 19 of Schedule 3 of the CoA (refer **Table 1**), this Plan must be prepared in consultation with the NSW Office of Water (NoW) and the local Council.

Accordingly, a version of this Plan was provided to both Council and NoW on 31 August 2015 for their review and comments.

Their responses are summarised below with copies of correspondence provided in **Appendix A**.

4.1 NSW Office of Water

The NSW Office of Water (NOW) was requested by Holcim for consultation on the preparation of this Management Plan on the 4th September 2015. Comments that were received by NOW included:

Groundwater

It is stated in section 5.3.2 that Jandra Quarry is not subject to groundwater inflow…The intensification in production approved by the recent modification does not result in any changes to the approved quarry pit in terms of depth and disturbance area and therefore the Jandra Quarry is highly unlikely to impact on groundwater. It should be acknowledged that any take or interception of groundwater by excavation related to Jandra Quarry must be accounted for via the appropriate water licence. Similarly any temporary excavation works, which require dewatering for construction purposes may require a groundwater licence under Part 5 of the Water Act 1912. As such should the development activities listed in section 7.1 require any groundwater dewatering or groundwater interception it is recommended that Holicm (Australia) Pty Ltd seek advice from DPI Water on licensing requirements.

Harvestable Rights

Jandra Quarry is located in an area whereby surface water is managed under the Water Management Act 2000 via the gazettal of the Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009. In accordance with the requirements of this legislation the development consent (DA 213-10-99) requires for this SWMP to include a site water balance which includes 'the site water storage capacity and licensing requirements for all stages of the development.' As such any cumulative water storage in excess of the properties Maximum Harvestable Right, excluding 'special dams' must be accounted for via a Water Access Licence within the Wallamba River Water Source The current sediment dam capacity for the site is 23ML this being comprised of the Main dam, with a capacity of 10 ML, and the Pit dam, with a capacity of 13 ML. However the Environmental Assessment indicated that the maximum sediment dam requirements were 20.3 ML, during stage 3. This results in an excess capacity of 2.7 ML which must be included in water storage accounted for via Harvestable Rights. Comparatively the SWMP notes in Table 6 that the minimum sediment requirements in Stage 3 are 13.7 ML for the quarry area and 6.6 ML for the Facilities area. DPI Water re-iterates as advised at time of Modification 5 that excess water storage above sediment basin Department of Primary Industries - Water | Page 2 of 2 requirements must be included in the properties harvestable right calculation, along with the capacity of all clean water dams. It is noted that the clean water dam as shown in Figure 1 has a capacity of 4 ML. DPI Water considers clean water storages as described in the SWMP to be within the properties harvestable right, as such additional licences are not required.

4.2 Greater Taree City Council

The Taree City Council was also requested for consultation on the development of this Management Plan. Comments received by Taree City Council included:

Section	SWMP Comment
6.3	"The likelihood of an extended dry period (resembling a 5th percentile dry year) occurring is very low in which case it may not justify the cost-benefit of creating a 25ML storage volume within the quarry pit."
	Taree Council Comment
	Extended dry periods resulting from forecast El Nino effects, coupled with climate change, are factors which should be incorporated into the SWMP over the life of the quarry. Creating a larger storage volume Pit Dam and/or Main Dam should be considered based on these climatic factors.
	SWMP Amendment
	Forecast El Nino effects and potential climate change effects have been considered and included in Section 6.3.
7.2.2	**SWMP Comment**
	"The Pit Dam will be progressively enlarged to ensure it has capacity to control sediment".
	Taree Council Comment
	Include in the SWMP estimated dimensions and storage volumes of the Pit Dam for each stage of the expansion to provide some assurance that there will be capacity to control the sediment**.**
	SWMP Amendment
	Progressive Pit Dam volumes have been included in Section 7.2.2.
7.2.3	**SWMP Comment**
	"*If monitoring results indicate a sustained exceedance trend, an artificial flocculation program should be investigated and if implemented, carried out in accordance with the guidelines shown in Managing Urban Stormwater - Soils and Construction Volume 1 - Appendix E*, (DECC, 2004)."
	Taree Council Comment
	A program for artificial flocculation should be incorporated into the SWMP providing details of the type and spread rate of flocculation product to enable it to be readily sourced and spread as and when required.
	SWMP Amendment
	The site does not have a requirement to undertake a flocculent program. Section 7.2.3 has been updated to ensure council that in the event that flocculation is required Holcim will undertake a program in line with the guidelines shown in *Managing Urban Stormwater - Soils and Construction Volume 1 - Appendix E*, (DECC, 2004)
10.2	**SWMP Comment**
	"Department of Planning approval of the Modification of Consent Condition 19, and Condition 3(h) of Schedule 5 –Environmental Management Conditions".
	Taree Council Comment
	Dates for the regular reviews, updates and amendments of the SWMP are to be included in

	the SWMP.
	SWMP Amendment
	The SWMP will be reviewed and updated each year before the Annual Review is submitted to the Department of Planning & Environment.

5 EXISTING ENVIRONMENT

The following sections summarise the factors influencing soil and water within and adjacent to the development site, based upon the information provided in Section 6.5.1 of the EA and Appendix D of the Submissions Report (October 2014).

The site is located at the head of two minor tributaries of Talawahl Creek. These minor tributaries (first order streams) flow northward, joining just before crossing the Pacific Highway after which they join another tributary that flows southwest to Talawahl Creek. Talawahl Creek is a tributary of Bungwahl Creek, which flows to the Wallamba River approximately 5.5 kilometres south of the site.

The soil overlying the quarry site has moderate erosion potential, being mildly to moderately dispersive. Particle size analyses and dispersion tests conducted on the soils reveal that more than 33% of soil particles on site are finer than 0.02mm and 10% or more of the soil material is dispersible fines (Jandra Quarry Extension Environmental Impact Statement, October 1999).

Effective control of erosion and sediment movement at the site is currently achieved via the following measures:

- sedimentation basins;
- wash off water collection and primary treatment systems;
- minimisation of disturbed areas;
- diversion of clean water from undisturbed areas around working areas;
- temporary erosion and sediment controls prior to commencement of topsoil and overburden removal;
- sequential clearing and rehabilitation of the quarry as extraction of material proceeds; and
- twice yearly maintenance of erosion and sediment control structures to ensure their efficiency.

5.1 Surface Water Management

5.1.1 Main Dam and Pit Dam

An existing sedimentation basin (referred to as ‘Main Dam’) is located north of the site offices along the main access road and a secondary sedimentation basin (referred to as ‘Pit Dam’) is situated in the quarry pit. The majority of the surface water runoff from the active site areas are directed to these two main sediment basins. Rainwater landing in the quarry is directed to the Pit Dam, while the remainder of the active site is directed to the Main Dam via a series of open channels and a gravity pit and pipe system.

When the Pit Dam reaches capacity, water is transported via gravity through a pipe system into the Main Dam. The Main Dam supplies the majority of the site’s water requirements with the exception of water for toilet flushing (supplied from rainwater tanks) and drinking water (which is purchased from an external supplier). Water is withdrawn from the Main Dam for use in the crushing and screening plant, wheel wash and dust control. After use, water is recycled back to the Main Dam.

A survey plan of the Main Dam including bathymetry, inlet and outlet features is shown in **Appendix B**. The Main Dam has a volume of approximately 10ML to the controlled low flow outlet.

The Pit Dam is 100m long, by 33m wide and is 14m deep at its deepest point with a total volume of approximately 13ML.

The discharge of water from the Main Dam is regulated by and required to comply with EPL 2796. The discharge point where water monitoring is undertaken is identified in Figure 1.

5.1.2 Clean Water Dam

A clean water dam is located in an undeveloped part of the property, approximately 100 metres to the northeast of the Main Dam (refer to **Figure 1** and **Appendix C**). This clean water dam collects water that has been diverted around disturbed areas. This clean water dam is occasionally utilised as a source of water for operational activities following extended dry weather conditions.

5.1.3 Overburden Emplacement Area

A bund extends around the perimeter of the overburden emplacement area to mitigate uncontrolled surface water runoff from this area during rain events (refer **Appendix C**).

5.1.4 Dust Suppression

Water which is applied in the processing plant to wash aggregates and suppress dust, drains to a stormwater sump at a low point in the processing area. Collected water is pumped to two small settlement basins adjacent to the Pit Dam (refer **Appendix C**). These two settlement basins provide primary sedimentation treatment for silted water and discharges by gravity to the Main Dam via a vegetated macrophyte treatment area.

5.1.5 Wheel Wash

A weighbridge and wheel wash system is located on the main access road to the north west of the Main Dam. The wheel wash system is activated by a sensor and cycles for 15 seconds each time a truck drives over the weighbridge, The system ensures that all truck wheels are cleaned and free of sediment and dust before leaving the site. Water drains to a sump beneath the wheel wash system, from where it is pumped to the north western corner of the Main Dam, when triggered by a level sensor (refer **Appendix C**).

5.1.6 Fuel Oil Storage Area

Appropriate fuel storage and spill control is necessary for preventing the discharge of hydrocarbons into dams and downstream waterways. Existing site controls include partitioning fuel storage areas from other areas of the site to reduce the risk of stormwater contamination as a result of fuel spills.

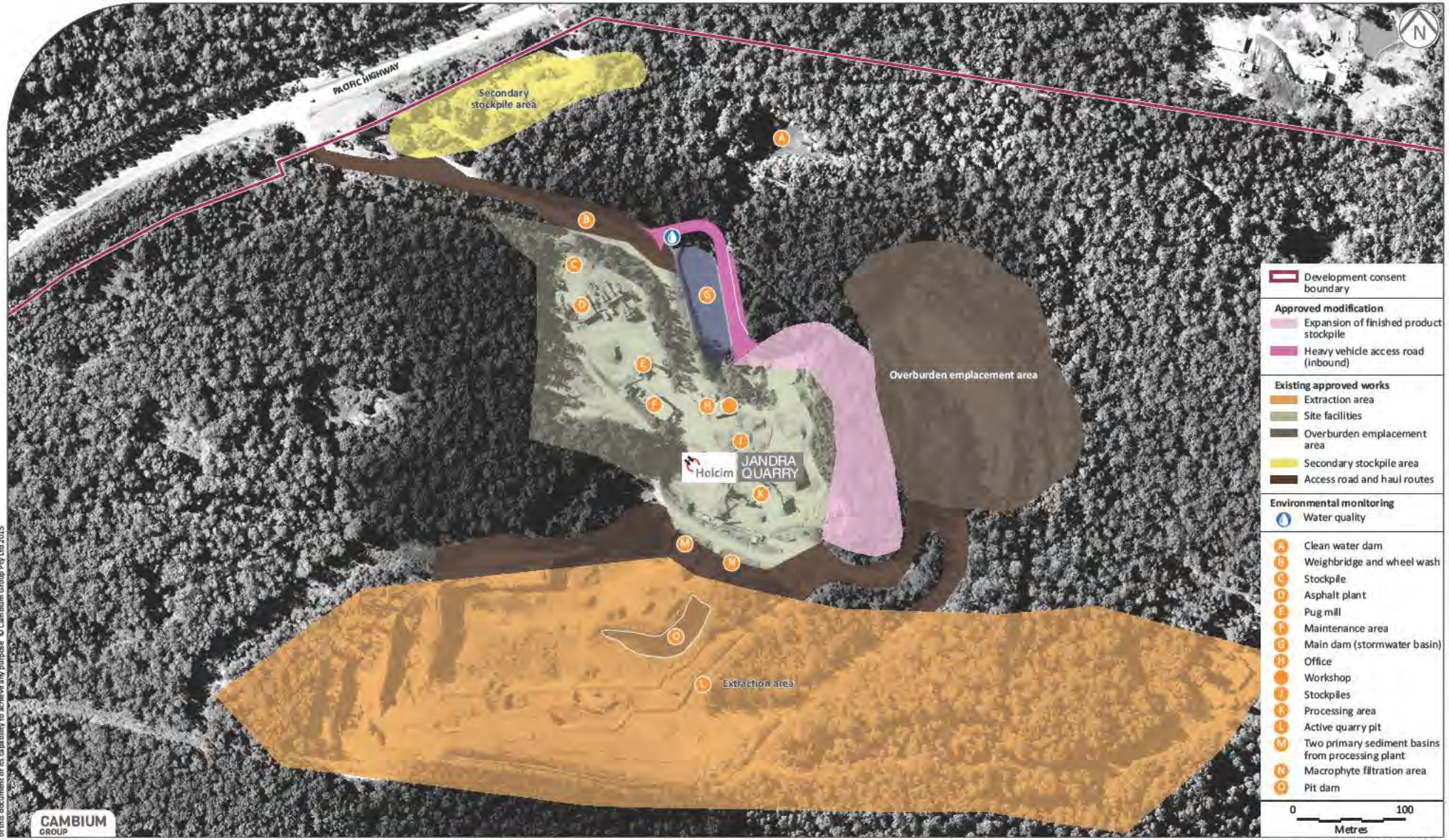
The fuel / oil storage area is covered by a roofed structure to limit the entry of rainfall and is designed with bunds to contain any oil or fuel spills, preventing discharge from the site. The floor of the storage area is sloped to a sump with a gate valve outlet. Any liquid that collects in the sump is removed periodically by an approved waste contractor.

Figure 1 Approved Development

FIGURE 1
Approved deve opment

element ENVIRONMENT

JANDRA QUARRY - SOIL & WATER MANAGEMENT PLAN



CAMBIUM GROUP

Source: EDH 2014

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5.2 Climate Statistics

Climate records from the Australian Bureau of Meteorology (BoM) automatic weather station at Taree (No. 060030) has been used to reflect the potential rainfall conditions at Jandra Quarry due to its proximity to the site (situated approximately 16km north), and extent of available data (from 1881 to present). A summary of the rainfall data is provided in **Table 2**.

Table 2 Climate Statistics for BoM Station 060030

Statistic	Mean	Lowest	5th %ile	10th %ile	Median	90th %ile	95th %ile	Highest
Jan	118.9	8.4	22.2	31.9	98.8	234.1	262.6	768.1
Feb	138.7	1.5	16.3	30	99.9	268.1	372.7	789.7
Mar	150.5	2.7	25.4	36.3	119.1	307	391.7	710
Apr	117	1.1	18.7	24.6	74.7	278.4	341.6	489.1
May	96.8	5.2	10.4	17.6	64.3	261.4	296.9	406.6
Jun	97.7	2.2	5.3	11.5	70.6	207.8	273.8	468.7
Jul	73.4	0	1.3	7.9	46.5	197.3	220.4	333.6
Aug	61.7	0	2.2	5.1	36.2	165.1	178.6	652.6
Sep	60.1	0	3.9	7.4	43.4	143.6	179	272.3
Oct	75.2	4.7	11.3	14.9	61.2	156.1	231.4	330.6
Nov	86.4	1.8	9.9	16.1	68.7	183.5	217.4	302.8
Dec	99.4	9.4	23.2	29	76.1	182.3	241.1	471
Annual	1174.9	555.5	725.8	770	1120.2	1641.6	1761.7	2410.3

Analysis of available rainfall records for Taree indicates that a dry year (5th percentile year) has an annual rainfall of 726 mm, an average year 1,175 mm, and a wet year (95th percentile year) 1762 mm. March is statistically the wettest month with an average monthly rainfall of 151 mm. September is statistically the driest month with an average monthly rainfall of 60 mm.

Evaporation rates are relatively constant under different climatic conditions and average pan evaporation data were derived from the BoM website. Annual pan evaporation for Jandra Quarry is estimated to be approximately 1450 mm/year.

5.3 Flooding and Groundwater

5.3.1 Flooding

As the majority of Jandra Quarry is elevated and in the upper catchment of minor tributaries (first order watercourses) of the Wallamba River, it does not fall within land identified in the Greater Taree LEP 2010 as flood prone land (potentially affected by 1% Annual Exceedance Probability). The Jandra Quarry site is therefore unlikely to be impacted by flood events.

5.3.2 Groundwater

Jandra Quarry is not subject to groundwater inflow. No groundwater was recorded by the geological investigations undertaken for the Jandra Quarry Extension Environmental Impact Statement (October 1999). The geological investigations concluded that that there was limited potential for groundwater flow, and that any groundwater encountered would likely originate from subsurface flows following recent rainfall events rather than from interception of an aquifer.

New activities approved by DA-231-10-99 MOD 5 involve relatively shallow excavations for the construction of the new heavy vehicle access road and expansion of the existing finished product stockpile area. The intensification in production approved by the recent modification does not result in any changes to the approved quarry pit in terms of depth and disturbance area and therefore the Jandra Quarry is highly unlikely to impact on groundwater.

6 SITE WATER BALANCE

6.1 Water Demands

Potable water for personal consumption is sourced off site and brought in as bottled water. Non-potable water is required for the following purposes:

Toilet Amenities

Non-potable water required for toilet flushing and hand basin use is supplied from rainwater tanks which harvest water from the roofs of the maintenance buildings. The rainwater supply is supported by a mains water top up system when necessary.

Process Water

Water is used in the processing plant for washing aggregates and dust suppression. It is applied in the form of fine mist sprays. For the water balance model, it is assumed that water is applied at a rate of 1.5% by weight of product throughput for all aggregate (which accounts for 50% of total finished product from the site).

Dust Suppression

Haul roads are sprayed by water cart as required depending on weather conditions. Finished product stockpiles are fitted with a sprinkler system which is turned on when required. A water cart fitted with a spray cannon is utilised for finished product stockpiles which are not covered by a sprinkler system. The water requirements for dust suppression are the largest of all site water demands. Dust suppression demands accounted for in the water balance model have been calibrated to generally align with historical metered data. The volumes of water required for dust suppression will vary with each stage of quarry development and the prevailing weather conditions.

Demands have been conservatively estimated assuming the following:

- all haul roads are sprayed by a water cart at least 4 to 5 times a day when dust suppression is required;
- haul road watering application rate estimated to be 1L/m^2/hour; and
- watering of haul roads occurs on all days when daily pan evaporation exceeds daily rainfall.

Product Moisture

Certain types of material such as road bases and other road pavement materials are required to have a moisture content of around seven percent (7%). Quarried material is typically dry and water is added to these products during processing. It has been assumed that 25% of annual production will require the addition of water.

Truck and Wheel Washing Facilities

Trucks and plant used in quarry operations are cleaned as part of general maintenance and prior to servicing. Water used in vehicle washing is treated to remove coarse grit and oil before being recycled back into the quarry water system by discharging to the Main Dam. A nominal volume of 10,000L per month (for the current operations) was allowed for in the water balance to account for water losses via evaporation, vehicle wetting and infiltration. Demands have been assumed to increase to 20,000L per month by Stage 1 as production intensifies to 475,000 tonnes.

Environmental losses

Water is lost to the environment from the sediment basins via evaporation and infiltration from the unlined sides and basin floors. Evaporation losses from open water storage areas have been estimated assuming the pond evaporation occurs at 70% of pan evaporation per unit area.

A summary of annual water demands for key quarry stages are shown in **Table 3**. Annual water demands estimated for the water balance model have been calibrated using historical data from the water meter on the transfer pump located next to the Main Dam. The data supplied covered the extraction period from August 2010 until May 2014 and is shown in **Table 4** and

Table 5. The metered data doesn't account for environmental losses in the system. In the absence of detailed meter data the overall demands have been adjusted higher than actual metered demands (on an annual basis) to reflect conservative demand assumptions.

Table 3 Annual Water Demands

Water Use	Current	Stage 1	Stage 2	Stage 3
Production (tonnes)	250,000	475,000	475,000	475,000
Haul Road Dust Suppression (ML)				
Dry Year	16.12	21.4	21.21	19.40
Mean	15.40	20.44	20.27	18.54
Wet Year	14.63	19.43	19.26	17.62
Product Moisture	4.38	8.31	8.31	8.31
Process Water	1.88	3.56	3.56	3.56
Truck Washing	0.10	0.20	0.20	0.20
Environmental losses (Main Dam)	3.14	3.14	3.14	3.14
Environmental losses (Pit Dam)	5.85	5.85	5.85	5.85

Table 4 Transfer Pump Details (Main Dam)

Pump Details at Main Dam (Holcim, 2014)	
Pump Type	Southern Cross 100x65 - 250
Max Pump Rate	200 L/min
Installation date	Aug 2010
Total Run time with motor speed at 48%	10235 hrs
Actual Pump rate	100 L/min

Table 5 Water Supplied from Main Dam (2010 - 2013)

Estimated water supplied from Main Dam (2010-2013)		
Pump rate	100	L/min
Pump Period	10235	hours
	614100	mins
Supplied Volume (2010-2013)	61410000	L
	61410	kL

Estimated water supplied from Main Dam (2010-2013)		
	61.41	ML
Quarry production for period of analysis (Holcim, 2014)	995,517	tonnes
Volume of water supplied / tonne of production	61.7	L/tonnes
Average volume supplied per year	15.4	ML/yr
Maximum annual volume supplied (2010)	17.8	ML/yr

6.2 Water Balance Model

A daily water balance model was developed in the EA to simulate the water cycle of Jandra Quarry. A daily time step was chosen to account for the sensitivity in open water storage behaviour. The model was used to compare quarry water demands, with the volume of stormwater runoff water generated and stored within the site. The objective of the model was to determine the magnitude of either water surplus or deficit at various stages of development under varying climatic conditions. Simulated water requirements have been based on the demands outlined above. Water supply has been determined using historical rainfall data to estimate runoff into the dams.

6.2.1 Rainfall

Historical 6-minute pluvio rainfall data for the site catchment model was obtained from BoM weather station (No. 060030) at Taree, located approximately 16 km to the north of the site.

To reflect the climatic variability of the region, 15 years of rainfall data were utilised (including dry, mean and wet years). A spreadsheet model was developed using catchment inflow data from a site specific MUSIC model to represent the water supply dam catchment.

The annual average depth of rainfall was found to be 1161 mm/annum for the period of analysis (1965-1979). To simulate real rainfall conditions, years with annual rainfall close to the statistical requirement were used in the model. Representative years included the following:

- 1965 - Dry Year (annual rainfall total 714 mm);
- 1968 - 1979 - Average Years (average annual rainfall 1186 mm); and
- 1967 - Wet Year (annual rainfall 1713 mm).

6.2.2 Evaporation

Evaporation rates are relatively constant under different climatic conditions and average pan evaporation data was derived using mapping from the BoM. Annual pan evaporation for Jandra Quarry was estimated to be approximately 1450 mm/year.

6.2.3 Catchments

Catchment areas have been delineated using aerial photography and topographical data supplied. Runoff coefficients were estimated for each catchment. Refer **Table 6** for catchment areas and Appendix D of the Submissions Report for MUSIC catchment model parameters. Pervious area characteristics for modelled catchments are based on values for Silty Clays provided in the *Draft NSW MUSIC Modelling Guidelines* (Sydney Metropolitan Catchment Management Authority, August 2010).

Table 6 Catchment Areas and Sediment Basin Design Characteristics

Sediment Basin Requirements	Catchment Area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Min. required volume (ML)	Runoff Storage per Hectare of catchment (m^3)	Existing Volume (ML)
Quarry Area						
- Current	8.04	4197	2098	6.3	783	13
- Stage 1	8.84	4614	2307	6.9	783	-
- Stage 2	13.57	7084	3542	10.6	783	-
- Stage 3	17.47	9119	4560	13.7	783	-
Facilities Area						
- Current	11.23	5862	2931	8.8	783	10
- Stage 1	10.37	5413	2707	8.1	783	10
- Stage 2	8.44	4406	2203	6.6	783	10
- Stage 3	8.44	4406	2203	6.6	783	10

6.2.4 Sensitivity Analysis

A sensitivity analysis was undertaken to enable assessment of the quarry's water balance at various stages of development and under various climatic conditions. The following scenarios were modelled;

- Current operations and proposed Stages 1, 2, and 3 of quarry development; and
- dry, average and wet years.

6.2.5 Storage

The Pit Dam storage was modelled with a capacity of 13ML under current operations and 13.7ML (the minimum sedimentation basin volume required in Stage 3) for Stages 1 to 3. The Main Dam storage capacity (10ML) was modelled as static for all stages of quarry development. At the start of each year both dams were assumed to be 50 percent full. For the purposes of assessment it was assumed that when the Main Dam level dropped to 10 percent capacity, pumping from the Pit Dam was triggered and necessary top up water supplied to the Main Dam.

All catchment runoff from the quarry area was assumed to drain to the Pit Dam and spilled into the Main Dam when the Pit Dam reached capacity. When the Main Dam reached capacity it was assumed to spill into the downstream waterway.

The Main Dam was assumed to be relatively well sealed and have a constant exfiltration rate through the walls and base of the dam of 0.01 mm/hr.

The Pit Dam was assumed to be relatively sealed by the underlying material. A constant exfiltration through the walls and base of the Pit Dam was assumed to be 0.1mm/hr for all stages of quarry development.

6.3 Water Balance Model Results

The model was used to prepare estimates of the following:

- daily and annual runoff from the dam catchments;

- monthly and annual demands;
- any overflows/spills from the dam; and
- any deficits or top up requirements for the quarry's water supply.

Table 7 provides a summary of results from the sensitivity analysis undertaken using the water balance model. Full water balance results are provided in Appendix D of the Submissions Report.

Table 7 Water Balance Results for varying stages of quarry development

	Current			Stage 1		
Summary Results	Dry Year	Mean Year	Wet Year	Dry Year	Mean Year	Wet Year
Total Runoff (ML/yr)	35	98	165	34	97	164
Total Demands (ML/yr)[1]	25.60	24.88	24.11	36.60	35.64	34.63
Stormwater Supplied (ML/yr)[2]	25.46	24.88	24.11	32.13	35.45	34.63
Total Storage Top Up (ML/yr)	0.13	0.00	0.00	4.46	0.19	0.00
% Demand Met	99%	100%	100%	88%	99%	100%
Spill Volume (ML/yr)	4	68	131	3	57	112
	Stage 2			**Stage 3**		
Summary Results	Dry Year	Mean Year	Wet Year	Dry Year	Mean Year	Wet Year
Total Runoff (ML/yr)	39	110	186	45	129	219
Total Demands (ML/yr)[1]	36.42	35.47	34.46	34.60	33.74	32.82
Stormwater Supplied (ML/yr)[2]	32.32	35.34	34.46	31.85	33.74	32.82
Total Storage Top Up (ML/yr)	4.09	0.13	0.00	2.75	0.00	0.00
% Demand Met	89%	100%	100%	92%	100%	100%
Spill Volume (ML/yr)	4	70	139	9	90	174

The modelled results show that the storage is capable of satisfying the quarry's water demands under the climatic conditions considered. Overflows will occur from the Main Dam under dry, average and wet rainfall conditions.

During Stages 1 to 3 of quarry development, water shortages may occur in extreme dry conditions (5^{th} percentile year) for up to a month if maximum production and water use is maintained. Modelled water shortages occur when both the Main Dam and Pit Dam fall below five percent storage capacity.

An estimated volume of 4ML is available in the clean water dam in the northern part of the site. This back up water source falls within the MHRDC, and will provide sufficient water to meet the bulk of the expected deficit in non-potable water required during drought conditions.

Dust suppression demands are the largest proportion of non-potable site demands and will increase during dry periods. Whilst dust suppression watering demands have been conservatively estimated based on conventional quarry operations, demand management opportunities exist and are cited in **Section 8**.

Increasing Pit Dam storage can improve stormwater harvesting yields to offset dry periods. The model results indicate that increasing the quarry Pit Dam to 25ML will provide sufficient storage to buffer the water supply system during extended dry periods in Stages 1 and 2 of quarry development, which is when the highest demands occur.

Extended dry periods (resembling a 5th Percentile dry year) that may occur more frequently as a result of expected El Nino effects and climate change have been factored into the development of the Pit Dam to 25ML.

The development of Stage 1 and 2 in the pit will assess the annual required volume of water from onsite storage. This will ensure that the development of water storage onsite meets the requirements of production and projected changes in environmental conditions.

7 ENVIRONMENTAL ASPECTS & IMPACTS

7.1 Development Activities

Key aspects of the development that could result in adverse impacts to soils and water include:

- vegetation clearing and overburden stripping;
- bulk earthworks;
- drainage works;
- material stockpiles;
- water use / extraction;
- maintenance operation including fuel and chemical storage, refuelling and chemical handling; and
- noxious weed treatment including herbicide spraying.

7.2 Impacts

Potential impacts on soil and water associated with the quarry are identified in the following sections. **Section 8** of the SWMP provides a suite of mitigation measures that will be implemented to avoid or minimise the impacts identified below.

7.2.1 Surface Water

During construction of the new heavy vehicle access road, expansion of the finished product stockpile area and transitioning between development stages 1 to 3, clearing vegetation and overburden stripping represent the primary risk to surface water quality. In the absence of suitable controls, these activities have the potential to release sediment due to runoff from disturbed areas or from roads where sediment has been tracked by earthworks machinery.

Other potential risks to surface water as a result of construction or operational activities at the development site include:

- sediment release from disturbed areas that have not been suitably stabilised;
- dust generation during earthworks that could settle in water bodies;
- chemical or fuel spills that could pollute receiving water bodies. This includes fuel or oil leakage from plant / equipment, accidental spills or the release of chemicals due to damage to chemical storage areas;
- construction materials or general waste generation that could enter water bodies;
- an increase in surface runoff due to an increase in cleared surfaces;
- tannin leachate from mulched vegetation stockpiles; and
- vegetation removal that could result in sediment release to adjoining minor ephemeral tributaries of Talawahl creek.

Surface water will continue to drain into the existing surface water management controls during construction and operation (i.e. Main Dam and Pit Dam). Sediment laden surface water runoff would therefore not discharge directly into the downslope ephemeral tributaries of Talawahl creek.

7.2.2 Sediment Basin Capacity

The function of the sediment basins are to catch all surface water runoff from disturbed areas within the site and to minimise the concentration of fines in discharged waters.

Future quarry operations will involve the relocation and resizing of the Pit Dam within the main quarry (refer **Appendix D**). The Pit Dam during Stages 1, 2 and 3 will be a combined sediment basin and sump. The area of the quarry will gradually increase as the extraction area extends to the east. The Pit Dam will be progressively enlarged to ensure it has capacity to control sediment from the maximum extent of the extraction area. The estimated dimensions of the drop cut for the Pit Dam for Stages 1, 2 and 3 are as follows:

Stage	Dimensions	Volume
One	Width: 20 metres Depth: 15 metres Length: 47 metres	6.9 ML
Two	Width: 20 metre Depth: 15 metres Length: 74 metres	10.6 ML
Three	Width: 20 metres Depth: 15 metres Length: 92 metres	13.7 ML

The floor of the quarry pit will be graded to ensure the fall is maintained towards the Pit Dam. The Main Dam will remain constant in size through the life of the quarry and will not need to be expanded to facilitate the progression in quarrying.

7.2.3 Sediment Basin Management

Soil testing undertaken for the Jandra Quarry Extension Environmental Impact Statement (October 1999) indicated that site soils range from slightly to highly dispersive and there is potential for fine dispersible soils to be suspended in stormwater runoff. Consequently the operation and maintenance of site erosion and sediment controls, including the Main Dam, requires attention in order to mitigate potential impacts to discharge water quality.

Management and control measures to ensure erosion does not occur include:

- Pumping of water from the sediment basin to catchment ponds for separation of water and fines.
- Re-use of water internally onsite crushing, screening and dust suppression.
- Installation of a rock lined spoon drain and rock lined dam wall at the point of overflow.
- All disturbed run-off locations are rock lined or diverted to rock lined drains to ensure that all sediments are captured.

No flocculation program is currently required for water quality management at any catchment area onsite. In the event of the site experiences issues in water quality at the Main Dam or proposed Sediment Dam, an artificial flocculation program will be investigated and if implemented, carried out in accordance with the guidelines shown in *Managing Urban Stormwater - Soils and Construction Volume 1 - Appendix E*, (DECC, 2004)

The site has also installed drainage and erosion controls along the North-West extraction boundary and light vehicle access road. This has been undertaken to ensure:

- Sediment discharge during wet weather events does not occur.
- Stability of the extraction boundary and light vehicle road is maintained.

Actions undertaken along the North-West boundary were agreed with staff from the DP&E following a site visit in July, 2015. Actions undertaken to ensure erosion and sediment control include:

1. Installation of a drainage pipeline under the roadway to allow controlled run-off of stormwater at the low point of the extraction boundary.
2. Installation of bridging rock at the toe of the batter to help stabilize the area on both sides of the light vehicle roadway and to ensure that sediment is contained in the existing disturbed area.
3. Installation of silt fencing along the North-West extraction perimeter to ensure sediment is contained in the existing disturbed area.
4. Visual monitoring of this location in future weather events to ensure erosion and sediment controls are in place and are operating effectively.

7.2.4 Land Contamination

Potential to encounter or disturb areas of contamination are low, with historical land uses prior to the commencement of quarrying operations being forested bushland surrounded by agriculture. Holcim is unaware of any potential contaminating activities that have been undertaken within the proposed new ground disturbance area.

An EPA Contaminated Land Record search was undertaken in April 2015 and no sites were recorded within the Greater Taree LGA.

Six separate site surveys of the future disturbance areas were undertaken during the EA process and no visual evidence of contamination or potentially contaminating activities were observed. In the event that previously unidentified contaminated land is located during construction activities or future quarrying, relevant statutory requirements would be complied with. As such no further assessment of contaminated land or land remediation is required.

8 ENVIRONMENTAL CONTROL MEASURES

A range of environmental requirements and control measures are identified in the EA, CoA and Holcim Environmental Guidelines. Specific measures and requirements to address impacts on soil and water are outlined in **Table 8**.

Table 8 Environmental Controls & Mitigation Measures

ID	Measure / Requirement	Reference	When to implement	Responsibility	Where addressed
ENVIRONMENTAL ASSESSMENT MITIGATION MEASURES					
SWMM1	The outlet from the wheel wash system discharges in close proximity to the low flow outlet from the Main Dam. It is recommended that either: ▪ A baffle (sediment curtain) be installed to lengthen the flow path of wheel wash water to the dam outlet; or ▪ The wheel wash outlet should be moved further away from the Main Dam outlet to encourage greater drop out of sediment from wheel wash water and to reduce the risk of highly sediment laden wash off water from short-circuiting and discharging into the downstream waterway when the Main Dam is full and in bypass mode.	Section 6.5.3 of EA	As soon as practicable	Quarry Manager	This table.
SWMM2	Runoff from undisturbed catchments should be diverted around the quarry area prior to discharge into the dam.	Section 6.5.3 of EA	During and following disturbance	Quarry Manager	Section 5.1.2;
SWMM3	Disturbed sites prone to erosion (i.e. exposed earth batters around processing areas) should be stabilised with vegetation.	Section 6.5.3 of EA	During and following disturbance	Quarry Manager	Refer Biodiversity & Rehabilitation Management Plan;
SWMM4	Inspections of erosion and sediment controls should be undertaken on a regular basis and at least quarterly.	Section 6.5.3 of EA	ERSED condition inspection pre- and post-rainfall; Main Dam siltation inspection	Quarry Manager	Section 9.1 SHE Schedule/E-Inspections

ID	Measure / Requirement	Reference	When to implement	Responsibility	Where addressed
			quarterly		
SWMM5	Exposed earth channels and flow paths should be stabilised with vegetation where appropriate.	Section 6.5.3 of EA	During and following disturbance	Quarry Manager	Refer Biodiversity & Rehabilitation Management Plan;
SWMM6	Should monitoring of Total Suspended Solids indicate levels in excess of 50mg/L, the Main Dam should be treated with a flocculating agent immediately following any storm event large enough to cause runoff. Such dosing should occur within 24 hours of the conclusion of each storm event.	Section 6.5.3 of EA	Following large storm event	Quarry Manager	Section 7.2.3
SWMM7	Construction of the heavy vehicle access road and expansion of the finished product stockpile area should be timed where possible during low rainfall months of the year.	Section 6.5.3 of EA	Where possible July - October	Quarry Manager	WMS
SWMM8	A sediment fence will be erected within the watercourse, immediately downslope of the northernmost edge of the expanded finished product stockpile area, prior to construction & ground disturbance.	Section 6.5.3 of EA	Prior to construction	Quarry Manager	SHE Schedule/E-Inspections
SWMM9	Drainage structures (pipe or box culverts) to convey overflow from the Main Dam levy, under the heavy vehicle access road, would be constructed first, to allow clean water from the Main Dam to 'bypass' the construction works, preventing the mobilisation of sediments during dam discharges.	Section 6.5.3 of EA	Prior to construction	Quarry Manager	Detailed design; WMS
HOLCIM ENVIRONMENTAL STANDARDS - GUIDELINE 4.11 WATER MANAGEMENT					
SWMM10	Sites shall recycle water back into production processes.	Guideline 4.11	During operations	Quarry Manager	WMS
SWMM11	Runoff from all disturbed areas shall pass through sediment control devices prior to being discharged from the site. Note: Disturbed areas include, but are not limited to, stockpile areas, internal unsealed roadways, processing plant area and	Guideline 4.11	During operations	Quarry Manager	SHE Schedule/E-Inspections

ID	Measure / Requirement	Reference	When to implement	Responsibility	Where addressed
	quarry development and extraction areas.				
SWMM12	The capacity of sediment control devices shall be maintained to ensure excess sediment does not build up and impact final water quality.	Guideline 4.11	During operations	Quarry Manager	Attachment 4.1H - Environmental Monitoring Worksheet
SWMM13	Sediment control devices shall discharge into drainage lines that are stable and vegetated via properly constructed spillways, ripraps or culverts.	Guideline 4.11	During operations	Quarry Manager	SHE Schedule/E-Inspections
SWMM14	All water discharged from the site (including stormwater and pit dewatering) shall be sampled and tested to ensure it meets state specific water quality objectives and site environmental permit conditions.	Guideline 4.11	During operations	Quarry Manager	EPL Water Quality Criteria; Attachment 4.1H - Environmental Monitoring Worksheet
HOLCIM ENVIRONMENTAL STANDARDS - GUIDELINE 4.17 STORAGE OF LIQUID FUELS & CHEMICALS					
SWMM15	All liquid fuels and chemicals are stored and handled in accordance with the Holcim bunding guidelines. Note: Liquid fuels and chemicals can include admixtures, acid based truck wash, industrial chemicals, fuels and oils.	Guideline 4.17	During operations	Quarry Manager	Attachment 4.17A - Bunding Guidelines
SWMM16	Bunded areas shall be subject to regular inspection and maintenance.	Guideline 4.17	During operations	Quarry Manager	Attachment 4.17C – Routine Bunding Inspection Checklist; Attachment 4.2E - Environmental Inspection checklist - Monthly Schedule
SWMM17	Any spills contained in a bunded area that require disposal are collected by an appropriately licensed waste contractor.	Guideline 4.17	During operations	Quarry Manager	Guideline 4.13 – Management of Non-Concrete Waste

ID	Measure / Requirement	Reference	When to implement	Responsibility	Where addressed
SWMM18	Sites have processes in place to ensure that operators remain with their vehicle at all times during the delivery of liquid fuels and chemicals to permit immediate response in the event of a spill or leakage.	Guideline 4.17	During operations	Quarry Manager	Attachment 4.17B – Model Liquid Fuel & Chemical Transfer Procedure
HOLCIM ENVIRONMENTAL STANDARDS - GUIDELINE 4.18 SPILL RESPONSE & REPORTING					
SWMM19	Spill response equipment shall be available and readily accessible in high-risk areas such as fuel and chemical storage areas and workshops.	Guideline 4.18	During operations	Quarry Manager	Attachment 4.18A - Spill Response Equipment Selection Guide
SWMM20	Sites shall develop and implement a spill response procedure.	Guideline 4.18	During operations	Quarry Manager	Attachment 4.18B - Spill Response Procedure; EPL PIRMP
SWMM21	All relevant personnel shall be trained in the sites spill response procedure.	Guideline 4.18	During operations	Quarry Manager	Attachment 4.18C - Spill Response Toolbox Presentation; Attachment 4.18D - Spill Response Toolbox Skills Assessment
SWMM22	During product unloading and mobile re-fuelling activities, any nearby stormwater drain entry points shall be isolated to prevent spilt substances from entering the drain.	Guideline 4.18	During operations	Quarry Manager	SHE Schedule/E-Inspections
SWMM23	Processes shall be in place to ensure any waste or spoil associated with a spill is collected and disposed of in accordance with local and state requirements.	Guideline 4.18	During operations	Quarry Manager	Guideline 4.13 - Management of Non-concrete Wastes
SWMM24	Spill response equipment shall be regularly maintained including the replacement of used equipment.	Guideline 4.18	During operations	Quarry Manager	Attachment 4.1H - Environmental Monitoring Worksheet

9 COMPLIANCE MANAGEMENT

9.1 Environmental inspections

The Quarry Manager and/or Quarry Supervisor will undertake inspections of the erosion and sediment (ERSED) controls during monthly environmental inspections to evaluate their condition and effectiveness. Inspection findings will be recorded on an inspection checklist form. If any maintenance and/or deficiencies in environmental controls are observed, they will be recorded on Holcim's environmental checklist form. Records will also include details of any maintenance required, the nature of the deficiency, any actions required and an implementation priority.

Inspections of the Main Dam to determine its siltation level will be undertaken as part of the quarterly environmental inspection checklist, to ensure the capacity and function of the sediment basin is maintained at all times.

9.2 Training

All relevant employees and contractors working on site will undergo site induction training, which will cover issues relating to soil and water management including:

- existence and requirements of this plan;
- relevant legislation;
- water quality management and protection measures; and
- procedures to be implemented in the event of an unexpected discovery of contaminated land.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with key roles in soil and water management onsite. Examples of training topics include:

- ERSED control installation methodology;
- working near or in drainage lines and creeks;
- emergency response measures in high rainfall events;
- preparedness for high rainfall events;
- lessons learnt from incidents and other events;
- spill response; and
- Identification of potentially contaminated material.

Further details regarding staff induction and training are outlined in the EMS.

9.3 Licenses and permits

An EPL is currently in force for the scheduled activities of "Crushing, grinding or separating" and "Extractive activities". This EPL prescribes water quality parameters to be measured and associated discharge criteria. They also detail the monitoring and analytical requirements by reference to authority publications, e.g. *Approved Methods for Sampling and Analysis of Water Pollutants in NSW* (2004). The water quality discharge criteria for the development are listed in **Table 9**.

Table 9 Discharge water quality criteria & monitoring frequency

Parameter	Criteria	Sampling method	Frequency	Analytical method
pH	6.5 - 8.5	Probe or Grab Sample	Each overflow event	Field analysis
Turbidity	50 NTU	Grab Sample	2 times daily during discharge	Field analysis and confirmed as required with laboratory assessment, regularly updating correlations and having a factor of conservatism.
Total Suspended Solids	50 mg/L	Grab Sample	2 times daily during discharge	Laboratory analysis
Oil and Grease	No visible	Grab Sample	Daily	Field observation

9.4 Weather monitoring

Rainfall will be measured and recorded in millimetres per 24-hour period at the same time each day. Onsite weather monitoring will be tracked using the Holcim weather station installed on Jandra Quarry site.

9.5 Auditing and reporting

Audits (both internal and external) and reporting will be undertaken to assess the effectiveness of environmental controls, compliance with this SWMP, CoA and other relevant approvals, licenses and guidelines. Audit requirements are detailed in Section 9.3 of the EMS.

These audit requirements include:

Internal Audits

- The EMS and this management plan.
- CoA requirements.
- Any relevant legal and other requirements (e.g. licenses, permits, regulations, contract and documentation).

An audit checklist will be developed and amended as necessary to reflect changes to this EMS, subsequent approvals and changes to Acts, regulations or guidelines.

Independent Audits

External auditing will be undertaken by an independent environment auditor in accordance with *ISO 19011:2003 - Guidelines for Quality and / or Environmental Management Systems Auditing,* as required by CoA Schedule 5, Condition 8. External auditing will be undertaken every three years, unless the Secretary directs otherwise, with the first audit being held before the 31 March 2016.

10 REVIEW AND IMPROVEMENT

10.1 Continuous improvement

Continuous improvement of this SWMP will be achieved in accordance with Section 10 of the EMS, through the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process is designed to:

- identify areas of opportunity for improvement of environmental management and performance;
- determine the cause or causes of non-conformances and deficiencies;
- develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies;
- verify the effectiveness of the corrective and preventative actions;
- document any changes in procedures resulting from process improvement; and
- make comparisons with objectives and targets.

Continuous Improvement will be delivered through two performance reviews, these include:

Environmental Group Meetings

An environment group review is initiated by the Planning & Environment Manager and includes relevant operational personnel and stakeholders specific to the development. The group meet quarterly, or at other pre-determined periods, to review environmental management issues specific to the development.

Annual Management Review

By the end of March each year, management reviews are undertaken as part of the continual improvement process required by CoA Schedule 5, Condition 4.

A management review will involve the executive management team. This review will be held every 12 months (before the end of March) and will include a review of all activities and operations listed in Section 10.2 of the EMS:

10.2 SWMP update and amendment

The processes described in Section 9 and 10 of the EMS may result in the need to update or revise this SWMP.

The approval of updates or revisions to the SWMP will need to be considered in accordance with Section 11.2 of the EMS. Updates will be reviewed by the Holcim Planning and Environment Manager and Quarry Manager before being sent to the Secretary for approval.

All amendments including a “minor amendment” will be submitted to the Secretary for approval as part of Holcim’s annual review of plans and programs.

APPENDIX A STAKEHOLDER CONSULTATION

Department of Primary Industries
Water

Contact Hannah Grogan
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Our ref ER21809 / OUT15/25935

Holcim (Australia) Pty Ltd
Tower B, Level 8
799 Pacific Highway
Chatswood NSW 2067

By email: Daniel.lidbetter@holcim.com

Dear Mr Daniel Lidbetter

Jandra Quarry: Soil and Water Management Plan

Thank you for providing DPI Water the opportunity to review the Soil and Water Management Plan (SWMP) for Jandra Quarry. DPI Water has reviewed the SWMP and provides the following comments:

Groundwater

It is stated in section 5.3.2 that *Jandra Quarry is not subject to groundwater inflow…The intensification in production approved by the recent modification does not result in any changes to the approved quarry pit in terms of depth and disturbance area and therefore the Jandra Quarry is highly unlikely to impact on groundwater.* It should be acknowledged that any take or interception of groundwater by excavation related to Jandra Quarry must be accounted for via the appropriate water licence.

Similarly any temporary excavation works, which require dewatering for construction purposes may require a groundwater licence under Part 5 of the *Water Act 1912*. As such should the development activities listed in section 7.1 require any groundwater dewatering or groundwater interception it is recommended that Holicm (Australia) Pty Ltd seek advice from DPI Water on licensing requirements.

Harvestable Rights

Jandra Quarry is located in an area whereby surface water is managed under the *Water Management Act 2000* via the gazettal of the *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009.* In accordance with the requirements of this legislation the development consent (DA 213-10-99) requires for this SWMP to include a site water balance which includes 'the site water storage capacity and licensing requirements for all stages of the development.' As such any cumulative water storage in excess of the properties Maximum Harvestable Right, excluding 'special dams' must be accounted for via a Water Access Licence within the Wallamba River Water Source

The current sediment dam capacity for the site is 23ML this being comprised of the Main dam, with a capacity of 10 ML, and the Pit dam, with a capacity of 13 ML. However the Environmental Assessment indicated that the maximum sediment dam requirements were 20.3 ML, during stage 3. This results in an excess capacity of 2.7 ML which must be included in water storage accounted for via Harvestable Rights. Comparatively the SWMP notes in Table 6 that the minimum sediment requirements in Stage 3 are 13.7 ML for the quarry area and 6.6 ML for the Facilities area. DPI Water re-iterates as advised at time of Modification 5 that excess water storage above sediment basin

requirements must be included in the properties harvestable right calculation, along with the capacity of all clean water dams. It is noted that the clean water dam as shown in Figure 1 has a capacity of 4 ML. DPI Water considers clean water storages as described in the SWMP to be within the properties harvestable right, as such additional licences are not required.

Please contact Hannah Grogan, Water Regulation Officer (Newcastle) on (02) 4904 2516 or hannah.grogan@dpi.nsw.gov.au if you have further enquiries regarding this matter.

Yours sincerely

Mitchell Isaacs
Manager, Strategic Stakeholder Liaison
21 September 2015

Daniel Lidbetter <daniel.lidbetter@lafargeholcim.com>

Jandra Soil and Water Management Plan

1 message

Arnna Fotheringham <Arnna.Fotheringham@gtcc.nsw.gov.au> 15 September 2015 at 08:18
To: "daniel.lidbetter@lafargeholcim.com" <daniel.lidbetter@lafargeholcim.com>

Dear Dan

Please find below comments from our Development Engineer Graham Schultz:

As requested, I have reviewed the Holcim's SWMP 2015 and it is generally acceptable subject to the amendments as shown to the following clauses –

6.3 "The likelihood of an extended dry period (resembling a 5th percentile dry year) occurring is very low in which case it may not justify the cost-benefit of creating a 25ML storage volume within the quarry pit."

Extended dry periods resulting from forecast El Nino effects, coupled with climate change, are factors which should be incorporated into the SWMP over the life of the quarry. Creating a larger storage volume Pit Dam and/or Main Dam should be considered based on these climatic factors.

7.2.2 "... The Pit Dam will be progressively enlarged to ensure it has capacity to control sediment ...".

Include in the SWMP estimated dimensions and storage volumes of the Pit Dam for each stage of the expansion to provide some assurance that there will be capacity to control the sediment.

7.2.3 "If monitoring results indicate a sustained exceedance trend, an artificial flocculation program should be investigated and if implemented, carried out in accordance with the guidelines shown in Managing Urban Stormwater - Soils and Construction Volume 1 - Appendix E, (DECC, 2004)."

A program for artificial flocculation should be incorporated into the SWMP providing details of the type and spread rate of flocculation product to enable it to be readily sourced and spread as and when required.

10.2 "Department of Planning approval of the Modification of Consent Condition 19, and Condition 3(h) of Schedule 5 –Environmental Management Conditions."

Dates for the regular reviews, updates and amendments of the SWMP are to be included in the SWMP.

A copy of the SWMP incorporating these amendments is to be submitted to Council for final approval.

Regards

Arnna Fotheringham

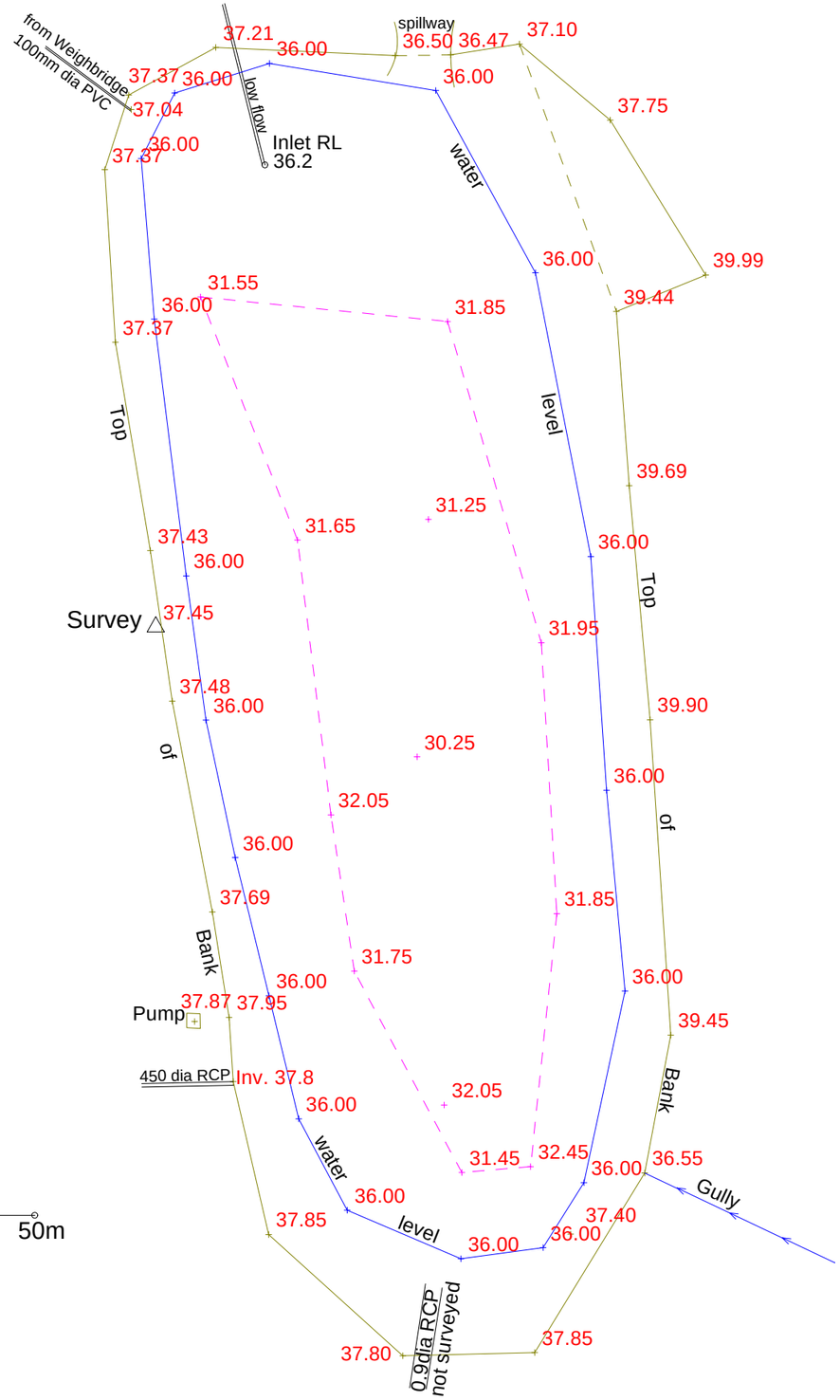
Development Planner | Regulatory Services
t: 02 6592 5247 | m: 0428 293 416
e: arnna.fotheringham@gtcc.nsw.gov.au | w: www.gtcc.nsw.gov.au

Greater Taree City Council

Greater Taree City Council image001.png 8K

APPENDIX B MAIN DAM SURVEY PLAN

APROX NORTH



0m 10 20 30 40 50m

DATUM IS APPROX. AHD ONLY

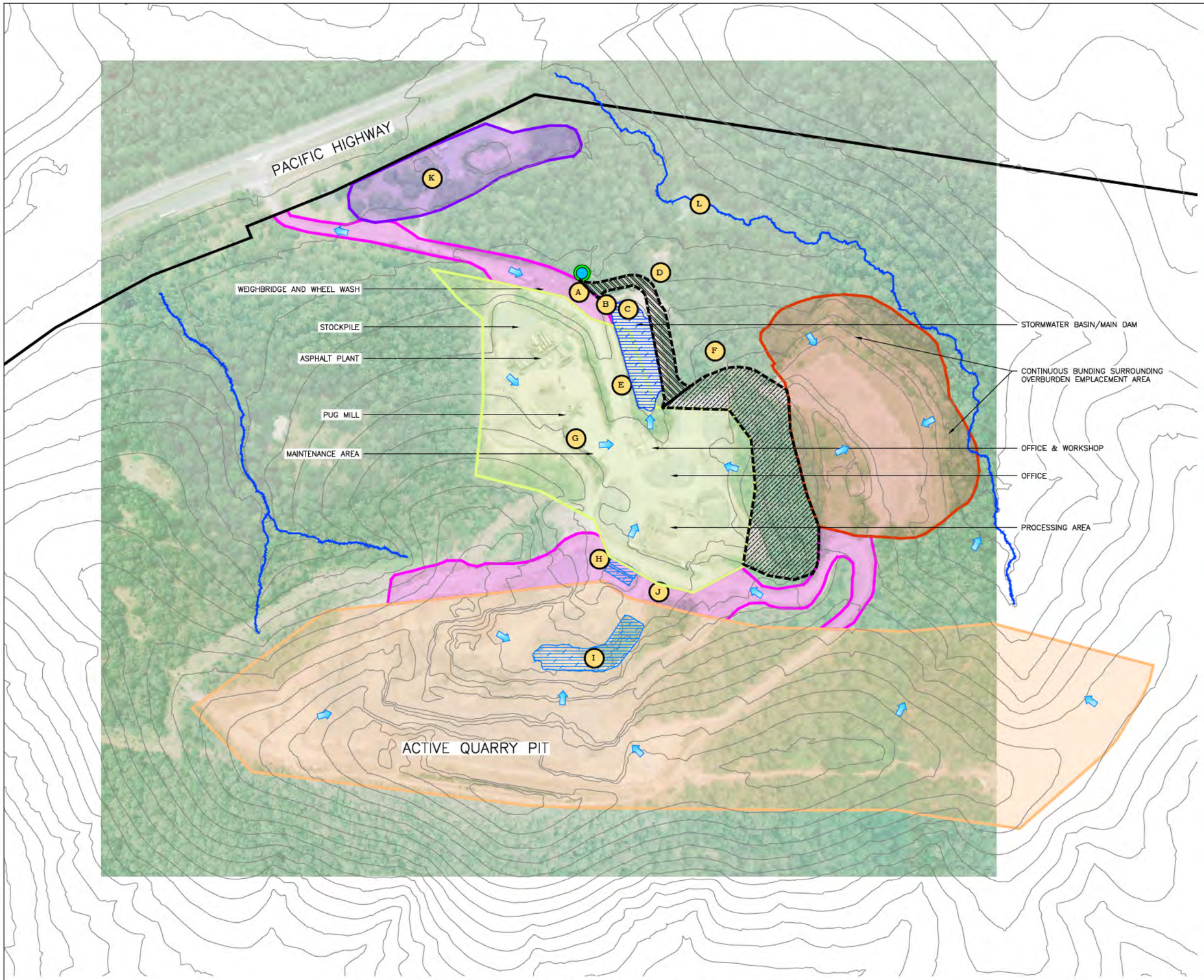
PLAN

JANDRA QUARRY
MAIN STORMWATER BASIN
POSSUM BRUSH

McGLASHAN & CRISP Pty Ltd
CONSULTING SURVEYORS
117 VICTORIA STREET, TAREE 2430. Ph:02 65521566. DX 7009

SCALE: 1:500	CLIENT HOLCIM (AUST) PTY LTD		REFERENCE F922/4714
DRAWN: JVC	LGA	PARISH	COMPUTER FILE DAM
DATE: 15/5/14			

APPENDIX C REVIEW OF EROSION AND SEDIMENT CONTROLS



A — Sedimentation sump and transfer pump. Truckwash water and road runoff discharges into sump and is pumped to the basin/main dam.

B — Truck wash water inlet

C — Basin orifice outlet to creek

D — Basin spillway to creek

E — Circulation pump from main dam. Dam water is supplied to pugmill, processing area, water cart, and truck wash as required.

F — Unstabilised access road

G — Roofwater tank. Harvested roofwater supplied to amenities block

H — Primary sedimentation basins for processing area. Basin drain via gravity to main dam via small macrophyte area

I — Primary sedimentation basin for quarry area. Drains via gravity through pipe system to the main dam.

J — Macrophyte treatment area

K — Secondary stockpile area. This area will require a sediment basin and appropriate erosion and sediment controls if it is intended to be used as a stockpiling location

L — Clean water dam

Recommendations:

1. Move truck wash water inlet away from basin outlet (or install baffle) to lengthen the flow path and improve sedimentation
2. Apply flocculant to main basin after storm event
3. Increase maintenance frequency

LEGEND:

- DEVELOPMENT CONSENT BOUNDARY
- ACCESS ROAD AND HAUL ROUTES
- PROPOSED HEAVY VEHICLE ACCESS ROAD
- PROPOSED EXPANSION OF FINISHED STOCKPILE AREA
- APPROVED EXTRACTION AREA
- APPROVED SECONDARY STOCKPILE AREA
- APPROVED OVERBURDEN EMPLACEMENT AREA
- APPROVED STOCKPILE AND SITE FACILITIES
- STORMWATER BASIN/MAIN DAM
- SEDIMENTATION BASINS
- WATER SAMPLING LOCATION
- ITEM REFERENCE
- FLOW ARROW
- CREEK/WATERCOURSE
- DRAINAGE CHANNEL

JANDRA QUARRY – REVIEW OF EROSION AND SEDIMENT CONTROLS

Storm

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Original sheet size A3

North

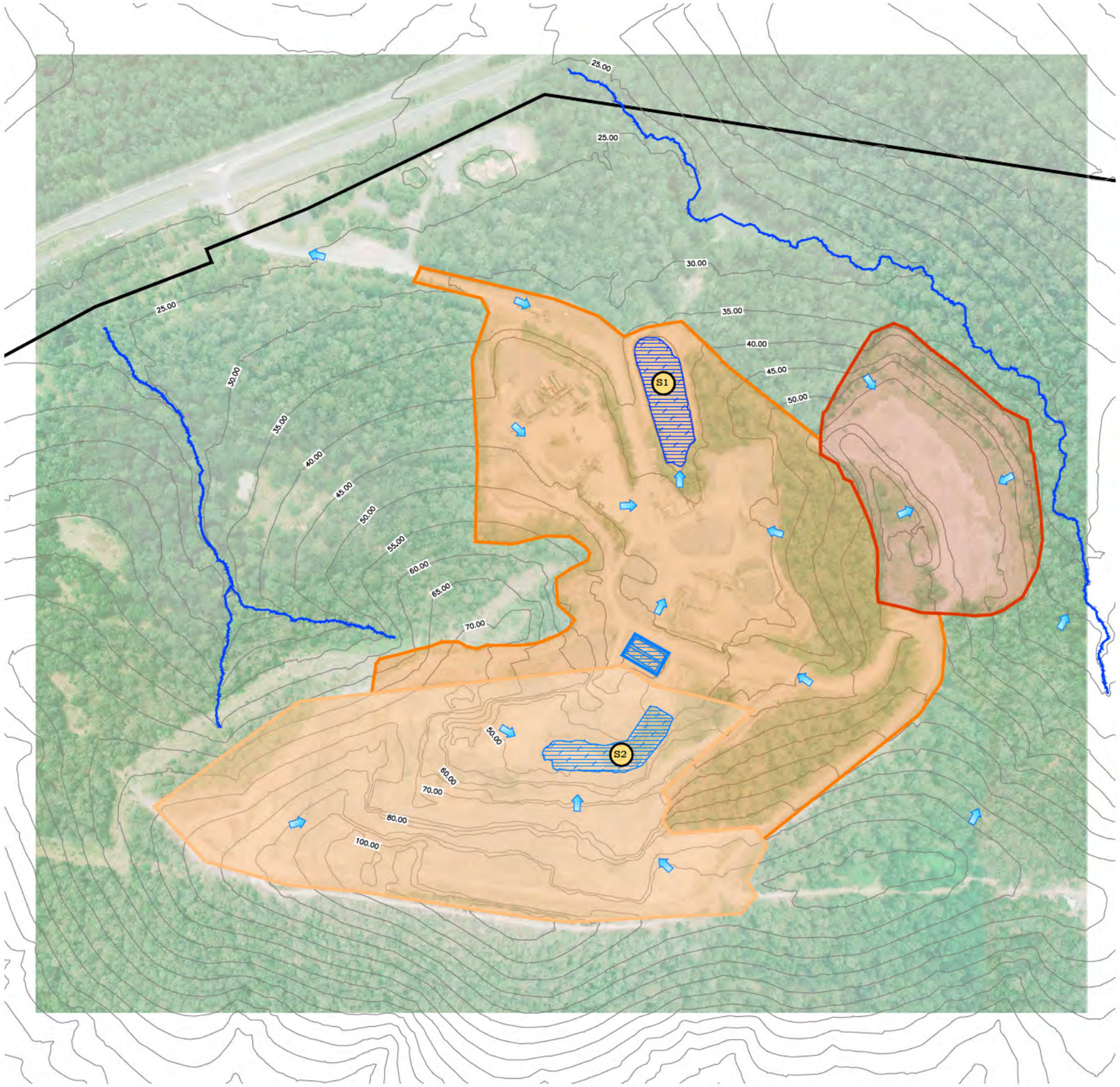
SYDNEY SUITE 18, 12 TRYON RD, LINDFIELD, NSW 2070 P 02 9499 4333

REVIEW OF EXISTING STORMWATER MGMT

Date 21.05.14

Figure 01

APPENDIX D SEDIMENTATION BASIN REQUIREMENTS



Sediment Basin Requirements	Catchment Area (ha)	*Settling zone volume (m3)*	*Sediment storage volume (m3)*	Min. required volume (ML)	Existing Volume (ML)
Quarry Area					
-Current	8.04	4197	2098	6.3	13
Facilities Area					
-Current	11.23	5862	2931	8.8	10

Note: Original sediment basin sizing calculations for Jandra Quarry (1999) have been revised and updated, based on modified catchment areas and new sizing method provided in Landcom's Blue Book

LEGEND:

- Active quarry/extraction catchment
- Stockpile and site facilities catchment
- Overburden emplacement catchment
- S1 — Main Dam/Sedimentation Basin for facilities area
- S2 — Sedimentation basin for active quarry area
- Flow Arrow

SEDIMENTATION BASIN PLAN (EXISTING)

Storm

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Original sheet size A3

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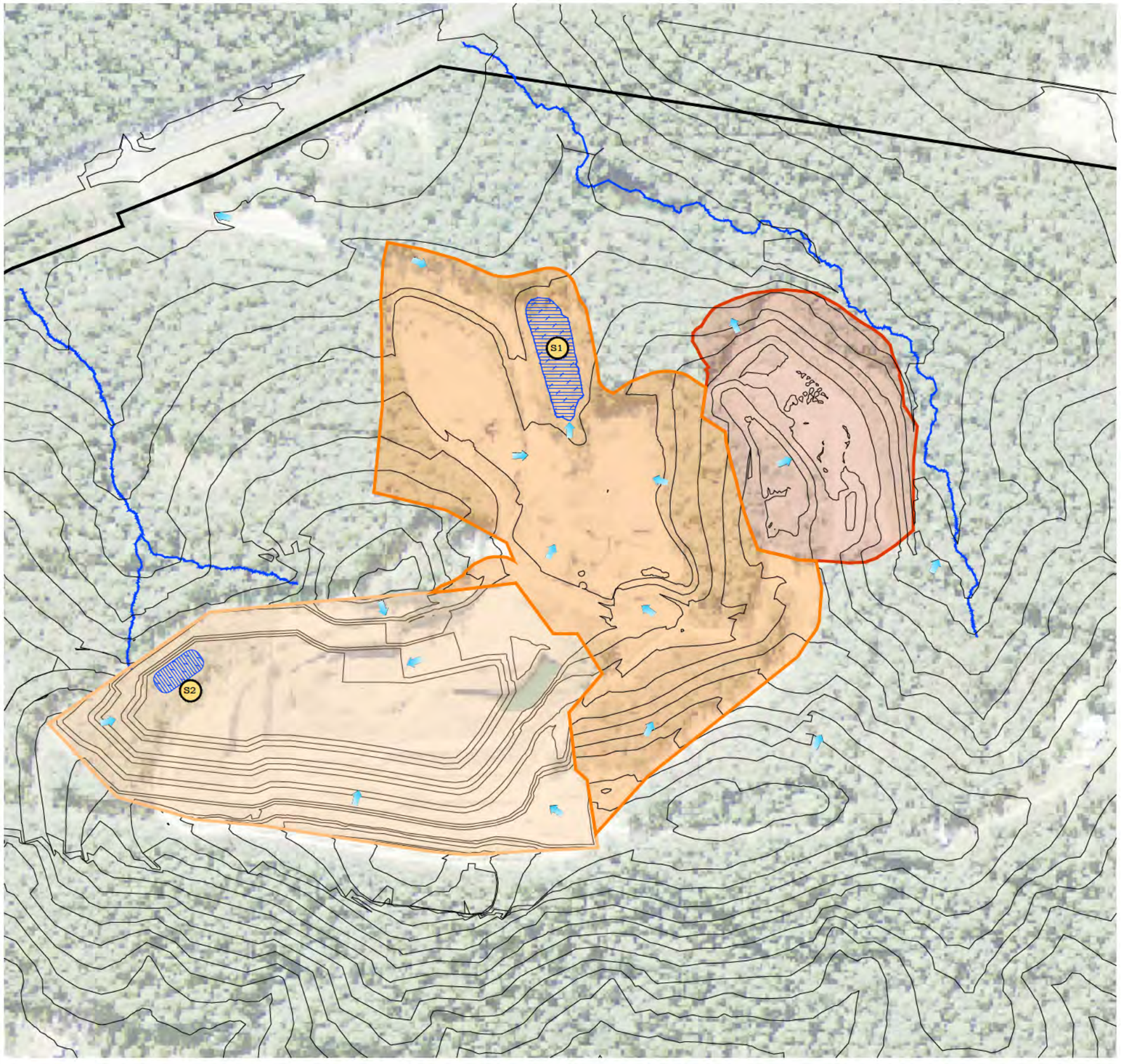
REVISED SED BASIN REQUIREMENTS FOR EXISTING

Date 21.05.14

Figure 02



Sediment Basin Requirements	Catchment Area (ha)	*Settling zone volume (m3)*	*Sediment storage volume (m3)*	Min. required volume (ML)	Existing Volume (ML)
Quarry Area					
-Stage 1	8.84	4614	2307	6.9	-
Facilities Area					
-Stage 1	10.37	5413	2707	8.1	10

Note: Original sediment basin sizing calculations for Jandra Quarry (1999) have been revised and updated, based on modified catchment areas and new sizing method provided in Landcom's Blue Book

LEGEND:

- Active quarry/extraction catchment
- Stockpile and site facilities catchment
- Overburden emplacement catchment
- S1 — Main Dam/Sedimentation Basin for facilities area
- S2 — Sedimentation basin for active quarry area
- Flow Arrow

SEDIMENTATION BASIN PLAN (STAGE 1)

Storm

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Original sheet size A3

North

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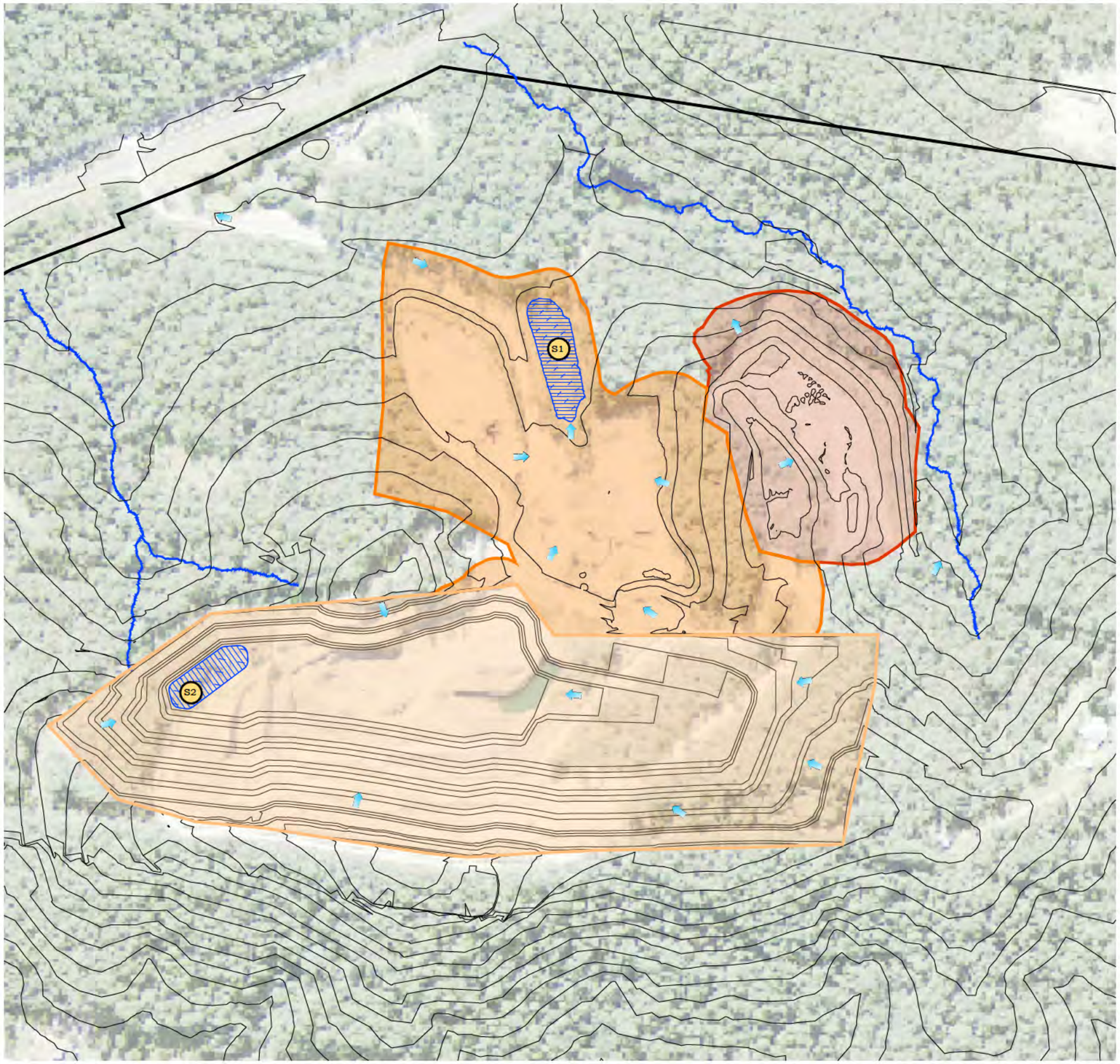
SED BASIN REQUIREMENTS FOR STAGE 1

Date 21.05.14

Figure 03



Sediment Basin Requirements	Catchment Area (ha)	*Settling zone volume (m3)*	*Sediment storage volume (m3)*	Min. required volume (ML)	Existing Volume (ML)
Quarry Area					
-Stage 2	13.57	7084	3542	10.6	-
Facilities Area					
-Stage 2	8.44	4406	2203	6.6	10

Note: Original sediment basin sizing calculations for Jandra Quarry (1999) have been revised and updated, based on modified catchment areas and new sizing method provided in Landcom's Blue Book

LEGEND:

- Active quarry/extraction catchment
- Stockpile and site facilities catchment
- Overburden emplacement catchment
- S1 — Main Dam/Sedimentation Basin for facilities area
- S2 — Sedimentation basin for active quarry area
- Flow Arrow

SEDIMENTATION BASIN PLAN (STAGE 2)

Storm

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Original sheet size A3

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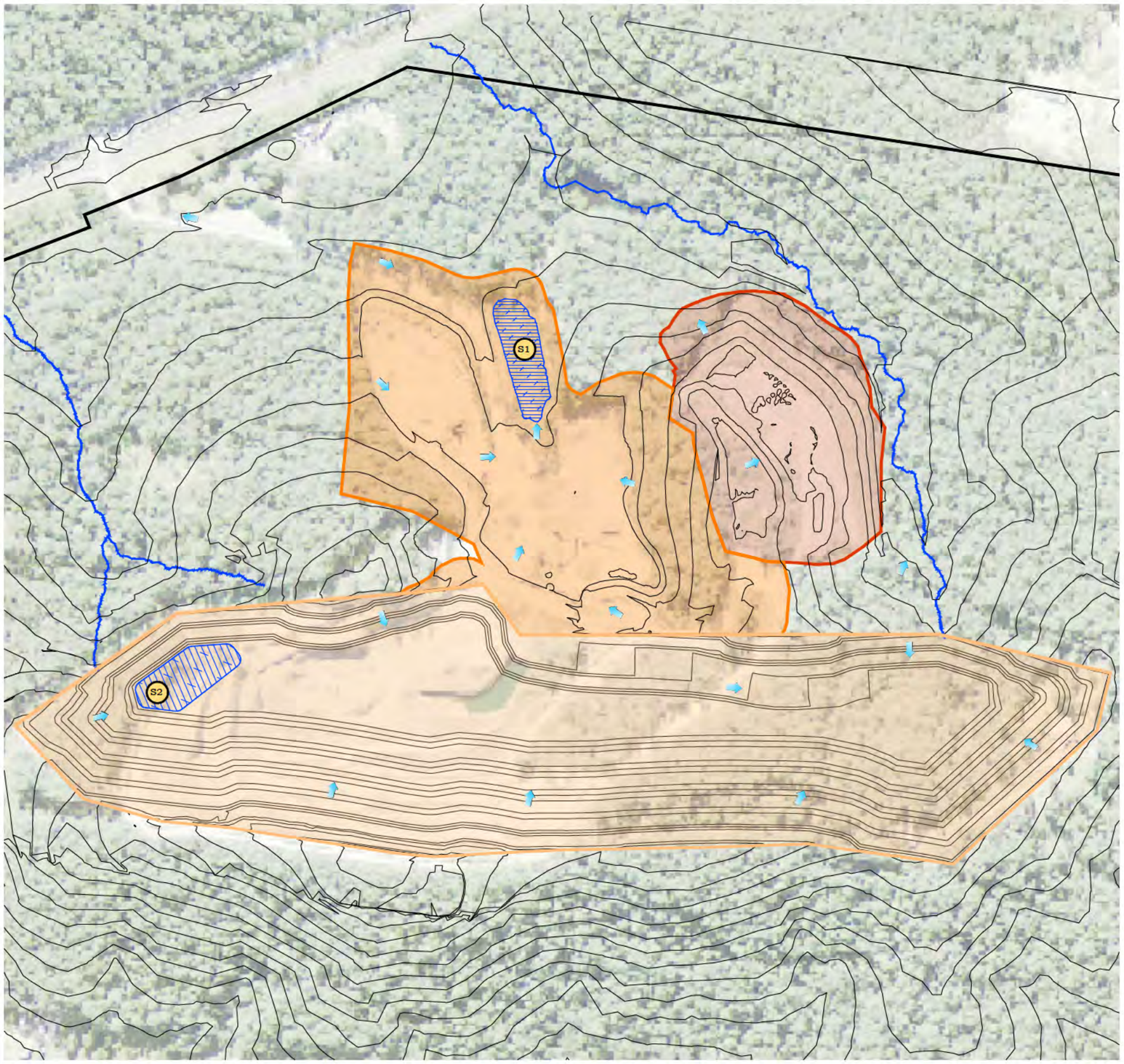
SED BASIN REQUIREMENTS FOR STAGE 2

Date 21.05.14

Figure 04



Sediment Basin Requirements	Catchment Area (ha)	*Settling zone volume (m3)*	*Sediment storage volume (m3)*	Min. required volume (ML)	Existing Volume (ML)
Quarry Area					
-Stage 3	17.47	9119	4560	13.7	-
Facilities Area					
-Stage 3	8.44	4406	2203	6.6	10

Note: Original sediment basin sizing calculations for Jandra Quarry (1999) have been revised and updated, based on modified catchment areas and new sizing method provided in Landcom's Blue Book

LEGEND:

- Active quarry/extraction catchment
- Stockpile and site facilities catchment
- Overburden emplacement catchment
- S1 Main Dam/Sedimentation Basin for facilities area
- S2 Sedimentation basin for active quarry area
- Flow Arrow

SEDIMENTATION BASIN PLAN (STAGE 3)

Storm

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Original sheet size A3

North

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SED BASIN REQUIREMENTS FOR STAGE 3

Date 21.05.14

Figure 05