Bioelektra Australia Pty Ltd

West Nowra Resource Recovery Park - Stage 2

Soils and Water Assessment Report

June 2021

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1. Introduction

1.1 Purpose of this report

Bioelektra Australia Pty Ltd (Bioelektra) proposes to construct and operate an integrated resource recovery facility at West Nowra (referred to in this report as 'the project'). This report has been prepared by GHD Pty Ltd to provide an assessment of soil and water management associated with the project as an input to the environmental impact statement. Bioelektra is the proponent of the project and the environmental impact statement is being prepared by GHD in accordance with the requirements of Part 4 of the NSW Environmental Planning and Assessment Act 1979 (the EP&A Act).

The report addresses the requirements of the Secretary of the NSW Department of Planning, Industry and Environment (the Secretary's Environmental Assessment Requirements (SSD 9887) dated February 2021).

1.2 Staged project approval

In 2016 Shoalhaven City Council (Council) sought approval for a Concept Proposal for a resource recovery park with a combined capacity of 130,000 tonnes per year (the West Nowra Resource Recovery Park). The Concept Proposal included:

- Stage 1 – clearing of land and provision of basic infrastructure on the nominated site, which would be undertaken by Council or contractors appointed by Council as part of early construction works.
- Stage 2 – construction and operation of a resource recovery park which would be undertaken by an alternative waste technology provider/facility operator, selected through a tendering process to provide the specialised resource recovery facilities.

Council sought Project Approval for Stage 1 as part of the same application.

A staged approach was adopted to enable construction of Stage 1 of the project to commence (subject to planning approval) while a contractor was appointed and while the details of Stage 2 were determined via the tendering and design process.

Council received Concept Approval and Stage 1 Project Approval for the West Nowra Resource Recovery Park on 25 August 2016 (SSD 7015). The approved Stage 1 works include:

- Demolition of the existing animal shelter
- Site preparation and clearing of the site
- Construction of perimeter, entry/exit and service roads and line marking
- Installation of perimeter/boundary fencing
- Weighbridge and weighbridge office
- Staff and visitor car parking, including line marking
- Detention and sedimentation dams/basins
- Identification of asset protection zones

Council subsequently awarded Bioelektra Australia Pty Ltd (Bioelektra) with the contract for delivery of Stage 2 of the work (SSD 9887), including the construction and operation of an integrated resource recovery facility at the site.

1.3 Project overview

The project is defined as the construction and operation of a resource recovery facility with pre-treatment for mixed municipal waste of up to 130,000 tonnes per year, comprising:

- A waste reception hall
- A processing building for shredding and sterilisation operations using 16 autoclaves to pre-treat and sterilise the waste
- A materials recovery facility for sorting all processed waste minus organic matter separated from autoclave pre-treatment
- A boiler room, transformer hall and liquid petroleum gas (LPG) station supplying utilities and electricity for site operations

The project also includes ancillary infrastructure including offices, amenities, staff and visitor parking, internal roadways, weighbridges and weighbridge offices, fencing, and a pumping station and firefighting tanks

The Concept Approval (SSD 7015) included construction and demolition (C&D) waste processing and an alternative waste treatment (AWT)/materials recovery facility (MRF).

C&D waste processing is no longer proposed part of the project and the waste processing technology proposed by Bioelektra includes sterilisation of waste through autoclaving and materials recovery through various sorting operations.

Other ancillary infrastructure not included as part of the Concept Approval (SSD 7015) but proposed for this project include the boiler room, transformer hall, LPG station and pumping station and firefighting tank.

1.4 Location of the project

The project would be located at 114 Flatrock Road in Mundamia (City of Shoalhaven), specifically, a 3.6 hectares (ha) site which previously operated as an animal shelter (Lot 342 DP 257515). The site is approximately five kilometres (km) to the west of the Nowra Central Business District, is accessed from Flatrock Road, off Yalwal Road in Mundamia, and is adjacent to the existing West Nowra Recycling and Waste Facility. Refer Figure 1-2.

1.5 Scope and limitations

This report: has been prepared by GHD for Bioelektra Australia Pty Ltd and may only be used and relied on by Bioelektra Australia Pty Ltd for the purpose agreed between GHD and the Bioelektra Australia Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Bioelektra Australia Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

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

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

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

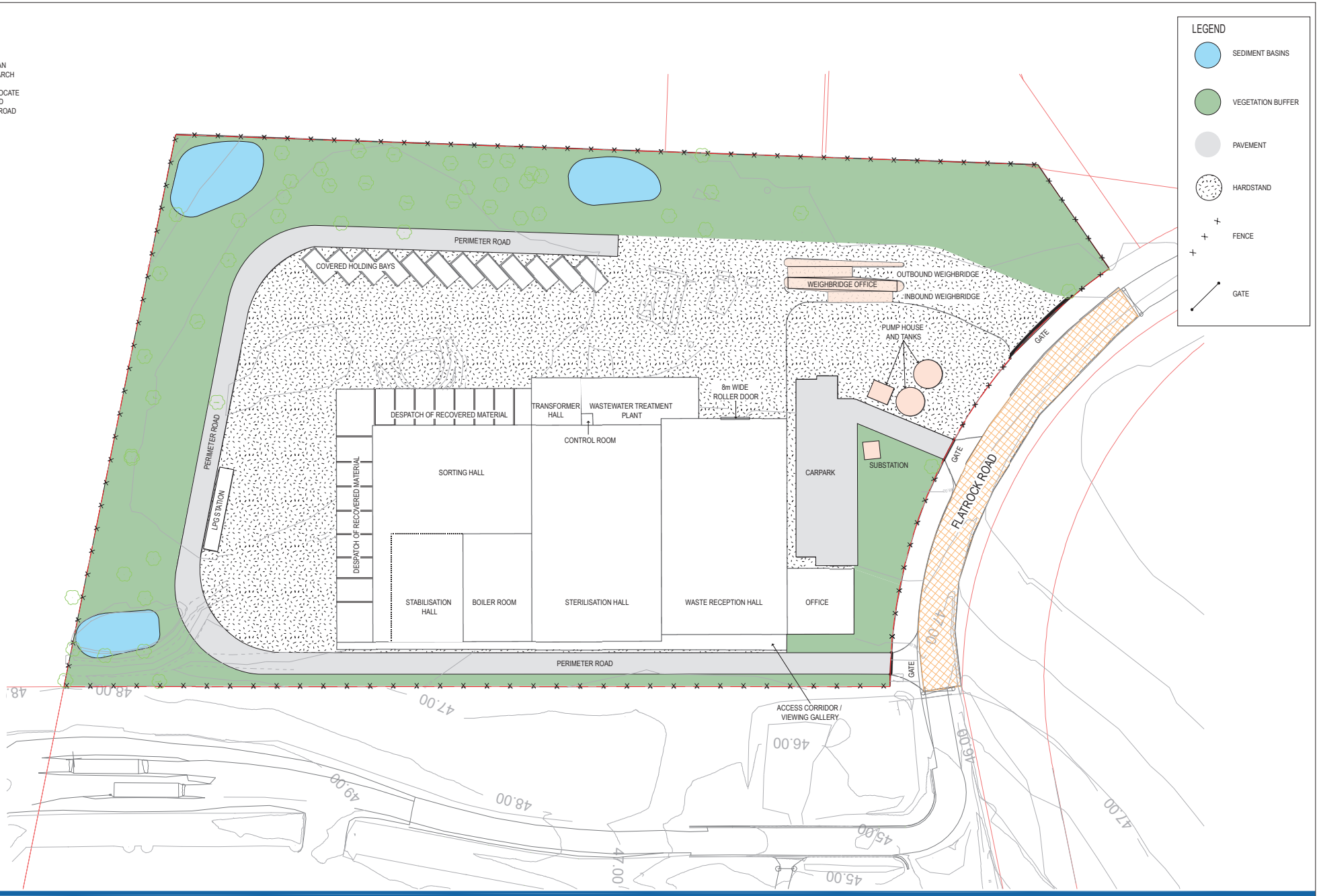
GHD has prepared this report on the basis of information provided by Bioelektra Australia Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

BASED ON PROPOSED SITE PLAN PREPARED BY BECA, DATED MARCH 2019 (REF: 2440823-ar-0501-a) AND AMENDED BY GHD TO RELOCATE LPG STATION, ADJUST COVERED HOLDING BAYS AND INTERNAL ROAD ALIGNMENTS AND REMOVE TRANSFER STATION.



Bioelektra Australia Pty Ltd
West Nowra Resource Recovery Park Stage 2

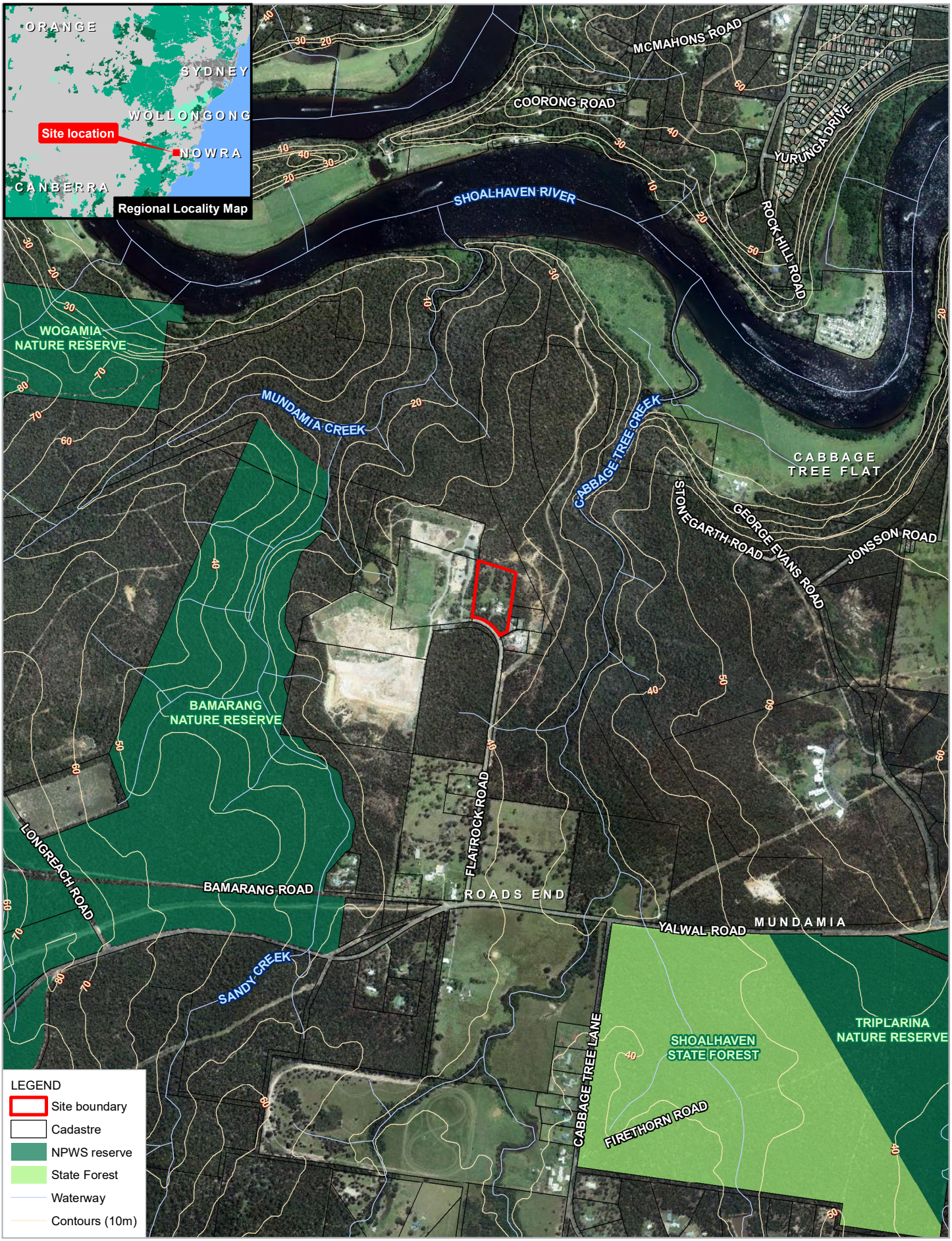
Preliminary Master Plan

Job Number 12536311
Revision A
Date December 2020

Figure 1-1

Level 15, 133 Castlereagh Street, Sydney NSW 2000 Australia **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

Plot Date: 11 December 2020 - 2:31 PM Plotted by: Daniela Taylor Cad File No: Drawing1.dwg



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Bioelektra Australia Pty Ltd
West Nowra RRF SSD EIS
Soils and Water Assessment

Project No. **12536311**
Revision No. **-**
Date **11 Jan 2021**

Site Location Plan

FIGURE 1-2

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Data source: Aerial imagery - Sixmaps 2021 (© Department of Customer Service 2020); General Topo: NSW LPI DTDB 2020 & 2015; Cadastre: NSW LPI DCDB 2020; Inset map - Geoscience Australia.
Created by: afoddy

1.6 Secretary's Environmental Assessment Requirements (SEARs)

The report addresses the soil and water requirements of the Secretary of the NSW Department of Planning and Environment (the Secretary's Environmental Assessment Requirements). The specific SEARs requirements addressed in this report are summarised in Table 1.1.

Table 1-1 Secretary's Environmental Assessment Requirements

Assessment requirements	Where addressed in report
An assessment of potential impacts to soil and water resources, topography, hydrology, groundwater, drainage lines, watercourses and riparian lands on or nearby the site, including mapping and description of existing background conditions and cumulative impacts.	Section 1.4, Section 2, and Section 5.1
Characterisation of water quality at the point of discharge to surface and/or groundwater against the relevant water quality criteria (including details of the contaminants of concern that may leach from the waste into the wastewater and proposed mitigation measures to manage any impacts to receiving waters);	Section 5.1
Details of stormwater/wastewater management system including the capacity of onsite detention system(s), onsite sewage management and measures to treat, reuse or dispose of water	Section 3, 5.1 and 5.2
Detailed flooding assessment.	Section 5.3
A description of erosion and sediment controls;	Section 3 and 5.1
Consideration of salinity and acid sulphate soil impacts	Soils assessed elsewhere in EIS
Characterisation of the nature and extent of contamination on the site and a description of proposed management measures	Soils assessed elsewhere in EIS

2. Existing environment

2.1 Surrounding environment

The site is located between two creeks that flow northwards into the Shoalhaven River. Namely Sandy Creek which is 680 m west of the site and Cabbage Tree Creek which is 450 m east of the site. The site elevation varies from 46.5 m AHD in the south western corner to a high point in the north of the site at 49 m AHD. It includes grassed areas modified by development activity and natural bushland remnants in the southern end of the property. The topography of the site is generally even and sloping westwards towards the adjacent waste management facility.

A small number (approximately six) of rural residential properties are located approximately 700 m south of the project site and a rural residential property located approximately 900 m to the north east. The Shoalhaven Campus of the University of Wollongong is located approximately 1.3 km to the south-east.

The existing West Nowra landfill is immediately to the west of the site. The DPIE West Nowra Office is located immediately to the southeast.

The remaining land to the north and east of the site is undeveloped bushland – primarily the Bamarang Nature Reserve and/or land owned by the Nowra Local Aboriginal Land Council and Council.

2.2 Existing soil and water management

There are no identified watercourses draining through the site. No groundwater dependent ecosystems have been identified in the vicinity of the site. The site is more than 450 metres from the nearest waterway (Cabbage Tree Creek) therefore no riparian areas would be impacted by the project.

Stage 1 works are ongoing and have involved the clearing of land and provision of basic infrastructure on the nominated site as part of early construction works. As part of the works, a sediment basin has been constructed on the north-western end of the site to manage erosion and sediment for disturbed areas during the Stage 1 construction phase. This basin now exists on-site and would be utilised during Stage 2 construction phase and the operational phase of the facility. Although Stage 1 works are ongoing, they would have been completed prior to the proposed works of this assessment and are therefore considered the baseline conditions.

An existing clean water drain exists along the western boundary of the site. It currently conveys runoff from the site south where it is understood to drain under the nearby landfill before flowing into downstream creeks. This drain would be retained during the Stage 2 construction phase and operational phase as a clean water drain.

3. Proposed soil and water management

This section gives an overview of the proposed soil and water management measures during the construction phase and the operational phase of the project.

3.1 Summary of soil and water management measures

3.1.1 Operational phase

- Upstream runoff would be diverted around the site where practical
- Runoff from perimeter roads and roofed areas from the western side would be spread out and discharged directly from site, minimising concentration of flows. This water is expected to be clean, given the infrequent use of the perimeter roads. Furthermore, it is noted that the volume of this water would form a very minor portion of the overall volume of water contributing to the downstream watercourse. Based on this, and the low risk of the water this discharge is not anticipated to result in a significant change to downstream ambient water quality conditions.
- Runoff from the carpark and entrance area would be managed in a stormwater treatment system involving a gross pollutant trap, buffer swale and constructed wetland
- Swale drains from the construction phase are to be retained along the northern, eastern, and southern boundaries and regraded as required to the remaining permanent sediment basin in the north-west and constructed wetland. The existing drain along the western boundary to be retained to convey clean runoff from perimeter road and roofed areas.
- Two of the basins which would act as sediment basins during construction, would be maintained and converted into a permanent detention basin (north-western basin) (Basin 1) and a constructed wetland (eastern basin) (Basin 3).
- The temporary basin on the south-western boundary would be removed, during construction, once the structures have been established and disturbed surfaces are vegetated as required.
- Runoff from the north-western hardstand areas would be diverted into the north-western permanent basin (Basin 1). Runoff from the eastern side of the roofed area, the parking/hardstand area and access route would be diverted into the constructed wetland (Basin 3).
- Runoff from undisturbed areas within the property boundary would be diverted to ensure that they do not intercept the flows from the road and roof areas to avoid contamination. It is assumed that these flows from the undisturbed areas would not need to be contained in the site water system as the quality of these flows would represent existing conditions
- Overflows are to be discharged off-site towards Cabbage Tree Creek
- Processing water would be sourced from potable mains water
- Wastewater produced as part of the works would be initially treated on-site and then tankered off-site for disposal at an appropriate wastewater treatment plant.

3.1.2 Autoclave technology

During the operational phase, the autoclave jacket would utilise approximately 43,800 tonnes per year of water in order to sterilize the municipal waste. However, due to recent improvements in the boiler design, approximately 80% of the water utilised in the process would be able to be recovered as condensate and re-used, significantly reducing the water demand over the long

term. Therefore, the remaining 20% (approximately 8,760 tonnes per year as per Table 3-1**Error! Reference source not found.**) of water required would be sourced from potable water.

Autoclaves are sealed devices which sterilize materials by using saturated steam under pressure (Tuttnauer, 2015). Mixed municipal solid waste is physically processed under conditions of saturated steam, pressure reaching up to five bars and temperatures up to 150ºC. Steam used during sterilization comes from steam generated from Bioelektra's own completely sealed steam units. As the units are completely sealed, no water is released to the environment. The autoclave jacket, as shown in Figure 3-1, separates the waste from where the steam is injected therefore the steam would not come into direct contact with the waste.

After the autoclaving process, sterile water vaporises from the waste and there is no impact to the environment as the water and waste are purified (Bioelektra Group). Steam from the internal part of the autoclave would be discharged during decompression to the external post-process steam condensation system which has a two-speed condensing system with exchangers, fans and chillers. A modular biological-mechanical filter would be installed downstream of the condensing system at the exhaust air outlet. The condensate would be discharged through a pipeline directly to the wastewater treatment plant.

Figure 3-1 Autoclave jacket and waste loading hatch (example)

Table 3-1 Site water demand

Water demand for processing 130,000 tonnes of waste			
Category	Daily demand max.(m^3/day)	Weekly demand max. (m^3/day)	Annual demand max. (m^3/year)
Water for amenities	3.0	20.8	1080.9
Water for process needs	24.0	168.0	8760.0
Total demand	**27.0**	**188.8**	**9840.9**
Consumption per tonne of waste (m^3/t)		**0.345**	

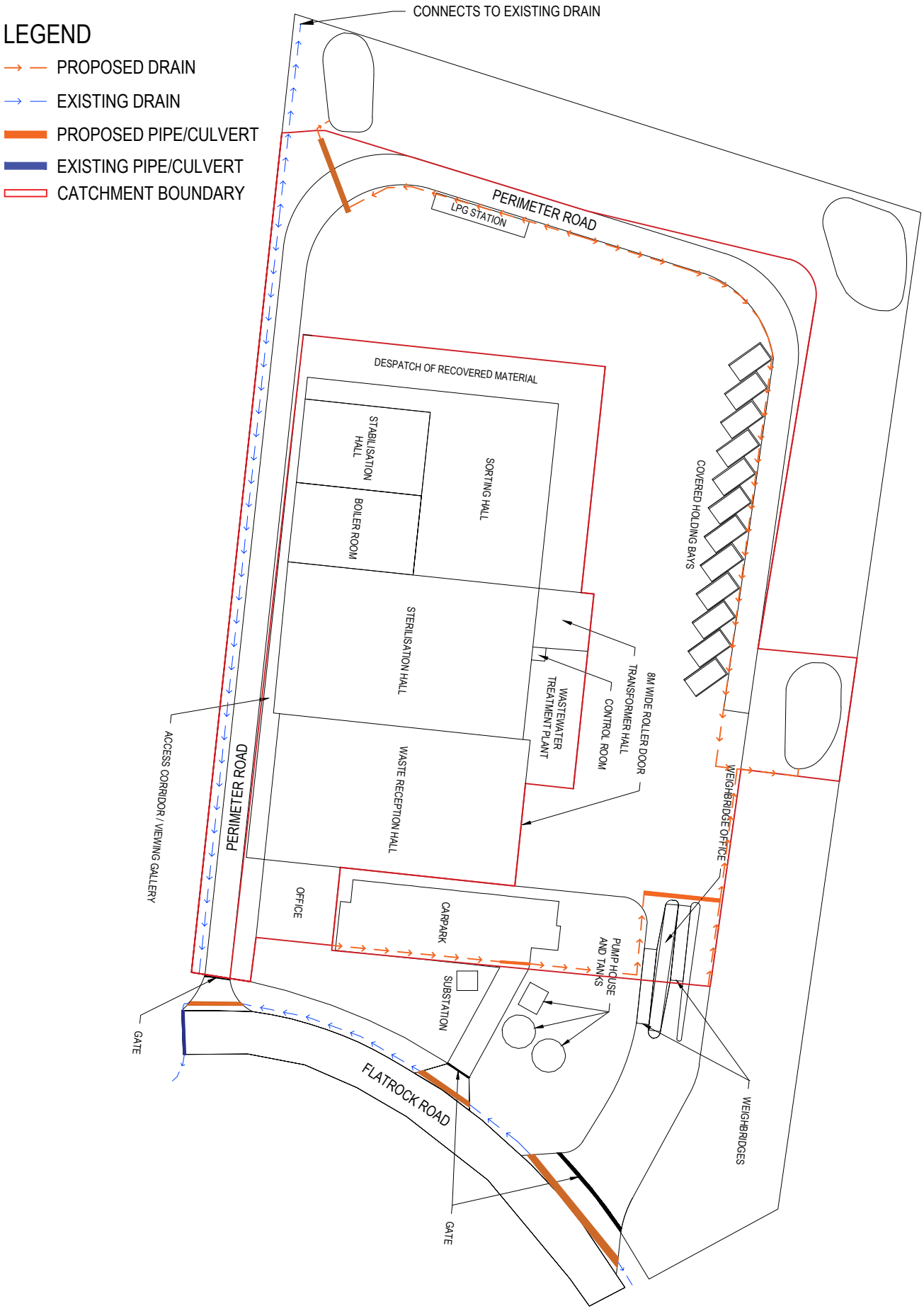
Further information on the operational phase soil and water management plan is presented in Figure 3-2. Flow and detention volumes and the overall water balance are discussed in more detail in the following chapters.

3.1.3 Constructed Wetland

The constructed wetland would collect runoff from the eastern side of the site including, the carpark, hardstand areas and eastern roofed areas. Following the *Design, construction and establishment of construction wetlands: design manual* (Melbourne Water, 2017)and *Managing Urban Stormwater Using Constructed Wetlands* report (Wong, Breen, Somes, & Lloyd, 1998), the wetland would consist of soil, water, and biota to mimic the processes and functions of surrounding natural systems to retain water and remove various pollutants while minimising its disturbance.

The wetland shape, bathymetry and placement of inlet and outlets would facilitate uniform flow across the wetland and support effective detention periods, inflow characteristics and storage volume. The wetland substrates would consist of topsoils with appropriate salinity, pH and soil structure to aid the retention of pollutants and minimize restrictions on plant growth.

In consultation with ecologists, native emergent and submerged macrophytes that are well adapted to the local climate, soils, and surrounding plant and animal communities would be used in the constructed wetland to support plant growth, improve water quality by trapping fine particles and soluble pollutants, and limit negative impacts on surrounding biodiversity.



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Bioelektra Australia Pty Ltd
West Nowra RRF SSD EIS
Soils and Water Assessment
Proposed Water Management System
Operational Phase

Job Number 12536311
Revision -
Date 13 Jan 2021

Figure 3-1

Level 15, 133 Castlereagh Street, Sydney NSW 2000 Australia T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com W www.ghd.com

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3.1.4 Construction phase

- Standard erosion and sediment control procedures involving minimisation of disturbed areas, minimisation of mobilised sediment and capturing of site runoff in sediment basins are to be designed and implemented in compliance with the guidelines under the Managing Urban Stormwater: Soils and Construction (DECC, 2008) for managing erosion and sediment.
- These sediment basins would consist of the existing permanent basin from Stage 1 in the north-west of the site and one proposed permanent basin on the eastern side that would then be converted during the operational phase to a constructed wetland. A temporary sediment basin in the south-western boundary would also be constructed, during Stage 1, in addition to any further temporary basins required to manage sediment per Managing Urban Stormwater: Soils and Construction (DECC, 2008). It is expected that Stage 1 works would be completed within approximately 4 – 6 weeks prior to commencement of Stage 2 construction works.
- During the construction phase, the majority of flows would be directed towards the south-west pond due the site topography sloping towards the south-west corner of the site.
- Swale drains are to be constructed along the site boundaries to intercept and direct sediment laden runoff to the sediment basins.
- Runoff from the site would be collected and either used to manage dust, or subsequently treated and discharged in accordance with per Managing Urban Stormwater: Soils and Construction (DECC, 2008)
- Overflows would be discharged off-site towards Cabbage Tree Creek

Section 5 describes the erosion and sediment control measures in further detail.

4. Assessment methodology

4.1 Preliminary risk assessment

The assessment methodology was developed based upon an analysis of the likely risks of the project concerning soils and water.

A risk assessment was undertaken for the proposed works. During the operational phase, waste would be confined indoors and processed fractions outdoors within enclosed containers such as hooklift bins and bags and the site is not anticipated to contain any waste areas subjected to rainfall. Only roof and general traffic areas are expected to be exposed on-site. Therefore, the potential pollutants of concern in stormwater runoff were understood to be those typically associated with industrial urbanisation. As such, a MUSIC model was developed to quantify potential impacts of the project in relation to the pollutants of concern.

No drawing of groundwater is proposed, therefore a detailed groundwater yield assessment was not undertaken. Further, as no riparian or Groundwater Dependent Ecosystems were identified in the vicinity of the site, these have not been assessed. Also, since there is no significant infrastructure on the waterways immediately downstream of the site, no detailed stormwater detention assessment was required.

Most of the site would be covered by buildings, and roof water runoff is considered to constitute a very low water quality risk to downstream waterways. The area of perimeter roads is minimal and flows from these areas would therefore not be concentrated. Runoff for larger trafficked areas such as the car park and entrance area would be collected and sent to a stormwater management system including a gross pollutant trap, vegetated buffer strip and a constructed wetland.

The above preliminary risk assessment has informed the assessment methodology, with items of low risk assessed qualitatively. As mentioned above, a MUSIC model was developed to provide a quantitative assessment of water quality for water leaving the site.

4.2 Water balance

A water balance assessment was developed to determine runoff quantities and processing requirements. Rainfall and evaporation data (described in Section 4.1.1 and 4.1.2) were used to determine the annual direct rainfall, runoff, and evaporation volumes for each dam. The water balance took into consideration both water runoff, demand for potable water and recycling of processing water.

The water balance considered runoff from the whole of the site, including Basin 1 and Basin 2. Dam geometries were estimated based on the space available and the size indicated on the general layout plan. Processing requirements and reuse volumes were estimated based on data available on similar projects. A spreadsheet was used to generate the water balance.

Figure 4-1 shows the structure of the water balance model.

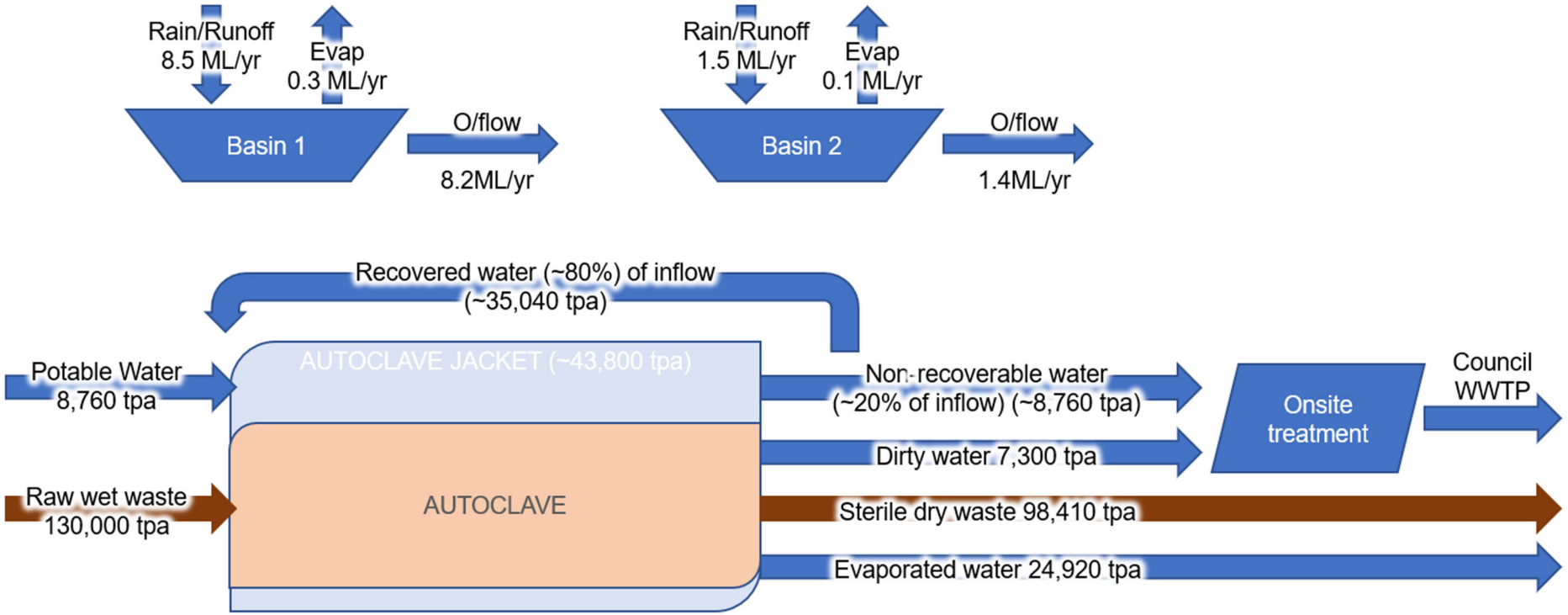

Figure 4-1 Site water balance structure during facility operation

4.2.1 Rainfall data

Data used to produce the water balance was derived from SILO Australian database of climate, provided by the Queensland Department of Environment and Science. The data was extracted as Patched Point Data, which combines observations and interpolations to provide daily data at selected locations. Rainfall data was extracted daily from 1900 until 2019.

4.2.2 Evaporation data

Evaporation data was also extracted from SILO as Patched Point Data. Synthetic estimates of lake evaporation were used for evaporation from the basins. Lake evaporation was extracted daily from 1900 until 2019.

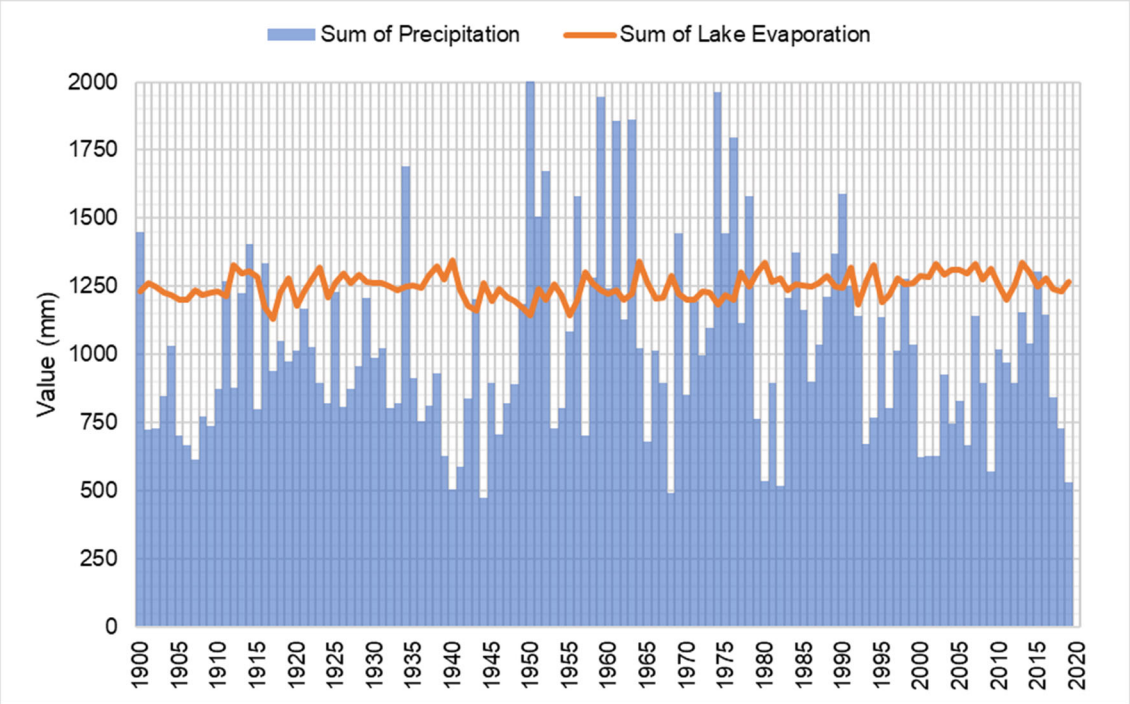

Figure 4-24-3 Yearly precipitation and evaporation time-series

4.3 MUSIC modelling

A MUSIC model was developed to assess the potential impact of runoff from the carpark and site entrance areas on downstream water quality. As discussed previously in Section 4 it is anticipated that pollutants of concern for these areas are consistent with those typically associated with industrial urbanisation, and that this area poses the primary significant risk with relation to water quality.

Therefore, a MUSIC model was deemed necessary to estimate any changes to water quality due to these aspects of the site and to assess the effectiveness of proposed mitigation.

4.3.1 Modelling setup

The MUSIC model simulated the pollutant loads for the proposed carpark and entrance area as well as the effectiveness of the proposed stormwater treatment system to estimate resultant pollutant loads in discharge for the system. It also estimated the existing generation of pollutants from the equivalent existing site area. Total Suspended Solids, Total Phosphorus, Total Nitrogen and Gross Pollutants were simulated which are common indicator pollutants for impervious catchments.

6-minute rainfall data was sourced from the Nowra RAN for the period of 1965 to 1996 with monthly average potential evapotranspiration based on observations at Port Kembla. Runoff parameters and pollutant generation parameters were sourced from *WaterNSW, 2012* with the proposed site adopted as an “Industrial” node and the existing site as an “Agricultural” node due to the current activity on the site related to the animal shelter.

The roof catchments associated with the proposed buildings was simulated as an impervious ‘urban’ node. Treatment efficiency of the gross pollutant trap was based on supplier provided information. Details of the wetland were estimated based on the indicative volume of the wetland based on the site layout plan.

Figure 4-4 shows the indicative setup of the MUSIC model. The nodes shown as an “S” are generic pollutant generation nodes with specific pollutant loading rates input as values. The figure shows how both the existing catchment and the proposed catchment with the proposed water quality system were represented.

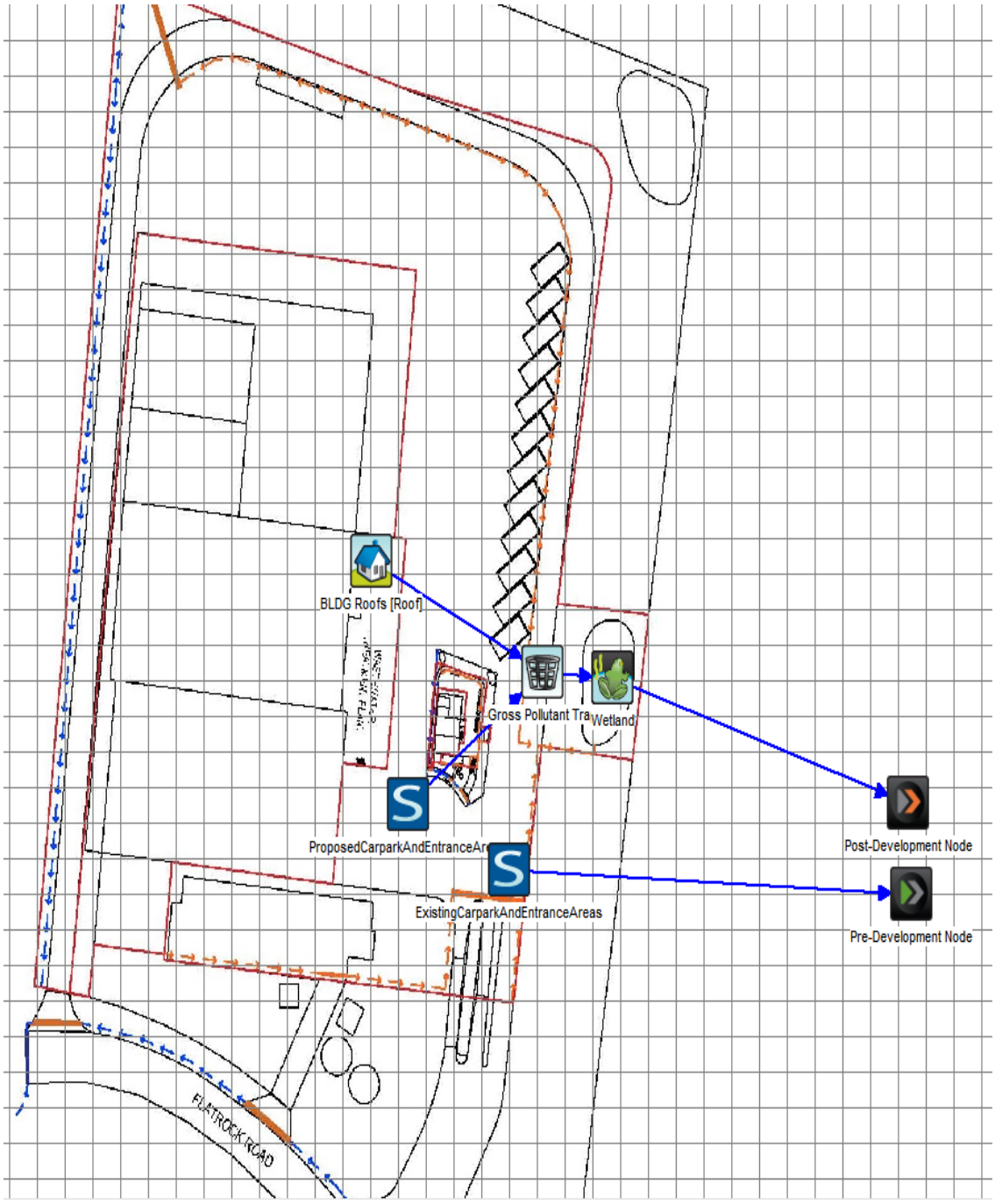

Figure 4-4 Indicative MUSIC model setup

5. Impact assessment and mitigation

The following sections assess the potential impacts of the project with relation to water quality, water sourcing, flooding and soils, as well as proposing mitigation measures where required and assessing the residual impacts after implementation of mitigation measures.

5.1 Water quality

5.1.1 Construction phase

During the construction phase, there may be a significant area of exposed soils that could have a potential impact on downstream systems through sedimentation. Therefore, erosion and sediment control measures are proposed based on the design principles outlined in Managing Urban Stormwater: Soils and Construction (Landcom 2005). Furthermore, it is proposed that the contractor prepare a detailed erosion and sediment control plan which is updated throughout the construction period.

Surface runoff would be managed to minimise the discharge of sediment-laden water downstream; broadly, this would be achieved through the following:

- Minimisation of disturbed areas and minimising the period of disturbance
- Diversion of clean runoff around disturbed areas
- Collection and management of disturbed runoff in sediment ponds

Stockpiles of material would be located well away (minimum of 5 metres from concentrated flow paths) from areas of frequent inundation.

Permanent stockpiles would be aligned to water flow and temporarily stabilised with vegetation.

Access roads and disturbance activities would be managed with consideration to minimising off-site transport of sediment.

All earthworks, filling, building, driveways or other works, would be designed and constructed (including stormwater drainage if necessary) so that at no time, would any ponding of stormwater occur on adjoining land as a result of the project.

The sediment basin at the north-western end of the site is intended to collect runoff from hardstand areas in the north-western area of the site and the constructed wetland pond is to collect sediment laden runoff from the eastern side of the site, including the carpark and hardstand areas as well as eastern roofed areas.

They would be designed to intercept any sediment-laden runoff and retain most sediment and other materials, thereby protecting downstream waterways from pollution. The retention would be provided by settling the suspended sediment from the stormwater flow, combined with the interception of bed-load material.

For this assessment, sediment ponds have been sized in consideration of Landcom (2005) design criteria for sediment basin sizing. Type F or D basins would be used because the soil on the site has been identified as fine silty-clay and sandy-clay sediments (E2W, 2008). A type F or D basin operates as a “dry basin”, where all runoff from a design storm event is captured, with the management of sediment and subsequent controlled discharge of water to re-instate the required capture storage volume within a defined management period, adopted as 5 days.

Type F basins rely on gravitational separation of sediment whereas Type D basins employ the use of a flocculent. Before beginning major works, soil sampling would be undertaken per Landcom (2005) to determine if flocculent would be required to achieve sedimentation.

All leachate generating activities would take place on sealed concrete slabs so there is minimal potential for contaminated water to enter the water table. Any washdown water/process leachate from within the enclosed waste reception hall would drain to wastewater grates installed in front of the entry gate system and discharged to a buffer tank.

It would then be transferred by pipeline to the wastewater treatment plant and treated to a standard to allow tankering from site to the Council wastewater treatment plant.

Table 5-1 Sediment pond volumes – construction phase

Sediment Pond	Required Volume (m^3) (Landcom 2005)	Volumetric Runoff Coefficient	Design Rainfall Percentile	Design Rainfall Duration (Days)	5-day Total Rainfall Depth (mm)
Basin 1	76.5 m^3	0.5	75 %ile	5 day	25.5 mm
Basin 2	76.5 m^3				
Basin 3	250.0 m^3				

The residual impacts after implementation of the proposed mitigation measures are expected to be acceptable on the basis that the site would be operated per the requirements of *Managing Urban Stormwater: Soils and Construction* (DECC, 2008).

5.1.2 Operational phase

During the operational phase, the site would operate a resource recovery facility which would confine the waste materials indoors. Since waste materials would not be stored outside and process water would be treated on-site before tankering for off-site disposal, runoff from site is expected to be as per typical industrial urbanised sites. This significantly reduces the risk to downstream surface waters with respect to water quality.

Runoff from perimeter roads is not expected to have a significant impact on downstream waters since its road surface areas are minimal and spread throughout the site and vehicles carrying compost are not expected to travel in this area of the site.

It is considered that there is a greater risk arising from construction of the car park and hardstand areas. Therefore, a stormwater treatment system involving a gross pollutant trap (also capable of capturing hydrocarbons), buffer strip and constructed wetland would be required to manage water quality in this area and is proposed.

The results of the MUSIC model (discussed in Section 4.3) are shown in Figure 5-1. They show that for all indicator pollutants, the predicted loading from the car park and hardstand areas post-development (including a gross pollutant trap, buffer strip and constructed wetland), is less than the predicted pollutant loading from the equivalent area in its current condition.

The parameters used for the constructed wetland are shown in Figure 5-2. It shows that the wetland would require approximately 150 m^3 of permanent storage and another 100 m^3 in extended detention storage during a rainfall event. Hence, the constructed wetland pond would require a total volume of 250 m^3.

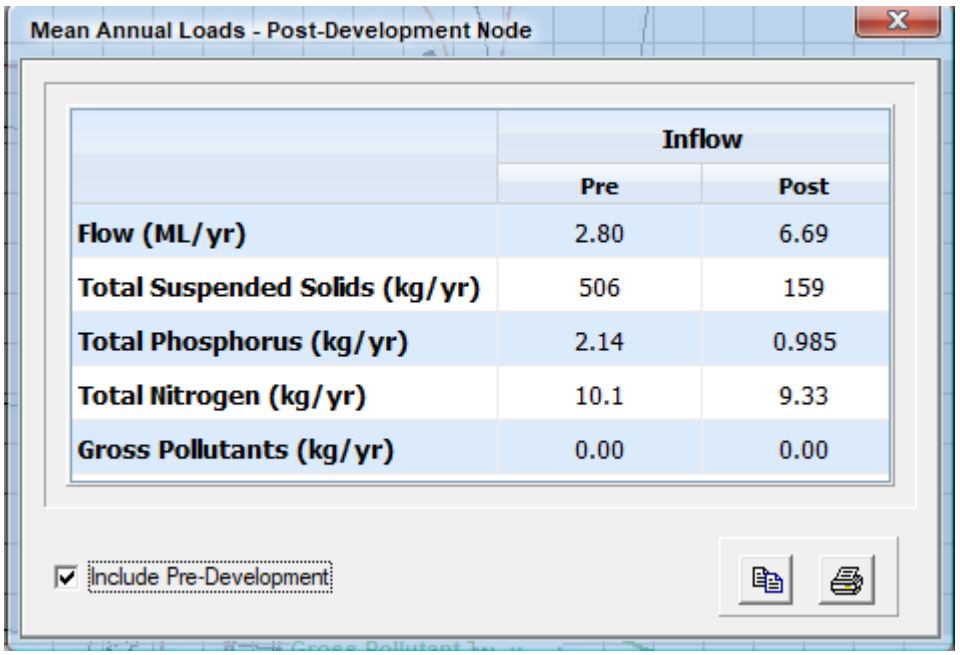

Figure 5-1 MUSIC Model results

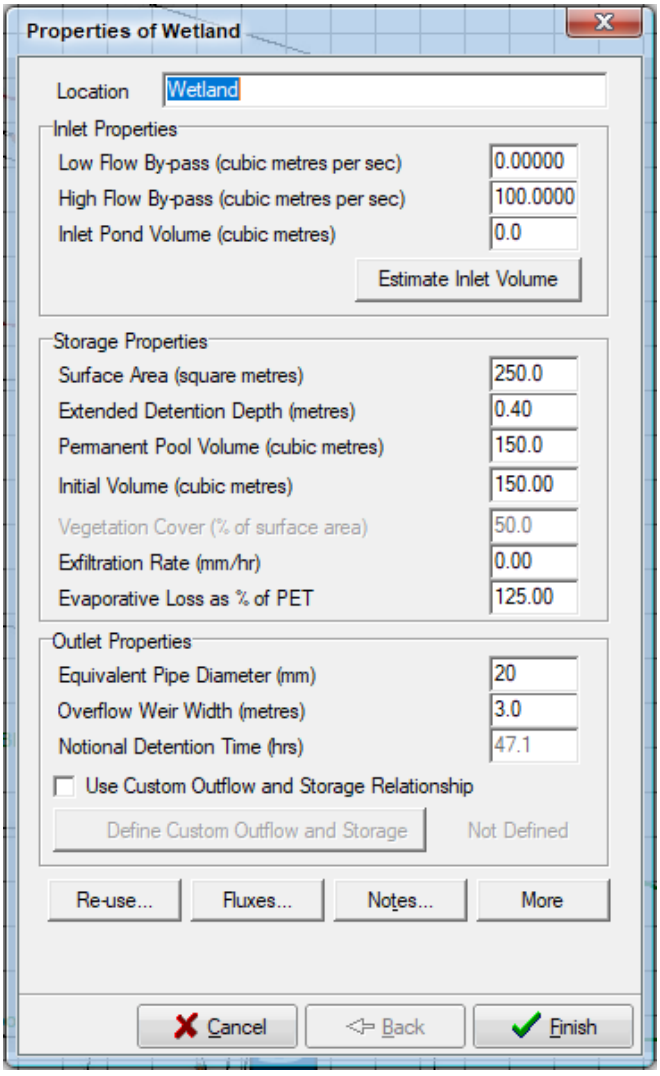

Figure 5-2 Properties of wetland in MUSIC Model

5.2 Water quality monitoring

A water quality monitoring program is to be implemented on-site to assess the runoff discharging from the sediment basins with respect to key waste and urbanisation pollutant parameters, to confirm the basis of the water quality risk assessment described above. These parameters are set out in Table 5-. Surface water quality would be assessed with consideration of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality ANZECC/ARMCANZ 2000 (ANZECC 2000).

It should be noted that analytes have been proposed for monitoring both with respect to pollutants of concern identified in this assessment. However, other pollutants, associated typically with waste products, have been included. This is not based on the anticipation that these pollutants would be discharged, rather to confirm the basis of this assessment and selection of pollutants of concern.

Table 5-2 Surface water quality parameters for sediment ponds

Parameter	Units of measure	Sampling method	Frequency
pH	pH	Probe	Quarterly (Year 1) Annually (Year 2 onwards)
Dissolved oxygen	milligrams per litre	Probe	
Electrical conductivity	micro siemens per centimetre	Probe	
Nitrogen – ammonia	milligrams per litre	Grab sample	
Total organic carbon	milligrams per litre	Grab sample	
Total dissolved solids	milligrams per litre	Grab sample	
Total suspended solids	milligrams per litre	Grab sample	
Total phosphorus	milligrams per litre	Grab sample	
Total nitrogen	milligrams per litre	Grab sample	
Major cations and anions	milligrams per litre	Grab sample	
Metals (aluminium, arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, zinc)	milligrams per litre	Grab sample	

Monitoring is to take place quarterly during the first year of the operational phase with samples to be taken during a discharge event from the constructed wetland occurring within the facility's operating hours. After the first year of operation, samples would be taken annually.

5.3 Water sourcing

Figure 5-3 represents the mean predicted annual demand volumes during the operational phases as predicted by the water balance. This indicates that on average the site has an excess of water with a total of 9.6 ML is expected to overflow annually from the two basins.

The soil and water management system on-site would be separate to the municipal waste pre-treatment process which would primarily utilise re-used water recovered from the sterilisation process.

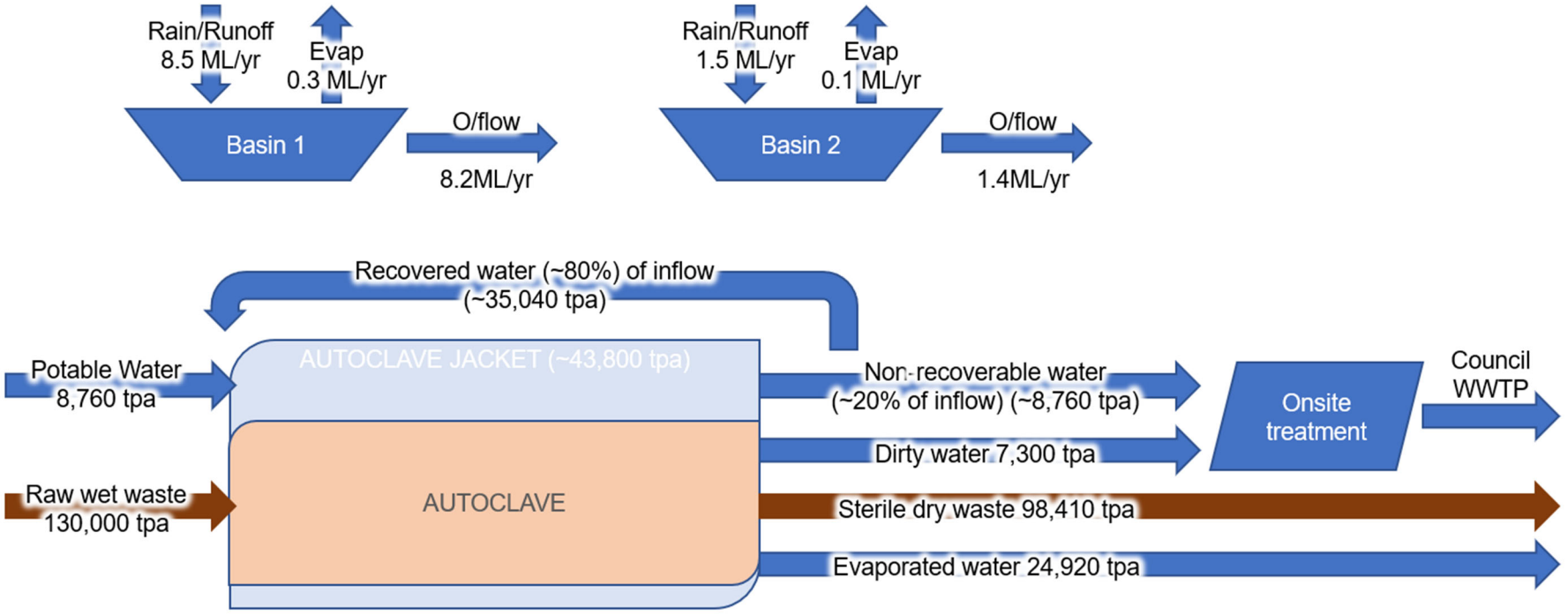

Figure 5-3 Expected site water balance volumes

5.4 Flooding

Detailed and recent flood study reports do not exist for the upper Shoalhaven River as this part of the river is considered to a have a generally low flood risk. There are several reports available exploring flooding regimes downstream of Nowra Bridge. A flood study of the Nowra Riverview Road area completed as part of the Nowra Floodplain Management Plan (February 2002) described expected flood levels at Nowra Bridge, 5 kilometres downstream of the study site.

Therefore, a high-level flood model was developed to determine the approximate flood level levels in the vicinity of the site during the 1 in 100 AEP storm. Flood levels are likely to be approximately 300-350 m from the site boundary and therefore no significant impacts from local flooding are predicted. Indicative flood extents are shown in Figure 5-4.

Figure 5-4 Approximate flood extents during the 1 in 100 AEP storm

No significant infrastructure has been identified downstream of the site between the site and the Shoalhaven River. Therefore, no detailed detention assessment has been carried out as no significant impacts, in terms of the site changes affecting future flood conditions, is expected. However, approximately 500 mm of detention storage would be provided in the site stormwater dams to minimise peak flows to minimise risk to erosion downstream.

6. Conclusions

The soil and water management plan has been prepared to address the soil and water requirements of the Secretary of the NSW Department of Planning, Industry and Environment (the Secretary's Environmental Assessment Requirements).

The report describes the existing environment including climate, topographical and hydrological characteristics. Impact assessment and mitigation measures have been developed based on the identification of key risks at the site in terms of soils and water.

The proposed water management system is as follows:

- During the construction phase:
  - Standard erosion and sediment control procedures involving minimisation of disturbed areas, minimisation of mobilised sediment and capturing of site runoff in sediment basins. These sediment basins would consist of two permanent basins to be utilised for other purposes during the operational phase as well as one temporary basin to be removed during construction
- During the operational phase:
  - Upstream runoff would be diverted around the site
  - Runoff from the perimeter roads and roofed areas on the western side would be directly discharged off-site, avoiding the concentration of flows where practical
  - Runoff from the car park and entrance area and roofed areas on the eastern side would be managed in a stormwater treatment system involving a gross pollutant trap, buffer swale and constructed wetland
  - Runoff from the north-western hardstand areas of the site would be collected into and managed in a permanent basin prior to discharge offsite as per existing conditions.
  - Water would be sourced from potable sources and water recycling would be utilised to minimise external demand.
  - Monitoring of water quality to assess impacts from the site's urbanisation.

Erosion and sediment control measures for both construction and operational phases are to be implemented in compliance with Managing Urban Stormwater: Soils and Construction (DECC, 2008).

The impacts of the site in terms of soils and water has been assessed with the above mitigation measures in place. It was noted that due to the nature of the project, no exposed outdoor storage of waste material is expected and that exposed site areas would be limited to roofs and general traffic areas.

Therefore a risk assessment of the site, primarily identified risks to downstream surface water quality to be typical of industrial urbanisation. A MUSIC model was hence developed to assess water quality impacts from the project.

These assessments indicate that with the implementation of recommended mitigation measures, no significant impacts are expected in terms of the soil and water from the project.

7. References

Landcom (2005), *Managing Urban Stormwater: Soils and Construction – Volume 1* NSW Department of Environment and Climate Change, June 2008.

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