WOODLAWN BIOREACTOR

Independent Audit
Leachate and Water Management System

Prepared for:

Veolia Environmental Services Pty Ltd

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Version No: FINAL
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PREPARED BY

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Maxwell Infrastructure (Management) Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
FINAL	27 August 2020	Duncan Barnes	Tracey Ball	Tracey Ball
Version 3	21 July 2020	Duncan Barnes	Tracey Ball	Tracey Ball
Version 2	7 July 2020	Duncan Barnes	Tracey Ball	Tracey Ball

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1 Introduction

1.1 Background to Site

Veolia Australia and New Zealand (Veolia) owns and operates the Woodlawn Bioreactor (the Development), which forms part of the 6000 hectare Woodlawn Eco-precinct. The Development is situated 250 kilometres south west of Sydney in the NSW Southern Highlands (refer to Figure 1). The Development consists of a former open cut mine void, where waste landfilling and landfill gas extraction occurs. The Development has been operating since September 2004 and has a capacity of 33 million cubic meters (m^3).

Waste is transferred to the Bioreactor via road and rail. Waste from local businesses and councils are sent to the Development via road. Waste in containers is also sent from Sydney via train and then transferred to trucks at the Crisps Creek Intermodal Facility near Tarago.

The Woodlawn site is a previous copper-zinc mine operating as a below ground and open cut mining operation. Associated facilities include evaporation dams and tailings storage facilities. Heron Resources (Heron) now operate the mine.

Veolia's current operation includes evaporation and leachate dams, some of which are co-managed by Veolia and Heron (including ED1). Veolia also operates a leachate treatment system and commissioned a Leachate Treatment Plant (LTP) in October 2018. The first discharge of treated leachate from the LTP to ED1 Coffer Dam started on 26 April 2019.

The Department of Planning, Industry and Environment (DPIE) approved Project Approval (10_0012) on 16 March 2012 to increase the landfill capacity and input limit from 500,000 tonnes per annum (TPA) to 1,130,000 TPA. DPIE has granted a number of modifications (MODs) to this consent since, being:

- PA 10_0012 MOD1: Modification for changing the site water and leachate management to allow the use of ED2 for the main storm water storage and ED3S for treated leachate storage;
- PA 10_0012 MOD2: To alter surface water and leachate management in December 2017. This modification includes requirements for an LTP, Coffer Dam and future volumes of existing Dams (ED1 and ED3N);
- PA 10_0012 MOD3: Modification to enable the construction and operation of a Solid Recovered Fuel (SRF) processing area within the Woodlawn Eco Precinct; and
- PA 10_0012 MOD4: In regards to bushfire impacted waste acceptance.

1.2 Audit Scope

This Independent Environmental Audit (Audit) covers the period from the day after the last audit ended (21 March 2019), until 11 March 2020 (last day of SLR Consulting Australia's [SLR's] onsite Auditing).

Condition 18R, Schedule 2 of Project Approval MP 10_0012, as modified, outlines the requirement to complete an Independent Audit of the Leachate and Water Management System (LWMS).

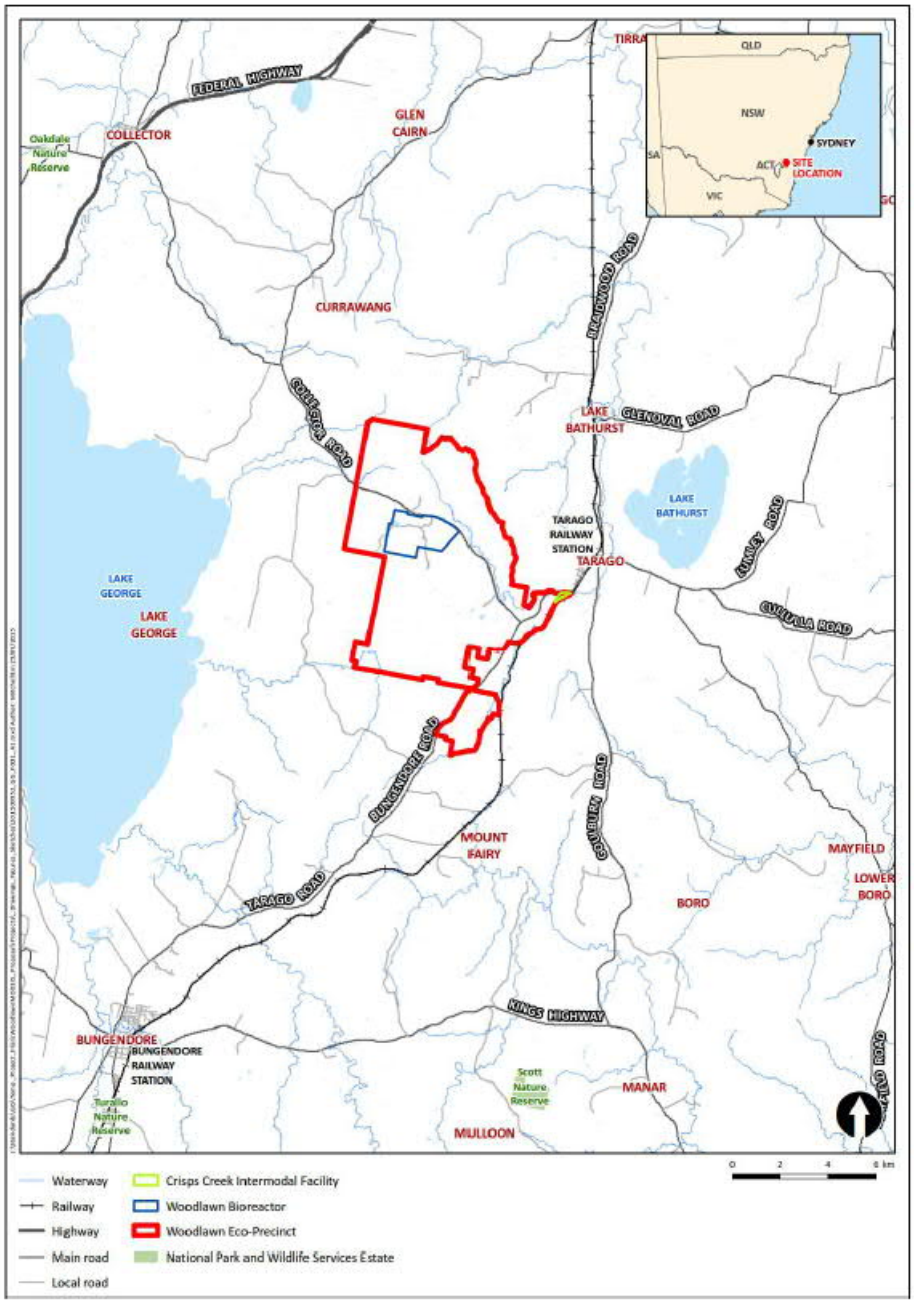

Figure 1 Woodlawn Bioreactor and Eco-Precinct Location

AUDITING

Independent Audit

The Audit will be undertaken in accordance with the following PA condition:

Condition 18R of Schedule 4 of the MP 10_0012, as modified:

18R. Within six months of commissioning the LTP and annually thereafter, unless otherwise agreed to by the Secretary, the Proponent shall commission and pay the full cost of an independent assessment of the leachate and water management system. This audit must be conducted by a suitably qualified, experienced and independent expert whose appointment has been endorsed by the Secretary. During the audit, this expert must:

(a) consult with the EPA, Water NSW and the Secretary;
(b) assess actual performance against the assumptions and predictions made in the project water balance prepared by WSP dated September 2017. This must include:
    i. actual versus predicted inputs and outputs into and out of each dam;
    ii. actual versus predicted mechanical evaporation from each dam;
    iii. actual versus predicted rainfall and evaporation; and
    iv. the actual versus predicted volume of water or treated leachate stored in each dam.
(c) Assess actual versus predicted performance of the LTP. This must include:
    i. Actual versus target effluent quality; and
    ii. Actual versus target throughput.
(d) determine whether the leachate and water management system is achieving its intended objectives; and
(e) Outline all reasonable and feasible measures that may be required to improve water and leachate management of the site.

It is noted that Condition 18R b) pertains to the accuracy of the WSP site Water Balance undertaken in 2017 (updated in May 2020). This Water Balance (like all Water Balances) is based on a number of assumptions which are prone to change over time. In addition, many inputs and outputs are never going to be exactly the same as what was assumed within the Water Balance. As such, SLR believes that Condition 18R b) cannot be assessed completely in accordance with the DPIE Independent Audit Guideline (June 2018) and the respective compliance status of the items within this condition should be read and interpreted in this context.

The layout of the Development is shown on Figure 2.

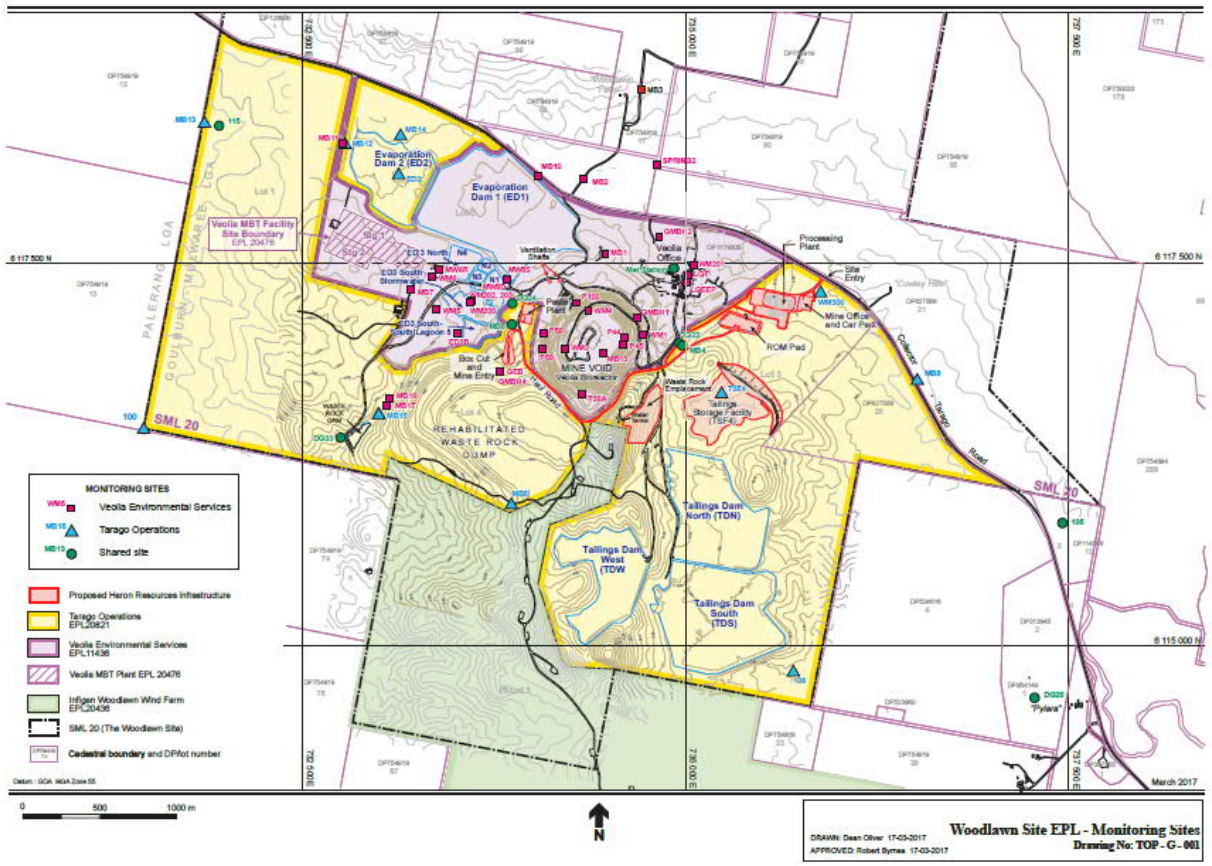

Figure 2 Layout of the Woodlawn Bioreactor

1.3 Key Site Contacts

Contact details for key personnel at the Development are provided in Table 1 below:

Table 1 Contact Details for Key Woodlawn Personnel

Name	Role	Telephone	Email
Henry Gundry	Woodlawn Eco-Precinct Manager	(02) 8588 1364	henry.gundry@veolia.com

1.4 Audit Methodology

The Audit was undertaken onsite by Tracey Ball (Lead Auditor) and Duncan Barnes (Water Specialist) of SLR, with the site component completed on 10 and 11 March 2020. The SLR Audit team are independent of Veolia as defined under Section 3.3 of the NSW Government's (2018) Independent Audit Guideline.

Information was provided by Veolia prior to, during and following the Audit. SLR also sourced some information from the Veolia website.

The methodology for the Audit consisted of the following key steps:

- Consultation with relevant government agencies as per the Audit requirements prior to the site component;
- Reviewing key documents/data provided by Veolia prior to the Audit;
- Site component of the Audit – including inspections and discussions with key Veolia operational personnel;
- Introductory and close out meetings;
- Review of additional relevant documentation/data/information obtained while onsite during the inspection or provided by Veolia after the site inspection; and
- Client review and comment on the draft Audit Table and Audit Report.

Photographs taken during the site inspections are included in Appendix A. Evidence was viewed and collected as part of the Audit, including monitoring records, reports and correspondence. While this key evidence has been referenced in Section 2, it has not been attached to this Audit report.

The Audit has been completed as per the Independent Audit Guideline (DPIE, June 2018).

The Audit team assessed the documentation outlined in Section 2.

1.4.1 Introductory and Closeout Meetings

Introductory and close out meetings were held for the Audit. At the opening meeting introductions were made by each of the meeting attendees and personnel from Veolia provided background details regarding the Development to SLR. During the close-out meeting a general discussion about initial findings and recommendations was undertaken. Table 2 lists those present at these meetings.

Table 2 Meeting Attendees

Name	Role	Comment
Ark Du	Landfill/Operations Engineer	Present at opening and closing meeting
Tracey Ball	SLR Lead Auditor	Present at opening and closing meeting
Duncan Barnes	SLR Mine Site Water Specialist	Present at opening and closing meeting

1.5 Consultation Requirements

Table 3 outlines stakeholder consultation completed for the Audit, undertaken in accordance with the Audit Guidelines and Condition 18R of Schedule 4 of the MP 10_0012, as modified.

Table 3 Stakeholder Consultation for the Audit

Regulatory Authority	Contact Details	Comment
Department of Planning, Industry and Environment (DPIE) – Planning Services	Jennifer Rowe Senior Compliance Officer Phone: 02 4247 1851 jennifer.rowe@planning.nsw.gov.au	Email sent from SLR to DPIE on 24 February 2020. Response provided from DPIE on 28 February 2020. See Table 4 below for comments and responses.
Environment Protection Authority (EPA)	Nick Feneley Senior Operations Officer, Waste Compliance Phone: 02 4224 4144 nick.feneley@epa.nsw.gov.au	Email sent from SLR to EPA on 24 February 2020. Response provided from EPA on 28 February 2020. See Table 5 below for comments and responses.
Water NSW	Jim Caddey Catchment Assessments Officer (Goulburn) Phone: 02 4824 3401 James.Caddey@waternsw.com.au	Email sent from SLR to Water NSW on 24 February 2020. Response provided from Water NSW on 26 February 2020. See Table 6 below for comments and responses.

1.5.1 DPIE Comments

Table 4 outlines the DPIE comments provided to SLR on 28 February 2020 relating to the Audit.

Table 4 DPIE Comments Relating to the Independent Audit

Aspect	Comment
The Audit needs to ensure that it addresses all the requirements outlined in Schedule 4 Condition 18R.	This Independent Audit considers the requirements outlined in Schedule 4 Condition 18R.
The audit should consider the number of complaints that were received in relation to odour and compare it to previous years.	According to the Complaints Register there was 32 complaints received in regards to odour during the 2018/2019 Annual Environment Management Report (AEMR) Period. This was less than the three periods before this: • 41 odour complaints in 2017/2018; • 36 odour complaints in 2016/2017; and • 88 odour complaints in 2015/2016. During the audit period, from 21 March 2019 until 11 March 2020, there was 9 odour complaints. During the last audit period (5 November 2018 to 20 March 2019) there was 8 odour complaints.
An analysis of whether the leachate treatment plant has led to a reduction in complaints should also be considered.	The leachate treatment plant commenced operations in 26 April 2019. Since then, and up until the end of the audit period (11 March 2020), a 10 month period, there was 3 odour complaints. The leachate treatment plant appears to have led to a reduction in odour complaints.
Whether any of the reasonable and feasible measures that were recommended to improve water and leachate management at the site outlined in the 2019 Audit were implemented, the status and whether they have been effective.	Refer to Section 4.1.

1.5.2 EPA Comments

Table 5 outlines the EPA comments provided to SLR on 28 February 2020 relating to the Audit.

Table 5 EPA Comments Relating to the Independent Audit

Aspect	Comment
EPA's key concerns are captured well in Condition 18R, so if the audit adequately addresses each of these items we should be satisfied.	The Independent Audit has considered in full the requirements of Condition 18R of Schedule 4 of the MP 10_0012, as modified.
Want to know whether or not the leachate and water management system is achieving its intended objectives (18Rc). Like to see some commentary around the consequences (both short term and long term of any variations between the actual measured performance of the system and the predictions made in the project Water Balance. This should include any consequences of the delays that have occurred in bringing the LTP up to its intended throughput.	Refer to Section 5.

Aspect	Comment
An assessment of progress on the recommendations made by SLR in the audit report completed in June 2019.	Refer to Section 4.1.
Commentary around the foam overflow incident that occurred on 15 July 2019 and an assessment of whether adequate actions have been implemented since then to prevent a reoccurrence and to ensure excessive foaming does not inhibit the efficiency of the treatment process.	According to site communications, foam came out of the bund at night, during a high wind event. At the time the LTP was unmanned. It was also reported that when the incident was identified the next day the foam was cleaned-up, with contaminated material landfilled and machinery that was used for the clean-up was washed down. The 2018-2019 Woodlawn Annual Report also reported that "The PIRMP was activated in this reporting period on 15/07/2019 due to a foam spill from Leachate Treatment Plant, which was contained effectively at the premises." Site personnel also advised that a new foam dosing system has been designed, where dosing occurs at the top of the tanks. This dosing system has been installed on one of the tanks, as seen during the site inspection. Cameras have also been installed at the top of the tanks to monitor foam, and to ensure that a foam incident does not reoccur. The Monthly LTP Reports also indicated that a number of further actions were implemented to manage foam and the efficiency of the treatment process. It appears that Veolia are undertaking appropriate actions to control excessive foaming, hence prevent the reoccurrence of such an incident.

1.5.3 Water NSW

Table 6 outlines Water NSW comments provided to SLR on 26 February 2020 relating to the Audit.

Table 6 Water NSW Comments Relating to the Independent Audit

Aspect	Comment
Water NSW does not appear to have been consulted in the preparation of the first audit. Consultation occurred with Department of Industry – Lands and Water and the Natural Resources Access Regulator	Noted.
An explanation should be given as to why measures, i.e. a meteorological station, has not been installed at the site	A meteorological station is installed at the site, near the site office. This weather station was inspected during the site visit. Data from this meteorological station was provided by Veolia and was used to undertake the audit.

2 Documents Reviewed and Referenced

Key documentation reviewed as part of the Audit includes:

- Project Approval MP 10_0012, as modified;
- Woodlawn Annual Reports;
- Monitoring results;
- WSP Woodlawn Water Balance Performance Review;
- Monthly Reports for the Leachate Treatment Plant (LTP);
- Environmental Management Plans; and
- Complaints Register.

3 Assessment of Compliance

The terms used in the Audit to describe the level of compliance of the site with the relevant approval documentation are outlined in Table 7. These are requirements of the DPIE Independent Audit Guideline (June 2018).

Table 7 Compliance Assessment Criteria

Assessment	Criteria
Compliant	The auditor has collected sufficient verifiable evidence to demonstrate that all elements of the requirement have been complied with within the scope of the audit.
Non-compliant	The auditor has determined that one or more specific elements of the conditions or requirements have not been complied with within the scope of the audit.
Not triggered	A requirement has an activation or timing trigger that has not been met at the time when the audit is undertaken, therefore an assessment of compliance is not relevant.

4 Approvals and Documentation Assessed

Audit findings and recommendations relating to Condition 18R of Schedule 4 of the MP 10_0012, as modified, are outlined in Section 5 of this report.

4.1 Previous Audit Recommendations

This is the second audit of Condition 18R. The first was undertaken last year, during March 2019. The status of the previous audit recommendations are outlined in Table 8, below.

Table 8 Status of Audit Recommendations

Rec. No.	Audit Recommendation	Comments	Status
1	Engage a suitably qualified person to revise the site Water Balance to provide a more accurate assessment of how the leachate / water management system is tracking against its key objectives given that many of the assumptions from the WSP Water Balance (dated September 2017) have changed. It is recommended that this Water Balance update be undertaken once the LTP is fully operational and once the uncertainties associated with Heron's ED1 water inflows/outflows, including the final ED1 evaporator system, have been determined. This updated Water Balance will be more accurate if Veolia continue to monitor all leachate / water flows around the site.	WSP revised the Water Balance on 30 April 2020. Two scenarios were assessed: • Scenario 1 – Heron will use water at ED3 South and Coffer Dam at 2 m/s; and • Scenario 2 – Heron will not use the water at ED3 South and Coffer Dam. This Water Balance used the most recent information available. Many of the assumptions used were conservative.	Completed
2	If the mechanical evaporators are expected to continue to operate less than 70% of the time (as predicted within the WSP Water Balance) then consider installing additional evaporators to make up the shortfall. This will be based on the outcomes of the revised Water Balance (refer to Rec 1).	An operating time of 70% is no longer considered to be accurate. The Water Balance was updated with more accurate operational times varying from 10% to 30%. Additional evaporators / sprayers were installed at the dams during the reporting period. Evaporators / sprayers are now installed at ED1 Coffer Dam, ED3N2, ED3N3, ED3N4 and ED3SS. Evaporation cannons have also been installed at the ED1 North Dam.	Completed

Rec. No.	Audit Recommendation	Comments	Status
3	Seek integration of Veolia's leachate / water management system with Heron's, where possible and where the systems overlap, to avoid potential conflicting interests and to benefit from mutual management opportunities.	Veolia attend a weekly meeting with Heron, where the Water Balance is a meeting topic. Water usage is discussed regularly but there is no formal future plan. Heron have advised that they will likely require a lot of water from the Veolia site and are currently in the process of developing their own Water Balance.	Ongoing
4	Install formalised depth markers in all dams and compare levels to available dam stage-storage relationships so that progress against the long term objectives can be easily assessed.	Depth markers installed at all the dams, as seen during the site inspection. A GPS Rover, which has 10mm accuracy, is also used to survey the dams. The dams are surveyed monthly by a qualified surveyor. The depth marker in the ED1 North dam was corroded due to the pH so it was removed.	Completed
5	Engage a suitably qualified surveyor to survey the ED1 North Dam to determine the current water level and overall storage capacity to assist with assessment against the leachate management objectives.	Veolia found historic data to determine the storage capacity of ED1 North Dam (approximately 1,000 ML).	Completed
6	Audit sub-condition (Schedule 2 Condition 18Rc) of MP 10_0012 MOD 2 during the next Annual Independent Audit.	Completed during this Audit.	Completed
7	Continue to seek measures that will reduce the volume of leachate produced, including the containment of runoff from the existing void batters/benches.	Veolia have installed five sumps and pumps to capture runoff from the void batters before mixing with leachate. In addition, they have also installed numerous bunds and a cross-bank at the top of void to prevent runoff from entering it. This was proven using current and historical aerial images. All leachate is currently minimised as best as possible but Veolia should continue to seek opportunities as the operation progresses and changes in the future.	Completed
8	Monitor the impact of the Bioreactor on the surrounding community through an analysis of complaints registered with the site, to be included in the next Annual Review.	Complaints included in the 2018-2019 Woodlawn Annual Report.	Completed

4.2 Project Approval PA 10_0012

Only condition 18R of Schedule 4 of Project Approval MP 10_0012, as modified, was assessed as part of this Audit. This is the primary approval for the Development. The Project Approval was first granted on 16 March 2012, with Modifications 1 to 4 granted on 9 September 2016, 22 December 2017 and 16 March 2020.

5 Audit Findings

Table 8 outlines the findings of the Independent Audit and proposed recommendations.

Table 9 Independent Audit Findings

Condition Number	Condition	Compliance Status	Evidence		Recommendation
			Predicted	Actual	
Project Approval MP 10_0012 MOD 2 Schedule 2 Condition 18R					
18R	Within six months of commissioning the LTP and annually thereafter, unless otherwise agreed to by the Secretary, the Proponent shall commission and pay the full cost of an independent assessment of the leachate and water management system. This audit must be conducted by a suitably qualified, experienced and independent expert whose appointment has been endorsed by the Secretary. During the audit, this expert must:	Compliant	This Independent Audit is the second audit to be conducted against this condition. The first was conducted in 2019, with an audit period from 5 November 2018 to 20 March 2019. This Audit was commissioned by Veolia on 28 February 2020, 11 months since the last audit. SLR are qualified, experienced and independent experts, endorsed by DPIE on 3 June 2020 (refer to Appendix D for the DPIE endorsement letter).		-

Condition Number	Condition	Compliance Status	Evidence	Recommendation
a)	Consult with the EPA, Water NSW and the Secretary;	Compliant	This Independent Audit is the second audit to be conducted against this condition. The EPA, Water NSW and DPIE were consulted during the Independent Audit (refer to Section 1.5).	-
b) i)	Assess actual performance against the assumptions and predictions made in the project Water Balance prepared by WSP dated September 2017. This must include: actual versus predicted inputs and outputs into and out of each dam	Compliant	The Water Balance was updated by WSP in parallel to this Audit (30 April 2020). As such, the actual and predicted inputs and outputs into and out of each dam are the same as the updated Water Balance which used the current dam configurations. These inputs / outputs are provided in Table 4.2 of the updated Water Balance (provided in Appendix B). The potential long-term consequences of differences between what was predicted in the WSP Water Balance and the actual performance of the system are having too much leachate on-site which can't be disposed of and not meeting the Project Approval (MP10_0012) requirements (refer to Condition D below). The potential short-term consequences are additional costs associated with managing the additional leachate volumes including the construction of additional water storages and evaporation systems.	Rec 1: Develop a long-term water usage plan with Heron following development of their site Water Balance. Seek to integrate the Veolia and Heron Water Balances as best as possible in future iterations.

Condition Number	Condition	Compliance Status	Evidence	Recommendation
ii)	Actual versus predicted mechanical evaporation from each dam	Non-Compliant [1]	The actual mechanical evaporation from each dam is not easily measurable. Veolia currently undertakes monthly monitoring of dams, which can be used to provide an approximate indication of dam evaporation. The operation of the floating evaporators and dam inflow spray locations are selected based on real time weather data including the wind direction, wind speed, temperature, humidity and the time of the day. Calibration of the dam evaporation (both natural and mechanical) is detailed in Table 5-1 of the updated Water Balance (provided in Appendix B). The model results in dams ED3N2, ED3N3 and ED3SS correlated well to the actual observed data, however, the uncalibrated model was consistently lower than the metered water level at dam ED3N4. The calibration changes to achieve a similar modelled water surface level to the measured surface water level included: — Existing Mechanical Evaporator – 5 number of units and operation time reduced from 20% to 10%. — Type A Mechanical Evaporator – reduced unit number from 4 to 1 and operation time from 30% to 10%. <u>Non-Compliant:</u> Veolia also confirmed all mechanical evaporators at dam ED3N4 were not fully in operation during the calibration period due to repair issues. The mechanical evaporation from dams ED1 and the ED1 Coffer Dam could not be assessed due to complexities associated with the ED1 Coffer Dam geomembrane liner and the high number of unknowns at dam ED1. It should be noted that the assumptions documented within the updated Water Balance are generally conservative with Veolia also undertaking numerous informal measures to promote evaporation (e.g. spraying discharges into the dams and the construction of a 10,000 m^3 evaporation pan within dam ED1).	Rec 2: Continue to seek opportunities to optimise the dam evaporation systems to maximise the removal of leachate from the system (e.g. positioning of mechanical evaporators, evaporator maintenance etc).

1 - It is noted that Condition 18R b) pertains to the accuracy of the updated WSP site Water Balance undertaken in 2020. This Water Balance (like all Water Balances) is based on a number of assumptions which are prone to change over time. In addition, many inputs and outputs are never going to be exactly the same as what was assumed within the Water Balance. As such, SLR believes that Condition 18R b) can't be assessed completely in accordance with the DPIE Independent Audit Guidelines (June 2018) and the respective compliance status of the items within this condition should be read and interpreted in this context.

Condition Number	Condition	Compliance Status	Evidence		Recommendation
iii)	Actual versus predicted rainfall and evaporation	Compliant	The updated Water Balance included three climate sub-sets (wettest, driest and average): 1. Wettest (1950-1959), a sequence with 4 years of annual rainfall > 1000 mm 2. Driest (1979-1988), a sequence with 5 years of annual pan evaporation > 1500 mm 3. Average (1963-1972), a sequence with annual rainfall < 900 mm and annual pan evaporation between 1000 mm to 1500 mm.	Annual rainfall and evaporation data was assessed from the on-site weather station for the audit period from 12 March 2019 to 11 March 2020. The rainfall and pan adjusted evaporation totals for the assessment period was 934 mm and 1454mm, respectively. These totals do not fit perfectly into any of the three climate sub-sets but do indicate that the audit period was generally slightly wetter than average. These slightly wetter conditions would increase the time to empty the leachate dams.	-

Condition Number	Condition	Compliance Status	Evidence	Recommendation
iv)	The actual versus predicted volume of water or treated leachate stored in each dam	Compliant	The Water Balance was updated by WSP in parallel to this Audit (30 April 2020). As such, the actual and predicted dam volumes are the same as the updated Water Balance which used the most recent bathymetry survey and metered water levels. Dam volumes at the time of the audit and Water Balance update are provided below: • ED1 North = 100 ML; • ED1 Coffer Dam = 10 ML; • ED3N1 = 0 ML (dry and advised that the dam was planned to be used and managed by Heron. Dam is planned to be relined by HDPE liner and used for clean water transfer by Heron.); • ED3N2 = 12.5 ML; • ED3N3 = 13.5 ML; • ED3N4 = 80 ML; and • ED3SS = 80 ML.	-

Condition Number	Condition	Compliance Status	Evidence	Recommendation
c) i)	Assess actual versus predicted performance of the LTP. This must include: Actual versus target effluent quality	Non-Compliant	The LTP was commissioned in October 2018. The first discharge of treated leachate to the ED1 Coffer Dam was on 26 April 2019. Non-Compliant: Information contained within the monthly LTP reports indicates that the majority of the effluent water quality parameter targets (detailed in the site Leachate Management Plan) have been achieved. Ammonia and BOD are the key odour parameters and these are generally undetectable. However, there has been regular exceedances of COD with some exceedances of Total Phosphorous and Nitrates. This occurred due to the ongoing optimisation of the LTP system including the fluctuation in feed leachate quality. Non-Compliant: SLR were advised of a foaming issue in November 2019. This incident occurred in middle of night with very strong winds. Foam escaped the bunding (90% was still contained) and the EPA was notified as soon as possible with extensive cleaning and earthworks works undertaken. The old system was replaced with a new temporary system which allows the anti-foam to mix in better. More engineering work will be required to establish permanent design. SLR were advised that they undertake weekly testing in a Nata accredited lab and daily testing on-site.	Rec 3: Continue to improve and optimise the LTP operation with the assistance of suitably qualified experts (as required). Rec 4: Continue upgrades to the foam management system and monitor the aeration tanks to ensure that a foaming incident does not occur again.
ii)	Actual versus target throughput	Non-Compliant	Non-Compliant: The LTP started discharging treated effluent into the ED1 Coffer Dam on 26 April 2019. Information contained within the monthly LTP reports indicates that during this period the average throughput has been 2.1 L/s. This equates to an annual average throughput of 2.1 L/s whilst operating, which is less than the predicted 4 L/s throughput. SLR were advised that Veolia will sacrifice throughput to ensure water quality which has occurred during the audit period due to the variability of the feed and an increase in nutrients. At the time of the audit the throughput was at 75% capacity. Veolia are working on the improvement and optimisation of the LTP to achieve the designated operation target. The potential consequences of differences between what throughput was predicted in the WSP Water Balance and the actual performance of the system are having too much leachate on-site as a result of Heron using less treated leachate. Veolia advised that they	Rec 3: Continue to improve and optimise the LTP operation with the assistance of suitably qualified experts (as required).

Condition Number	Condition	Compliance Status	Evidence		Recommendation
			are currently avoiding this potential consequence by managing the extraction rate of the raw leachate to cooperate with LTP performance.		
d)	Determine whether the leachate and water management system is achieving its intended objectives	Compliant	1. Construction of a suitably sized and lined coffer dam (referred to as ED1 Coffer Dam) to store and evaporate treated leachate from its leachate treatment plant from September 2018 for 4- year period without filling.	The LTP started discharging effluent (treated leachate) to the ED1 Coffer Dam on 26 April 2019. The ED1 Coffer Dam has been constructed and is now receiving treated leachate from the LTP. The updated Water Balance concludes that the ED1 Coffer Dam "is not predicted to fill up to 80% of the freeboard level volume in any climatic sequence based on the assumed evaporator capacity. Assuming no water usage by Heron, the peak predicted water storage in the dam occurs during the wettest climatic scenario when 84.97 ML is stored (approximately 54% of the total dam capacity to freeboard level). By 2023 less than 40% of the dam capacity to freeboard volume is reached during the wettest climatic sequence".	-
		Compliant	2. In accordance with Condition 18S of the Project Approval (MP 10_0012), as modified, the volume of mine water stored in ED1 must be no more than 10 ML by 31 December 2023.	ED1 North not only receives runoff from its external catchment, but also receives water from the Plant Collection Dam (PCD) and Western Ridge, dewatering activities by Heron. The future water storage in the ED1 North dam was investigated during the latest revision of the Water Balance by WSP. The updated Water Balance concluded that "Dam ED1 does completely empty by 2023 for the driest climatic sequences. Considering this dam receives stormwater runoff from external catchments, sustaining this dam as completely empty may be difficult. For the wettest climatic sequence, the dam requires 27% of its total storage capacity to cater for direct rainfall and catchment runoff at the end of 2023. Modelling of this dam could be further refined if information regarding water transfer from Heron and the PCD (if any) were provided. Also, details and	-

Condition Number	Condition	Compliance Status	Evidence		Recommendation
				assumptions for the new evaporation pad may provide further storage capacity". The only predicted water in the ED1 North dam by 2023 will be runoff from the dam surface and upslope catchment areas. This runoff can't be pumped out from the dam.	
		Compliant	3. In accordance with Condition 18T of the Project Approval (MP 10_0012), as modified, ED3N must be emptied of effluent from the existing leachate system by 31 December 2022.	The future water storage in the ED3N dams was investigated during the latest revision of the Water Balance by WSP. The updated Water Balance concluded that "The future design simulation results indicated dams ED3N2, ED3N3 and ED3N4 collectively had enough capacity to cater for future leachate and rainfall inputs. The mechanical evaporators at ED3N4 dried out this dam in 2022 based on the average climatic sequence and in 2024 based on the wettest climatic sequence". Based on the updated Water Balance results and the conservative nature of the Water Balance assumptions it is highly likely that Veolia is on target to empty the ED3N dams by 2022. However, there is still some risk that this objective may not be met if the site receives significantly higher than average rainfall during this period.	-
		Compliant	4. Install floating evaporators in ED3N1, ED3N2, ED3N3, ED3N4 and ED3SS to manage leachate from September 2017 through to December 2019.	As was the case during the previous audit period, floating evaporators have already been installed in ED3N2, ED3N3, ED3N4 and ED3SS. In addition, dam water inflows are sprayed into the dams to further increase evaporation rates. The operation of the floating evaporators and dam inflow spray locations are selected based on real time weather data including the wind direction, wind speed, temperature, humidity and the time of the day.	-

Condition Number	Condition	Compliance Status	Evidence		Recommendation
				It is noted that evaporation is no longer required in ED3N1 as it now only receives water from direct rainfall runoff. Veolia advised leachate stored in ED3N1 was pumped into other ED3N cells during the audit period i.e. ED3N2, N3 and N4 dams. Veolia also noted this is the main reason why the measured level in dam ED3N doesn't match the model (as documented in the updated water balance report).	
		Non-compliant	5. Operate effectively without adversely impacting on the surrounding community.	Non-compliant: The Complaints Register dated 26 March 2020 indicates there was 9 odour complaints during the audit period, from 21 March 2019 until 11 March 2020. This was less than the 2019 Audit, with an audit period of only 4 months. No offsite discharges occurred during the audit period.	Rec 5: Continue to Monitor the impact of the Bioreactor on the surrounding community through an analysis of complaints registered with the site, to be included in the next Annual Review.
		Compliant	6. Minimise leachate production	Veolia have installed five sumps and pumps to capture runoff from the void batters before mixing with leachate. In addition, they have also installed numerous bunds and a cross-bank at the top of void to prevent runoff from entering it. This was proven using current and historical aerial images.	Rec 6: Continue to seek opportunities for leachate minimisation as the operation progresses and changes in the future.
		Compliant	7. Effectively separate all classes of water	Based on observations during the site inspection, information pertaining to the diversion of runoff and the prevention of seepage through the dam walls SLR believes that leachate and clean water are effectively separated at the facility as best is practically possible.	-

Condition Number	Condition	Compliance Status	Evidence	Recommendation
e)	Outline all reasonable and feasible measures that may be required to improve water and leachate management at the site	-	Rec 1: Seek to develop a long-term water usage plan with Heron following development of their site Water Balance. Seek to integrate the Veolia and Heron Water Balances as best as possible in future iterations. Rec 2: Continue to seek opportunities to optimise the dam evaporation systems to maximise the removal of leachate from the system (e.g. positioning of mechanical evaporators, evaporator maintenance etc). Rec 3: Continue to improve and optimise the LTP operation with the assistance of suitably qualified experts (as required). Rec 4: Continue upgrades to the foam management system and monitor the aeration tanks to ensure that a foaming incident does not occur again. Rec 5: Continue to Monitor the impact of the Bioreactor on the surrounding community through an analysis of complaints registered with the site, to be included in the next Annual Review. Rec 6: Continue to seek opportunities for leachate minimisation as the operation progresses and changes in the future.	

6 Conclusion

Condition 18R of Schedule 4 of the MP 10_0012, as modified, was assessed by this Independent Audit.

This Independent Audit was undertaken at a time of change with regards to the water / leachate management system. The LTP became operational during the Audit period, with treated leachate first discharged into the ED1 Coffer Dam on 26 April 2019. It must be noted that the operation of the LTP is still being optimised. Veolia was also in discussions with Heron regarding integrating the water management system to identify mutual opportunities.

In terms of actual performance against the assumptions and predictions made in the project Water Balance included in the report by WSP, dated April 2020, the Development was found to be generally compliant as the Water Balance was updated in parallel to this Audit. As such, the actual and predicted inputs and outputs into and out of each dam are the same as the updated Water Balance which used the current dam configurations.

A couple of Non-Compliances were identified (refer to Section 5) as several of the mechanical evaporators were not operational during the audit period and some issues have occurred during the optimisation of the LTP. It is acknowledged that these operational issues are generally to be expected with many inputs and outputs expected to vary slightly from what was assumed within the Water Balance. As such, SLR believes that Condition 18R b) cannot be assessed completely in accordance with the DPIE Independent Audit Guideline (June 2018) and the respective compliance status of the items within this condition should be read and interpreted in this context.

The leachate and water management system is achieving its intended objectives (those that could be assessed), except for operating effectively without adversely impacting on the surrounding community. This is due to the number of odour complaints received from the local community (refer to Section 5).

Evidence was observed that Veolia does proactively manage water with additional measures implemented to decrease and improve leachate management at the site.

Reasonable and feasible measures that are recommended to improve water and leachate management of the site are provided in Section 5.

APPENDIX A

Photographs

Photo 1 – ED1 Coffer Dam (1)

Photo 2 – ED1 Coffer Dam (2)

Photo 3 – ED1 Coffer Dam (3)

Photo 4 - ED1 North (1)

Photo 5 – ED1 North (2)

Photo 6 – ED1 North (3)

Photo 7 – ED1 North (4)

Photo 8 – ED3 North 1

Photo 9 – ED3 North 3 (1)

Photo 10 – ED3 North 3 (2)

Photo 11 – ED3 North 2 & ED3 North 3

Photo 12 – ED3SS (1)

Photo 13 – ED3SS (2)

Photo 14 – ED3SS (3)

Photo 15 – Informal Depth Marker at ED3SS

Photo 16 – Informal Depth Marker

Photo 17 – Leachate Treatment Plant (1)

Photo 18 – Leachate Treatment Plant (2)

Photo 19 – Leachate Treatment Plant (3)

Photo 20 – Leachate Treatment Plant (4)

Photo 21 – Leachate Treatment Plant (5)

Photo 22 – Leachate Treatment Plant (6)

Photo 23 – Void (1)

Photo 24 – Void (2)

Photo 25 – Void (3)

Photo 26 – Meteorological Station at Woodlawn

APPENDIX B

WSP Site Water Balance (30 April 2020)

MEMO

TO:	Ark Du
FROM:	Eric Lam / Louise McGinley
SUBJECT:	**Woodlawn Water Balance Performance Review**
OUR REF:	PS118674-WAT-MEM-003 RevC.docx
DATE:	**30 April 2020**

1. INTRODUCTION

This memorandum presents the water balance assessment for the Woodlawn facility, NSW. The water balance performance review will inform Veolia of the predicated available capacity of the site dams to manage leachate produced at the bioreactor and site stormwater.

Veolia manages putrescible waste at the bioreactor facility sited at the former open cut mine. Methane gas is captured at the bioreactor and used to generate power.

The Woodlawn site is a shared facility between Heron and Veolia. Heron operate a below ground mine facility and associated tailings and evaporation dams. There is some interaction of water usage between Veolia and Heron at the evaporation dams.

2. SCOPE OF WORKS

This water balance is required to assess the performance of applied mechanical evaporators and estimate future storage availability at dams ED1, ED1 Coffer Dam, ED3N2, ED3N3, ED3N4, ED3S and ED3SS. The scope of works includes:

— Review and update the 2017 Goldsim model based on data and assumptions provided by Veolia

— Calibrate model parameters based on the inflows and outflows provided in Table 4.1

— Assess future storage availability at dams based on the inflows and outflows provided in Table 4.2 for the climatic sequences of low, medium and high rainfall conditions.

This assessment will report on the likelihood of the following based on the climatic sequences of low, medium and high rainfall conditions:

— Emptying of ED3N cells by end of 2022

— Emptying of ED1 North by end of 2023

— Prediction of when ED1 Coffer Dam fills to 80% of the freeboard volume.

3. PREVIOUS STUDIES

The recent previous WSP studies that assessed water balance at the Woodlawn facility include:

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— *Leachate management by mechanical evaporators and the proposed ED1 coffer dam*, dated 28th September 2017 (WSP reference: PS105723-RES-LTR-01 RevA)

— *Woodlawn Bioreactor Water Balance for Proposed Amendment to Surface Water Management*, dated November 2015 (WSP reference: 2269623A-WAT-REP-001 RevA)

A summary of these previous studies is presented in Appendix C.

4. MODELLING APPROACH

4.1 MODELLING SOFTWARE

A Goldsim model has been used to perform the water balance for the dams ED1, ED1 Coffer Dam, ED3N2, ED3N3, ED3N4, ED3S and ED3SS. The model version used for this study was Goldsim version 12.1. A comparison of results between Goldsim version 10.5, which was used in the 2017 study, and version 12.1 showed there was no difference in the performance of the different model versions.

4.2 MODEL SIMULATIONS

The model was run for the following scenarios:

1. Calibration Simulation

   Based on the updated data and assumptions provided by Veolia, a suitable calibration simulation period of between 17 July 2019 to 17 December 2019 was identified.

2. Future Design Simulation

   The calibrated parameters were used to assess future water storage availability. The following climatic sequence were applied for the low, medium and high rainfall conditions:

   a) Wettest (1950 – 1959), a sequence with annual rainfall > 1000 mm

   b) Driest (1979 – 1988), a sequence with annual pan evaporation > 1500 mm

   c) Average (1963 – 1972), a sequence with annual rainfalls < 900 mm and annual pan evaporation between 1000 mm and 1500 mm.

4.3 MODEL INPUTS AND ASSUMPTIONS

The modelling inputs, calibration parameters and Veolia assumptions for each dam are listed in Table 4.1 and Table 4.2 for the calibration and future simulations respectively. The following assumptions are also applied to the updated water balance model:

— The monthly efficiency of the Existing, Minetek, Type A and Type B mechanical evaporators is similar to the September 2017 Goldsim water balance model. The monthly efficiencies adopted for the September 2017 modelling are provided in Appendix C.

— Veolia provided site measured daily rainfall and evaporation data, dated August 2017 to January 2020. Gaps within the data series were patched using SILO data from station TARAGO, WOODLAWN MINES (station number 70313). The SILO data compares closely to the Veolia site measured data.

— A calibration period from 19 July 2019 to 17 December 2019 was selected for dams ED3N2, ED3N3, ED3N4, ED3S, ED3SS and ED1.

  The calibration period was selected when leachate was not being pumped into dams ED3N2, ED3N3 and ED3N4. Veolia confirmed leachate stored in ED3N1 was pumped

into the other ED3N dams during September and October 2019. After this time, leachate in ED3N2 was sprayed onto ED3N2, ED3N3 and ED3N4. No other leachate sources were pumped into the ED3N dams during the calibration period. Veolia do not record leachate pumping between the ED3N dams. Therefore, selecting this calibration period has the advantages of:

  - minimising the number of variables in the model allowing for easier calibration, and
  - the dams ED3N2-4 can remain as individual lagoons in the calibration model (while also interconnected via spillways). The dam set up will therefore not change between the calibration and future climate sequence simulations.

- A calibration period from 25 Feb 2019 to 17 December 2019 was selected for ED1 Coffer Dam. As this dam was recently commissioned, the calibration period commenced when the dam was close to empty so that the uncertainty on initial storage volume can be minimised.
- The 2017 model parameters for indirect catchment areas and a runoff coefficient of 0.1 for ED1 and ED3S were applied. The runoff coefficient represents the percentage of rainfall volume that appears as stormwater runoff at the dams (i.e. 10% of the rainfall volume from the indirect catchment will be stored at ED1 and ED3S). All other dams are assumed to have a catchment comprising the dam surface area. Rainfall directly on the bioreactor / waste area is classified as leachate rather than stormwater.
- The initial site PAN evaporation value of 0.6 is applied to the calibration model.
- Bathymetry survey, metered water levels and leachate rates are updated based on data provided by Veolia (supplied on 29th January 2020).
- It is assumed all mechanical evaporators are operating to full capacity, as indicated in Table 4.2.
- Design simulations for the future climatic sequence commences in the month of December. Water levels measured on 17 December 2019 are set as initial water level in all dams.

Table 4.1 List of dams and inputs for calibration simulation

DAM	INPUTS & INLFLOWS	OUTFLOWS	CALIBRATION METHOD
ED3N2	Updated bathymetry survey (dam elevation, area and volume), dated 24th April 2018. Site measured daily rainfall data. Treated leachate inflows, dated 16th October 2017 to 19th July 2019. Monthly water level survey dated September 2017 to December 2019.	Site measured daily natural evaporation data. Mechanical Evaporator, Type A (x1 Unit), 15% operation time and pumping rate at 2 l/s.	The dams are calibrated by adjusting the mechanical evaporator assumptions until the measured water level and modelled water level results are similar. Veolia regularly pumps leachate between the ED3N dams between in order to maintain the freeboard levels. The movement of leachate pumping between the dams is not tracked. Veolia confirmed that emptying of dam ED3N1 occurred during the calibration period.
ED3N3		Site measured daily natural evaporation data. Mechanical Evaporator, Type A (x1 Unit), 15% operation time and pumping rate at 2 l/s.	
ED3N4		Site measured daily natural evaporation data. Mechanical Evaporator, Type Existing (× 5 Units), 20% operation time and pumping rate at 14 l/s Mechanical Evaporator, Type A (x 4 units), 30% operation time and pumping rate at 2 l/s.	
ED3SS	Updated bathymetry survey (dam elevation, area and volume), dated 3 March 2016. Site measured daily rainfall data. Treated leachate inflows, dated 01-Sept-2017 to 16-Oct-2017 & 22-Jul-2019 to 28-Jan-2020. Monthly water level data, dated September 2017 to Dec 2019.	Site measured daily natural evaporation data. Mechanical Evaporator, Type B (x3 Unit), 15% operation time and pumping rate at 1 l/s.	Calibrating by adjusting the mechanical evaporator assumptions until the measured water level and modelled water level results are similar.
ED3S	Updated bathymetry survey (dam elevation, area and volume), dated 19 July 2016. Site measured daily rainfall data. Monthly water level data, dated September 2017 to December 2019. Bioreactor stormwater inflows are included in the model based on pit slope area, rainfall events and runoff coefficient.	Site measured daily natural evaporation data. No Mechanical Evaporators No water use by Heron While seepage is likely to be occurring at this dam, the initial assumption is not to include a seepage rate.	Calibrate by adjusting the site PAN evaporation factor and / or coefficient of runoff. We understand in practice Veolia manage pit slope runoff by pumping from the small dams adjacent to bioreactor. However, the pumping rates between the small dams adjacent to the bioreactor and ED3S are reactionary based on the maintaining the capacity of the small dams and are not recorded.
ED1 Coffer Dam	Bathymetry survey, dated 18th October 2018 Site measured daily rainfall data. Monthly water level data, dated September 2017 to December 2019. Treated leachate (m^3) from LTP from its commissioning (30-April-2019 to 08-May-2019), (14-May-2019 to 30-May-2019), (03-June-2019 to 11-July-2019), (19-July-2019 to 18-Feb-2020).	Site measured daily natural evaporation data. No seepage loss No water use by Heron No mechanical evaporators	Calibrate by adjusting the site PAN evaporation factor.

DAM	INPUTS & INLFLOWS	OUTFLOWS	CALIBRATION METHOD
ED1	The bathymetry characteristics for this dam was estimated by subtracting the latest (October 2018) Coffer dam survey from the 2017 Goldsim model bathymetry data (ED1 + ED1 Coffer Dam). Site measured daily rainfall data. Monthly water level data, dated March 2017 to December 2019 (note volume data is not included). No water transfer from Old Plant Containment Dam (PCD).	Site measured daily natural evaporation data. Mechanical Evaporation, Mine Teck (x 1 Unit), 5% operation time at a pumping rate of 68 l/s. No seepage loss No dewatering by Heron.	Water transfers (if any) based on Heron's usage and PCD transfers were not available. Veolia confirmed water transfers to ED1 by Heron will be very much restricted and Veolia are in discussions with Heron to eliminate water inputs. Calibration of parameters for this dam was not possible as two water transfer unknowns, i.e. Heron usage and PCD rate. However, Veolia have confirmed they are trying not to put any water into ED1 apart from the direct rainfall and the rain falling on the surrounding catchment areas.

Table 4.2 List of dams and their inputs to be modelled for storage capacities availability to the year 2023

DAM	INLFLOWS	OUTFLOWS	ASSUMPTIONS
ED3N2	Low, medium and high rainfall climatic sequence. No leachate.	Mechanical Evaporator Unit Type A (x1), pump rate 2 l/s @ 15% pump availability Natural Evaporation corresponding to low, medium and high climatic sequence.	Veolia confirmed they have recently carried out repair work to pumps and future climatic scenarios should assume all pumps will be in available and in full operation. Apply calibrated site PAN evaporation value.
ED3N3		Mechanical Evaporator Unit Type A (x1), pump rate 2 l/s @ 15% pump availability Natural Evaporation corresponding to low, medium and high climatic sequence.	
ED3N4		Mechanical Evaporator Unit Type A (x4), pump rate 2l/s @ 30% pump availability Mechanical Evaporator Unit Existing (x5), pump rate 2.8 l/s @ 20% pump availability (i.e. pump rate 14 l/s for all 5 units combined) Natural Evaporation corresponding to low, medium and high climatic sequence.	
ED3SS	Low, medium and high rainfall climatic sequence. No leachate.	Natural Evaporation corresponding to low, medium and high climatic sequence. Mechanical Evaporation assumption, Type B (x3 Unit), 40% operation time at 1 l/s.	Veolia plan to modify the pumping unit so that it can operate 40% of the time. The assumption the pump operation time is to increase from 15% (calibration model) to 40% for future climatic scenarios is included in the design model. However, Veolia has confirmed the modification works to this pump has not been completed yet. Apply calibrated site PAN evaporation value.
ED3S	Low, medium and high rainfall climatic sequence. Bioreactor stormwater inflows are included in the model based on pit slope area, rainfall events and runoff coefficient.	Scenario1: No water use by Heron. Scenario2: Heron uses water at 2 L/s. No Mechanical Evaporators Natural Evaporation corresponding to low, medium and high climatic sequence.	Seepage loss assumed at 0 mm/day (based on calibration model). Apply calibrated site PAN evaporation value.
ED1 Coffer Dam	Low, medium and high rainfall climatic sequence. Leachate inflow from Leachate Treatment Plant at 4 l/s.	Mechanical Evaporator Unit Type A (x5 units), 20% operation time at 4 l/s. Natural Evaporation corresponding to low, medium and high climatic sequence. No seepage loss Scenario1: No water use by Heron. Scenario2: Heron uses water at 2 L/s.	The assumption each mechanical evaporator has an output rate of 4 l/s (similar to the leachate input rate) is included in the design model. Following Veolia's review of the ED1 Coffer Dam water balance results, Veolia confirmed the system being installed will be modified such that evaporation will happen while discharging via spraying. Hence the total mechanical evaporators output will be similar to the total leachate input of 4 l/s. This proposed operating arrangement is not incorporated into the current water balance model. Apply calibrated dam PAN evaporation value.
ED1	Low, medium and high rainfall climatic sequence. No change to catchment area contributing runoff. No Old PCD water transfers. No water transfer from Heron's mining operation.	Mechanical Evaporation (Mine Tek) x 1 Unit, 5% operation time at a pumping rate of 68 l/s. Natural Evaporation corresponding to low, medium and high climatic sequence.	Veolia recently constructed a 10,000 m² evaporation pan within footprint of ED1. Future operational plans by Veolia are to maintain water in the evaporation pan by pumping from ED1. It is likely pumping will operate intermediately in maintaining water in the evaporation pan. The rate of pumping and design information for evaporation pan not available at time of this report. Apply calibrated site PAN evaporation value.

5. WATER BALANCE MODEL CALIBRATION RESULTS

5.1 CALIBRATION CHANGES

A summary of the calibration results and changes to parameters at each dam is presented in Table 5.1. Graphical results from the calibration simulations are presented in Appendix A.

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Table 5.1 Calibration Simulation results

DAM	CALIBRATION RESULTS
ED3N2	The results from the calibration simulations are presented in Appendix A Figure A.1 and Figure A.2 for ED3N2 and ED3N3 respectively.
ED3N3	Veolia confirmed pumping and spraying of additional leachate to empty ED3N1 into dams ED3N2 and ED3N3 may have been carried out during the calibration period, with some drift to ED3N4. Apply a site PAN evaporation value of 0.6, the dams ED3N2 and ED3N3 showed good calibration between 19th July to the 27th September 2019. Its therefore unlikely significant leachate volumes were added or moved between the dams during those months. After 27th September the model agrees with information provided by Veolia that leachate from ED3N1 was pumped into ED3N2 and ED3N3. There is a sharp rise in the measured water level resulting in an average daily surplus volume of leachate of approximately 2.0 ML recorded over the 5-month calibration period compared to the simulated volume and occurring mostly at ED3N3. Calibrated site PAN value for these dams is 0.6. No change to the mechanical evaporator units.
ED3N4	The result from the calibration simulation is presented in Appendix A Figure A.3 for ED3N4. At dam ED3N4, the uncalibrated modelled water level was consistently lower than the metered water level. The lower modelled water level occurs between 19th July to the 27th September 2019 despite ED3N2 and ED3N3 dams showing a good calibration during this period. The ED3N4 modelled and metered water level time / level slopes were similar (i.e. no steep jump in metered water level during the calibration period). This implies that over the calibration period the modelled dam volume is responding to rainfall events at a similar rate to measured volume changes. We understand leachate is transferred in sequence from ED3N2 to ED3N3 and finally to ED3N4. If the surplus volume at ED3N4 was due to added leachate, then we would have to assume this volume was added only to ED3N4 during 19th July to 27th Sept, without passing through ED3N2 or ED3N3. During emptying ED3N1, when the weather condition was not favourable for evaporation, the flow from ED3N1 was directly pumped into ED3N4 via a separate pipe work. Veolia did not track the volume of the leachate transfer. This may be the reason for the surplus volume in ED3N4. Veolia confirmed all mechanical evaporators at ED3N4 were not fully in operation during the calibration period due to repair issues. Therefore, the pumping rate, pumping units and / or percentage pump availability was lower than initially assumed. The calibration changes to achieve a similar modelled water surface level to measured surface water level included: — Existing Mechanical Evaporator – 5 number of units and operation time reduced from 20% to 10%. — Type A Mechanical Evaporator – reduced unit number from 4 to 1 and operation time from 30% to 10%. Veolia confirmed all mechanical evaporators are repaired and will return to full operating capacity by mid-2020 after testing. The assumption that all mechanical evaporators are operating to full capacity and site PAN value of 0.6 will be applied to the future design simulations.
ED3SS	The result from the calibration simulation is presented in Appendix A Figure A.4 for ED3SS. The modelled and measured surface water level are correlating well. No change was necessary to the operation assumptions of the mechanical evaporator. The results indicate a PAN of 0.6 is appropriate.
ED3S	The result from the calibration simulation is presented in Appendix A Figure A.5 for ED3S. The volumetric balance of water appears well from 19th July to 27th September. The distribution of pumping stormwater to this dam may not occur immediately following rainfall events, which may account for the slight variation in water level during this timeframe. From the 27th September to 17th December, the water level drops sharply. This steep drop in water level can't be justified by changing PAN evaporation or adding seepage losses to the model. Veolia provided the likely explanation that pumping of stormwater stopped from the bioreactor slope dams to ED3S. This was because, due to dry weather, the bioreactor slope dams had enough capacity to store stormwater. The intermediate pumping regime between the bioreactor slope dams and ED3S is likely to be influencing the calibration. As the future simulations are based on long term operations, we proposed to continue with the design simulations based on the calibrated PAN value of 0.6 and runoff coefficient of 0.1.
ED1 Coffer Dam	The result from the calibration simulation is presented in Appendix A Figure A.6 for ED1 Coffer Dam. To take account of the geomembrane liner providing a higher evaporation rate than the rest of the site, a higher PAN value was applied to this dam only. A PAN value of 1.6 is required to achieve a similar modelled water surface level to measured surface water level. The geomembrane liner enhances the evaporation efficiency at shallow depths, with this effect diminishes as the water depth increases. It is proposed for the design model to apply an average based on the site PAN (0.6) and the ED1 Coffer Dam calibration PAN (1.6). By averaging the PAN value (resulting in PAN value of 1.1) this will take into consideration the higher PAN value is only applicable when the water levels are very shallow.

DAM	CALIBRATION RESULTS
ED1	The result from the calibration simulation is presented in Appendix A Figure A.7 for ED1. The simulated water level is performing reasonably well compared to the measured water levels from 19th July to 27th September, it is therefore not proposed to change input parameters for calibration purposes. The measured water surface indicates there may have been transferred steadily to the dam between 27th September to 25th November. There is a sharp draw down of water from the 25th November to 17th December. Veolia confirmed this sharp drop in water level was observed on site. Too many unknowns at this dam to calibrate, information from Heron and the Old PCD water transfer rates (if any) were not available.

6. SIMULATION RESULTS FOR FUTURE YEARS

A summary of the future design simulations based on the climatic sequences of low, medium and high rainfall conditions at each dam is presented in Table 6.1.

The graphical outputs from the Goldsim model are presented in Appendix B.

Table 6.1 Future capacity results

DAM	DATE OF RESULT	AVERAGE CLIMATE SEQUENCE	WETTEST CLIMATE SEQUENCE	DRIEST CLIMATE SEQUENCE	FUTURE DESIGN SIMULATION RESULTS
ED3N2	1 January 2023	Water Level = 789.9 m Storage volume = 10.35 ML 55% of total dam capacity to freeboard	Water Level = 791.3 m Storage volume = 19.7 ML Dam full, water transferred to ED3N3	Water Level = 789.2 m Storage volume = 5.961 ML 32% of total dam capacity to freeboard	The ED3N2, ED3N3 and ED3N4 dams are connected via spillways however, Veolia manage water levels to maintain 0.5 m freeboard below spillway level. Veolia pump and spray leachate between the dams. The results from all dams for the future design simulations are considered together. The results for the average, wettest and driest climatic sequences for dams ED3N2, ED3N3 and ED3N4 are presented in Appendix B B.1, B.2 and B.3. During the average and driest climatic sequences there are no spillway flows between dams throughout the simulation periods. For these climatic scenarios, the mechanical evaporator units in dams ED3N2 and ED3N3 are operating sufficiently to provide adequate storage capacity to cater for rainfall events. The evaporators however, do not dry out these dams. During the wettest climatic sequence, there are times when ED3N2 and ED3N3 are full and all three dams become hydraulically linked by spillway flows. At dam ED3N4, the mechanical evaporators gradually reduce water volumes and the dam is predicted to be dry in the following climatic events: — Average sequence: July 2022 — Driest sequence: Dec 2021 — Wettest sequence: Feb 2024
ED3N3	1 January 2023	Water Level = 790.4 m Storage volume = 11.2 ML 70% of total dam capacity to freeboard	Water Level = 791.5 m Storage volume = 17.53 ML Dam full, water transferred to ED3N4	Water Level = 789.7 m Storage volume = 7.116 ML 44% of total dam capacity to freeboard	
ED3N4	1 January 2023	Water Level = 786.4 m Storage volume = 0.01 ML Dam almost empty	Water Level = 789.2 m Storage volume = 30.2 ML 30% of total dam capacity to freeboard	Water Level =786.9 m Storage volume = 0.2 ML Dam almost empty	
ED3SS	1 January 2023	Water Level = 785.83 m Storage volume = 0.02 ML Dam almost empty	Water Level = 787.58 m Storage volume = 13.68 ML 12 % of total dam capacity to freeboard	Water Level = 785.88 m Storage volume = 0.09 ML Dam almost empty	The results for the average, wettest and driest climatic sequences for dam ED3SS are presented in Appendix B B.4. The mechanical evaporators reduce water volumes quickly and the dam is predicted to be dry in the following climatic events: — Wettest sequence: July 2023 — Average sequence: July 2022 — Driest sequence: Feb 2022 After the dam initial dries, the mechanical evaporators react following rainfall events to keep dam almost empty.

DAM	DATE OF RESULT	AVERAGE CLIMATE SEQUENCE	WETTEST CLIMATE SEQUENCE	DRIEST CLIMATE SEQUENCE	FUTURE DESIGN SIMULATION RESULTS
ED3S	1 January 2023	*Scenario 1 (Heron usage 0 l/s)* Water Level = 791.08 m Storage volume = 148.1 ML 95 % of total dam capacity to freeboard	*Scenario 1 (Heron usage 0 l/s)* Water Level = 791.19 m Storage volume = 155.9 ML Breaches freeboard volume	*Scenario 1 (Heron usage 0 l/s)* Water Level = 791.15 m Storage volume = 153.1 ML 98 % of total dam capacity to freeboard	*Scenario 1 (Heron usage 0 l/s)* The results for the average, wettest and driest climatic sequences for dam ED3S Scenario 1 are presented in Appendix B B.5.1. The water level results for the particular date (1st January 2023) presented in this table show the average climatic sequence results in a slightly lower water level than the driest climatic sequence. This does not represent the overall 8 year climatic trend of the average and driest periods. The increase in water volumes following rainfall events is due to this dam receiving stormwater runoff from the bioreactor pit slopes and not having mechanical evaporators. For all climatic scenarios the dam frequently breaches the spillway volume.
	1 January 2023	*Scenario 2 (Heron usage 2 l/s)* Water Level = 790.06 m Storage volume = 78.99 ML 50 % of total dam capacity to freeboard	*Scenario 2 (Heron usage 2 l/s)* Water Level = 791.17 m Storage volume = 154.75 ML Close to freeboard volume	*Scenario 2 (Heron usage 2 l/s)* Water Level = 789.05 m Storage volume = 27.98 ML 18 % of total dam capacity to freeboard	*Scenario 2 (Heron usage 2 l/s)* The results for the average, wettest and driest climatic sequences for dam ED3S Scenario 2 are presented in Appendix B B.5.2. While the dam continues to breach the freeboard volume for each climatic sequence, the water usage by Heron has resulted in much fewer breaches occurring over a shorter in time.
ED1 Coffer Dam	1 January 2023	*Scenario 1 (Heron usage 0 l/s)* Water Level = 786.87 m Storage volume = 10.84 ML 7 % of total dam capacity to freeboard	*Scenario 1 (Heron usage 0 l/s)* Water Level = 787.80 m Storage volume = 61.04 ML 39 % of total dam capacity to freeboard	*Scenario 1 (Heron usage 0 l/s)* Water Level = 786.89 m Storage volume = 11.4 ML 7 % of total dam capacity to freeboard	*Scenario 1 (Heron usage 0 l/s)* The results for the average, wettest and driest climatic sequences for dam ED1 Coffer Dam Scenario 1 are presented in Appendix B B.6.1. The dam has adequate capacity to cater for all climatic scenarios based on the mechanical evaporator and leachate input assumptions. The peak predicted water storage in the dam occurs during the wettest climatic scenario when 84.97 ML is stored (approximately 54% of the total dam capacity to freeboard level).
	1 January 2023	*Scenario 2 (Heron usage 2 l/s)* Water Level = 786.54 m Storage volume = 0.34 ML Close to empty	*Scenario 2 (Heron usage 2 l/s)* Water Level = 786.58 m Storage volume = 0.86 ML Close to empty	*Scenario 2 (Heron usage 2 l/s)* Water Level = 786.55 m Storage volume = 0.53 ML Close to empty	*Scenario 2 (Heron usage 2 l/s)* The results for the average, wettest and driest climatic sequences for dam ED1 Coffer Dam Scenario 1 are presented in Appendix B B.6.2. The dam has adequate capacity to cater for all climatic scenarios based on the mechanical evaporator and leachate input assumptions. The peak predicted water storage in the dam occurs during the wettest climatic scenario when 23.9 ML is stored (approximately 15% of the total dam capacity to freeboard level).

DAM	DATE OF RESULT	AVERAGE CLIMATE SEQUENCE	WETTEST CLIMATE SEQUENCE	DRIEST CLIMATE SEQUENCE	FUTURE DESIGN SIMULATION RESULTS
ED1	31 December 2023	Water Level = 785.26 m Storage volume = 29.94 ML 3% of total dam capacity to freeboard	Water Level = 786.53 m Storage volume = 326.2 ML 27% of total dam capacity to freeboard	Water Level = 784.69 m Storage volume = 0.03 ML Dam almost empty	The results for the average, wettest and driest climatic sequences for dam ED1 Coffer Dam Scenario 1 are presented in Appendix B B.7. For the driest climatic sequences, dam ED1 is empty by the end of 2023. However, considering this dam receives stormwater runoff from external catchments, sustaining a completely empty dam may be difficult. For the wettest climatic sequence, the dam requires 27% of its total storage capacity to cater for direct rainfall and catchment runoff. Veolia is currently constructing an evaporation pad (March 2020). The rate of pumping and design information for evaporation pan was not available at time of this report. However, once in operation this evaporation pad may further reduce water volumes in ED1. The operation practice will be to intermittently pump water from ED1 to the evaporation pan and to maintain water levels at the evaporation pan.

7. CONCLUSION

7.1 CALIBRATED WATER BALANCE SIMULATIONS

The calibrated water balance simulations indicate a site PAN value of 0.6 is appropriate for the Woodlawn site.

At dam ED1 Coffer Dam, the geomembrane lining may be increasing the rate of natural evaporation. The calibrated water balance simulation estimated a PAN of 1.6 was required to match measured water levels to modelled water levels. However, water levels in ED1 Coffer Dam are currently shallow with the effect of the geomembrane on evaporation at its greatest. The future design simulations applied an average PAN based on site PAN (0.6) and the ED1 Coffer Dam calibrated PAN (1.6). By averaging the PAN value this will take into consideration the higher PAN value is only applicable when the water levels are very shallow.

The calibration simulation found the mechanical evaporators at ED3N4 were not operating to full capacity. Veolia confirmed this may be due to maintenance and repair issues experienced on site. However, Veolia provided the assumption that all mechanical evaporators are now operating to full capacity and this assumption was applied to the future design simulations.

All other dams calibrated reasonably well, although short term operating rules and pumping between dams influenced some results over the calibration period. As the future design scenarios are based on long term operations, adjusting model parameters to accommodate the short-term operations over the calibration period was not carried out.

7.2 FUTURE DESIGN SIMULATION

The future design simulation results indicated dams ED3N2, ED3N3 and ED3N4 collectively had enough capacity to cater for future leachate and rainfall inputs. The mechanical evaporators at ED3N4 dried out this dam in 2022 based on the average climatic sequence and in 2024 based on the wettest climatic sequence.

At dam ED3SS and based on the assumption the mechanical evaporators operation time is to increase to 40%, the mechanical evaporators dried out this dam and maintained shallow water depths between drying. Depending on the climatic sequence this dam will first empty in either 2022 based on average and driest climatic sequence or in 2023 for the wettest climatic sequence.

Capacity issues at dam ED3S occur most prominently when Heron water usage was assumed at 0 l/s. The dam frequently reaches spillway volume and spills for long durations for all climatic sequences, refer to Appendix B B.5.1 and B.5.2. While capacity issues remain for the scenario that Heron uses 2 l/s of water from this dam, Heron's water usages results in much fewer breaches occurring over a shorter duration.

Dam ED1 does completely empty by 2023 for the driest climatic sequences. Considering this dam receives stormwater runoff from external catchments, sustaining this dam as completely empty may be difficult. For the wettest climatic sequence, the dam requires 27% of its total storage capacity to cater for direct rainfall and catchment runoff at the end of 2023. Modelling of this dam could be further refined if information regarding water transfer from Heron and the Old PCD (if any) were provided. Also, details and assumptions for the new evaporation pad may provide further storage capacity.

ED1 Coffer Dam, is not predicted to fill up to 80% of the freeboard level volume in any climatic sequence based on the assumed evaporator capacity. Assuming no water usage by Heron, the peak predicted water storage in the dam occurs during the wettest climatic scenario

when 84.97 ML is stored (approximately 54% of the total dam capacity to freeboard level). By 2023 less than 40% of the dam capacity to freeboard volume is reached during the wettest climatic sequence.

Following Veolia's review of the ED1 Coffer Dam water balance model results, Veolia confirmed the system being installed will be modified such that the total mechanical evaporators output will be similar to the total leachate input of 4 l/s. This proposed operating arrangement will increase the predicted water levels in the ED1 Coffer Dam. Modifying the water balance model to incorporate this proposed operating arrangement is not included in the current water balance model results.

APPENDIX A CALIBRATION GRAPHICAL OUTPUTS

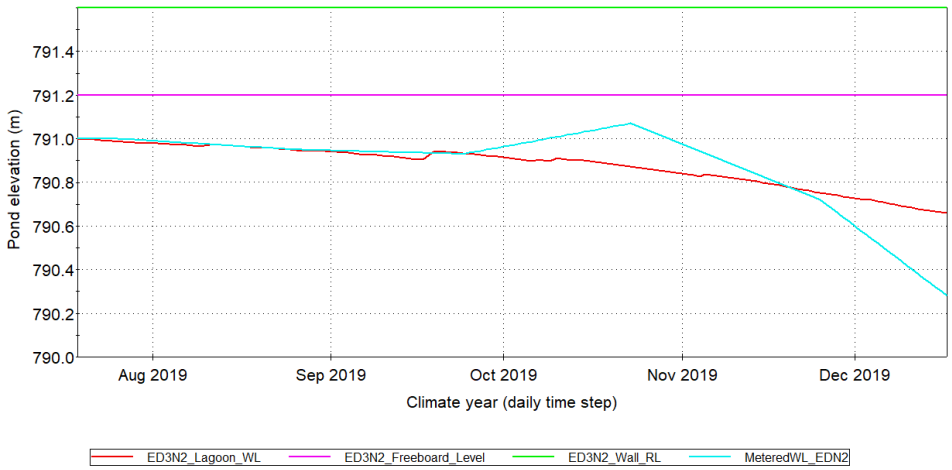


Figure A.1 ED3N2 Calibration Model Results

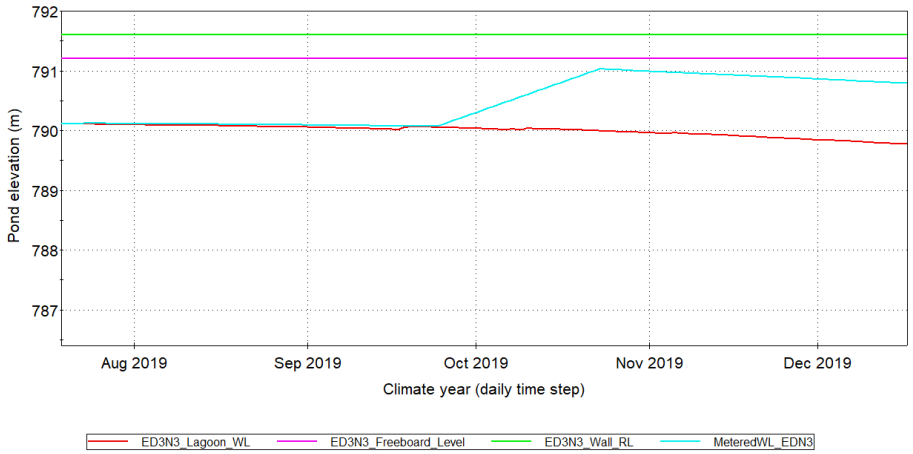


Figure A.2 ED3N3 Calibration Model Results

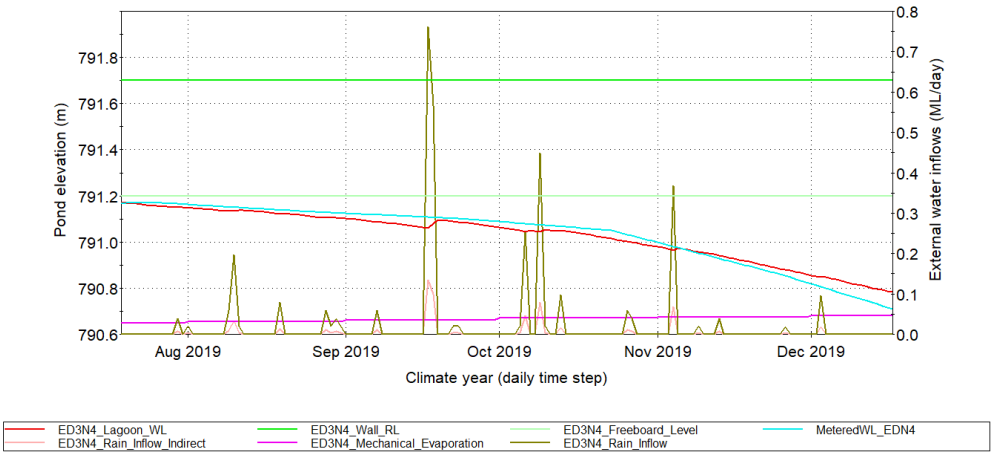


Figure A.3 ED3N4 Calibration Model Results

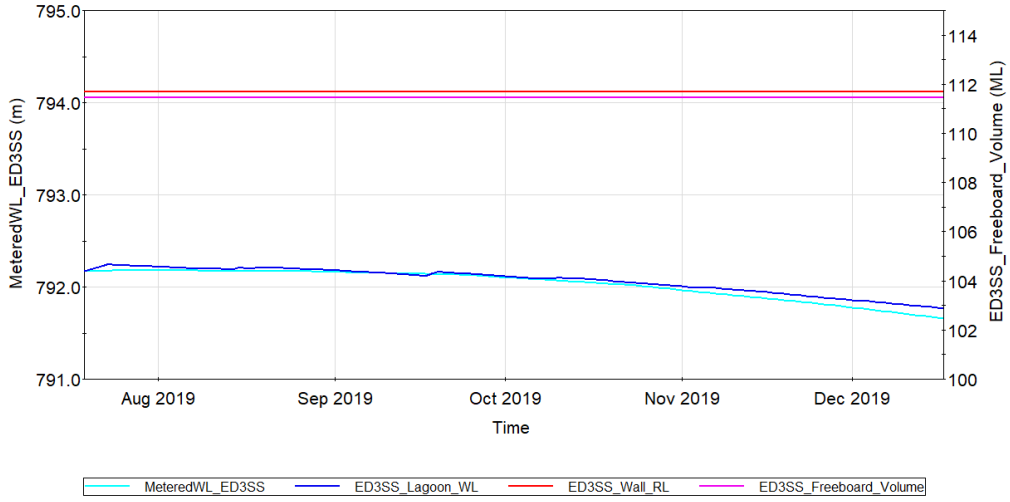


Figure A.4 ED3SS Calibration Model Results

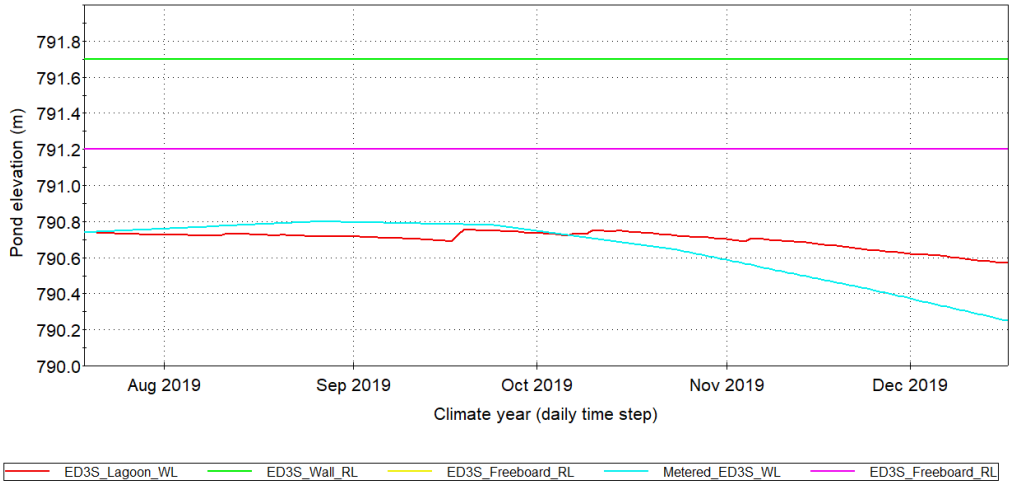


Figure A.5 ED3S Calibration Model Results

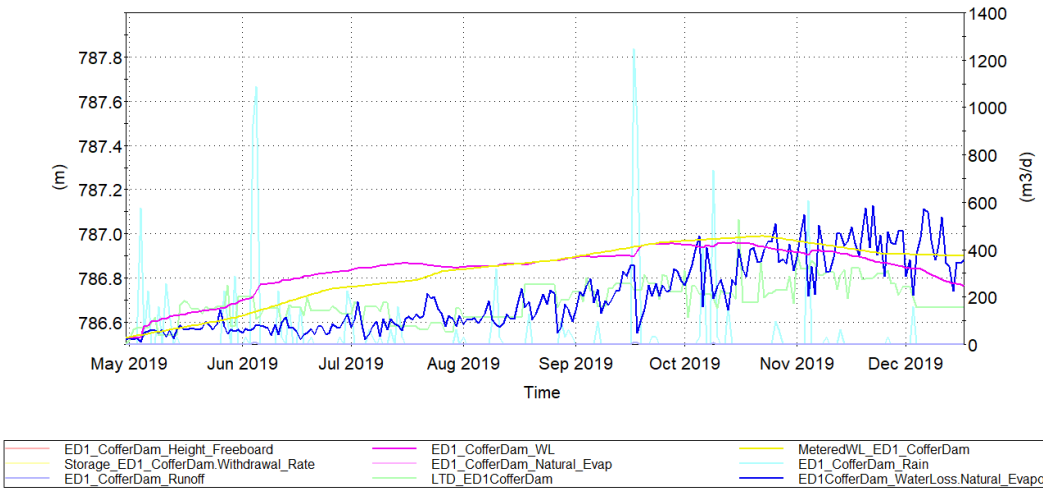


Figure A.6 ED1 Coffer Dam Calibration Model Results

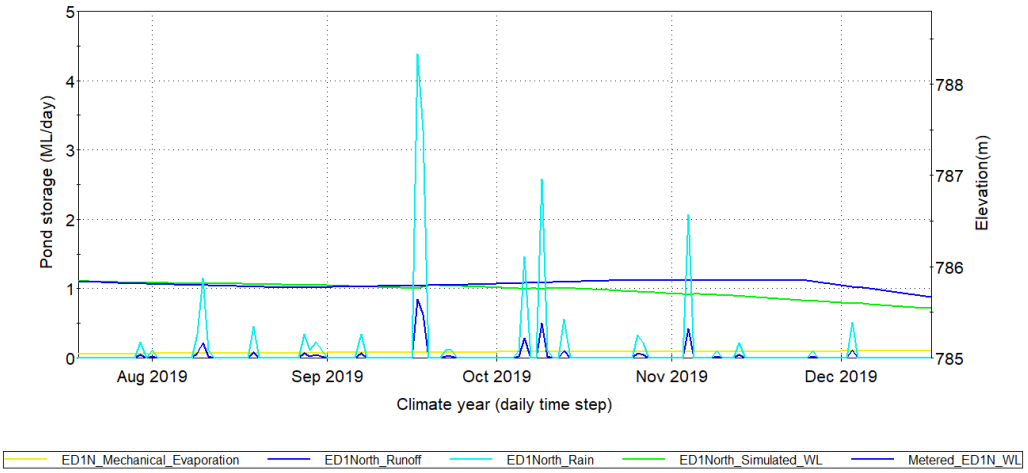


Figure A.7 ED1 Calibration Model Results

APPENDIX B FUTURE DESIGN SCENARIOS GRAPHICAL OUTPUTS

B.1 SIMULATED RESULTS FOR ED3N2

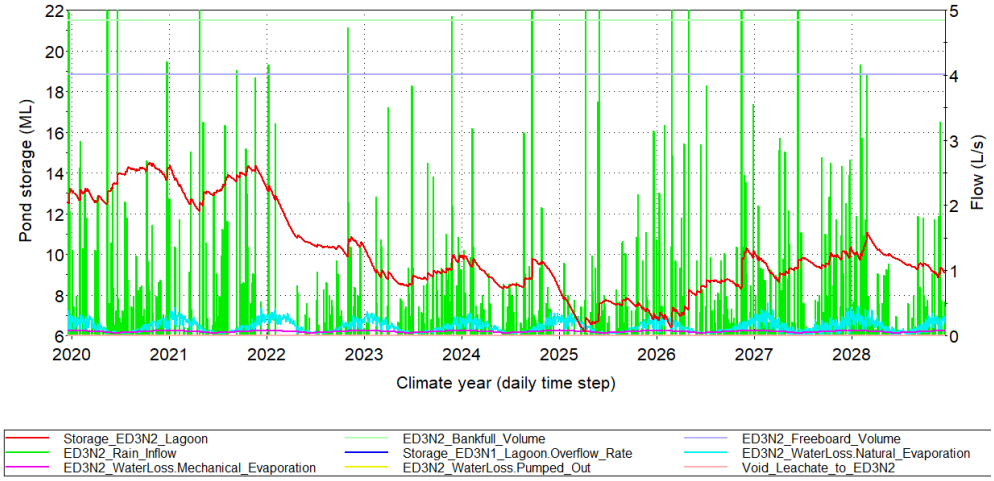


Figure B.1 Simulated results for average climatic sequence ED3N2

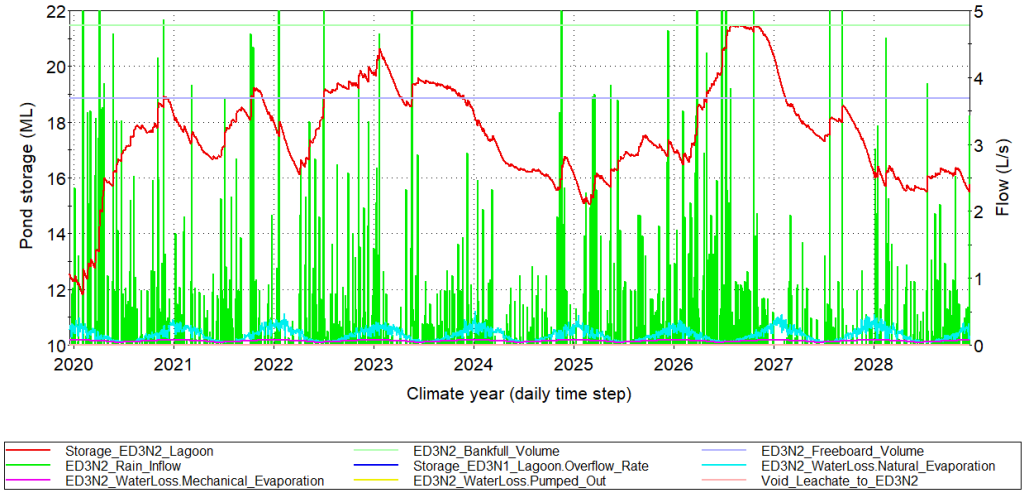


Figure B.2 Simulated results for wettest climatic sequence ED3N2

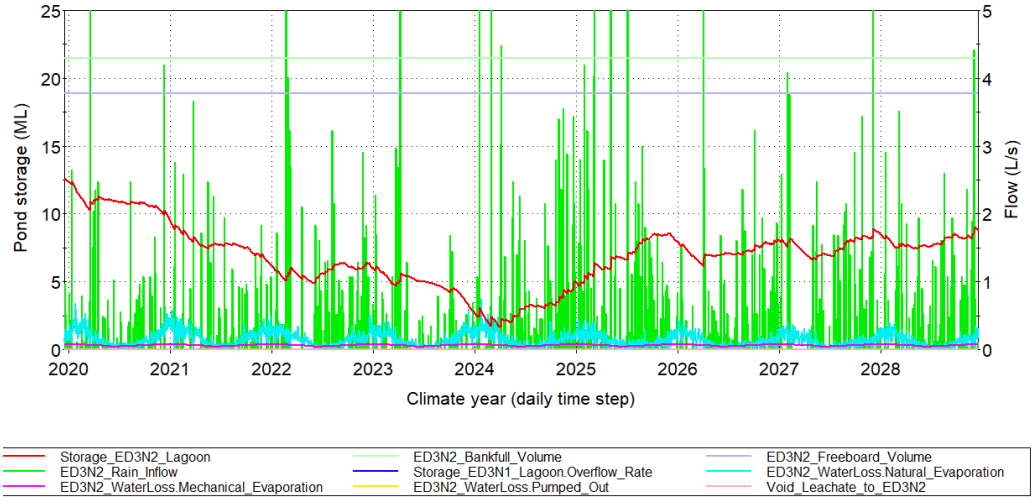


Figure B.3 Simulated results for driest climatic sequence ED3N2

B.2 SIMULATED RESULTS FOR ED3N3

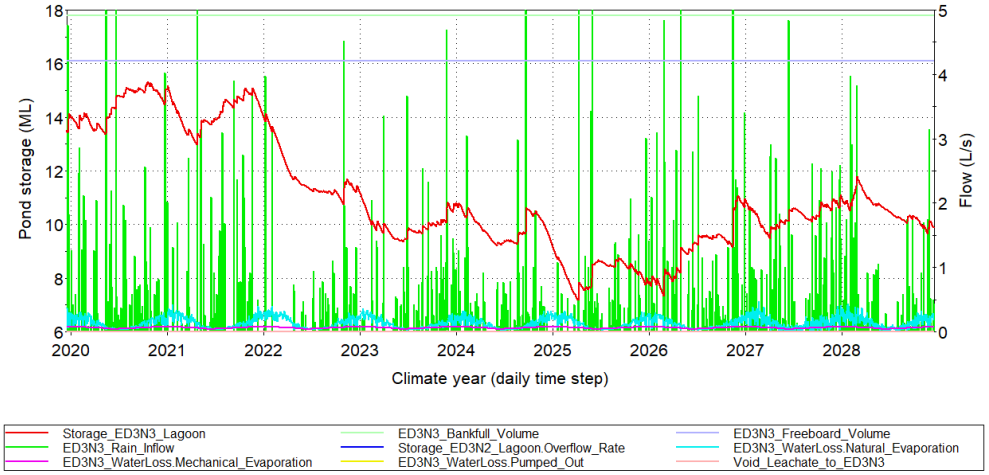


Figure B.4 Simulated results for average climatic sequence ED3N3

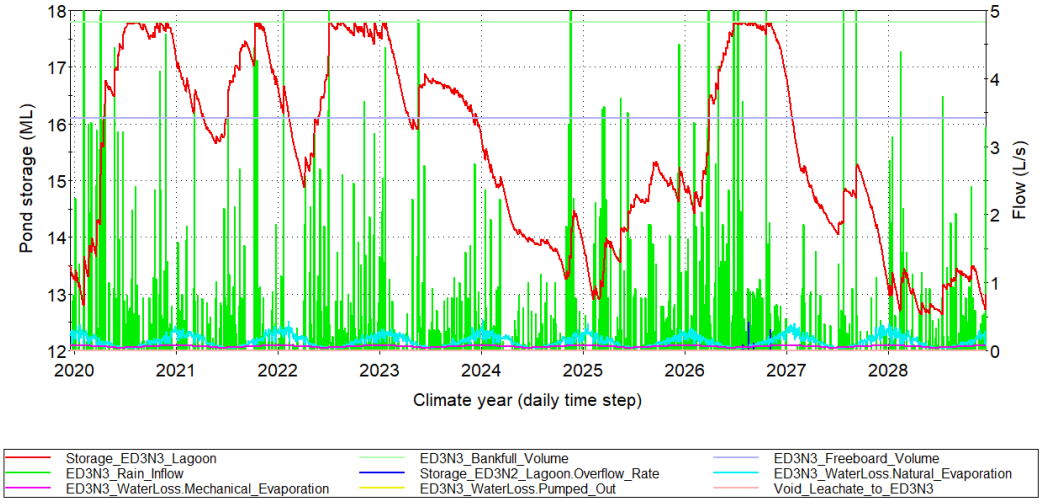


Figure B.5 Simulated results for wettest climatic sequence ED3N3

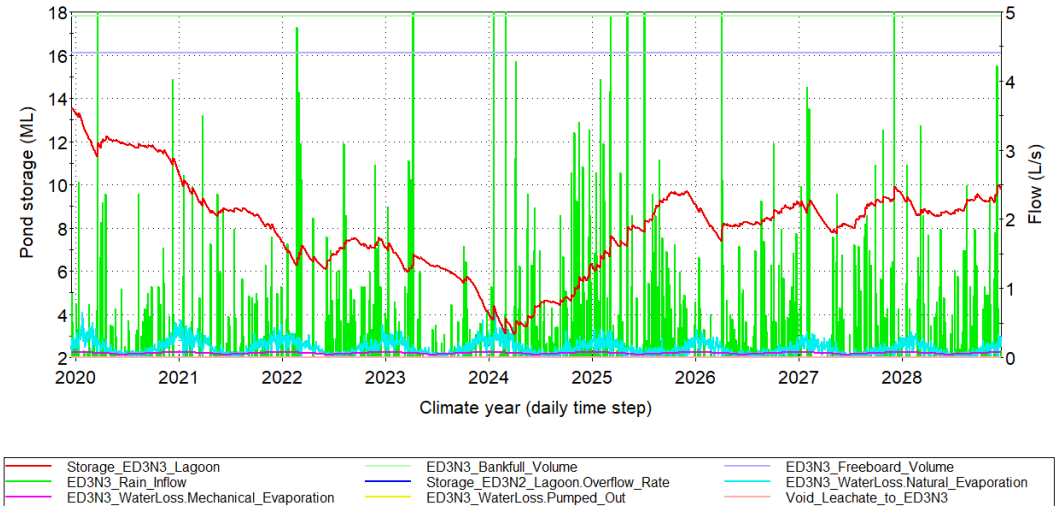


Figure B.6 Simulated results for driest climatic sequence ED3N3

B.3 SIMULATED RESULTS FOR ED3N4

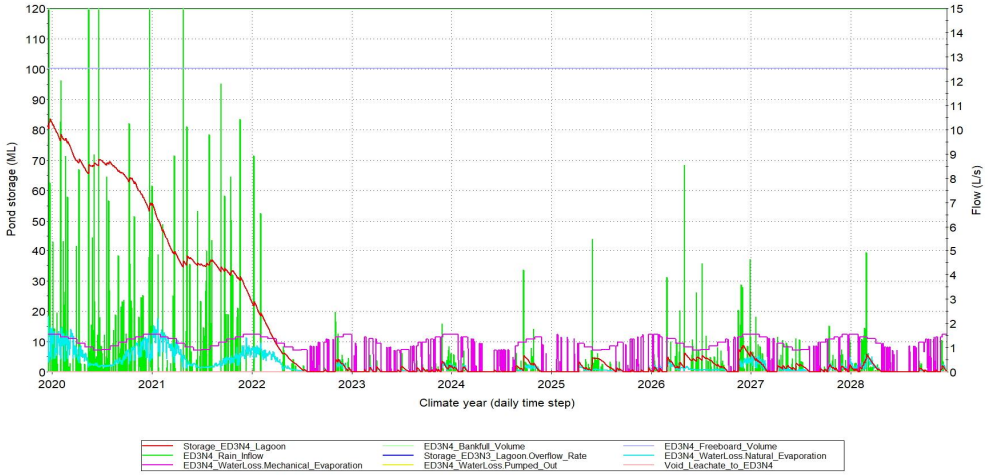


Figure B.7 Simulated results for average climatic sequence ED3N4

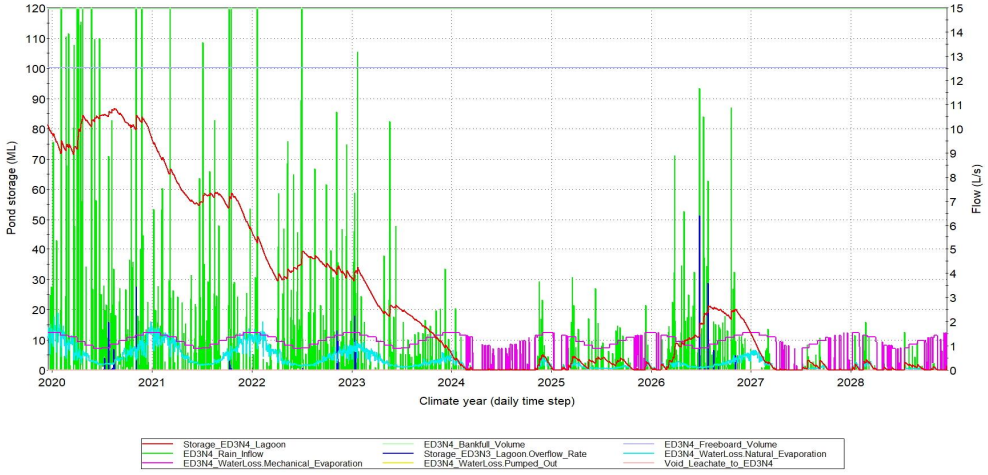


Figure B.8 Simulated results for wettest climatic sequence ED3N4

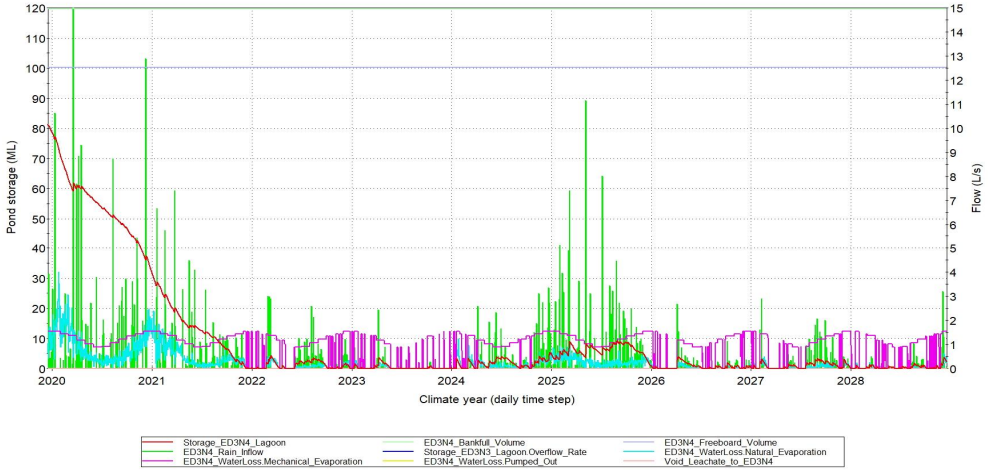


Figure B.9 Simulated results for driest climatic sequence ED3N4

B.4 SIMULATED RESULTS FOR ED3SS

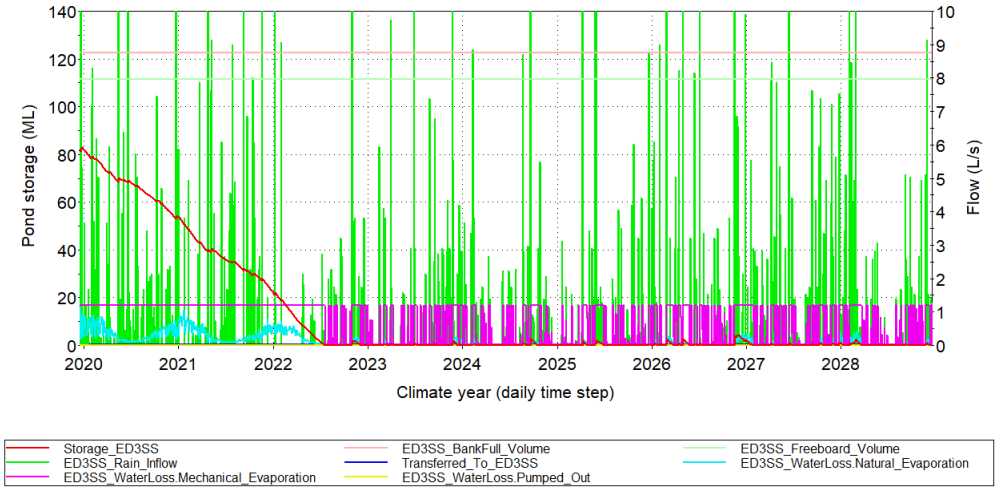


Figure B.10 Simulated results for average climatic sequence ED3SS

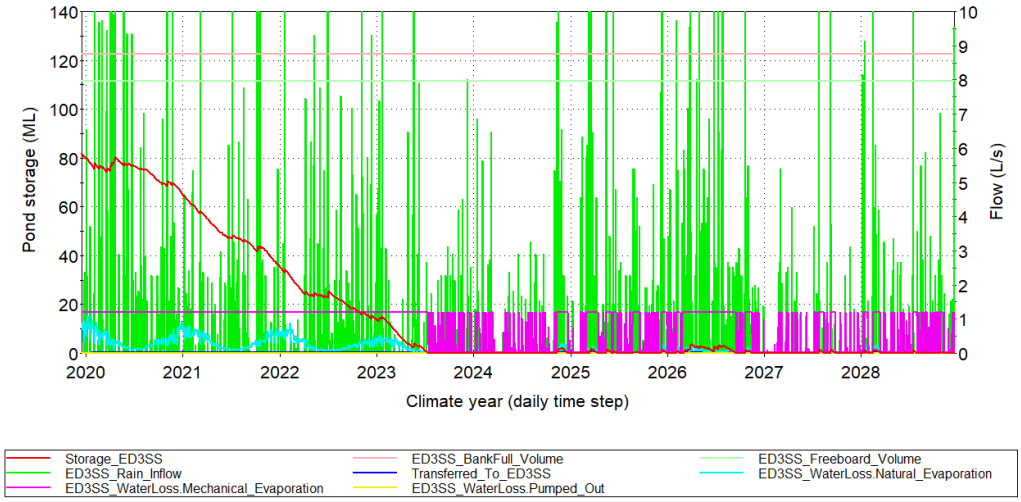


Figure B.11 Simulated results for wettest climatic sequence ED3SS

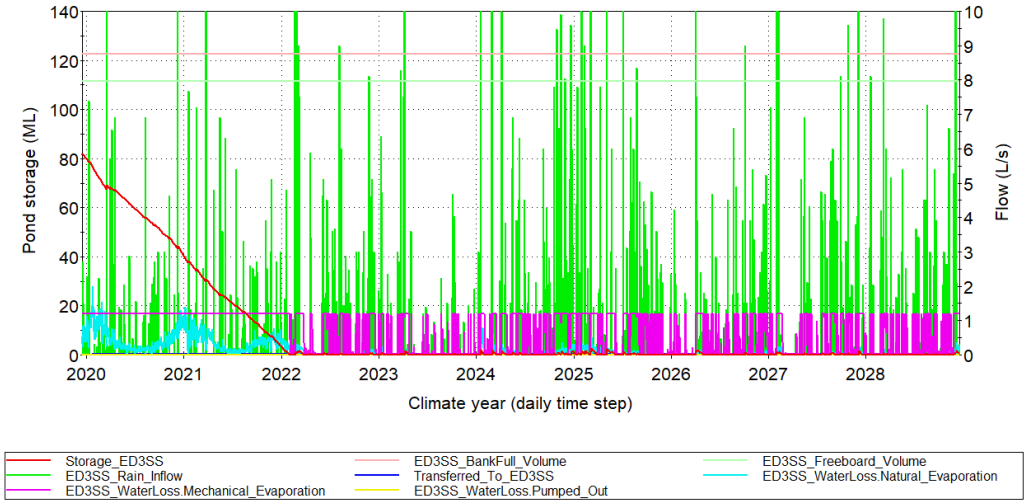


Figure B.12 Simulated results for driest climatic sequence ED3SS

B.5 SIMULATED RESULTS FOR ED3S

B.5.1 SCENARIO 1 (HERON USES 0 L/S)

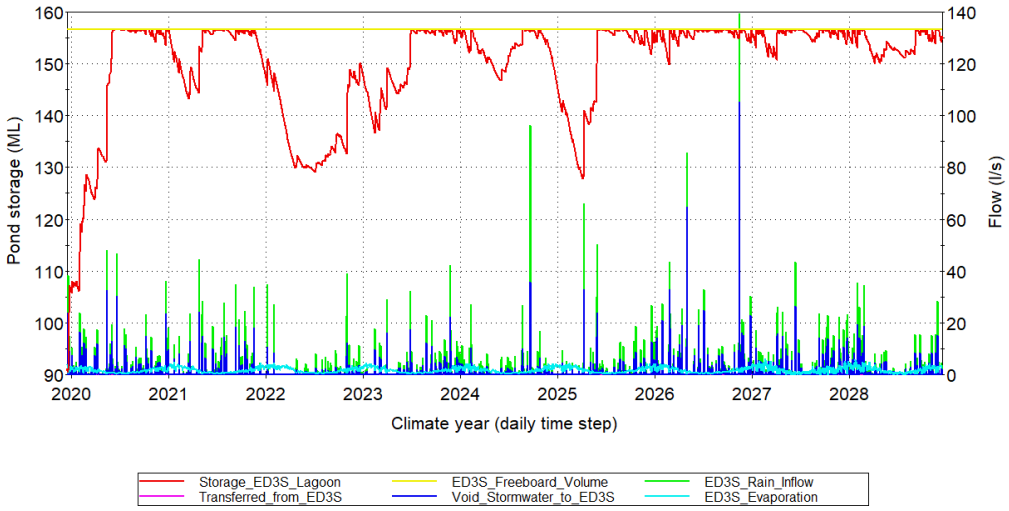


Figure B.13 Simulated results for average climatic sequence ED3S Scenario 1

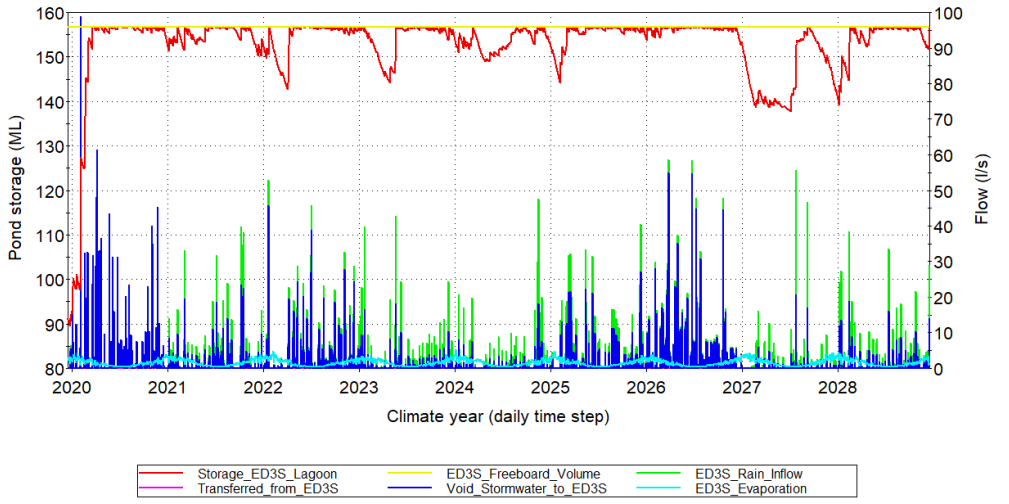


Figure B.14 Simulated results for wettest climatic sequence ED3S Scenario 1

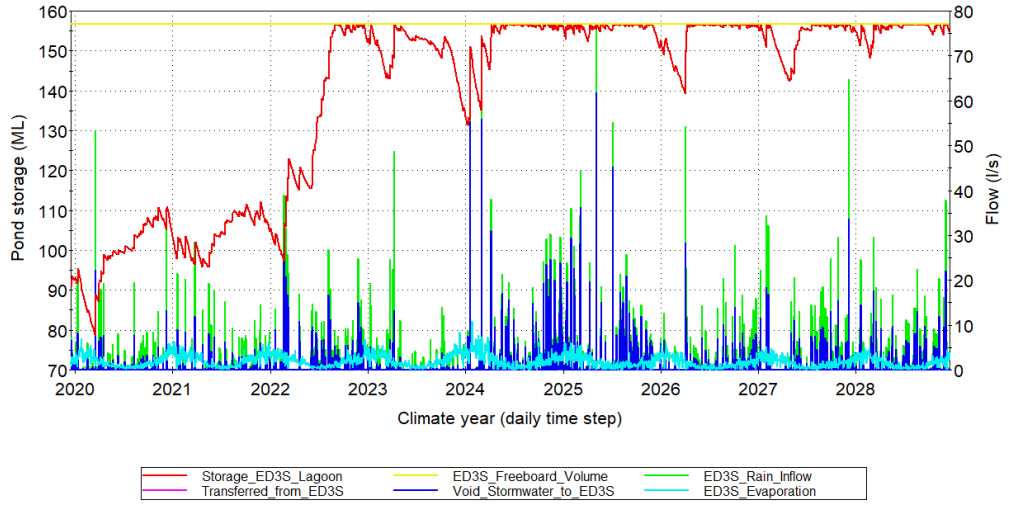


Figure B.15 Simulated results for driest climatic sequence ED3S Scenario 1

B.5.2 SCENARIO 2 (HERON USES 2 L/S)

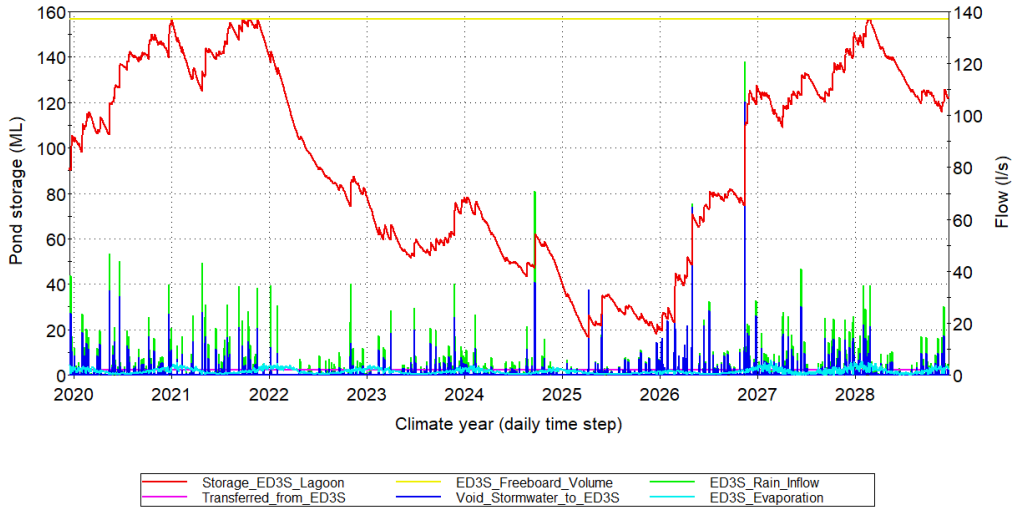


Figure B.16 Simulated results for average climatic sequence ED3S Scenario 2

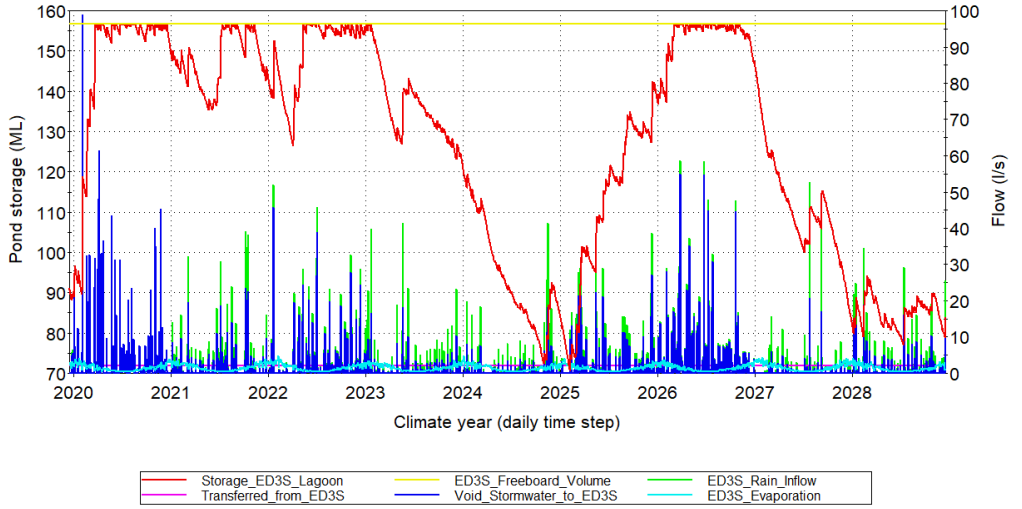


Figure B.17 Simulated results for wettest climatic sequence ED3S Scenario 2

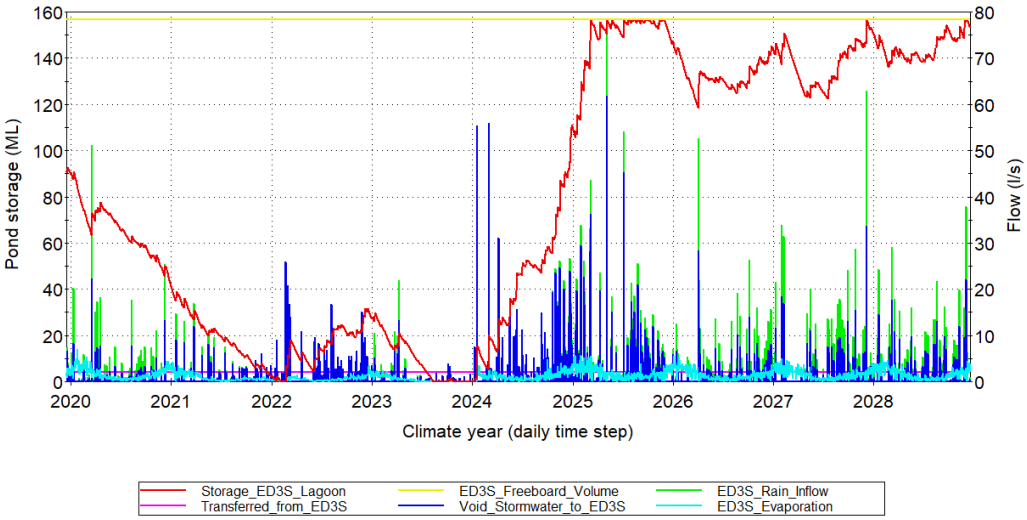


Figure B.18 Simulated results for driest climatic sequence ED3S Scenario 2

B.6 SIMULATED RESULTS FOR ED1 COFFER DAM

B.6.1 SCENARIO 1 (HERON USES 0 L/S)

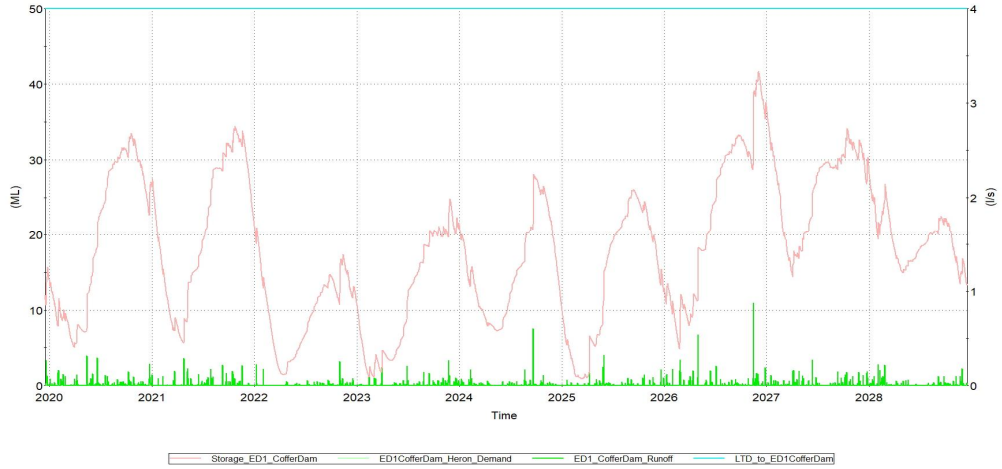


Figure B.19 Simulated results for average climatic sequence ED1 Coffer Dam Scenario 1

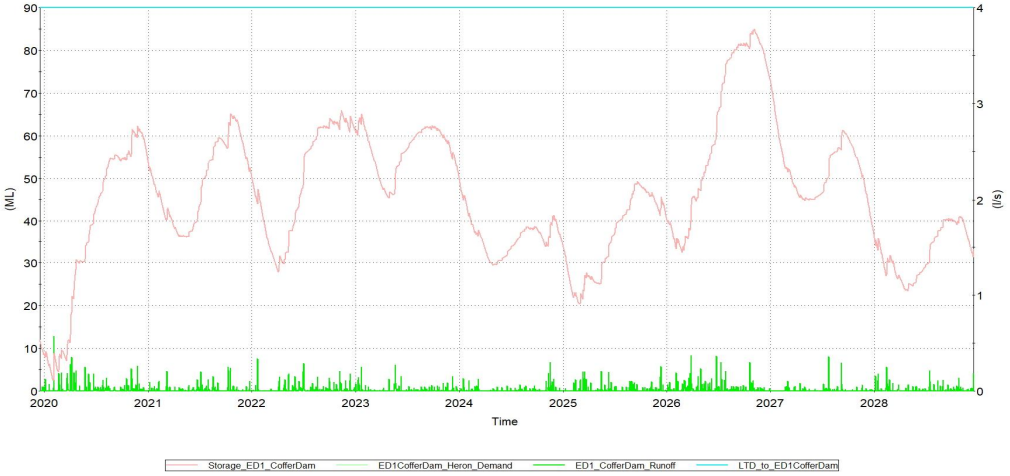


Figure B.20 Simulated results for wettest climatic sequence ED1 Coffer Dam Scenario 1

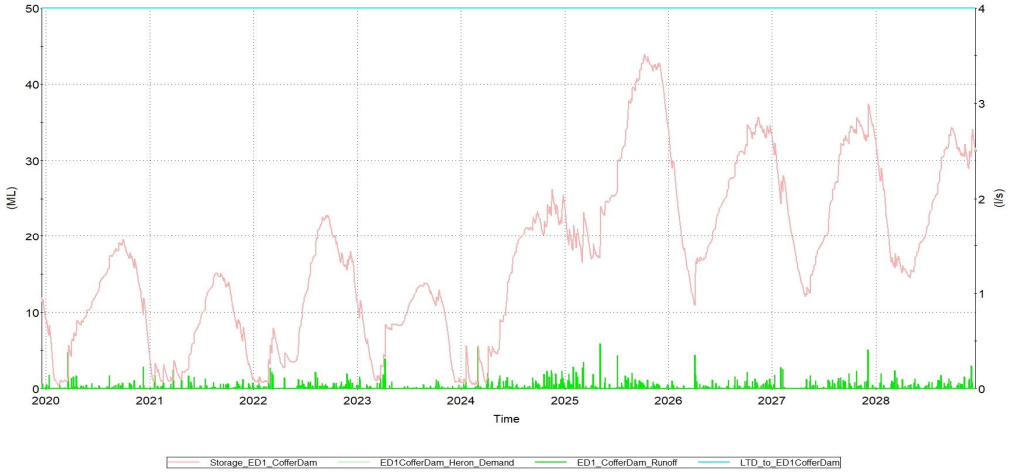


Figure B.21 Simulated results for driest climatic sequence ED1 Coffer Dam Scenario 1

B.6.2 SCENARIO 2 (HERON USES 2 L/S)

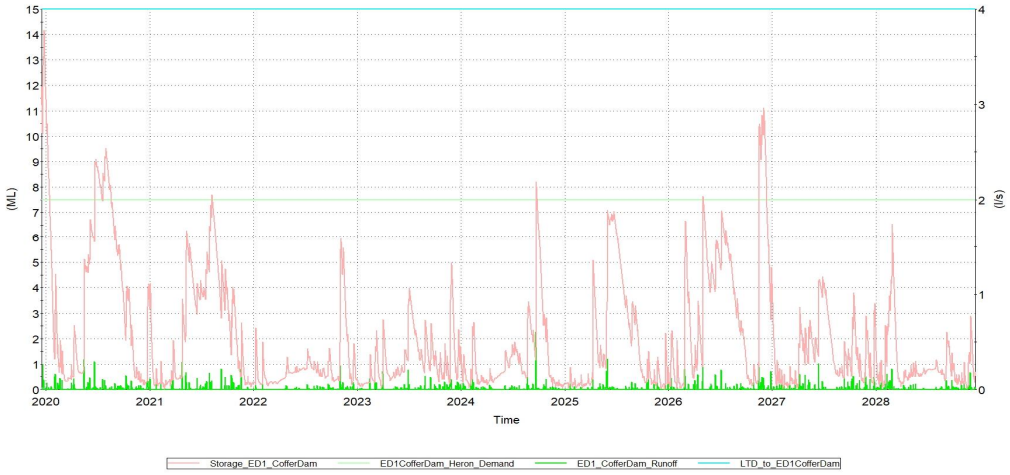


Figure B.22 Simulated results for average climatic sequence ED1 Coffer Dam Scenario 2

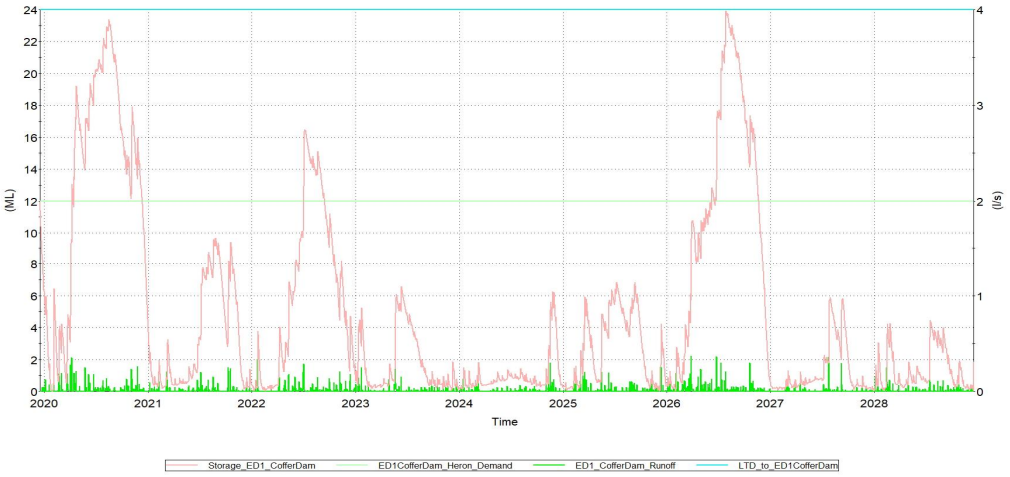


Figure B.23 Simulated results for wettest climatic sequence ED1 Coffer Dam Scenario 2

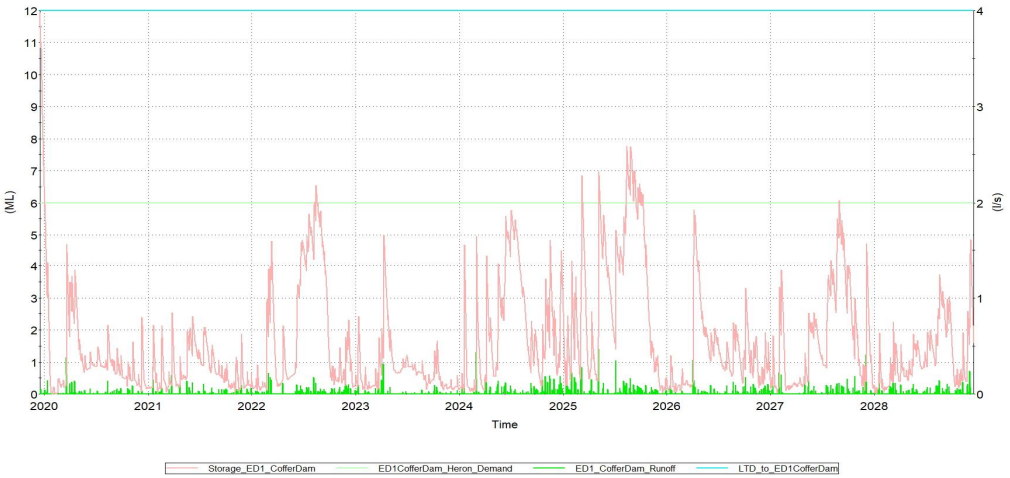


Figure B.24 Simulated results for driest climatic sequence ED1 Coffer Dam Scenario 2

B.7 SIMULATED RESULTS FOR ED1

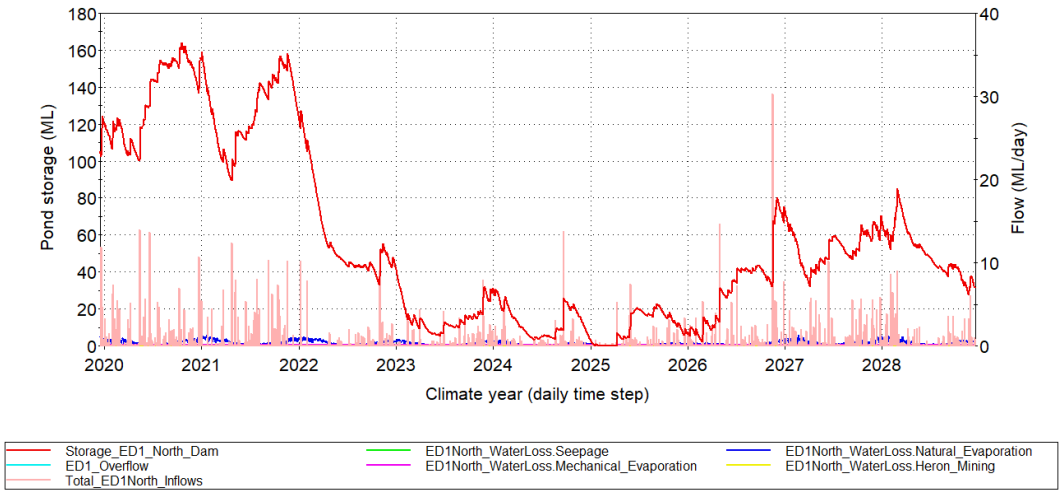


Figure B.25 Simulated results for average climatic sequence ED1

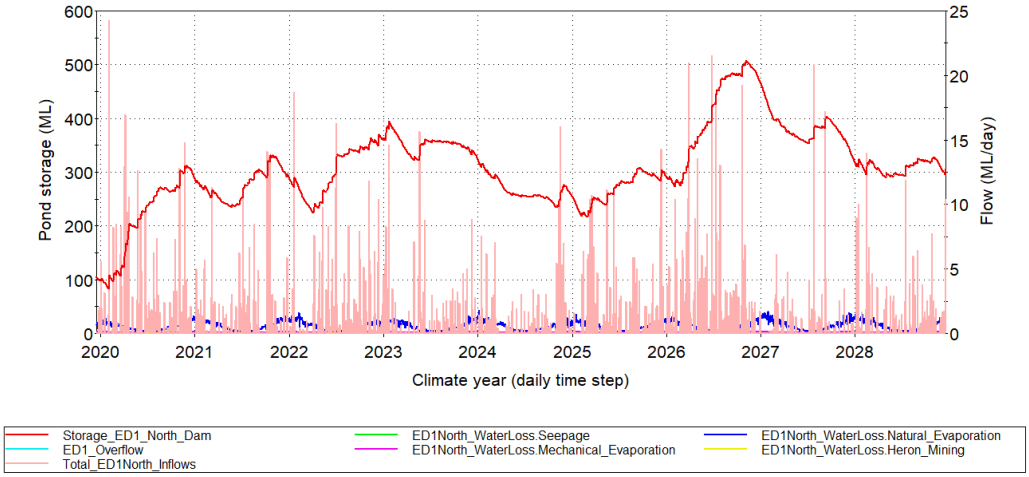


Figure B.26 Simulated results for wettest climatic sequence ED1

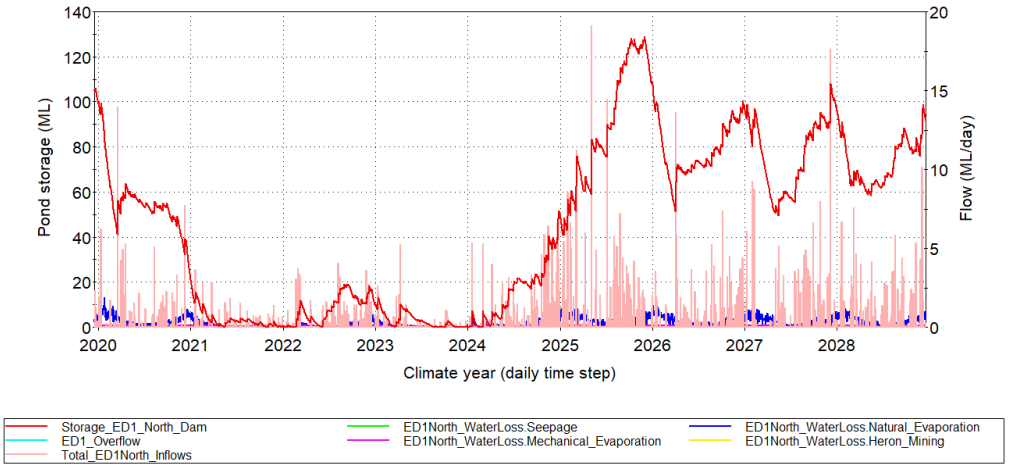


Figure B.27 Simulated results for driest climatic sequence ED1

APPENDIX C PREVIOUS STUDIES

C.1 LEACHATE MANAGEMENT BY MECHANICAL EVAPORATORS AND THE PROPOSED ED1 COFFER DAM (WSP, SEP 2017)

WSP investigated the Veolia's strategy to use ED1 exclusively for its leachate management. A geomembrane lined coffer dam within the footprint of ED1, named ED1 Coffer Dam, was proposed to manage the storage and evaporation of treated leachate. By using ED1 Coffer Dam to manage leachate, the remainder of the ED1 dam will be allowed to dry up with the use of mechanical evaporators.

Once ED1 is empty, it is proposed this dam will be relined to avoid seepage and used subsequently for leachate storage and management. The water balance assessments results indicated the following:

- required number of proposed mechanical evaporators to manage leachate from September 2017 to December 2019 at ED3SS and ED3N lagoons:
  - 1 x Type A at ED3N1, ED3N2, ED3N3 operating for 70% of the year at a flow rate of 126 L/min
  - 3 x Type B at ED3SS operating for 70% of the year at a flow rate of 86 L/min
  - 5 x Existing Mechanical Evaporator operating for 34% of the year at a flow rate of 168 L/min and 11 x Type A operating for 70% of the year at a flow rate of 126 L/min at ED3N4 or
  - 5 x Existing Mechanical Evaporator operating for 40% of the year at a flow rate of 336 L/min and 3 x Type A operating for 70% of the year at a flow rate of 126 L/min at ED3N4.
- size of proposed ED1 Coffer Dam.
  - The proposed 150 ML Coffer Dam may be able to service for the intended 4-year period, if Heron uses water from the coffer dam at a rate of 2 L/s and 4 x Type A Evaporators are used simultaneously for 70% of the time every year.
  - One and a half cells of 150 ML Coffer Dam may be required to service the intended 4-year period, if Heron does not use water from the coffer dam and a total of 5 x Type A Evaporators are used simultaneously for 70% of the time every year.
  - Three cells of 150 ML Coffer Dam may be required to service the intended 4-year period, if Heron does not use water from the coffer dam and evaporators are not used.
- required number of Mintek mechanical evaporator units to dry up ED1 North Dam in ten years. Two units of Minetek 75kw Evaporator with 1500 L/min flow operating for at least 34% every year will be able to dry up the ED1 North Dam to 10 ML within:
  - 6 years in the wettest climate
  - 2 year in the driest climate
  - 3 years in the average climate used in the simulation.

These results are subject to the climatic sequences, dam and mechanical evaporator characteristics data used in water balance modelling.

Table C.1 lists the characteristics for the Existing, Minetek, Type A and Type B Evaporators provided by Veolia. The seasonal variation of water loss through Existing Mechanical Evaporators were related to monthly potential evaporation based on data provided by Veolia that were used in the June 2016 assessment (Table C.2). The Existing Mechanical Evaporators are expected to be similar to TurboMist (http://www.turbomist.com/products). The same relationship was used for the Minetek unit without scaling.

The monthly evaporation characteristics for the floating evaporator Type A and Type B units were scaled from the characteristics for Existing Mechanical Evaporators to achieve Veolia's estimated average annual rate of water loss from the volume passing through the units for 2016-2017 period. Refer to Table C.2 for the monthly scaled evaporation loss rates for Type A and Type B and Minetek units.

Table C.1 Characteristics of modelled mechanical evaporator types

EVAPORATOR TYPE	MINETEK 400/200	TYPE A	TYPE B	EXISTING MECHANICAL EVAPORATOR
Applied quantity	1	1	1	1
Rated flow (L/min)	1500	126	86	350
Expected loss rate (L/min) at 100% availability	420	25	6.0	98
Availability % planned	Up to 70	70	70	Up to 70
Actual flow through (L/min) in 2016-2017 (source: Veolia)	Not installed	126	86	168 (due to pump restrictions)
Availability % in 2016-2017	Not installed	80	50	34
Evaporator flow (L/s) in 2016-2017		1.68	0.72	0.95
Average loss (L/s) in 2016-2017		0.33	0.05	0.27
% loss /year in 2016-2017		20%	7%	28%
Achieved loss rate (L/ min) in 2016-2017		19.9	3.0	16.20

Source: WSP (September 2017)

Table C.2 Monthly relationship between potential evaporation and evaporation as % of the inflow volume through the mechanical evaporators

MONTH	POTENTIAL EVAPORATION (MM/DAY)	POTENTIAL EVAPORATION (MM/MONTH)	% OF INFLOW EVAPORATED BY THE EXISTING MECHANICAL EVAPORATOR	% OF INFLOW EVAPORATED BY THE TYPE A EVAPORATOR	% OF INFLOW EVAPORATED BY THE TYPE B EVAPORATOR
1	5.9	180.1	40.0	28.8	7.3
2	4.5	136.4	36.8	26.5	6.7

MONTH	POTENTIAL EVAPORATION (MM/DAY)	POTENTIAL EVAPORATION (MM/MONTH)	% OF INFLOW EVAPORATED BY THE EXISTING MECHANICAL EVAPORATOR	% OF INFLOW EVAPORATED BY THE TYPE A EVAPORATOR	% OF INFLOW EVAPORATED BY THE TYPE B EVAPORATOR
3	3.9	119.2	35.3	25.4	6.4
4	2.3	71.2	30.2	21.8	5.5
5	1.4	43.4	26.1	18.8	4.8
6	0.9	27.9	22.8	16.4	4.2
7	1.1	32.0	23.8	17.2	4.4
8	1.7	52.5	27.6	19.9	5.0
9	2.6	79.7	31.3	22.6	5.7
10	3.7	112.4	34.7	25.0	6.3
11	4.6	139.8	37.0	26.7	6.8
12	5.8	175.1	39.6	28.5	7.2

Source: WSP (September 2017)

C.2 WOODLAWN BIOREACTOR WATER BALANCE FOR PROPOSED AMENDEMETN TO SURFACE WATER MANAGEMENT (WSP, NOV 2015)

WSP|Parsons Brinckerhoff (now WSP) undertook a water balance assessment in June 2016 for Veolia's application for regulatory approval to utilise the ED1 and ED2 evaporation dams for treated leachate storage and evaporation (2269623B-RES-LTR-03 Rev0). The main objective of the Veolia nominated scenarios was to assess whether ED1 will overflow over a period of 40 years, if the treated leachate is discharged as per projected schedule (refer to Figure C.1) for comparison between 2016 and 2017 estimates) under the following three scenarios:

- Scenario A. ED1 does not receive runoff from the Plant Containment Dam (PCD) catchment and groundwater from pit dewatering.
- Scenario B. Condition of Scenario A and water transfer from ED3N and ED3S cells at 1 L/s.
- Scenario C. Condition of Scenario B and groundwater transfer from pit dewatering with concurrent water use by Heron Resources for mineral processing.

The June 2016 modelled assessment suggested that Heron's mining operation may assist Veolia in reducing the water storage requirement for the planned leachate production from 2018 for the next 40 years by using some of the water stored in the dam.

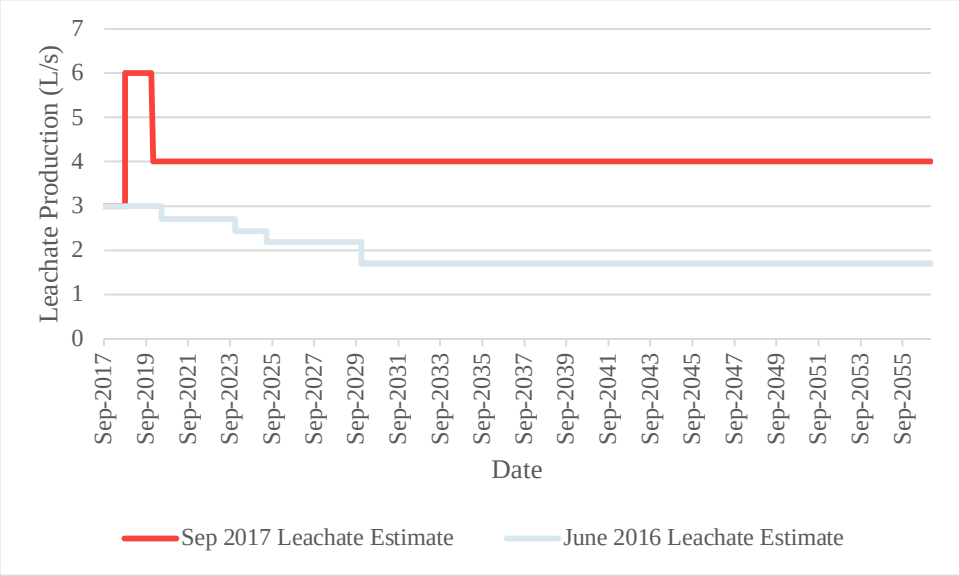


Figure C.1 Comparison of leachate rates between June 2016 and Sep 2017 estimates (source: Veolia)

APPENDIX C
Audit Certification Form

Development Name	Woodlawn Bioreactor Site
Development Consent No.	Project Approval MP 10_0012, as modified
Description of Development	Bioreactor where landfilling and gas extraction is undertaken
Development Address	Collector Road, Tarago, NSW
Operator	Veolia Environmental Services (Australia) Pty Ltd
Operator Address	Collector Road, Tarago, NSW
Title of Audit	Woodlawn Bioreactor LWMS 2020 Independent Audit

I certify that I have undertaken the independent Audit and prepared the contents of the attached independent Audit report and to the best of my knowledge:

The Audit has been undertaken in accordance with relevant approval condition(s) and in accordance with the Auditing standard AS/NZS ISO 19011:2014 and Post Approval Guidelines – Independent Audits

The findings of the Audit are reported truthfully, accurately and completely;

I have exercised due diligence and professional judgement in conducting the Audit;

I have acted professionally, in an unbiased manner and did not allow undue influence to limit or over-ride objectivity in conducting the Audit;

I am not related to any owner or operator of the development as an employer, business partner, employee, sharing a common employer, having a contractual arrangement outside the Audit, spouse, partner, sibling, parent, or child;

I do not have any pecuniary interest in the Audited development, including where there is a reasonable likelihood or expectation of financial gain or loss to me or to a person to whom I am closely related (i.e. immediate family);

Neither I nor my employer have provided consultancy services for the Audited development that were subject to this Audit except as otherwise declared to the lead regulator prior to the Audit; and

I have not accepted, nor intend to accept any inducement, commission, gift or any other benefit (apart from fair payment) from any owner or operator of the development, their employees or any interested party. I have not knowingly allowed, nor intend to allow my colleagues to do so.

Note.

The Independent Audit is an 'environmental Audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an Audit report produced to the Minister in connection with an environmental Audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Signature	
Name of Lead / Principal Auditor	Tracey Ball
Address	10 Kings Road, New Lambton NSW 2305, Australia
Email Address	tball@slrconsulting.com
Auditor Certification (if relevant)	Principal Environmental Auditor
Date:	7 July 2020

APPENDIX D

Endorsement of SLR

Mr Henry Gundry
Veolia Environmental Services (Australia) Pty Ltd
Cnr Unwin and Shirley Streets
ROSEHILL NSW 2142

03/06/2020

Dear Henry

Woodlawn Bioreactor & Leachate Treatment Plant
(MP10_0012)

I refer to your letter dated 28 May 2020 seeking the Secretary's endorsement for an audit team to undertake the Leachate and Water Management System Audit (audit) in accordance with Schedule 4 Condition 18R of Project Approval MP10_0012 for the Woodlawn Bioreactor and Woodlawn Leachate Treatment Plant.

Having considered the qualifications and experience of the SLR Consulting Pty Ltd audit team, namely;

- Tracey Ball – SLR Lead Auditor
- Duncan Barnes – SLR Water Quality Specialist

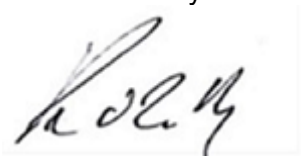
the Secretary endorses the appointment of this team to undertake the audit in accordance with the approval. This approval is conditional on the audit team being independent of the development. The Department reserves the right to request an alternate auditor or audit team for future audits.

Notwithstanding the agreement for the above listed audit team for this Project, each respective project approval or consent requires a request for the agreement to the auditor or audit team be submitted to the Department, for consideration of the Secretary. Each request is reviewed and depending on the complexity of future projects, the suitability of a proposed auditor or audit team will be considered.

Prior to submitting the audit report, it is recommended that Veolia review the report to ensure it complies with the relevant approval condition.

If you wish to discuss the matter further, please contact Jennifer Rowe on (02) 4247 1851.

Yours sincerely



Katrina O'Reilly
Team Leader - Compliance
Compliance

As nominee of the Planning Secretary

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