EFFLUENT MANAGEMENT PLAN

ASHBOURNE – MOSS VALE

INTERIM WASTEWATER TREATMENT SCHEME (IWTS)

For Earth, For Life
Kubota

TRUEWATER COMMUNITY
PEOPLE • WATER • ENVIRONMENT

True Water

True Water provide sustainable sewage and wastewater treatment infrastructure solutions. Our expertise is applied to deliver capital, operational, and environmental benefit to all stakeholders.

True Water's "whole of life" focus results in reliable, versatile, and efficient infrastructure and improved wastewater management within regional and urban landscapes.

Vision

To deliver sewage and wastewater treatment infrastructure that best addresses the interests of current and future generations.

Mission

People. Water. Environment.

Through comprehensive management of wastewater True Water aims to protect the natural environment, safeguard public health, and improve quality of life.

Values

- Satisfy the needs of all stakeholders
- Maintain social and environmental awareness
- Serve future generations
- Enhance and drive innovation
- Be open and transparent

Integrated Environmental Management System (IEMS)

Sewage and water infrastructure requires the implementation of detailed planning, delivery, management, and auditing processes. For infrastructure delivery and operation to be successful it must satisfy stakeholder objectives and provide operational security throughout infrastructure life cycle. Protection of public health and the environment is paramount and neutral or beneficial impact must be secured.

True Water's Integrated Environmental Management System (IEMS) directs and informs all activities throughout the infrastructures lifecycle. The IEMS is a conclusive quality management process specifically designed to deliver stakeholder objectives, secure compliance, and protect public health and the environment. The IEMS includes management plans, polices, and guidelines:

- Environmental Management Policy
- Quality Management Policy
- Quality Management System
- Work Health and Safety Policy
- Safety Management System
- Code of Conduct
- Trade Waste Policy
- Compliance Policy
- Audit Policy
- Human Resources Policy
- Privacy Policy
- Company Operating Procedures
- Effluent Management Plan
- Risk Management Plan
- Health and Environmental Management Plan
- Installation Guideline
- Works Execution Plan - Construction
- Environmental Management Plan - Construction
- Work Health and Safety Management Plan - Construction
- Subcontractor Management Plan
- Commissioning Management Plan
- Works Execution Audit
- Sustainable Management Guideline
- Maintenance and Management Guideline
- Sampling and Testing Guideline
- WWTS Operation and Maintenance Manuals
- WWTS Owner's Manuals

EFFLUENT MANAGEMENT PLAN (EMP)

Site Address:

32 Lovelle Street and 141 Yarrawa Road, Moss Vale, NSW 2571

Lot 3 DP706194 and Lot 12 DP8660366

Client:

Prime Moss Vale Pty Ltd

Suite 30.02, Level 30, 420 George Street, Sydney NSW 2000

Prepared By:

True Water

02 6645 3377

PO Box 351 Maclean NSW 2463

Document Control

Version History

Date	Version	Revision Description	Approved By
15.09.22	EMP-ASHBv1	Draft	Raphaela Janoni
21.10.22	EMP-ASHBv1	Final Draft	James Mahoney
31.10.22	EMP-ASHBv1	Review	Angela Villate & Michael Gordon
07.11.22	EMP-ASHBv2	Draft Review	James Mahoney

INTERIM WASTEWATER TREATMENT SCHEME DESCRIPTION

Ashbourne is a master planned residential development located on the southern edge of the township of Moss Vale in the Southern Highlands of NSW. The greenfield site is not currently serviced by the municipal sewerage network. Until the capacity of the Moss Vale Sewage Treatment Plant is increased, the local water utility *(Wingecarribee Shire Council (WSC))* cannot provide permanent sewer service to the site.

To facilitate project commencement the developer, Prime Moss Vale Pty Ltd consulted with WSC. It was agreed an Interim Wastewater Treatment Scheme (IWTS) dispersing effluent wholly onsite would be a suitable interim wastewater servicing solution to service Stage 1 of the development (178 Lots). The IWTS is expected to operate for a maximum period of three years.

As part of the interim servicing strategy, municipal infrastructure will be delivered by Prime Moss Vale Pty Ltd, including; the reticulated sewer main, the catchments' sewer pump station, and new sewer rising main connecting the pump station to the existing municipal reticulated network. As the municipal network is at capacity, wastewater will be pumped from the pump station to the Interim Wastewater Treatment Plant (IWTP) and Effluent Dispersal System (EDS). Once the Moss Vale Sewage Treatment Plant is upgraded, wastewater will be redirected to the new rising main and to the municipal network, and the IWTS will be decommissioned.

Local government approvals have been acquired for the reticulated sewerage network, the sewage pump station including emergency storage, as well as the IWTS. Additionally, the IWTS requires a Network Operators Licence under the WIC Act. The licensed Independent Water Utility (IWU) will be True Water DTR Pty Ltd.

Executive Summary

Site Address	141 Yarrawa Road & 32 Lovelle Street, Moss Vale NSW 2571
Lot and Plan	Lot 3 DP 706194 and Lot 12 DP 866036
Local Government Authority	Wingecarribee Shire Council (WSC)
Owners/Developer	Prime Moss Vale Pty Ltd (PMV)
Contact Point	[redacted]
Contact Number	[redacted]
Block Size	Approximately 125.7 hectares
Boundaries	Yarrawa Road, Lovelle Street, Moss Vale Golf Course and other urban and rural land zoned lots.
Potable Water Supply	Wingecarribee Reservoir and Bundanoon Reservoir
Municipal Sewer Connection	Moss Vale STP at capacity and being upgraded, municipal connection expected 2026.
Network Operator Licensee (IWU)	True Water DTR Pty Ltd
Expected Interim Period	3 years
Influent Volume	Average Dry Weather Flow (ADWF) = 76,896Litres/day Peak Dry Weather Flow (PDWF) = 112,140Litres/day
Effluent Standard	Class B
Wet Weather Storage Volume	4.1 Megalitres *(greater than 10 days @ 5 x ADWF)*
Effluent Dispersal System	Spray Irrigation (9.68ha) – *Conditional DA acquired*
Effluent Irrigation Rate	<1mm/m^2/day

The Site

The site consists of separate and adjoining allotments comprising a total area of 125.7 hectares. The legal description of the site is Lot 3 in DP 706194 (No 32 Lovelle Street) and Lot 12 in DP 866036 (No 141 Yarrawa Road). The site is bordered by Yarrawa Road, Lovelle Street, Moss Vale Golf Course and other urban and rural land zoned lots. Currently the site is pastoral land, with a dwelling on each of the existing lots.

There is sufficient unconstrained land for sustainable site-specific wastewater management which achieves required offsets to environmental features and property boundaries, as required by legislation and guidelines.

Interim Scheme Purpose

The purpose of the Interim Scheme is to provide a sewer service to the site until the capacity of the Moss Vale Sewage Treatment Plant is increased, and permanent discharge to the municipal network is available.

Interim Scheme Timeline

Commencement of the Interim Scheme will coincide with the occupation of the first new dwelling and is expected to be late 2024. Completion of the Moss Vale Sewage Treatment Plant permanent upgrade is expected in mid to late 2025. Considering progress to date, it is likely municipal service will not be available until a later date. Therefore, to address uncertainty and ensure the Interim Scheme is suitably funded, financial planning allows for a five-year interim period, (December 2029).

Interim Scheme Summary

The Interim Scheme is an effluent dispersal scheme.

All wastewater will be captured within the WSC approved reticulated sewerage network and conveyed to the ultimate sewage pump station. The ultimate sewage pump station shall be utilised to regulate flows and concentrations. Wastewater will be transferred via a rising main to the Interim Wastewater Treatment Plant (IWTP) for treatment. Treated effluent will be dispersed via spray irrigation at a rate of less than 1mm/m^2/day within the nominated and DA approved Effluent Dispersal Area (EDA).

The Interim Scheme is not a recycled water scheme and is not an effluent reuse scheme. Treated effluent dispersal will have no secondary use, and there will be no crop irrigation or agricultural use. The purpose is solely effluent dispersal.

Interim Scheme Infrastructure

The Interim Scheme will service Stage 1 of the greenfield development and consist of seven infrastructure components.

- Municipal reticulated sewerage network,
- Municipal sewer pump station and emergency storage,
- Municipal sewer main connecting the sewer pump station and existing municipal network,
- Interim rising main from the ultimate sewer pump station to the IWTP,
- Interim Wastewater Treatment Plant (IWTP),
- Interim influent and effluent storages,
- Interim Effluent Dispersal System (EDS).

On completion of the interim period, ownership of the three municipal components will be transferred to the local water utility, and the four interim components will be decommissioned.

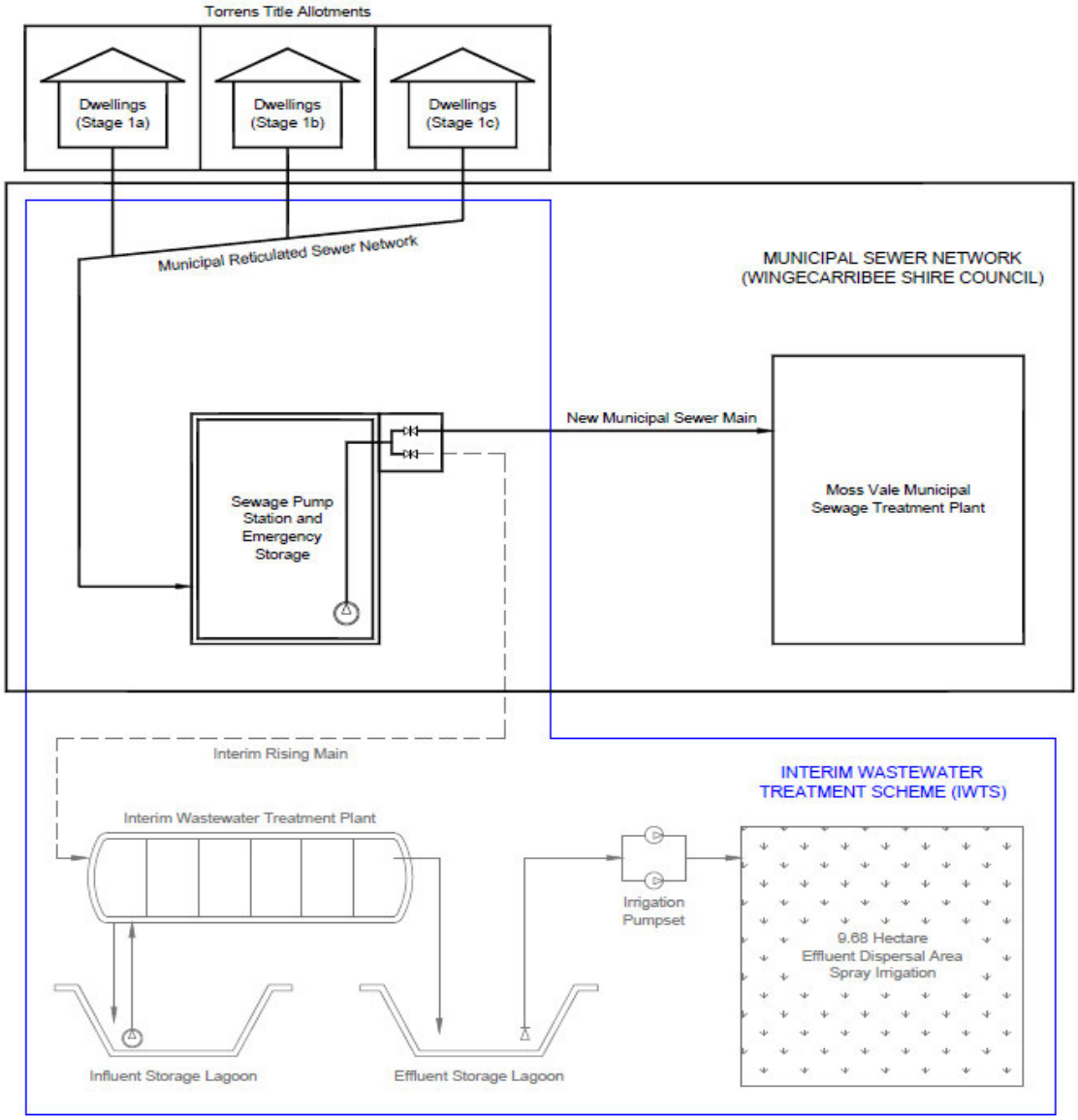

Figure 2.1 - Summary of Interim Infrastructure and future municipal network

Municipal Reticulated Sewerage Network

The approval, construction, testing, and commisioning of the reticulated sewerage network will follow established business as usual processes. Once the interim period is complete the reticulated sewerage network will be transferred to the Local Water Utility and form part of the municipal network. The DA Determination for the reticulated sewerage network to service stage one of the development has been aquired from WSC and is included within the submission.

Municipal Sewer Pump Station and Emergency Storage

The approval, construction, testing, and commisioning of the sewage pump station including emergency storage will follow estabilshed business as usual proceeses. Once the interim period is complete, the sewage pump station including emergency storage will be transferred to the Local Water Utility and form part of the municipal network. The sewage pump station including emergency storage is designed to service the entire lot yeild of 1,073 lots and will be installed and commissioned prior to the release of Stage 1. The DA Determination approval for the ultimate sewage pump station including emergency storage has been granted by WSC and is included within the submission.

Municipal sewer main connecting the sewer pump station and existing municipal network,

The municipal sewer main connecting the sewer pump station to the existing municipal network will be installed, tested and transferred to the local water utility prior to the release of the Stage 1 lots. Connection of the sewer pump station to the existing municipal network provides a contingency failsafe and aids in mitigating risk.

Interim - rising main from the ultimate sewer pump station to the IWTP

The Rising main from the ultimate sewer pump station will be constructed, installed and marked as per municipal standards and relevant guidelines and codes.

Interim - Wastewater Treatment Plant (IWTP)

The IWTP will be a Kubota biological WWTP providing Class B treatment with a nominal treatment capacity of 110kL/day and a peak treatment capacity of 137.5kL/day. The IWTP will be installed below ground and include sealed gas tight lids. Below ground installation provides favourable amenity and limits visual impact, noise, and odour. Air emissions shall be filtered through carbon filtration to prevent odour. The IWTP will be designed and constructed to provide a minimum 30-year operational life. The location of the IWTP will be as per the DA determination. The DA Determination for the reticulated sewerage network to service stage one of the development has been granted by WSC and is included within the submission.

Interim - Influent and Effluent Storage,

To ensure extreme wet weather events are suitably managed influent and effluent storage will provide 4.1Megalitres of storage, which is greater than 10 days peak wet weather flow storage.

Interim - Effluent Dispersal System

The Setion 68 approved effluent dispersal system is a 9.68 hectare spray irrigation system located to achieve suitable buffers and offsets to environmental features and property boundaries as required by legislation, guidelines, and codes. Daily Water Balance Modelling utilising 50 years of SILO weather data has been completed utilising [redacted] An extremely conservative approach to effluent dispersal will be employed. Treated effluent will be dispersed via spray irrigation at a rate of less than 1mm/m^2/day within the nominated effluent dispersal area.

Independent Water Utility Funding

As the interim wastewater scheme is a temporary measure, [redacted] There will be no charges, levies, or fees to the property owner pertaining to the delivery or operation of the IWU. [redacted]

Independent Water Utility Operation

A network operators licence ensures IWU operation and management of the temporary wastewater infrastructure is in accordance with legislative and regulatory requirements. Operation and management will be in accordance with the IWU's Integrated Environmental Management System (Attachment *B.1.*) and Strategic Asset Management Policy (Attachment *B.5.*).

The IWU applicant is certified under ISO standards; 9001:2015, 14001:2015, and 45001:2018 for the *"Provision of wastewater and sewage treatment technologies to Australia and the Pacific. Services include consultancy, delivery, project management, engineering, asset management (servicing and maintenance) and operation (remote monitoring and response)."*

Contents

1 Introduction

This Effluent Management Plan (EMP) for the Ashbourne – Interim Wastewater Treatment Scheme (IWTS) has been developed on behalf of the Developer, Prime Moss Vale Pty Ltd (PMV). The EMP forms part of the Integrated Environmental Management System (IEMS) which manages and mitigates risks arising from the treatment and dispersal of wastewater generated by the development.

The site is not currently serviced by a municipal sewerage network with the delivery horizon for municipal sewerage being approximately 3 years. An IWTS is required to treat and manage wastewater generated by the development wholly within the site.

To protect public health and the environment, a reliable and compliant IWTS must service the development. Although the interim period is a maximum of 5 years, all wastewater infrastructure will be designed to deliver a 50-year life cycle and deliver beneficial outcomes when assessed from an economic, environmental, and social viewpoint.

The IWTS will employ Best Available Technique and Technology (BATT) for the site-specific management of wastewater. Environmental factors, public health, and work health and safety are considered as part the safety in design process in order to deliver infrastructure which fulfills compliance requirements and satisfies stakeholder objectives.

1.1 Purpose

The purpose of the EMP is to assess the site and its environmental factors and identify any potential constraint to site-specific wastewater management. The EMP estimates wastewater flow generated by the activity and details the most suitable method to sustainably manage wastewater wholly within the property boundaries.

1.2 Objective

The EMP is an important management tool, which will provide reasonable and practicable steps to deliver best practice operational measures and satisfy environmental duty of care. Specifically, the objective of the EMP is:

- Ensure all wastewater is safely and sustainably managed wholly within the boundaries of the site,
- Deliver public health and environmental security,
- Prevent negative impact to environmental health,
- Prevent negative impact to public health,
- Drive improvements in infrastructure management and operation,
- Safeguard water systems,
- Prevent land or soil degradation,
- Enhance conservation measures within both the development area and the surrounding environment.

1.3 Scope

The EMP is one of several management plans within the **Integrated Environmental Management System (IEMS)** which considers risk and constraints and provides mitigation or management measures. The scope of this EMP is:

- Identify site specific constraints, hazards, risks and challenges,
- Identify environmental constraints, hazards and risks,
- Confirm environmental values,
- Consider potential impacts,
- Develop appropriate mitigation measures,
- Negate environmental impacts with the aim to achieve neutral or beneficial outcomes,

- Negate impacts to public health,
- Aid in water cycle management,
- Aid conservation measures within both the development area and the surrounding environment,
- Facilitate the sustainable dispersal of effluent.

The EMP is an important management tool which provides reasonable and practicable steps to deliver a sustainable wastewater solution to the proposed development. This EMP is an operational document which will be updated to reflect the operating conditions, the performance of the IWTS, and the recommendations of operational audits.

1.4 Legislation and Regulation

Local government approvals have been acquired for the reticulated sewerage network, the ultimate sewage pump station including emergency storage, as well as the interim wastewater treatment system. Additionally, a Network Operators Licence is required and must be issued by the Independent Pricing and Regulatory Tribunals (IPART) under the WIC Act. The licensed Network Operators will be True Water DTR Pty Ltd.

1.5 True Water – Independent Water Utility Applicant

True Water is a “whole of life cycle” wastewater management specialist. True Water specialise in the design, delivery, and operation of small to large scale site specific WWTS’s and small scale municipal WWTS’s. Our whole of life experience informs infrastructure design, providing scalable wastewater treatment systems that satisfy utility specification and provide long term operational security. True Water’s experience includes:

- Acquisition of >2,000 local and state government approvals for site-specific WWTSs, including WWTSs servicing up to 4,000EP,
- Delivery of >1,500 WWTSs throughout Australia and the Pacific including single WWTSs servicing 5,000EP,
- Management of WWTSs for federal, state, and local government and multinationals throughout Australia and the Pacific.

2 Project Overview

Ashbourne is a master planned, greenfield residential development on the southern edge of Moss Vale. The site will be developed in stages and will ultimately consist of approximately 1,073 allotments. The site is 125.7 hectares, irregularly shaped, and bordered by Yarrawarra Road, Lovelle Street, Moss Vale Golf Course, and other urban and rural land zoned lots. The site is not currently serviced by the municipal sewerage network and until the capacity of the Moss Vale Sewage Treatment Plant is increased, the local water utility, Wingecarribee Shire Council (WSC), cannot provide permanent sewer service.

To facilitate project commencement Prime Moss Vale Pty Ltd (PMV) consulted with WSC. It was agreed an Interim Wastewater Treatment Scheme (IWTS) would be a suitable interim sewage servicing solution.

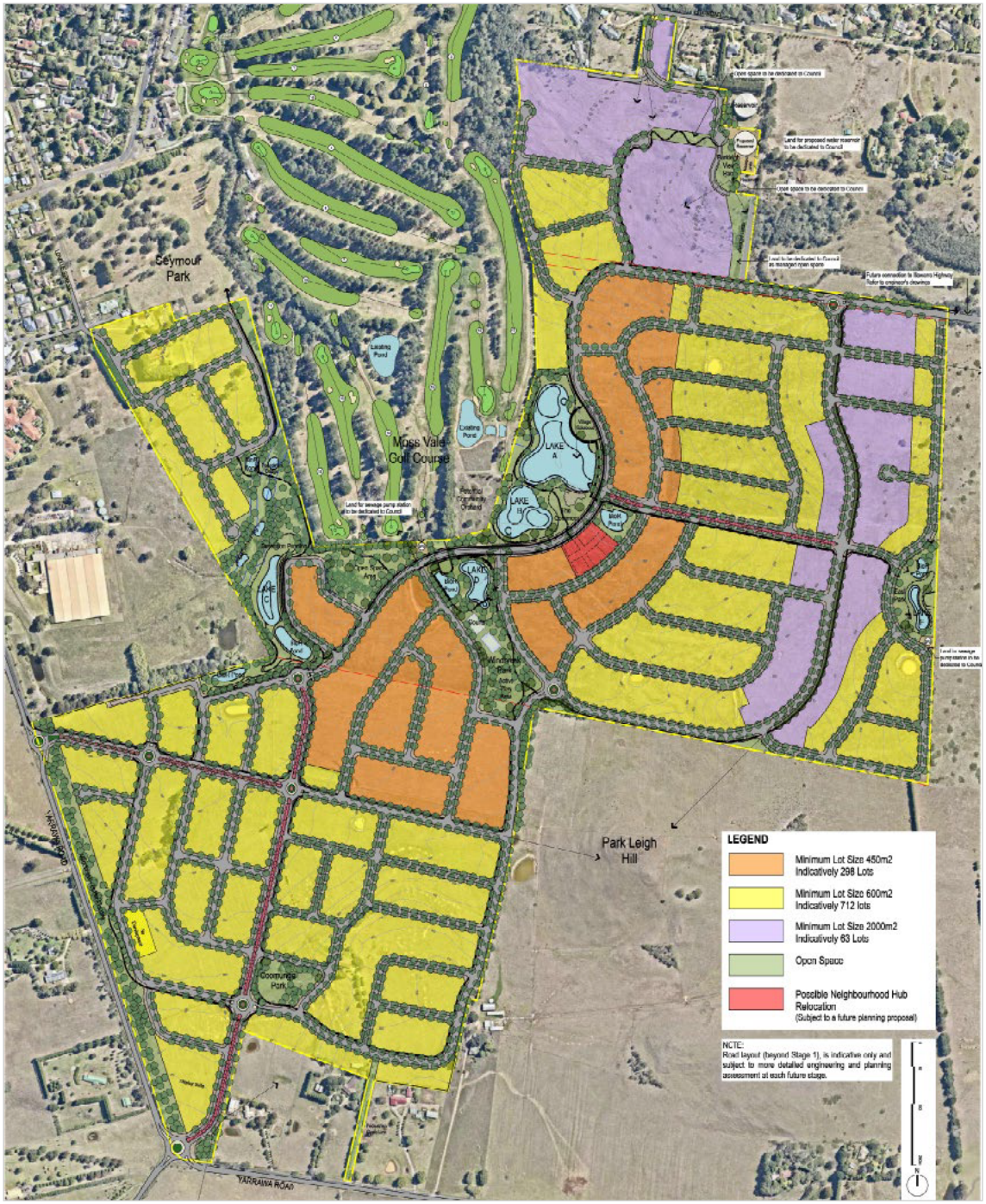

Figure 2.1 - Ashbourne – Moss Vale development Master Plan
(Development Consent approved by Wingecarribee Shire Council on 14/06/2022)

2.1 Interim Wastewater Treatment Scheme (IWTS)

All wastewater will be captured within the reticulated sewerage network and conveyed to the ultimate sewage pump station. The ultimate pump station shall be utilised to even flows and concentrations. Wastewater will be transferred via a rising main to the IWTS for treatment. Various treatment and dispersal options have been assessed, the most viable and responsible servicing option is a Kubota Wastewater Treatment Plant (WWTP) and effluent dispersal via spray irrigation.

The Kubota WWTP will have a nominal treatment capacity of 110,000 L/day and a peak treatment capacity of 137.5k L/day. Effluent dispersal shall be via spray irrigation. A maximum dispersal rate of 1mm/m^2/day shall be adopted. To ensure wet weather events are suitably managed, influent and effluent storage will provide ten days wet weather storage.

Lot 12 DP866036 is the approved location for the IWTS. Siting of all infrastructure components will be as per approvals and will ensure suitable buffers and offsets to dwellings and property boundaries and environmental features.

2.2 Influent and Effluent Limits

An assessment of influent concentrations is attached as *Appendix D - Influent Quality Concentrations - Worley Parsons (2016)*. The design parameters for the IWTP include a safety factor and are outlined within *Table 2.1.* Effluent from the IWTP will conform to effluent quality limits outlined in *Table 2.1.*

Table 2.1- Influent and effluent release limits

Quality Characteristic	**Influent**	**Effluent**
Average Dry Weather Flow (L/day)	76,896	
Peak Dry Weather Flow (L/day)	112,140	
5 day BOD (mg/L)	100 - 450	<20
Suspended Solids (mg/L)	100 - 400	<30
pH (pH units)	6 – 8	6 - 8
Free Residual Chlorine (mg/L)	-	<2
E.coli (cfu/100mL)	-	<100
Total Nitrogen (mg/L)	50 - 100	<30
Total Phosphorus (mg/L)	10 - 25	<10

The interim wastewater scheme is an effluent dispersal scheme.

The interim scheme is not a recycled water scheme and is not an effluent reuse scheme. Treated effluent dispersal will have no secondary use, and there will be no crop irrigation or agricultural use, the purpose is solely effluent dispersal.

3 Subject Site

The site consists of two separate and adjoining allotments comprising a total area of 125.7 hectares (Lot 3 , DP 706194, No 32 Lovelle Street and Lot 12, DP 8660366, No 141 Yarrawa Road). The site is bordered by Yarrawarra Road, Lovelle Street, Moss Vale Golf Course and other urban and rural land zoned lots.

The site is located within the South-eastern Highlands Bioregion. The bioregion covers the dissected ranges and plateau of the Great Dividing Range and extends to the Great Escarpment in the east and to the western slopes of the inland drainage basins.

The land has been extensively cleared and used as pasture fields for cattle. Native vegetation consist of regrowth and the site has little to no environmental conservation value. Site assessment identified clay soils and undulating slopes of up to 10%. Generally, surface water flows within the area will be shed from the gentle undulating slopes towards several gullies and drainage corridors.

3.1 Climate

Bureau of Meteorology average rainfall and evaporation records from sites close to Ashbourne - Moss Vale development indicate that the region has a warm temperate climate, with warm summers and mild winters. The nearest available average rainfall data is from Moss Vale AWS Station 068239 (5km from site). The nearest evaporation data is from Goulburn Tafe Station 070263 (65km from site).

Table 3.1 – Mean rainfall (Moss Vale AWS – Station 068239), mean evaporation (Goulburn Tafe – Station 070263)

Climate (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Rainfall	55.1	101.1	55.4	37.8	33.3	54.8	31	33.1	30.9	49.1	59.4	56	**597**
Mean Evaporation	192.2	145.6	120.9	75	49.6	33	37.2	58.9	84	120.9	147	186	**1250.3**
Deficit	-137.1	-44.5	-65.5	-37.2	-16.3	21.8	-6.2	-25 8	-53.1	-71.8	-87.6	-130	**-653.3**

The highest recorded annual rainfall since 2002 from Moss Vale AWS Station 068239 was 1186mm in 2020. The average annual rainfall recorded in the last five years (2017–2021) was 755mm. The annual mean rainfall is 597mm per annum. The mean evaporation rate is 1250mm per annum. Mean evaporation is 653mm greater than mean rainfall.

3.2 Lot Parcels

Figure 3.1 – Ashbourne - Moss Vale development Lot 12 DP866036 satellite imagery (NSW Six Maps 2022)

Figure 3.2 – Ashbourne - Moss Vale development Lot 3 DP706194 satellite imagery (NSW Six Maps 2022)

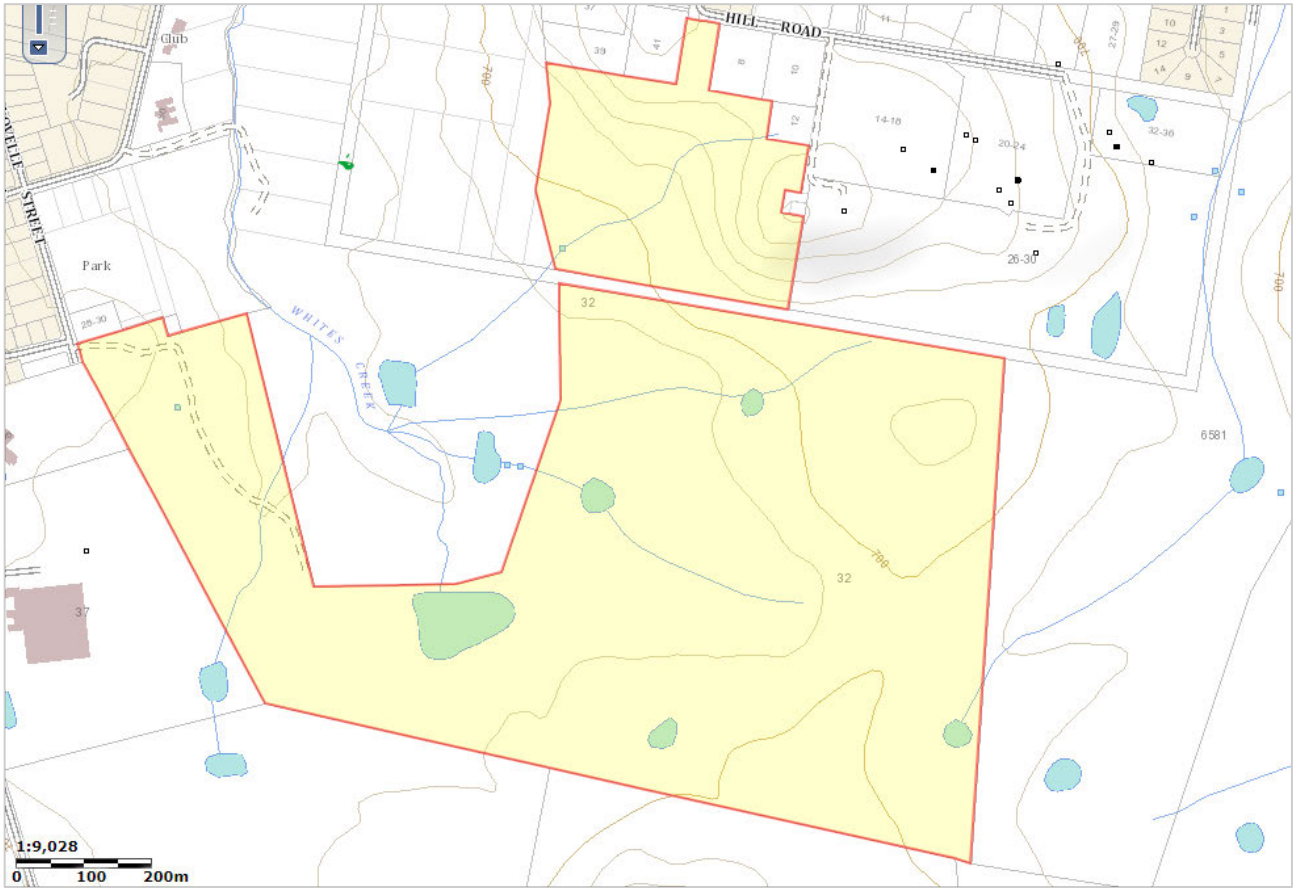

Figure 3.3 – Ashbourne - Moss Vale development Lot 12 DP866036 map (NSW Six Maps 2022)

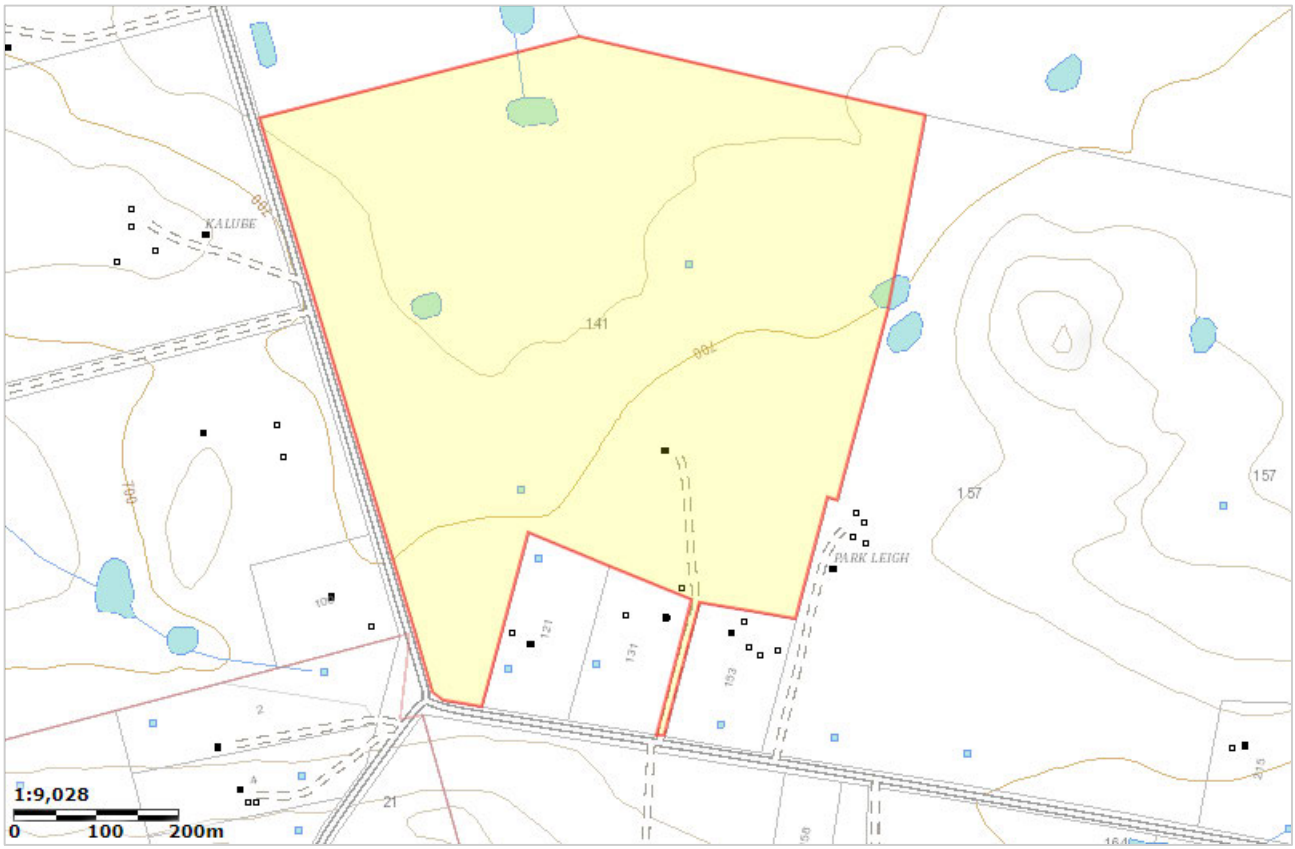

Figure 3.4 - Ashbourne - Moss Vale development Lot 3 DP706194 map (NSW Six Maps 2022)

4 Review of Environmental Factors

Multiple assessments and reports have been undertaken by various consultants to identify and document environmental factors and confirm environmental values. This section directly references reports completed by various consultants and provides a summary of relevant information.

4.1 Flooding

As per *Figure 4.1* Wingecarribee Shire Council's '*Whites Creek Flood Study (2007)',* there is a low risk of flooding over the site and specifically the area nominated for effluent dispersal.

Figure 4.1 - Wingecarribee Shire Council's 'Whites Creek Flood Study (2007)

4.2 Stormwater Management

The *Statement of Environmental Effects (Urbis 2020)* is provided within the submission package and details the stormwater management and drainage works proposed within Stage 1, include the reshaping and revegetation of Whites Creek to improve flooding behaviour both within the site and downstream towards Moss Vale township and enhance the environmental and ecological value of the creek.

Proposed riparian corridor works within the Whites Creek area are shown *Figure 4.2* and include the adoption of a pool and riffle system, designed to provide passive floodplain storage, and contain floodwaters within the subject site via the defined watercourse.

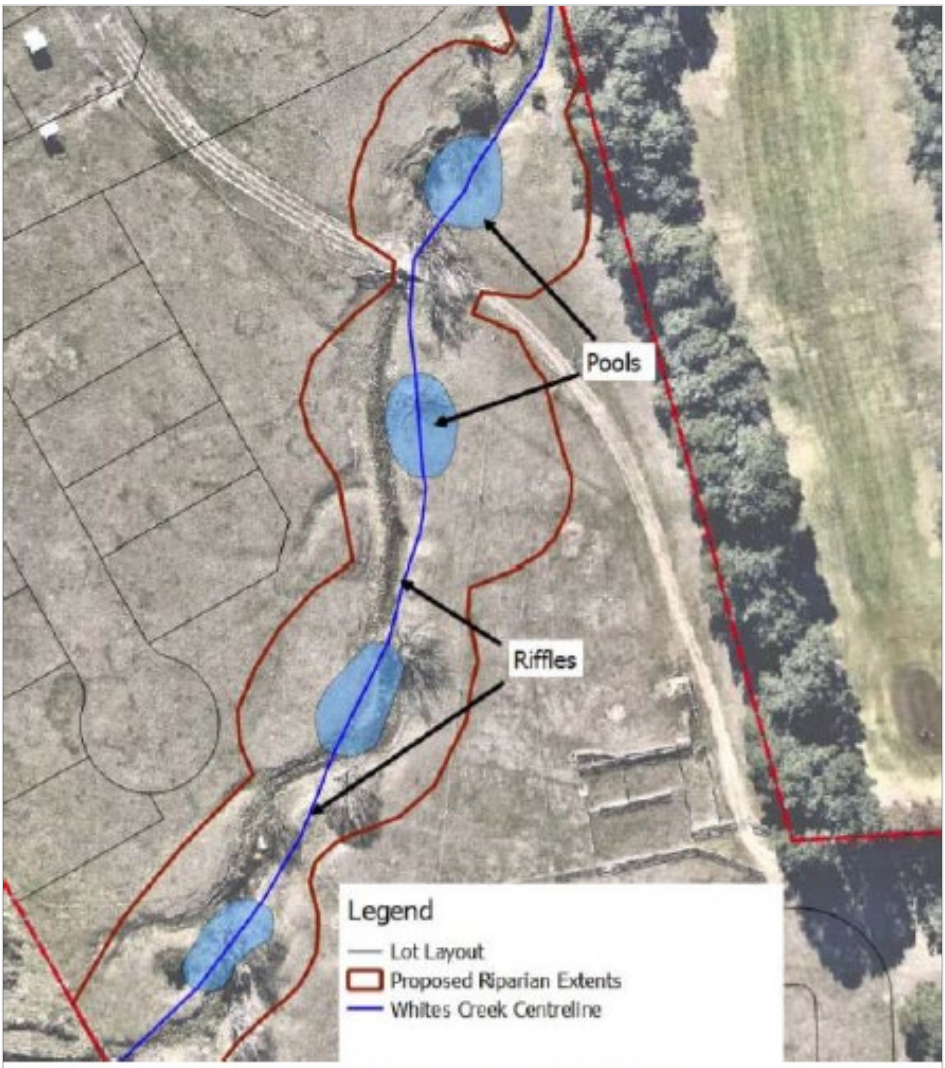

Figure 4.2 - Ashbourne – Proposed riparian corridor, as per Statement of Environmental Effects – Urbis (2020)

4.3 Riparian Zones

The *Statement of Environmental Effects (Urbis 2020)* identified the site contains riparian corridors (first order watercourses under the Strahler system) that form tributaries to Whites Creek. However, the riparian corridors contain no significant vegetation. Figure 4.2 details how the riparian corridor will be revegetated to 10 metres from the top of bank as per the *Guidelines for Controlled Activities on Waterfront Lands (2018).* These revegetation works will be completed in accordance with the landscape design prepared by Arterra and outlined in Section 5.3.6 of the Statement of Environmental Effects.

4.4 Geology and Soil

The *Land Capability Assessment – SEEC (2020),* is provided within the submission package and details nine test pits excavated by SEEC within the site and within the subject area. All nine test pits revealed relatively consistent soil conditions across the site. A summary of the nine test pits follows:

Test Pit	Depth (mm)	Indicative permeability
1	0-350	Strongly pedal, greyish brown, silty clay loam topsoil; 35-40 mm ribbon.
	350-1,200+	Strongly pedal, light brown, light/medium clay; 75-80 mm ribbon. Minor mottling from 700 mm.
2	0-100	Strongly pedal, dark brown, silty clay loam topsoil; 35-40 mm ribbon.
	100-400	Strongly pedal, greyish brown, silty clay loam topsoil; 35-40 mm ribbon.
	400-1,200+	Strongly pedal, light brown, light/medium clay; 75-80 mm ribbon.
3	0-500	Strongly pedal, brown sandy loam to sandy clay loam topsoil;. 25-30 mm ribbon.
	500-780	Moderately pedal, fine sandy clay loam; 30-35 mm ribbon. 10% coarse fragments.
	780-1,200	Slightly mottled orange brown sandy clay loam; 40-45 mm ribbon.
4	0-300	Strongly pedal, dark brown clay loam topsoil; 40 mm ribbon.
	300-600	Strongly pedal, light brown light clay; 50 mm ribbon.
	600-1,100+	Moderately pedal, light brown light/medium clay; 70-80 mm ribbon. Minor mottling from 1,000+ mm.
5	0-400	Strongly pedal, dark brown silty clay loam topsoil; 30 mm ribbon.
	400-600	Strongly pedal, light brown light clay; 60-65 mm ribbon.
	600-1,100	Moderately pedal, slightly mottled medium clay. Refusal at 1,100mm on rock.
6	0-300	Strongly pedal, dark brown clay loam topsoil; 40 mm ribbon.
	300-600+	Strongly pedal light brown light/medium clay; 75 mm ribbon.
7	0-300	Strongly pedal dark brown clay loam topsoil; 30 mm ribbon.
	300-500	Strongly pedal greyish brown silty clay loam; 35 mm ribbon.
	500-1,000	Moderately pedal light brown light clay. Refusal on rock at 1,000mm.
8	0-350	Strongly pedal greyish brown silty clay loam topsoil; 35-40 mm ribbon.
	350-1,200+	Strongly pedal light brown light/medium clay; 75-80 mm ribbon. Minor mottling from 700 mm.
9	0-100	Strongly pedal dark brown silty clay loam topsoil; 35-40 mm ribbon.
	100-400	Strongly pedal greyish brown silty clay loam topsoil; 35-40 mm ribbon.
	400-1,200+	Strongly pedal light brown light/medium clay; 75-80 mm ribbon.

As per the *Land Capability Assessment – SEEC (2020),* the site has moderate infiltration capacity due to the strongly pedal topsoil and Category 5 light clay overlying Category 6 medium to heavy clay. Site inspection identified minor evidence of potential periodic waterlogging in the subsoil. The shallowest instance of mottling occurred at a depth of 700 mm. Two geotechnical investigations were completed and are provided within the submission package, *Geotechnical Investigation 1 & 2, Douglas Partners (2020)*. The geotechnical investigations confirm the *SEEC* soil assessment.

4.5 Groundwater

The *Land Capability Assessment – SEEC (2020)*, found no evidence of ground water ingress into any of the nine test pits to a depth of 1200mm. The geotechnical investigations completed by Douglas Partners included a series of test pits and boreholes throughout the subject site. Test pits ranged in depth from 1 metre to 2.5 metres and no groundwater was encountered in the test pits throughout the site. Boreholes were excavated to a greater depth, with several boreholes in low lying land to northwest of the subject area reporting ground water at a depth ranging from 2.2 - 7.0 metres.

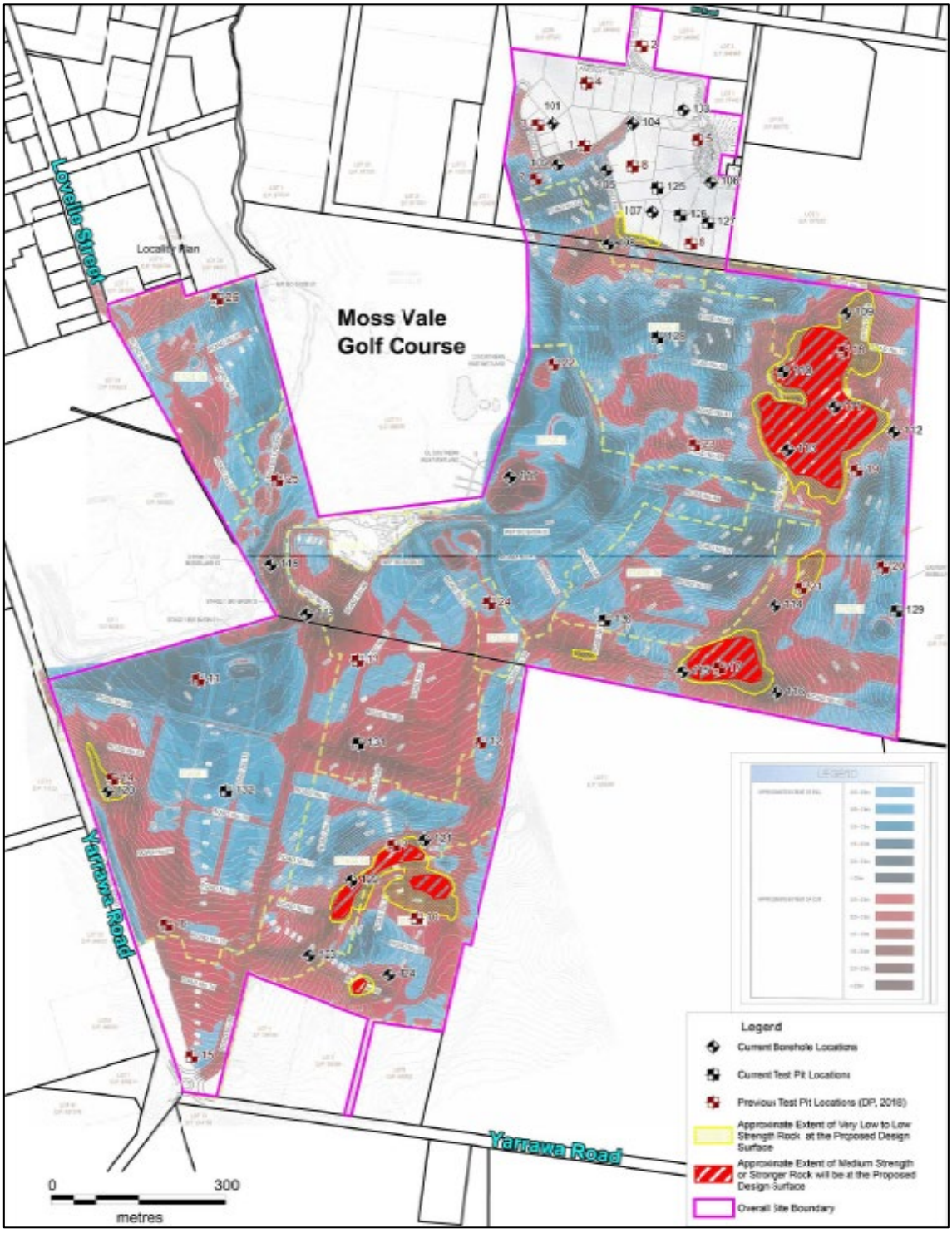

Figure 4.3 – Teste Pits from Geotechnical Investigation 1 & 2, Douglas Partners (2020)

4.6 Groundwater Bores

Groundwater data extracted from Water NSW and Miniview identified four boreholes within properties neighbouring the site (GW012983, GW100812, GW072790 and GW106235). Each groundwater bore is located greater than 130m from the site boundaries, with the closest groundwater bore being more than 450 metres from the nominated and approved effluent dispersal area.

Figure 4.4 - Ashbourne - Moss Vale development - Location of boreholes in relation to the site (Miniview)

4.7 Topography and Surface Drainage

The sites topography consists of gently undulating slopes of up to 10%. Generally, surface water flows within the area will be shed from the gentle undulating slopes towards several gullies and drainage corridors.

Site investigation identified minor erosion within drainage depressions on the site, (*see Figure 4.1).* Although the irrigation rate will be less the 1mm/m^2/day, to mitigate any risk of irrigation contributing to erosion, a 40metre buffer/setback shall be applied. The 40metre setback shall be applied from the interim irrigation system to any drainage feature, drainage depression or gully.

4.8 Cultural Heritage

An Aboriginal Cultural Heritage Assessment has been completed and is provided within the submission package, Aboriginal Cultural Heritage Assessment *(Biosis 2019).* Conditional Development Consent was issued by Wingecarribee Shire Council on 14/06/2022.

5 Land Capability – Effluent Dispersal

Utilising information documented within various assessments and reports, the land capability summary confirms environmental factors and assigns a level of risk.

Table 5.1 – Land Capability Summary - Site and Soil Constraint Assessment

Site or Soil Constraint	Assessment of Possible Constraint	Level of Risk	Mitigation Measures
Small lot size	Site is 125.7ha, effluent dispersal area is available	Low	N/A
Steep slope	Slopes of 0 – 10%	Low	N/A
Slope instability	Slopes of 0 – 10%	Low	N/A
Geology	No major discontinuities	Low	N/A
Shallow soil	Soil depth greater than 1m	Low	N/A
Very shallow soil over bedrock	Soil depth greater than 1m	Low	N/A
Seasonal waterlogging over perched water tables	Site has moderate infiltration capacity	Low	N/A
Shallow permanent water table	Test pits - no groundwater observed to 1.2m	Low	N/A
Groundwater quality risk (cat. 1 & 2)	Category 5 overlying category 6 clay soils	Low	N/A
Soils with low permeability (cat. 6)	Category 5 topsoils	Low	N/A
Dispersive or sodic soils	Not identified	Low	N/A
Acid sulfate soils	Not identified	Low	N/A
Soil salinity	Electrical conductivity indicates the long-term effluent dispersal may impact salinity	Moderate	See *Section 5.2*
Susceptible ecological area or downslope water bodies	Site surrounded by roadways and urban and land zoned lots, low ecological value.	Low	N/A
Highly disturbed area or fill	Not identified	Low	N/A
Waterway / gully	Gullies and farm dams within the site	Low	N/A
Registered bores	Located >130m from site boundaries	Low	N/A
Climate data (Bureau of Meteorology)	Mean Rainfall 597mm, Evaporation 1250mm Mean temperatures: Max 20.3 – 41.2˚C, Min 5.1 – 14.3˚C	Low	N/A
Cold or wet climate	Mean evaporation >1000mm/year	Low	N/A
Hot or dry climate	90th percentile >1,000mm/year	Low	N/A
Potential for flooding	Proposed riparian corridor works designed to provide passive floodplain storage and contain floodwaters	Moderate	See *Section 5.2*

5.1 Potential Risk Constraints

Risk assessment identified potential risks to wastewater management as:

- pH - low pH 5 identified. Potential salinity risk from the dispersal of poorly treated effluent or a long-term effluent dispersal scheme.
- Potential for Flooding -

5.2 Mitigation Measures

The above risks / constraints are best mitigated by:

- High quality effluent. (Class B / Advanced Secondary Treatment),
- Conservative effluent dispersal rates (Design Irrigation Rates/DIR),
- Earthworks and soil amelioration to improve soil pH,
- Appropriate stormwater management.

6 Design Flows

The Wingecarribee Local Housing Strategy, *Housing Our Community, Wingecarribee Shire Council, June 2020,* states the average effective tenancy for the shire is 2.39 people per household (2.39ET). For the purpose of sizing the IWTS, two flow scenarios will be considered:

- Average Dry Weather Flow (ADWF) = 2.4Ep x 180L/Ep
- Peak Dry Weather Flow (PDWF) = 3.5Ep x 180L/Ep

For the purpose of modelling and water balance the annual average flow will be calculated:

- Annual Average Flow (AAF) = 2.9Ep x 180L/Ep

Table 6.1 - Flow Calculations

Flow Scenario	Effective Tenancy	Total EP 178 Dwellings	Total Daily Flow at 180L/Ep (L/day)
ADWF	2.4	427.2	76,896
AAF	2.9	516.2	92,916
PDWF	3.5	623	112,140

6.1 Peak Wet Weather Flow

As the reticulated sewerage network will be transfer to the municipal utility, the reticulated sewerage network will be designed, constructed, tested, and commissioned following established business as usual processes and standard local governement and utility approvals. As the reticulated sewerage network will use Best Available Techniques and Technologies (BATT) and is within a greenfield site, wet weather ingress should be largely prevented. However, for the purpose of sizing wet weather storages PWDF shall equal five times ADWF.

- The Peak Wet Weather Flow is 384,480L/day.

7 Wastewater Management System

Wastewater treatment will be provided by a Kubota Johkasou (self-contained purification system). Kubota Wastewater Treatment Plants (WWTPs) have been developed and manufactured in Japan for many decades. Over 10 million Johkasou have been produced in the last 40 years.

The competitive nature of the Japanese market has driven research and development to provide ever smaller, more economical, environmentally friendly, and sustainable effluent treatment solutions. The Kubota WWTP specified for this site has been chosen for several reasons:

- Kubota is a global industry leader, Johkasou are mass manufactured under strict quality controls, and all plants conform with internationally recognised ISO standards, ensuring guaranteed outcomes,
- Kubota Johkasou provide surety of installation, commissioning, operation and treatment quality, due to millions of past installations and ISO Accreditations,
- Unlike many custom built WWTPs (referred to in Australia as Packaged Plants), mass produced Johkasou have a long history of successful operation.

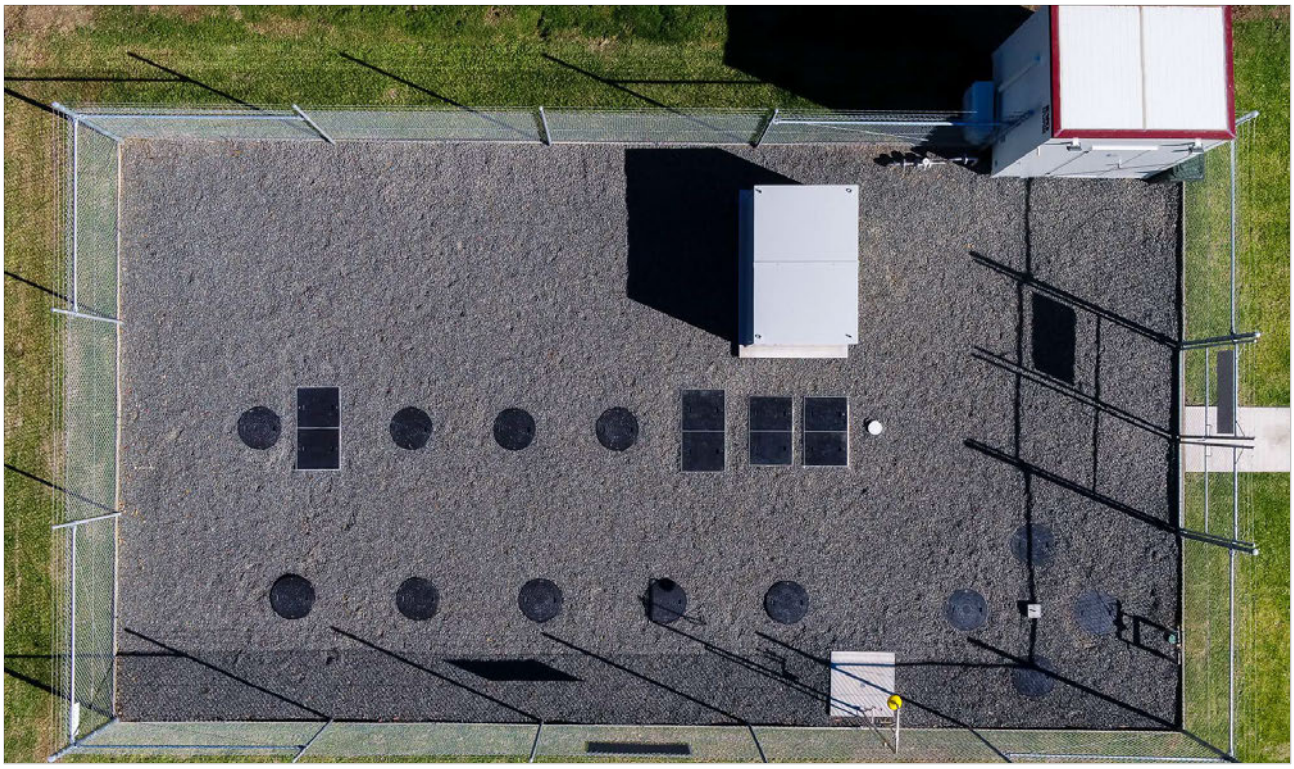

Figure 7.1 - 40kL Kubota WWTP for Water Utility within fenced compound

7.1 Treatment Process

The Kubota WWTP employs a highly refined Media Bed Biofilm Reactor (MBBR) treatment process. MBBR treatment is reliable and efficient while limiting mechanisation and power consumption. The Kubota MBBR process consists of various chambers, each with a separate type of specialised plastic carriers (media). Each carrier is designed to target specific types of microorganism, grow specific types of biofilms, and provide biological filtration of wastewater. Each chamber and carrier/media undertake a specific role in the removal of contaminants from the wastewater stream.

Biofilm processes require less space, less power, and less mechanisation than other treatment options as biomass is more highly concentrated, and efficiency is less dependent on aeration and final sludge separation.

7.2 Treatment System

Kubota is ISO:9001 and ISO:14001 accredited and produce manufactured WWTPs that are tried and tested and guaranteed to achieve the design treatment level. An Equalisation Chamber shall be installed prior to the WWTP to regulate diurnal flows and influent concentrations. The WWTP utilises the following processes to achieve treated water quality:

- Solid Liquid Separation
- Anaerobic Filtration
- Moving Bed Filtration
- Carrier Filtration
- Treated Water Clarification
- Disinfection

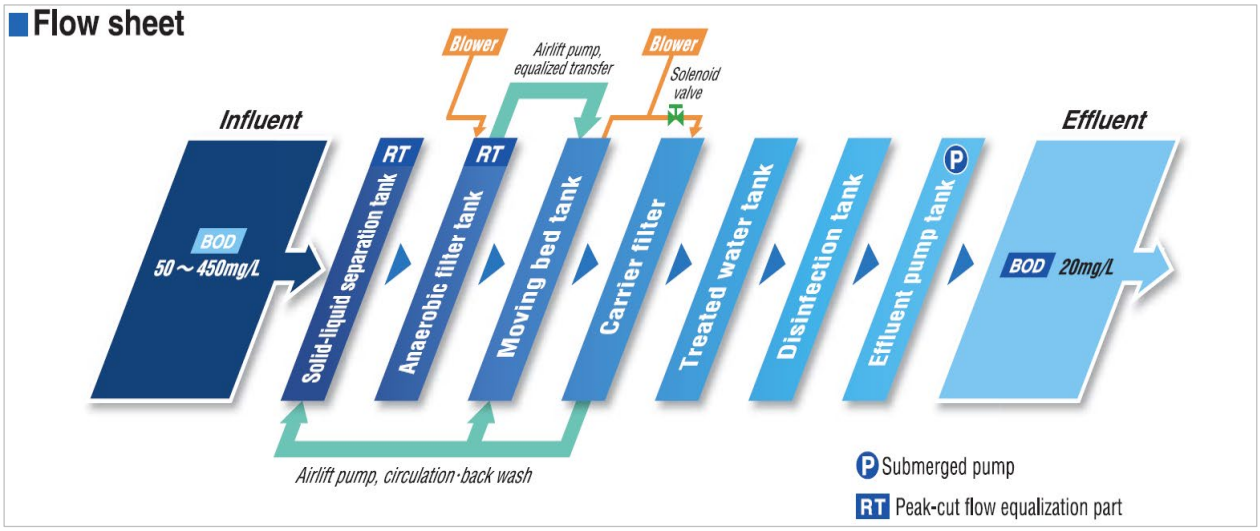

Figure 7.2 – Flow path of Kubota WWTP

7.2.1 Solid Liquid Separation Chamber

This chamber is designed to physically separate the solids from the incoming wastewater stream. A baffle forces water to the bottom of the chamber to increase pressure and aid in solids separation.

7.2.2 Anaerobic Filtration Chamber

The chamber contains a spherical-skeleton type filter media. Water enters at the bottom of the chamber and passes upward through the static media bed. Bacterial growth on the surface of the filter media provides anaerobic treatment, capturing suspended solids and reducing BOD[5]. [redacted]

7.2.3 Moving Bed Filtration - Fluidised Media Chamber 1

This chamber contains a cylindrical type of foam media. The media is constantly moved/fluidised by aeration. [redacted]

7.2.4 Carrier Filter - Fluidised Media Chamber 2

This chamber contains a hollow type of fluidized media for aerobic treatment. The media type is different to the media within Fluidised Media Chamber 1 and different microorganisms are active. [redacted]

7.2.5 Treated Water Chamber

The treated water chamber is filled with a small media functioning as filtration. Pre-treated effluent enters at the bottom of the chamber then flows upward through the media, suspended solids are captured and settled to the bottom. [redacted]

7.2.6 Disinfection Chamber

Within the treated water chamber, treated water is channelled through a tablet chlorination system. [redacted]

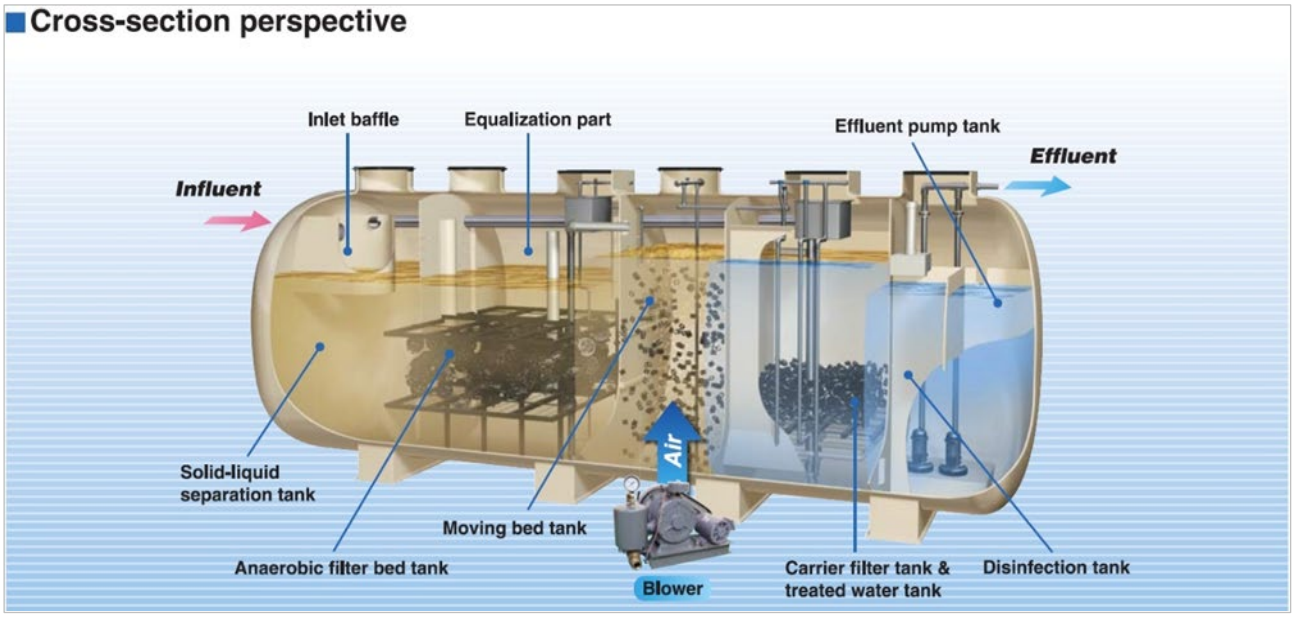

Figure 7.3 - Typical Section Diagram of Kubota Advanced WWTP

7.3 Sizing of Interim Wastewater Treatment Plant (IWTP)

It is expected the interim scheme shall be operational for approximately 3years. Considering sales and construction rates it is likely that the 178 dwellings will be constructed in the third year of operation, to ensure infrastructure is conservatively sized all infrastructure components shall be sized and designed to provide a minimum 30-year operational life.

7.3.1 Influent Volume

The catchment will consist of 178 residential dwellings within an urban setting. The ADWF for the site is expected to be 76,896Litres/day and the PDWF for the site is expected to be approximately 112,140Litres/day.

The ultimate sewage pump station and emergency storage shall be utilised as an Equalisation Chamber (EQ). The EQ will control diurnal and peak flows and even influent concentration. The approximate volume of the sewage pump station and emergency storage is 330kL (4.3 x ADWF). During standard operation the EQ pump set will be set to discharge hourly. The peak transfer volume will be 110,000L/day.

7.3.2 Capacity of Interim Wastewater Treatment Plant (IWTP)

The IWTP will have a nominal daily treatment capacity of 110kL/day and a peak treatment capacity of 137.5kL/day. To ensure redundancy and mitigate risk, the capacity of the IWTP is significantly greater than the estimated ADWF & PDWF.

The IWTP is a scalable plant and can be expanded at any time if required to manage unforeseen increases in flow, or to address shortfalls in municipal service delivery.

7.3.3 Wet Weather Storage

To ensure extreme wet weather events are suitably managed, influent and effluent storage will provide 4.1 Megalitres of storage. Influent storage will manage up to 10days peak wet weather flow (3.1 Megalitres). Effluent storage will provide storage for approximately 15 days of average dry weather flow (1 Megalitre).

7.4 Control and Monitoring of Infrastructure

Suitable control and monitoring of the IWTS are vital for correct operation of the system and the success of long-term management. System control and monitoring must be automated where possible to reduce the involvement of the property owner and site staff. The plant will be monitored remotely with maintenance provided by True Water technicians.

Risk mitigation is a key focus in the design of the proposed IWTS. Each stage of the process is focused on providing stable and secure sewage infrastructure that limits risk to public health and the environment. There are two monitoring functions: operational monitoring and performance monitoring.

Figure 7.4 - 40kL Kubota WWTP for Water Utility - Plant room, electrical box, and monitoring unit (foreground) site office (background)

Operational monitoring refers to the day-to-day function of the I\WTS and includes the monitoring of mechanical function. A telemetry system is integrated into the wastewater system to monitor the function of the IWTS and provide real time notification of events which allows immediate response. Real time monitoring includes; daily flow, operational levels, power supply and pump operation, with all parameters automatically logged and actioned by the True Water Customer Resource Management (CRM) system.

8 Effluent Dispersal System (EDS)

Various Effluent Dispersal Systems (EDS) can be employed for the dispersal of effluent. Due to the size and pastoral nature of the dispersal area, the most suitable and efficient EDS is spray irrigation. Effluent dispersal will be wholly within Lot 12 DP866036 and will consist of a spray irrigation system located to maintain suitable buffers and offsets to property boundaries and environmental features. Approximately 17 hectares of land has been identified as suitable for effluent irrigation (unconstrained), 9.68 hectares of which is subject to conditional DA approval. Treated effluent will be dispersed via spray irrigation at a rate of less than 1mm/m^2/day.

8.1 Design Irrigation Rate (DIR)

The interim schme includes three flow control points, the the EQ Chamber, the influent storage, and the effluent storage. Each shall be utilised to control diurnal, peak flows, and wet weather flows and to ensure control of the irrigation rate. A maximum volume of 90,000L/day shall be irrigated over the 9.68ha area, resulting in an irrigation rate of <1mm/m^2/day.

The spray irrigation system shall be design to deliver even dispersal of effluent. The design distribution uniformity will be better >90% and will require uniform placement of fixed sprinklers within a grid type arragement. By applying a sustainable irrigation rate, and through the even distribution of effluent, the irrigation scheme will:

- Prevent run off
- Reduce deep drainage
- Maintain soil structure
- Limit nutrient migration
- Reduce environmental risk

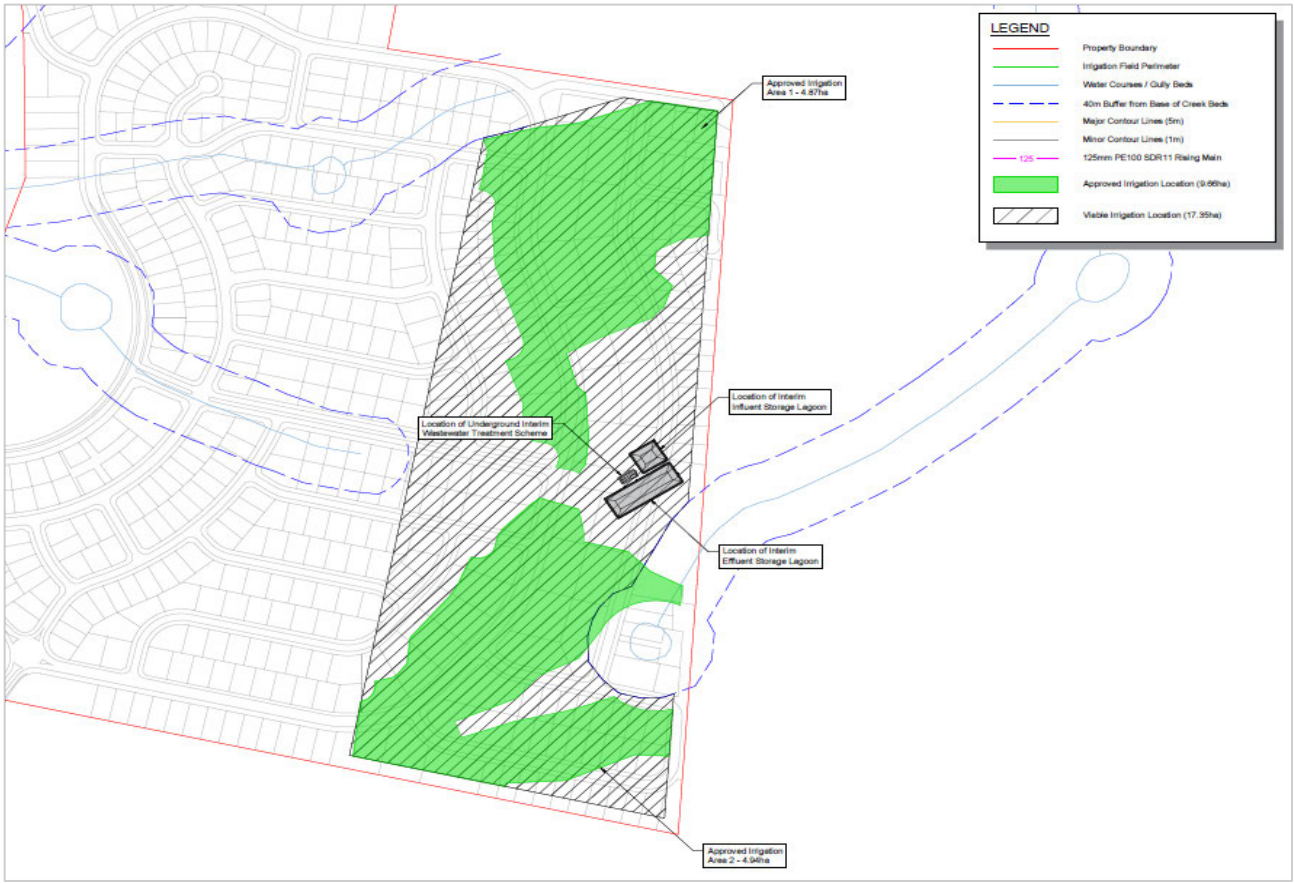

Figure 8.1 – 17ha suitable for effluent irrigation (unconstrained), 9.68ha subject to current approval

8.1.1 Design Irrigation Rate - Water Balance Modelling

The QLD Government developed Model for Effluent Disposal by Land Irrigation Software (MEDLI) has been employed as it provides an understanding of both hydraulic and nutrient for the site. M[redacted]

8.1.2 Design Irrigation Rate – Australian Standards

The Australian Standards AS/NZS1547:2012 is a domestic wastewater guideline, the guideline is inherently conservative, and recommended dispersal rates include a safety factor that is designed to ensure suitability in cold and wet climates of New Zealand and the southern Australia.

AS/NZS1547 - Table M1 *(see Figure 8),* allocates a Design Irrigation Rate (DIR) for the spray irrigation on light clay soils of 3mm/day, and a DIR for medium to heavy clay soils of 2mm/day.

TABLE M1
RECOMMENDED DESIGN IRRIGATION RATE (DIR) FOR IRRIGATION SYSTEMS

Soil Category (see Note 1)	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation rate (DIR) (mm/day)		
				Drip irrigation	Spray irrigation	LPED irrigation
1	Gravels and sands	Structureless (massive)	> 3.0	5 (see Note 2)	5	(see Note 3)
2	Sandy loams	Weakly structured massive	> 3.0			4
			1.4 – 3.0			
3	Loams	High/ moderate structured	1.5 – 3.0	4 (see Note 1)	4	3.5
		Weakly structured or massive	0.5 – 1.5			
4	Clay loams	High/ moderate structured	0.5 – 1.5	3.5 (see Note 1)	3.5	3
		Weakly structured	0.12 – 0.5			
		Massive	0.06 – 0.12			
5	Light clays	Strongly structured	0.12 – 0.5	3 (see Note 1)	3	2.5 (see Note 4)
		Moderately structured	0.06 – 0.12			
		Weakly structured or massive	< 0.06			
6	Medium to heavy clays	Strongly structured	0.06 – 0.5	2 (see Note 2)	2	(see Note 3)
		Moderately structured	< 0.06			
		Weakly structured or massive	< 0.06			

Figure 8.2 – Recommended DIR for Irrigation Systems from AS/NZS 1547:2012

8.2 Environmental Guidelines - Use of Effluent by Irrigation

The *NSW EPA - Use of Effluent by Irrigation Guideline* is educational and advisory in nature. It is not a mandatory or regulatory tool and it does not introduce new environmental requirements. The emphasis is on best management practices related to the management of effluent by irrigation, to be used to design and operate effluent irrigation systems, with the goal of reducing risks to the environment, public health and agricultural productivity. The Guideline considers a wide range of dispersal methods, including forestry, horticulture, pasture, turf, land rehabilitation and recreation areas, However, the guideline does not specifically consider effluent dispersal with no secondary use.

The guideline provides guidance on key factors for an effluent irrigation scheme. The guideline has been considered throughout the design process, and as specifically required by IPART, irrigation of treated effluent will have zero runoff and less than 15mm deep percolation.

8.3 Irrigation Pumps

Two KSB 65-50-165 pumps will be located with the control room in the WWTP compound. The pumps will be sited adjacent to the irrigation storage dam and will operate as duty/standby. Pump scheduling and runtime will be managed via the IWTP control system.

8.4 Irrigation Controller

A irrigation control unit shall control the irrigation scheme. The controller will control pump operation including run time and sequencing of distribution thorough the solenoid valves. Other functions of the controller include:

- Controlling pump run time
- Controlling filtration backwash
- Rain sensing and pump control

8.5 Irrigation Distribution

A distribution manifold consisting of a series of solenoid valves will distribute flows to the irrigation zones. The distribution manifold will be located adjacent to the irrigation pump house and be controlled by the irrigation control unit. Water will enter the manifold via a high density poly main. The irrigation control will switch solenoids when the set dispersal time per zone has been reached.

8.6 Irrigation Zones

Irrigation zones shall be approximately 0.9 hectares. Each zone will use Toro S-II Impact sprinklers (or similar) with an 17-18m distribution radius. Depending on the distance from the pump set to each zone, flow rates, head and friction loss, each zone shall have 16 sprinklers. Nozzles size may be varied from 4mm – 5mm to ensure uniform dispersal of effluent throughout the irrigation system.

9 Impact Assessment

In general terms, the aim of a Wastewater Treatment System (WWTS) is to safeguard public health and protect the environment. This impact assessment outlines the processes applied throughout WWTS lifecycle to mitigate risk, prevent adverse impacts, and deliver neutral or beneficial outcomes.

9.1 Integrated Environmental Management System (IEMS)

The IEMS provides a comprehensive management structure to manage risks, direct activities, meet objectives, and deliver best practice outcomes. True Waters IEMS is designed to integrate the company mission; the protection of people, water, and the environment, into daily operation, processes, and culture. The 12 Element framework is a key consideration of True Water's Integrated Environmental Management System (IEMS).

9.2 The 12 Element Framework

The 12 Element framework is applied in many sectors as a tool to manage and control hazards and assure quality. Examples from the water sector include a 12 Element framework for the management of drinking water quality contained in the Australian Drinking Water Guidelines (2011), for recycled water in the Australian Guidelines for Water Recycling (AGWR 2006, 2007), and for sewage in the Australian Sewage Quality Guidelines (2012). Although these guidelines do not specifically consider site-specific wastewater treatment and effluent dispersal they provide a reference.

The 12 Element framework is designed to be a conclusive and proactive management tool. [redacted]

These factors are considered in detail within the Section 5 of the Risk Management Plan.

Element 1 - Commitment to Safe and Responsible Management

True Water's business operations deal exclusively with the assessment, design, manufacture, supply, delivery, and operation of wastewater treatment infrastructure in Australia and the Pacific. [redacted]

Element 2 - Objectives / Targets

True Waters objectve is to deliver sewage and wastewater treatment infrastructure that best addresses the interests of current and future generations. [redacted]

Element 3 - Assessment

The assessment process is designed to capture and consider all variables across infrastructure lifecycle. [redacted]

Element 4 - Potential impacts

Mismanagement or neglect of a WWTS has the potential to negatively impact public health and pollute the environment. [redacted]

[redacted]

Element 5 - Control & Prevention Measures

True Waters approach to controlling and preventing potential impacts considers the likelihood, severity, consequences, and levels of uncertainty for each unmitigated risk. Quality and critical control points, critical paths, parameters and contingencies are identified. [redacted]

Element 6 - Performance & Environmental Monitoring

The operation and performance of each WWTS is continuously and adequately monitored. Monitoring consists of remote monitoring, scheduled inspection, field testing and laboratory testing. Monitoring is undertaken to ensure WWTS performance complies with objectives, targets, and regulatory approvals, and to identify potential impacts.

[redacted]

Element 7 - Record Keeping

True Water employs a Total Asset Management System for the management and maintenance of wastewater infrastructure. This system includes document management and reporting capabilities which ensure document integrity [redacted]

Element 8 - Communication & Reporting

Communication & reporting consists of both internal and external reporting. Internal reports are produced to ensure internal decision making is accurately informed. [redacted]

[redacted]

Element 9 - Corrective Actions / Contingency

Corrective actions and contingency are applied during infrastructure operation to ensure suitable control and preventative measures are in place to mitigate risk. Corrective actions and contingency are reviewed, audited, and improved, to ensure corrective actions and contingency reflect best available technologies and techniques. [redacted]

[redacted]

Element 10 - Evaluation / Audit

Evaluation and audit is undertaken annually. The purpose of the evaluation and audit is to assess the suitablility of management and operation, and confirm if the objectives and targets have been achieved. [redacted]

[redacted]

Element 11 – Communication and Engagement

Good communication and stakeholder engagement is essential in cordinating management efforts and responding to any fault, incident or emergency. Stakeholders include all people that may use the infrastructure, or be directly or indirectly impact by the infrastuctures operation. [redacted]

12. Review / Continual Improvement

Operational procedures and management plans will be reviewed annually to confirm measures are suitable and to identify if amendment or update is required. Generally, the review will follow the 12 Element framework but will specifically evaluate the following questions in relation to the framework:

[redacted]

[redacted]

- [redacted] activities in relation to the other 12 elements? Can improvements to the review process be made?

10 Monitoring, Operation, Maintenance, and Management

Maintenance and servicing are to be carried out in strict compliance with the conditions of the regulatory approval, and in accordance with the system manufacturer. The IWTS will function compliantly when proper monitoring, operation, maintenance, and management processes are implemented.

Should influent flows or concentrations exceed limits outlined within this EMP, it is the owner's responsibility to arrange additional infrastructure capacity as required to compliantly treat and disperse wastewater.

Table 10.1 – Maintenance Management Information

Management Type	Reporting	Frequency
Telemetry	All Operation • *High Level* • *Daily Flow* • *Power Outage* • *Pump Outage* • *Fault Check*	Daily – Automated
General Onsite Visual Inspection	Grease Arrestor WWTP Transfer Pumps	Weekly – Site Staff A4 Inspection sheet
Maintenance and Servicing	Grease Arrestor WWTP Transfer Pumps Transfer Pipe • *Inflow* • *Outflow* • *Visual inspection* Spray Irrigation • *Mowing* • *Visual inspection*	3 Monthly – True Water CRM and automated Service & Maintenance database
Annual Audit	Assessment of all items listed above	Annually

10.1 Telemetry

The True Water Works & Services Group provide 24/7/365 monitoring for wastewater infrastructure throughout Australia and will provide all monitoring of the Ashbourne IWTS.

10.2 General Onsite Visual Inspection

The following items will be completed by the site staff to aid in the management of the IWTS.

- Check and if required clean all grease arrestors or sediment traps,
- Maintain records of all required documentation including maintenance reports and audits,
- Ensure cleaning products utilised within the site are suitable for disposal through the WWTP,
- Maintain suitable signage to inform stakeholders and residents not to discharge foreign matter such as nappies, sanitary napkins, and waste into the drainage system,
- Ensure storm water and runoff is directed away from dispersal area,
- Visually inspect the EDA each month including signage.

10.3 Maintenance and Servicing

The True Water Works & Services Group provide maintenance and servicing for wastewater infrastructure throughout Australia. True Water will provide all maintenance and servicing of the Ashbourne IWTS.

10.4 Annual Audit and Reporting

The True Water Design and Consultancy Group provide annual auditing of wastewater infrastructure throughout Australia. True Water will undertake the annual audit of the Ashbourne IWTS.

10.5 Emergency Contacts

Table 10.2 – Emergency Contact Details

Organisation	Response Personnel Responsibilities	Contact Information	Hours of Operation
User	• General Operation and management • Routine visual inspection • Booking and organising pump out and management • Assess incident and decide on necessary actions relating to WWTP		
True Water	• Assess incident and decide on necessary actions relating to WWTP • Telemetry monitoring	(02) 6645 3377	Business Hours
True Water – Technical Assistance	• Assess incident and decide on necessary actions relating to WWTP	0429 931 221	After Hours

The Emergency Management Plan is detailed within the Ashbourne - Moss Vale Health and Environment Management Plan (HEMP).

11 Conclusion

Ashbourne - Moss Vale is a master planned residential development consisting of 1,073 allotments to be developed in stages. The site is a 125.7 hectare irreglarly shaped lots bordered by Yarrawarra Road, Lovelle Street, Moss Vale Golf Course and other urban and rural land zoned lots. The greenfield site is not currently serviced by the municipal sewerage network. Until the capacity of the Moss Vale Sewage Treatment Plant is increased, the local water utility cannot provide permanent sewer service to the site.

To facilitate project commencement an interim wastewater servicing solution will service Stage 1 (178 Lots). The Interim Wastewater Treatment Scheme (IWTS) will disperse effluent wholly onsite and is expected to operate for a maximum period of three years. There is sufficient land available for sustainable site-specific wastewater management that achieves required buffers to all sensitive receptors and environmental features as required by legislation, guidelines, and codes.

The estimated design flow for the site is, Average Dry Weather Flow of 76,896 Litres/day and a Peak Dry Weather Flow of 112,140Litres/day. The WWTP will be a 110kL/day Kubota MBBR system with a peak design capacity of 137.5kL/day. The WWTP will be installed below ground, have sealed gas tight access lids, and be vented through a carbon odour filter. Below ground installation provides favourable amenity and prevents visual impact, prevents noise, and prevents odour.

Effluent dispersal shall be via spray irrigation with a maximum dispersal rate of less than 1mm/m^2/day adopted.

All IWTS infrastructure shall be sited considering suitable buffers and offsets to environmental features, property boundaries and sensitive receptors. The IWTS will be operated in strict compliance with relative regulation and approvals.

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13 Acronyms and Abbreviations

AF	Average Flow
AAF	Annual Average Flow
Council	Wingecarribee Shire Council
DLR	Design Loading Rate
DSS	Desired Standards of Service
EDA	Effluent Dispersal Area
EDS	Effluent Dispersal System
EP	Equivalent Persons
HAZMAT	Hazardous Materials
IEMS	Integrated Environmental Management System
IWTP	Interim Wastewater Treatment Plant
IWTS	Interim Wastewater Treatment System
IMP	Infrastructure Management Plan
MBBR	Moving Bed Biofilm Reactor
PF	Peak Flow
SDS	Safety Data Sheet
STP	Sewage Treatment Plant
STS	Sewage Treatment System
WSC	Wingecarribee Shire Council
WWS	Wet Weather Storage
WWTP	Wastewater Treatment Plant
WWTS	Wastewater Treatment System

14 Glossary

Approved or Approval	A documented statement of approval by the site supervisor and/or all relevant Regulating Authorities.
Biochemical Oxygen Demand (BOD)	The amount of dissolved oxygen required by bacteria to stabilize, digest, and purify wastewater under aerobic conditions; an indirect measure of the amount of organic matter in wastewater; a measure of the relative strength of wastewater expressed in mg/L.
Business day	Any day other than a Saturday, Sunday, or public holiday.
Certificate of Completion	Certification issued by the Contractor to certify that all Works have been completed to the Manufacturer's requirements and specifications and as per the approved plans and specifications.
Certificate of Operation	Certification of compliance with the operating licence and/or warranty conditions. A Certificate of Operation is provided on completion of each Routine Operational Assessment.
Commission	The running and checking of the WWTS or WWTP at Completion of Works to ensure proper operation.
Compliance	Adherence to all operational parameters as specified by the Regulating Authority and/or the Contractor/Manufacturer.
Completion of Works	The completion of the WWTS or WWTP installation in accordance with the plans and specifications and successful Commission.
Concentration	Quantification of the concentration of specific contaminants within wastewater, influent or effluent.
Confidential Information	All information, trade secrets and knowledge of or disclosed by a party (**Discloser**) to another party (**Receiver**) that: • is by its nature confidential, • is designated or marked by the Discloser as confidential, or • the Receiver knows or ought to know is confidential, and includes the terms of this agreement and any information provided or received by a party pursuant to this agreement, but does not include information which: • is or becomes public knowledge other than by breach of this agreement or any other confidentiality obligation, or • is independently developed by a party while having no knowledge of or access to the other party's Confidential Information.
Controlled Access	The limitation of public or livestock access to a site to minimise the likelihood of direct physical contact with effluent.
Document Register	The register of project specific documents, policies, or guidelines.

E. coli (Escherichia coli)	A member of the faecal coliform group of bacteria, and indicative of faecal contamination.
Environmental Performance	The performance of WWTS or WWTP relative to protection of both public health and the natural and physical environment.
Effluent	Water derived from sewage and wastewater, treated to a level appropriate for its intended dispersal.
Effluent Dispersal Area (EDA)	The designated area in which effluent is applied to the environment.
Effluent Sample	The onsite checking of pH, turbidity, and Free Residual Chlorine within effluent.
Effluent Test	The laboratory testing of contaminants with effluent.
Factor of Safety	The proportionate increase in designed capacity or performance of an WWTS or WWTP aimed at reducing the risk of adverse impacts on public or environmental health.
Faecal Coliforms (Fc)	Indicator bacteria common to the digestive systems of warm–blooded animals that is cultured in standard tests to indicate either contamination from sewage and wastewater or the level of disinfection; generally measured as number of colonies/100mL.
HACCP	Hazard Analysis and Critical Control Point. An industry recognised Risk Management system that identifies, evaluates, and controls hazards including aspects of water quality significant to effluent dispersal.
GST	Goods & Services Tax – a tax levied by the Federal Government on the supply of goods and services.
Influent	Raw sewage and wastewater flowing into the WWTS or WWTP. Influent parameters must be within the parameters specified for the WWTS or WWTP.
Irrigation	The dispersal of effluent to land or soil.
Laboratory Test	The laboratory testing of contaminants within raw sewage and wastewater, Influent or effluent.
Effluent Dispersal System (EDS)	The system constructed to apply effluent to land, including, irrigation systems, mounds, and others.
Maintenance Report	The written report outlining the inspection, checks, effluent sampling, and maintenance activities completed during a Routine maintenance of the WWTS or WWTP.
Manufacturer	A person or company that makes the products used within the WWTS or WWTP.
Monitor	Check, supervise, observe, or measure the parameters and variables, as well as the performance of the WWTS and WWTP.

Non–Compliance	The failure to adhere to operational parameters as specified by the regulating authority or the Manufacturer.
Notice to Rectify Noncomplying System	A notice issued to the operator or owner of the WWTS or WWTP stating infrastructure operation does not satisfy the operating licence or warranty conditions and must be rectified.
Operating Licence	The licence to operate the WWTS infrastructure issued by the regulating authority.
Performance Audit	The audit of all wastewater treatment infrastructure, and the reporting of infrastructure compliance and performance for the preceding 12month period.
Performance objectives	Measurable operational parameters required for a WWTS or WWTP to be compliant under the condition of the Regulatory Authorities and the Manufacturer.
Qualified Installer	A person who is trained and accredited by the Manufacturer as being proficient in the installation, Commission, and Quality Assurance of a WWTS or WWTP.
Qualified Technician	A person who is trained and accredited by the Manufacturer in the operation, servicing, maintenance, and operation of the installed WWTS or WWTP.
Quality Assurance	A series of tests and checks undertaken by the Contractor to ensure installation of components meet all requirements and guidelines.
Regulatory Authority	An authority or body that is empowered by statute or regulation to approve and set conditions for the operation, Monitoring, and management of a WWTS or WWTP.
Reticulated Sewerage Network	A network of pipes including property connection sewers nominally up to and including DN 300 that receives sewage from properties and convey sewage to a central location.
Risk Assessment	The overall process of risk identification, risk analysis and risk evaluation using available information to predict how often hazards or specified events may occur (likelihood) and the magnitude of their consequences.
Risk Management	The systematic evaluation of the WWTS or WWTP, the identification of hazards and hazardous events, the assessment of risks, and the development and implementation of preventive strategies to manage the risks.
Routine Inspection	The routine inspection of the WWTS or WWTP by a trained person in strict adherence with the Routine Inspection Checklist.
Routine Operational Assessment	The routine (usually at three-month intervals) assessment of the maintenance, management, and operation of the WWTS or WWTP by a Qualified Technician.

Routine Maintenance	The routine maintenance (usually at three-month intervals) of the WWTS or WWTP by a Qualified Technician to ensure satisfactory performance and compliance.
Sewage/Wastewater	The discharge from sanitary fixtures and sanitary appliances.
Sewage Treatment Plant (STP)	The plant and equipment used to treat sewage and wastewater.
Sewage Treatment System (STS)	All infrastructure from the inlet of the STP to the outlet of the Effluent Dispersal Area (EDA), including all components, tanks, treatment plants, processes, and Effluent Dispersal System (EDS) required to treat sewage and wastewater and dispersal the Effluent to the environment.
Site Officer	The representative of the Principal or Contractor assigned to monitor, manage, coordinate, or sign off on the works.
Suspended Solids (SS)	Small solid particles which remain in suspension in water as a colloid or due to the motion of the water, and an important indicator of water quality and expressed in terms of milligrams per litre (mg/L).
Total Nitrogen (TN)	Measure of the complete nitrogen content in sewage and wastewater including nitrate (NO3), nitrite (NO2), ammonia (NH3), ammonium (NH4), and organic nitrogen, expressed as milligrams per litre (mg/L).
Total Phosphorus (TP)	Sum of all forms of phosphorus in effluent. Chemical element and nutrient essential for all life forms, occurring as orthophosphate, pyrophosphate, tripolyphosphate and organic phosphate forms, expressed as milligrams per litre (mg/L)
Treatment Quality	Effluent quality as detailed within the Regulatory Approval.
Treated Water / Effluent	Water derived from sewage and wastewater and treated to a level appropriate for its intended dispersal.
Wastewater Treatment Plant (WWTP)	The plant and equipment used to treat sewage and wastewater.
Wastewater Treatment System (WWTS)	All infrastructure from the inlet of the WWTP to the outlet of the Effluent Dispersal Area (EDA), including all components, tanks, treatment plants, processes, and Effluent Dispersal System (EDS) required to treat sewage and wastewater and dispersal the Effluent to the environment.

Appendix A

Kubota Interim Wastewater Treatment Scheme Plans & Layout

ASHBOURNE - DEVELOPMENT
INTERIM WASTEWATER TREATMENT SCHEME

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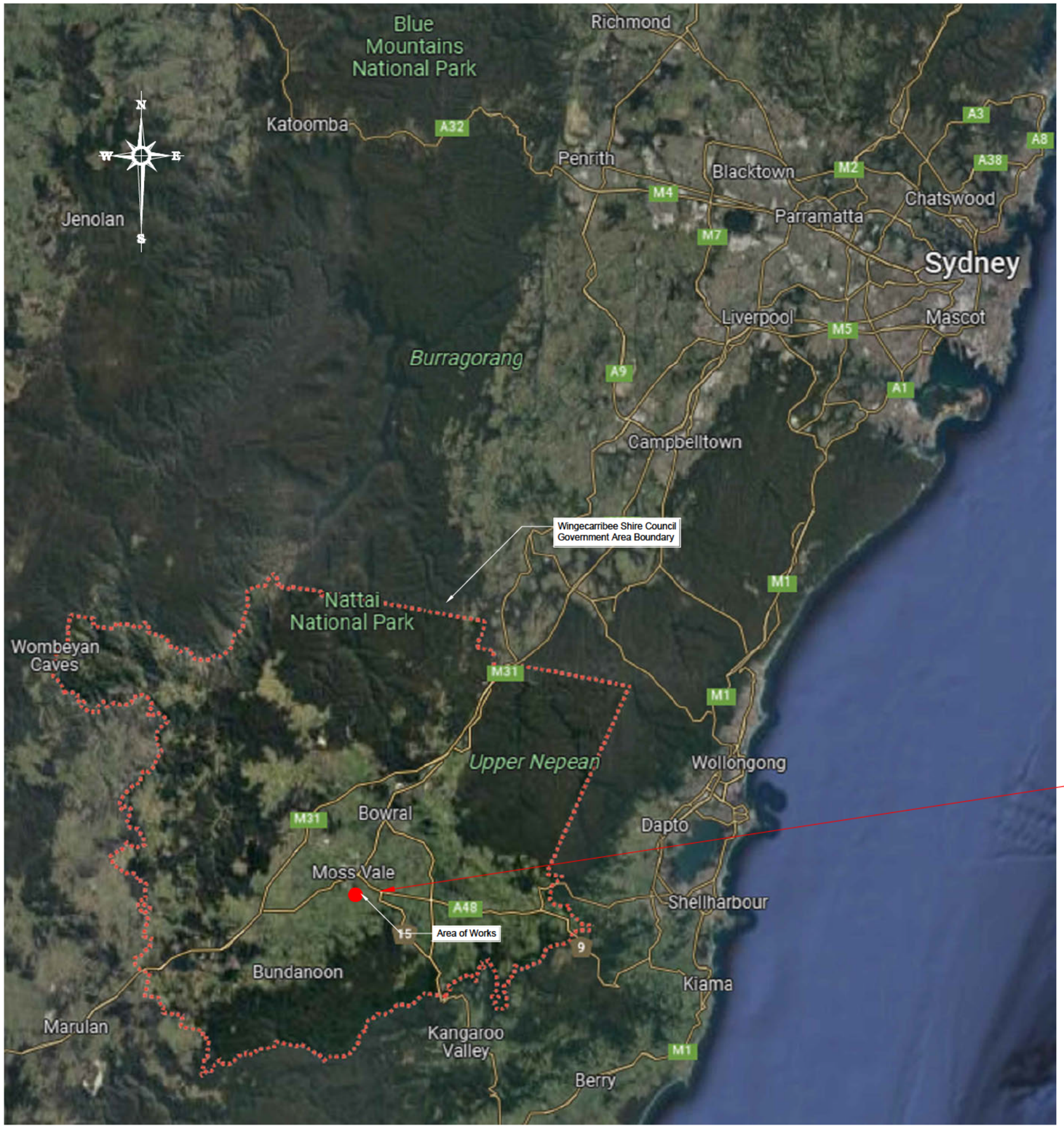
DRAWING SCHEDULE	
DRG NO.	**DRAWING TITLE**
ASHB-IWTS-G-0001	COVER SHEET, LOCALITY PLAN AND DRAWING SCHEDULE
ASHB-IWTS-G-0002	AREA OF OPERATIONS - LOCAL GOVERNMENT BOUNDARY
ASHB-IWTS-G-0003	AREA OF OPERATIONS - LOT AND DP IDENTIFICATION
ASHB-IWTS-G-0004	AREA OF OPERATIONS - BOUNDARY OF OPERATIONS
ASHB-IWTS-H-0001	INSTRUMENTATION LIST
ASHB-IWTS-H-0002	PROCESS FLOW DIAGRAM
ASHB-IWTS-H-0003	OVERALL SITE PLAN - GENERAL LOCATION
ASHB-IWTS-H-0004	SITE LOCALITY PLAN - IWTS LAYOUT
ASHB-IWTS-H-0005	KUBOTA IWTS FINISHED COMPOUND
ASHB-IWTS-H-0006	KUBOTA IWTS DETAIL
ASHB-IWTS-H-0007	KUBOTA IWTS AIR & ELECTRICAL CONFIGURATION
ASHB-IWTS-H-0008	KUBOTA IWTS ELEVATION DETAIL
ASHB-IWTS-H-0009	INTERIM INFLUENT STORAGE LAGOON DETAIL
ASHB-IWTS-H-0010	INTERIM EFFLUENT STORAGE LAGOON DETAIL
ASHB-IWTS-H-0011	INTERIM EFFLUENT DISPERSAL GENERAL SITE PLAN
ASHB-IWTS-H-0012	INTERIM EFFLUENT DISPERSAL SPECIFICATION

JOB STATUS: CONCEPT		PROJECT: ASHBOURNE DEVELOPMENT, MOSS VALE - INTERIM WASTEWATER TREATMENT SCHEME	CLIENT: Aoyuan building a healthy lifestyle
DRAWING TITLE: COVER SHEET, LOCALITY PLAN AND DRAWING SCHEDULE			
REV.: A	DRAWING NO.: ASHB-IWTS-G-0001	SCALE: 1:10500	DISCLAIMER: ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY.



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JOB STATUS
CONCEPT

DRAWING TITLE
AREA OF OPERATIONS - LOCAL GOVERNMENT BOUNDARY

DRAWING NO. **ASHB-IWTS-G-0002**

REV. **A**

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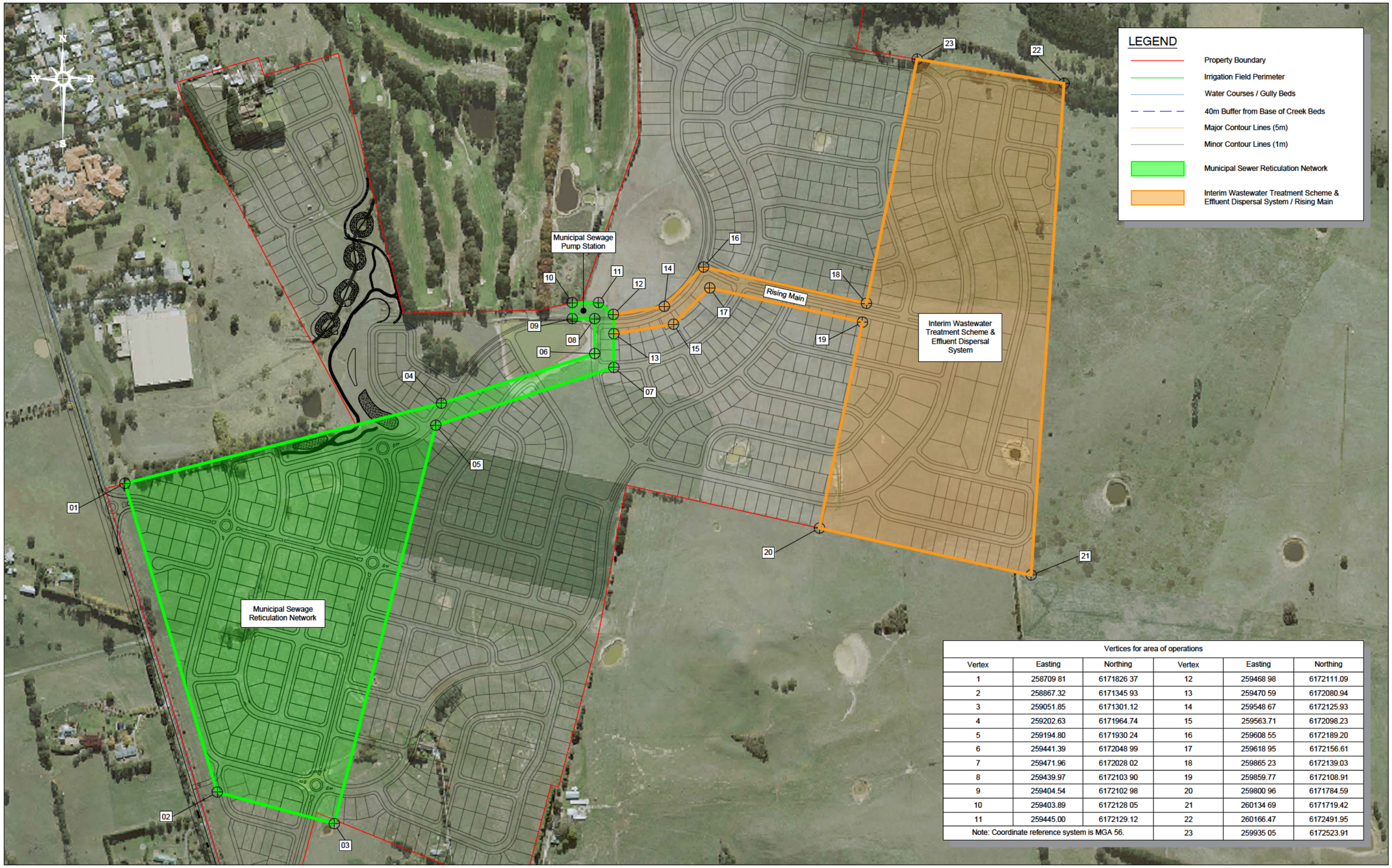
JOB STATUS
CONCEPT

DRAWING TITLE
AREA OF OPERATIONS - LOT AND DP IDENTIFICATION

DRAWING NO. **ASHB-IWTS-G-0003**

REV. **A**



Vertices for area of operations					
Vertex	Easting	Northing	Vertex	Easting	Northing
1	258709 81	6171826 37	12	259468 98	6172111.09
2	258867.32	6171345 93	13	259470 59	6172080.94
3	259051.85	6171301.12	14	259548 67	6172125.93
4	259202.63	6171964.74	15	259563.71	6172098.23
5	259194.80	6171930 24	16	259608 55	6172189.20
6	259441.39	6172048 99	17	259618 95	6172156.61
7	259471.96	6172028 02	18	259865 23	6172139.03
8	259439.97	6172103 90	19	259859.77	6172108.91
9	259404.54	6172102 98	20	259800 96	6171784.59
10	259403.89	6172128 05	21	260134 69	6171719.42
11	259445.00	6172129.12	22	260166.47	6172491.95
Note: Coordinate reference system is MGA 56.			23	259935 05	6172523.91

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JOB STATUS
CONCEPT

DRAWING TITLE
AREA OF OPERATIONS - BOUNDARY OF OPERATIONS

DRAWING NO. **ASHB-IWTS-G-0004**

REV. **A**

GENERAL LEGEND

- 25 — 25mm POLYETHYLENE LINE (TREATED EFFLUENT)
- 32 — 32mm POLYETHYLENE LINE (TREATED EFFLUENT)
- 40 — 40mm POLYETHYLENE LINE (TREATED EFFLUENT)
- 50 — 50mm POLYETHYLENE LINE (TREATED EFFLUENT)
- 63 — 63mm POLYETHYLENE LINE (TREATED EFFLUENT)
- -20- — 20mm UPVC PIPE
- -25- — 25mm UPVC PIPE
- -40- — 40mm UPVC PIPE
- -50- — 50mm UPVC PIPE
- -100- — 100mm UPVC Pipe
- - 50 - - 50mm DWV PIPE
- - 100 - - 100mm DWV PIPE
- - 150 - - 150mm DWV PIPE
- 25PW — 25mm POTABLE WATER POLY L NE
- 32PW — 32mm POTABLE WATER POLY L NE
- 40PW — 40mm POTABLE WATER POLY LINE
- 415V — 415V POWER SUPPLY
- 240V — 240V POWER SUPPLY
- IWTS INTERNAL ELECTRICAL AND COMMUNICATIONS
- 17mm PC/RG DRIP LINE
- AIR L NE
- FLUSH BOX W/ FLUSH VALVE
- 5-WAY INDEXING VALVE
- SPRINKLER HEAD
- S — SAMPLE TEST NG POINT
- T — ON-SITE TAP - WATER PO NT LOCATION
- HR — HOSE REEL
- FH — FIRE HYDRANT
- SG — SIGHT GLASS
- P — POWER LOCATION - SINGLE PHASE
- P — POWER LOCATION - THREE PHASE

- VALVE - GENERIC
- VALVE - NORMALLY CLOSED
- BALL VALVE
- BALL VALVE - NORMALLY CLOSED
- GATE VALVE
- GATE VALVE - NORMALLY CLOSED
- KNIFE EDGE GATE VALVE
- KNIFE EDGE GATE VALVE NORMALLY CLOSED
- BUTTERFLY VALVE
- GLOBE VALVE
- BACKFLOW PREVENTER
- NON RETURN VALVE
- DIAPHRAGM VALVE
- PLUG VALVE
- PRESSURE REGULATING VALVE (SELF CONTA NED PRV OR PSV)
- SAFETY/REL EF VALVE
- VAC / PRESS — PRESSURE & VACUUM REL EF VALVE
- FLAP VALVE
- FOOT VALVE
- SL DE VALVE
- PENSTOCK
- STOPBOARD FRAME
- STOPBOARD/BULKHEAD GATE (NORMALLY OPEN)
- STOPBOARD/BULKHEAD GATE (NORMALLY CLOSED)
- THREE PORT VALVE
- FOUR PORT VALVE W/ SOLENOID
- THREE WAY SOLENOID VALVE
- SOLENOID VALVE
- BACK PRESSURE VALVE
- REDUCER
- FLEXIBLE HOSE

- STATICALLY LOADED
- SPR NG LOADED
- WEIGHT ACTUATOR
- FLOAT ACTUATOR
- H — MANUAL OPERATED VALVE - GENERIC
- MOTOR OPERATED VALVE - GENERIC
- CONTROL VALVE OPENS ON FAILURE OF ACTUAT NG ENERGY
- CONTROL VALVE CLOSES ON FAILURE OF ACTUAT NG ENERGY
- CONTROL VALVE RETA NS POSITION ON FA LURE OF ACTUATING ENERGY
- PNEUMATIC CYLINDER ACTUATOR (GENERIC - S NGLE ACTUAT NG)
- PNEUMATIC CYLINDER ACTUATOR (SINGLE ACTUATING, SPR NG RETURN) OPENS ON FAILURE OF ACTUATING ENERGY
- PNEUMATIC CYLINDER ACTUATOR (SINGLE ACTUATING, SPR NG RETURN) CLOSES ON FAILURE OF ACTUATING ENERGY
- PNEUMATIC CYLINDER ACTUATOR (SINGLE ACTUATING, SPR NG RETURN) RETAINS POSITION ON FAILURE OF ACTUATING ENERGY
- PNEUMATIC CYLINDER ACTUATOR (GENERIC - DOUBLE ACTUATING)
- PNEUMATIC CYLINDER ACTUATOR (DOUBLE ACTUATING) OPENS ON FAILURE OF ACTUATING ENERGY
- PNEUMATIC CYLINDER ACTUATOR (DOUBLE ACTUATING) CLOSES ON FAILURE OF ACTUATING ENERGY
- PNEUMATIC CYLINDER ACTUATOR (DOUBLE ACTUATING) RETAINS POSITION ON FAILURE OF ACTUATING ENERGY
- MASS FLOWMETER
- ULTRASONIC FLOWMETER
- MAGNETIC FLOWMETER
- TURB NE FLOWMETER
- POSITIVE DISPLACEMENT FLOWMETER

- EXHAUST FAN
- WEIR
- DECANTER
- PULSATION DAMPENER
- SPRAY NOZZLE
- A R D FFUSER
- D FFUSER
- HUM D FIER
- WEIGHTED NON-RETURN INLET DAMPER
- DAMPER
- C — CHORINE CONTACT POINT
- INJECTOR
- A R L FT
- A R OR GAS F LTER
- MEMBRANE F LTER
- STRAINER
- Y STRAINER
- DISK FILTER
- STEAM TRAP
- FLEXIBLE COUPLING
- EXPANSION JOINT
- FLANGE
- CAP FLANGE
- HOSE COUPLING
- PRESSURE UNION
- IA — SERVICE SUPPLY
- TP # — TIE- N POINT
- FALL — D RECTION OF FALL
- SCREW CONVEYOR
- BELT CONVEYOR
- VACUUM BREAKER

- PUMP, CENTRIFUGAL
- PUMP, SUBMERSIBLE
- PUMP, AXIAL
- PUMP, SUBMERGED SUCTION
- PUMP, POSITIVE DISPLACEMENT
- PUMP, METER NG
- PUMP, ROTARY LOBE
- BLOWER OR FAN
- AIR COMPRESSOR GENERAL
- COMPRESSOR POSITIVE DISPLACEMENT
- COMPRESSOR CENTRIFUGAL
- SAFETY SHOWER C/W EYE WASH
- STATIC MIXER
- VIBRATOR
- MACERATOR
- HEATING/COOLING CO L
- AIR HEATER
- AIR COOLER
- FLOAT NG SURFACE AERATOR
- FIXED SURFACE AERATOR
- MIXER
- BAR SCREEN
- SCREW SCREEN
- AERATED SCREEN

- PRESSURE GAUGE
- INSTRUMENT, FRONT MOUNTED IN CENTRAL PANEL
- INSTRUMENT, REAR MOUNTED IN CENTRAL PANEL
- INSTRUMENT, FRONT MOUNTED IN LOCAL PANEL
- INSTRUMENT, REAR MOUNTED IN LOCAL PANEL
- COMPUTER INTERFACE WITH SHARED FUNCTIONS FOR DISPLAY & CONTROL LOCALLY MOUNTED
- COMPUTER INTERFACE WITH SHARED FUNCTIONS FOR DISPLAY & CONTROL CENTRAL PANEL MOUNTED
- COMPUTER INTERFACE WITH SHARED FUNCTIONS FOR DISPLAY & CONTROL LOCAL PANEL MOUNTED
- STATUS INDICATOR LOCALLY MOUNTED
- STATUS INDICATOR, FRONT MOUNTED IN CENTRAL PANEL
- STATUS INDICATOR, REAR MOUNTED INCENTRAL PANEL
- STATUS INDICATOR, FRONT MOUNTED IN LOCAL PANEL
- STATUS INDICATOR, REAR MOUNTED IN LOCAL PANEL
- PLC — PLC
- M — MOTOR CONTROL CENTRE
- I — INTERLOCK
  I = UNDEFINED LOGIC
  OR = LOGICAL OR
  & = LOGICAL AND
  NOT = LOGICAL NOT
- VSD — VARIABLE SPEED DRIVE
- MF — MOTOR
  MF = FIXED. MV = VARIABLE
- MF — MOTOR - SUBMERSIBLE
  MF = FIXED. MV = VARIABLE
- I / M — MANUAL INTERLOCK WITH DESIGNATED MAN/PLC SELECTOR SWITCH
- DIAPHRAGM SEAL
- EARTH
- AUDIBLE ALARM
- DWG NUMBER — CONTINUATION TAG
- LIMIT OF CONTRACT/ SPEC. CHANGE

REV	DATE	REVISIONS	DRAWN	DESIGN	APP	REF NO.
A	25/10/22	CONCEPT DESIGN	CDN	JM	JM	-

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PROJECT: ASHBOURNE DEVELOPMENT, MOSS VALE - INTERIM WASTEWATER TREATMENT SCHEME

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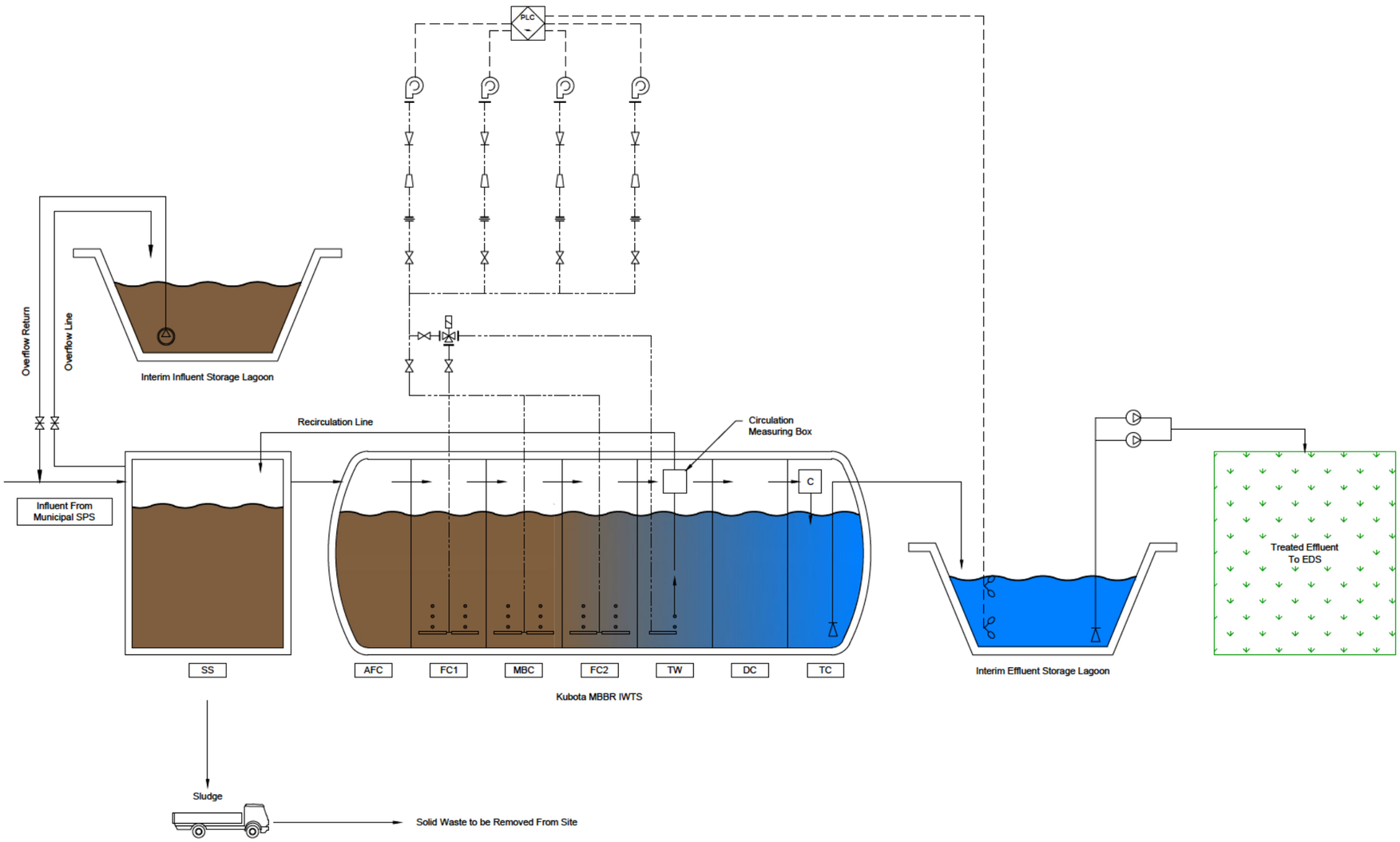
JOB STATUS: CONCEPT

DRAWING TITLE: INSTRUMENTATION LIST

DRAWING NO.: ASHB-IWTS-H-0001

REV.: A

Tank Name List		
Parts	Symbol	Tank Name
RC	EQ	Equalisation Tank
	SS	Sludge Storage Tank
FRP	AFC	Anaerobic Filter Chamber
	FC1	No.1 Filtration Chamber
	MBC	Moving Bed Chamber
	FC2	No.2 Filtration Chamber
	TW	Treated Water Chamber
	DC	Disinfection Chamber
	TC	Transfer Chamber



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JOB STATUS
CONCEPT

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PROCESS FLOW DIAGRAM

DRAWING NO.
ASHB-IWTS-H-0002

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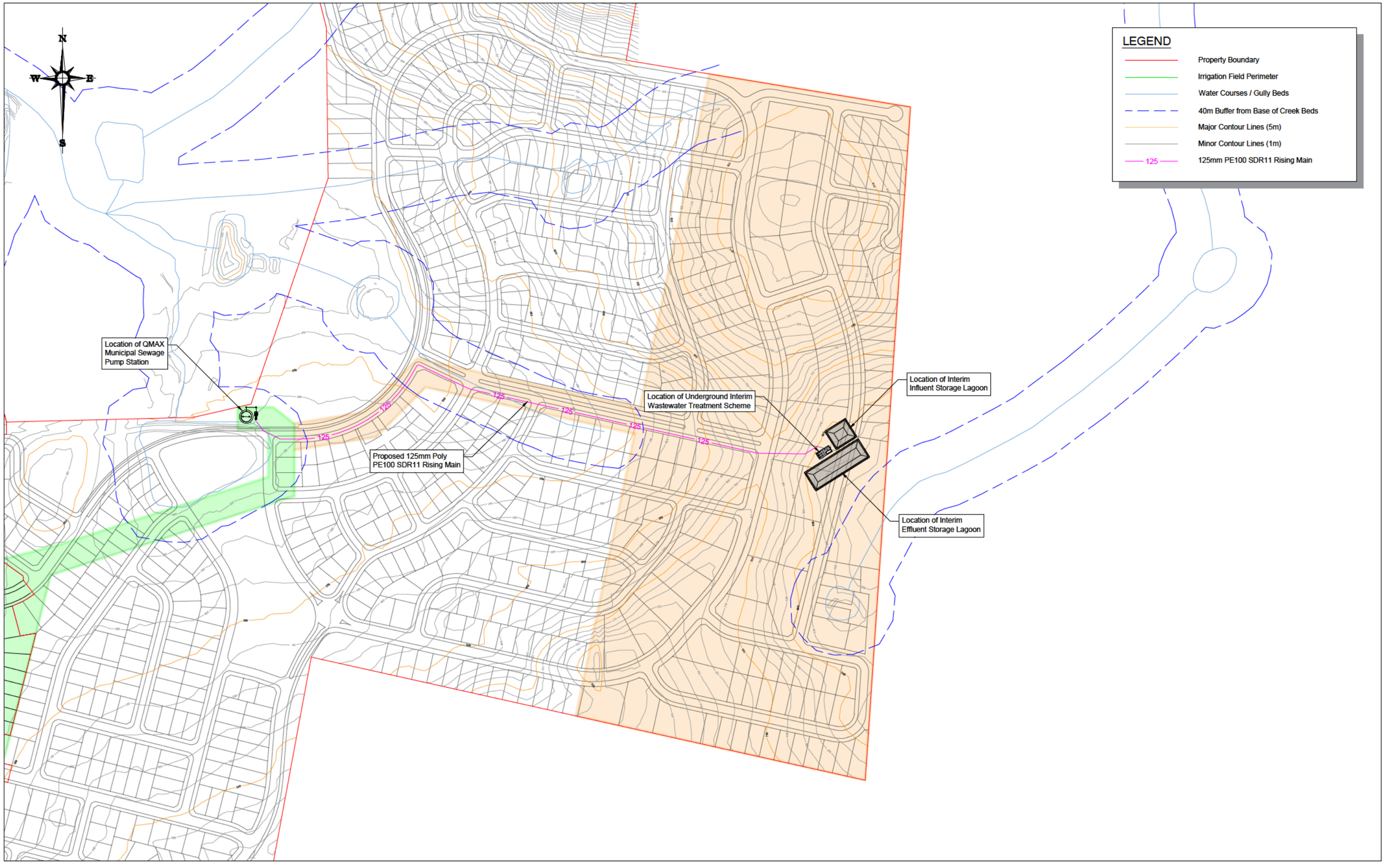

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JOB STATUS
CONCEPT

DRAWING TITLE
OVERALL SITE PLAN - GENERAL LOCATION

DRAWING NO.
ASHB-IWTS-H-0003

REV.
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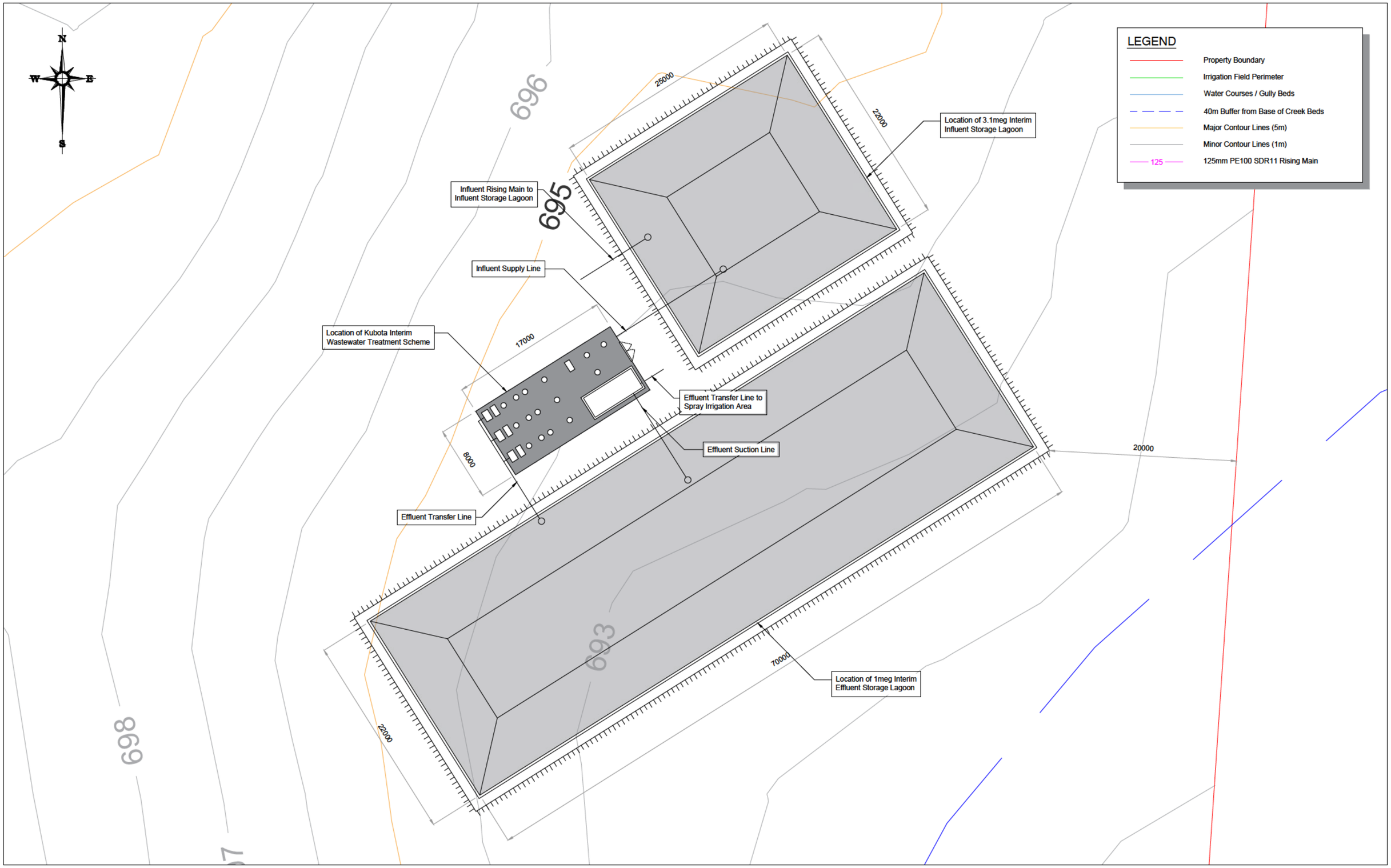

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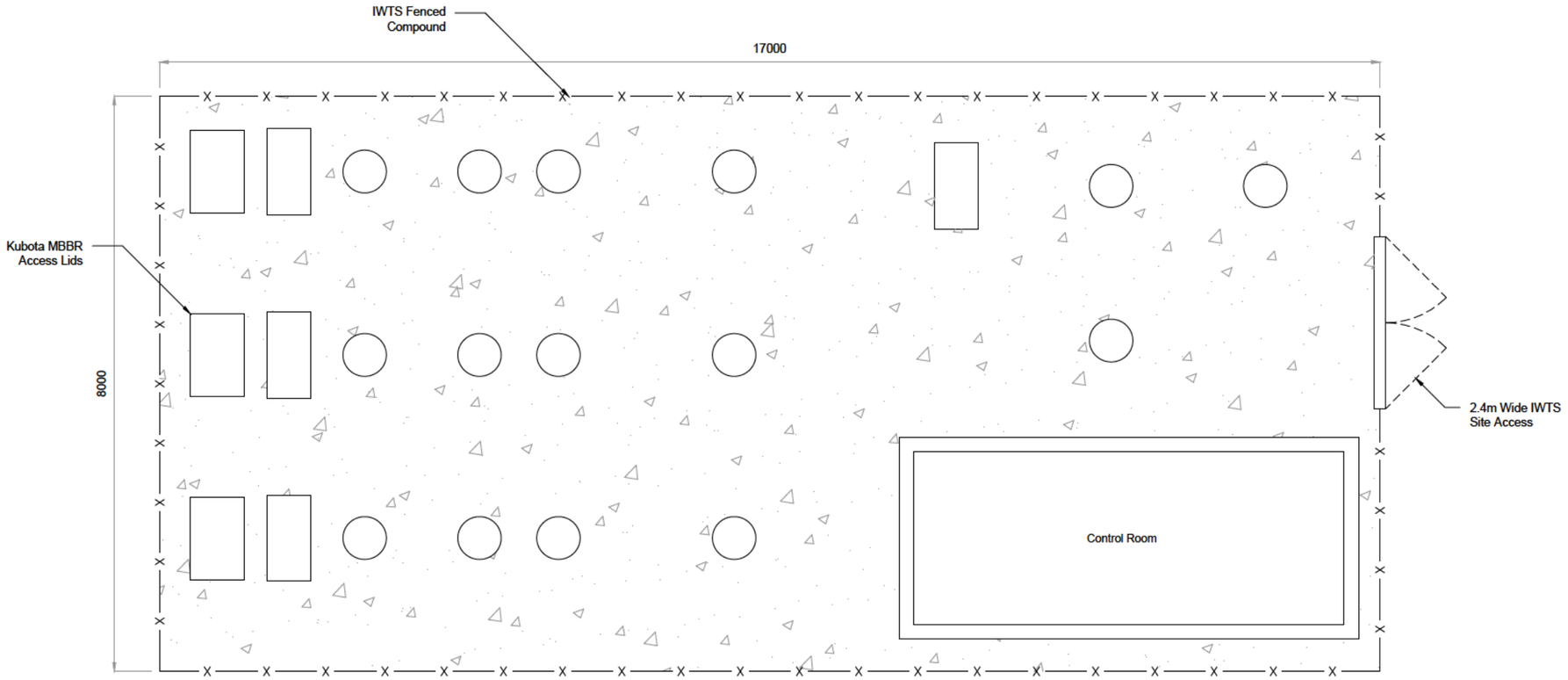
JOB STATUS
CONCEPT

DRAWING TITLE
SITE LOCALITY PLAN - IWTS LAYOUT

DRAWING NO.
ASHB-IWTS-H-0004

REV.
A



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Daniel Mahoney	

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PROJECT
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SCALE: 1:75

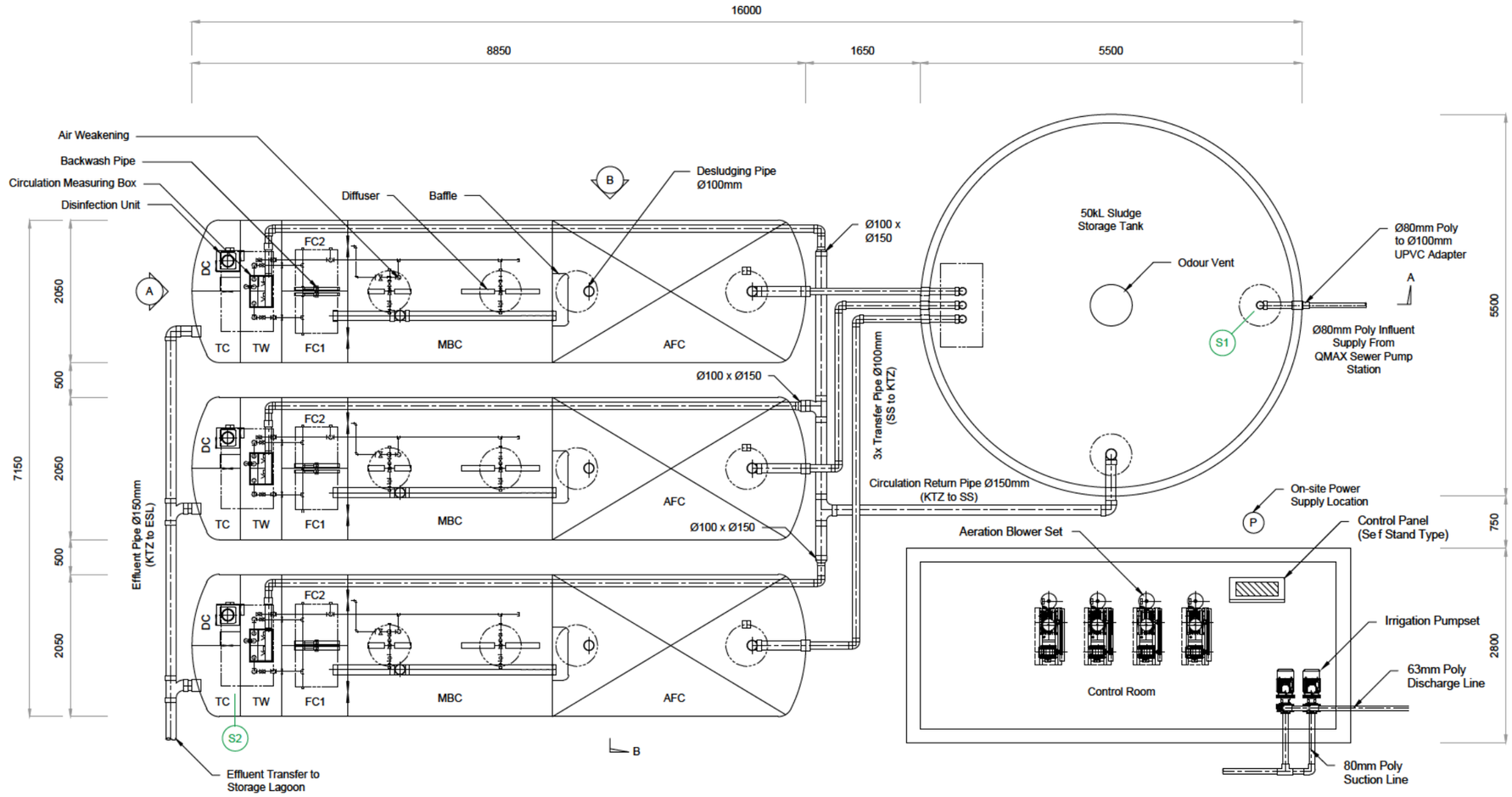
JOB STATUS
CONCEPT

DRAWING TITLE
KUBOTA IWTS FINISHED COMPOUND

DRAWING NO.
ASHB-IWTS-H-0005

REV.
A

Tank Name List		
Parts	Symbol	Tank Name
RC	EQ	Equalisation Tank
	SS	Sludge Storage Tank
FRP	AFC	Anaerobic Filter Chamber
	FC1	No.1 Filtration Chamber
	MBC	Moving Bed Chamber
	FC2	No.2 Filtration Chamber
	TW	Treated Water Chamber
	DC	Disinfection Chamber
	TC	Transfer Chamber



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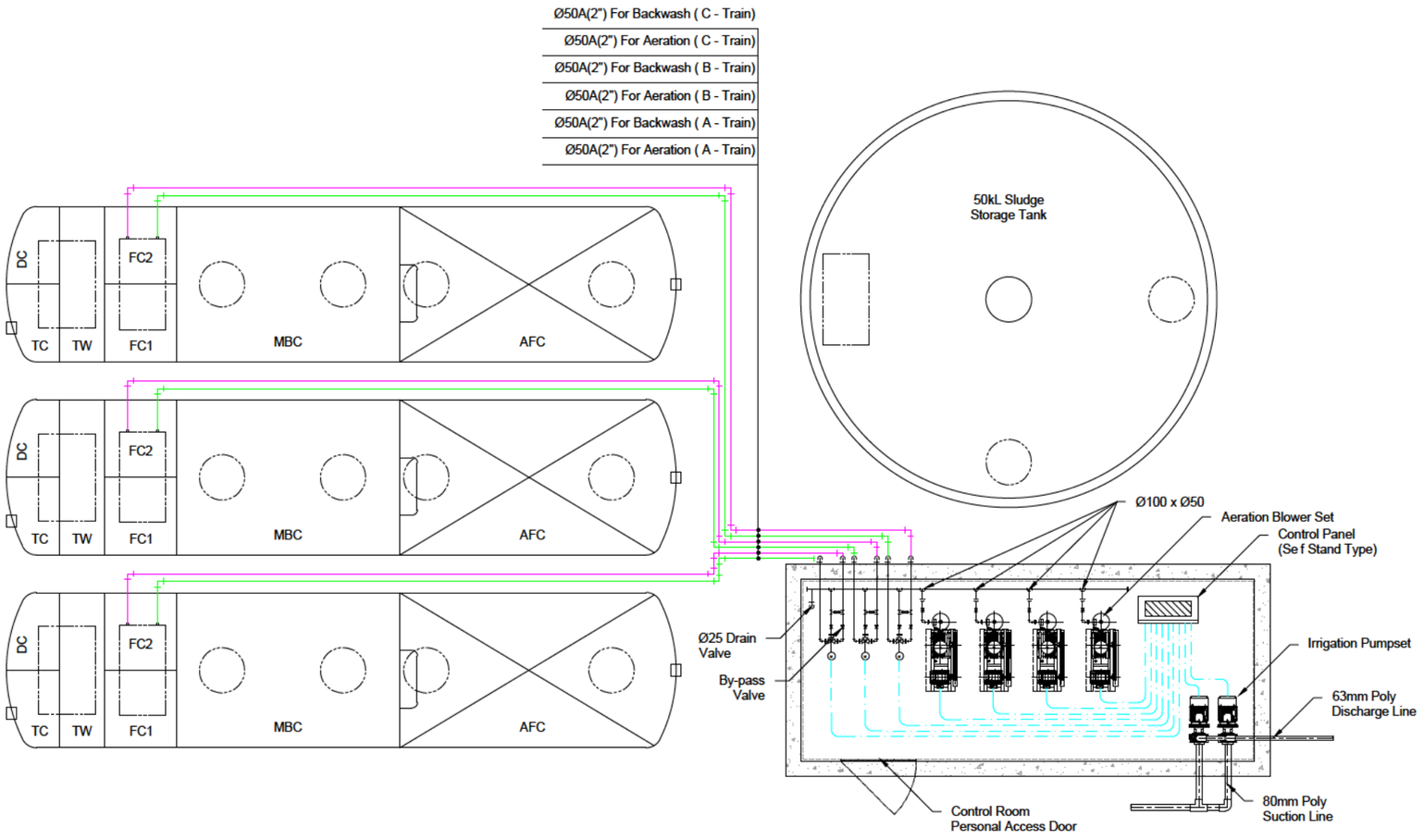
JOB STATUS
CONCEPT

DRAWING TITLE
KUBOTA IWTS DETAIL

DRAWING NO.
ASHB-IWTS-H-0006

REV.
A

Tank Name List		
Parts	Symbol	Tank Name
RC	EQ	Equalisation Tank
	SS	Sludge Storage Tank
FRP	AFC	Anaerobic Filter Chamber
	FC1	No.1 Filtration Chamber
	MBC	Moving Bed Chamber
	FC2	No.2 Filtration Chamber
	TW	Treated Water Chamber
	DC	Disinfection Chamber
	TC	Transfer Chamber



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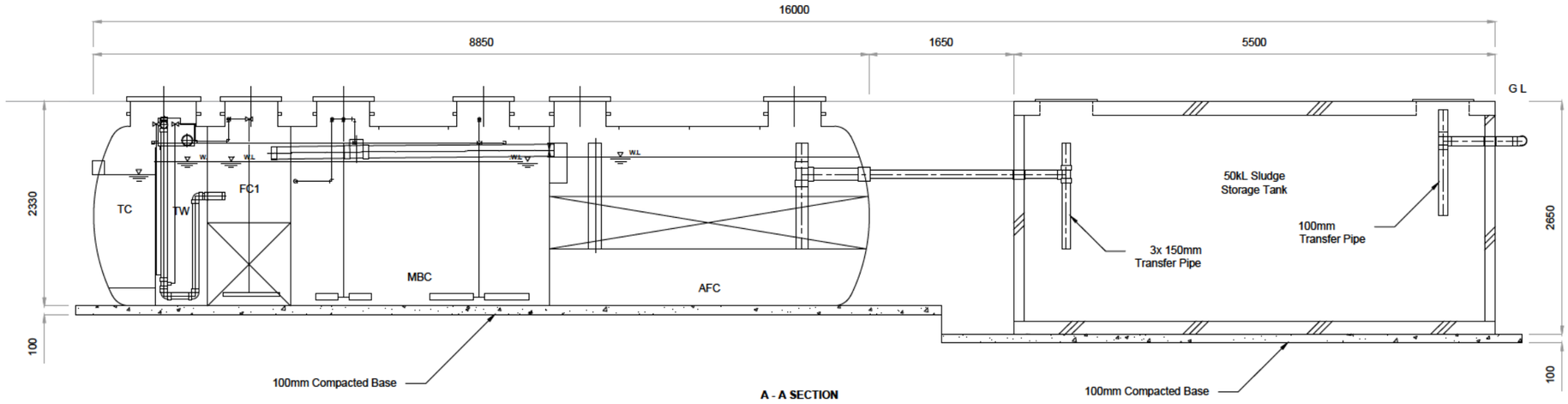
SCALE: 1:75

JOB STATUS
CONCEPT

DRAWING TITLE
KUBOTA IWTS AIR & ELECTRICAL CONFIGURATION

DRAWING NO. **ASHB-IWTS-H-0007**

REV. **A**



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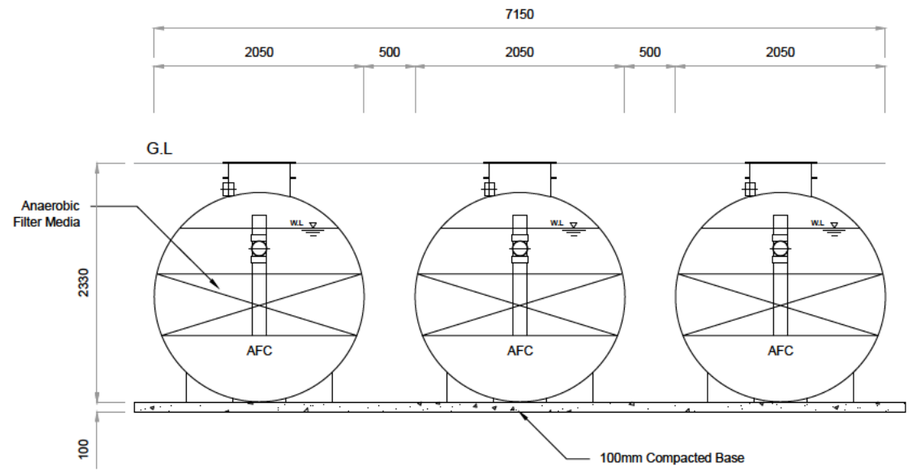

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SCALE: 1:50

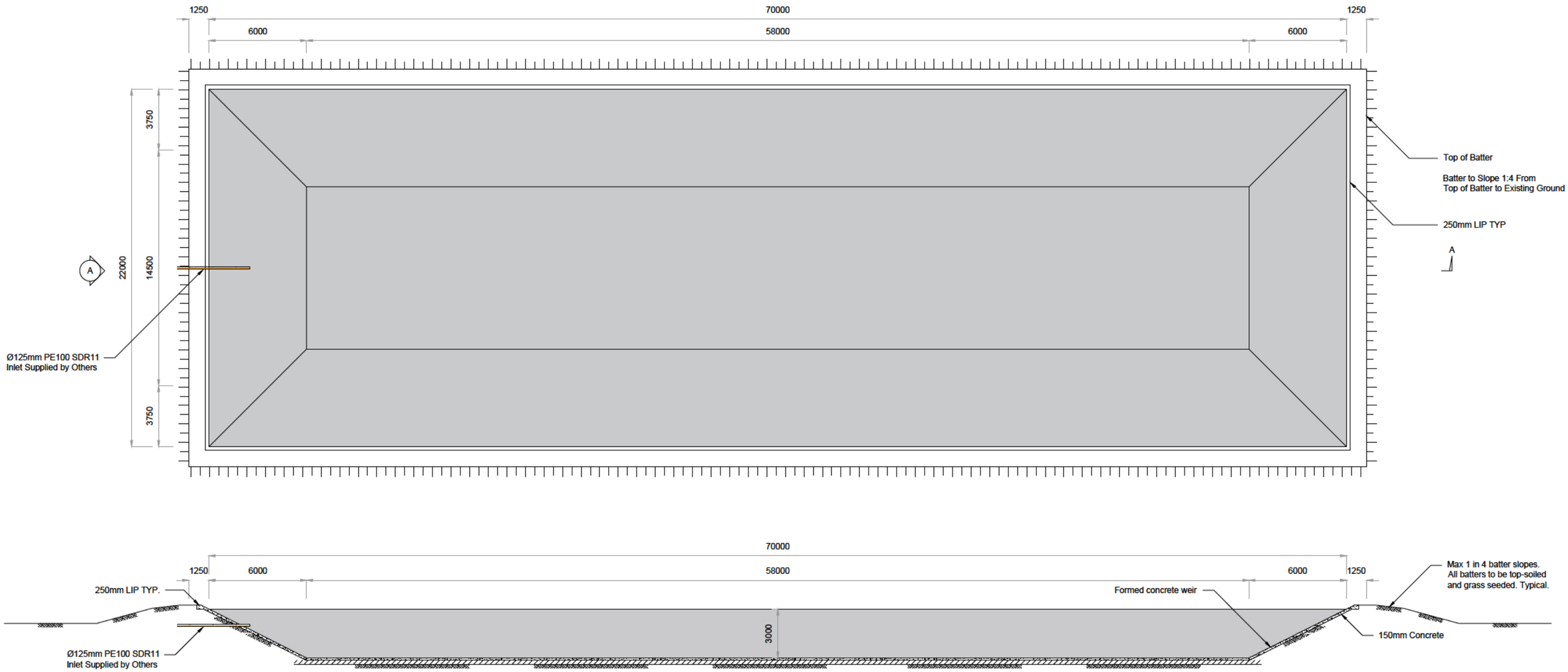
JOB STATUS
CONCEPT

DRAWING TITLE
KUBOTA IWTS ELEVATION DETAIL

DRAWING NO.
ASHB-IWTS-H-0008

REV.
A

NTERIM NFLUENT STORAGE = 3100m³



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SCALE: 1:250

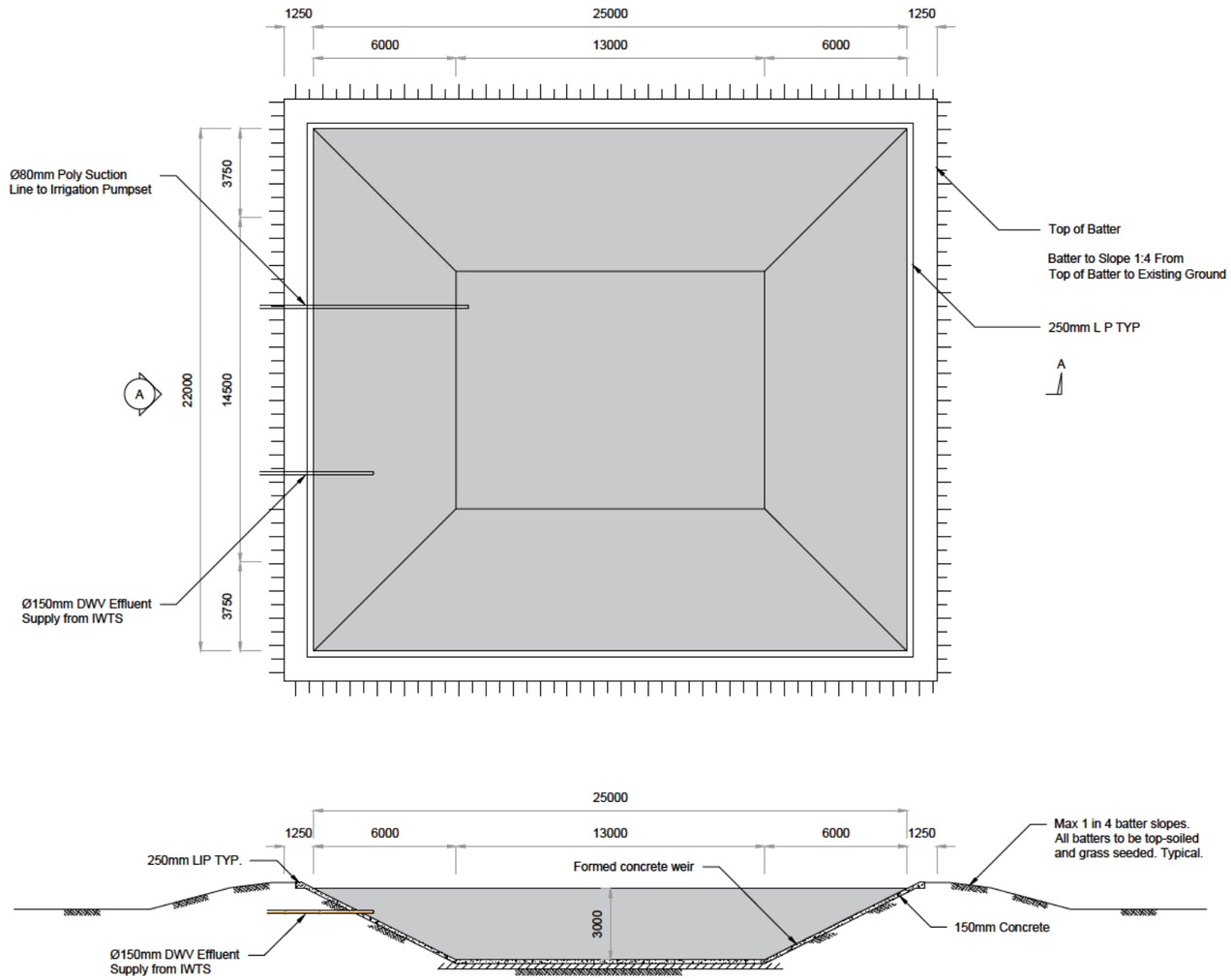
JOB STATUS
CONCEPT

DRAWING TITLE
INTERIM INFLUENT STORAGE LAGOON DETAIL

DRAWING NO. **ASHB-IWTS-H-0009**

REV. **A**

NTERIM EFFLUENT STORAGE = 1000m^3



A - A Section

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SCALE: 1:250

JOB STATUS
CONCEPT

DRAWING TITLE
INTERIM EFFLUENT STORAGE LAGOON DETAIL

DRAWING NO. **ASHB-IWTS-H-0010**

REV. **A**

REV	DATE	REVISIONS	DRAWN	DESIGN	APP	REF NO.	REFERENCE DRAWING	NUMBER
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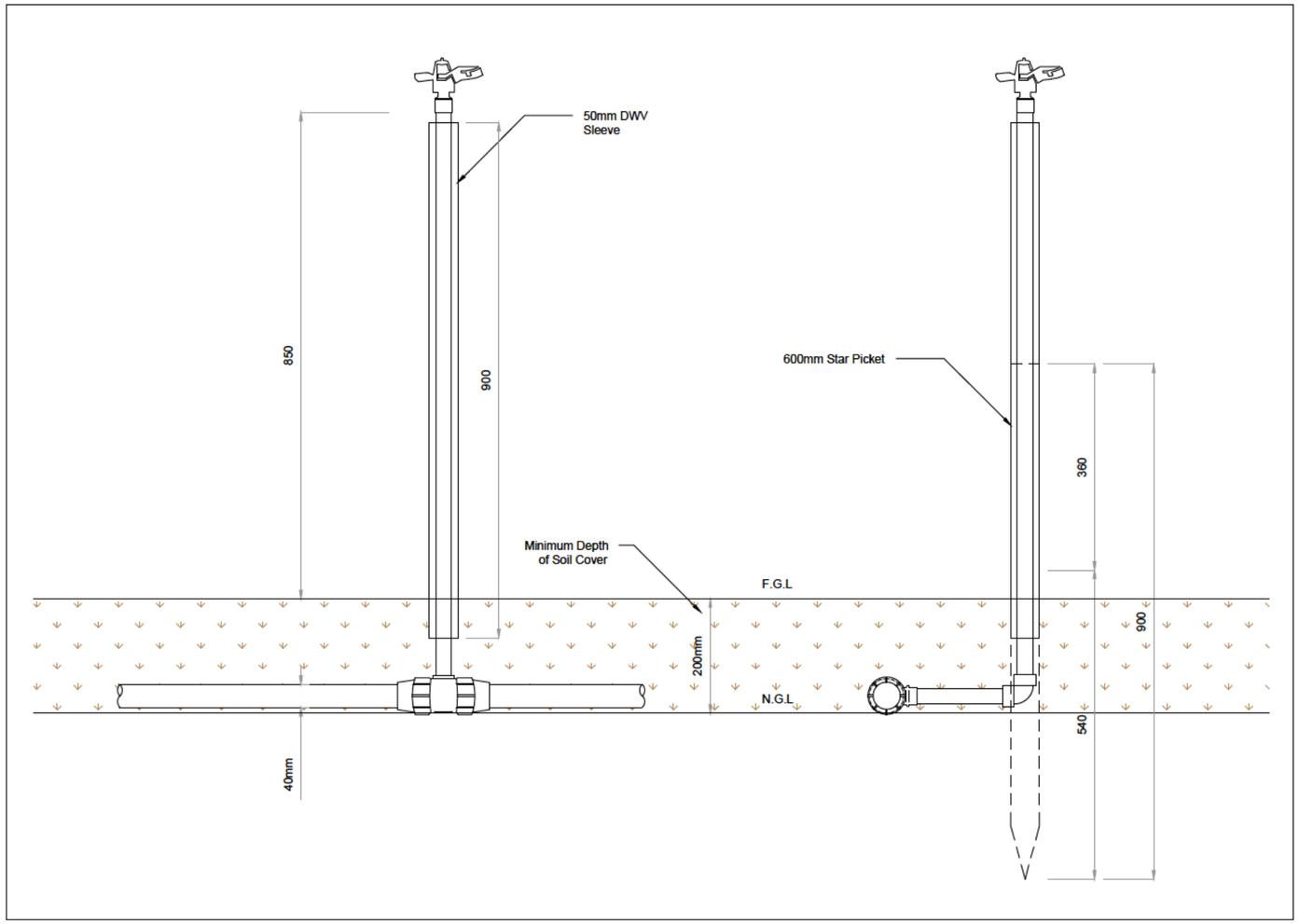
SCALE: 1:4000

JOB STATUS
CONCEPT

DRAWING TITLE
INTERIM EFFLUENT DISPERSAL GENERAL SITE PLAN

DRAWING NO. **ASHB-IWTS-H-0011**

REV. **A**



GENERAL SPRINKLER AND
RISER CONFIGURATION

True Water Rain Sprinkler

Irrigation Specifications - Sprinkler	
Irrigation Zone	4
Area per Zone	-
Sprinkler per Zone	7
Spray Diameter	26m (Approx)
Nozzle Type	4.5mm x 4.5mm
Flow Rate per Nozzle	32L / min @ 250 kPa
Flow Rate per Zone	224L / min @ 250 kPa
Design Flow Rate	224L / min or 3.73 l/s

Performance Chart - Double Jet

Size (mm)	3.7 x 2 5		4.1 x 2.8		4.4 x 3.2		4.5 x 4.5		5.4 x 3.0		6.1 x 3.2		7.1 x 2.5	
kPa	Flow Lpm	Diameter (m)	Flow Lpm	Diameter (m)	Flow Lpm	Diameter (m)	Flow Lpm	Diameter (m)	Flow Lpm	Diameter (m)	Flow Lpm	Diameter (m)	Flow Lpm	Diameter (m)
200	15 8	24.4	19.7	24.9	22.2	25.6	25.2	26 3	29.8	27 6	31.7	28.4	44.6	29 8
250	17.7	25.5	22.1	25.8	24.9	26.3	32.0	27 8	33.5	29 3	41.5	30.1	50.1	31.7
300	19 5	25 8	24.4	27.3	27.3	27.6	34.3	29 3	36.7	31.4	44.8	33 0	55.0	34.4
350	21.1	26.5	26.2	27.5	29.5	27.7	37.1	27.7	39.8	31 3	49.3	32.7	59.4	34.4
400	22.2	26 8	27.9	28.0	31.3	28.5	39.1	30 5	41.7	32.4	52.0	34.7	63.0	35 8
450	24.0	28 0	29.8	28.2	33.6	29.0	42.0	30 8	45.2	31.7	56.0	32 5	67.5	33 6
Code	10150033700		10150034100		10150034400		10150034900		10150035400		10150036100		10150037100	

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SCALE: NTS

JOB STATUS
CONCEPT

DRAWING TITLE
INTERIM EFFLUENT DISPERSAL SPECIFICATION

DRAWING NO.
ASHB-IWTS-H-0012

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Appendix B

MEDLI Modelling (Water Balance)

MEDLI REPORT

ASHBOURNE – MOSS VALE

INTERIM WASTEWATER TREATMENT SCHEME (IWTS)

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MEDLI REPORT

Site Address:

32 Lovelle Street and 141 Yarrawa Road, Moss Vale, NSW 2571

Lot 3 DP706194 and Lot 12 DP8660366

Client:

Prime Moss Vale Pty Ltd

Suite 30.02, Level 30, 420 George Street, Sydney NSW 2000

Prepared By:

True Water

02 6645 3377

PO Box 351 Maclean NSW 2463

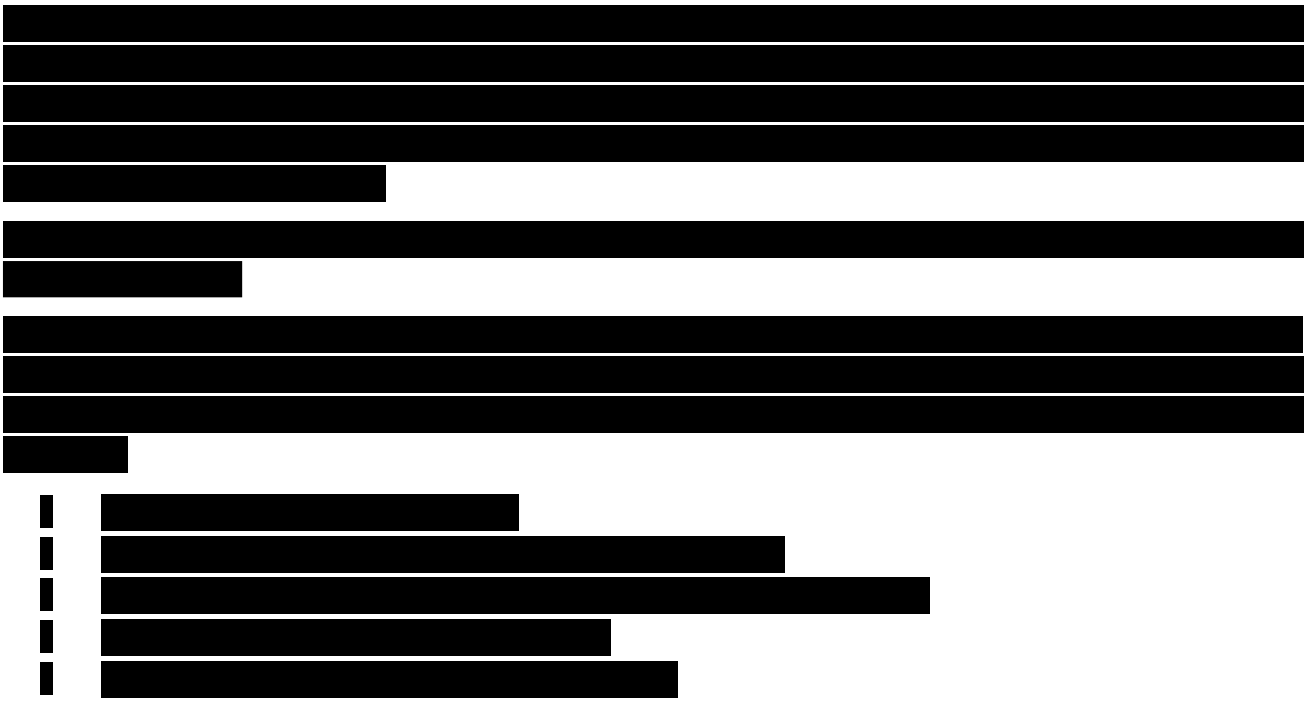
Document Control

Version History

Date	Version:	Revision Description	Approved by:
03.10.22	MEDLI-ASHBv1	Draft	Raphaela Janoni
18.10.22	MEDLI-ASHBv1	Final Draft	James Mahoney

Executive Summary

This document covers the Model for Effluent Disposal by Land Irrigation (MEDLI) for the Ashbourne Interim Wastewater Treatment Scheme (IWTS). The service area is in Moss Vale – New South Wales.



Contents

Appendices

1 Introduction

Modelling of effluent irrigation is undertaken to evaluate potential impacts on the receiving environment. [redacted]

1.1 Purpose

[redacted]

1.2 Scope

[redacted]

2 Site Description

The site consists of two separate and adjoining allotments comprising a total area of 125.7 hectares. The legal description of the site is Lot 3 in DP 706194 (No 32 Lovelle Street) and Lot 12 in DP 8660366 (No 141 Yarrawa Road). The site is bordered by Yarrawarra Road, Lovelle Street, Moss Vale Golf Course, and other urban and rural land zoned lots. The site is currently predominately pastural land, with a dwelling on each of the existing lots.

There is sufficient unconstrained land for sustainable site-specific wastewater management that achieves required offsets to environmental features and property boundaries as required by legislation and guidelines.

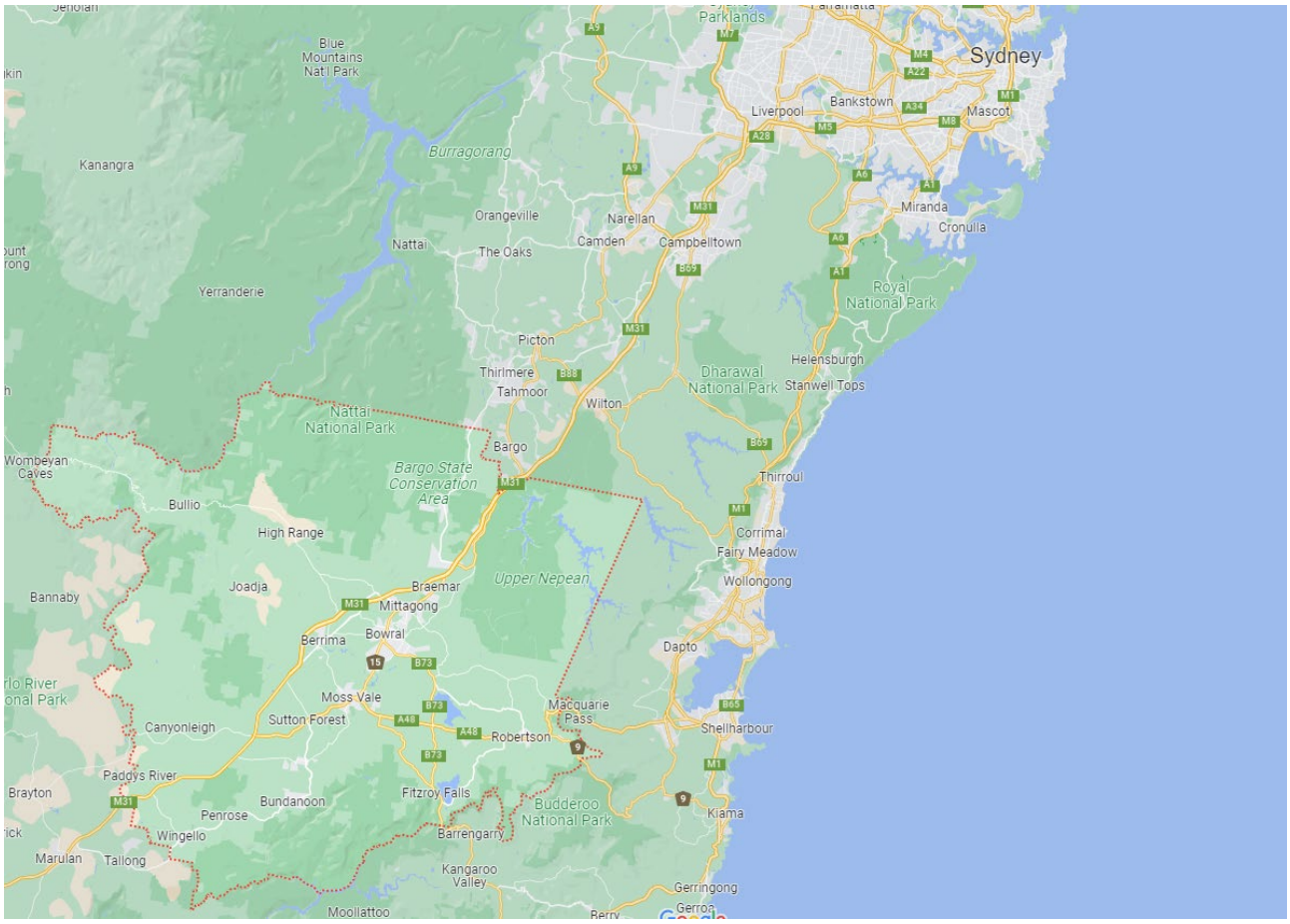


Figure 2.1 – The IWTP is located on the south-eastern fringe of Mossvale, Lot 301 (SP263791) and effluent is disposed of on Lot10 (RP903517)

3 MEDLI Inputs

MEDLI simulates the effluent stream from its production in an enterprise through to the disposal area and integrates waste production, pond water and nutrient balance, irrigation scheduling, soil water balance, plant growth, and soil nutrient cycling on a daily time-step. It also estimates steady-state soil salinity balance, nitrate transport through groundwater and performs simple quantitative microbial risk analysis. The Multirun option allows MEDLI to be run automatically for different combinations of wet-weather storage volume and irrigation area to identify the optimum design based on cost or environmental performance criteria such as overtopping amounts and frequency.

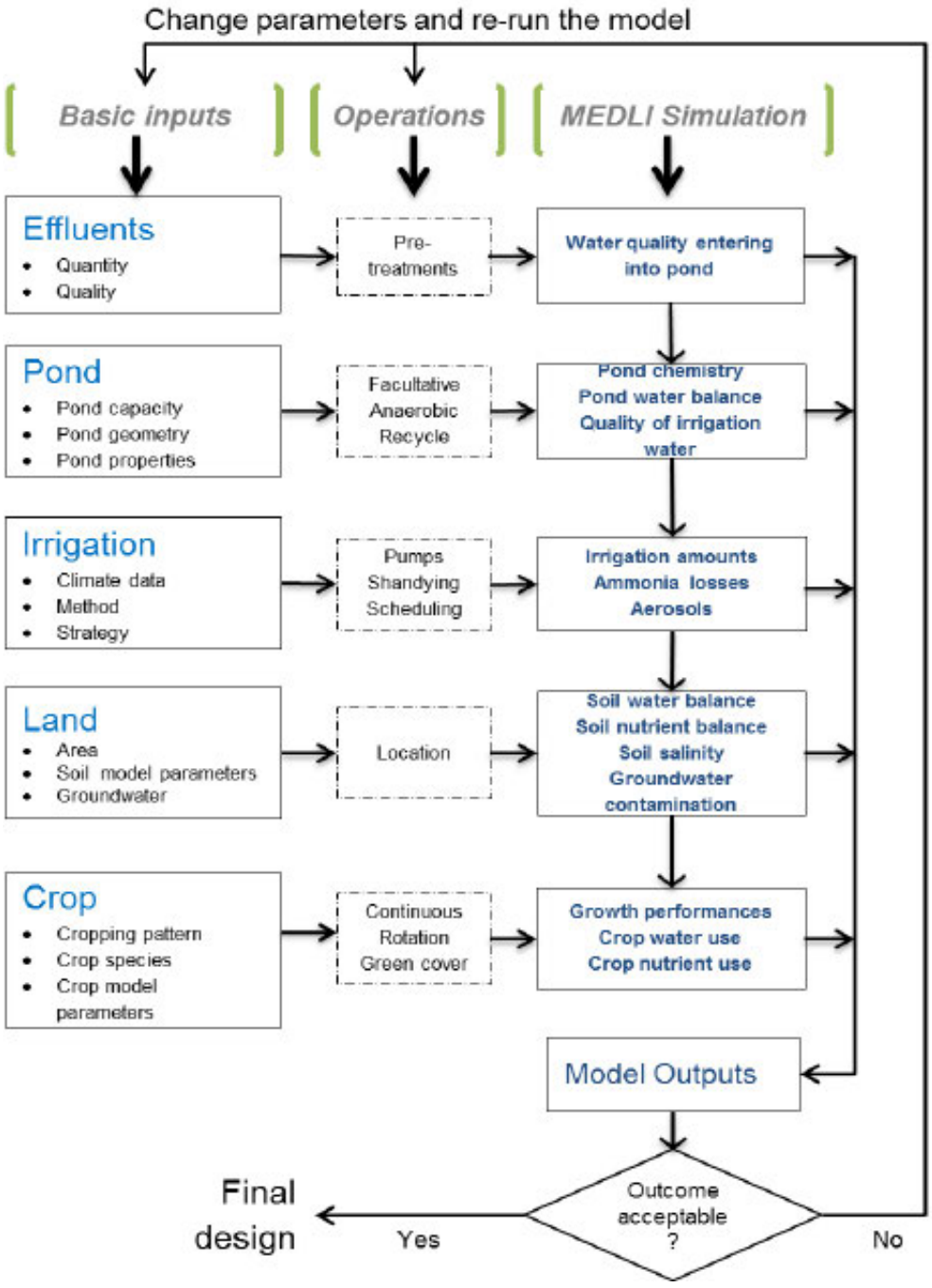


Figure 3.1 – Flowchart of the MEDLI modelling process from the DES Technical Guideline for Disposal of Effluent via Irrigation

3.1 Modelling Scenario

[redacted]

3.1.1 [redacted]

[redacted]

[redacted]

[redacted]

3.3.1 [redacted]

[redacted]

3.3.2 [redacted]

[redacted]

3.3.3 [redacted]

[redacted]

3.3.4 [redacted]

[redacted]

3.3.5 [redacted]

[redacted]

[redacted]

3.4.1 [redacted]

[redacted]

3.4.2 [redacted]

[redacted]

3.4.3 [redacted]

[redacted]

3.4.4 [redacted]

[redacted]

[redacted]

[redacted]

3.5.1 [redacted]

[redacted]

3.5.2 [redacted]

[redacted]

[redacted]

[redacted]

3.6.1 [redacted]

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[redacted]

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3.6.4 [redacted]

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[redacted]

3.6.10 [redacted]

[redacted]

3.6.11 [redacted]

[redacted]

3.6.12 [redacted]

[redacted]

4 MEDLI Summary

[redacted]

- [redacted] due to nitrate leaching beneath the irrigation area, and
  - details of health risk analyses.

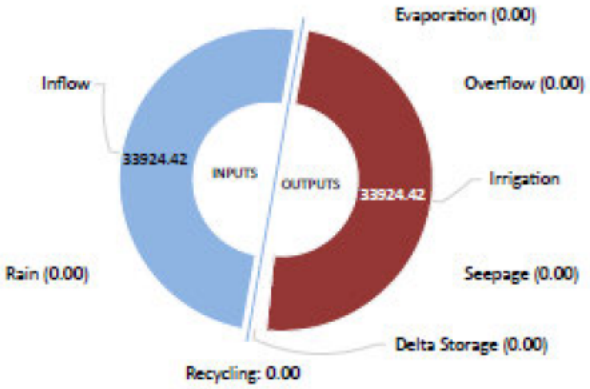
4.1 Pond System Water Performance – Overflow

The Pond System will have a final storage capacity of 4,079m^3 resulting in 0mm of overflow.

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: 4079 m3

Pond System Water Balance (m3/year)



Name	Value
Rain	0.00
Inflow	33924.42
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	33924.42
Seepage	0.00
Delta Storage	0.00

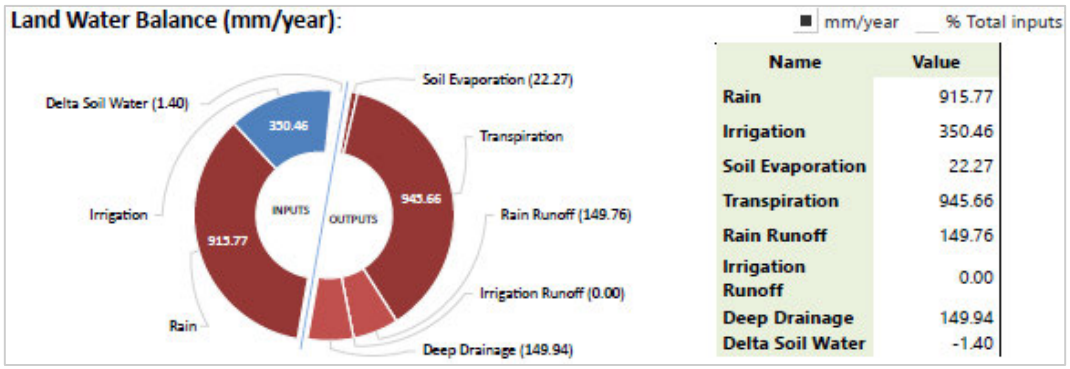
Overflow Diagnostics

Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% reuse (fraction)	1.00

Figure 4.1 – Ashbourne MEDLI Run - Pond System Performance

4.2 Land Water Balance

The Land Water confirms 0mm of irrigation run off per year.

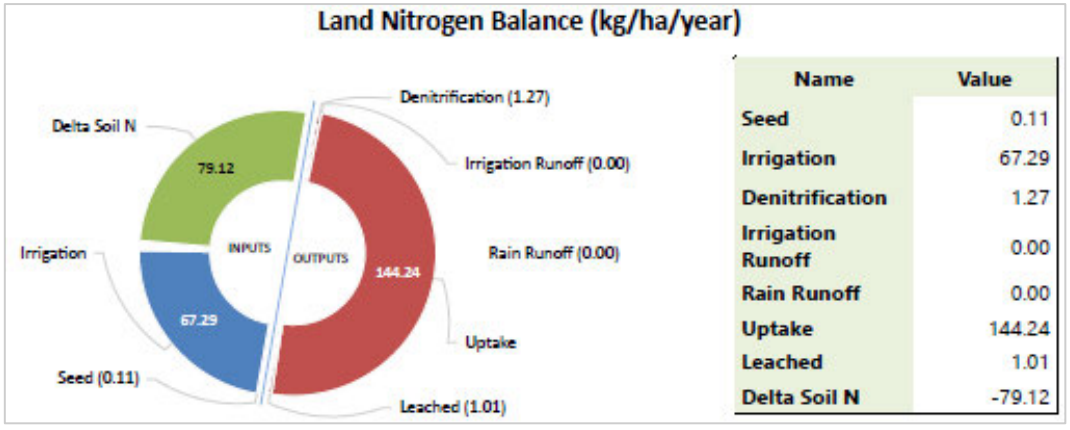


Name	Value
Rain	915.77
Irrigation	350.46
Soil Evaporation	22.27
Transpiration	945.66
Rain Runoff	149.76
Irrigation Runoff	0.00
Deep Drainage	149.94
Delta Soil Water	-1.40

Figure 4.2 – Ashbourne MEDLI Run - Land Water Balance

4.3 Land Nitrogen Balance

The Nitrogen Balance confirms a total leached nitrogen volume of 1.01kg/ha/year through the 1.5m soil profile.

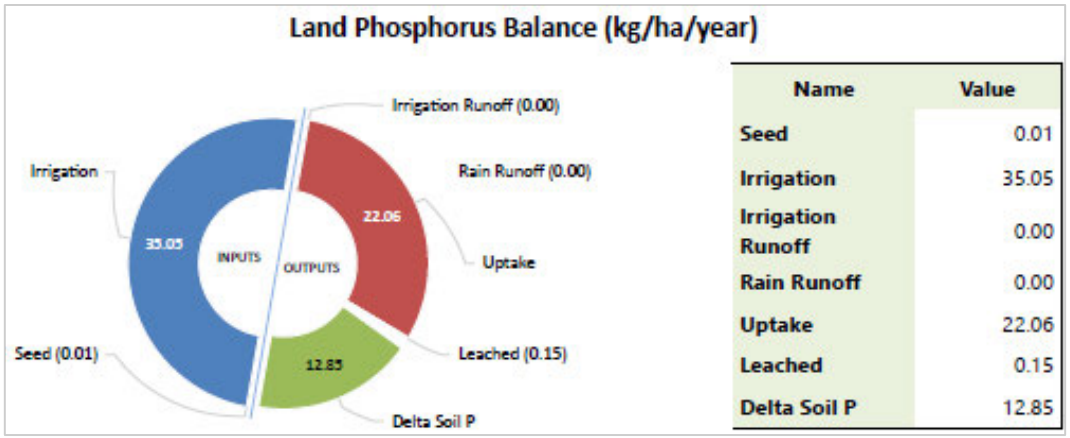


Name	Value
Seed	0.11
Irrigation	67.29
Denitrification	1.27
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	144.24
Leached	1.01
Delta Soil N	-79.12

Figure 4.3 – Ashbourne MEDLI Run - Land Nitrogen Balance

4.4 Land Phosphorous Balance

The Phosphorus Balance confirms the total leached phosphorus volume of 0.15kg/ha/year through the 1.5m soil profile.



Name	Value
Seed	0.01
Irrigation	35.05
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	22.06
Leached	0.15
Delta Soil P	12.85

Figure 4.4 – Scenario 1 MEDLI Run, Land Phosphorus Balance

4.5 Sustainability Diagnostics

The Sustainability Diagnostics confirm the maximum annual Nitrate–N concentration of deep drainage of 0.68mg/L. And confirm the design soil profile storage life based on average infiltrated water phosphorus concentration of 0.1mg/L/year is 90.87years.

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/ha/year)	67.29
Average annual soil nitrogen removed by plant uptake (kg/ha/year)	144.24
Average annual soil nitrogen removed by denitrification (kg/ha/year)	1.27
Average annual soil nitrogen leached (kg/ha/year)	1.01
Average annual nitrate-N loading to groundwater (kg/ha/year)	1.01
Soil organic-N kg/ha (Initial - Final)	4620.00 - 940.28
	118.20 - 0.06
Average nitrate-N concentration of deep drainage (mg/L)	0.68
Max. annual nitrate-N concentration of deep drainage (mg/L)	20.77

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/ha/year)	35.05
Average annual soil phosphorus removed by plant uptake (kg/ha/year)	22.06
Average annual soil phosphorus leached (kg/ha/year)	0.15
Dissolved phosphorus (kg/ha) (Initial - Final)	0.48 - 2.47
Adsorbed phosphorus (kg/ha) (Initial - Final)	2300.27 - 2914.92
Average phosphate-P concentration in rootzone (mg/L)	0.36
Average phosphate-P concentration of deep drainage (mg/L)	0.10
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.10
Design soil profile storage life based on average infiltrated water phosphorus concn. of 3.14 mg/L (years)	90.87

Figure 4.5 – Ashbourne MEDLI Run - Sustainability Diagnostics

Appendix 1

Ashbourne IWTS

MEDLI Report

MEDLI REPORT - FULL RUN

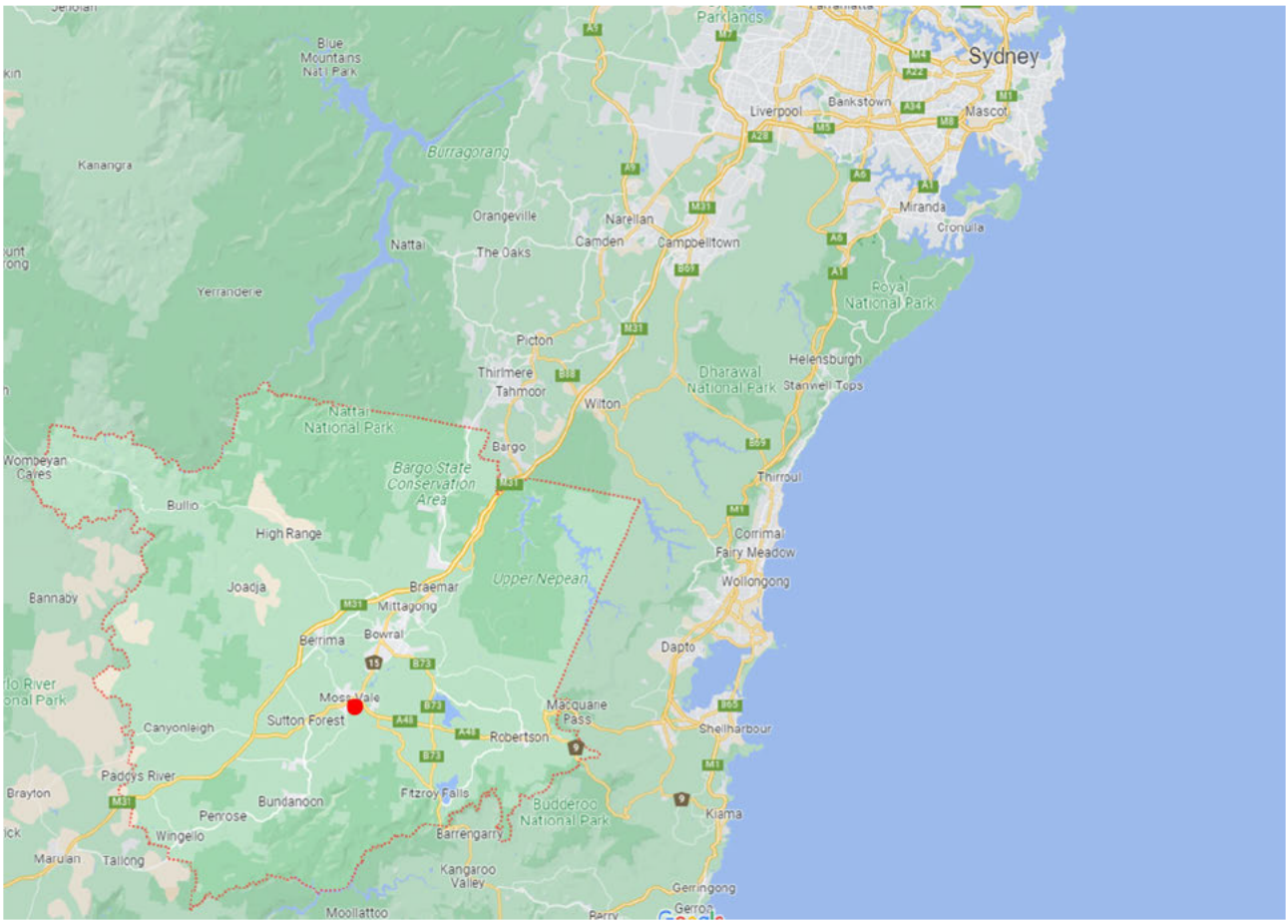
Enterprise: ASHBOURNE INTERIM WASTEWATER TREATMENT SYSTEM (IWTS)

Description:
MEDLI Modelling for Effluent Irrigaiton

Client: Aoyuan

MEDLI User: JM-OFFICE-ALPHA\jim-m

Scenario Details:
178 Lots (516 - Conservative EP)
9.68Hectare Spray Irrigation
50year MEDLI Run



DESCRIPTION

Climate Data: Ashbourne Moss Vale, -34.55°, 150.4°

Run Period: 01/01/1971 to 31/12/2018 48 years, 0 days

Climate Statistics:

	5th Percentile	50th Percentile	95th Percentile
Rainfall (mm/year)	546	896	1478
Pan Evaporation (mm/year)	1052	1227	1496

Climate Data:

Chart ■ Table

■ Monthly Daily

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain (mm)	77.0	104.7	97.4	75.7	69.3	102.7	52.1	69.6	57.5	64.6	79.6	65.5	915.8
Pan (mm)	173.3	132.9	115.2	77.3	52.9	38.1	44.6	67.9	95.9	126.6	142.7	175.1	1242.4
Max Temp (oC)	25.3	24.2	22.2	19.0	15.5	12.3	11.7	13.3	16.4	19.1	21.4	24.0	18.7
Min Temp (oC)	13.6	13.7	11.9	8.8	5.9	3.7	2.5	3.2	5.5	7.8	10.0	12.1	8.2
Rad (MJ/m2/day)	21.6	18.9	16.4	13.5	10.4	8.7	10.0	13.3	17.1	20.0	21.5	22.9	16.2
Net Evap (mm)	96.2	28.2	17.8	1.6	-16.3	-64.6	-7.4	-1.7	38.4	62.0	63.0	109.6	326.7

DESCRIPTION

Effluent type: New Sewage Treatment Plant

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality: ☐ Chart ■ Table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Effluent (m3)	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92 9	92.9
TN (mg/L)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
TP (mg/L)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
TDS (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VS (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TS (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Wastestream after any recycling and pretreatment if applicable

Effluent quantity: 33924.42 m3/year or 92.88 m3/day (Min-Max: 92.88 - 92.88)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

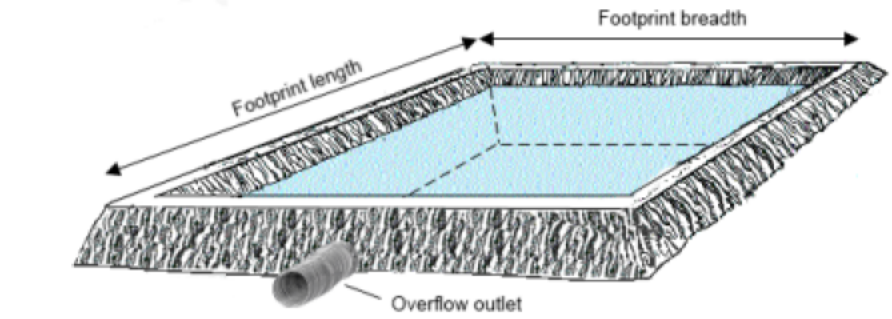
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	20.00 (20.00 - 20.00)	678.49 (678.02 - 679.88)
Total Phosphorus	10.00 (10.00 - 10.00)	339.24 (339.01 - 339.94)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

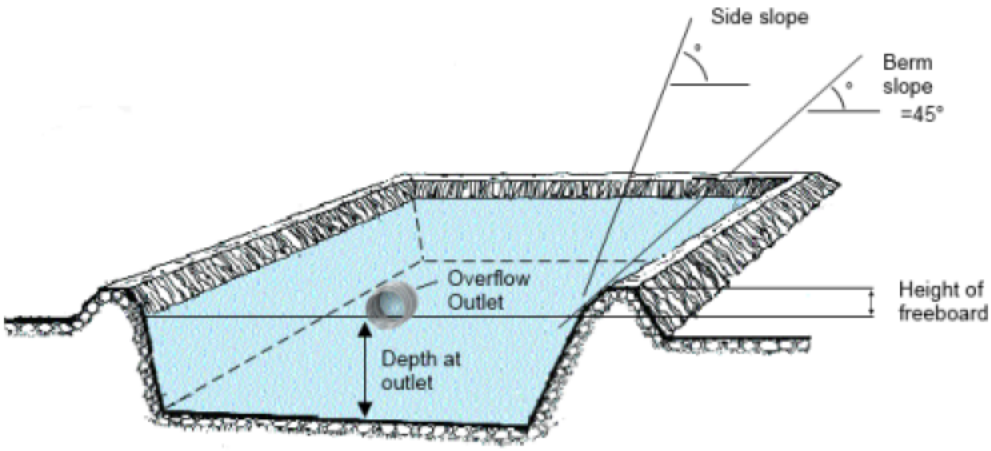
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	4079.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	3.00
Maximum water surface area (m2)	1573.05
Pond footprint length (m)	97.15
Pond footprint width (m)	16.19
Pond catchment area (m2)	1573.05
Average active volume (m3)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.01
Maximum pump rate limit (ML/day)	0.10

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

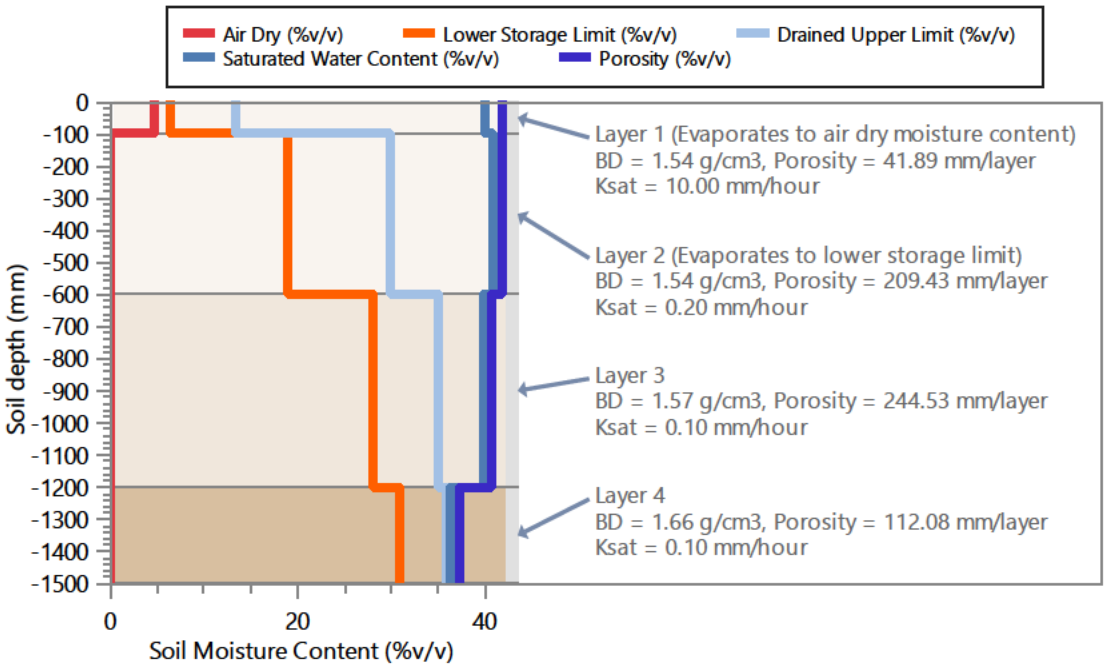
DESCRIPTION

Land: New Paddock

Area (ha): 9.68

Soil Type: Duplex 2, 1500.00 mm defined profile depth

Profile Porosity (mm)	607.92
Profile saturation water content (mm)	593.10
Profile drained upper limit (or field capacity) (mm)	482.00
Profile lower storage limit (or permanent wilting point) (mm)	362.70
Profile available water capacity (mm)	119.30
Profile limiting saturated hydraulic conductivity (mm/hour)	0.10
Surface saturated hydraulic conductivity (mm/hour)	10.00
Runoff curve number II (coefficient)	82.00
Soil evaporation U (mm)	8.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Kikuyu 2 Pasture -2

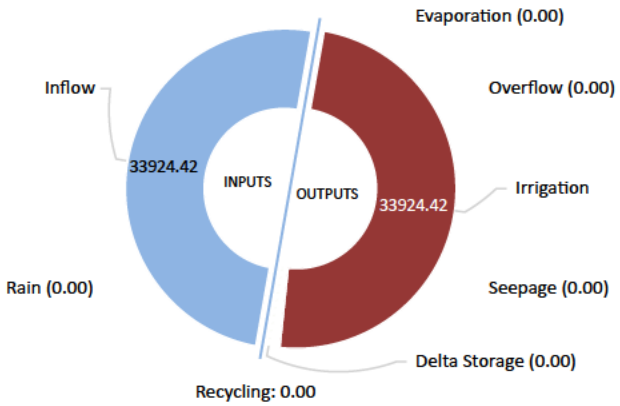
Average monthly cover (fraction) (minimum - maximum)	0.97 (0.92 - 1.00)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 1 x Pan coefficient 0.95)	0.95
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: 4079 m3

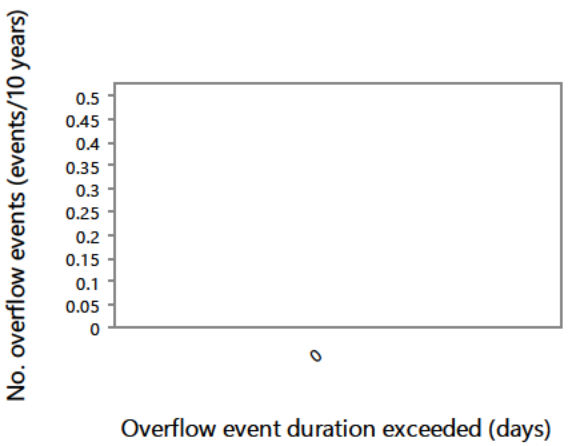
Pond System Water Balance (m3/year)

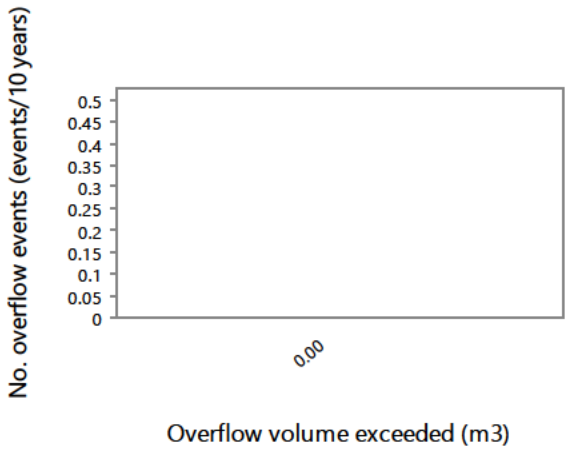


Name	Value
Rain	0.00
Inflow	33924.42
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	33924.42
Seepage	0.00
Delta Storage	0.00

Overflow Diagnostics

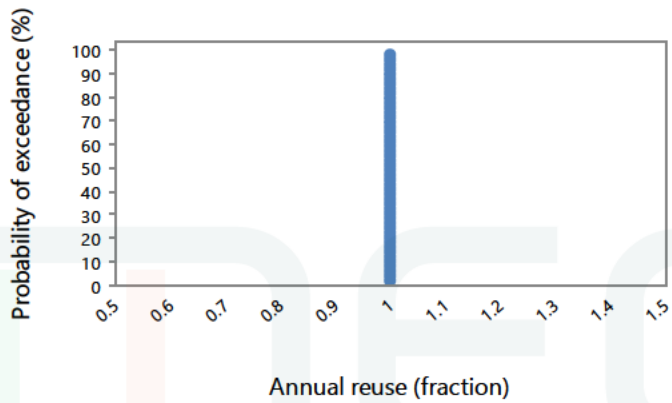
Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% reuse (fraction)	1.00





Export plot

Export plot



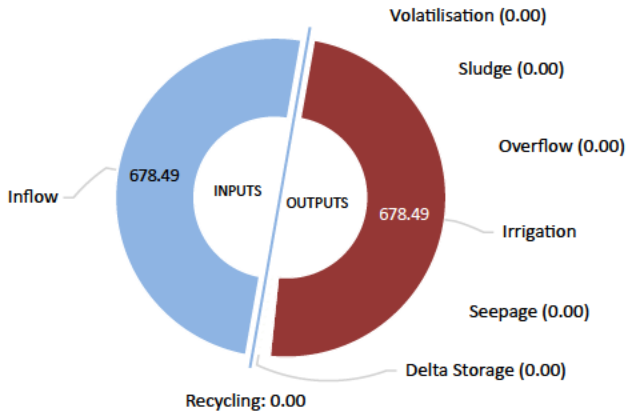
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

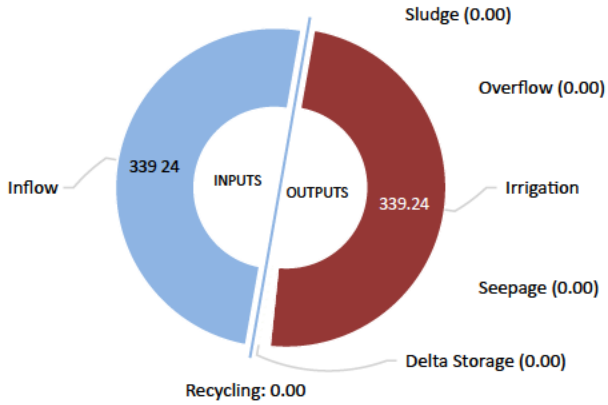
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



Name	Value
Inflow	678.49
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	678.49
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)



Name	Value
Inflow	339.24
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	339.24
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	20.00
Average phosphorus concentration of pond liquid (mg/L)	10.00
Average salinity of pond liquid (dS/m)	0.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	20.00
Final phosphorus concentration of pond liquid (mg/L)	10.00
Final salinity of pond liquid (dS/m)	0.00

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year) Average Shandy water irrigation (m3/year) (minimum - maximum)	33924.42 0.00 (0.00 - 0.00)
Total water irrigated (m3/year) Proportion of irrigation events requiring shandying (fraction of events)	33924.42 0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	20.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	19.20
Average phosphorus concentration of irrigation water (mg/L) Average salinity of irrigation water (dS/m)	10.00 0.00

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

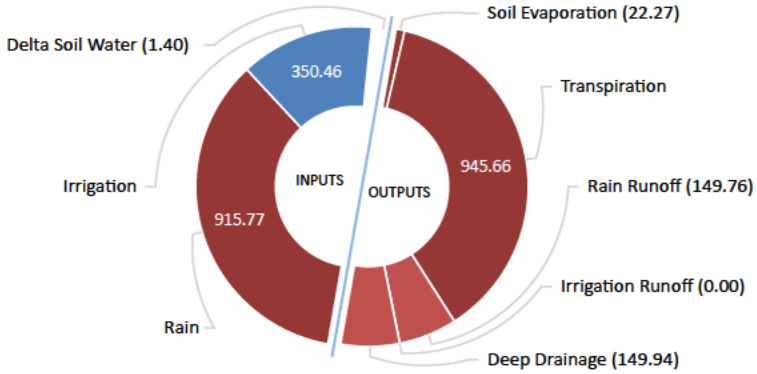
PERFORMANCE

Land Performance - Soil Water

Paddock: New Paddock, 9.68 ha
Soil Type: Duplex 2, 104.00 mm PAWC at maximum root depth

Land Water Balance (mm/year):

■ mm/year ☐ % Total inputs



Name	Value
Rain	915.77
Irrigation	350.46
Soil Evaporation	22.27
Transpiration	945.66
Rain Runoff	149.76
Irrigation Runoff	0.00
Deep Drainage	149.94
Delta Soil Water	-1.40

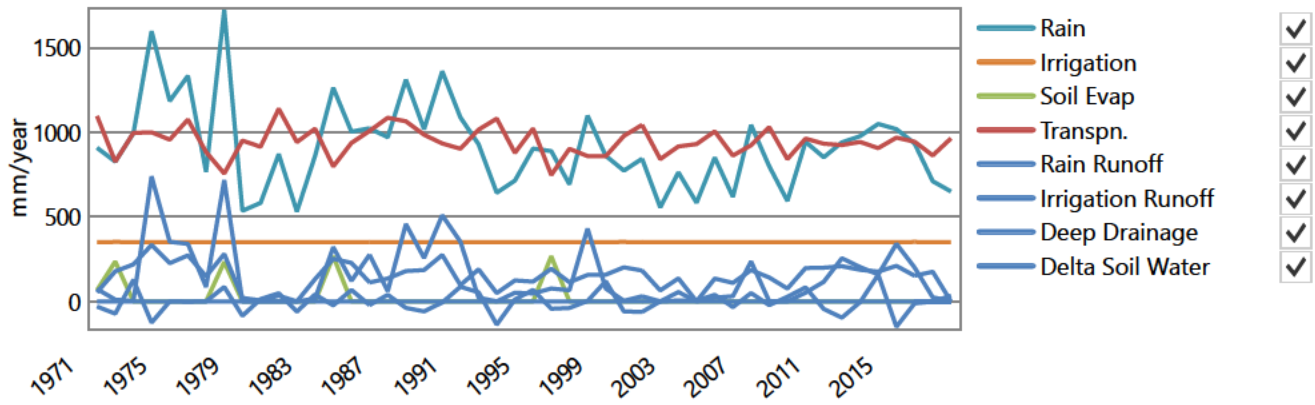
Average Monthly Totals (mm):

☐ Chart ■ Table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rain	77.0	104.7	97.4	75.7	69.3	102.7	52.1	69.6	57.5	64.6	79.6	65.5	915.8
Irrigation	29.7	27.1	29.7	28.8	29.7	28.8	29.7	29.7	28.8	29.7	28.8	29.7	350.5
Soil Evap	1.3	0.1	0.0	0.0	0.0	1.2	2.7	4.3	4.4	5.0	3.1	0.2	22.3
Transpn.	104.1	94.6	91.5	63.8	48.2	33.9	38.0	58.2	81.4	103.2	108.2	120.5	945.7
Rain Runoff	0.1	3.3	15.6	16.7	11.2	41.5	16.5	30.5	4.7	4.8	3.6	1.3	149.8
Irrigation Runoff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deep Drainage	1.3	2.3	5.9	8.6	13.7	20.5	25.8	25.6	20.0	13.6	8.1	4.4	149.9
Delta Soil Water	-0.2	31.6	14.2	15.4	25.8	34.3	-1.1	-19.3	-24 2	-32.2	-14.6	-31.2	-1.4

Average Annual Totals (mm/year):

■ Chart ☐ Table



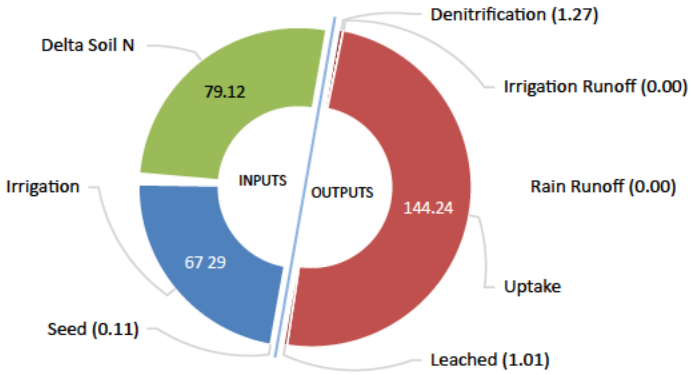
PERFORMANCE

Land Performance - Soil Nutrient

Paddock: New Paddock, 9.68 ha **Soil Type**: Duplex 2

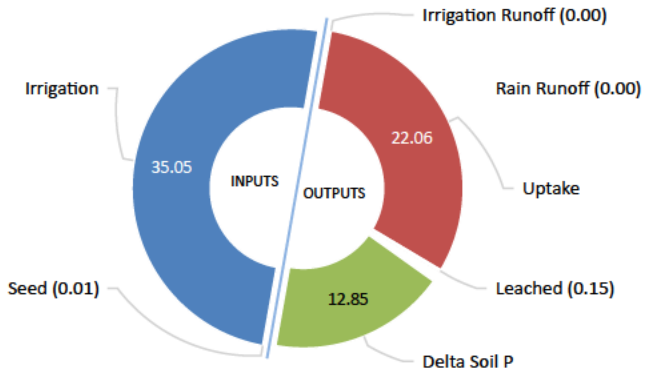
Irrigation ammonium volatilisation losses (kg/ha/year): 2.80
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.20

Land Nitrogen Balance (kg/ha/year)



Name	Value
Seed	0.11
Irrigation	67.29
Denitrification	1.27
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	144.24
Leached	1.01
Delta Soil N	-79.12

Land Phosphorus Balance (kg/ha/year)



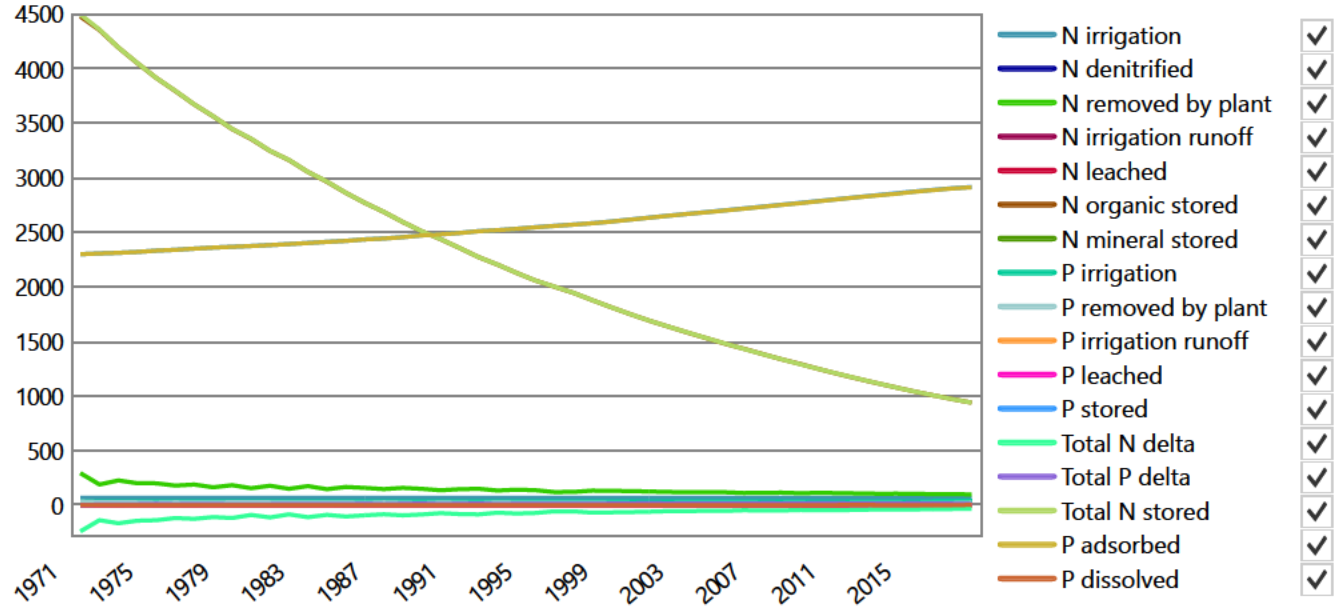
Name	Value
Seed	0.01
Irrigation	35.05
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	22.06
Leached	0.15
Delta Soil P	12.85

PERFORMANCE

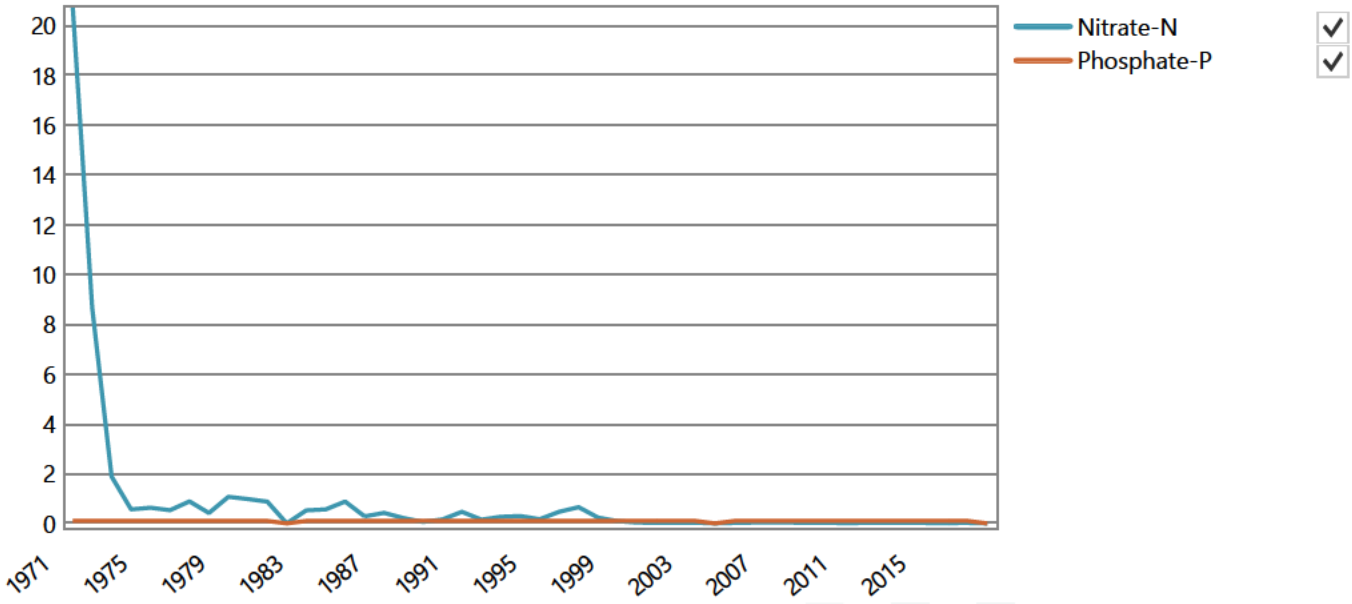
Land Performance - Soil Nutrient

Paddock: New Paddock, 9.68 ha **Soil Type**: Duplex 2

Annual Nutrient Totals (kg/ha):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: New Paddock, 9.68 ha **Soil Type**: Duplex 2

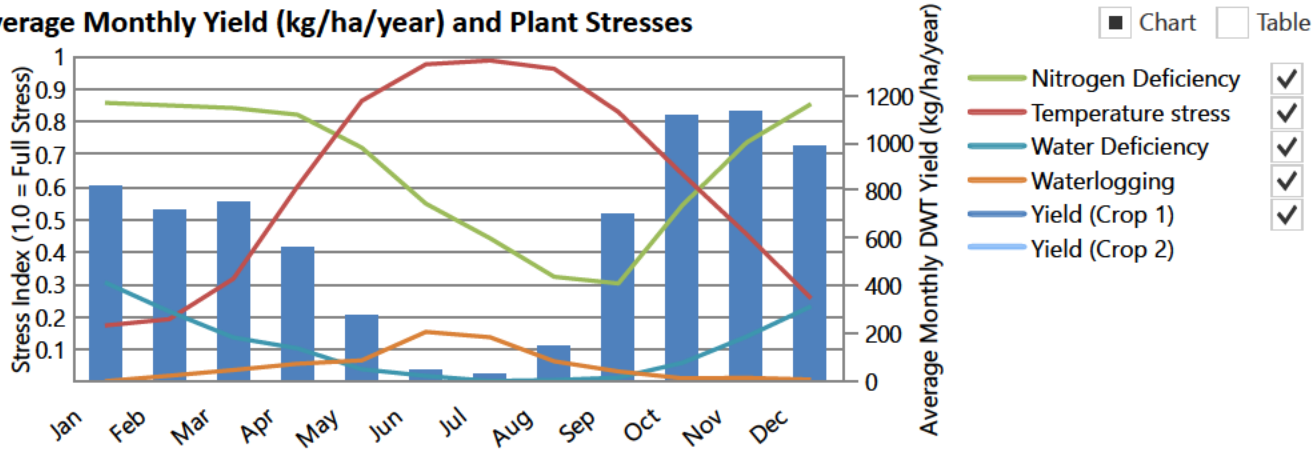
Plant: Continuous Kikuyu 2 Pasture -2

Average annual shoot dry matter yield (kg/ha/year)	7296.30 (5473.99 - 13845.21)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.97 (0.92 - 1.00)
Average monthly root depth (mm) (minimum - maximum)	1162.26 (1104.17 - 1200.00)

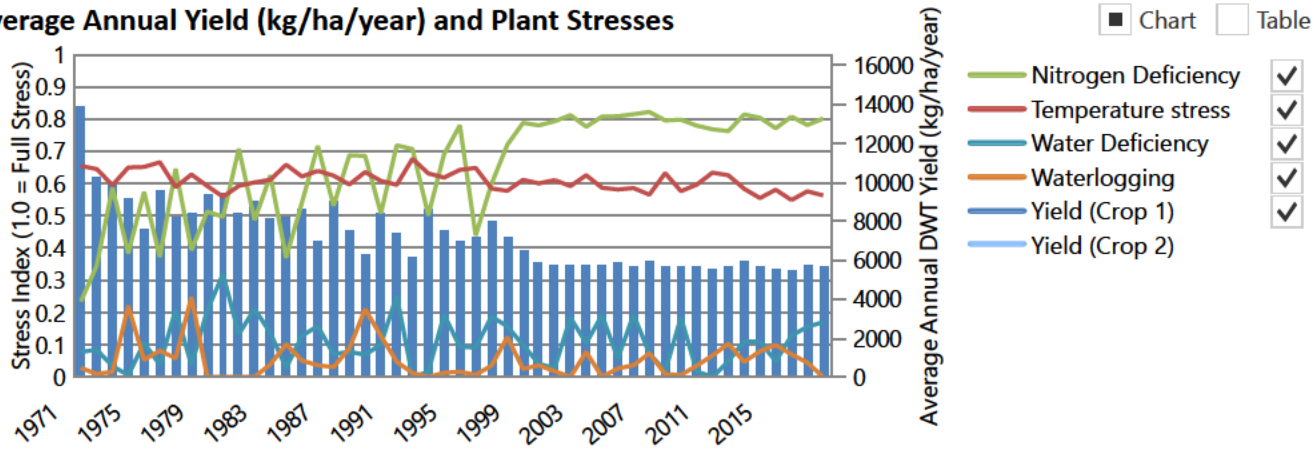
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/ha/year)	144.24 (99.45 - 294.13)
Average annual net phosphorus removed by plant uptake (kg/ha/year)	22.06 (16.39 - 34.10)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.02 - 0.03)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.005)

Average Monthly Yield (kg/ha/year) and Plant Stresses



Average Annual Yield (kg/ha/year) and Plant Stresses



No. of harvests/year: 1.25 (normal), 0.10 (forced by crop death due to frosting (0.08), water stress (0.02))
No. days without crop/year (days/year): 2.29 due to frosting (0.58), temperature stress - not frost (1.60), water stress (0.06), waterlogging (0.04)

PERFORMANCE

Land Performance

Paddock: New Paddock, 9.68 ha **Soil Type**: Duplex 2

Plant: Continuous Kikuyu 2 Pasture -2

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

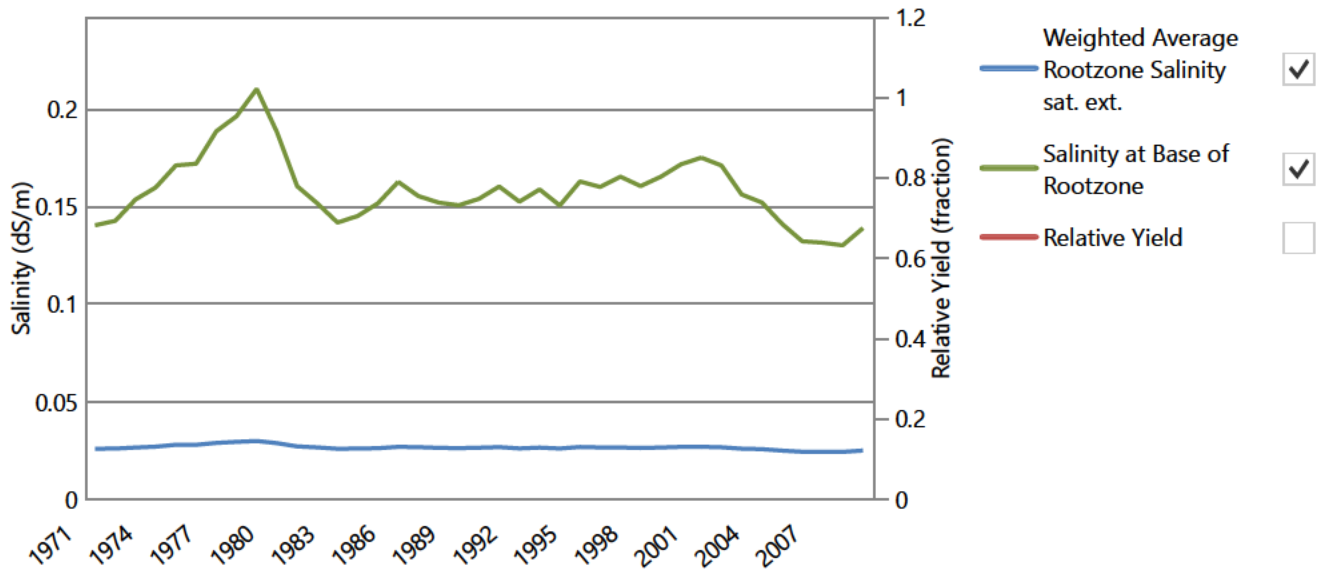
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	0.02
Salt added by rainfall (kg/ha/year)	147.08
Average annual effluent salt added & leached at steady state (kg/ha/year)	147.08
Average leaching fraction based on 10 year running averages (fraction)	0.35
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	0.03
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	0.16
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

Average Annual Rootzone Salinity and Relative Yield:

■ Chart ☐ Table

All values based on 10 year running averages



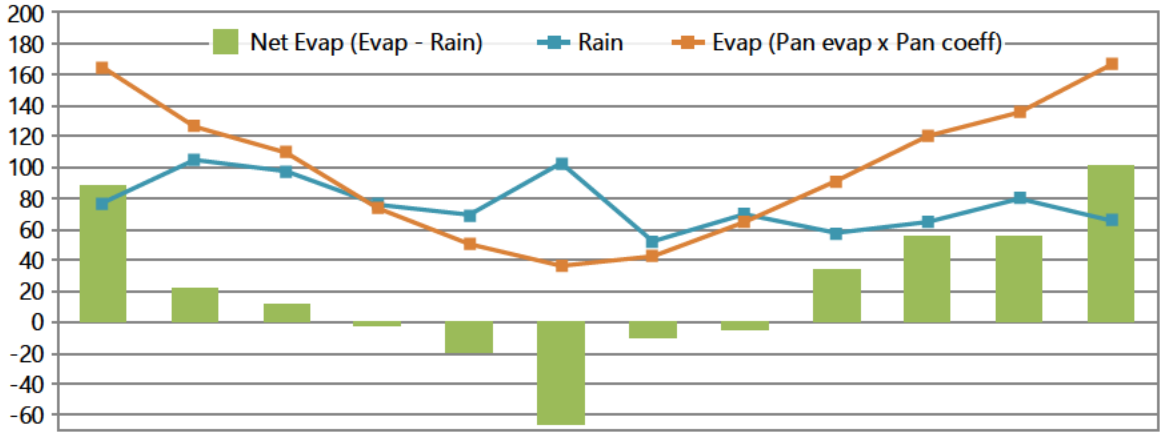
DIAGNOSTICS

Sustainability Diagnostics: ASHBOURNE INTERIM WASTEWATER TREATMENT SYSTEM (IWTS)

Averaged Historical Climate Data Used in Simulation (mm)

Location: Ashbourne Moss Vale, -34.55°, 150.4°

Run Period: 01/01/1971 to 31/12/2018 48 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	77.0	104.7	97.4	75.7	69.3	102.7	52.1	69.6	57.5	64.6	79.6	65.5	915.8
Evap	164.6	126.2	109.4	73.5	50.3	36.2	42.4	64.5	91.1	120.2	135.5	166.3	1180.3
Net Evap	87.6	21.5	12.0	-2.3	-19.0	-66.5	-9.7	-5.1	33.6	55.6	55.9	100.8	264.5
Net Evap/day	2.8	0.8	0.4	-0.1	-0.6	-2.2	-0.3	-0.2	1.1	1.8	1.9	3.3	0.7

DIAGNOSTICS

Sustainability Diagnostics: ASHBOURNE INTERIM WASTEWATER TREATMENT SYSTEM (IWTS)

Pond System: 1 closed storage tank

New Sewage Treatment Plant - 33924.42 m3/year or 92.88 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.25 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	20.00 (20.00 - 20.00)	678.49 (678.02 - 679.88)
Total Phosphorus	10.00 (10.00 - 10.00)	339.24 (339.01 - 339.94)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

Last pond (Wet weather store): 4079.00 m3

Theoretical hydraulic retention time (days)	43.92
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0 26 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% effluent reuse (fraction)	1.00
Average salinity of last pond (dS/m)	0.00
Salinity of last pond on final day of simulation (dS/m)	0.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

☐ Chart ■ Table

Overflow volume exceeded (m3)	No. overflow events (events/10 years)
0.00	0.00

DIAGNOSTICS

Sustainability Diagnostics: ASHBOURNE INTERIM WASTEWATER TREATMENT SYSTEM (IWTS)

Irrigation Information

Irrigation: 9.68 ha total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/ha/year
Total irrigation applied (m3)	33924.42	3504.59
Total nitrogen applied (kg)	651.35	67.29
Total phosphorus applied (kg)	339.24	35.05
Total salts applied (kg)	0.00	0.00

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: ASHBOURNE INTERIM WASTEWATER TREATMENT SYSTEM (IWTS)

Paddock Land: New Paddock: 9.68 ha

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 1.00 mm each day Irrigation window from 1/1 to 31/12 including the days specified A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Duplex 2, 104.00 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	77.0	104.7	97.4	75.7	69.3	102.7	52.1	69.6	57.5	64.6	79.6	65.5	915.8
Irrigation	29.7	27.1	29.7	28.8	29.7	28.8	29.7	29.7	28.8	29.7	28.8	29.7	350.5
Soil Evap	1.3	0.1	0.0	0.0	0.0	1.2	2.7	4.3	4.4	5.0	3.1	0.2	22.3
Transpn.	104.1	94.6	91.5	63.8	48 2	33.9	38.0	58.2	81.4	103.2	108.2	120.5	945.7
Rain Runoff	0.1	3.3	15.6	16.7	11 2	41.5	16.5	30.5	4.7	4.8	3.6	1.3	149.8
Irr. Runoff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Drainage	1.3	2.3	5.9	8.6	13.7	20.5	25.8	25.6	20.0	13.6	8.1	4.4	149.9
Delta	-0.2	31.6	14.2	15.4	25.8	34.3	-1.1	-19.3	-24.2	-32.2	-14.6	-31.2	-1.4

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/ha/year)	67.29
Average annual soil nitrogen removed by plant uptake (kg/ha/year)	144.24
Average annual soil nitrogen removed by denitrification (kg/ha/year)	1.27
Average annual soil nitrogen leached (kg/ha/year)	1.01
Average annual nitrate-N loading to groundwater (kg/ha/year)	1.01
Soil organic-N kg/ha (Initial - Final)	4620.00 - 940.28
	118 20 - 0.06
Average nitrate-N concentration of deep drainage (mg/L)	0.68
Max. annual nitrate-N concentration of deep drainage (mg/L)	20.77

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/ha/year)	35.05
Average annual soil phosphorus removed by plant uptake (kg/ha/year)	22.06
Average annual soil phosphorus leached (kg/ha/year)	0.15
Dissolved phosphorus (kg/ha) (Initial - Final)	0.48 - 2.47
Adsorbed phosphorus (kg/ha) (Initial - Final)	2300.27 - 2914.92
Average phosphate-P concentration in rootzone (mg/L)	0.36
Average phosphate-P concentration of deep drainage (mg/L)	0.10
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.10
Design soil profile storage life based on average infiltrated water phosphorus concn. of 3.14 mg/L (years)	90.87

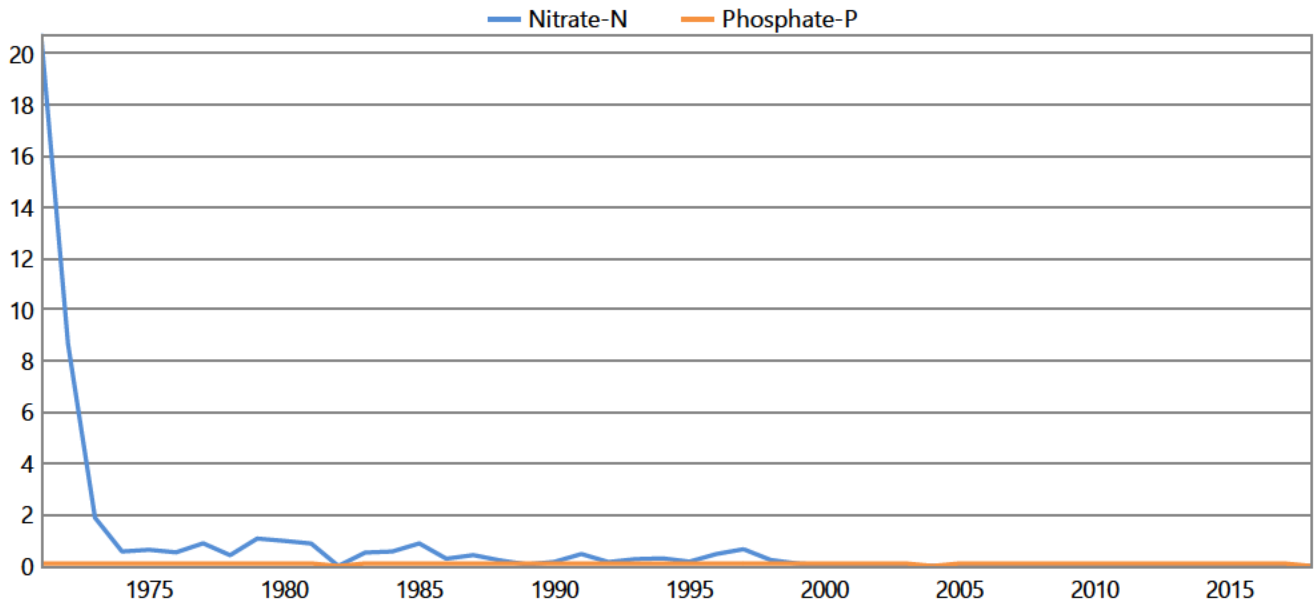
DIAGNOSTICS

Sustainability Diagnostics: ASHBOURNE INTERIM WASTEWATER TREATMENT SYSTEM (IWTS)

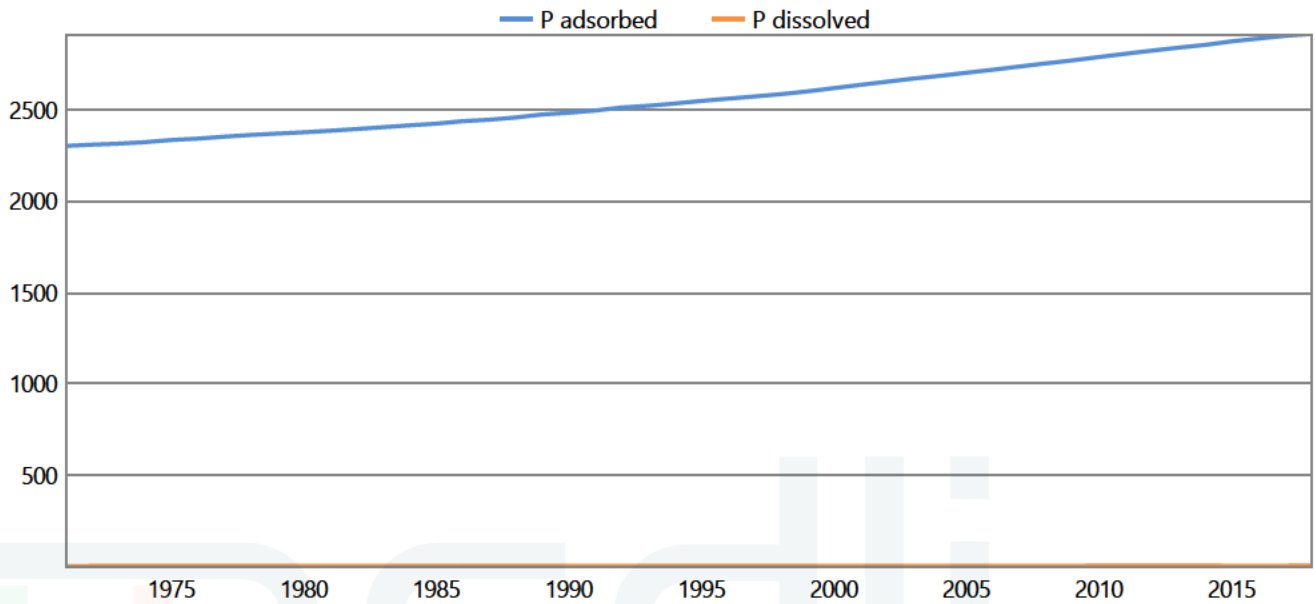
Paddock Land: New Paddock: 9.68 ha

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/ha)



DIAGNOSTICS

Sustainability Diagnostics: ASHBOURNE INTERIM WASTEWATER TREATMENT SYSTEM (IWTS)

Paddock Plant Performance: New Paddock: 9.68 ha

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 2 Pasture -2

Average annual shoot dry matter yield (kg/ha/year)	7296.30 (5473.99 - 13845.21)
Average monthly plant (green) cover (fraction)	0.97 (0.92 - 1.00)
Average monthly crop factor (fraction)	0.92 (0.87 - 0.95)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	1162.26 (1104.17 - 1200.00)
Average number of normal harvests per year (no./year)	1.25 (1.00 - 2.00)
Average number of normal harvests for last five years only (no./year)	1.00
Average number of crop deaths per year (no./year)	0.10 (0.00 - 2.00)
Average number of crop deaths for last five years only (no./year)	0.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.65 (0.23 - 0.82)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.18 (0.08 - 0.37)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.99 (0.95 - 1.00)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.11 (0.01 - 0.31)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.05 (0.00 - 0.16)
No. days without crop/year (days)	2.29

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts

All values based on 10 year running averages

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	0.02
Salt added by rainfall (kg/ha/year)	147.08
Average annual effluent salt added & leached at steady state (kg/ha/year)	147.08
Average leaching fraction based on 10 year running averages (fraction)	0.35
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	0.03
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	0.16
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen

Appendix C

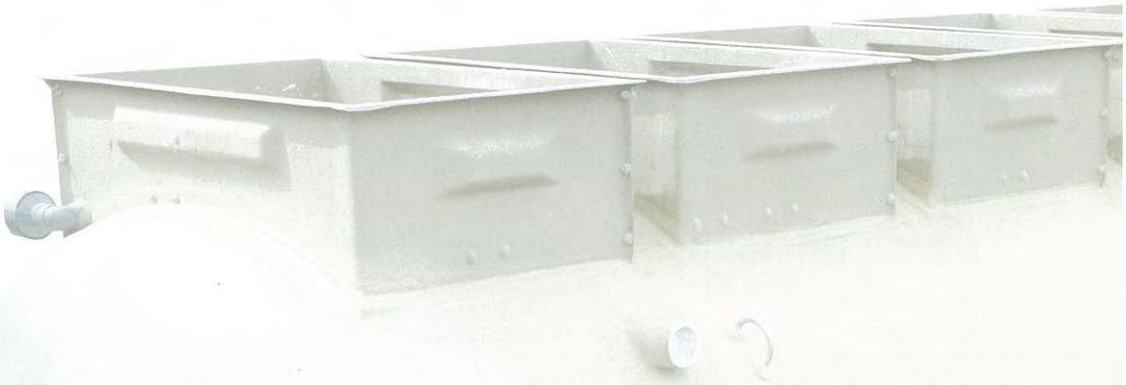
Kubota Wastewater Treatment Equipment

Kubota

For Earth, For Life

Kubota FRP Johkasou, Sewage Treatment Equipment

[Suitable for 5 ~ 5,000 persons]



The Pinnacle of Water Treatment Technology

KJ-5

KM-SG-NP

Plant Package

Kubota's advanced water treatment technology now delivered in a package

To meet water treatment needs, Kubota has committed itself to offering optimal water treatment solutions by utilizing all the technologies and expertise available. This is the mission of Kubota, a leading player in the global and Japan water treatment markets. Kubota now unveils a package incorporating its advanced water treatment engineering expertise, which has been refined through many years of experience in building water treatment plants. Optimal water treatment solutions are available in locations and in sizes customers require. Kubota's "plant package" is sure to serve as the key concept of combined wastewater treatment tanks. Customers who are dedicated to building environmentally friendly communities and lifestyles befitting the 21st century choose Kubota tanks.

Environmental Technology | **Water Purification** | **Craftsmanship**

Kubota FRP Johkasou, Sewage Treatment Equipment

Small-size Johkasou

This wastewater treatment tank is designed for individual homes and vacation homes to small-scale stores and apartment buildings. It is a standard product.

KJ

Flow rate	Effluent water quality
1.0～2.0(m³/day)	BOD 20mg/L T-N 20mg/L

Sedimentation-separation anaerobic filter moving bed process

HS-P

Flow rate	Effluent water quality
1.0～2.0(m³/day)	BOD 20mg/L

Anaerobic filter contact aeration process

HC-B / HC-A

Flow rate	Effluent water quality
2.8～10.0(m³/day)	BOD 20mg/L

Anaerobic filter moving bed biofilm filter process

Large-size Johkasou

This wastewater treatment tank can be adapted to various uses, including large-scale plants, public facilities and apartment buildings. It is custom-made according to the facility's demands.

Membrane Bioreactor Type

Kubota's wastewater treatment tanks are used to preserve the environment in areas where sewage systems are rarely installed. Specifically, this is Kubota's proprietary membrane bioreactor system,where a highly-concentrated activated sludge system is coupled with submerged fine-pore membranes to perform advanced water treatment. Treated water can be reused, without post-treatment, as flush water for toilet and spray water.

KM-SG-NP

Flow rate
5.1～(m³/day)

Effluent water quality
BOD 5mg/L, COD 10mg/L, T-N 10mg/L,T-P 1mg/L

Moving Bed Media Filter Type

This type of wastewater treatment tank constitutes a compact water treatment system. Since this type of tank adopts a moving bed media filter system and incorporates a flow volume control function, it is able to perform stable water treatment for condominiums, stores, plants, and other large-scale buildings.

K-HC-T

Flow rate	Effluent water quality
2.55～92(m³/day)	BOD 20mg/L, COD 30mg/L

Peak-cut flow solid-liquid separation anaerobic filter moving bed media filter process

K-HC-R

Flow rate	Effluent water quality
2.55～(m³/day)	BOD 20mg/L, COD 30mg/L

Flow equalization-type moving bed media filter process

Kubota's Refined Expertise Catapults Clean Technology to the Next Stage

The pinnacle of water treatment technology,demonstrating highly advanced and stable water treatment performance

Submerged Membrane

Submerged Membrane® is a patented technology that has been achieved through the combination of Kubota advanced water treatment technology and its unique membrane technology.

Membrance Bioreactor System

Applicable Products | Model KM-SG-NP

Removal of T-N, T-P

Since it processes high-concentration activated sludge, it is easily possible to remove not only organic pollution such as BOD, but also nitrogen. Phosphorus can be removed through direct coagulant dosing into the nitrification tank.

Compact installation space

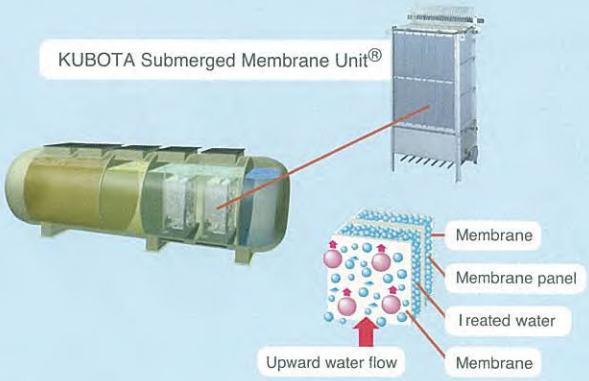
Since it processes high-concentration activated sludge, no sedimentation tank or sludge thickening tank is required. Installation space can be designed 30～60% smaller compared with conventional systems.

Reusable treated water

Since treated water is discharged through small membrane pores (0.4 μm), treated water is stable and with high quality effluent. Most microorganisms cannot pass through the membrane, so treated water can be reused without the high-treatment facilities.

KUBOTA Submerged Membrane Unit®

The KUBOTA Submerged Membrane Unit® incorporates microporous membranes made from polyolefin. Although fluids smaller than the membrane's micropores can permeate the membrane, contaminated ingredients cannot permeate it due to their larger size. Furthermore, contaminants are pulled to the membrane surface. Water flow created by aeration,and air bubbles contact the membrane's surface and move upward while vibrating the surface. This keeps the membrane surface always clean and prevents the micropores from clogging.



Reducing tank size and stabilizing water treatment at the same time means lower construction costs

Media flow filter method

Applicable Products | Models KJ,HC-B/A,K-HC-T,K-HC-R

Achieving highly efficient treatment with moving bed media

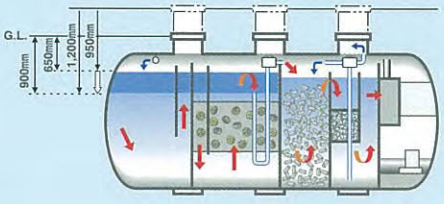
The moving bed tank employs a hollow cylindrical media that is highly capable of retaining microorganisms.

Filter media
Smooth-surfaced cylinder
(φ14-16 × 15 mm)

Moving bed media
(φ28 × 28 mm)

For K-HC-T type, depth of inlet pipe can be designed in the range GL-650～900 mm.

If manhole connection piping is used, a pump-up tank is not required in the lowest range of inlet pipe depth, GL-1200 mm. (φ2500 tank)



Sedimentation-separation anaerobic filter moving bed process

KJ

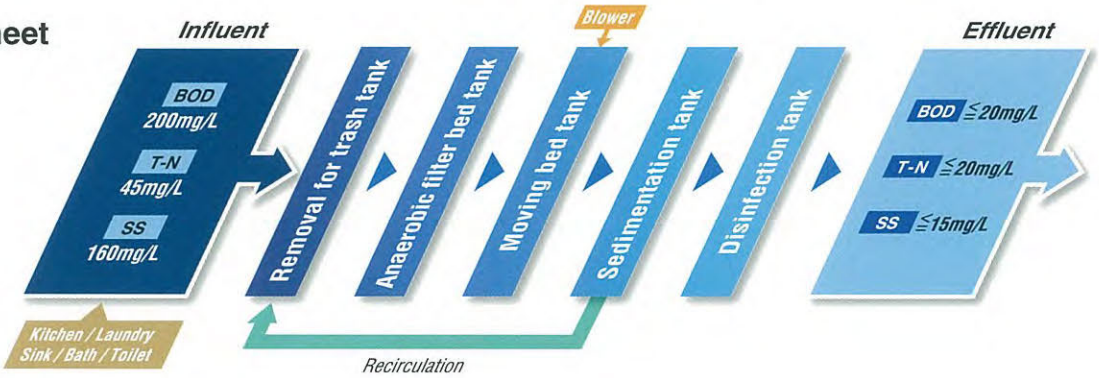
Flow rate (m^3/day) 1.0 ~ 2.0

N removal

- All types of wastewater treatment tanks (johkasou) are designed shallow, with an overall height of 1,550 mm, and a 50 mm vertical space between the bottom of the inflow and discharge pipes.
- Environmentally friendly with ability to eliminate BOD, nitrogen and floating substances
- Simple maintenance by using parts with enhanced visibility and operability, and without the need for backwash cleaning

Cross-section perspective

Flow sheet

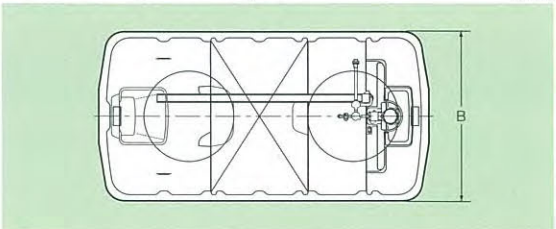


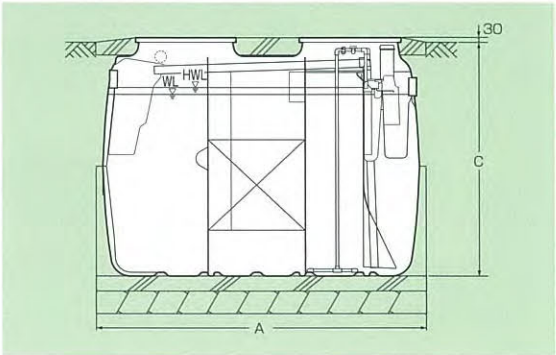
Specifications (200 L/person day, inf. BOD 200 mg/L, influent 12 hrs/day)

Population for the treatment unit		5 persons	7 persons	10 persons
Model		KJ-5	KJ-7	KJ-10
Flow rate (m^3/day)		1.0	1.4	2.0
Dimensions (mm)	Length A	2,190	2,790	3,060
	Width B	1,120	1,200	1,660
	Height C	1,580	1,580	1,580
Manhole number	ϕ450	–	2	1
	ϕ600	2	1	2
Inf.eff.pipe dia. (mm)		ϕ100		
Air pipe dia. (mm)		ϕ13		
Capacity (m^3)	Removal for trash tank	0.752	1.058	1.504
	Anaerobic filter bed tank	0.753	1.053	1.510
	Moving Bed tank	0.469	0.626	0.899
	Sedimentation tank	0.320	0.461	0.705
	Disinfection	0.021	0.021	0.021
	Total capacity	2.315	3.219	4.639
Blower air flow rate (L/min)		60	80	120

Drawing example

(mm)





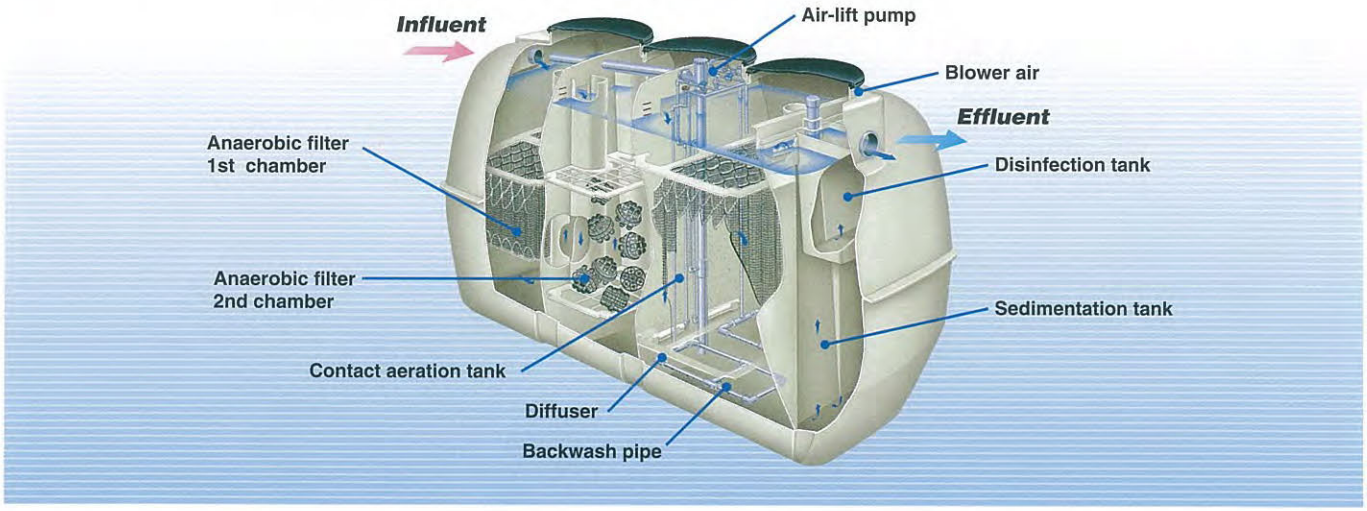
Anaerobic filter contact aeration process

HS-P

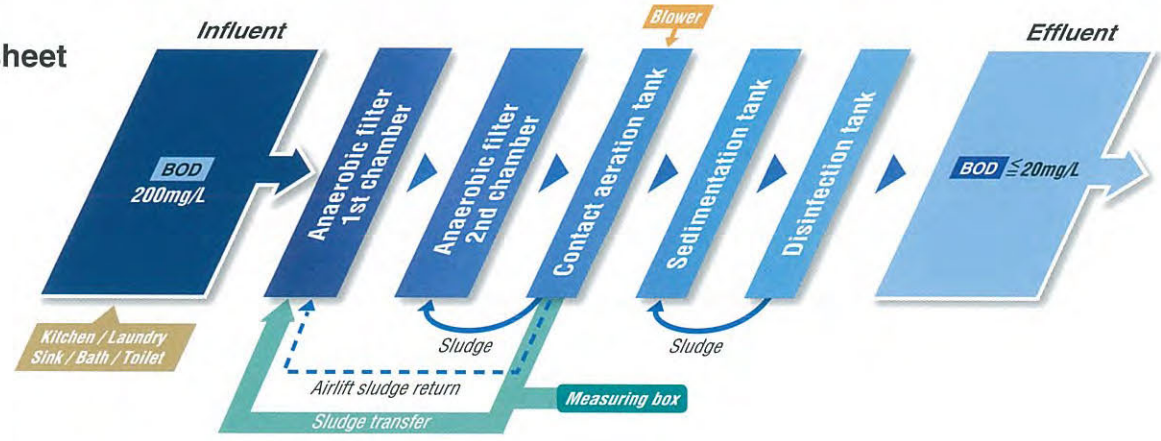
Flow rate (m^3/day)
1.0 ~ 2.0

- Adoption of anaerobic and aerobic treatment processes with filter media assure very stable performance with less sludge and odors.
- Compact installation space such as under the parking lot is enough.
- Kubota assures you enjoyable lives in a better environment.

Cross-section perspective



Flow sheet

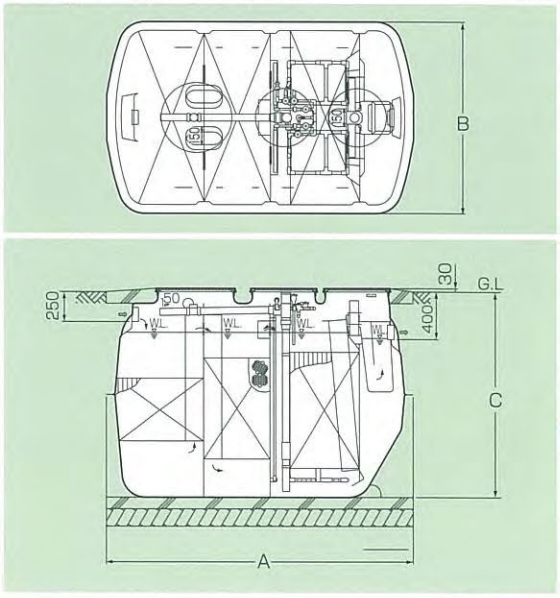


Specifications (200 L/person day, inf. BOD 200 mg/L, influent 12 hrs/day)

Population for the treatment unit		5 persons	7 persons	10 persons
Model		HS-5P	HS-7P	HS-10P
Flow rate (m^3/day)		1.0	1.4	2.0
Dimensions (mm)	Length A	2,450	2,640	3,255
	Width B	1,230	1,650	1,870
	Height C	1,800	1,800	1,800
Manhole number	ϕ500	3	2	4
	ϕ600	–	1	–
Inf.Eff.Pipe dia. (mm)		ϕ100		
Air Pipe dia. (mm)		ϕ13		
Capacity (m^3)	Anaerobic filter 1st chamber	0.907	1.275	2.130
	Anaerobic filter 2nd chamber	0.610	1.067	1.414
	Contact aeration tank	1.009	1.423	2.037
	Sedimentation tank	0.308	0.478	0.717
	Disinfection	0.025	0.025	0.025
	Total capacity	2.859	4.268	6.323
Blower air flow rate (L/min)		60	80	120

Drawing example

(mm)



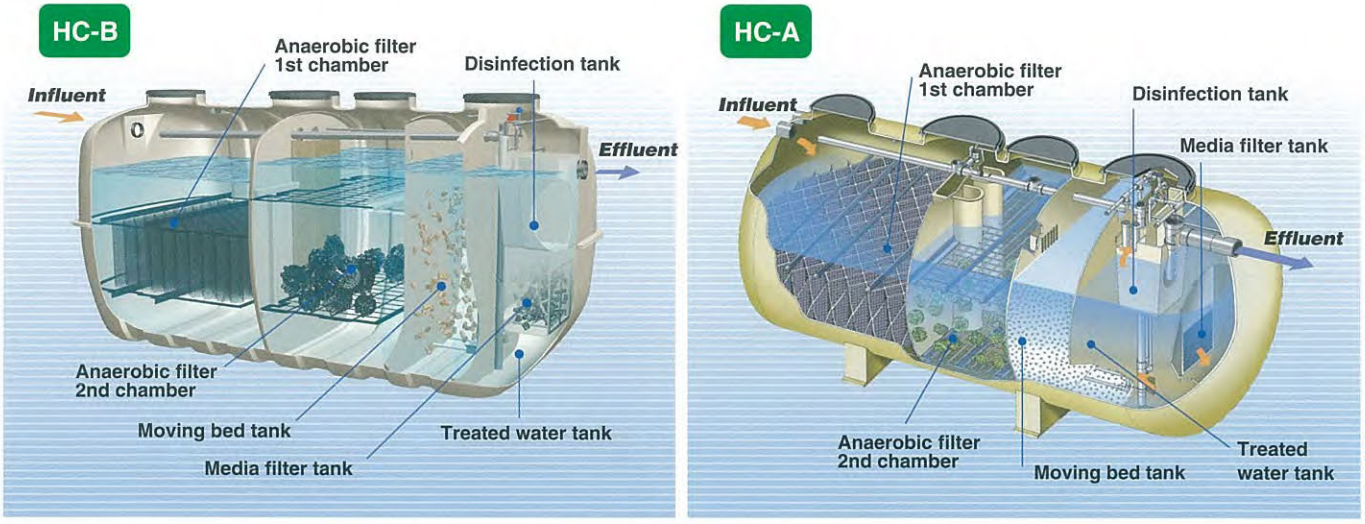
Anaerobic filter moving bed biofilm filter process

HC-B/A

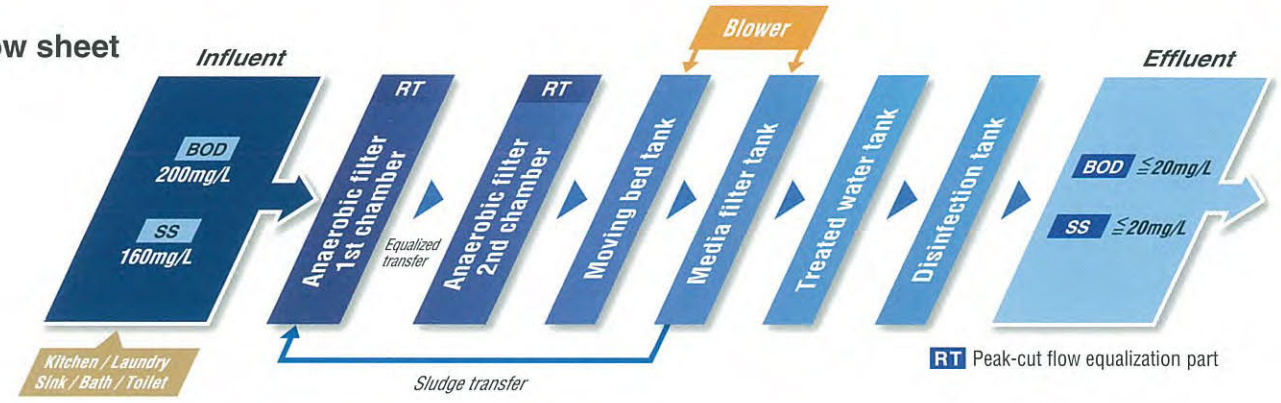
Flow rate (m^3/day)
2.8 ~ 10.0

- Features a compact body design and standard height and width. Environmentally friendly with ability to eliminate BOD and floating substances
- Kubota original horizontal filtration system enables easier maintenance.
- Wider option with two lineups: single-piece molding and two-piece molding with upper and lower parts

Cross-section perspective



Flow sheet

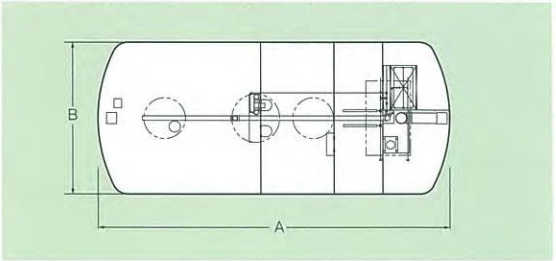


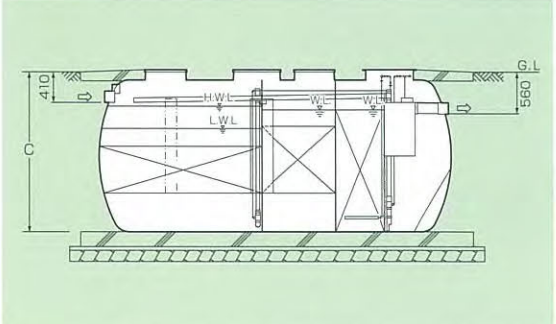
Specifications (200 L/person day, inf. BOD 200 mg/L, influent 12 hrs/day)

Population for the treatment unit		14 persons	30 persons	40 persons	50 persons
Model		HC-14B	HC-30B	HC-40A	HC-50A
Flow rate (m^3/day)		2,8	6,0	8,0	10,0
Dimensions (mm)	Length A	3,100	4,300	5,160	6,060
	Width B	1,660	2,000	φ2,050	φ2,050
	Height C	1,990	2,180	2,180	2,180
Manhole number	φ500 / φ600	2/1	2/2	2/1	–/3
Chercker plate number	600 × 1,000	–	–	1	1
Inf.eff.pipe dia. (mm)		φ125			
Air pipe dia. (mm)		φ13	φ20		
Capacity (m^3)	Peak-cut flow equalization part	0.298	0.939	1.192	1.440
	Anaerobic filter 1st chamber	2.542	4.746	6.346	7.677
	Anaerobic filter 2nd chamber	1.771	2.754	3.170	3.849
	Moving bed tank	0.489	1.593	2.123	2.660
	Media filter tank	0.112	0.150	0.253	0.253
	Treated water tank	0.860	1.292	1.371	1.371
	Disinfection tank	0.030	0.063	0.105	0.105
	Total capacity	5.804	10.598	13.368	15.915
Blower air flow rate (L/min)		80	200	250	300

Drawing example (HC-A)

(mm)





Kubota FRP Johkasou, Sewage Treatment Equipment

Membrane bioreactor (MBR) process

KM-SG-NP

Flow rate (m^3/day) 5.1~

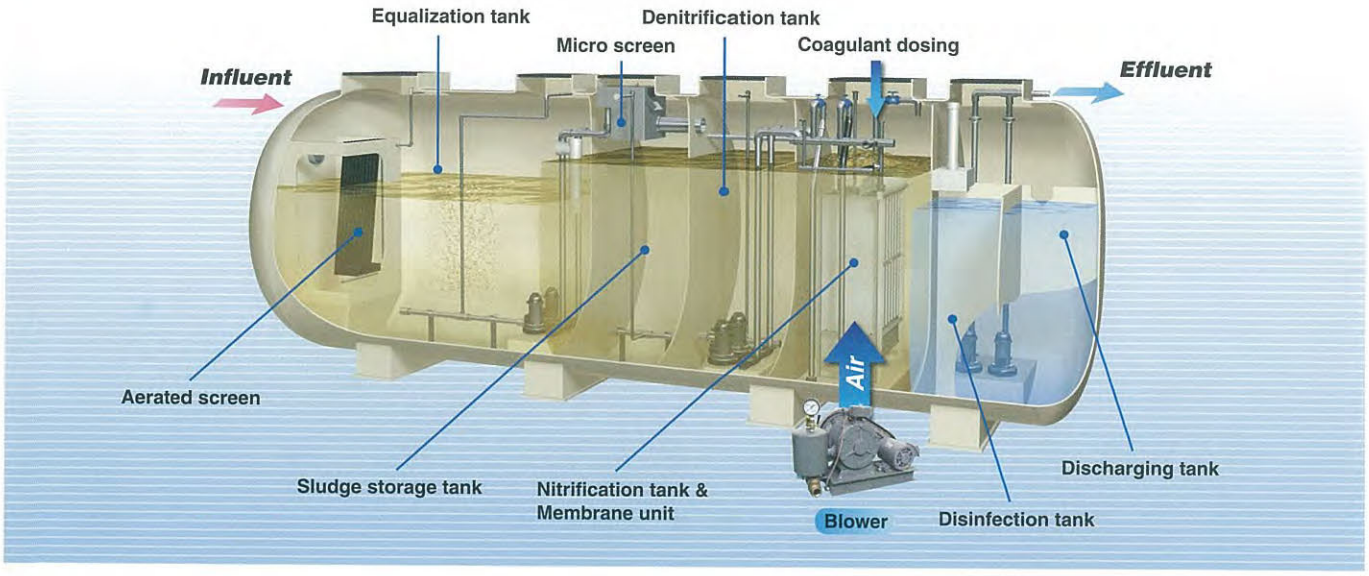
N/P removal

- Capable of removing nitrogen and phosphorus by means of membrane separation + recycling-type high concentration activated sludge method + coagulation dephosphorization method

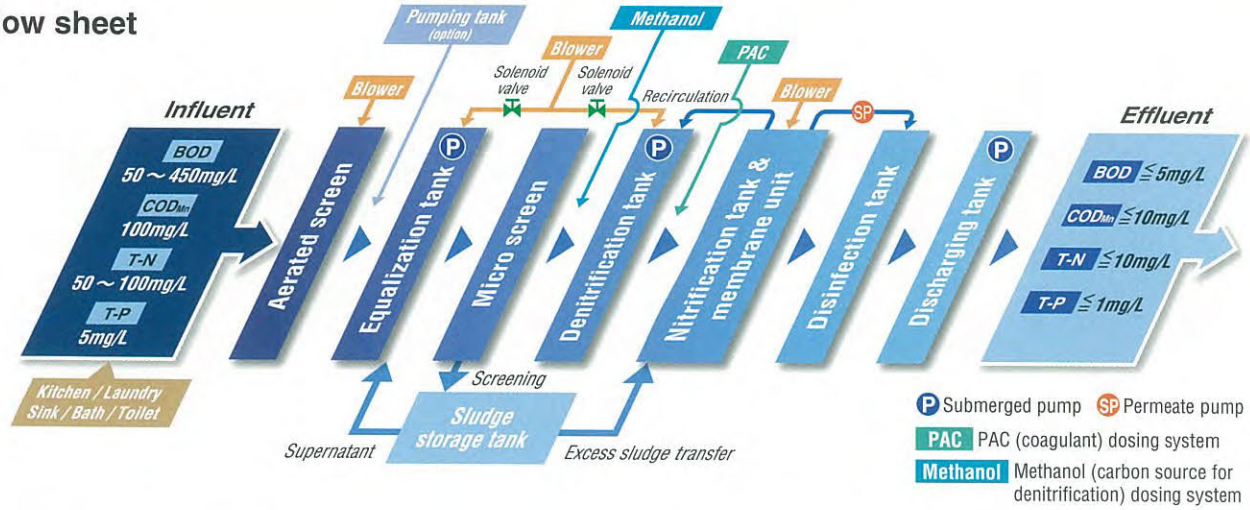
Submerged Membrane

Submerged Membrane® is a patented technology that has been achieved through the combination of Kubota advanced water treatment technology and its unique membrane technology.

Cross-section perspective



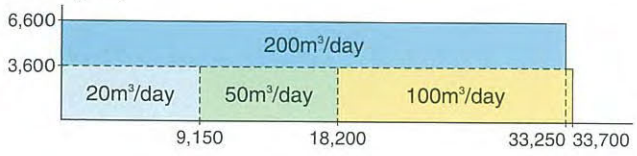
Flow sheet



Specifications (200 L/person day, inf. BOD 200 mg/L, influent 12 hrs/day)

Population for the treatment unit	persons	100	200	500	1,000
Flow rate	m^3/day	20	40	100	200
Tank size (φ2,500 x 2,800H)	L (mm)	8,550	6,100+7,950	7,350+8,400 +7,350+8,500	8,250+8,250+6,950+7,700 +8,250+8,250+6,900+7,700
Rated power (200V)	kW	3.39	4.84	8.79	17.28

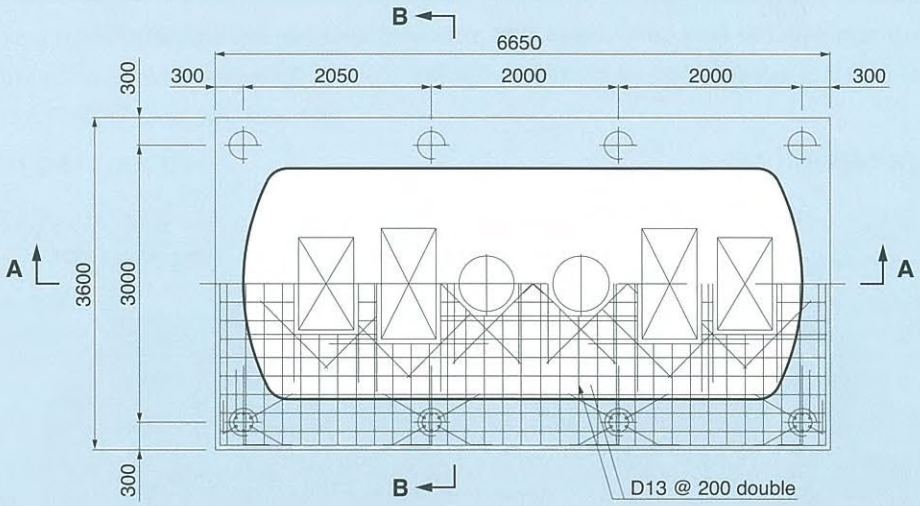
- Size (mm)



Large-size Johkasou Drawing Example

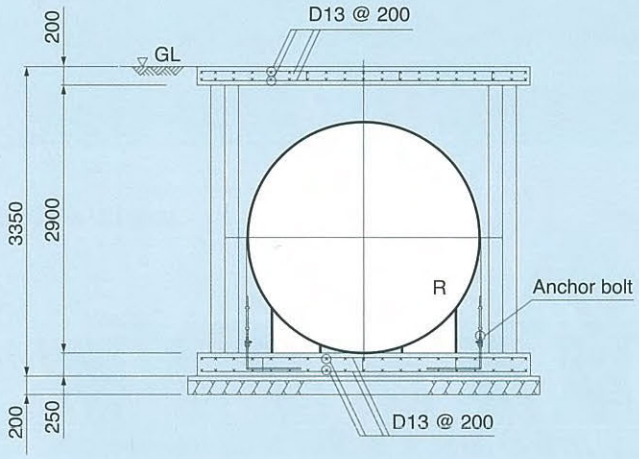
Size (mm)

Plan drawing

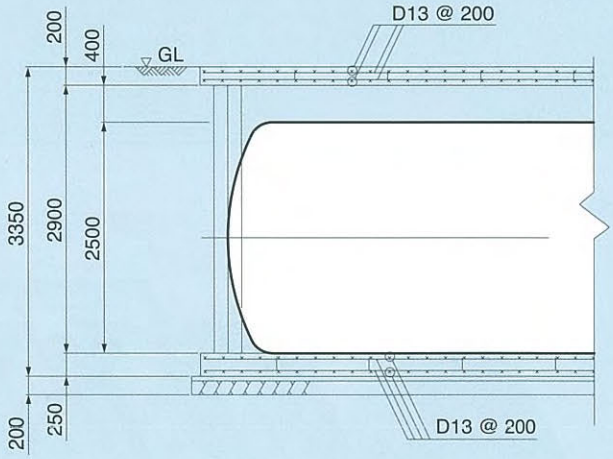


Size (mm)

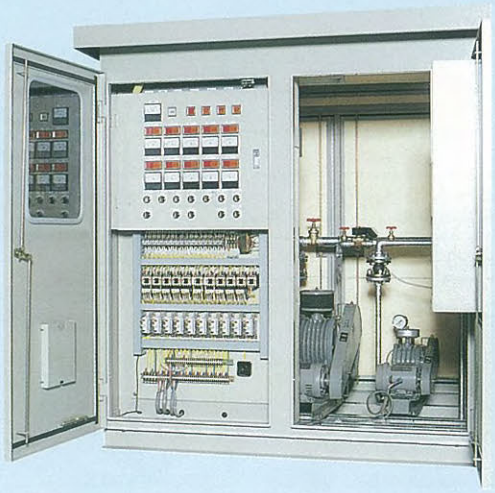
B-B cross-section bar arrangement drawing



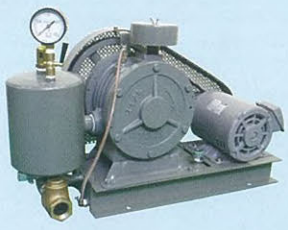
A-A cross-section bar arrangement drawing



Large-size Johkasou Machine Room



Submerged pump



Rotary-type blower

Roots-type bower

Kubota's FRP Johkasou in use around the world

● Overseas transportation

Container type

● Saudi Arabia: Water recyling

Model KM-SG-NP Flow rate 530 m³/day

● Vietnam: for Factory sewage

Model K-HC-R Flow rate 80 m³/day

● Vietnam: for Factory sewage

Model K-HC-T Flow rate 12 m³/day

● Vietnam: for Hospital sewage

Model K-HC-R Flow rate 50 m³/day

● Vietnam: for Individual residence sewage

Model HS-5P Flow rate 1.0 m³/day



Water


Food



Kubota Continues Support for Global "Food, Water and Environment" Now and in the Future

Kubota's 120 years of history has been one of facing up to social challenges.
Our commitments–Creating a better social foundation and Supporting people's day-to-day lives–have never changed from our establishment until today, 120 years later.
"For Earth, For Life"
Kubota will continue making every effort to support people's smiles and rich day-to-day lives in the future by contributing globally to addressing common issues we all face:
"Food," "Water," and "Environment."





Environment


KUBOTA Corporation
Johkasou Business Unit

Osaka Head office:
1-2-47, Shikitsuhigashi, Naniwa-ku, Osaka 556-8601, Japan
Phone: +81-6-6648-3580 Fax: +81-6-6648-3588

Tokyo Head office:
1-3, Nihombashi-Muromachi 3-Chome, Chuo-ku Tokyo 103-8310, Japan
Phone: +81-3-3245-3708 Fax: +81-3-3245-3720

Hanoi Representative Office:
Zone C, 9th Floor, CDC Building, 25-27 Le Dai Hanh, Hanoi, Vietnam
Phone: +84-4-3974-9192 FAX: +84-4-3974-9189

URL http://www.kubota-global.net E-mail jokaso_hp_toiawase@kubota.co.jp

Cat.No.C-OKJE01 Printed in Japan '11.5.2.STD.JP.

Appendix D

Influent Quality Concentrations - Worley Parsons (2016)

WorleyParsons
resources & energy

Technical Letter

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Rev	Description	Author	Review	WorleyParsons Approval	Date
A	Issued for Review	J Jeon	G Gloag	S Page	1 July 16
0	Issued for Use	J Jeon	G Gloag	S Page	26 July 16

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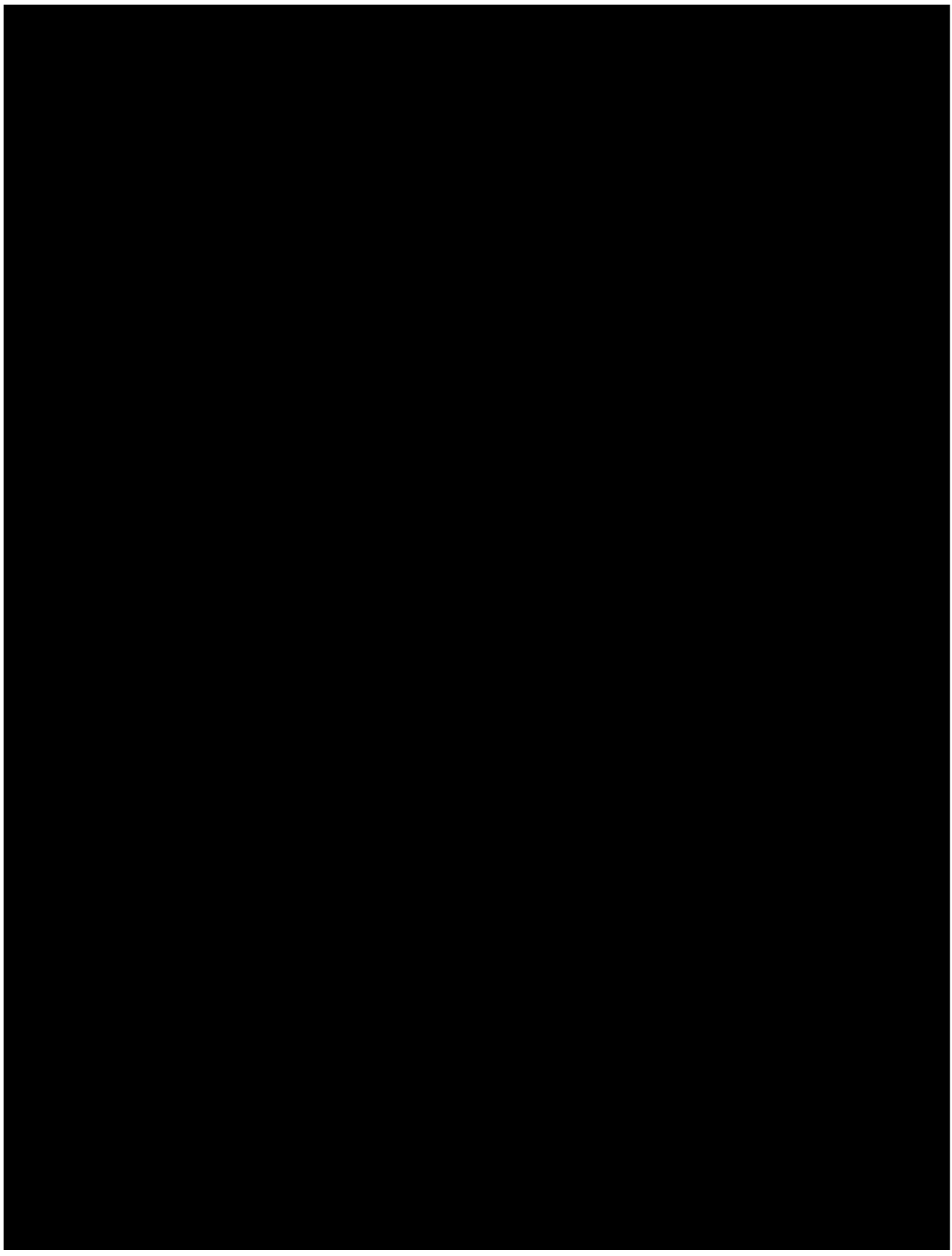

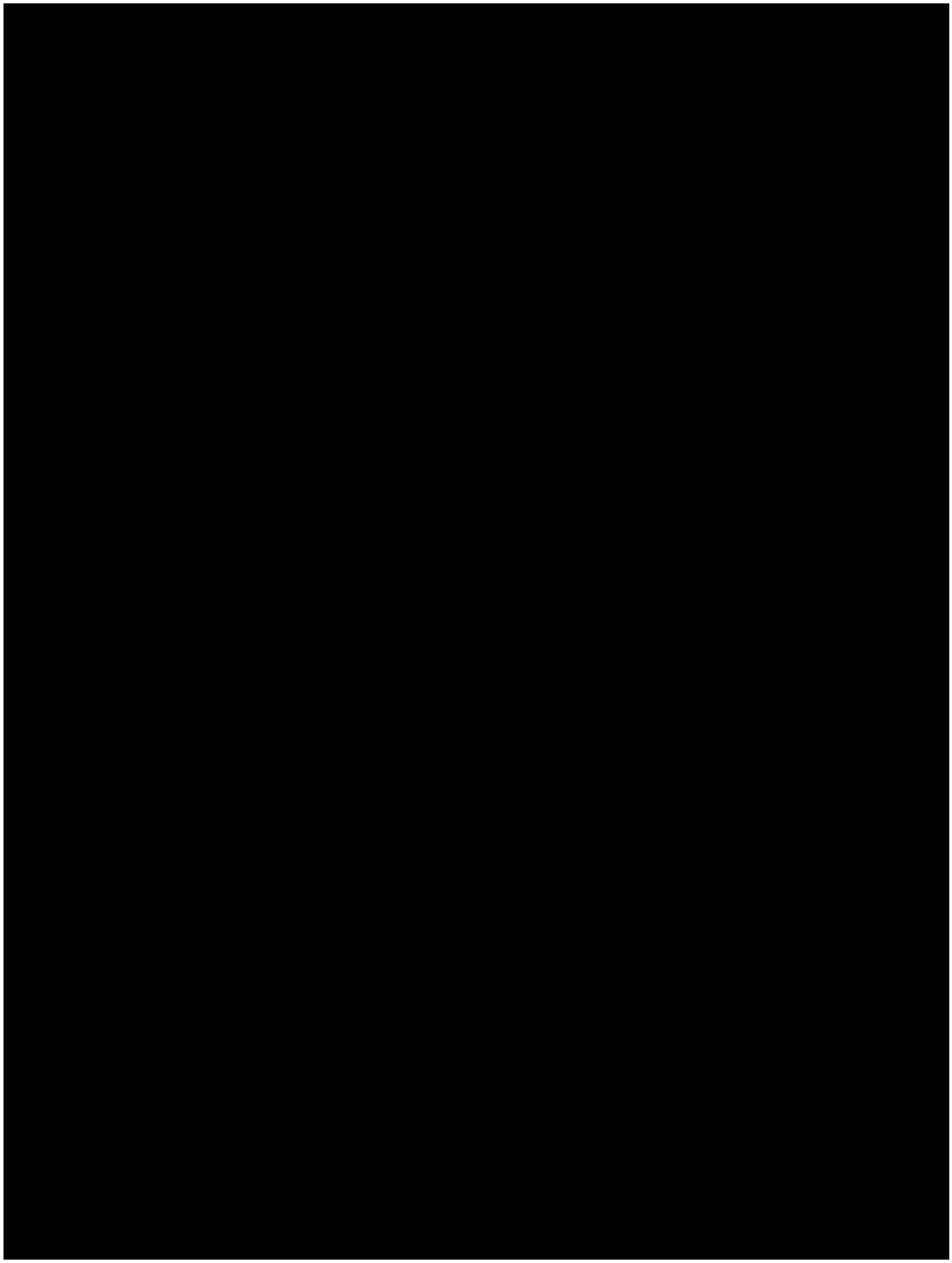

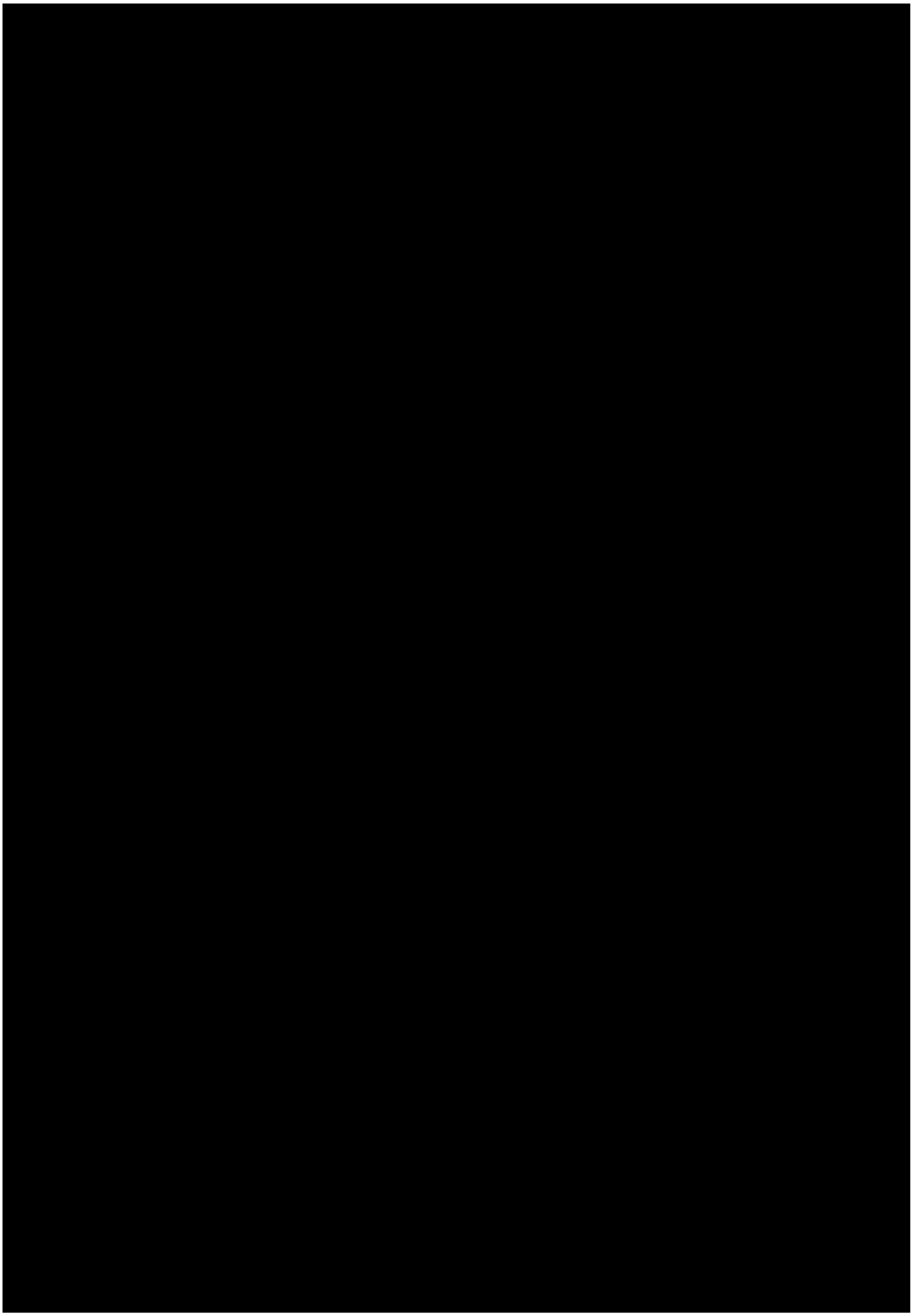

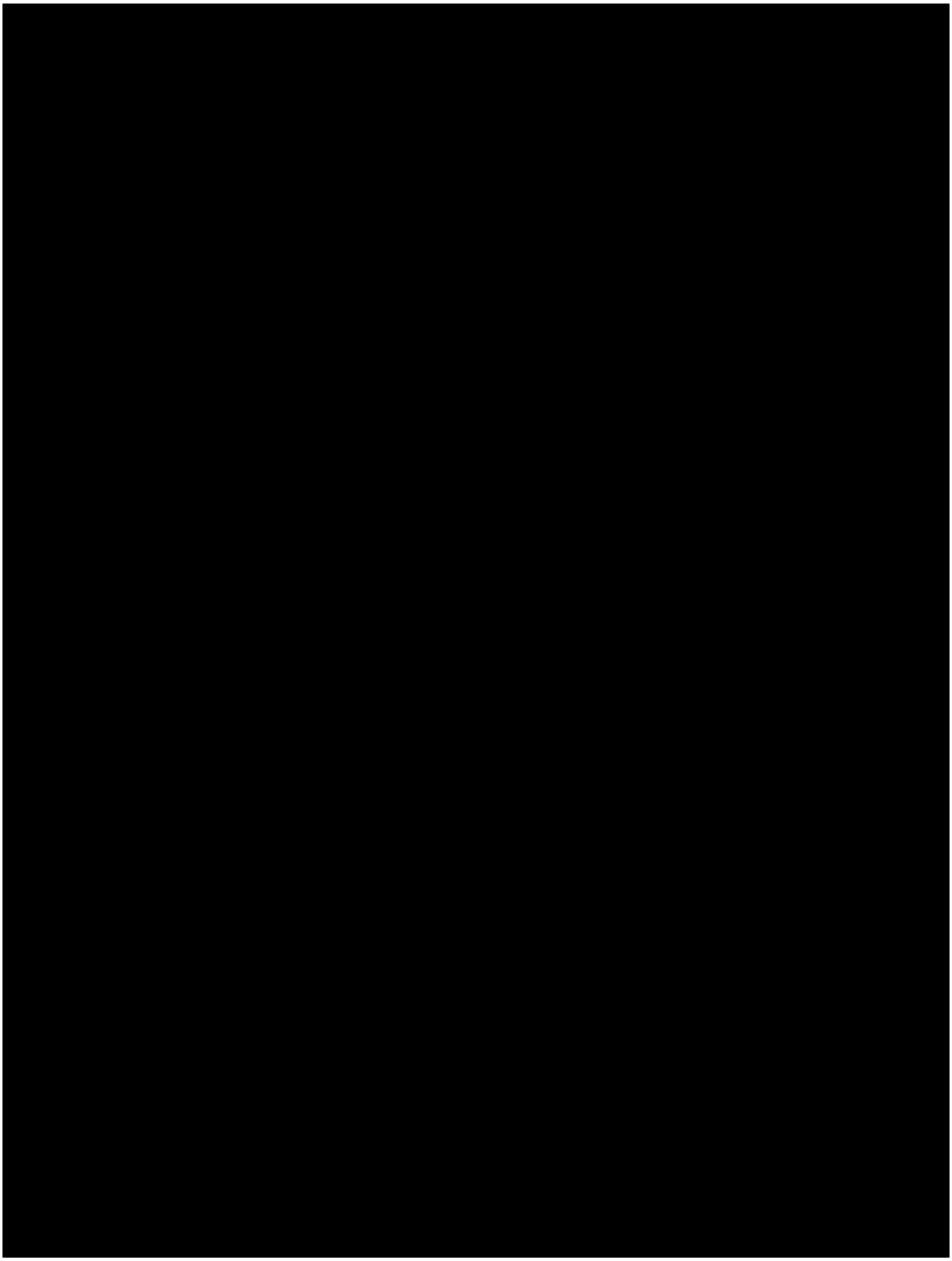

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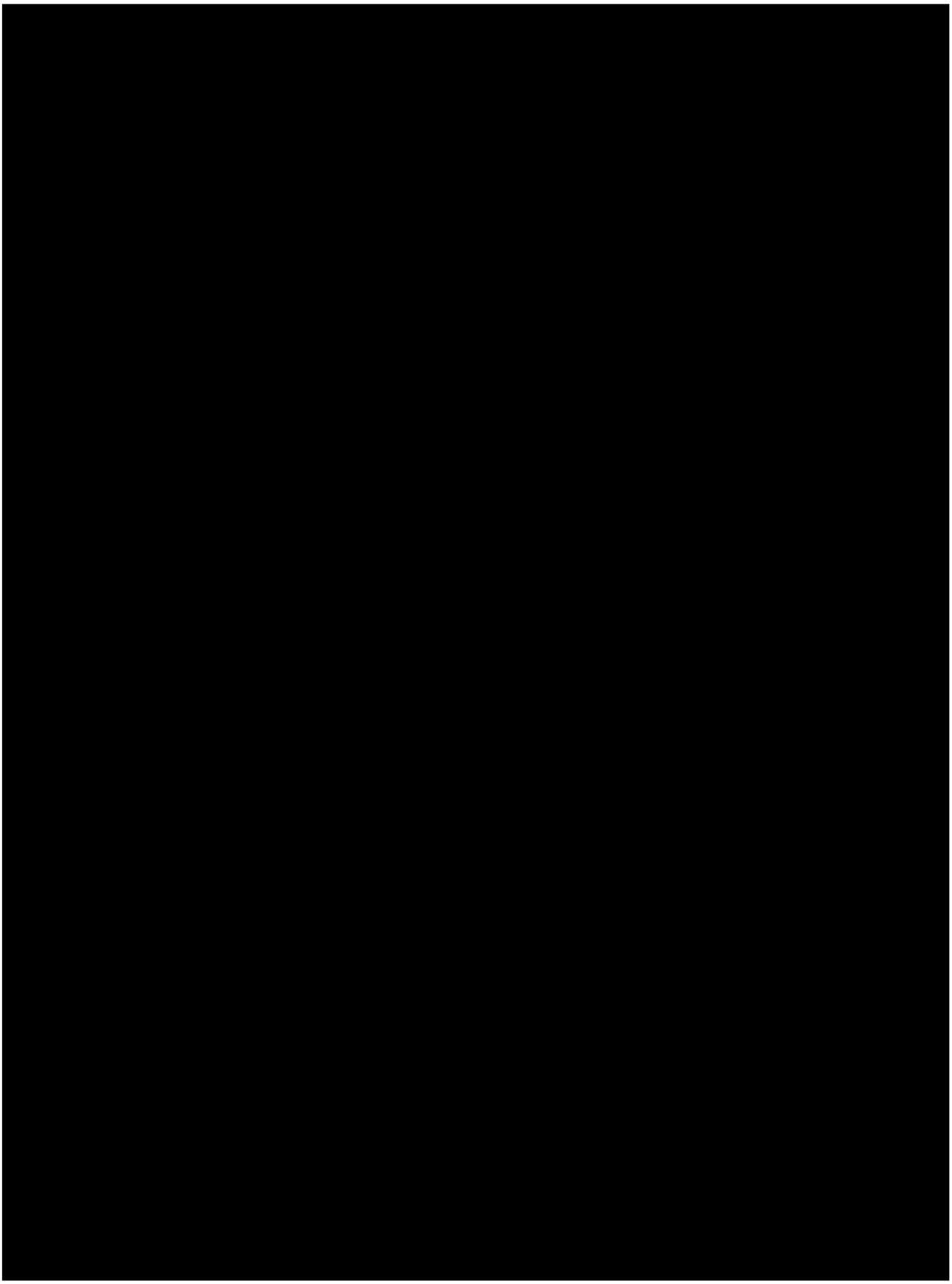

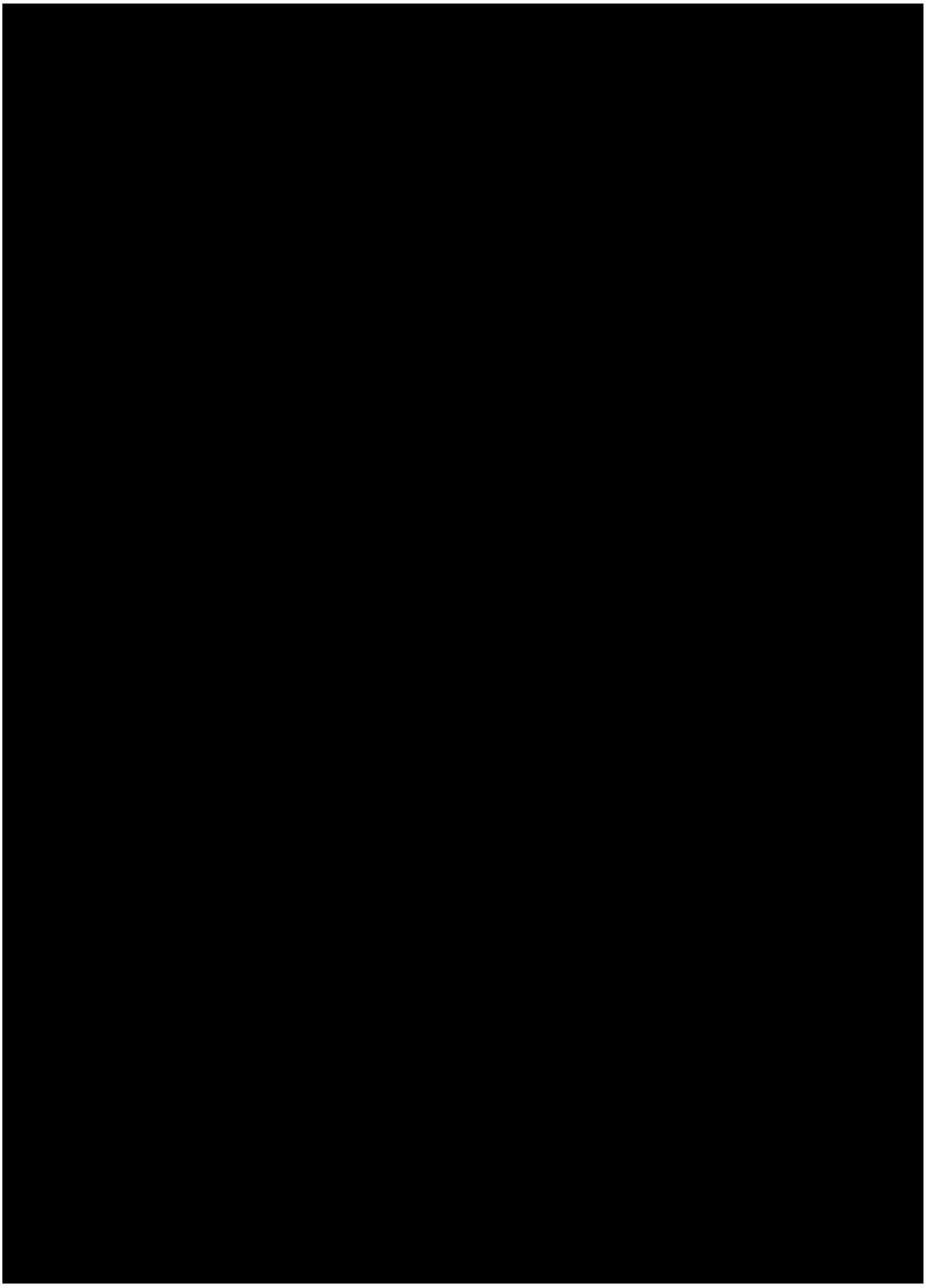

Appendix E

True Water ISO Cert 9001, 45001 and 14001

CERTIFICATE OF REGISTRATION

True Water Australia

6b Ironbark Drive, Townsend, NSW 2463, Australia

Has been assessed and certified by Compass Assurance Services to the following management systems, standards and guidelines:

ISO 9001:2015

QUALITY MANAGEMENT SYSTEMS

The scope of the certification covers the following activities:

Provision of wastewater and sewage treatment technologies to Australia and the Pacific. Services include consultancy, delivery, project management, engineering, asset management (servicing and maintenance) and operation (remote monitoring and response).

Managing Director

CERTIFICATION DATE:	DATE OF ISSUE:	EXPIRY DATE:	CERTIFICATE #:
4 August 2022	31 August 2022	4 August 2025	4000-2765-02

COMPASS ASSURANCE SERVICES

Compass Assurance Services Pty Ltd
Level 1, 135 Queen Street, Cleveland, 4163 QLD
1300 495 855 | www.cas.com.au

CERTIFICATE OF REGISTRATION

True Water Australia

6b Ironbark Drive, Townsend, NSW 2463, Australia

Has been assessed and certified by Compass Assurance Services to the following management systems, standards and guidelines:

ISO 45001:2018

OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEMS

The scope of the certification covers the following activities:

Provision of wastewater and sewage treatment technologies to Australia and the Pacific. Services include consultancy, delivery, project management, engineering, asset management (servicing and maintenance) and operation (remote monitoring and response).

Managing Director

CERTIFICATION DATE:	DATE OF ISSUE:	EXPIRY DATE:	CERTIFICATE #:
4 August 2022	31 August 2022	4 August 2025	4075-2765-01

COMPASS ASSURANCE SERVICES

Compass Assurance Services Pty Ltd
Level 1, 135 Queen Street, Cleveland, 4163 QLD
1300 495 855 | www.cas.com.au

CERTIFICATE OF REGISTRATION

True Water Australia

6b Ironbark Drive, Townsend, NSW 2463, Australia

Has been assessed and certified by Compass Assurance Services to the following management systems, standards and guidelines:

ISO 14001:2015

ENVIRONMENTAL MANAGEMENT SYSTEMS

The scope of the certification covers the following activities:

Provision of wastewater and sewage treatment technologies to Australia and the Pacific. Services include consultancy, delivery, project management, engineering, asset management (servicing and maintenance) and operation (remote monitoring and response).

Managing Director

CERTIFICATION DATE:	DATE OF ISSUE:	EXPIRY DATE:	CERTIFICATE #:
4 August 2022	31 August 2022	4 August 2025	4074-2765-01

COMPASS ASSURANCE SERVICES

Compass Assurance Services Pty Ltd
Level 1, 135 Queen Street, Cleveland, 4163 QLD
1300 495 855 | www.cas.com.au

Appendix F

Kubota ISO Cert 9001 and 14001

Kubota ISO Cert 9001

Union of Japanese Scientists and Engineers

MS
CM008

CERTIFICATE OF REGISTRATION

Union of Japanese Scientists and Engineers (JUSE) ISO Registration Center

Name of Certification : Quality Management Systems
Standard against the implemented audit :
JIS Q 9001:2015(ISO 9001:2015)
Reg. No. : JUSE-RA- 786
Registered Client : Kubota Corporation, Environmental Solutions Division, Environmental Systems Business Unit
Top Management : Ryuji Yamamoto, General Manager of Environmental Systems Business Unit
Location: Kyobashi Trust Tower, 1-3, Kyobashi 2-chome, Chuo-ku, Tokyo, 104-8307 Japan
(Kubota Corporation, Tokyo Head Office; Kubota Membrane Co., Ltd., Tokyo Office, Engineering Dept.)
Refer to "Description of Certificate (Detail)"
Scope of Registration held :
Design & Development and Production of the Small-sized Plastic Septic Tank and Bathtub, and Design & Development, Production Trust Management of the Medium/Large-sized Plastic Septic Tank; Reserch & Development, Design, Production and After-sales Service of Membrane Unit, Membrane Cartridge and All Its Related Spare Parts

We certify and register the above organization meets the requirements of the aforementioned standard.

Period of Validity : April 21, 2021 - April 20, 2024
Date of Initial Registration : April 21, 2003

Shinichi Sasaki
President

Masato Onodera
Director ISO Registration Center

Union of Japanese Scientists and Engineers(JUSE)
2-7-1, Nishi-Shinjuku, Shinjuku-Ku, Tokyo, 163-0704, JAPAN

Quality Management Systems

Description of Certificate (Detail)

Registered Client	Kubota Corporation Environmental Solutions Division, Environmental Systems Business Unit
Scope of Registration held	Design & Development and Production of the Small-sized Plastic Septic Tank and Bathtub, and Design & Development, Production Trust Management of the Medium/Large-sized Plastic Septic Tank; Reserch & Development, Design, Production and After-sales Service of Membrane Unit, Membrane Cartridge and All Its Related Spare Parts

No.	Name of Site Location Scope
1	Kubota Corporation, Tokyo Head Office; Kubota Membrane Co., Ltd., Tokyo Office, Engineering Dept. Kyobashi Trust Tower, 1-3, Kyobashi 2-chome, Chuo-ku, Tokyo, 104-8307 Japan Sales and After-sales Service of Membrane Unit, Membrane Cartridge and All Its Related Spare Parts
2	Kubota Corporation, Shiga Plant 2-1, Takamatsu-cho, Konan-shi, Shiga, 520-3211, Japan Design & Development and Production of the Small-sized Plastic Septic Tank and Bathtub, and Design & Development, Production Trust Management of the Medium/Large-sized Plastic Septic Tank
3	Kubota Corporation, Hanshin Office; Kubota Membrane Co., Ltd., Hanshin Office, Engineering Dept. 1-1, Hama 1-chome, Amagasaki-shi, Hyogo, 661-8567 Japan Sales, Reserch & Development, Design, Quality Assurance and After-sales Service of Membrane Unit, Membrane Cartridge and All Its Related Spare Parts
4	Kubota Corporation, Kyuhoji Business Center; Kubota Membrane Co., Ltd., Head Office, Manufacturing Dept. and Quality Assurance Dept. 2-35, Jinmu-cho, Yao-shi, Osaka, 581-8686 Japan Procurement, Production, Inspection, Logistics and Quality Assurance of Membrane Unit, Membrane Cartridge and All Its Related Spare Parts

Kubota ISO Cert 14001

Union of Japanese Scientists and Engineers

MS
CM008

CERTIFICATE OF REGISTRATION

Union of Japanese Scientists and Engineers (JUSE) ISO Registration Center

Name of Certification : Environmental Management Systems
Standard against the implemented audit :
JIS Q 14001:2015(ISO 14001:2015)
Reg. No. : JUSE-EG- 031
Registered Client : Kubota Co., Ltd., Shiga Plant
KMEW Co., Ltd., Shiga Plant
Top Management : Takashi Uchikawa, Plant Manager
Location: 2-1, Takamatsu-cho, Konan-shi, Shiga 520-3211, Japan.
Scope of Registration held :
1. Research & development and production of FRP products
2. Production of roof materials

We certify and register the above organization meets the requirements of the aforementioned standard.

Period of Validity : May 18, 2021 - May 17, 2024
Date of Initial Registration : May 18, 2000

Shinichi Sasaki
President

Masato Onodera
Director ISO Registration Center

Union of Japanese Scientists and Engineers(JUSE)
2-7-1, Nishi-Shinjuku, Shinjuku-Ku, Tokyo, 163-0704, JAPAN