



Smith Beach Development
Waste Water Treatment Plant
June 2024 Update

Document

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DOCUMENT TITLE	Smith Beach Development

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1. Smith Beach Development Waste Water Treatment Plant

The Right Water Company will provide a scheme that treats the local wastewater from the development and recycles and reuses the wastewater for irrigation of public and private outdoor areas along with toilet flushing. The energy demand for the recycling plant will target carbon neutrality with 24 months of operation. The third pipe reuse scheme and wastewater collection and reticulation and infrastructure are excluded from the scheme.

The proposed Smith Beach development will use a modular sewer treatment plant (STP) to produce a WA Department of Health High Exposure Risk effluent. The high quality of treated water makes it suitable for uses that include direct human contact. Treatment and monitoring of the effluent will comply with the requirements of [Table 8 of the Guidelines for the Non-Potable Uses of Recycled Water in Western Australia](#).

The treatment plant can be described as follows:

- 125kL/day treatment capacity with turn down capability to 20kL/day.
- High Exposure Risk Category water quality.
- Plant area 88 meters by 37 meters.
- There is an enclosure allowed to manage visual impact 25 meters by 27 meters.
- Includes odour treatment.
- Dewatering screw press for solid sludge treatment.

The proposed Sewage Treatment plant consists of the following components:

- Six 50kL polyethylene balance tanks
- Package sewage treatment plant.
- One 50kL polyethylene treated effluent tank.
- Two 2000kL treated effluent tanks.
- Sludge dewatering screw press.
- Odour control.
- Bulk earthworks.
- Shed enclosure.
- Concrete works.
- Fencing.

The battery limits and assumptions area as follows:

- Influent connection from sewer reticulation.
- Effluent connection to 3rd party pipe for reticulation.

The influent quality assumptions are as follows:

INFLUENT QUALITY	TYPE	Domestic strength sewage, values assumed
	TEMPERATURE	16 - 23°C
	PH	6.0 – 9.0
	BOD	< 350 mg/L
	TSS	< 350 mg/L
	OIL & GREASE	10 – 50 mg/L (i)
	T-N	30 – 60 mg/L
	T-P	3 – 12 mg/L
	TDS	<1,000 mg/L

The effluent quality to be produced is as follows:

EFFLUENT QUALITY (MBR)	RISK LEVEL	High
	PH	6.5 – 8.5
	BOD	< 10 mg/L
	TSS	< 10 mg/L
	OIL & GREASE	< 50 mg/L (i)
	T-N	< 10 mg/L
	T-P	1 mg/L
	E. COLI	<10 CFU/100 mL
	FREE CHLORINE	0.2-2 mg/L

The High Exposure category of treatment enables the use of the final water for direct urban irrigation without access restrictions, toilet flushing or agricultural irrigation. Given these potential uses of the water, the traditional disposal method of subsurface irrigation can be limited, and higher value use of the water can therefore be considered. To balance external use of the water with the STP production peaks, storage tanks for treated water will be required to store/buffer water before it is utilised.

The water balance for the project is included in [Appendix B](#) and is based on average occupancies is shown in the table below. The water balance assumes the following:

- Irrigation for the overall development is based on a normal irrigation demand required to sustain landscaping, as per the Stantec Australia Site and Soil Evaluation for Onsite Wastewater Management 8 December 2021 (“Site and Soil Evaluation Report”). Irrigation rates were calculated by Swan Systems based on the uses in the Site and Soil Evaluation Report.
- Toilet flushing for all households, camping area and the hotel/commercial area based on estimated flows included in the Site and Soil Evaluation Report.

The proposed water treatment scheme will produce approximately 4ML (4,000kL) of excess treated water per year in the winter months. The main determining factor of excess irrigation water is seasonal occupancy of the houses and hotel and seasonal irrigation demand.

The surplus water, that which isn't consumed for toilet flushing or "standard" irrigation demand, must be stored in tackage for further use when demand arises. It is proposed to install two 2000kL treated water storage tanks on site to store the excess treated water when not required for irrigation. The proposed tanks are 24 meters in diameter and 5 meters high

The treated water storage tank strategy is to accumulate water through the winter rainfall period and lower the storage level though summer by means of additional irrigation or water offtakes.

The development water balance is based on the assumptions in the table below based on occupancy rates and water flow rates as per the Site and Soil Evaluation Report.

			YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
ANNUAL LOTS OCCUPIED	#	61	10.00	15.00	15.00	15.00	6.00
POS DEVELOPMENT RATE	%		10%	10%	40%	40%	100%
RESIDENTIAL		UNIT	WASTEWATER FLOW (L/DAY)		KL/DAY		
Max no. of dwellings		#	61				
Wastewater flows		L/dwelling/day	50,570		50.6		
NON-RESIDENTIAL		UNIT	WASTEWATER FLOW (L/DAY)		KL/DAY		
Campground		l/day	10,360		10.4		
Hotel & Community Hub		l/day	68,090		68.1		
Total Flow (@100% occupancy)					129.1		

GHD used MEDLI to simulate the proposed treated water recycling system. The reports are included in [Appendix C](#). These reports detail the inputs/assumptions and summarise the findings from simulating operation of the proposed recycled water scheme for a 31-year period (1990 to 2020 inclusive) when the area is fully developed and assuming that all proposed irrigation areas are irrigated at rates aligned with the Swan Systems' monthly time-step water balance.

Two theoretical soil profiles were simulated:

1. Deep sand, representing "best case" conditions.
2. Sand overlying shallow rock at a nominal depth of 500mm, representing "worst case" conditions.

ITEM		TOTAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
OCCUPANCY RATES														
Holiday Homes			90%	90%	90%	90%	80%	70%	60%	60%	70%	80%	90%	90%
Hotel			90%	90%	90%	60%	50%	40%	40%	50%	60%	70%	90%	90%
Campground			90%	90%	90%	60%	50%	40%	40%	50%	60%	70%	90%	90%
WASTEWATER FLOWS														
Wastewater Flows	kL	34,285	3,600	3,251	3,600	2,777	2,470	2,003	1,913	2,157	2,474	2,956	3,484	3,600
TREATED WATER USE														
Holiday Homes - Toilet Flushing	kL	934	89	81	89	86	79	67	60	60	67	79	86	89
Hotel and Community Hub (Toilet Flushing)	kL	747	84	76	84	54	47	36	37	47	54	65	81	84
Campground (Toilet Flushing)	kL	194	22	20	22	14	12	9	10	12	14	17	21	22
Available Water	kL	32,409	3,405	3,074	3,405	2,623	2,332	1,891	1,806	2,038	2,339	2,795	3,296	3,405
Overall Irrigation Demand	kL	118,276	21,408	17,630	13,271	8,040	2,325	387	0	1,066	6,103	11,334	15,983	20,730
Non-Potable Water Balance (+ = surplus)	kL	-85,867	-18,003	-14,556	-9,866	-5,417	7	1,504	1,806	972	-3764	-8,539	-12,687	-17,325

Available POS areas confirmed as sufficient to accept all treated water as a base case disposal strategy for approval.

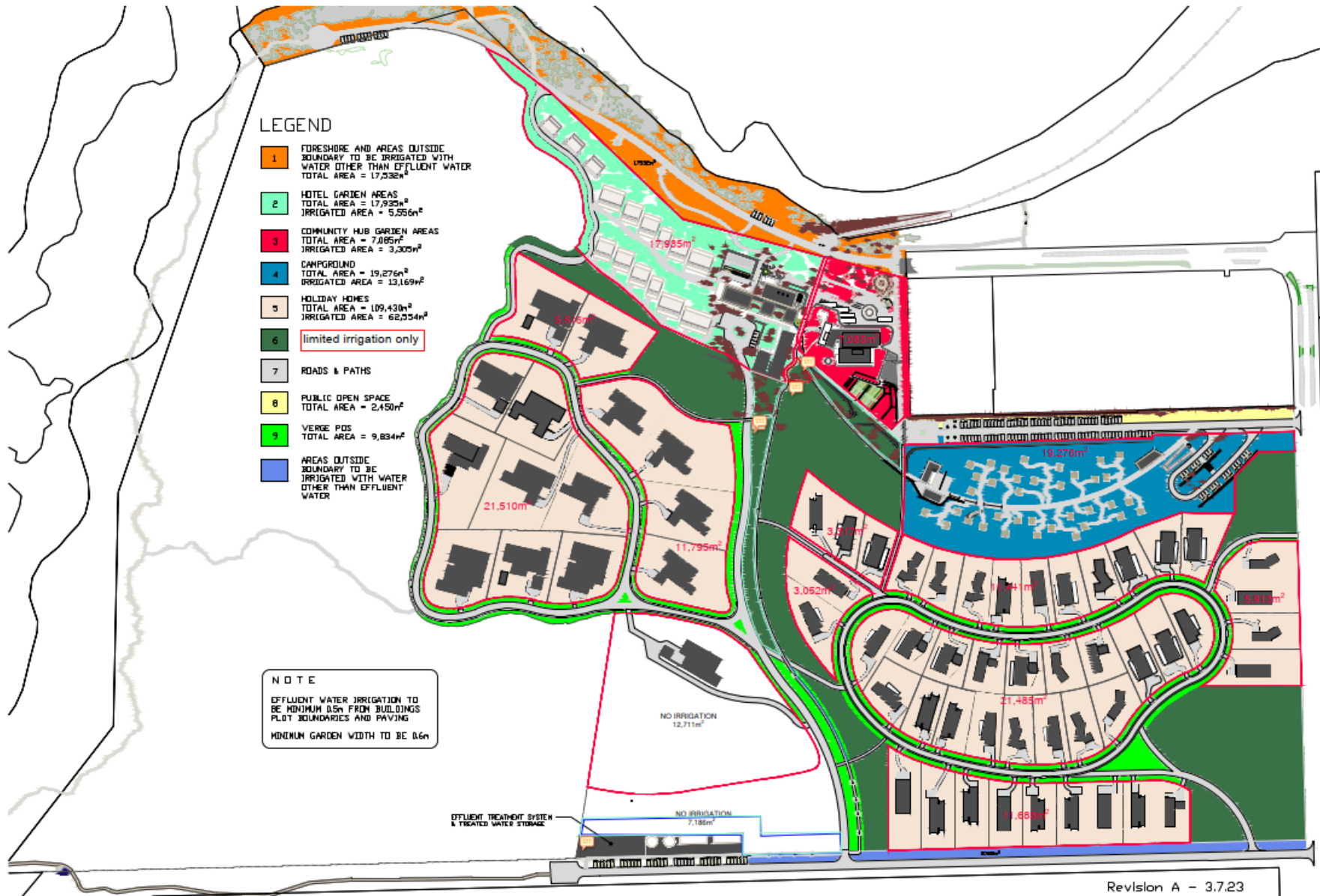


Figure 1 Irrigation areas and locations are as identified in the figure above.

The six areas considered for irrigation are shown below:

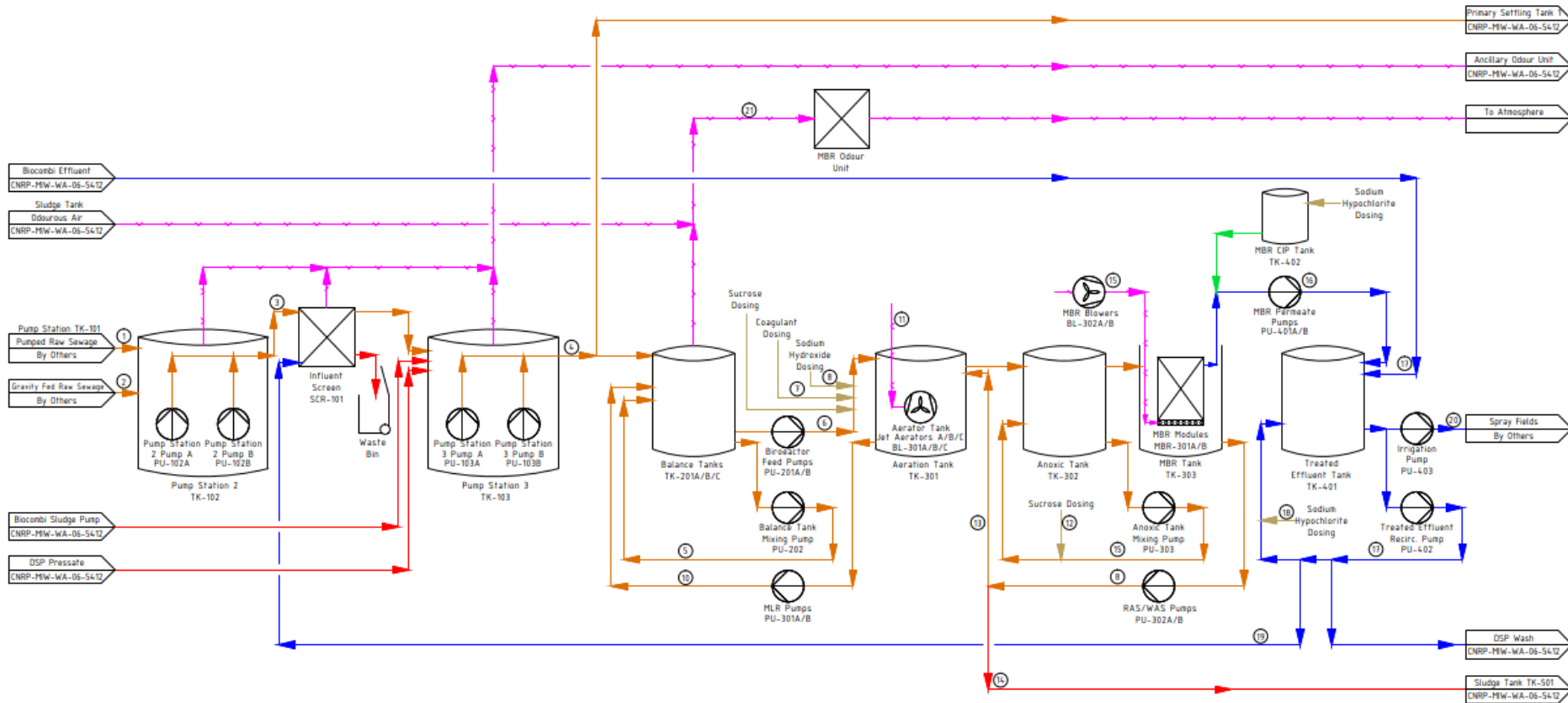
AREA	TOTAL AREA - M ²	TOTAL AREA - HA	IRRIGATED AREA - M ²	IRRIGATED AREA- HA
HOTEL GARDEN AREAS	17,935	1.794	5,556	0.556
COMMUNITY HUB	7,085	0.709	3,305	0.331
CAMPGROUND	19,276	1.928	13,169	1.317
HOLIDAY HOMES	109,430	10.943	62,554	6.255
PUBLIC OPEN SPACE	2,450	0.245	2,450	0.245
VERGE POS	9,834	0.983	9,834	0.983
TOTAL	166,010	16.601	96,868	9.687

The resultant nutrient loading for the development site as calculated by Swan Systems based on the use of treated water for irrigations is as follows:

KG/HA TOTAL													
ELEMENT	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
NITROGEN	3.52	3.17	3.52	2.71	2.41	1.95	1.86	2.10	2.41	2.89	3.40	3.52	33.46
PHOSPHOROUS	0.35	0.32	0.35	0.27	0.24	0.20	0.19	0.21	0.24	0.29	0.34	0.35	3.35
CHLORINE	0.07	0.06	0.07	0.05	0.05	0.04	0.04	0.04	0.05	0.06	0.07	0.07	0.67

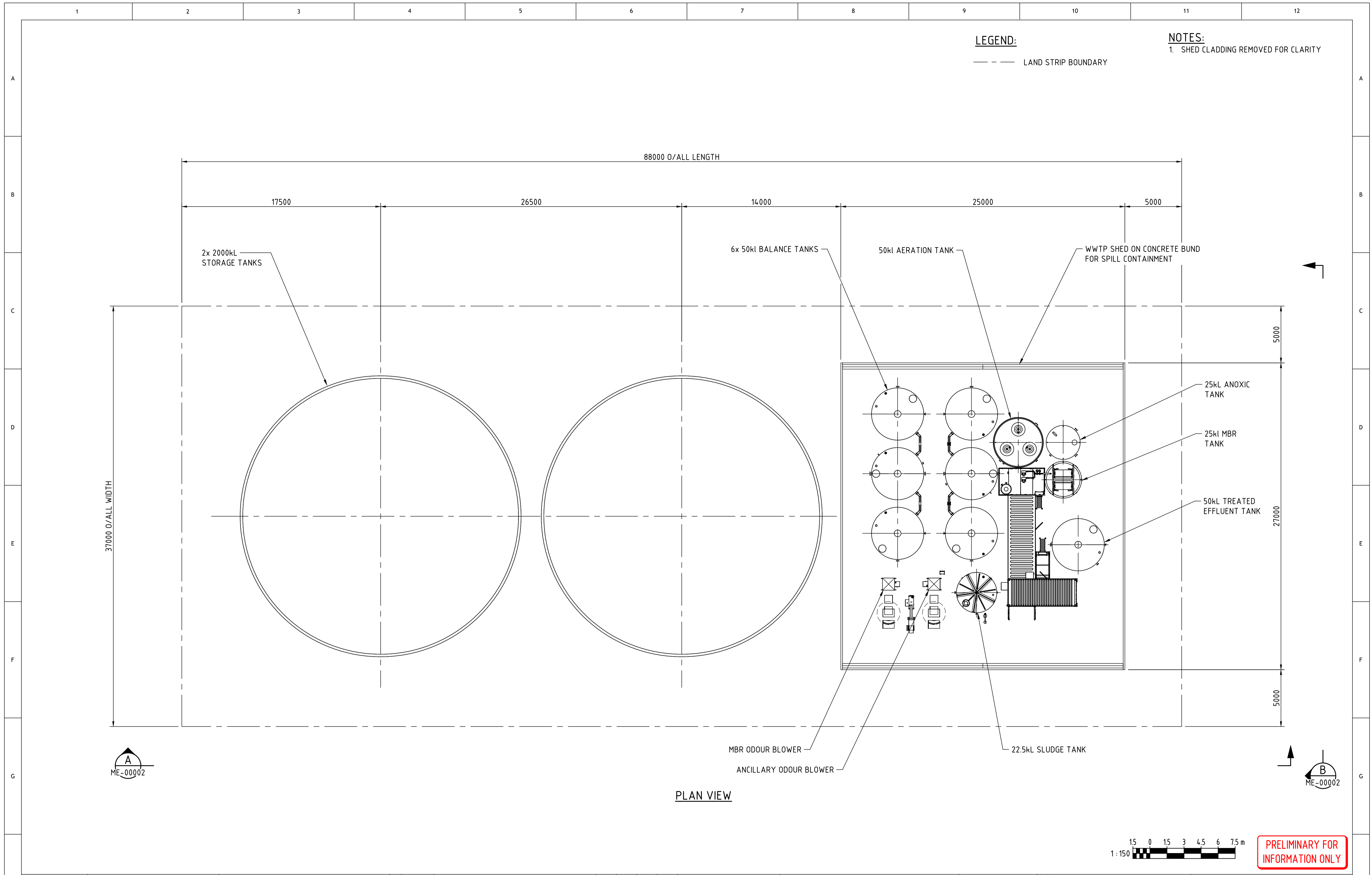
Total Nutrient loading for the development site in Kg/ha – (Kg/ha obtained from average monthly water production after toilet flushing)

Appendix A: Waste Water Treatment Plan Layout

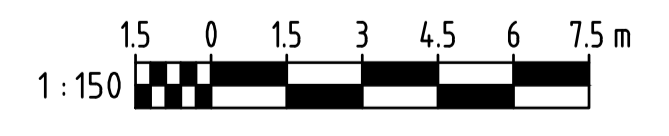


Notes:
 1. 24/7 operation, 500EP
 2. PS = Pump Station
 3. PST = Primary Settling Tank

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Unit	PS 1 (Remote) to PS 2	Gravity sewage to PS 2	PS 2 to Influent Screen	PS 3 to Balance Tanks	Balance Tank(s) recirculation	Bioreactor Feed	Coagulant dosing	Sodium hydroxide dosing	Total Aerobic tank aeration supply	Mixed Liquor Return	Anoxic Tank recirculation	Total Sucrose dosing	Recirculated Activated Sludge	Waste Activated Sludge to Sludge Tank	MBR tank Air Scour supply	MBR Permeate	Treated Effluent Recirculation	Sodium Hypochlorite dosing	Influent screen washing	Treated Effluent to Irrigation Spray Field	MBR Odour Unit
m ³ /hr (max)	TBA	TBA	TBA	21.2	70.8	27.8	-	-	162	21.2	21.5	-	21.2	-	180	8.7	25.0	-	3.6	12.9	590
m ³ /d	TBA	TBA	TBA	127	127	-	-	-	-	-	-	-	-	5.2	-	-	-	-	-	126.4	-
L/d	-	-	-	-	-	-	10	22	-	-	-	30	-	-	-	-	-	15	-	-	-
m ³ /month	TBA	TBA	9810	9810	-	-	0.24	0.52	-	-	-	0.72	-	-	-	-	-	0.85	-	8798	-
Operational pressure	kPag	TBA	0	TBA	TBA	320	70	70	0	100	110	110	110	110	40	110	360	360	250	500	-1.0
Operational temperature	degC	20	20	20	20	20	20	20	20	20	20	20	20	20	60	20	20	20	20	20	20



PLAN VIEW



PRELIMINARY FOR INFORMATION ONLY

DRAWING NUMBER	DESCRIPTION
6575-40-DWG-ME-00002	WWTP - GENERAL ARRANGEMENT - ELEVATIONS



REV	DATE	REVISION DESCRIPTION	DRAWN	CHECKED	ENGINEER APPROVED	APPROVED BY	DATE
A	07.06.2024	ISSUED FOR INFORMATION				RH	

DESIGN ENGINEER	DATE
R.HAMER	04.06.24
CHECKED BY	DATE
LEAD ENGINEER	DATE



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CLIENT	TRWC
PROJECT	SMITHS BEACH WASTE WATER TREATMENT PLANT
TITLE	WWTP GENERAL ARRANGEMENT PLAN

DRAWING STATUS			
ISSUED FOR INFORMATION			
CLIENT DWG NO	AS1100-1992		SIZE
SCALE	GRID	DATUM	A1
DWG NO	6575-40-DWG-ME-00001		REV
			A

Irrigation Requirements

Water demand for each area was calculated based on crop type, soil conditions, and local climate data. An effective rainfall of 50% was assumed, utilizing 10 years of weather data from the Cape Naturaliste BoM weather station, located 13 km from the development site. Crop profiles were derived using crop coefficients provided.

The table below summarizes all the parameters used in the calculations.

Parameter	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Historical average rainfall	mm	11.8	12.2	27.5	46.4	96.3	106.6	137.9	109.2	54.3	36.2	14.8	6.3
Evapotranspiration (Eto) historical average	mm/Month	227	187.9	167.3	118.5	90.1	71.5	74	81.9	100.3	134.9	172.3	216.9
Crop coefficients	Unitless	1	1	0.9	0.9	0.8	0.8	0.8	0.8	0.9	1	1	1
Forecast plant water usage	mm	221	182	137	83	24	4	0	11	63	117	165	214
Irrigation required	ML	21.41	17.63	13.27	8.04	2.32	0.39	0.00	1.07	6.10	11.33	15.98	20.73

Monthly irrigation volume required per area- KL

Area	January	February	March	April	May	June	July	August	September	October	November	December	Total
Hotel garden areas	1227.88	1011.19	761.17	461.15	133.34	22.22	0.00	61.12	350.03	650.05	916.74	1188.98	6783.88
community hub	730.41	601.51	452.79	274.32	79.32	13.22	0.00	36.36	208.22	386.69	545.33	707.27	4035.41
Campground	2910.35	2396.76	1804.15	1093.03	316.06	52.68	0.00	144.86	829.65	1540.77	2172.89	2818.17	16079.35
Holiday homes	13824.43	11384.83	8569.90	5191.98	1501.30	250.22	0.00	688.09	3940.90	7318.82	10321.41	13386.56	76378.43
Public open space	541.45	445.90	335.65	203.35	58.80	9.80	0.00	26.95	154.35	286.65	404.25	524.30	2991.45
Verge POS	2173.31	1789.79	1347.26	816.22	236.02	39.34	0.00	108.17	619.54	1150.58	1622.61	2104.48	12007.31
Total	21407.83	17629.98	13270.92	8040.04	2324.83	387.47	0.00	1065.55	6102.68	11333.56	15983.22	20729.75	118275.83

Nutrient and Pollutant Load Calculations

The treated wastewater contains essential nutrients such as nitrogen (N), phosphorus (P), as well as free Chlorine. Based on treatment plant data, the average concentrations are:

- Nitrogen: <10 mg/L
- Phosphorus: 1 mg/L
- Free Chlorine: 0.2-2 mg/L

Calculations were based on proposed irrigation volumes per month and nutrient loadings are given for each area as total Kg per month and total Kg per year. This report also includes total loadings in Kg/ha for the whole development site.

If irrigation water demand can be satisfied monthly by using treated water, Nitrogen, Phosphorus, and Chlorine application rates per hectare per year are 122.1 kg, 12.21 kg, and 2.42 kg respectively.

Given that the water demand (118276 kL) exceeds the potential treated water available after toilet flushing (32409 kL), an additional table in the report illustrates calculated nutrient loadings if all available water were utilized, resulting in yearly additions of 33.46 kg of Nitrogen, 3.35 kg of Phosphorus, and 0.67 kg of Chlorine per hectare.

In the Busselton-Capel area, specific nutrient loading limits are outlined in allocation plans and environmental management guidelines. Typically, the recommended rates are 140 kg/ha/year for Nitrogen and 10 kg/ha/year for Phosphorus. However, allowable nutrient loadings are almost always site-specific and there is no fixed 'allowable limit'. These limits depend on the risk assessment of the receiving environment.

In the current scenario, this suggests that Phosphorus loading is within the recommended limit.

Monthly Kg of Nitrogen per site

Total Kg of Nitrogen													
Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Hotel garden areas	12.28	10.11	7.61	4.61	1.33	0.22	0.00	0.61	3.50	6.50	9.17	11.89	67.84
community hub	7.30	6.02	4.53	2.74	0.79	0.13	0.00	0.36	2.08	3.87	5.45	7.07	40.35
Campground	29.10	23.97	18.04	10.93	3.16	0.53	0.00	1.45	8.30	15.41	21.73	28.18	160.79
Holiday homes	138.24	113.85	85.70	51.92	15.01	2.50	0.00	6.88	39.41	73.19	103.21	133.87	763.78
Public open space	5.41	4.46	3.36	2.03	0.59	0.10	0.00	0.27	1.54	2.87	4.04	5.24	29.91
Verge POS	21.73	17.90	13.47	8.16	2.36	0.39	0.00	1.08	6.20	11.51	16.23	21.04	120.07
Total	214.08	176.30	132.71	80.40	23.25	3.87	0.00	10.66	61.03	113.34	159.83	207.30	1182.76

Monthly Kg of Phosphorus per site

Total Kg of Phosphorus													
Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Hotel garden areas	1.23	1.01	0.76	0.46	0.13	0.02	0.00	0.06	0.35	0.65	0.92	1.19	6.78
community hub	0.73	0.60	0.45	0.27	0.08	0.01	0.00	0.04	0.21	0.39	0.55	0.71	4.04
Campground	2.91	2.40	1.80	1.09	0.32	0.05	0.00	0.14	0.83	1.54	2.17	2.82	16.08
Holiday homes	13.82	11.38	8.57	5.19	1.50	0.25	0.00	0.69	3.94	7.32	10.32	13.39	76.38
Public open space	0.54	0.45	0.34	0.20	0.06	0.01	0.00	0.03	0.15	0.29	0.40	0.52	2.99
Verge POS	2.17	1.79	1.35	0.82	0.24	0.04	0.00	0.11	0.62	1.15	1.62	2.10	12.01
Total	21.41	17.63	13.27	8.04	2.32	0.39	0.00	1.07	6.10	11.33	15.98	20.73	118.28

Monthly Kg of Chlorine per site

Total Kg of Chlorine													
Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Hotel garden areas	0.25	0.20	0.15	0.09	0.03	0.00	0.00	0.01	0.07	0.13	0.18	0.24	1.36
community hub	0.15	0.12	0.09	0.05	0.02	0.00	0.00	0.01	0.04	0.08	0.11	0.14	0.81
Campground	0.58	0.48	0.36	0.22	0.06	0.01	0.00	0.03	0.17	0.31	0.43	0.56	3.22
Holiday homes	2.76	2.28	1.71	1.04	0.30	0.05	0.00	0.14	0.79	1.46	2.06	2.68	15.28
Public open space	0.11	0.09	0.07	0.04	0.01	0.00	0.00	0.01	0.03	0.06	0.08	0.10	0.60
Verge POS	0.43	0.36	0.27	0.16	0.05	0.01	0.00	0.02	0.12	0.23	0.32	0.42	2.40
Total	4.28	3.53	2.65	1.61	0.46	0.08	0.00	0.21	1.22	2.27	3.20	4.15	23.66

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All figures in kg/Ha

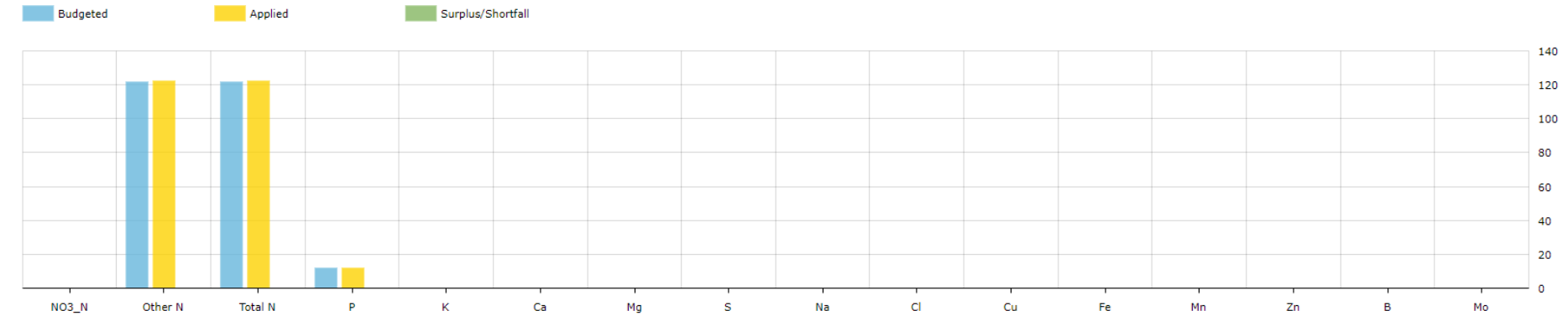


Figure 1 Nutrient application report Kg/ha. SWAN Systems

Total Nutrient loading for the development site in Kg – (Kg/ha obtained from required irrigation volumes)

	Kg total												
Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Nitrogen	214.1	176.3	132.7	80.4	23.2	3.9	0.0	10.7	61.0	113.3	159.8	207.3	1182.8
Phosphorus	21.4	17.6	13.3	8.0	2.3	0.4	0.0	1.1	6.1	11.3	16.0	20.7	118.3
Chlorine	4.3	3.5	2.7	1.6	0.5	0.1	0.0	0.2	1.2	2.3	3.2	4.1	23.7

Total Nutrient loading for the development site in Kg/ha – (Kg/ha obtained from required irrigation volumes)

	Kg/ha total												
Element	January	February	March	April	May	June	July	August	September	October	November	December	Total
Nitrogen	22.1	18.2	13.7	8.3	2.4	0.4	0	1.1	6.3	11.7	16.5	21.4	122.1
Phosphorus	2.21	1.82	1.37	0.83	0.24	0.04	0	0.11	0.63	1.17	1.65	2.14	12.21
Chlorine	0.442	0.364	0.274	0.166	0.048	0.008	0	0.022	0.126	0.234	0.33	0.428	2.442

Total Nutrient loading for the development site in Kg/ha – (Kg/ha obtained from average monthly water production after toilet flushing)

	Kg/ha total												
Element	January	February	March	April	May	June	July	August	September	October	November	December	Total
Nitrogen	3.52	3.17	3.52	2.71	2.41	1.95	1.86	2.10	2.41	2.89	3.40	3.52	33.46
Phosphorus	0.35	0.32	0.35	0.27	0.24	0.20	0.19	0.21	0.24	0.29	0.34	0.35	3.35
Chlorine	0.07	0.06	0.07	0.05	0.05	0.04	0.04	0.04	0.05	0.06	0.07	0.07	0.67

Development water Balance

Item	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days per month	Days	31	28	31	30	31	30	31	31	30	31	30	31	
Average daily water production	L/day	116,129	116,107	116,129	92,567	79,677	66,767	61,710	69,581	82,467	95,355	116,133	116,129	
Average monthly Water production	L/Month	3600000	3251000	3600000	2777000	2470000	2003000	1913000	2157000	2474000	2956000	3484000	3600000	
Average monthly Water production	kL	3600	3251	3600	2777	2470	2003	1913	2157	2474	2956	3484	3600	34285
Holiday Homes - Toilet Flushing	kL	89	81	89	86	79	67	60	60	67	79	86	89	932
Hotel and Community Hub (Toilet Flushing)	kL	84	76	84	54	47	36	37	47	54	65	81	84	749
Campground (Toilet Flushing)	kL	22	20	22	14	12	9	10	12	14	17	21	22	195
Available water produced after toilet flushing	kL	3405	3074	3405	2623	2332	1891	1806	2038	2339	2795	3296	3405	32409
Overall irrigation required	kL	21408	17630	13271	8040	2325	387	0	1066	6103	11334	15983	20730	118276
Non-potable water balance (+= Surplus)	kL	-18003	-14556	-9866	-5417	7	1504	1806	972	-3764	-8539	-12687	-17325	-85867

Appendix – 5-year weather data calculations

Irrigation Requirements

Water demand for each area was calculated based on crop type, soil conditions, and local climate data. As requested by the customer, only the latest 5 years of weather data from the Cape Naturaliste BoM weather station, located 13 km from the development site, were utilized. An effective rainfall of 50% was assumed. Crop profiles were derived using crop coefficients provided. The table below summarizes all the parameters used in the calculations.

Parameter	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Historical average rainfall	mm	5.5	14.5	25.6	60.7	95.5	126.5	127.2	97.3	55.7	46	18.7	2
Evapotranspiration (Eto) historical average	mm/Month	235.4	196.7	172.4	123	92.8	72.5	73.5	83.3	100.9	136.3	177.4	233.9
Crop coefficients	Unitless	1	1	0.9	0.9	0.8	0.8	0.8	0.8	0.9	1	1	1
Forecast plant water usage	mm	233	189	142	80	26	0	0	18	63	113	168	233
Irrigation required	ML	22.57	18.31	13.76	7.75	2.52	0.00	0.00	1.74	6.10	10.95	16.27	22.57

Monthly irrigation volume required per area- KL

Area	January	February	March	April	May	June	July	August	September	October	November	December	Total
Hotel garden areas	1294.55	1050.08	788.95	444.48	144.46	0.00	0.00	100.01	350.03	627.83	933.41	1294.55	7028.34
community hub	770.07	624.65	469.31	264.40	85.93	0.00	0.00	59.49	208.22	373.47	555.24	770.07	4180.83
Campground	3068.38	2488.94	1870.00	1053.52	342.39	0.00	0.00	237.04	829.65	1488.10	2212.39	3068.38	16658.79
Holiday homes	14575.08	11822.71	8882.67	5004.32	1626.40	0.00	0.00	1125.97	3940.90	7068.60	10509.07	14575.08	79130.81
Public open space	570.85	463.05	347.90	196.00	63.70	0.00	0.00	44.10	154.35	276.85	411.60	570.85	3099.25
Verge POS	2291.32	1858.63	1396.43	786.72	255.68	0.00	0.00	177.01	619.54	1111.24	1652.11	2291.32	12440.01
Total	22570.24	18308.05	13755.26	7749.44	2518.57	0.00	0.00	1743.62	6102.68	10946.08	16273.82	22570.24	122538.02

Nutrient and Pollutant Load Calculations

The treated wastewater contains essential nutrients such as nitrogen (N), phosphorus (P), as well as free Chlorine. Based on treatment plant data, the average concentrations are:

- Nitrogen: <10 mg/L
- Phosphorus: <1mg/L
- Free Chlorine: 0.2-2 mg/L

Calculations were based on proposed irrigation volumes per month and nutrient loadings are given for each area as total Kg per month and Total Kg per year. This report also includes total loadings in Kg/ha for the whole development site.

If irrigation water demand can be satisfied monthly by using treated water, Nitrogen, Phosphorus, and Chlorine application rates per hectare per year are 126.5 kg, 12.65 kg, and 2.53 kg respectively.

Given that the water demand (122538 kL) exceeds the potential treated water available after toilet flushing (32409 kL), an additional table in the report illustrates calculated nutrient loadings if all available water were utilized, resulting in yearly additions of 33.46 kg of Nitrogen, 3.35 kg of Phosphorus, and 0.67 kg of Chlorine per hectare.

In the Busselton-Capel area, specific nutrient loading limits are outlined in allocation plans and environmental management guidelines. Typically, the recommended rates are 140 kg/ha/year for Nitrogen and 10 kg/ha/year for Phosphorus. However, allowable nutrient loadings are almost always site-specific and there is no fixed 'allowable limit'. These limits depend on the risk assessment of the receiving environment.

In the current scenario, this suggests that Phosphorus loading is within the recommended limit.

Monthly Kg of Nitrogen per site

Total Kg of Nitrogen													
Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Hotel garden areas	12.95	10.50	7.89	4.44	1.44	0.00	0.00	1.00	3.50	6.28	9.33	12.95	70.28
community hub	7.70	6.25	4.69	2.64	0.86	0.00	0.00	0.59	2.08	3.73	5.55	7.70	41.81
Campground	30.68	24.89	18.70	10.54	3.42	0.00	0.00	2.37	8.30	14.88	22.12	30.68	166.59
Holiday homes	145.75	118.23	88.83	50.04	16.26	0.00	0.00	11.26	39.41	70.69	105.09	145.75	791.31
Public open space	5.71	4.63	3.48	1.96	0.64	0.00	0.00	0.44	1.54	2.77	4.12	5.71	30.99
Verge POS	22.91	18.59	13.96	7.87	2.56	0.00	0.00	1.77	6.20	11.11	16.52	22.91	124.40
Total	225.70	183.08	137.55	77.49	25.19	0.00	0.00	17.44	61.03	109.46	162.74	225.70	1225.38

Monthly Kg of Phosphorus per site

Total Kg of Phosphorus													
Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Hotel garden areas	1.29	1.05	0.79	0.44	0.14	0.00	0.00	0.10	0.35	0.63	0.93	1.29	7.03
community hub	0.77	0.62	0.47	0.26	0.09	0.00	0.00	0.06	0.21	0.37	0.56	0.77	4.18
Campground	3.07	2.49	1.87	1.05	0.34	0.00	0.00	0.24	0.83	1.49	2.21	3.07	16.66
Holiday homes	14.58	11.82	8.88	5.00	1.63	0.00	0.00	1.13	3.94	7.07	10.51	14.58	79.13
Public open space	0.57	0.46	0.35	0.20	0.06	0.00	0.00	0.04	0.15	0.28	0.41	0.57	3.10
Verge POS	2.29	1.86	1.40	0.79	0.26	0.00	0.00	0.18	0.62	1.11	1.65	2.29	12.44
Total	22.57	18.31	13.76	7.75	2.52	0.00	0.00	1.74	6.10	10.95	16.27	22.57	122.54

Monthly Kg of Chlorine per site

Total Kg of Chlorine													
Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Hotel garden areas	0.26	0.21	0.16	0.09	0.03	0.00	0.00	0.02	0.07	0.13	0.19	0.26	1.41
community hub	0.15	0.12	0.09	0.05	0.02	0.00	0.00	0.01	0.04	0.07	0.11	0.15	0.84
Campground	0.61	0.50	0.37	0.21	0.07	0.00	0.00	0.05	0.17	0.30	0.44	0.61	3.33
Holiday homes	2.92	2.36	1.78	1.00	0.33	0.00	0.00	0.23	0.79	1.41	2.10	2.92	15.83
Public open space	0.11	0.09	0.07	0.04	0.01	0.00	0.00	0.01	0.03	0.06	0.08	0.11	0.62
Verge POS	0.46	0.37	0.28	0.16	0.05	0.00	0.00	0.04	0.12	0.22	0.33	0.46	2.49
Total	4.51	3.66	2.75	1.55	0.50	0.00	0.00	0.35	1.22	2.19	3.25	4.51	24.51

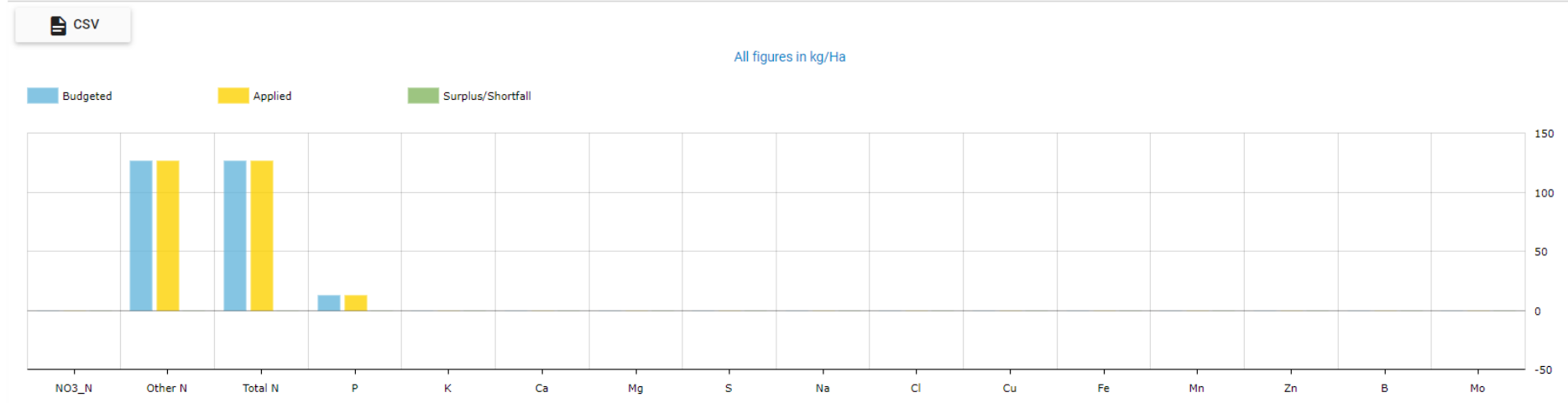


Figure 2 Nutrient application report Kg/ha. SWAN Systems

Total Nutrient loading for the development site in Kg – (Kg/ha obtained from required irrigation volumes)

	Kg total												
Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Nitrogen	225.7	183.1	137.6	77.5	25.2	0.0	0.0	17.4	61.0	109.5	162.7	225.7	1225.4
Phosphorus	22.6	18.3	13.8	7.7	2.5	0.0	0.0	1.7	6.1	10.9	16.3	22.6	122.5
Chlorine	4.5	3.7	2.8	1.5	0.5	0.0	0.0	0.3	1.2	2.2	3.3	4.5	24.5

Total Nutrient loading for the development site in Kg/ha – (Kg/ha obtained from required irrigation volumes)

	Kg/ha total												
Element	January	February	March	April	May	June	July	August	September	October	November	December	Total
Nitrogen	23.30	18.90	14.20	8.00	2.60	0.00	0.00	1.80	6.30	11.30	16.80	23.30	126.50
Phosphorus	2.33	1.89	1.42	0.80	0.26	0.00	0.00	0.18	0.63	1.13	1.68	2.33	12.65
Chlorine	0.47	0.38	0.28	0.16	0.05	0.00	0.00	0.04	0.13	0.23	0.34	0.47	2.53

Total Nutrient loading for the development site in Kg/ha – (Kg/ha obtained from average monthly water production after toilet flushing)

	Kg/ha total												
Element	January	February	March	April	May	June	July	August	September	October	November	December	Total
Nitrogen	3.52	3.17	3.52	2.71	2.41	1.95	1.86	2.10	2.41	2.89	3.40	3.52	33.46
Phosphorus	0.35	0.32	0.35	0.27	0.24	0.20	0.19	0.21	0.24	0.29	0.34	0.35	3.35
Chlorine	0.07	0.06	0.07	0.05	0.05	0.04	0.04	0.04	0.05	0.06	0.07	0.07	0.67

Development water Balance

Item	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days per month	Days	31	28	31	30	31	30	31	31	30	31	30	31	
Average daily water production	L/day	116,129	116,107	116,129	92,567	79,677	66,767	61,710	69,581	82,467	95,355	116,133	116,129	
Average monthly Water production	L/Month	3600000	3251000	3600000	2777000	2470000	2003000	1913000	2157000	2474000	2956000	3484000	3600000	
Average monthly Water production	kL	3600	3251	3600	2777	2470	2003	1913	2157	2474	2956	3484	3600	34285
Holiday Homes - Toilet Flushing	kL	89	81	89	86	79	67	60	60	67	79	86	89	932
Hotel and Community Hub (Toilet Flushing)	kL	84	76	84	54	47	36	37	47	54	65	81	84	749
Campground (Toilet Flushing)	kL	22	20	22	14	12	9	10	12	14	17	21	22	195
Available water produced after toilet flushing	kL	3405	3074	3405	2623	2332	1891	1806	2038	2339	2795	3296	3405	32409
Overall irrigation required	kL	22570	18308	13755	7749	2519	0	0	1744	6103	10946	16274	22570	122538
Non-potable water balance (+= Surplus)	kL	-19165	-15234	-10350	-5126	-187	1891	1806	294	-3764	-8151	-12978	-19165	-90129

Appendix C: GHD MELDI Modelling Outputs

Scenario: Run 01_Deep coarse sand.med

General Information

SCENARIO REPORT: Full run

General information

Enterprise: Run 01_ Shandy TWW_Deep coarse sand

Client: The Right Water Group

MEDLI user: GHD/Atrevenen

Description:

Swans Systems Water Balance

Scenario details:

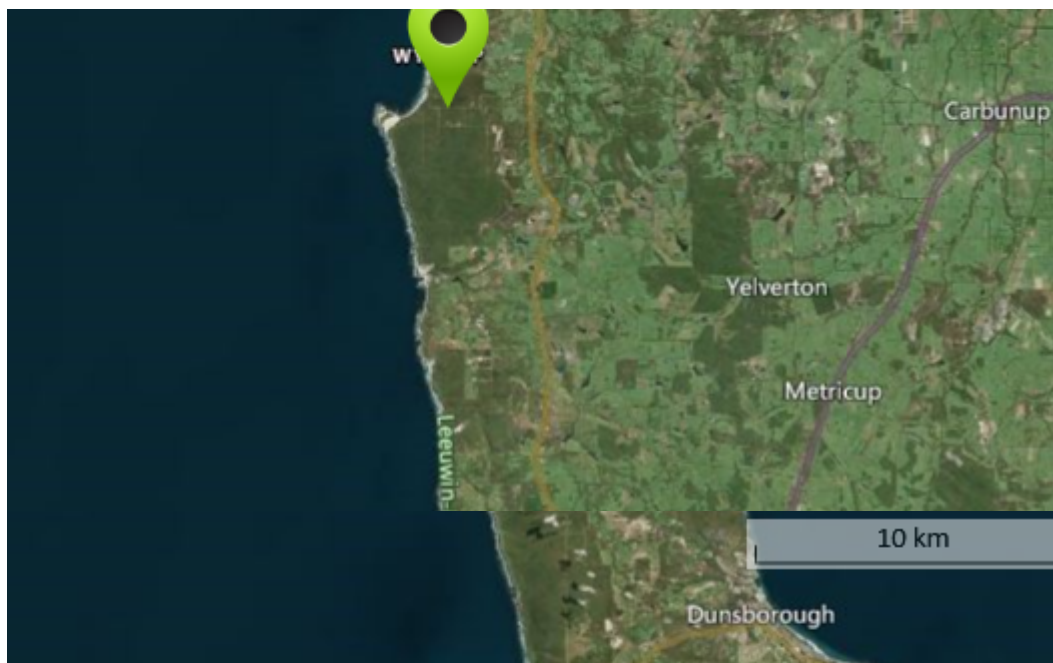
Proposed scheme water top-up of recycled water tank accounted for in waste estimation inflow volume and nutrient concentrations. Notional soil properties assumed in the absence of site specific information on soil characteristics.

Soil hydrologic layers 'Deep coarse sand' characterised to 1.5 m bgl. This is to represent a best case/ high infiltration scenario.

Coastal couch grass parameters adopted (maximum root depth assumed ~300mm).

Map of location:

Note: If the map below appears as a dark box, check that the network is accessible and that the coordinates are not for a location in the ocean.



Climate information

Climate Data Location: **SmithsBeach, -33.7°, 115°**

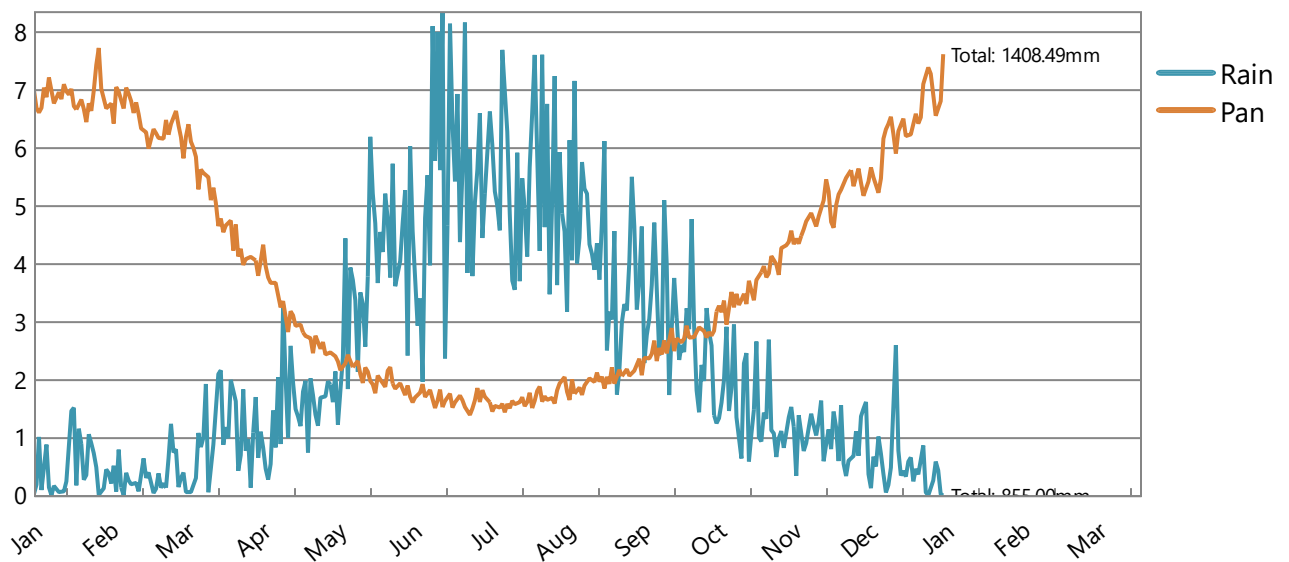
Run Period: **01/01/1990 to 31/12/2020 (31 years)**

Climate statistics

	5th Percentile		50th Percentile		95th Percentile	
Rainfall (mm/year)	(Year 2006)	678.6	(Year 2007)	824.8	(Year 1999)	1088.7
Pan evaporation (mm/year)	(Year 2005)	1281.0	(Year 2006)	1407.6	(Year 2011)	1534.3

Climate data

Daily average across run period:



Description



Wastestream information

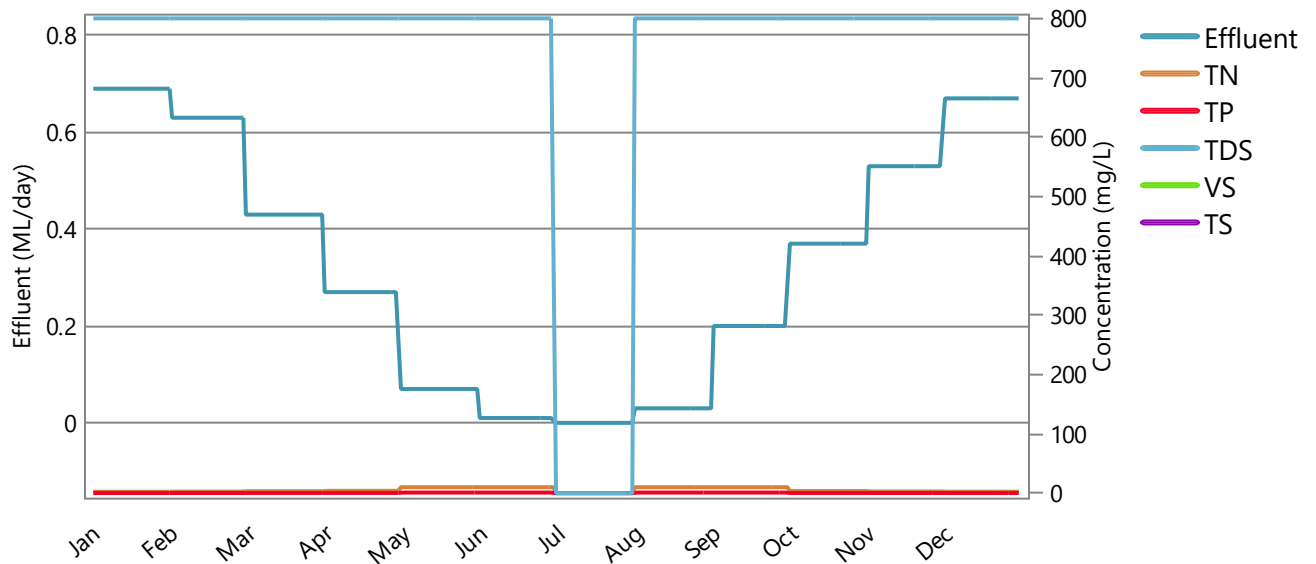
Wastestream Name: Waste estimation system - TWW

Wastestream production description

Daily TWW data supplied for a representative year. This wastestream is not separately pretreated.

Wastestream

Average Daily Quantity and Flow-Weighted Average Quality:



Description

Wastestream

Effluent Quantity: 118.13 ML/year or 0.32 ML/day (Min-Max 0.00 - 0.69)

Flow-Weighted Average (Min - Max) Daily Effluent Quality Entering the Pond System:

	Concentration (mg/L)	Load (kg/year)
Total nitrogen	3.43 (2.43 - 10.00)	405.78 (405.35 - 407.01)
Total phosphorus	0.34 (0.24 - 1.00)	40.65 (40.61 - 40.77)
Total dissolved salts	800.00 (800.00 - 800.00)	94506.32 (94368.00 - 94904.00)
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)

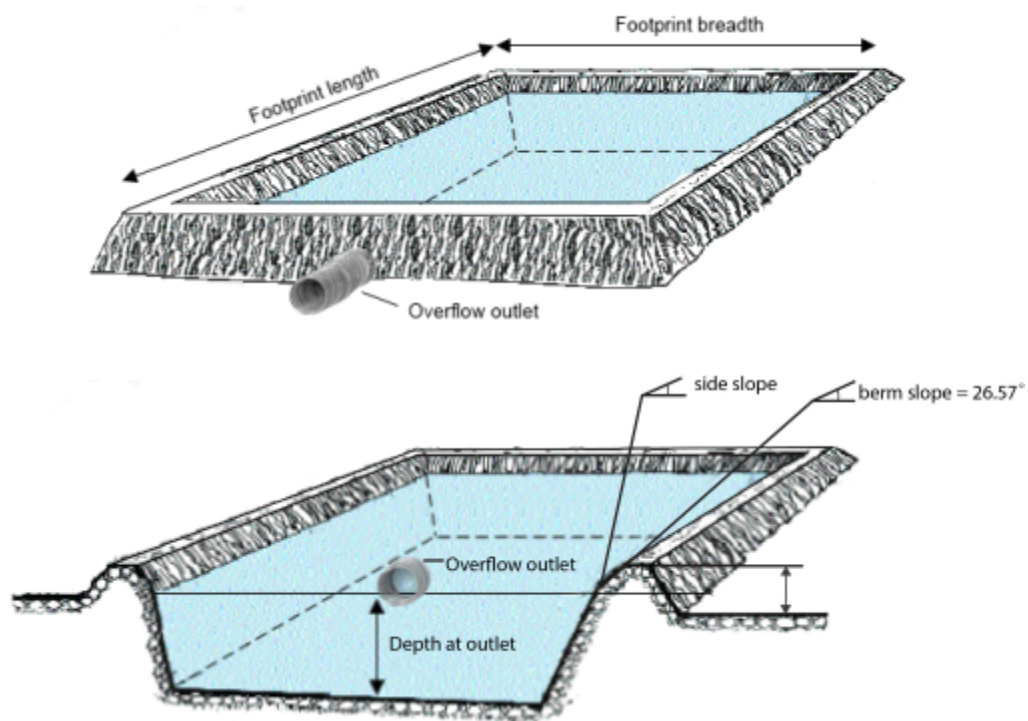


Pond system information

Pond System Configuration: 1 closed (sludge-free) storage tank

Pond system details

	Pond 1
Maximum pond volume (ML)	5.00
Minimum allowable pond volume (ML)	0.00
Pond depth at overflow outlet (m)	2.80
Maximum water surface area (m ²)	2043.78
Pond footprint length (m)	65.93
Pond footprint width (m)	33.97
Pond catchment area (m ²)	2239.59
Average active volume (ML)	0.04



Irrigation pump limits

Minimum pump rate per area limit (ML/day/ha)	0.00
Maximum pump rate per area limit (ML/day/ha)	0.70

Shandyng water

Annual allocation of fresh water available for shandyng (ML/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	No

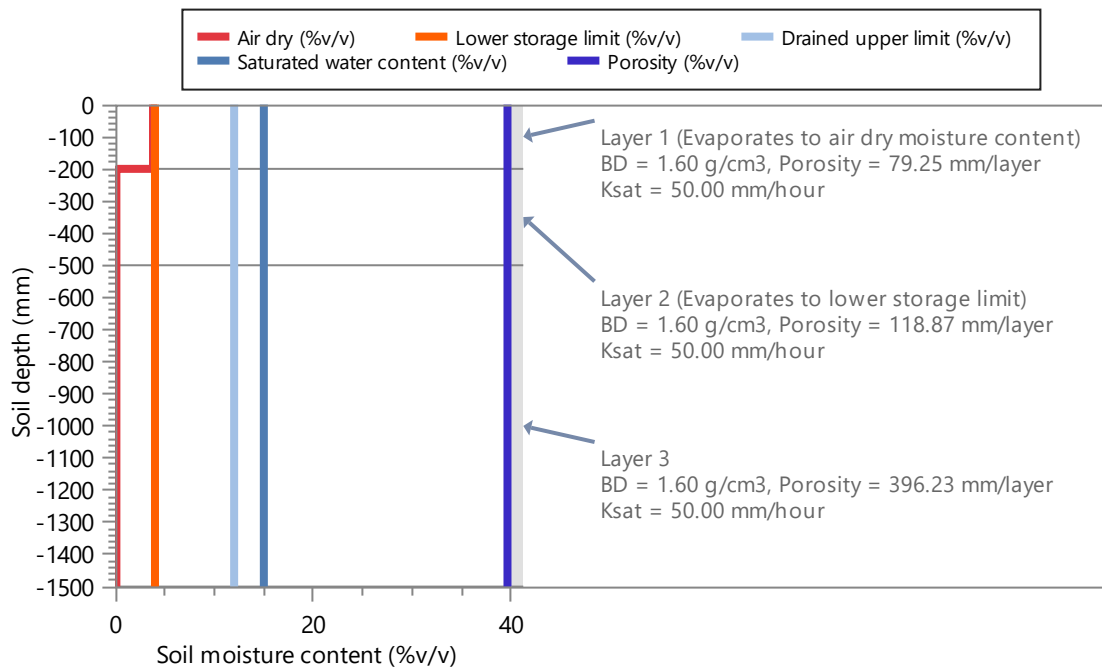
Paddock information

Paddock: Coastal Couch, 9.687 ha

Soil type: Deep coarse sand, 1500.00 mm defined profile depth

Profile porosity (mm)	594.34
Profile saturation water content (mm)	225.00
Profile drained upper limit (or field capacity) (mm)	180.00
Profile lower storage limit (or permanent wilting point) (mm)	60.00
Profile available water capacity (mm)	120.00
Profile limiting saturated hydraulic conductivity (mm/hour)	50.00
Surface saturated hydraulic conductivity (mm/hour)	50.00
Runoff curve number II (coefficient)	72.00
Soil evaporation U (mm)	6.00
Soil evaporation Cona (mm/sqrt day)	3.30

Profile



Planting regime: Continuous Coastal couch grass

Average monthly cover (%) (minimum - maximum)	79.85 (77.79 - 80.30)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Dead cover (if Mthly Covers) or Tot. cover left after harvest (%)	100.00
Potential rooting depth in defined soil profile (mm)	300.00
Salt tolerance	Tolerant
Salinity threshold (dS/m soil saturation extract)	6.90
Proportion of yield decrease per dS/m increase (%/dS/m)	6.40

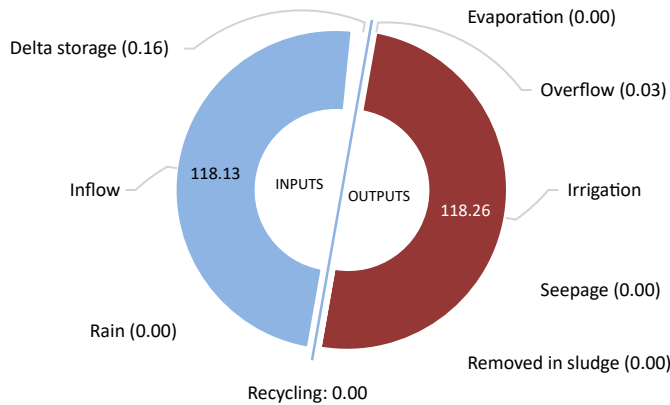
Irrigation rules: Lateral move

Rule 1. Irrigation triggered every 1 days and rainfall is less than or equal to 10000.00 mm
Rule 2. Irrigate a fixed amount of 7.00 mm each day
Rule 3. Irrigation window from 1/1 to 31/12 including the days specified
Rule 4. A minimum of 0 days must be skipped between irrigation events

Pond system information

Pond System Configuration: 1 closed (sludge-free) storage tank (wet weather storage pond: 5 ML)

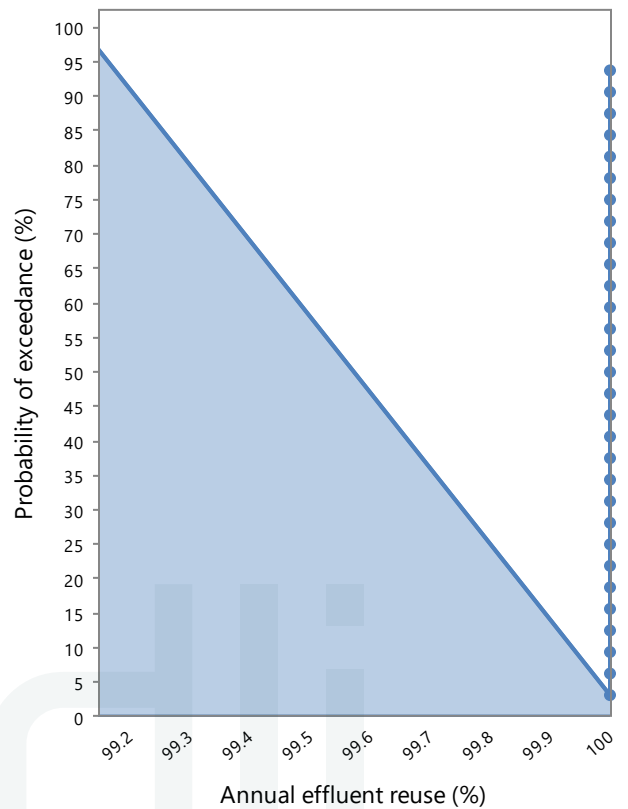
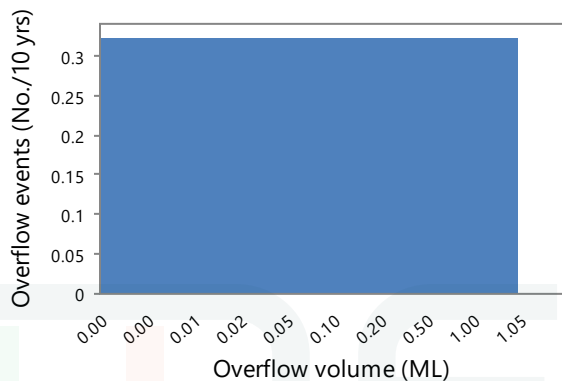
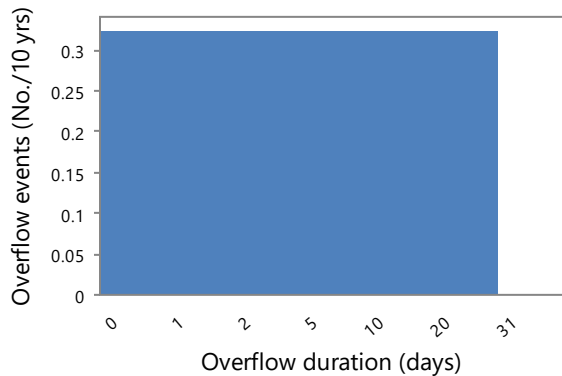
Pond system water balance (ML/year)



Name	Value
Rain	0.00
Inflow	118.13
Recycling	0.00
Evaporation	0.00
Overflow	0.03
Irrigation	118.26
Seepage	0.00
Removed in sludge	0.00
Delta storage	-0.16

Overflow and reuse diagnostics

Metric	Value
Total volume of overflow (ML/10 years)	0.34
Total number of overflow events (events/10 years)	0.32
Total number of pond overflow days (days/10 years)	10.00
Probability of at least 90% effluent reuse (%)	100.00
Effluent reuse (Proportion of inflow + net gain in rain that is irrigated) (%)	99.97

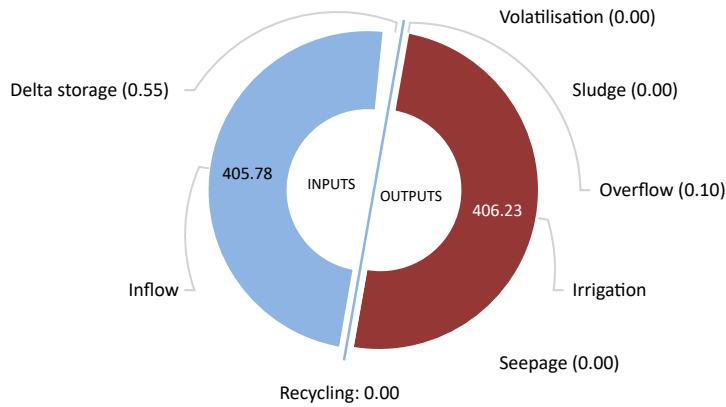


Performance

Pond system information

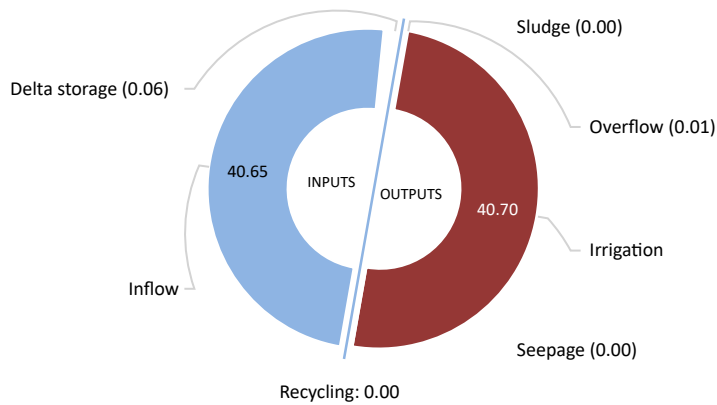
Pond System Configuration: 1 closed (sludge-free) storage tank

Pond system nitrogen balance (kg/year)



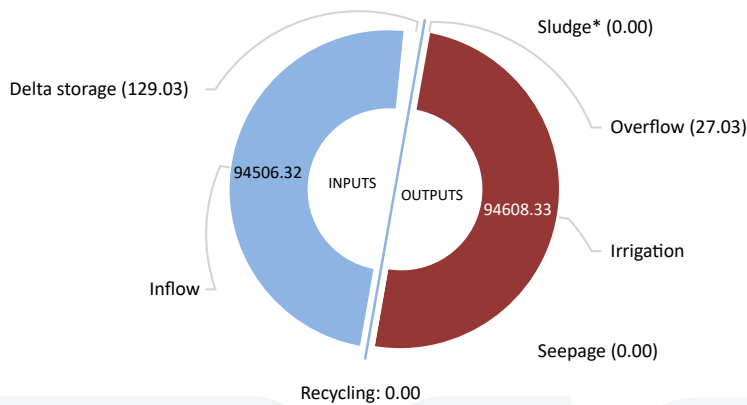
Name	Value
Inflow	405.78
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.10
Irrigation	406.23
Seepage	0.00
Delta storage	-0.55

Pond system phosphorus balance (kg/year)



Name	Value
Inflow	40.65
Recycling	0.00
Sludge	0.00
Overflow	0.01
Irrigation	40.70
Seepage	0.00
Delta storage	-0.06

Pond system salt balance (kg/year)



Name	Value
Inflow	94506.32
Recycling	0.00
Sludge*	0.00
Overflow	27.03
Irrigation	94608.33
Seepage	0.00
Delta storage	-129.03

* 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

Pond system information

Pond System Configuration: 1 closed (sludge-free) storage tank

Pond nutrient concentrations and salinity

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	2.54
Average phosphorus concentration of pond liquid (mg/L)	0.25
Average salinity of pond liquid (dS/m)	1.25

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

Water use (assumes 100% irrigation efficiency)

Metric	Value
Pond water irrigated (ML/year)	118.26
Average shandy water irrigation (ML/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (ML/year)	118.26
Proportion of irrigation events requiring shandying (% of events)	0.00
Proportion of years shandying water allocation of 0 ML/year is exceeded (% of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation quality

Metric	Value
Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	3.44
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	3.44
Average phosphorus concentration of irrigation water (mg/L)	0.34
Average salinity of irrigation water (dS/m)	1.25

Irrigation diagnostics

Metric	Value
No. periods/year without any irrigable effluent in the wet weather storage pond (periods/year)	1.00
Average length of such periods (days)	31.00

Irrigation triggering and application

No. Days without Irrigation Applied per Year: 31.00 (with pond water volume below minimum volume for irrigation)

No. Days without Irrigation Applied per Year: 31.00 (with no supply - no application)

No. Days with Irrigation Applied per Year: 334.26 (with supply limited - partial application [295.19] and full application [39.06])

No. Days with Irrigation Triggered per Year: 365.26

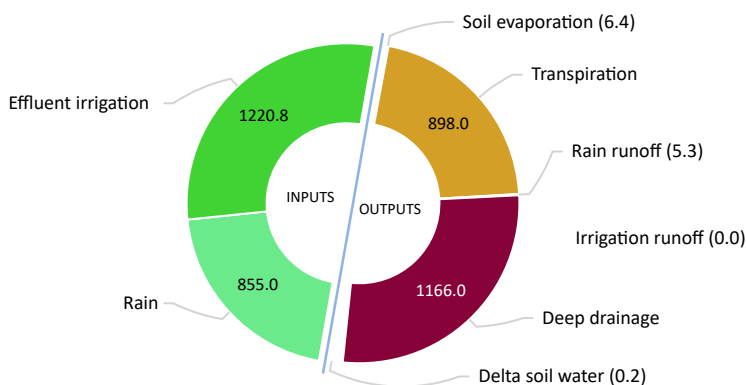


Paddock information

Paddock: Coastal Couch, 9.687 ha

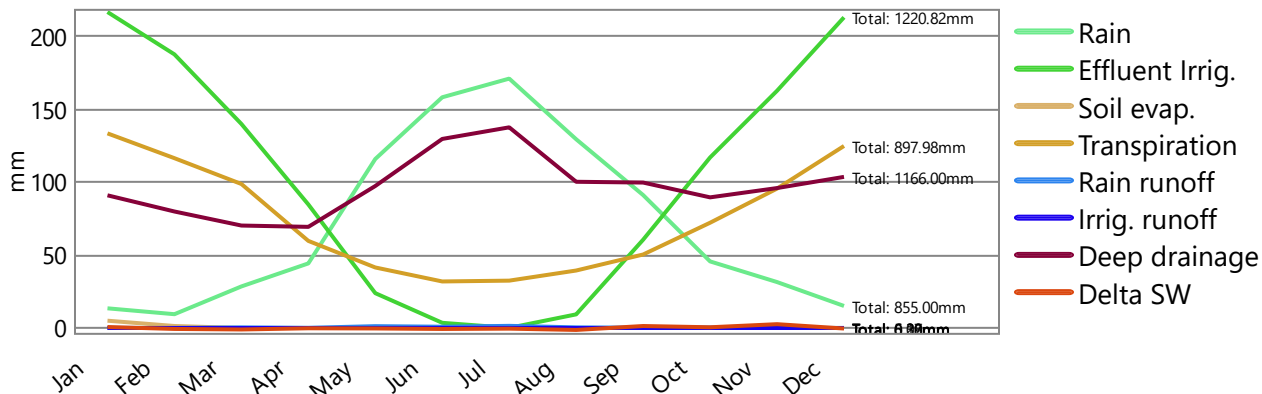
Soil Type: Deep coarse sand, 24.00 mm PAWC at maximum root depth

Soil water balance (mm/year)

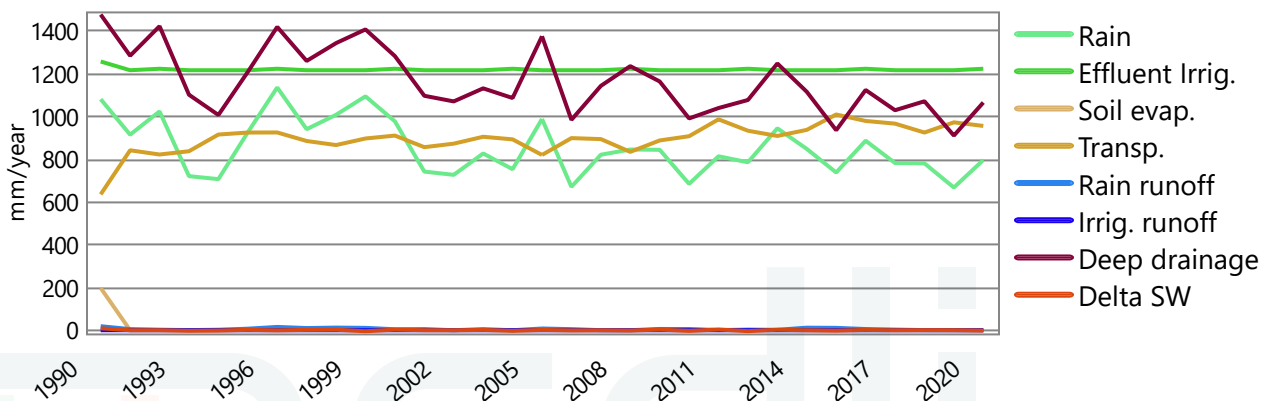


Name	Value
Rain	855.0
Effluent irrigation	1220.8
Soil evaporation	6.4
Transpiration	898.0
Rain runoff	5.3
Irrigation runoff	0.0
Deep drainage	1166.0
Delta soil water	0.2

Average monthly totals (mm)



Average annual totals (mm/year)



Performance

Paddock information

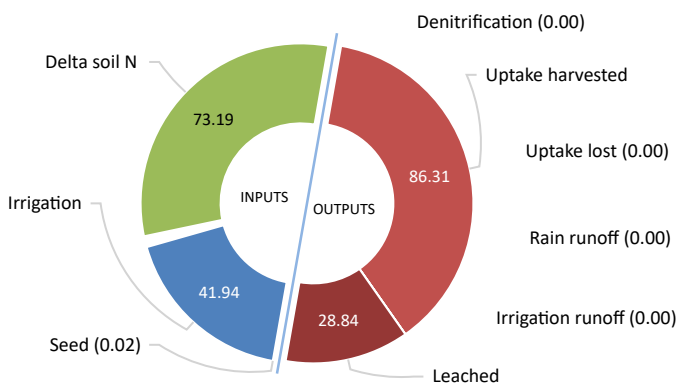
Paddock: Coastal Couch, 9.687 ha

Soil Type: Deep coarse sand

Irrigation Ammonia-N Volatilisation Losses (kg/ha/year): 0.00

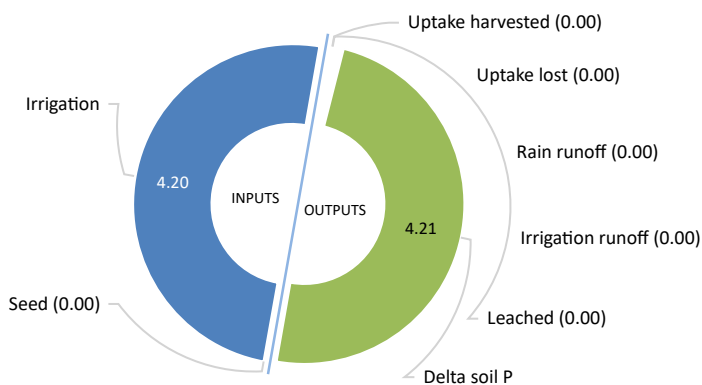
Proportion of Total Nitrogen in Irrigated Effluent as Ammonium (%): 0.00

Soil nitrogen balance (kg/ha/year)



Name	Value
Seed	0.02
Irrigation	41.94
Denitrification	0.00
Uptake harvested	86.31
Uptake lost	0.00
Rain runoff	0.00
Irrigation runoff	0.00
Leached	28.84
Delta soil N	-73.19

Soil phosphorus balance (kg/ha/year)



Name	Value
Seed	2.90E-03
Irrigation	4.20
Uptake harvested	2.90E-03
Uptake lost	0.00
Rain runoff	0.00
Irrigation runoff	0.00
Leached	3.29E-03
Delta soil P	4.21

Performance

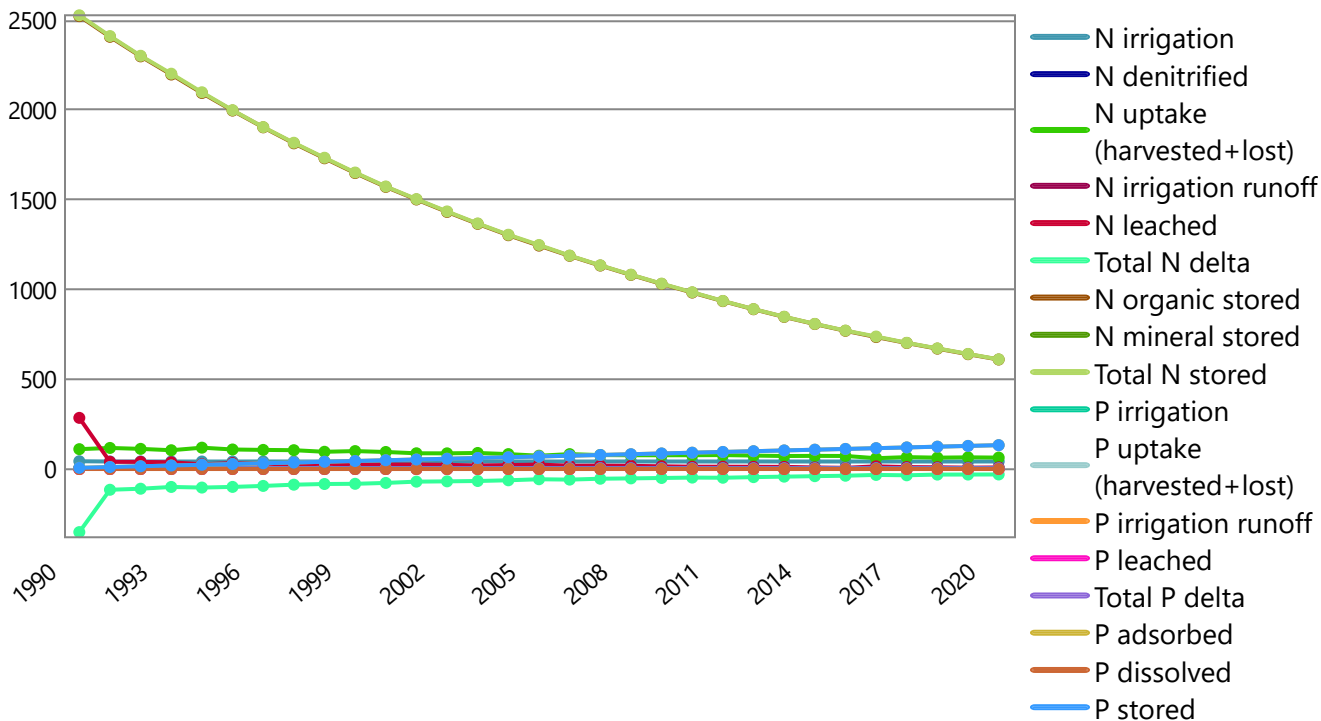


Paddock information

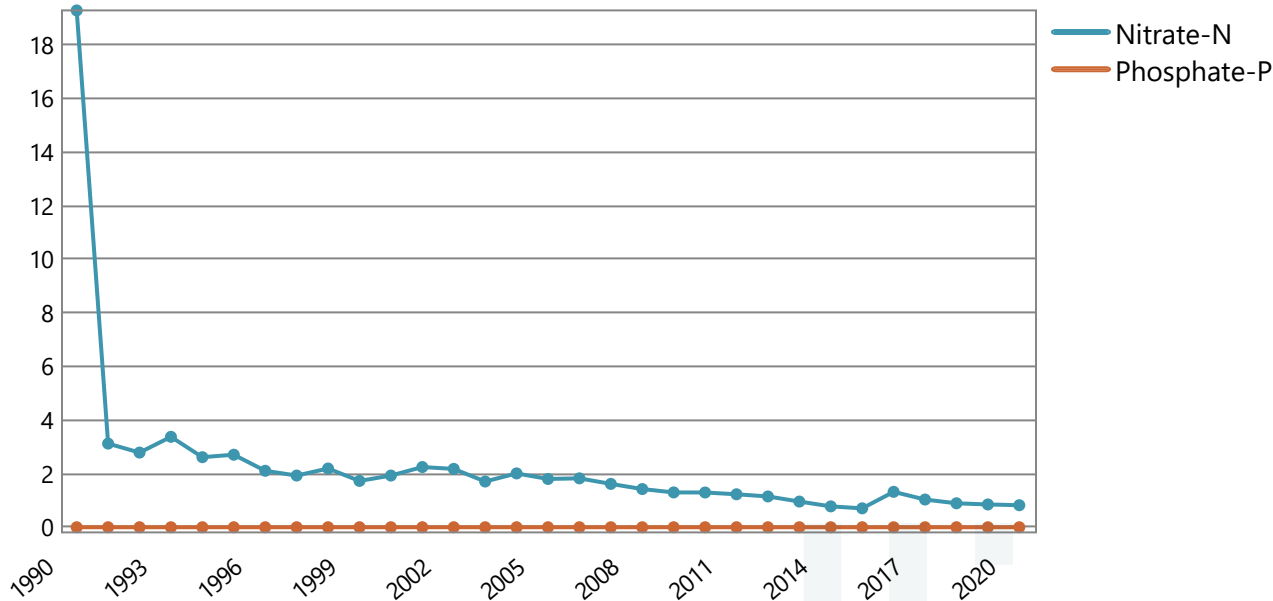
Paddock: Coastal Couch, 9.687 ha

Soil Type: Deep coarse sand

Annual nutrient totals (kg/ha)



Annual nutrient leaching concentration (mg/L)



Performance



Paddock information

Paddock: Coastal Couch, 9.687 ha

Soil Type: Deep coarse sand

Planting Regime: Continuous Coastal couch grass

Plant growth (minimum - maximum)

Metric	Value
Average annual shoot dry matter harvestable yield* (kg/ha/year)	6041.79 (4872.14 - 7494.68)
Average annual shoot dry matter lost (kg/ha/year)	0.00 (0.00 - 0.00)
Average monthly plant (green) cover (%)	79.85 (77.79 - 80.30)
Average monthly root depth (mm)	295.16 (290.58 - 296.19)

Plant nutrient uptake (minimum - maximum)

Metric	Value
Average annual shoot nitrogen in harvestable yield* (kg/ha/year)	86.31 (60.17 - 118.94)
Average annual shoot nitrogen lost (kg/ha/year)	0.00 (0.00 - 0.00)
Average annual shoot phosphorus in harvestable yield* (kg/ha/year)	0.00 (0.00 - 0.09)
Average annual shoot phosphorus lost (kg/ha/year)	0.00 (0.00 - 0.00)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.01 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.000 (0.000 - 0.000)

*Harvestable yield is a measure of *net* gain over a nominated period - say monthly. It is the total shoot-dry-matter gain minus any shoot-dry-matter loss within a given period. Hence, just like financial investments, negative harvestable yields may occur when the (episodic) losses exceed the gains made within a particular accounting period.

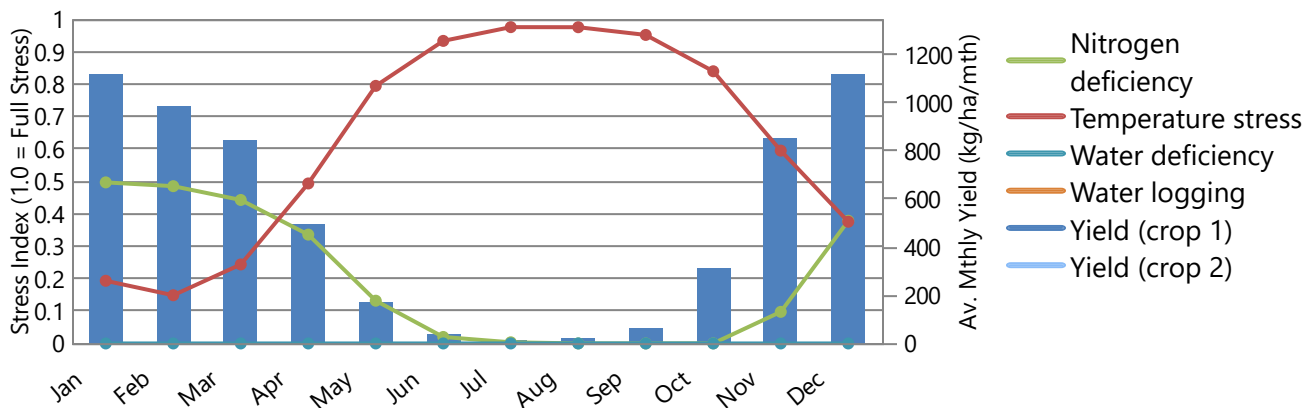
Paddock information

Paddock: Coastal Couch, 9.687 ha

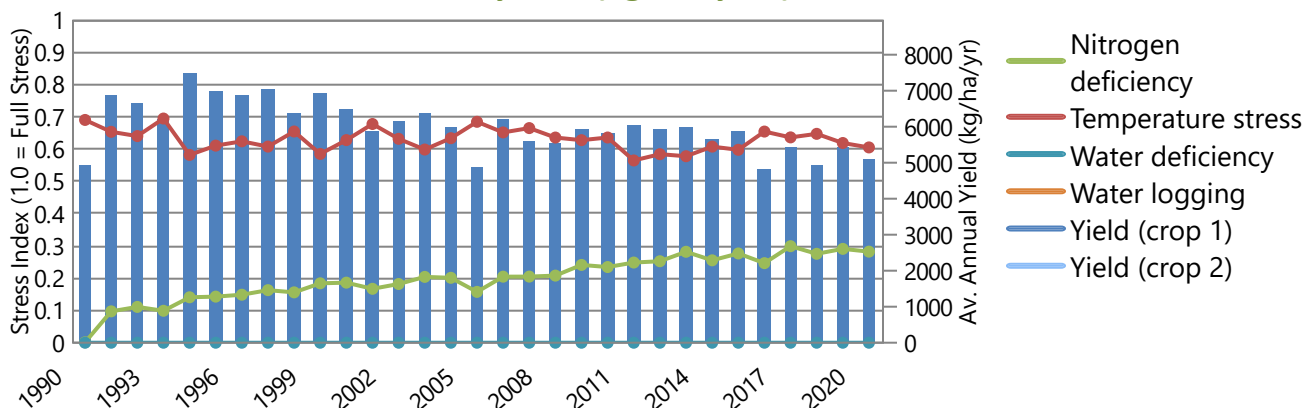
Soil Type: Deep coarse sand

Planting Regime: Continuous Coastal couch grass

Av. monthly stresses & harvestable yield* (kg/ha/month)



Av. annual stresses & harvestable yield* (kg/ha/year)



*Harvestable yield is a measure of *net* gain over a nominated period - say monthly. It is the total shoot-dry-matter gain minus any shoot-dry-matter loss within a given period. Hence, just like financial investments, negative harvestable yields may occur when the (episodic) losses exceed the gains made within a particular accounting period.

Normal and forced harvest information

No. of Harvests per Year: 27.58 (normal).

No. Days without Crop per Year (no./year): 0.00

Performance



Paddock information

Paddock: Coastal Couch, 9.687 ha

Soil Type: Deep coarse sand

Planting Regime: Continuous Coastal couch grass

Plant salinity tolerance

Metric	Value
Salt tolerance	Tolerant
Salinity threshold (dS/m soil saturation extract)	6.90
Proportion of yield decrease per dS/m increase (%/dS/m)	6.40
No. years assumed for leaching to reach steady-state (years)	10.00

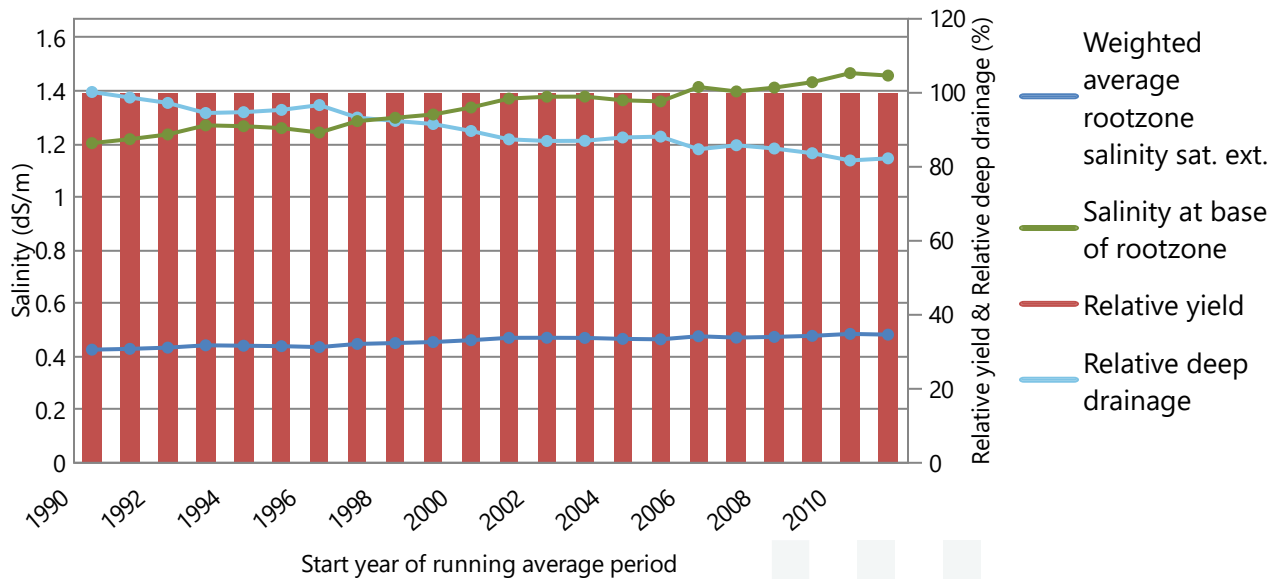
Soil salinity

Metric	Value
Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	0.75
Salt added by rainfall (kg/ha/year)	163.15
Average annual salt added & leached at steady state (kg/ha/year)	9929.67
Average leaching fraction based on 10 -year running averages (fraction)	0.75
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	0.46
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	1.33
Relative crop yield expected due to salinity (%)	100.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (%)	0.00

Performance

Average annual rootzone salinity and relative yield

All values based on 10 -year running averages.



Recharge

Average Groundwater Recharge (ML/day): 0.31

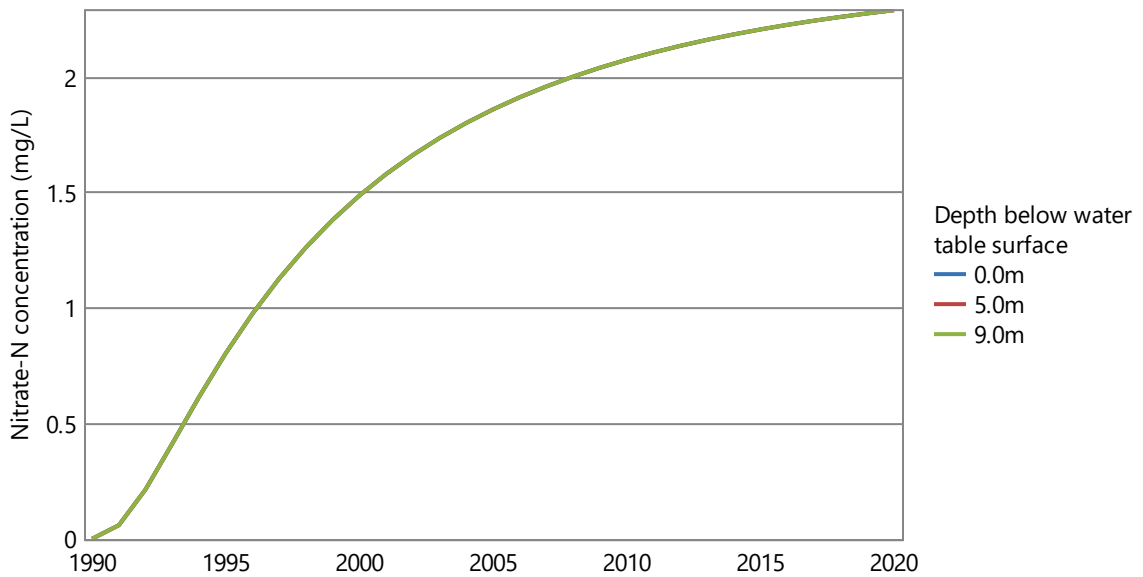
Average nitrate-N Concentration of Recharge (mg/L): 2.47

Aquifer characteristics

Metric	Value
Thickness (m)	10.0
Porosity (%)	10.0
Specific flux (mm/hour)	0.4
Vertical dispersion coefficient (m ² /day)	1.0
Longitudinal dispersion coefficient (m ² /day)	100.0
Retardation factor due to adsorption (multiplier)	1.0

Groundwater Nitrate-N concentration (mg/L)

Concentration at property boundary, 1000 m from effluent irrigation area.

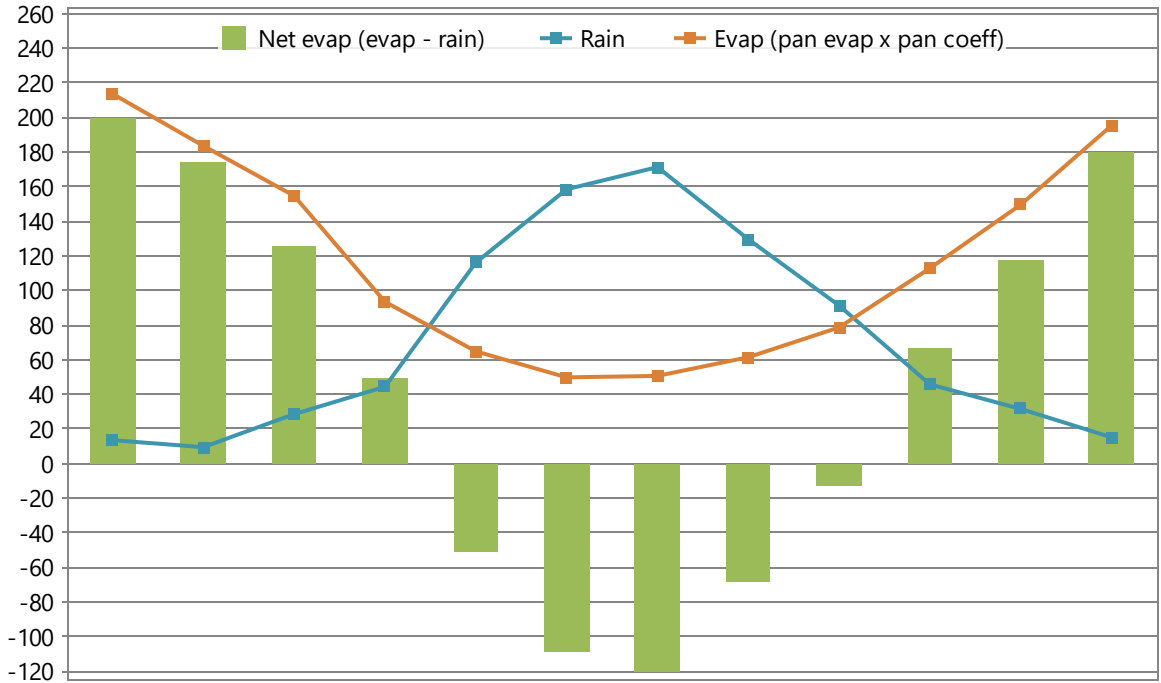


Scenario information

Enterprise: Run 01_Shandy TWW_Deep coarse sand

Climate long-term monthly averages (mm)

SmithsBeach, -33.7°, 115°
01/01/1990 to 31/12/2020 (31 years)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	13.5	9.5	28.5	44.4	116.1	158.5	171.3	129.6	91.3	45.7	31.6	15.1	855.0
Evap	213.6	183.6	154.7	93.5	64.9	49.8	50.6	61.4	78.7	112.8	149.6	195.3	1408.5
Net evap	200.1	174.1	126.2	49.1	-51.2	-108.7	-120.6	-68.2	-12.6	67.1	118.0	180.1	553.5
Net evap/day	6.5	6.2	4.1	1.6	-1.7	-3.6	-3.9	-2.2	-0.4	2.2	3.9	5.8	1.5

Diagnostics



Pond system information

Pond System Configuration: 1 closed (sludge-free) storage tank

Effluent Type: Waste estimation system - 118.13 ML/year or 0.32 ML/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 334.26 non-zero flow days/year.

Constituent	Concentration (mg/L)	Load (kg/year)
Total nitrogen	3.43 (2.43 - 10.00)	405.78 (405.35 - 407.01)
Total phosphorus	0.34 (0.24 - 1.00)	40.65 (40.61 - 40.77)
Total dissolved salts	800.00 (800.00 - 800.00)	94506.32 (94368.00 - 94904.00)
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)

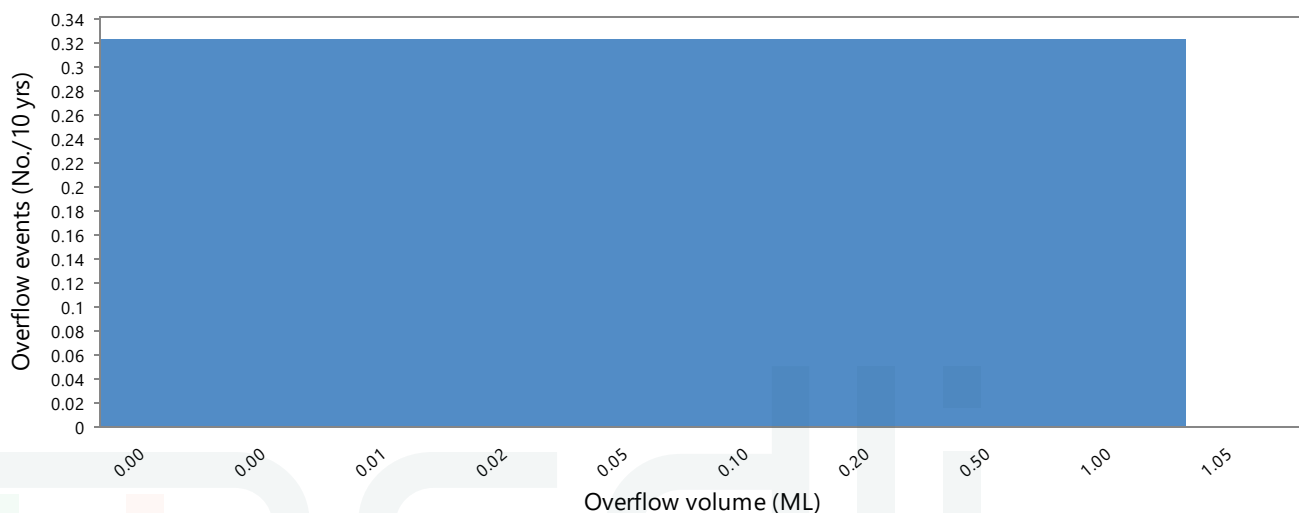
Ammonia-N loss from pond system water surface area: 0.00 kg/m2/year

Last pond (wet weather store): 5.00 ML

Metric	Value
Theoretical hydraulic retention time (days)	15.46
Volume of overflow (ML/year) Average (minimum-maximum)	0.03 (0.00 - 1.05)
Volume of overflow per day (m3/day) Average (minimum-maximum)	0.09 (0.00 - 690.00)
No overflow days - Average per year (Total in run period)	1.00 (31)
No. overflow events per 10 years exceeding threshold of 0.002 ML* (events/10 years)	0.32
Average overflow event recurrence interval (years)	31.00
Average duration of overflow (days)	31.00
Probability of at least 90% effluent reuse (%)	100.00
Effluent reuse (proportion of inflow + net rain gain that is irrigated) (%)	99.97
Average salinity (dS/m)	1.25
Salinity on final day of simulation (dS/m)	1.25

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

Volume distribution of the overflow events



Diagnostics

Scenario information

Area irrigated: 9.687 ha total area

Loading to whole irrigation area: (assuming 100% irrigation efficiency)

	Quantity/year	Quantity/ha/year
Total irrigation applied (ML)	118.26	12.21
Total nitrogen applied (kg)	406.23	41.94
Total phosphorus applied (kg)	40.70	4.20
Total salts applied (kg)	94608.33	9766.53

Shandying

Metric	Value
Annual allocation of fresh water for shandying (ML/year)	0.00
Average shandy water irrigation (ML/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)
Minimum shandy water is used	No

Irrigation issues

Metric	Value
Number of days without irrigation (days/year)	31.00
Number of periods without irrigatable water (periods/year)	1.00
Average length of such periods (days)	31.00



Paddock information

Paddock: - Coastal Couch, 9.687 ha

Irrigation: Lateral move with 25% ammonium loss during irrigation

Irrigation Rules	
Irrigation triggered every 1 days and when rainfall is less than or equal to 10000.00 mm	
Irrigate a fixed amount of 7.00 mm	
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): Deep coarse sand, 24.00 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	13.5	9.5	28.5	44.4	116.1	158.5	171.3	129.6	91.3	45.7	31.6	15.1	855.0
Efflt. irrg.	217.0	187.9	140.1	84.8	23.9	3.6	0.1	9.4	60.6	117.1	162.9	213.3	1220.8
Soil evap	5.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4
Transpn.	133.7	116.6	98.9	59.8	41.6	32.0	32.5	39.5	50.5	72.3	95.7	125.0	898.0
Rain runoff	0.1	0.0	0.4	0.1	1.3	0.9	1.5	0.4	0.2	0.3	0.0	0.1	5.3
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	91.1	80.0	70.4	69.5	97.5	129.8	137.8	100.4	99.9	89.7	96.1	103.8	1166.0
Delta SW	0.7	-0.6	-1.0	-0.2	-0.3	-0.7	-0.4	-1.3	1.4	0.5	2.6	-0.4	0.2

Soil nitrogen balance: (Concentrations are flow-weighted)

Metric	Value
Average annual nitrogen added in seed (kg/ha/year)	0.02
Average annual nitrogen added from irrigation (kg/ha/year)	41.94
Av. annual soil N removed by uptake (harvest + lost) (kg/ha/year)	86.31 (86.31, 0.00)
Av. annual soil nitrogen removed by denitrification (kg/ha/year)	0.00
Average annual soil nitrogen leached (kg/ha/year)	28.84
Average annual nitrate-N loading to groundwater (kg/ha/year)	28.84
Soil organic-N kg/ha (Initial - Final)	2640.00 - 610.15
Soil inorganic-N kg/ha (Initial - Final)	240.00 - 0.82
Average nitrate-N concentration of deep drainage (Max annual concentration)	
Across all years (mg/L)	2.47 (19.28)
Excluding first year of data (mg/L)	1.76 (3.37)

Soil phosphorus balance: (Concentrations are flow-weighted)

Metric	Value
Average annual phosphorus added in seed (kg/ha/year)	2.90E-03
Average annual phosphorus added from irrigation (kg/ha/year)	4.20
Av. annual soil P removed by uptake (harvest + lost) (kg/ha/yr)	2.90E-03 (2.90E-03, 0.00)
Average annual soil phosphorus leached (kg/ha/year)	3.29E-03
Dissolved phosphorus (kg/ha) (Initial - Final)	4.41E-13 - 3.86E-04
Adsorbed phosphorus (kg/ha) (Initial - Final)	2.40 - 132.82
Average phosphate-P concentration in rootzone (mg/L)	2.24E-04
Average phosphate-P concentration of deep drainage (Max annual concentration)	
Across all years (mg/L)	2.83E-04 (5.30E-04)
Last year only (mg/L)	2.76E-04 (N.D.*)
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.20 mg/L (years)	716.40

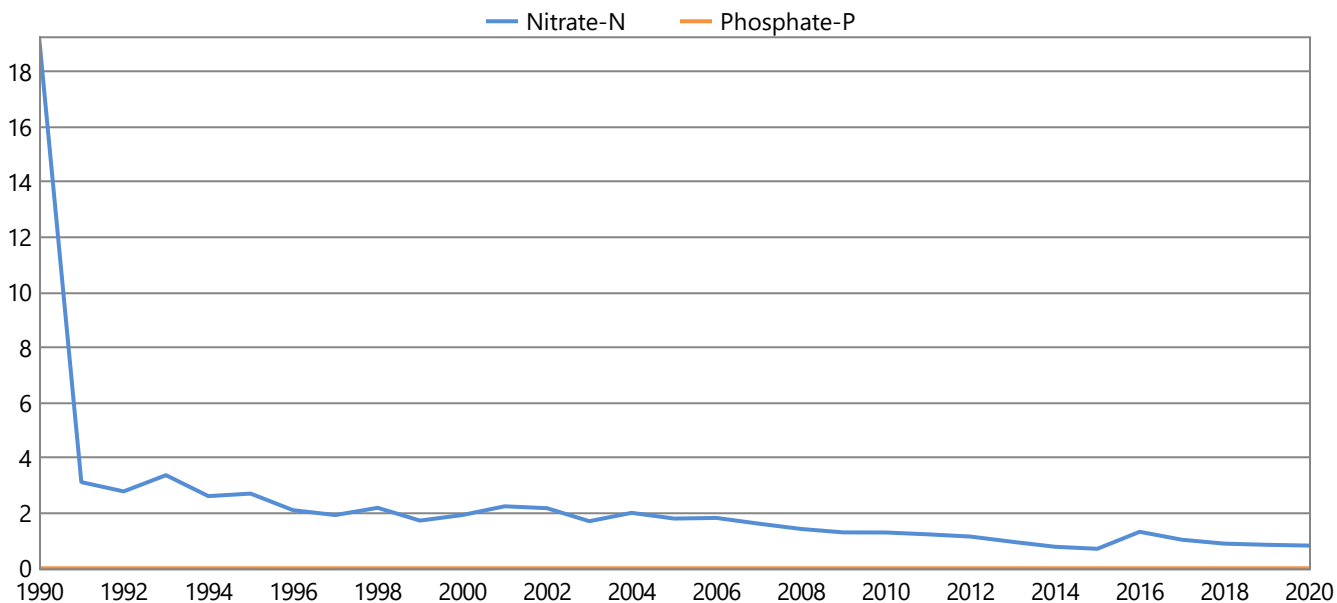
* Not determined

Paddock information

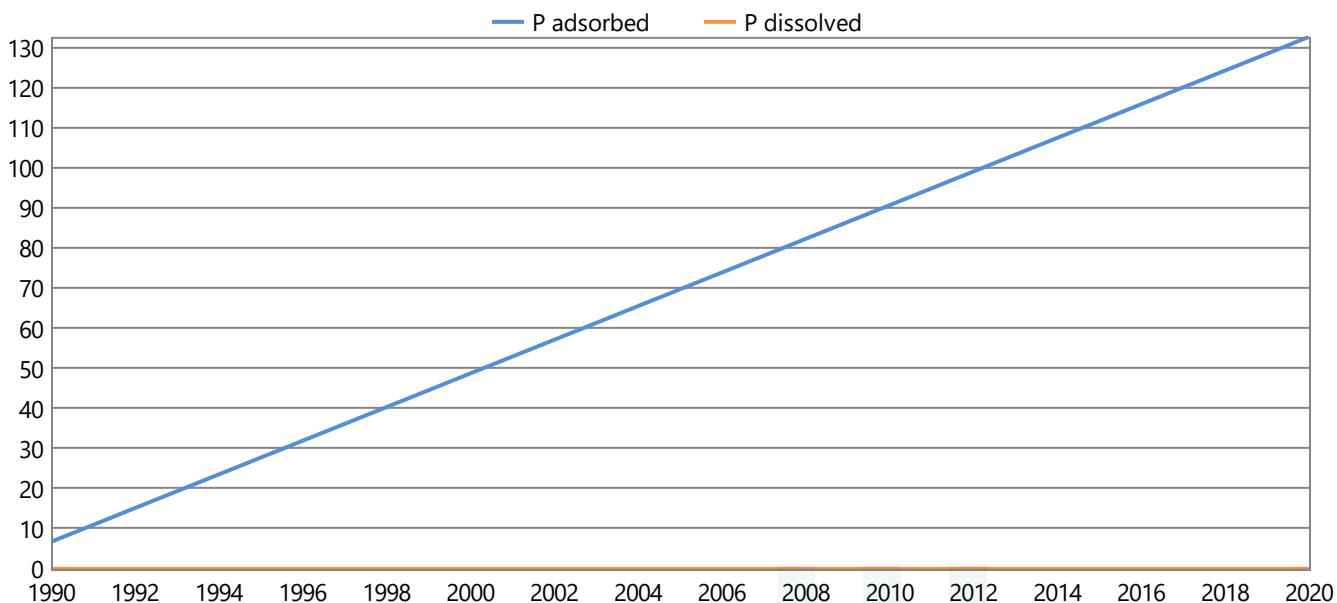
Paddock: Coastal Couch, 9.687 ha

Irrigation: Lateral move with 25% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual phosphate-P in soil (kg/ha)



Diagnostics



Paddock information

Paddock: Coastal Couch, 9.687 ha

Planting Regime: Continuous Coastal couch grass

Average plant performance (minimum - maximum)

Metric	Value
Average annual shoot dry matter harvestable yield (kg/ha/year)	6041.79 (4872.14 - 7494.68)
Average annual shoot dry matter lost (kg/ha/year)	0.00 (0.00 - 0.00)
Average monthly plant (green) cover (%)	79.85 (77.79 - 80.30)
Average monthly crop factor (fraction)	0.64 (0.62 - 0.64)
Dead cover (if Mthly Covers) or Tot. cover left after harvest (%)	100.00
Average monthly root depth (mm)	295.16 (290.58 - 296.19)
Average number of normal harvests per year (no./year)	27.58 (20.00 - 33.00)
Average number of normal harvests for last five years only (no./year)	24.00
Average number of forced harvests per year (no./year)	0.00 (0.00 - 0.00)
Average number of forced harvests for last five years only (no./year)	0.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.20 (0.00 - 0.30)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.19 (0.08 - 0.39)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.98 (0.94 - 1.00)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop per year. Excludes bare fallow days (days)	0.00

Soil salinity - plant salinity tolerance: Tolerant

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

All values based on 10 -year running averages.

Metric	Value
Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	0.75
Salt added by rainfall (kg/ha/year)	163.15
Average annual salt added & leached at steady state (kg/ha/year)	9929.67
Average leaching fraction based on 10 -year running averages (fraction)	0.75
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	0.46
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	1.33
Relative crop yield expected due to salinity (%)	100.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (%)	0.00

SCENARIO REPORT: Full run

General information

Enterprise: Run 02_ Shandy TWW_Shallow Rock

Client: The Right Water Group

MEDLI user: GHD/Atrevenen

Description:

Swans Systems Water Balance

Scenario details:

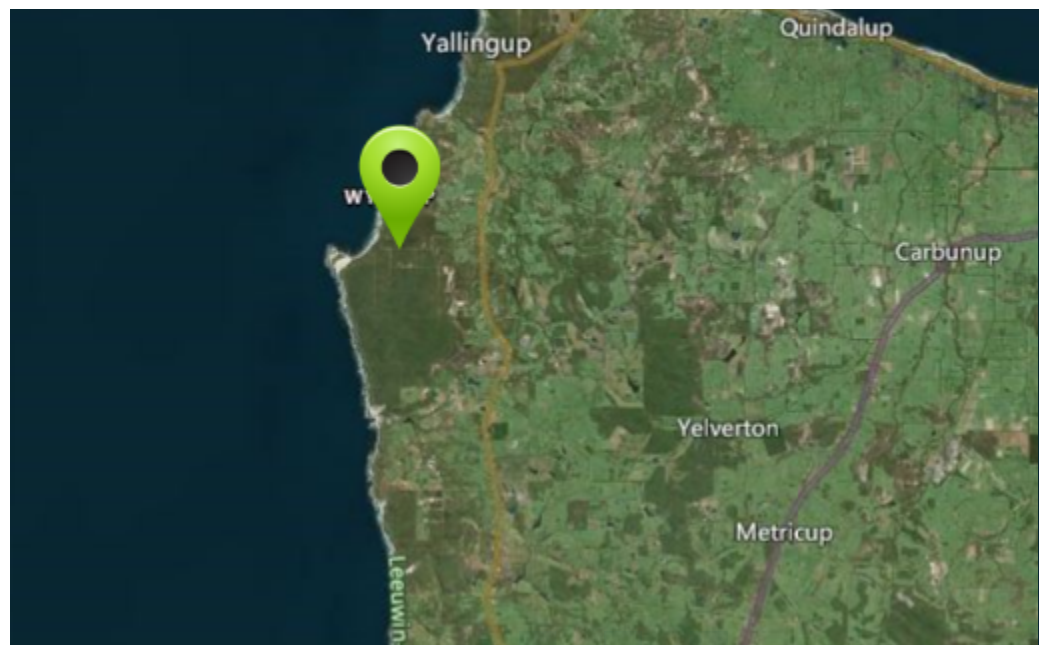
Proposed scheme water top-up of recycled water tank accounted for in waste estimation inflow volume and nutrient concentrations. Notional soil properties assumed in the absence of site specific information on soil characteristics.

Soil hydrologic layers 'shallow sand on bedrock'. Shallow rock at 500 mm. Rock unable to be defined in MEDLI, 0.5 - 1.5 m bgl saturated hydraulic conductivity assumed to be 0 mm/hour. This is to represent a worst case scenario applicable in areas with sands overlying shallow rock.

Coastal couch grass parameters adopted (maximum root depth assumed ~300mm).

Map of location:

Note: If the map below appears as a dark box, check that the network is accessible and that the coordinates are not for a location in the ocean.



Climate information

Climate Data Location: SmithsBeach, -33.7°, 115°

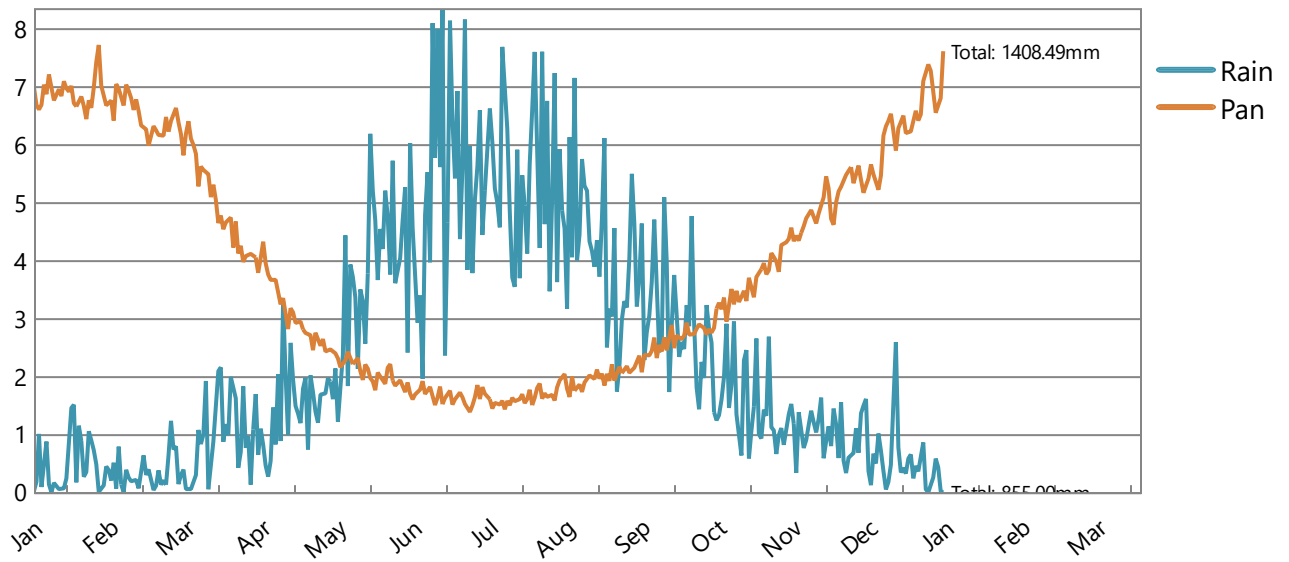
Run Period: 01/01/1990 to 31/12/2020 (31 years)

Climate statistics

	5th Percentile		50th Percentile		95th Percentile	
Rainfall (mm/year)	(Year 2006)	678.6	(Year 2007)	824.8	(Year 1999)	1088.7
Pan evaporation (mm/year)	(Year 2005)	1281.0	(Year 2006)	1407.6	(Year 2011)	1534.3

Climate data

Daily average across run period:



Description



Wastestream information

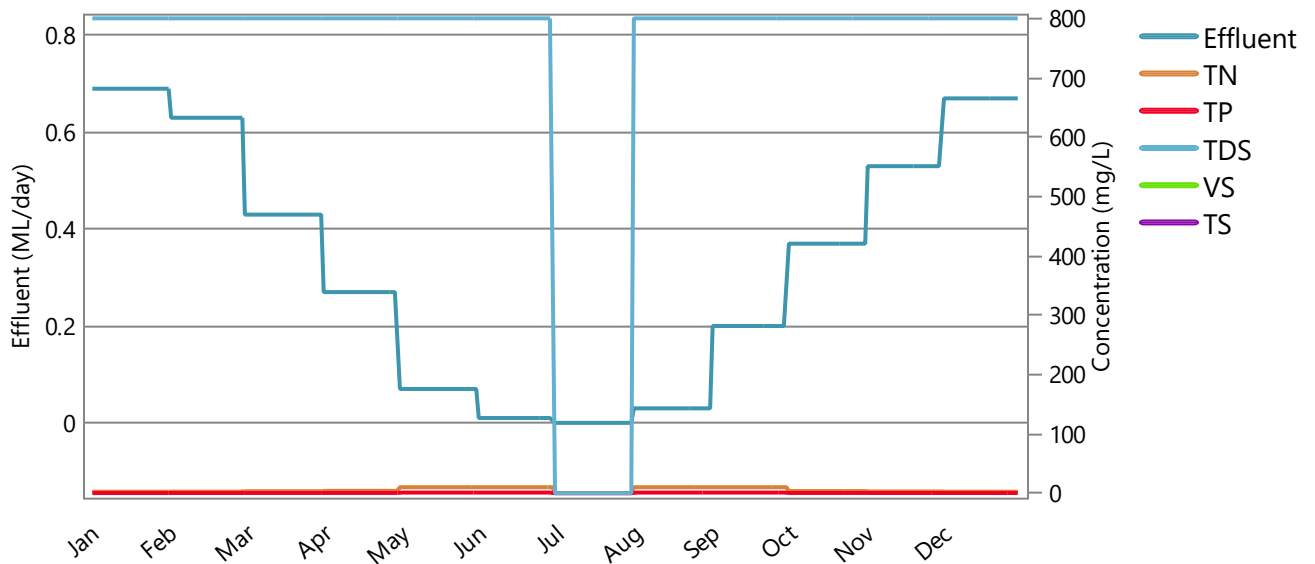
Wastestream Name: Waste estimation system - TWW

Wastestream production description

Daily TWW data supplied for a representative year. This wastestream is not separately pretreated.

Wastestream

Average Daily Quantity and Flow-Weighted Average Quality:



Description

Wastestream

Effluent Quantity: 118.13 ML/year or 0.32 ML/day (Min-Max 0.00 - 0.69)

Flow-Weighted Average (Min - Max) Daily Effluent Quality Entering the Pond System:

	Concentration (mg/L)	Load (kg/year)
Total nitrogen	3.43 (2.43 - 10.00)	405.78 (405.35 - 407.01)
Total phosphorus	0.34 (0.24 - 1.00)	40.65 (40.61 - 40.77)
Total dissolved salts	800.00 (800.00 - 800.00)	94506.32 (94368.00 - 94904.00)
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)

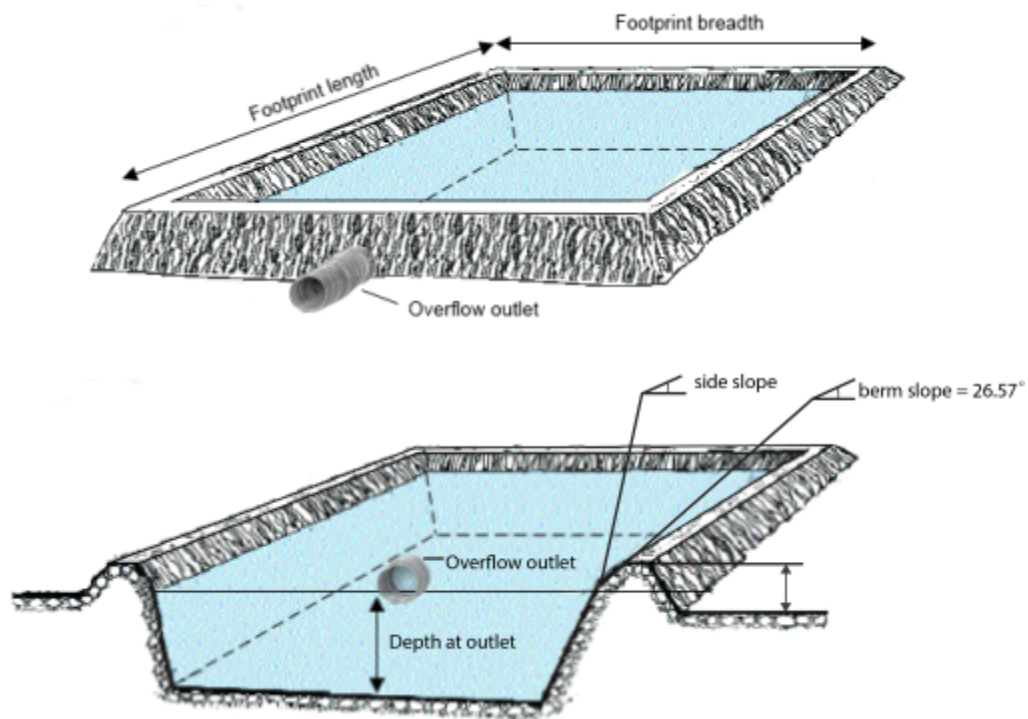


Pond system information

Pond System Configuration: 1 closed (sludge-free) storage tank

Pond system details

	Pond 1
Maximum pond volume (ML)	5.00
Minimum allowable pond volume (ML)	0.00
Pond depth at overflow outlet (m)	2.80
Maximum water surface area (m ²)	2043.78
Pond footprint length (m)	65.93
Pond footprint width (m)	33.97
Pond catchment area (m ²)	2239.59
Average active volume (ML)	0.04



Irrigation pump limits

Minimum pump rate per area limit (ML/day/ha)	0.00
Maximum pump rate per area limit (ML/day/ha)	0.70

Shandyng water

Annual allocation of fresh water available for shandyng (ML/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	No

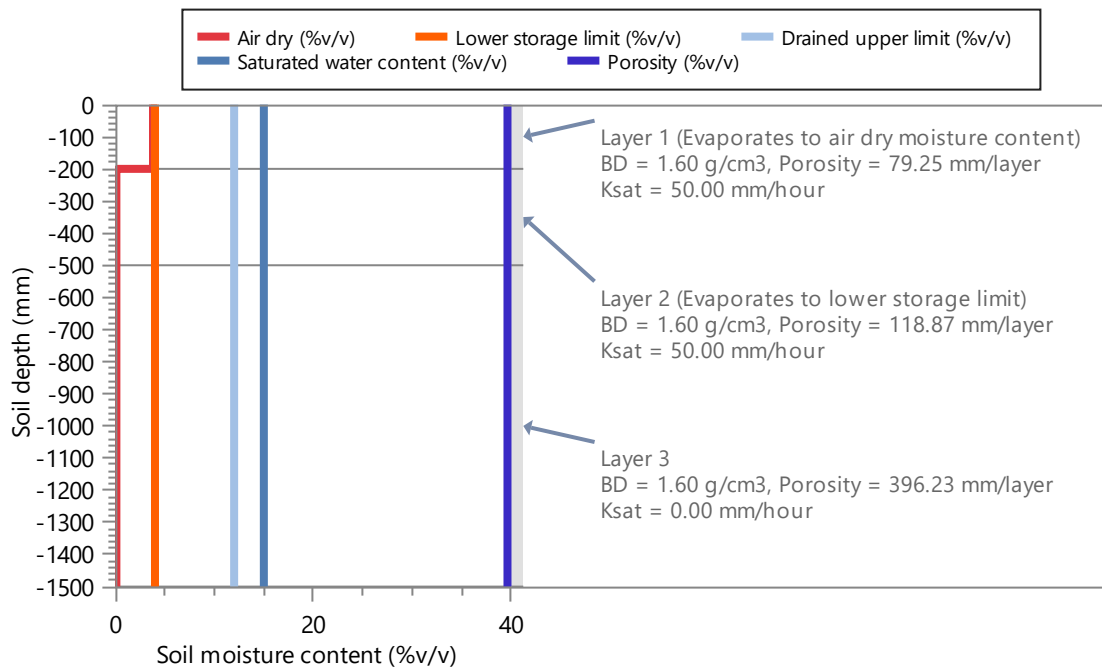
Paddock information

Paddock: Coastal Couch, 9.687 ha

Soil type: Shallow Rock, 1500.00 mm defined profile depth

Profile porosity (mm)	594.34
Profile saturation water content (mm)	225.00
Profile drained upper limit (or field capacity) (mm)	180.00
Profile lower storage limit (or permanent wilting point) (mm)	60.00
Profile available water capacity (mm)	120.00
Profile limiting saturated hydraulic conductivity (mm/hour)	0.00
Surface saturated hydraulic conductivity (mm/hour)	50.00
Runoff curve number II (coefficient)	72.00
Soil evaporation U (mm)	6.00
Soil evaporation Cona (mm/sqrt day)	3.30

Profile



Planting regime: Continuous Coastal couch grass

Average monthly cover (%) (minimum - maximum)	79.85 (77.80 - 80.31)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Dead cover (if Mthly Covers) or Tot. cover left after harvest (%)	100.00
Potential rooting depth in defined soil profile (mm)	300.00
Salt tolerance	Tolerant
Salinity threshold (dS/m soil saturation extract)	6.90
Proportion of yield decrease per dS/m increase (%/dS/m)	6.40

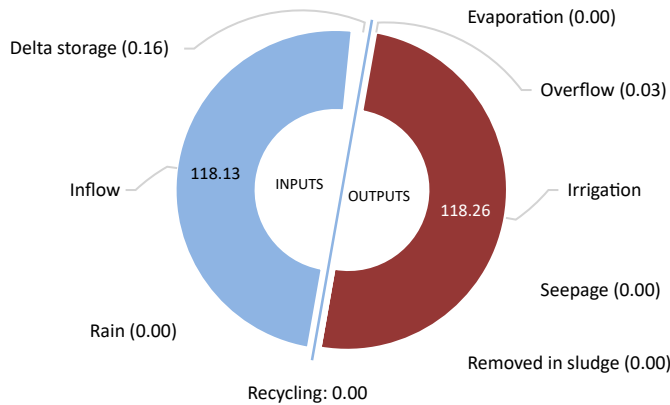
Irrigation rules: Lateral move

Rule 1. Irrigation triggered every 1 days and rainfall is less than or equal to 10000.00 mm
Rule 2. Irrigate a fixed amount of 7.00 mm each day
Rule 3. Irrigation window from 1/1 to 31/12 including the days specified
Rule 4. A minimum of 0 days must be skipped between irrigation events

Pond system information

Pond System Configuration: 1 closed (sludge-free) storage tank (wet weather storage pond: 5 ML)

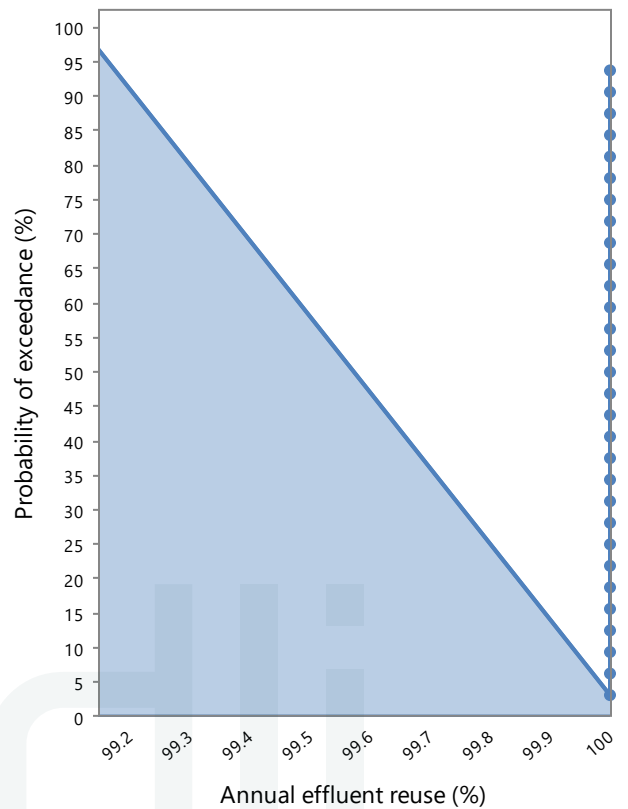
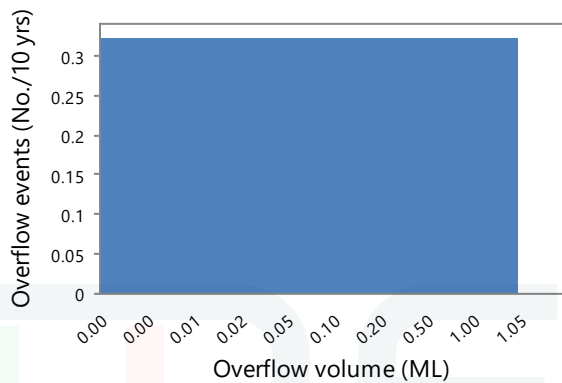
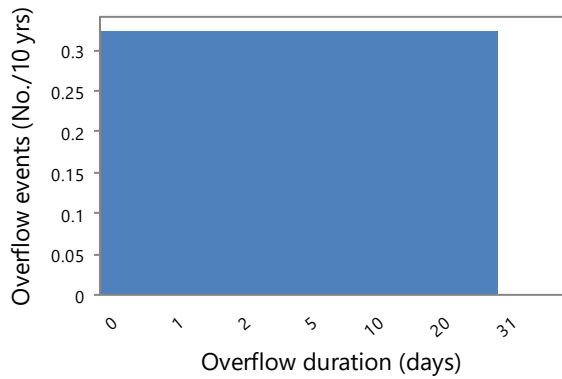
Pond system water balance (ML/year)



Name	Value
Rain	0.00
Inflow	118.13
Recycling	0.00
Evaporation	0.00
Overflow	0.03
Irrigation	118.26
Seepage	0.00
Removed in sludge	0.00
Delta storage	-0.16

Overflow and reuse diagnostics

Metric	Value
Total volume of overflow (ML/10 years)	0.34
Total number of overflow events (events/10 years)	0.32
Total number of pond overflow days (days/10 years)	10.00
Probability of at least 90% effluent reuse (%)	100.00
Effluent reuse (Proportion of inflow + net gain in rain that is irrigated) (%)	99.97

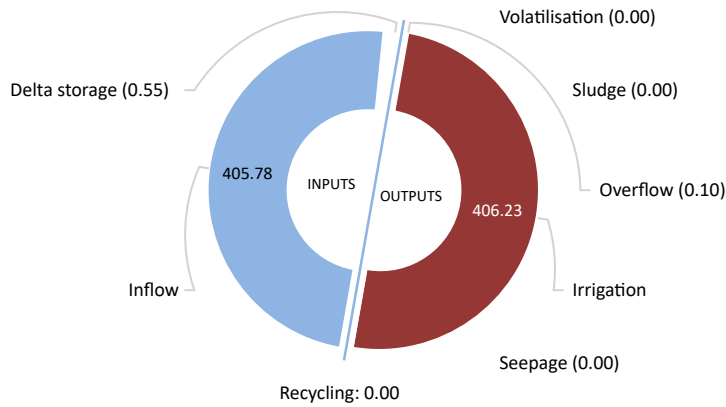


Performance

Pond system information

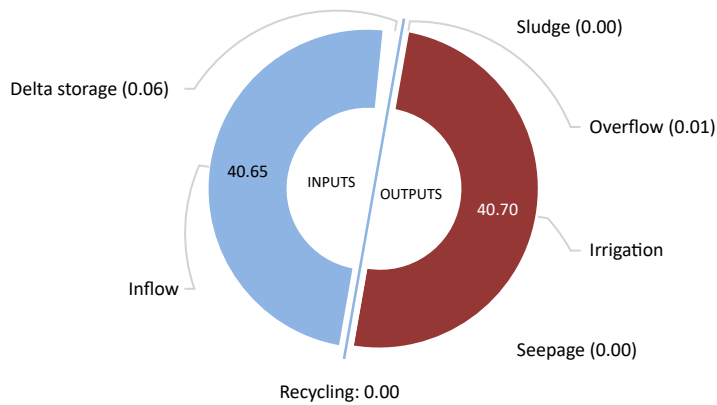
Pond System Configuration: 1 closed (sludge-free) storage tank

Pond system nitrogen balance (kg/year)



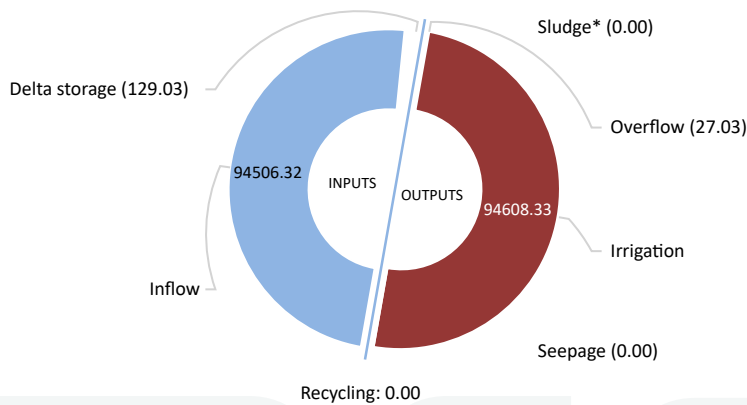
Name	Value
Inflow	405.78
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.10
Irrigation	406.23
Seepage	0.00
Delta storage	-0.55

Pond system phosphorus balance (kg/year)



Name	Value
Inflow	40.65
Recycling	0.00
Sludge	0.00
Overflow	0.01
Irrigation	40.70
Seepage	0.00
Delta storage	-0.06

Pond system salt balance (kg/year)



Name	Value
Inflow	94506.32
Recycling	0.00
Sludge*	0.00
Overflow	27.03
Irrigation	94608.33
Seepage	0.00
Delta storage	-129.03

* 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

Pond system information

Pond System Configuration: 1 closed (sludge-free) storage tank

Pond nutrient concentrations and salinity

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	2.54
Average phosphorus concentration of pond liquid (mg/L)	0.25
Average salinity of pond liquid (dS/m)	1.25

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

Water use (assumes 100% irrigation efficiency)

Metric	Value
Pond water irrigated (ML/year)	118.26
Average shandy water irrigation (ML/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (ML/year)	118.26
Proportion of irrigation events requiring shandyng (% of events)	0.00
Proportion of years shandyng water allocation of 0 ML/year is exceeded (% of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation quality

Metric	Value
Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	3.44
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	3.44
Average phosphorus concentration of irrigation water (mg/L)	0.34
Average salinity of irrigation water (dS/m)	1.25

Irrigation diagnostics

Metric	Value
No. periods/year without any irrigable effluent in the wet weather storage pond (periods/year)	1.00
Average length of such periods (days)	31.00

Irrigation triggering and application

- No. Days without Irrigation Applied per Year: 31.00 (with pond water volume below minimum volume for irrigation)
- No. Days without Irrigation Applied per Year: 31.00 (with no supply - no application)
- No. Days with Irrigation Applied per Year: 334.26 (with supply limited - partial application [295.19] and full application [39.06])
- No. Days with Irrigation Triggered per Year: 365.26

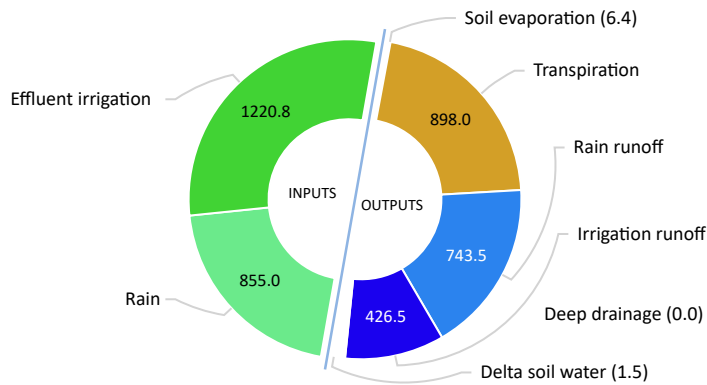


Paddock information

Paddock: Coastal Couch, 9.687 ha

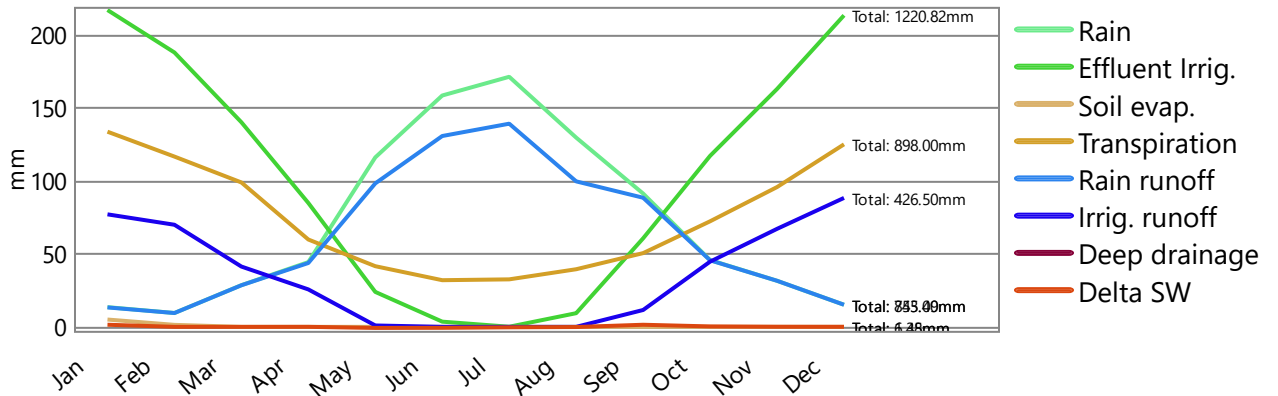
Soil Type: Shallow Rock, 24.00 mm PAWC at maximum root depth

Soil water balance (mm/year)

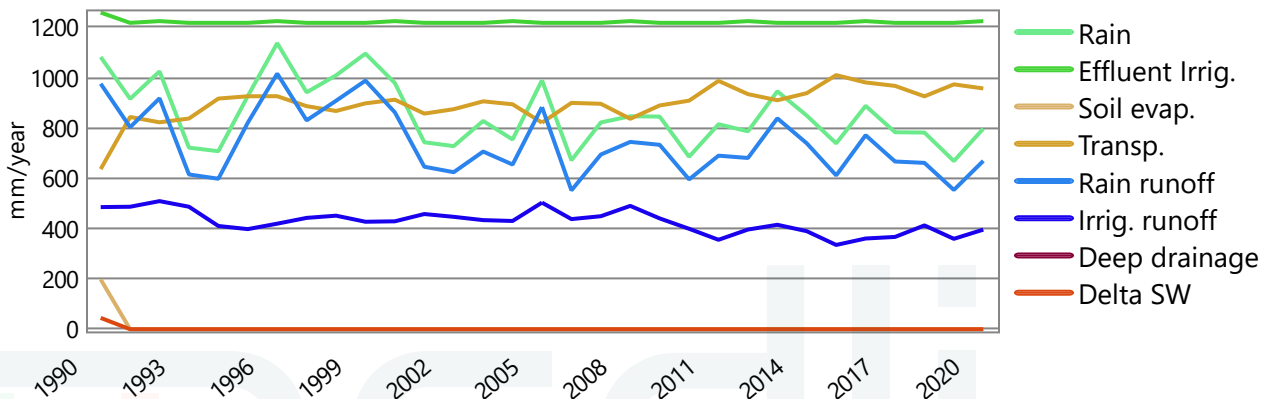


Name	Value
Rain	855.0
Effluent irrigation	1220.8
Soil evaporation	6.4
Transpiration	898.0
Rain runoff	743.5
Irrigation runoff	426.5
Deep drainage	0.0
Delta soil water	1.5

Average monthly totals (mm)



Average annual totals (mm/year)



Performance

Paddock information

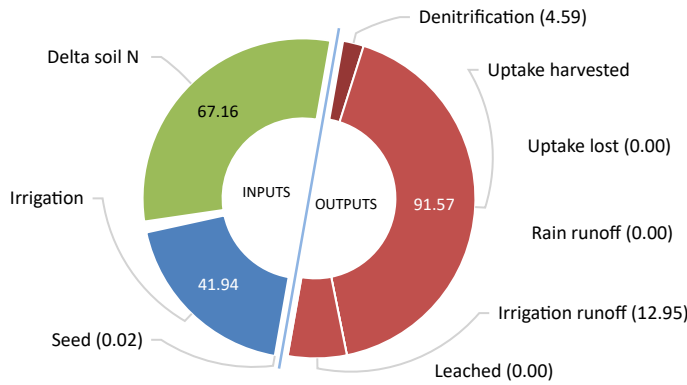
Paddock: Coastal Couch, 9.687 ha

Soil Type: Shallow Rock

Irrigation Ammonia-N Volatilisation Losses (kg/ha/year): 0.00

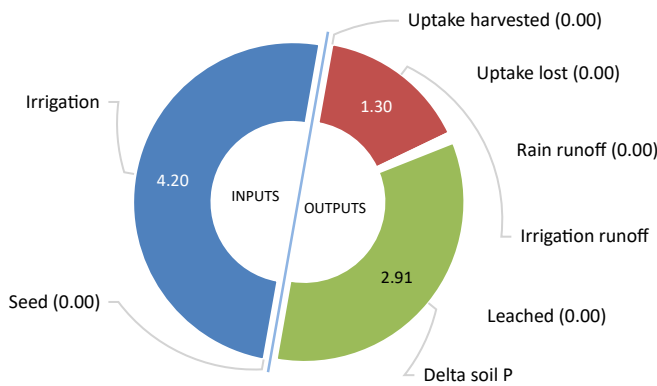
Proportion of Total Nitrogen in Irrigated Effluent as Ammonium (%): 0.00

Soil nitrogen balance (kg/ha/year)



Name	Value
Seed	0.02
Irrigation	41.94
Denitrification	4.59
Uptake harvested	91.57
Uptake lost	0.00
Rain runoff	0.00
Irrigation runoff	12.95
Leached	0.00
Delta soil N	-67.16

Soil phosphorus balance (kg/ha/year)



Name	Value
Seed	2.90E-03
Irrigation	4.20
Uptake harvested	2.90E-03
Uptake lost	0.00
Rain runoff	0.00
Irrigation runoff	1.30
Leached	0.00
Delta soil P	2.91

Performance

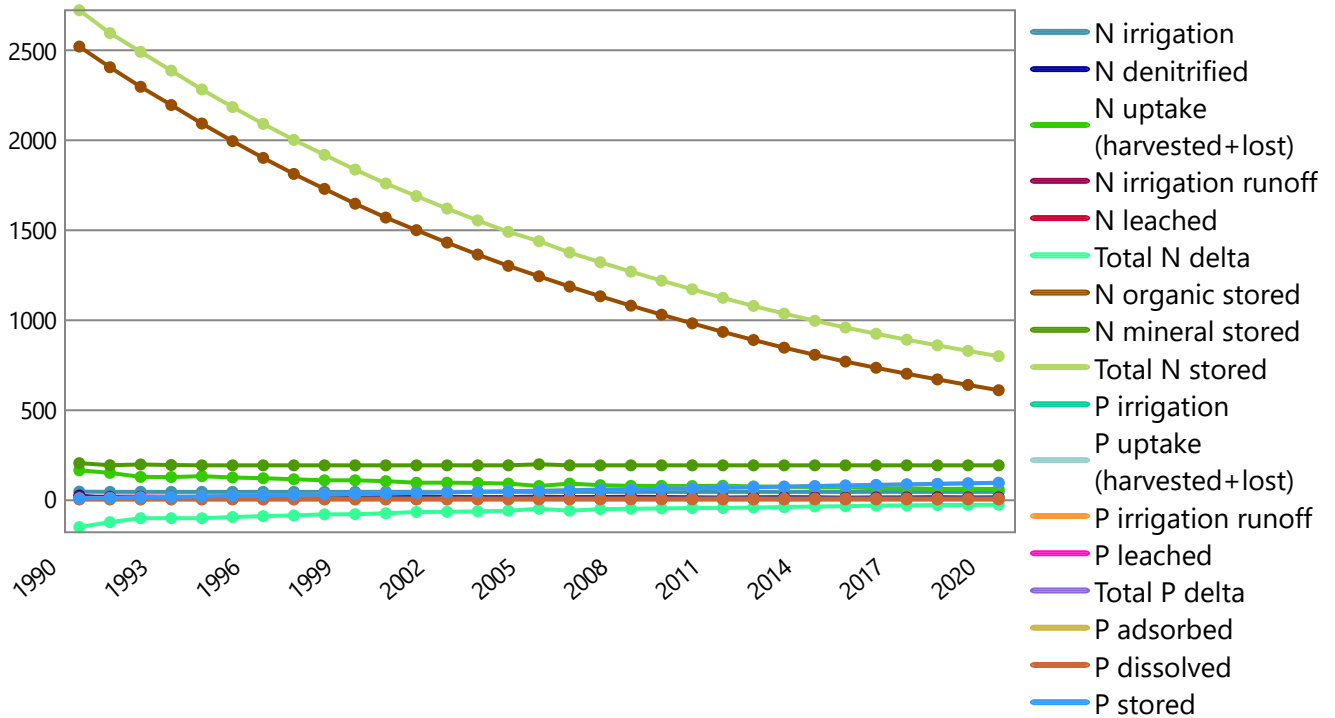


Paddock information

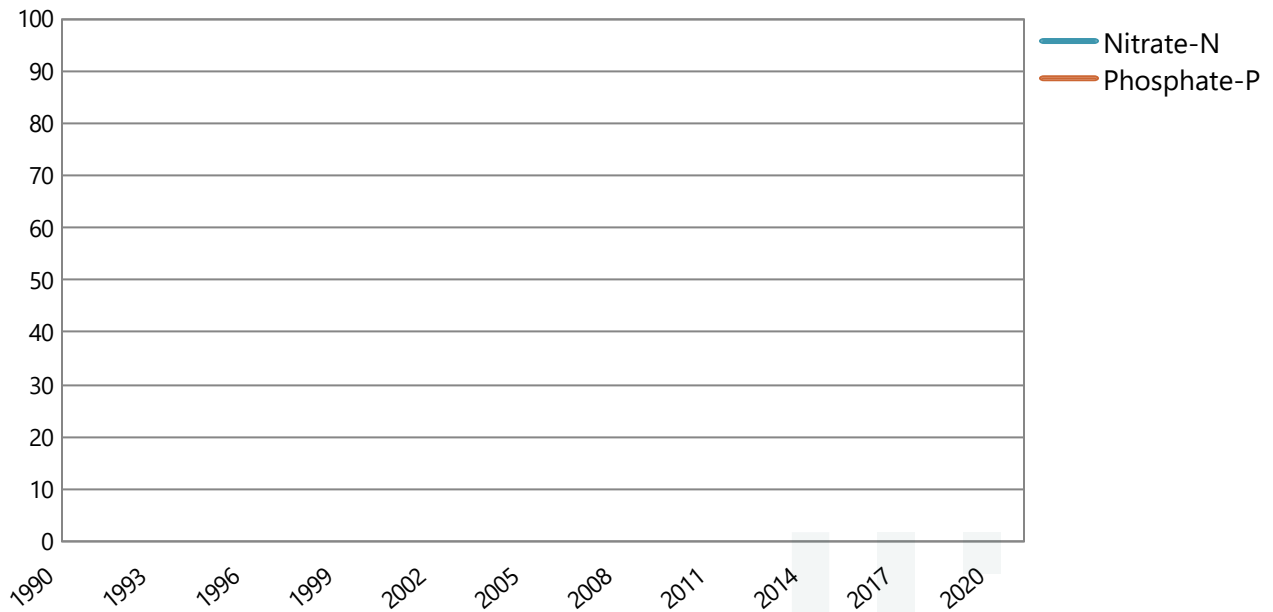
Paddock: Coastal Couch, 9.687 ha

Soil Type: Shallow Rock

Annual nutrient totals (kg/ha)



Annual nutrient leaching concentration (mg/L)



Performance



Paddock information

Paddock: Coastal Couch, 9.687 ha

Soil Type: Shallow Rock

Planting Regime: Continuous Coastal couch grass

Plant growth (minimum - maximum)

Metric	Value
Average annual shoot dry matter harvestable yield* (kg/ha/year)	5894.73 (4604.09 - 7580.99)
Average annual shoot dry matter lost (kg/ha/year)	0.00 (0.00 - 0.00)
Average monthly plant (green) cover (%)	79.85 (77.80 - 80.31)
Average monthly root depth (mm)	295.19 (290.65 - 296.21)

Plant nutrient uptake (minimum - maximum)

Metric	Value
Average annual shoot nitrogen in harvestable yield* (kg/ha/year)	91.57 (57.53 - 161.96)
Average annual shoot nitrogen lost (kg/ha/year)	0.00 (0.00 - 0.00)
Average annual shoot phosphorus in harvestable yield* (kg/ha/year)	0.00 (0.00 - 0.09)
Average annual shoot phosphorus lost (kg/ha/year)	0.00 (0.00 - 0.00)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.01 - 0.04)
Average annual shoot phosphorus concentration (fraction dwt)	0.000 (0.000 - 0.000)

*Harvestable yield is a measure of *net* gain over a nominated period - say monthly. It is the total shoot-dry-matter gain minus any shoot-dry-matter loss within a given period. Hence, just like financial investments, negative harvestable yields may occur when the (episodic) losses exceed the gains made within a particular accounting period.

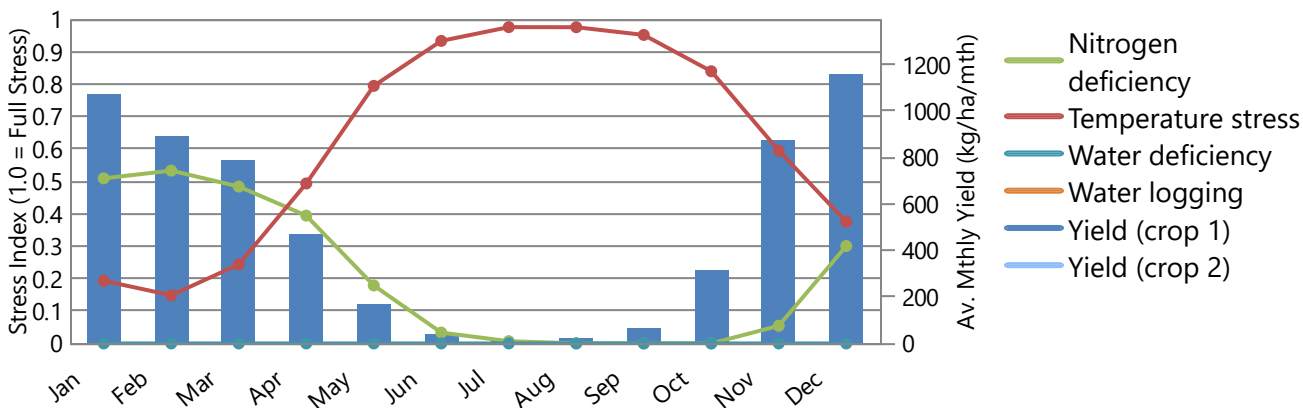
Paddock information

Paddock: Coastal Couch, 9.687 ha

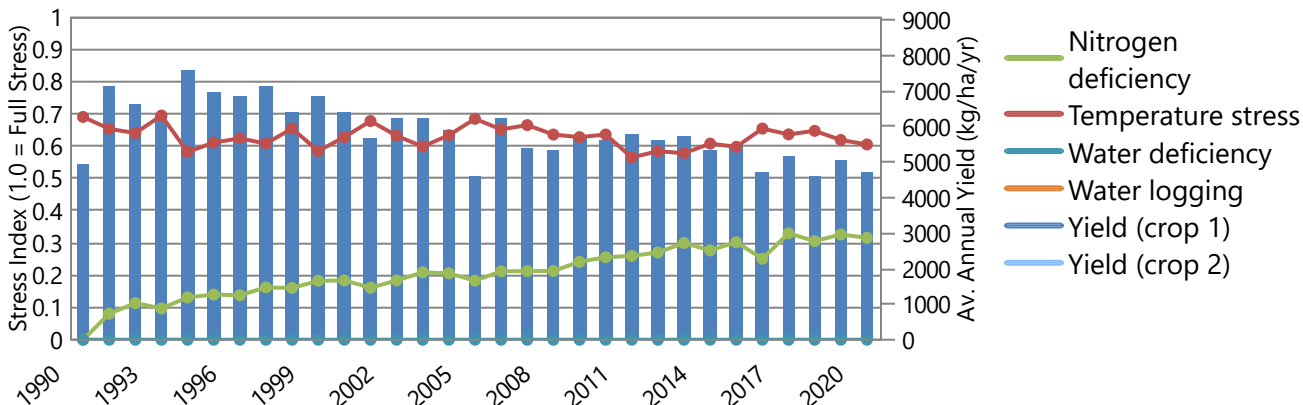
Soil Type: Shallow Rock

Planting Regime: Continuous Coastal couch grass

Av. monthly stresses & harvestable yield* (kg/ha/month)



Av. annual stresses & harvestable yield* (kg/ha/year)



*Harvestable yield is a measure of net gain over a nominated period - say monthly. It is the total shoot-dry-matter gain minus any shoot-dry-matter loss within a given period. Hence, just like financial investments, negative harvestable yields may occur when the (episodic) losses exceed the gains made within a particular accounting period.

Normal and forced harvest information

No. of Harvests per Year: 26.87 (normal).

No. Days without Crop per Year (no./year): 0.00



Paddock information

Paddock: Coastal Couch, 9.687 ha

Soil Type: Shallow Rock

Planting Regime: Continuous Coastal couch grass

Plant salinity tolerance

Metric	Value
Salt tolerance	Tolerant
Salinity threshold (dS/m soil saturation extract)	6.90
Proportion of yield decrease per dS/m increase (%/dS/m)	6.40
No. years assumed for leaching to reach steady-state (years)	10.00

Soil salinity

Metric	Value
Average Infiltrate Salinity (dS/m)	1.10

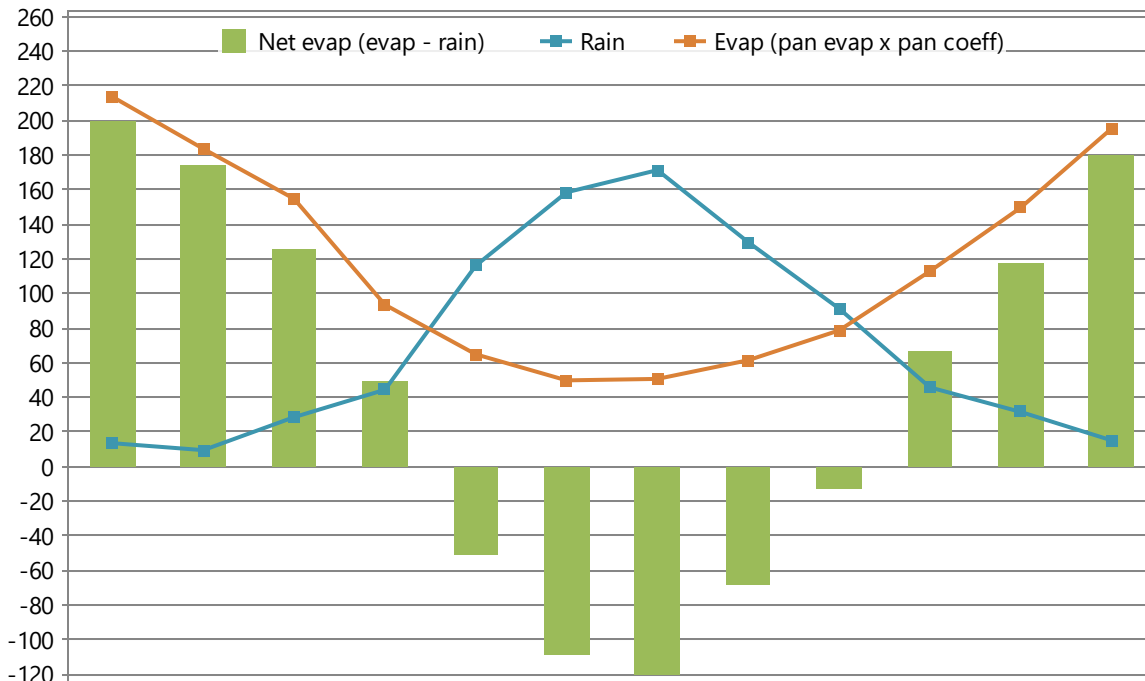
Insufficient deep drainage to run steady state salinity calculations.

Scenario information

Enterprise: Run 02_Shandy TWW_Shallow Rock

Climate long-term monthly averages (mm)

SmithsBeach, -33.7°, 115°
01/01/1990 to 31/12/2020 (31 years)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	13.5	9.5	28.5	44.4	116.1	158.5	171.3	129.6	91.3	45.7	31.6	15.1	855.0
Evap	213.6	183.6	154.7	93.5	64.9	49.8	50.6	61.4	78.7	112.8	149.6	195.3	1408.5
Net evap	200.1	174.1	126.2	49.1	-51.2	-108.7	-120.6	-68.2	-12.6	67.1	118.0	180.1	553.5
Net evap/day	6.5	6.2	4.1	1.6	-1.7	-3.6	-3.9	-2.2	-0.4	2.2	3.9	5.8	1.5

Diagnostics



Pond system information

Pond System Configuration: 1 closed (sludge-free) storage tank

Effluent Type: Waste estimation system - 118.13 ML/year or 0.32 ML/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 334.26 non-zero flow days/year.

Constituent	Concentration (mg/L)	Load (kg/year)
Total nitrogen	3.43 (2.43 - 10.00)	405.78 (405.35 - 407.01)
Total phosphorus	0.34 (0.24 - 1.00)	40.65 (40.61 - 40.77)
Total dissolved salts	800.00 (800.00 - 800.00)	94506.32 (94368.00 - 94904.00)
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)

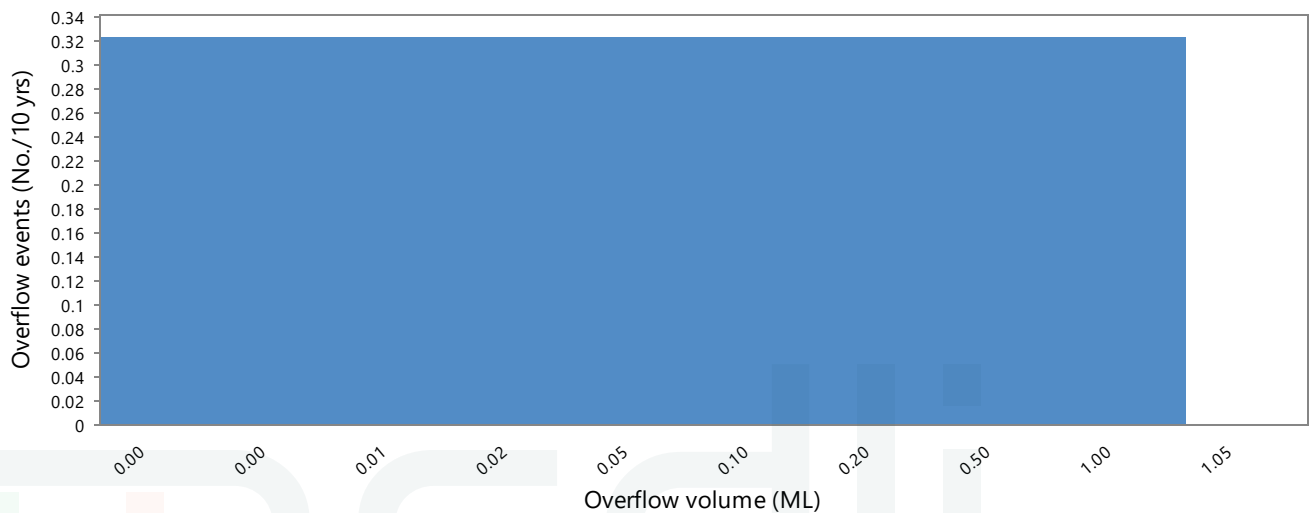
Ammonia-N loss from pond system water surface area: 0.00 kg/m2/year

Last pond (wet weather store): 5.00 ML

Metric	Value
Theoretical hydraulic retention time (days)	15.46
Volume of overflow (ML/year) Average (minimum-maximum)	0.03 (0.00 - 1.05)
Volume of overflow per day (m3/day) Average (minimum-maximum)	0.09 (0.00 - 690.00)
No overflow days - Average per year (Total in run period)	1.00 (31)
No. overflow events per 10 years exceeding threshold of 0.002 ML* (events/10 years)	0.32
Average overflow event recurrence interval (years)	31.00
Average duration of overflow (days)	31.00
Probability of at least 90% effluent reuse (%)	100.00
Effluent reuse (proportion of inflow + net rain gain that is irrigated) (%)	99.97
Average salinity (dS/m)	1.25
Salinity on final day of simulation (dS/m)	1.25

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

Volume distribution of the overflow events



Diagnostics

Scenario information

Area irrigated: 9.687 ha total area

Loading to whole irrigation area: (assuming 100% irrigation efficiency)

	Quantity/year	Quantity/ha/year
Total irrigation applied (ML)	118.26	12.21
Total nitrogen applied (kg)	406.23	41.94
Total phosphorus applied (kg)	40.70	4.20
Total salts applied (kg)	94608.33	9766.53

Shandying

Metric	Value
Annual allocation of fresh water for shandying (ML/year)	0.00
Average shandy water irrigation (ML/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)
Minimum shandy water is used	No

Irrigation issues

Metric	Value
Number of days without irrigation (days/year)	31.00
Number of periods without irrigatable water (periods/year)	1.00
Average length of such periods (days)	31.00



Paddock information

Paddock: - Coastal Couch, 9.687 ha

Irrigation: Lateral move with 25% ammonium loss during irrigation

Irrigation Rules	
Irrigation triggered every 1 days and when rainfall is less than or equal to 10000.00 mm	
Irrigate a fixed amount of 7.00 mm	
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): Shallow Rock, 24.00 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	13.5	9.5	28.5	44.4	116.1	158.5	171.3	129.6	91.3	45.7	31.6	15.1	855.0
Efflt. irrg.	217.0	187.9	140.1	84.8	23.9	3.6	0.1	9.4	60.6	117.1	162.9	213.3	1220.8
Soil evap	5.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4
Transpn.	133.7	116.6	98.9	59.8	41.5	32.0	32.5	39.5	50.5	72.3	95.7	125.0	898.0
Rain runoff	13.3	9.5	28.5	43.7	98.3	130.7	139.1	99.6	88.4	45.6	31.6	15.1	743.5
Irr. runoff	77.1	69.9	41.3	25.6	0.9	0.0	0.0	0.0	11.6	44.7	67.1	88.3	426.5
Drainage	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
Delta SW	1.5	0.0	0.0	0.0	-0.7	-0.7	-0.3	-0.1	1.4	0.3	0.1	0.0	1.5

Soil nitrogen balance: (Concentrations are flow-weighted)

Metric	Value
Average annual nitrogen added in seed (kg/ha/year)	0.02
Average annual nitrogen added from irrigation (kg/ha/year)	41.94
Av. annual soil N removed by uptake (harvest + lost) (kg/ha/year)	91.57 (91.57, 0.00)
Av. annual soil nitrogen removed by denitrification (kg/ha/year)	4.59
Average annual soil nitrogen leached (kg/ha/year)	0.00
Average annual nitrate-N loading to groundwater (kg/ha/year)	0.00
Soil organic-N kg/ha (Initial - Final)	2640.00 - 608.18
Soil inorganic-N kg/ha (Initial - Final)	240.00 - 189.78
Average nitrate-N concentration of deep drainage (Max annual concentration)	
Across all years (mg/L)	0.00 (0.00)
Excluding first year of data (mg/L)	0.00 (0.00)

Soil phosphorus balance: (Concentrations are flow-weighted)

Metric	Value
Average annual phosphorus added in seed (kg/ha/year)	2.90E-03
Average annual phosphorus added from irrigation (kg/ha/year)	4.20
Av. annual soil P removed by uptake (harvest + lost) (kg/ha/yr)	2.90E-03 (2.90E-03, 0.00)
Average annual soil phosphorus leached (kg/ha/year)	0.00
Dissolved phosphorus (kg/ha) (Initial - Final)	4.41E-13 - 1.89E-04
Adsorbed phosphorus (kg/ha) (Initial - Final)	2.40 - 92.70
Average phosphate-P concentration in rootzone (mg/L)	9.03E-05
Average phosphate-P concentration of deep drainage (Max annual concentration)	
Across all years (mg/L)	0.00 (0.00)
Last year only (mg/L)	0.00 (N.D.*)
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.32 mg/L (years)	999.90

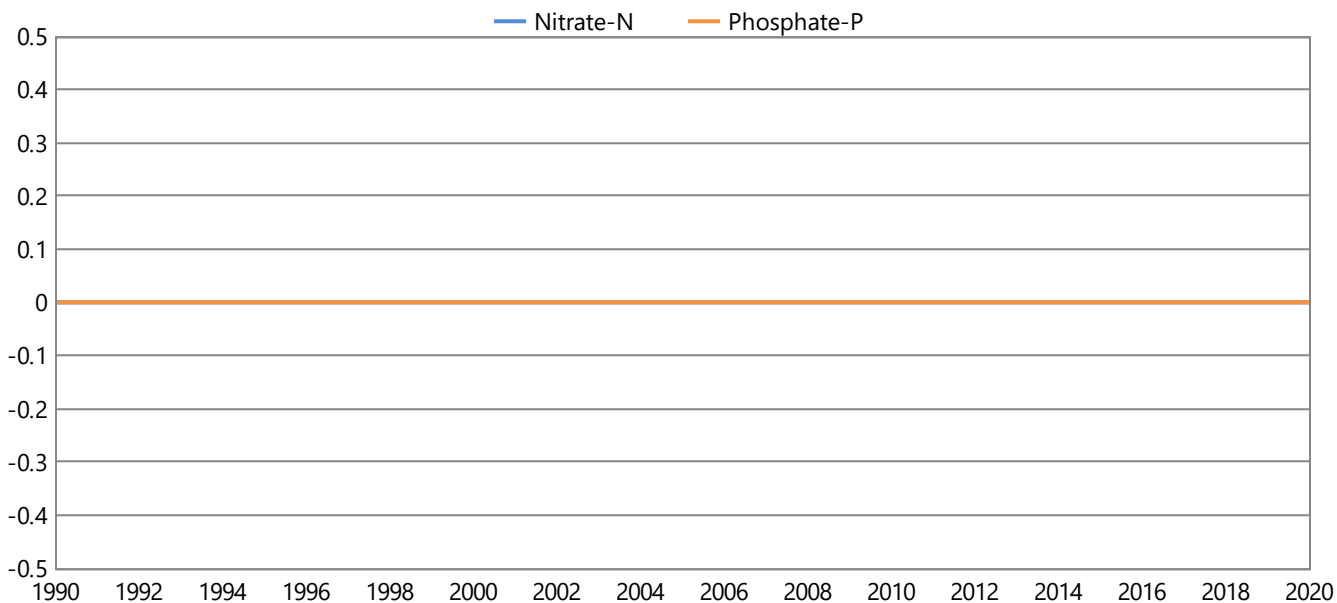
* Not determined

Paddock information

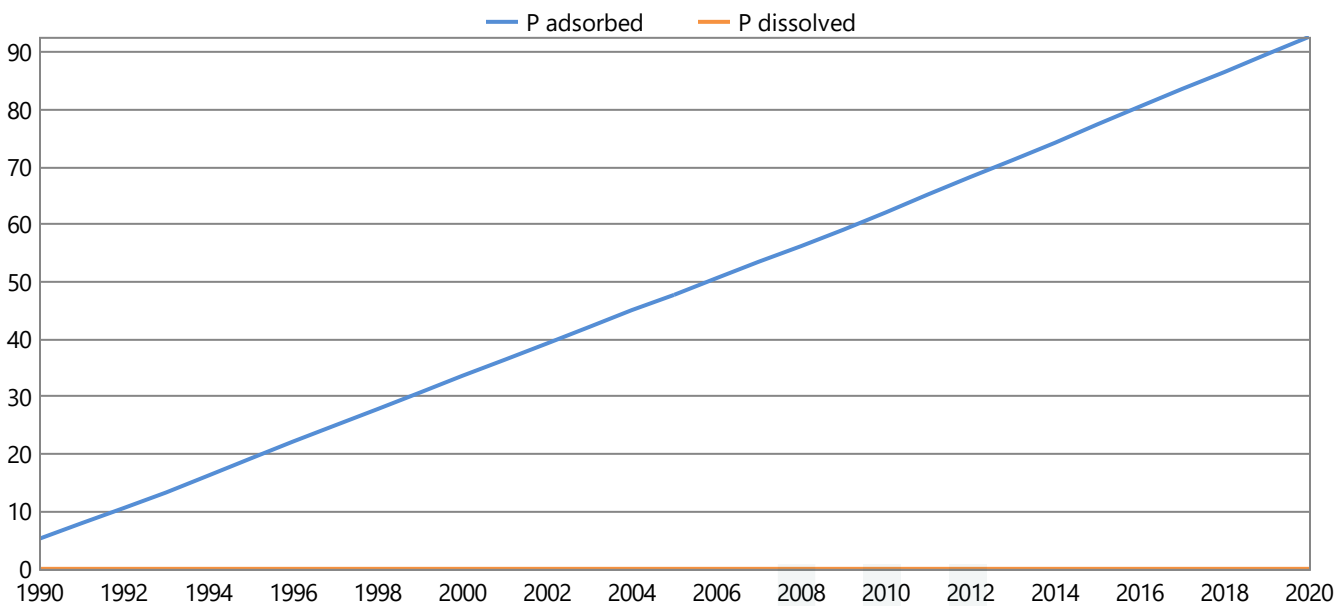
Paddock: Coastal Couch, 9.687 ha

Irrigation: Lateral move with 25% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual phosphate-P in soil (kg/ha)



Diagnosics



Paddock information

Paddock: Coastal Couch, 9.687 ha

Planting Regime: Continuous Coastal couch grass

Average plant performance (minimum - maximum)

Metric	Value
Average annual shoot dry matter harvestable yield (kg/ha/year)	5894.73 (4604.09 - 7580.99)
Average annual shoot dry matter lost (kg/ha/year)	0.00 (0.00 - 0.00)
Average monthly plant (green) cover (%)	79.85 (77.80 - 80.31)
Average monthly crop factor (fraction)	0.64 (0.62 - 0.64)
Dead cover (if Mthly Covers) or Tot. cover left after harvest (%)	100.00
Average monthly root depth (mm)	295.19 (290.65 - 296.21)
Average number of normal harvests per year (no./year)	26.87 (20.00 - 35.00)
Average number of normal harvests for last five years only (no./year)	22.60
Average number of forced harvests per year (no./year)	0.00 (0.00 - 0.00)
Average number of forced harvests for last five years only (no./year)	0.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.21 (0.00 - 0.33)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.19 (0.08 - 0.39)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.98 (0.94 - 1.00)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop per year. Excludes bare fallow days (days)	0.00

Soil salinity - plant salinity tolerance: Tolerant

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

All values based on 10 -year running averages.

Insufficient deep drainage to run steady state salinity calculations.

