

### 3 Bicheno STP

#### 3.1 Activity and report details

Activity name	Bicheno STP		
Activity address	Tasman Highway, Bicheno		
Permit number	Licence to Operate - 2868	Date of issue	14/09/1983
EPN	NA	Date of issue	NA
Treatment level	Secondary Treatment		
Authorised Dry Weather Flows	450 kL/day		
Key Influent Source	Residential/Tankered Waste		
Contact person	Kate Westgate		
Report author	Jayden Taylor		
Contact details	<a href="mailto:Environment@taswater.com.au">Environment@taswater.com.au</a>		
Date of submission	30 September 2023		

Figure 3--1: Bicheno Sewage Treatment Plant



## 3.2 Monitoring and compliance summary

### 3.2.1 Flow data

Table 3-A: Flow monitoring summary

	Influent	Effluent	Reuse
Location Name	Tas Hwy SPS Sewer Inlet	Old Mines Lagoon	Bicheno Golf Club
Coordinates	E 604716 N 5367128	E 604916 N 5367266	E 604948 N 5367275
Method of Measurement	In line meter	Level sensor	In line meter
Date of last Calibration/Validation (if applicable).	12/01/23	12/01/23	12/01/23

Table 3-B: Annual flow and rainfall data

Month	Average Daily Influent Volume (kL/day)	Rainfall (mm/month) BOM Station ID 92160	Discharge to Waters Total Effluent Volume (ML)	Discharge to Reuse Total Effluent Volume (ML)
July 2022	309	88.6	9.79	0.00
August 2022	289	131.0	8.88	0.00
September 2022	568	197.8	19.27	0.00
October 2022	674	328.0	22.64	0.00
November 2022	544	132.8	18.02	0.00
December 2022	501	116.4	16.12	0.07
January 2023	447	40.4	5.11	5.52
February 2023	342	50.8	0.00	6.39
March 2023	359	112.2	6.38	3.52
April 2023	435	102.4	11.69	1.26
May 2023	278	1.6	3.51	4.42
June 2023	361	95.8	10.72	0.00
Annual 2022-23	426	1397.8	132.13	21.17
% of Total Discharge	--	--	86.2%	13.8%

2022-23 monthly flow data was submitted directly to the EPA.

### 3.2.2 Bypass events

There were no bypass events associated with the STP during the reporting period.

### 3.3 Discharge compliance with permit limits

Table 3-C: Compliance Summary

Parameter	Ammonia	BOD5	Chlorine	Nitrogen	Oil and grease	pH	Phosphorous	E coli	Total suspended solids
Permit/EPN limit	mg/L	mg/L	mg/L	mg/L	mg/L	Units	mg/L	MPN/100ml	mg/L
Maximum	--	40	--	--	10	--	--	1000	60
90th percentile	--	--	--	--	--	--	--	--	--
50th Percentile	--	--	--	--	--	--	--	--	--
Minimum	--	--	--	--	--	--	--	--	--
<b>Samples analysed</b>									
Number required	--	12	--	--	12	--	--	12	12
Number analysed	12	12	--	12	12	12	12	12	12
<b>Summary of results</b>									
Max	24.1	91	--	33.2	2.1	10.0	7.1	8164	106.0
90th percentile	23.4	49	--	32.2	1.7	9.7	6.9	2095	70.2
50th percentile	11.1	32	--	21.0	1.0	8.3	4.9	700	13.5
Min	0.1	8	--	12.0	1.0	7.1	3.0	31	4.0
<b>EPN Limit Compliance</b>									
% compliance with Maximum	--	67%	--	--	100%	--	--	58%	75%
% compliance with 90th percentile	--	--	--	--	--	--	--	--	--
% compliance with 50th percentile	--	--	--	--	--	--	--	--	--
% compliance with pH range	--	--	--	--	--	--	--	--	--

Table 3-D: Mass loads to the environment

Parameter	EPN Limit	Frequency	2022-23 result
Nitrogen (kg)	--	Annual	3033.8
Phosphorous (kg)	--	Annual	606.9
Method	Time weighted/Grab sample method		

Table 3-E: Performance Analysis (Discharge to environment)

Effluent compliance parameter	Date(s) of Non-compliance	Reasons for Non-compliance	Actions to improve performance
E. coli	13/12/2022 03/01/2023 06/03/2023 14/06/2023	Process modelling suggests that the Bicheno STP lagoons have sufficient hydraulic retention time for meeting the effluent E. coli target. The reason for occasional non-compliances could be high inflow following rain events or short circuiting.	No specific actions
BOD	06/03/2023 4/04/2023	Algae is believed to be the primary reason for elevated BOD, and suspended solids.	No specific actions
TSS	06/03/2023 4/04/2023	Algae is a source of oxygen and is fundamental to lagoon treatment. Most of the non-compliant results were in warmer months when algal blooms occur.	

Note: Non-compliances only identified for the times STP has discharged to water

No other parameters had exceedances in the reporting period.

### 3.4 Reuse Annual Reporting

The Bicheno STP supplies Class B recycled water for irrigation purposes to the Bicheno recycled water scheme which currently consists of one customer, the Bicheno Golf Club. During the reporting year TasWater engaged a consultant to review the Bicheno Environmental Management Plan and update the drafted site Irrigation and Environmental Management Plan (IEMP), developed on behalf of the Bicheno Golf Clubs behalf to address non-compliance and soil sustainability concerns identified during previous audits monitoring program.

Table 3-F: Reuse Compliance Summary

Parameter	BOD5	Conductivity	pH	E coli
Permit/EPN limit	mg/L	µS/cm	Units	MPN/100ml
Maximum	50	1000	9.0	10000
90th percentile	--	--	--	--
50th Percentile	--	--	--	1000
Minimum	--	--	5.5	--
Samples analysed				
Number required	12	12	12	12
Number analysed	12	12	12	12
Statistical summary				
Max	91	776	10.0	8164
90th percentile	49	711	9.7	2095
50th percentile	32	631	8.3	700
Min	8	558	7.1	31
Summary of results				
% compliance with Maximum	92%	100%	--	100%
% compliance with 90th percentile	--	--	--	--
% compliance with 50th percentile	--	--	--	58%
% compliance with pH range	--	--	75%	--

Table 3-G: Performance analysis (Discharge to reuse)

Reuse Compliance Parameter	Date(s) of non-compliance	Reasons for non-compliance	Actions to improve performance
BOD	06/03/2023 1/05/2023	Algae is believed to be the primary reason for elevated BOD, and suspended solids.	No specific actions undertaken in reporting period
pH	06/03/2023 4/04/2023	Algae is a source of oxygen and is fundamental to lagoon treatment. Most of the non-compliant results were in warmer months when algal blooms occur. Elevated results in colder months can be due to presence of	

Reuse Compliance Parameter	Date(s) of non-compliance	Reasons for non-compliance	Actions to improve performance
		residual algae from previous months due to long HRT.	

\*Non-compliances only identified for the times STP has discharged to reuse

Annual soil sampling was completed at two sites (Site 1 and Site 2) in November 2022. The field component of the annual compliance audit was completed in conjunction with the soil sampling, with a follow up phone audit completed on 9 February 2022. A summary of the findings of the programs is provided in the table below.

Table 3-H: Annual recycled water scheme compliance audit and soil monitoring

Program	Compliance audit	Soil monitoring
Outcomes	Non-compliance - Recycled water dam overflowed across emergency irrigation area.	Soil salinity and sodicity remain within the historical range for both sites. Nutrient levels are generally within or below the recommended range. Median salinity and SAR levels in recycled water suggest a slight to moderate risk of soil permeability loss from recycled water irrigation.
Comments	Stormwater backed into the recycled water dam via the spillway due to level and capacity of downstream drain. There was a potential that contents of the recycled water storage dam could mix with the stormwater inflow and overflow downstream. Following event TasWater engaged with customer regarding stormwater drainage maintenance and repair requirements to prevent future occurrence. Customer's drafted site Irrigation and Environmental Management Plan (IEMP) also updated to include storage dam operation requirements	The Bicheno golf course site has inherent salinity (topsoil and subsoil) and sodicity issues (subsoil) due to the duplex nature of the soil, geology of area and proximity to the coast. Irrigation with recycled water may exacerbate soil sodicity and salinity if onsite drainage and irrigation scheduling is not managed appropriately. Salinity and sodicity should be monitored at this site.

#### RWS Groundwater Site Status: Amber

RWS groundwater monitoring network consists of five monitoring bores; ID numbers BIGW1 – BIGW5. Biannual monitoring was completed at bore ID BIGW5 in October 2022 and annual sampling at all bores in April 2023. Bore ID BIGW1 is located downgradient of the recycled water storage dam. Microbiological sampling was completed at all bores.

The current site status remains moderate due to elevated total phosphorous concentrations which exceeded guideline criterion at bore ID's BIGW2-4 and most notably BIGW5. A Piper diagram assessment of the water quality data from BIGW5 and the Bicheno STP suggested that the irrigation from the recycled water storage dam is chemically different from the groundwater further supporting the theory the elevated phosphorous concentration are from fertiliser programs to maintain high value turf at the golf course.



Biannual sampling at the extended analytical suite will continue at BIGW5 during the 2023-24 groundwater monitoring program. Annual sampling at the standard suite will continue at the remaining four bores. Further information regarding groundwater monitoring is provided in section 3.6.

### 3.5 Ambient monitoring program

Table 3-1: Program details

<b>Program</b>	Bicheno STP Old Mines Lagoon Ambient Monitoring Program
<b>Status</b>	Ambient water quality, sediment and biological monitoring completed during the reporting period.
<b>Update</b>	Discharges to Old Mines Lagoon occurred during reporting period. Ambient water quality, sediment and biological monitoring occurred on a quarterly (March 2021 – September 2022) and monthly (September – December 2022) basis within Old Mines Lagoon and included ambient water quality monitoring, sediment analysis, and benthic infauna and algae monitoring. An Ambient Monitoring Report has been submitted separately to this AER.
<b>Comments</b>	<p>Ambient water quality, sediment and biological monitoring within Old Mines Lagoon (and at Templestowe lagoon) was completed during no/infrequent discharges and continuous discharge events (post May 2022) due to unavailability of the adjacent recycled water scheme. A summary of the ambient water quality and biological monitoring findings reported in the Bicheno STP Old Mines Lagoon Ambient Monitoring Report 2023 is provided below:</p> <ul style="list-style-type: none"> <li>• Monitoring captured conditions in Old Mines Lagoon during normal intermittent Bicheno STP effluent discharges to Old Mines Lagoon and during continuous effluent discharges to Old Mines Lagoon.</li> <li>• Nutrients increased within the discharge channel site in Old Mines Lagoon due to continuous, direct discharges into this location post May 2022.</li> <li>• Ammonia levels at the discharge site greatly exceeding the Default Guideline Value (DGV) for saline waters during these discharge events.</li> <li>• Ammonia levels were high in sediment samples collected at the discharge channel site particularly after six months of continuous discharge but were also high in the north of the lagoon.</li> <li>• Levels of chlorophyll and total algae in water samples increased at the discharge channel site following continuous STP discharge.</li> <li>• Many metal contaminants increased in concentration in the water of Old Mines Lagoon after mid 2022 following the high rainfall and increased catchment run-off. Elevated levels of soluble aluminium, copper and iron, and total zinc, increased most notably at the discharge channel site in Old Mines Lagoon and exceeded DGVs.</li> <li>• Aquatic ecosystem Protected Environmental Values (PEVs) are likely impacted during continuous direct effluent discharges into the discharge channel of Old Mines Lagoon, especially from ammonia, metals (aluminium, copper and zinc) and eutrophication. There were no significant impacts elsewhere in Old Mines Lagoon attributable to the effluent discharges.</li> <li>• Pathogen concentrations (specifically enterococci) surprisingly reduced in Old Mines Lagoon following continuous discharge from the STP. The impact of effluent discharges on recreational and aesthetic PEVs is not clear as there are several sources of pathogens within the Old Mines Lagoon catchment.</li> <li>• Sediment samples in the north of Old Mines Lagoon were greater in organic enrichment and metal concentration than the site closest to the discharge channel on all sampling occasions.</li> <li>• The assemblage of benthic infauna at the discharge channel was altered following direct discharge of STP effluent to Old Mines Lagoon, likely due to the influence of freshwater. This change in community composition was localised and did not extend into the greater lagoon.</li> </ul> <p>The results of the ambient water quality, sediment and biological monitoring conducted depend significantly on whether Old Mines Lagoon is open/closed to the ocean and/or whether the STP is discharging effluent into the receiving environment. Intermittent, infrequent discharges appear to have limited impact in the Old Mines Lagoon receiving environment especially when the lagoon is</p>

open to the ocean resulting in flushing discharges away. During continuous effluent discharges, impacts were observed around the location of the discharge, but again were not observed throughout Old Mines Lagoon whether the lagoon was open or closed.

### 3.6 Groundwater monitoring

Site Status: AMBER - Likely STP impacts identified

Bicheno STP groundwater monitoring network consists of four bores (ID numbers BIGW6-9) located on the eastern and northern perimeter of the lagoons. Bi-annual sampling was completed at all four STP monitoring bores (BIGW6-9) and RWS monitoring bore ID BIGW5 in October 2022 and April 2023. Annual sampling was completed at RWS monitoring bores ID's BIGW1-4 in April 2023 with additional information provided in section 3.4. Microbiological sampling was completed at all bores during the 2022-23 sampling program.

Nutrient concentrations remain comparable between bore ID's BIGW7-9, with total nitrogen, ammonia and total phosphorus being above several adopted groundwater assessment criteria, and no significant change compared to the 2021 – 2022 monitoring observations. The sustained concentrations at the down gradient bores (ID's BIGW7 – 9) suggest likely source from the STP lagoons. Biological indicators continued to report at or below laboratory level of detection (exceptions BIGW7 and BIGW9 which were slightly above laboratory level of reporting) continue to support it is unlikely biological seepage impact is occurring at the nearby receiving environments at Denison Beach (approximately 500m) and the Lagoon (Approximately 100m).

Groundwater levels across the site was recorded at approximately ~1.2 – 2.5 mBGL (metres Below Ground Level) with a variance of 0.65 m across the network. Groundwater levels in March 2023 indicate a reversal of flow direction compared to initial observations 2017. Groundwater levels were also confirmed and observed in the June 2022 investigation into Lagoon Leakage which completed test pits on the STP pond embankments. Investigation identified exposed joint in the discharge pipeline which was rectified. This investigation was triggered by findings from the 2019 thermal imagery survey.

Biannual sampling at the extended analytical suite will continue at the four STP monitoring locations and RWS monitoring bore BIGW5. Annual sampling will continue at the remaining four RWS monitoring bores. The groundwater report recommendations will be reviewed and prioritised during the 2023-24 reporting year.

### 3.7 Inflow and infiltration (I&I)

The latest revision to the TasWater Inflow and Infiltration Management Plan includes details of the actions undertaken statewide to address I&I issues. Update to the actions completed will be provided in the next revision due September 2024.

A Multi Criteria Assessment was undertaken by TasWater in 2022 to prioritise I&I investigation and works state-wide. This catchment was ranked 39 out of 79 in priority.



### 3.8 Sludge and Biosolids

The latest revision to the Sewage Sludge Management Plan (SSMP) includes full details of the actions undertaken during the reporting period, the most recent sludge profiling results, and upcoming annual desludging program.

This STP was fully compliant with the 2022-23 SSMP.

No stockpiling occurs at this site.

Table 3-J: Desludging and Comments

Desludging Status	Comments
High Priority	Desludging scheduled to occur in 2024-2025, as per the current prioritisation planning schedule.

### 3.9 Non-compliance with other permit requirements

Table 3-K: EPN Non-compliances

EPN Condition	Description of non-conformance	Future Actions to be taken
Effluent quality limits for discharge to water and reuse	Discharge compliance with permit limits.	See section 3.3 Discharge compliance with permit limits.
Non-compliant discharge location	Although, the current discharge arrangement partly predates TasWater's operational control, Permit No. 2868 specifically precludes discharge of effluent to the environmentally sensitive coastal lagoon. Permit No. 2868 is based on a discharge arrangement using neighbouring private land that is likely no longer tenable.	TW strategy for Bicheno STP is to target an Infrequent Discharge (Full Reuse) arrangement via new reuse scheme. Based on the current project schedule TW anticipate commissioning of project prior to end of 2024. TasWater has drafted the EIS and revised EMP, due to be submitted for EPA assessment in FY2024.

### 3.10 Complaints and incident reporting

No complaints reported during FY2022-23 reporting period.

Table 3-L: Incident Reporting

Date	Category	Details	Mitigation actions
3/5/2023	Mechanical	Reuse pump malfunction, causing a pump station overflow.	Temporary replacement pump installed.
19/05/2023	Mechanical	Output pipe blockage, causing an overflow from the manhole.	Flow was diverted from the discharge location to the reuse scheme until blockage rectified.

### 3.11 Any other relevant information

Table 7-M: Projects or significant operational events that occurred in FY 2022-23:

Project or significant operational event	Progress
STP Outfall Replacement and Extension	Complete

Project or significant operational event	Progress
Bicheno STP Recycled Water Scheme (RWS) Project (full reuse).	On track for delivery in December 2024

For further information on Bicheno STP please contact TasWater on 13 6992

[www.taswater.com.au](http://www.taswater.com.au)