

	Request for Information (RFI) Template	Document Identifier	240-72663051	Rev	2
		Effective Date	14 March 2025		
		Review Date	March 2030		
		RFI Number	E1275CTRDT		

PART A REQUEST FOR INFORMATION (RFI) - E1275CTRDT			
Description of the works/goods/services	E1276CTRDT - Request for Information on the Ultra-High Purity Reverse Osmosis Technology for the treatment of Wastewater for reuse.		
Deadline for submission	12 June 2025	At (South African Standard Time)	10H00
Tender Office address	Tenders are uploaded via Eskom Tender bulletin site on the Eskom E-tendering page.		
EOI's/RFI are to be submitted electronically via Eskom E- tendering site by the stipulated closing date and time. <i>Please note it is the responsibility of the supplier to ensure that EOI/RFI submission is submitted before the closing date and time</i>	Tenders are uploaded via Eskom Tender bulletin site on the Eskom E-tendering page.		
Electronic Submission of RFI	The tenderer must upload the tender via Eskom Tender bulletin site on the Eskom E- tendering page. All documents need to be submitted in a PDF and Excel format (The limit is 50MB per file and total submission of 900MB per submissions). No Zip/condense files can be uploaded No hard copy will be accepted If for some reason you resubmit your EOI, then the latest version of the EOI submitted will only be accepted and all previous submission/s will be null and void. Please ensure that the submission status is indicated as complete. Supplier Help Manual guide and video can be found on Eskom E-Tendering page		
E-tendering Help Manual for supplier	E-tendering Help Manual attached		

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Eskom Holdings SOC Ltd (“Eskom”) invites you to submit an:

- **Request for information (RFI)** to submit information for the works/goods/services as stated in the table. This RFI is a stand-alone information-gathering and market-testing exercise, intended only to inform and assist Eskom’s further deliberation and development of a strategy for the Request for Information on the Ultra-High Purity Reverse Osmosis. Eskom may request indicative prices if so stated in this RFI.

Eskom has delegated the responsibility for this **RFI** to the signatory of this document, whose details can be found below.

We look forward to receipt of your response.

Yours faithfully



Procurement Manager

Shamani Padayachee

Date: 14 May 2025

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DEFINITIONS

In this Document, except as otherwise defined herein, the following terms shall have the following meanings:

B-BBEE	- means Broad-Based Black Economic Empowerment.
Document	- this document which outlines the requirements of Eskom's further deliberation and development of a ultra-high purity reverse osmosis technology for the treatment of wastewater for the re-use
ERIC	- Eskom Research and Innovation Centre that is located at Lower Germiston Road, Rosherville, Gauteng.
Procurement Process	- Means the procurement process being conducted in terms of this RFI in respect of the Project or requested information.
RT&D	- Research, Testing and Development, a business unit in Eskom.
Respondent	- any entity or consortium that submits a Response to this Document.
State Owned Company or SOC	- a legal entity that is or has previously been created by the Government in order to partake in commercial activities on the Government's behalf, where in the context of the Project, such entity may include any entity with a mandate to engage in the energy or financing sector.

INTRODUCTION AND BACKGROUND

Electricity Eskom has prescribed to the Zero Liquid Effluent (ZLED) Discharge philosophy which necessitates the treatment and/or reuse of wastewater generated on site. Furthermore, environmental legislation promulgated, prohibits the disposal of effluent with a total dissolved solids (TDS) concentration that is greater than 5% and a leachable concentration for TDS of 100 000mg/L or more, to landfill.

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Some of the wastewater generated at Eskom can be treated using established technologies, such as conventional reverse osmosis (RO). However, wastewater with very high dissolved and suspended solids cannot be treated with conventional RO; due to its high scaling and fouling potential. To overcome this limitation, it is envisaged that these wastewaters can be treated with ultra-high purity reverse osmosis (UHPRO) to recover water for reuse.

UHPRO is a commercial technology. The membranes used in UHPRO are able to withstand pressures of up to 120 bar, enabling concentrations of reject/brine streams up to 130 000mg/L; thereby resulting in a 50% reject/brine volume reduction (compared to conventional RO). This then has the potential to reduce the requirement for thermal processes to achieve ZLED.

UHPRO has been implemented in the mining industry but is not widely used hence there is a need to assess its robustness and ease of application to treat wastewaters generated at Eskom.

Information is required on the use of Ultra-High Purity Reverse Osmosis Technology for the treatment of wastewater such as:

- Water in ash water return dams
- Contaminated station drains water
- Concentrated cooling water
- Flue gas desulphurisation (FGD) blowdown water
- Ion exchange regeneration wastewater
- Tied colliery mine water
- Reverse Osmosis plant reject

MOTIVATION OF THE RFI

Due to the ZLED philosophy and environmental legislations that govern disposal of effluent to the environment, it is necessary to treat water for reuse.

Some of the wastewater generated at Eskom can be treated using established technologies, such as conventional reverse osmosis (RO). However, wastewater with very high dissolved and suspended solids cannot be treated with conventional RO; due to its high scaling and

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fouling potential. To overcome this limitation, it is envisaged that these wastewaters can be treated with ultra-high purity reverse osmosis (UHPRO) to recover water for reuse. This technology is a proven commercial technology and has the potential to reduce the requirement for thermal processes to achieve ZLED.

BENEFITS TO ESKOM

The implementation of UHPRO to treat wastewater in Eskom provides the following benefits:

- Alternative improved treatment when compared with conventional RO
- Ability to treat more complex wastewaters with regards to fouling and scaling potential
- Potential reduction in treatment costs (to be evaluated)
- Recovery of water for reuse from wastewater
- Reduced treatment of recovered water for reuse
- Reduced freshwater consumption by reusing treated water from UHPRO
- Reduction in wastewater volumes to be treated/disposed
- Compliance to environmental legislation
- Conformance to ZLED philosophy
- Savings arising from the above (reduced freshwater costs, reduced wastewater treatment/disposal costs, reduced treatment costs of recovered water for reuse and reduced/no penalties as a result of contravening environmental legislation)

ADDITIONAL INFORMATION

Submit information on the use Ultra-High Pressure Reverse Osmosis (UHPRO) technology for the treatment of various wastewaters.

The submission **MUST** include:

- The background literature and justification for the use of the UHPRO technology for wastewater treatment to substantiate its use.
- Installation requirements of the technology (mechanical, electrical, C&I, civil, etc) for the pilot plant.
- Utility requirements (air, electricity, water, etc.).
- Information on the maintenance requirements of the system.
- The impact of the technology on downstream water quality (increased conductivity, turbidity or blowdown requirements).
- Waste produced from the technology
- The footprint required and maximum load of the technology proposed for civil requirements.
- The typical capital, operating and maintenance costs (itemised) of the pilot testing equipment.

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- Indicate any exclusions, deviations and limitations (based on physical and chemical properties) from the Contractor's supply.
- A process flow diagram, P&ID and General Arrangement drawings must be included with the submission, clearly defining battery limits.
- Provide a budget capital cost for full scale installation (mechanical, civil, and electrical work must be included).
- The typical capital cost of the equipment.
- The typical operating cost of the system.
- Highlight any process constraints / limits that impact the operation of the system.
- Provide case studies and information on reference plant where the technology has been employed with process information showing plant performance
- Provide information on the expected maintenance requirements regarding lifespan of consumable items, etc. where applicable.
- Indicate the estimated lead time for the delivery of the equipment.

The water qualities for the various effluent streams to be treated are as follows:

a. Wastewater which contains high levels of ash and oil

The dirty water dams receive the wastewater from the station. This includes all drains from the water and steam circuit, drains from the CW pipework in the units, floor-washing effluent, etc. These drains are contaminated with ash when the stations are forced to implement emergency floor ashing to clear the boiler throat prior to shutting down the unit to repair the defect. The ash is washed into the station drains and ends up in these dirty water dams. In addition to this, the water is contaminated with oil from leaks which exist on the plant. This is also washed into the station drains. The design of the system is such that this water must be treated by an oil and grit system. However, this system is only designed for certain levels of oil and grit and is usually overloaded, and hence it is not effective. As part of the ZLED philosophy, the water from this system must be returned to the cooling water system for further treatment. This excess ash then impacts the cooling water treatment system and causes frequent failures on the clarifiers bridges and stirrers.

A solution is required for this dirty water dam water which will remove all the ash and oil from the water and produce water which is of a raw water quality or better. Table 1 shows the raw analysis of the dissolved species. The intention is to understand the capability of the technology with regards to the removal of ash and oil.

The typical analysis of raw water quality is as per Table 1 and Figures 1-15 below:

Table 1: Raw Vaal water supplied to Tutuka Power Station

Parameter	Unit	Minimum	Maximum	Average	95 th percentile
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Conductivity	µS/cm	110.0	433.0	237.6	327.0
pH		4.3	9.9	7.5	8.9
m-alkalinity as CaCO ₃	mg/kg	15.0	129.5	71.8	108.0
p-alkalinity as CaCO ₃	mg/kg	0.0	19.1	0.4	0
Ca Hardness as CaCO ₃	mg/kg	6.0	104.0	38.8	62.9
Mg Hardness as CaCO ₃	mg/kg	3.8	91.6	38.4	66.4
Chloride	mg/kg	0.4	29.7	11.8	20.1
Potassium	mg/kg	1.7	4.5	3.2	4.0
Phosphate	mg/kg	0.0	2.0	1.0	2.0
Silicate	mg/kg	2.4	51.7	23.1	42
Sulphate	mg/kg	7.4	46.0	26.7	42.3
Sodium	mg/kg	6.0	32.2	15.5	26.7
Total organic carbon as C	mg/kg	4.2	10.4	7.6	9.6
Total hardness as CaCO ₃	mg/kg	28.9	170.0	69.4	124.5
Turbidity	NTU	0	88.3	29.3	58.0

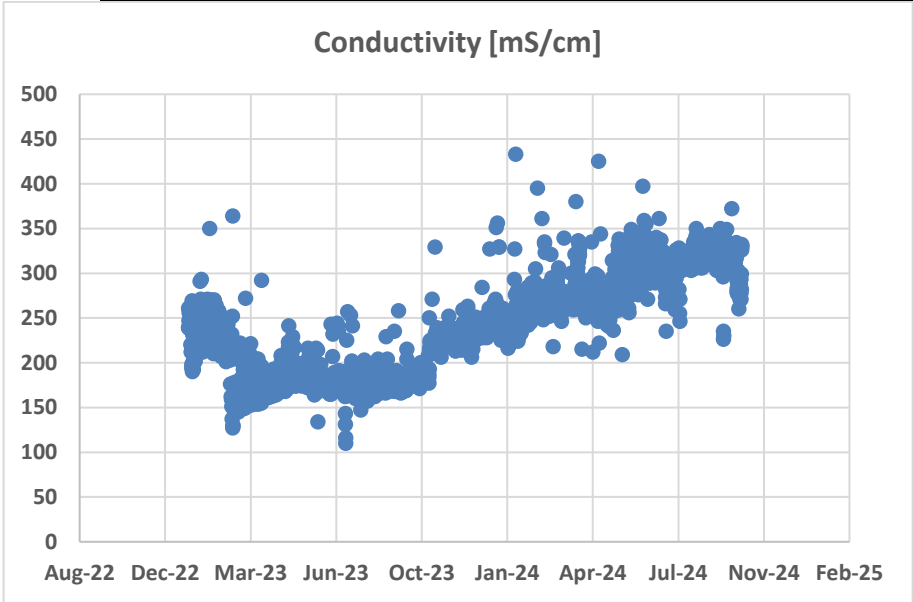


Figure 1: Raw water conductivity at Tutuka Power Station

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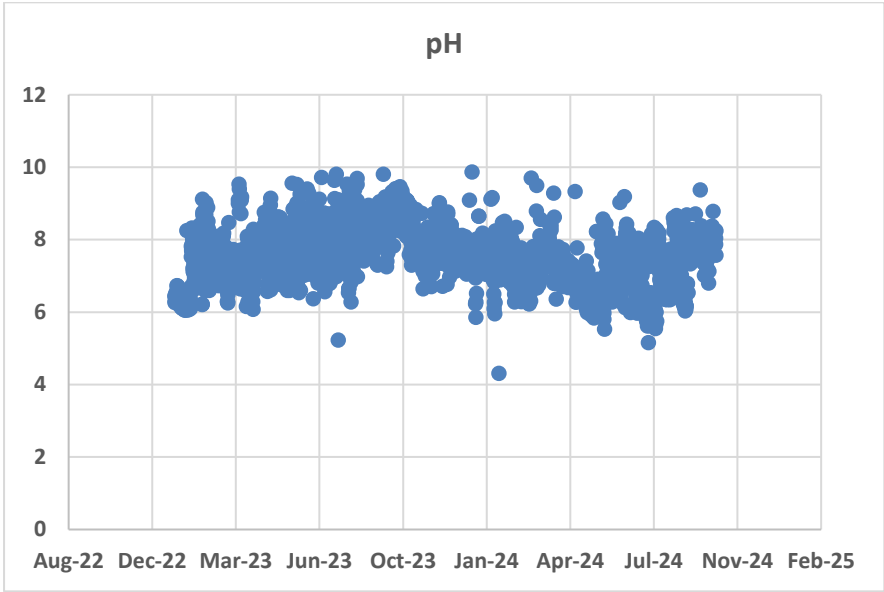


Figure 2: Raw water pH at Tutuka Power Station

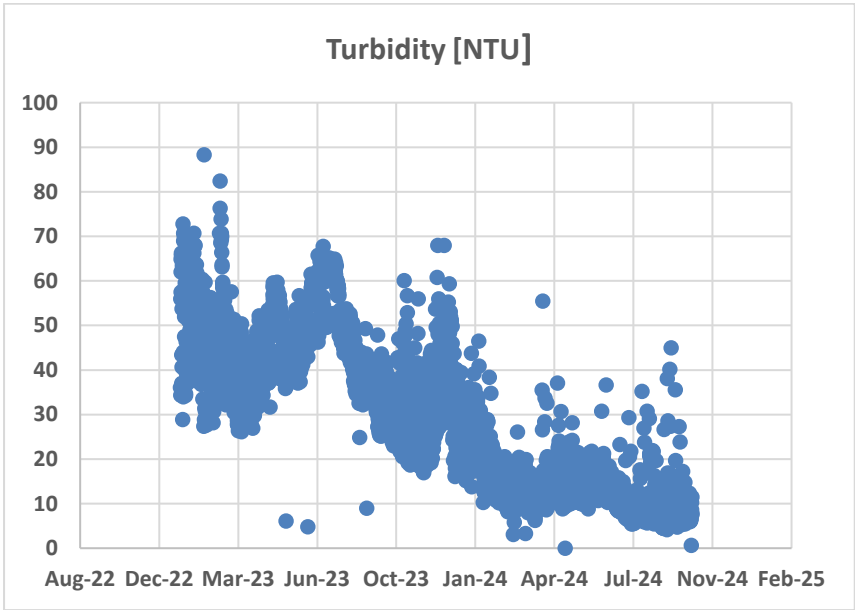


Figure 3: Raw water turbidity at Tutuka Power Station

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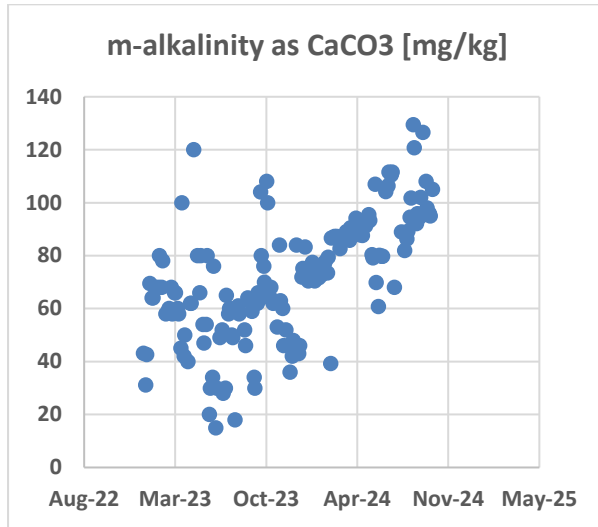


Figure 4: Raw water m-alkalinity

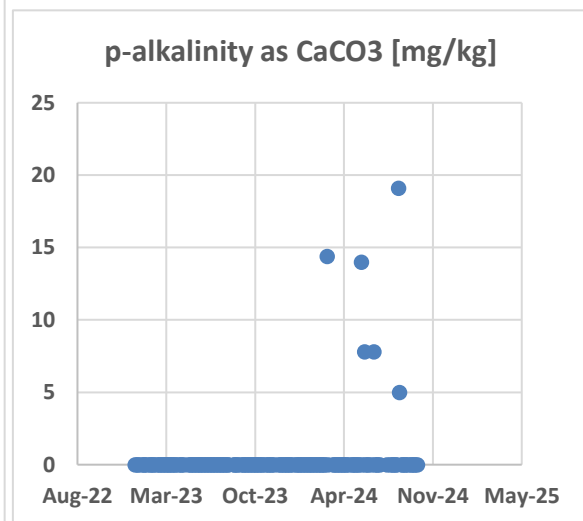


Figure 5: Raw water P-alkalinity

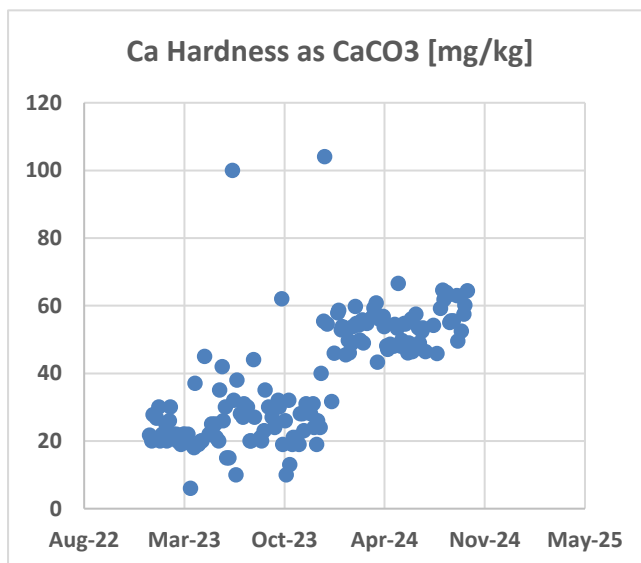


Figure 6: Raw water Ca hardness

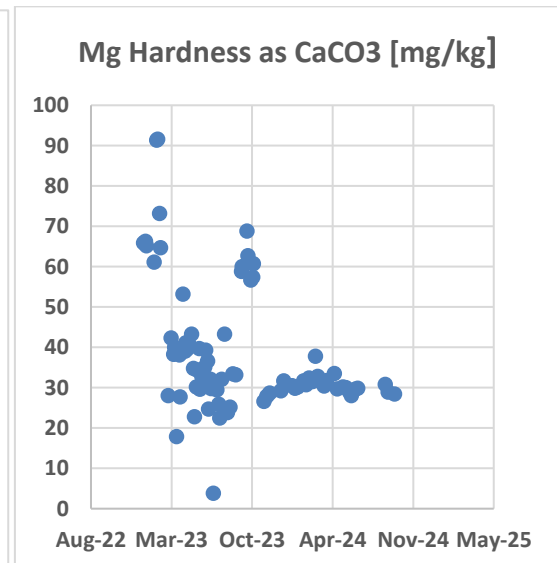


Figure 7: Raw water Mg hardness

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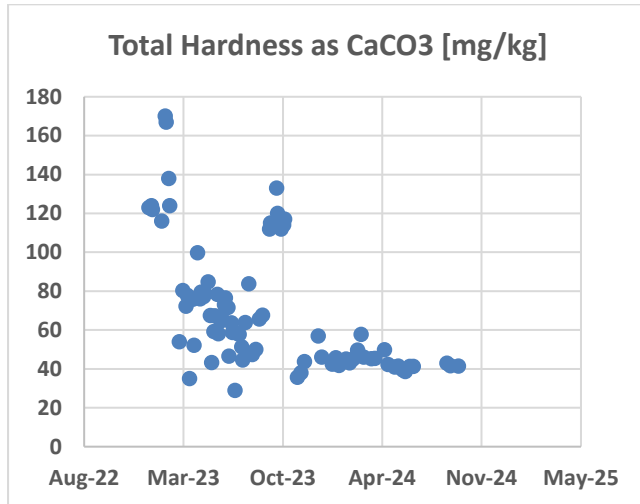


Figure 8: Raw water total hardness carbon

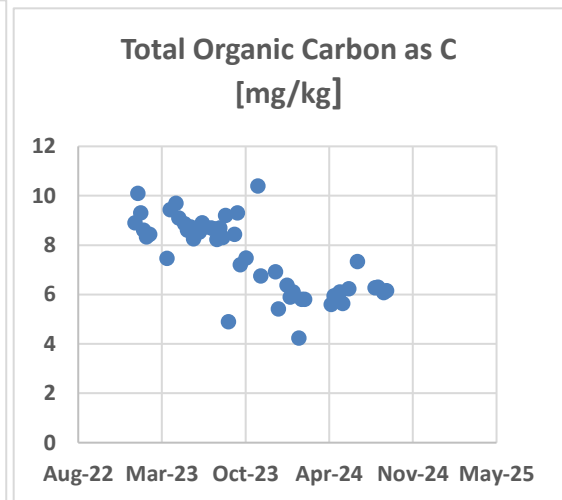


Figure 9: Raw water Total organic carbon

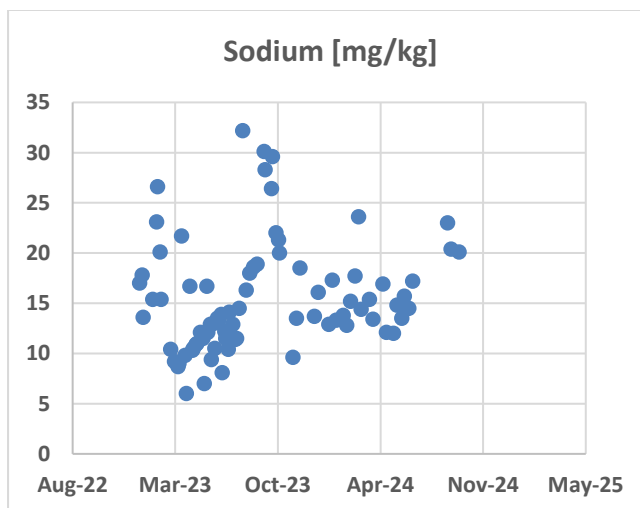


Figure 10: Raw water sodium

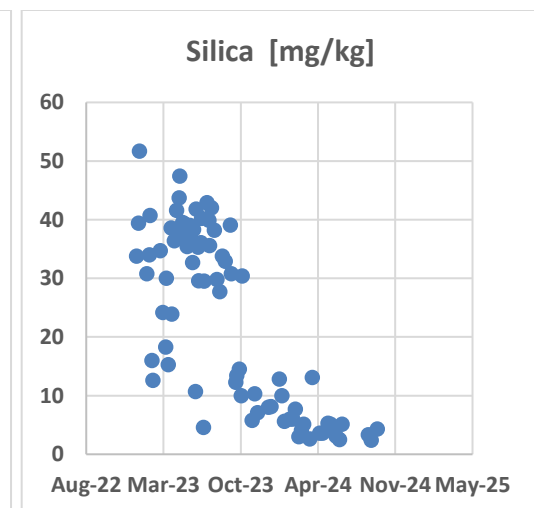


Figure 11: Raw water silica

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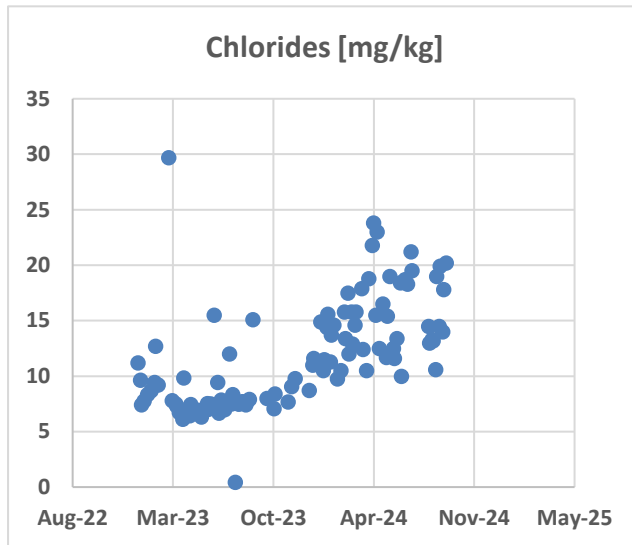


Figure 12: Raw water Chlorides

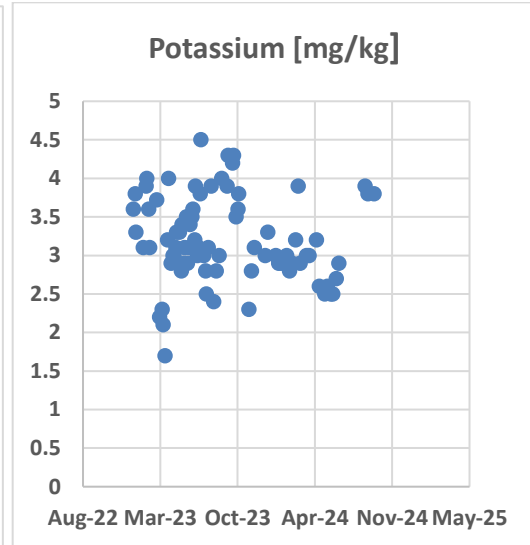


Figure 13: Raw water Potassium

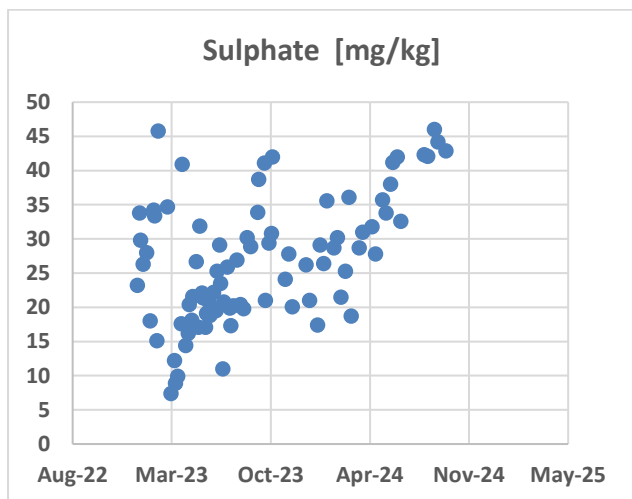


Figure 14: Raw water sulphate

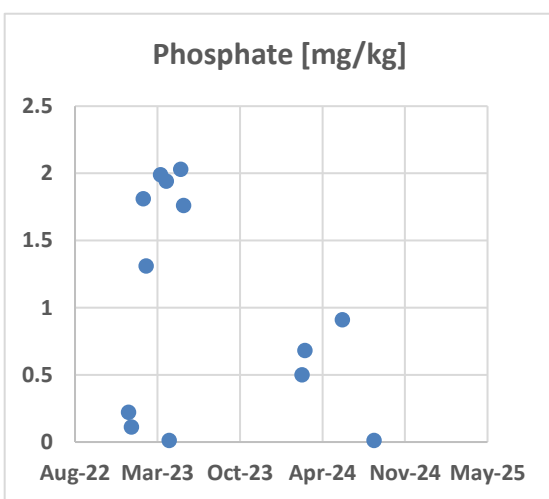


Figure 15: Raw water phosphate

Table 2: Wastewater which contains high levels of ash and oil (Dirty Water Dam recovery - Tutuka Power Station)

Parameter	Unit	Range	Average	95 th percentile
pH	-	6.91 - 10.9	9.1	9.7
Conductivity	µS/cm	809 – 33564	10036.7	25654.8
Turbidity	NTU	1.2 – 343.0	20.5	47.1
Calcium Hardness as CaCO ₃	mg/kg	17.9 – 1431.0	113.7	251.5
Magnesium Hardness as CaCO ₃	mg/kg	42.1 – 1191	342.7	926
Total Hardness as CaCO ₃	mg/kg	65.8 – 1309.0	430.1	1065.4

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m-alkalinity	mg/kg	22.8 – 946.8	361.7	680
p-alkalinity	mg/kg	0 - 222	58.0	176.8
Sodium	mg/kg	58.8 - 10180	2034.6	5537
Potassium	mg/kg	8 - 214	56.8	167.2
Chloride	mg/kg	56.7 - 7726	1778.6	6140.5
Silica as SiO ₂	mg/kg	0.8 - 339	17.0	29.7
Sulphate	mg/kg	214 - 27000	3970.2	10424.5
FOG	mg/kg	100-5000	4682	4754

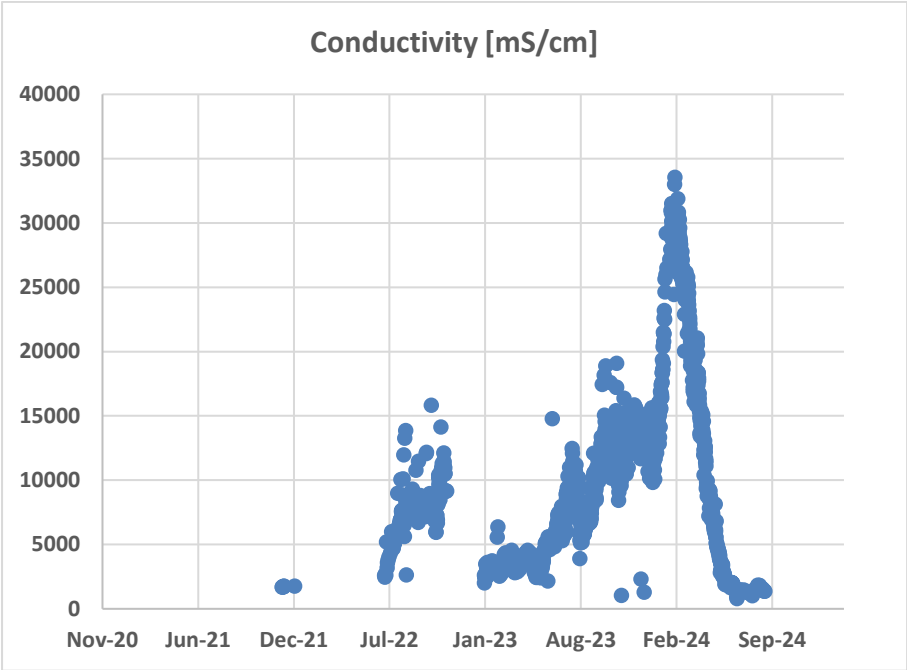


Figure 16: Dirty water dam recovery conductivity at Tutuka Power Station

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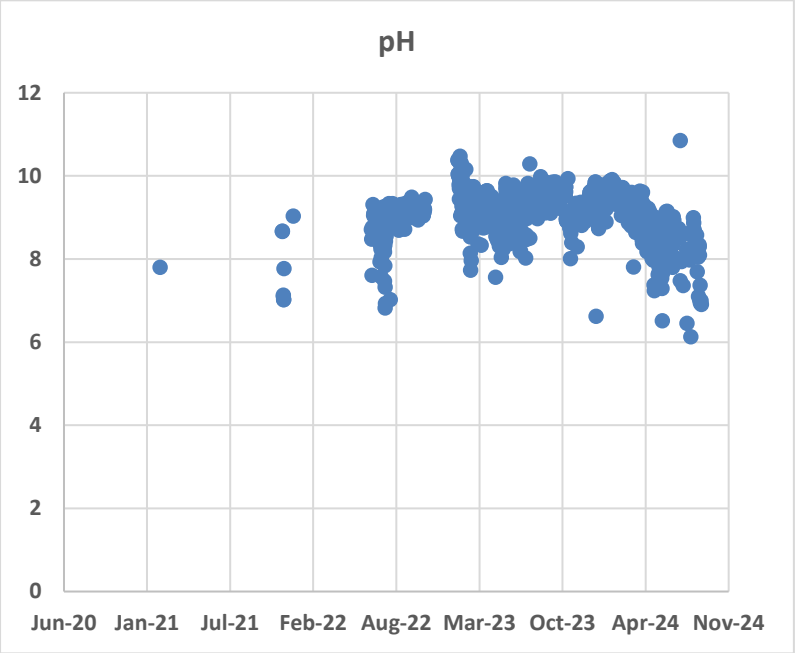


Figure 17: Dirty water dam recovery pH at Tutuka Power Station

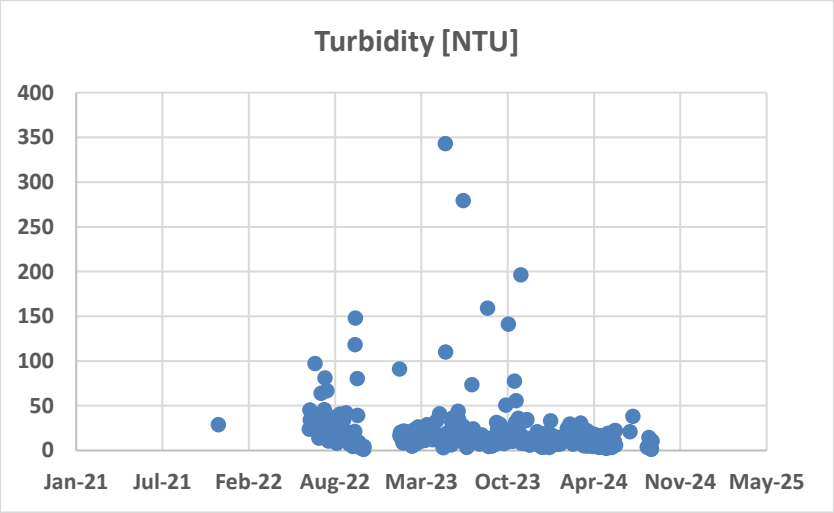


Figure 18: Dirty water dam recovery turbidity at Tutuka Power Station

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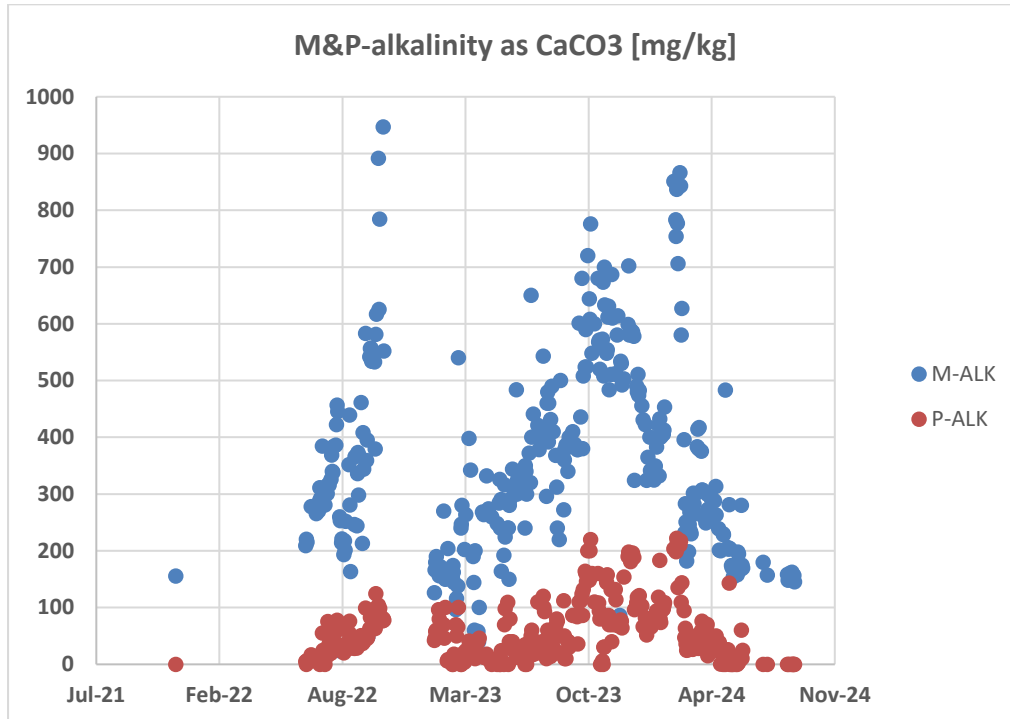
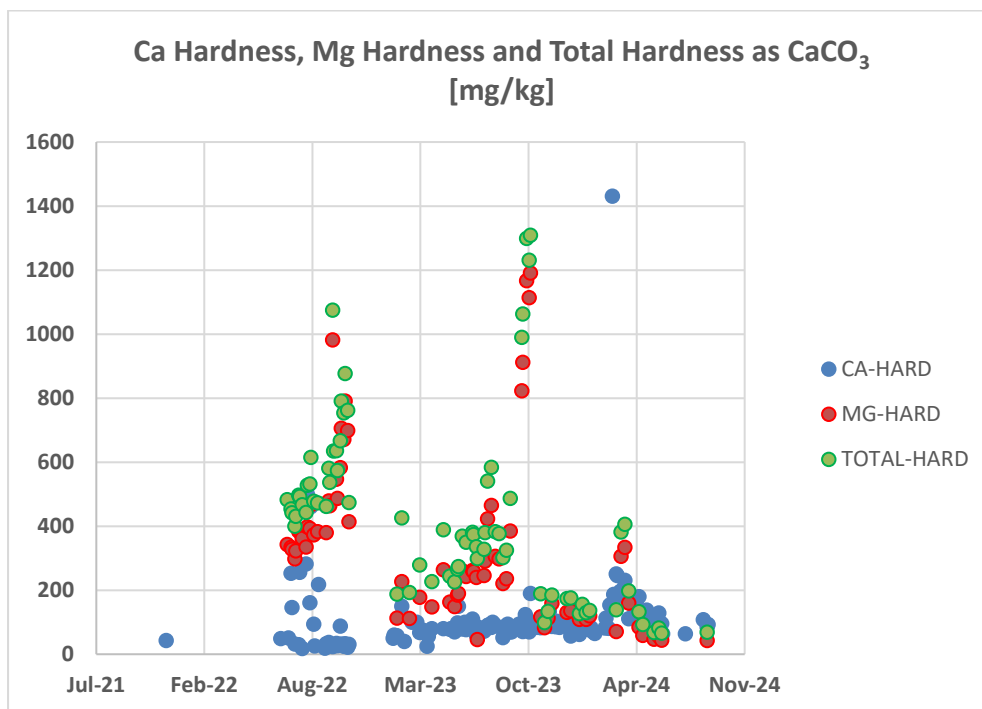


Figure 19: Dirty water dam recovery M&P alkalinity at Tutuka Power Station



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Figure 20: Dirty water dam recovery Calcium, magnesium and total hardness at Tutuka Power Station

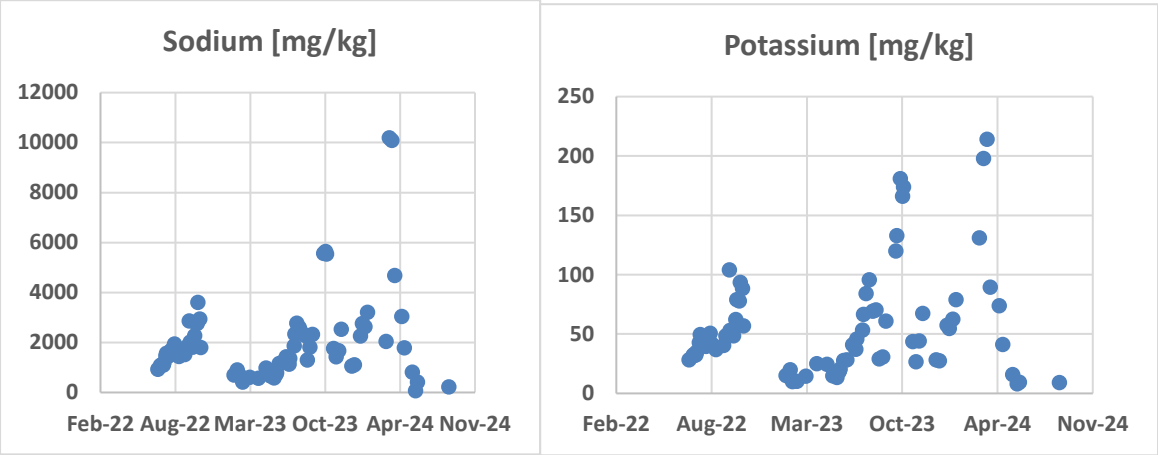


Figure 21: Dirty water recovery Sodium Potassium

Figure 22: Dirty water recovery

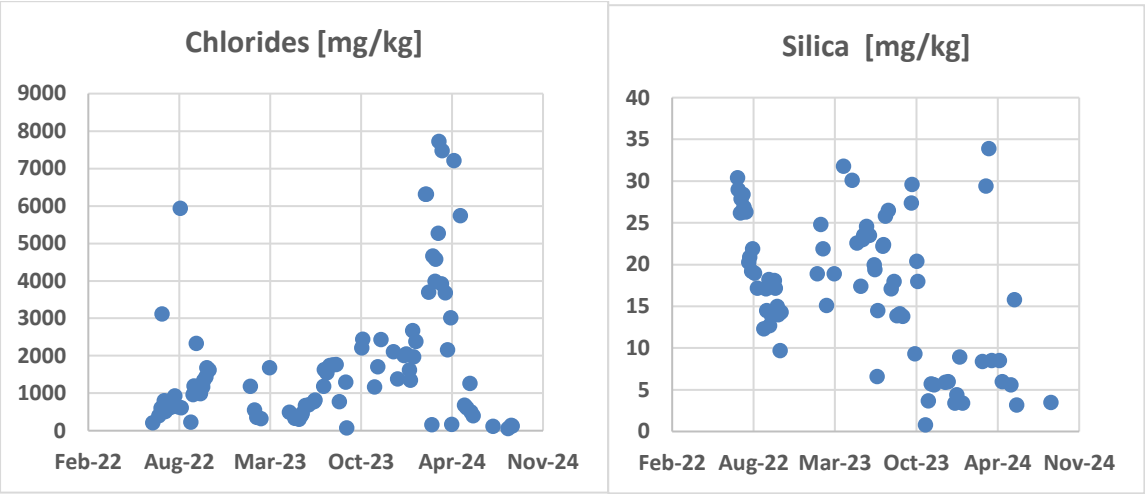


Figure 23: Dirty water recovery chlorides

Figure 24: Dirty water recovery silica

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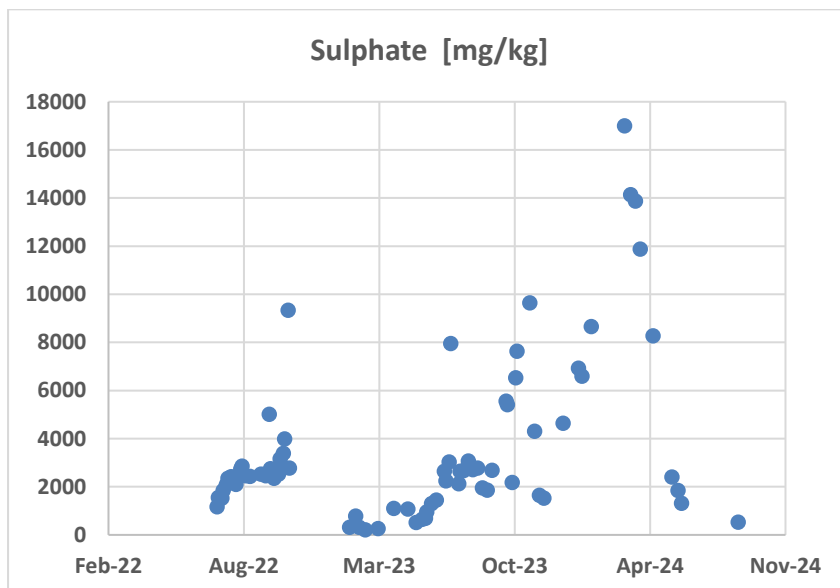


Figure 25: Dirty water recovery Sulphate

The water that is recovered must be of a quality similar to raw water quality in Table 1 or better. The flow requirement differs for each of the sites from 100 l/s to about 400l/s. The water to be treated (i.e. the DWD recovery stream) is predominantly a mixture of clay, sand and coal in water. The indicative dry base ash of a DWD sample is 63%. The typical particle size of the solids in the water is between 0.25 µm – 794.33 µm.

Ash Water – High pH

Many of the stations have problems with very high levels of water in the ash system. Reverse osmosis plants have been built at some of the stations to treat this water. These reverse osmosis plants are problematic as a result frequent scaling. A solution is required for the treatment of this high salinity, high pH water.

The typical water quality for treatment from the ash dams at Duvha is as indicated in the Figures 26-32 and Table 3 below:

Table 3: Ash water return (Duvha Power Station)

Parameter	Unit	Range	Average	95 th percentile
pH	-	7.99 – 12.48	11.14	12.06
Conductivity	µS/cm	152 - 4707	1897.01	3524.9
Turbidity	NTU	0.22-14.4	2.34	6.21
Calcium Hardness as CaCO ₃	mg/kg	300-1784	77.35	1394.7
Magnesium Hardness as CaCO ₃	mg/kg	86 – 327	163.98	224.9
Total Hardness as CaCO ₃	mg/kg	330 – 1970	921.87	1540.7

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Parameter	Unit	Range	Average	95 th percentile
m-alkalinity	mg/kg	20.7 – 700.8	179.48	532.8
p-alkalinity	mg/kg	9.2 – 687.7	164.68	520.68
Sodium	mg/kg	8.38 – 277	134.54	174.3
Ammonium	mg/kg	0 – 1.1	0.1	0.335
Nitrate	mg/kg	0 – 18.7	4.16	12.1
Phosphate	mg/kg	0.1 – 27.6	0.91	6.6
Potassium	mg/kg	16.6 – 315	39.89	56.84
Chloride	mg/kg	4.37 – 252	91.18	126.8
Fluoride	mg/kg	0 – 12.5	0.86	4.67
Sulphate	mg/kg	37.4 – 1403	649.09	969.35
TOC as C	mg/kg	0.762 – 6	2.38	3.94

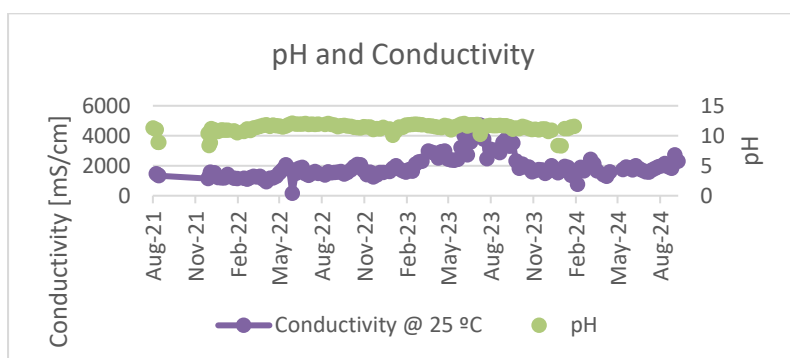


Figure 26: Duvha Ash Water pH and Conductivity

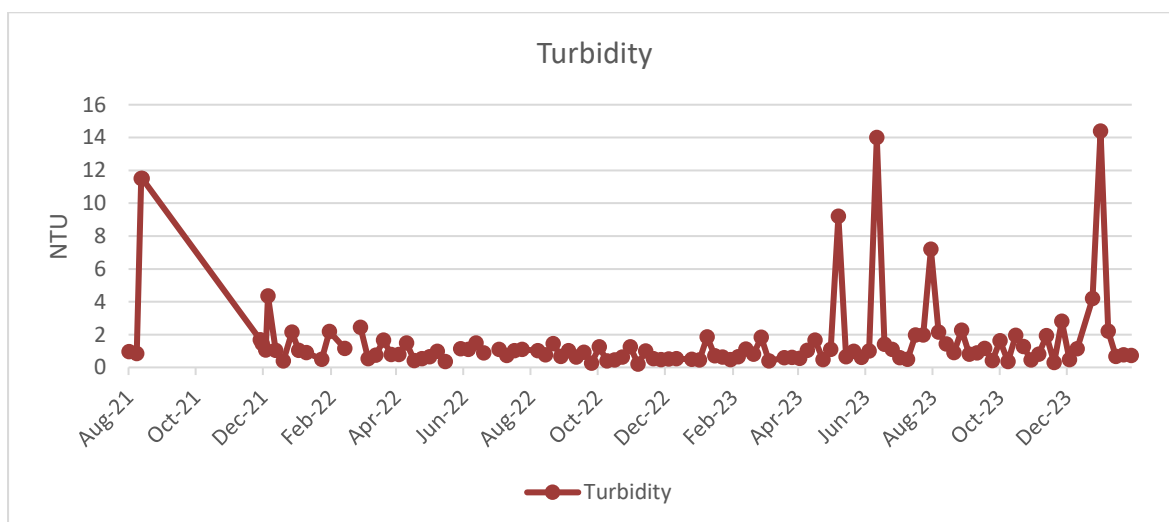


Figure 27: Duvha Ash Water Turbidity

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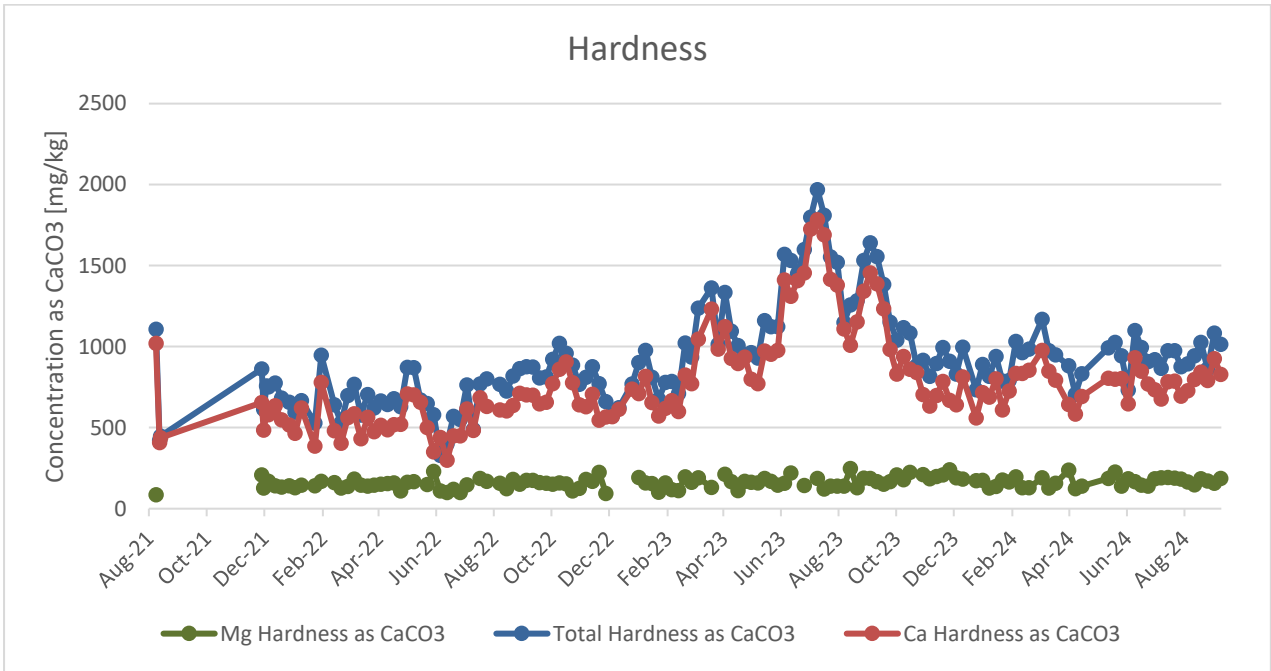


Figure 28: Duvha Ash Water Hardness

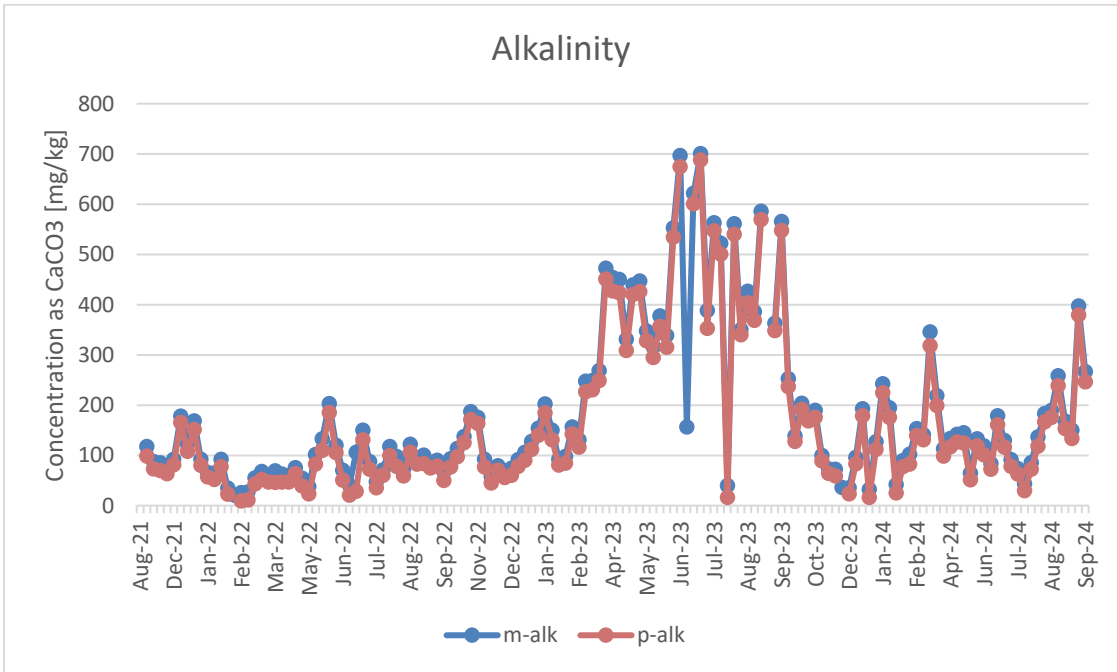


Figure 29: Duvha Ash Water Alkalinity

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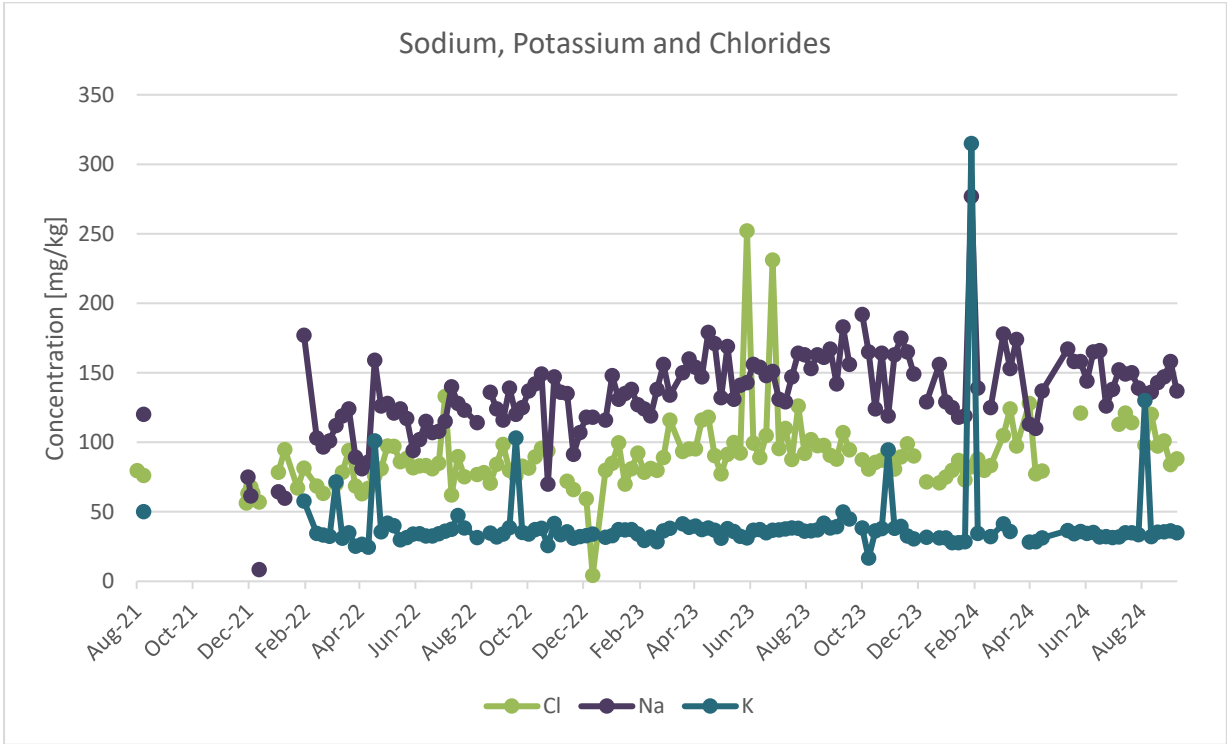


Figure 30: Duvha Ash Water Sodium, Chlorides and Potassium

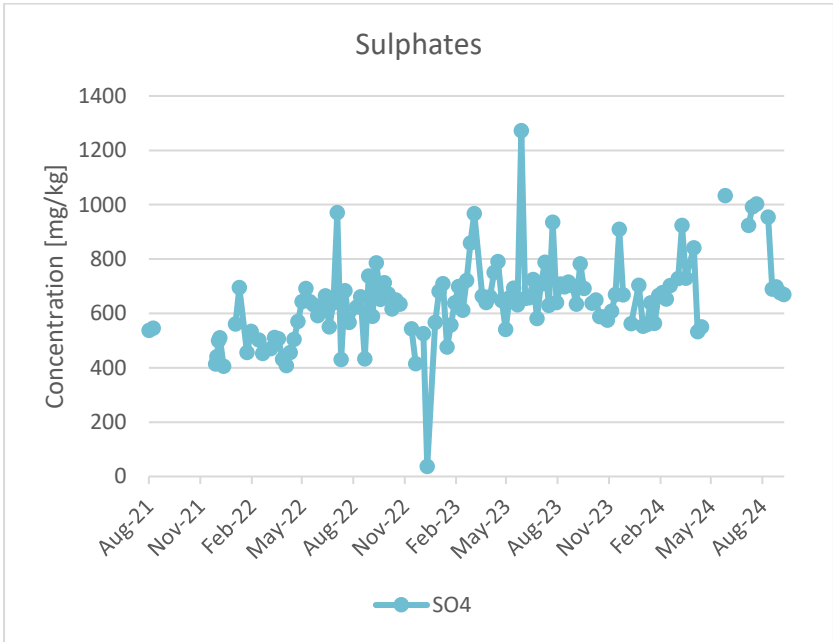


Figure 31: Duvha Ash Water Sulphates

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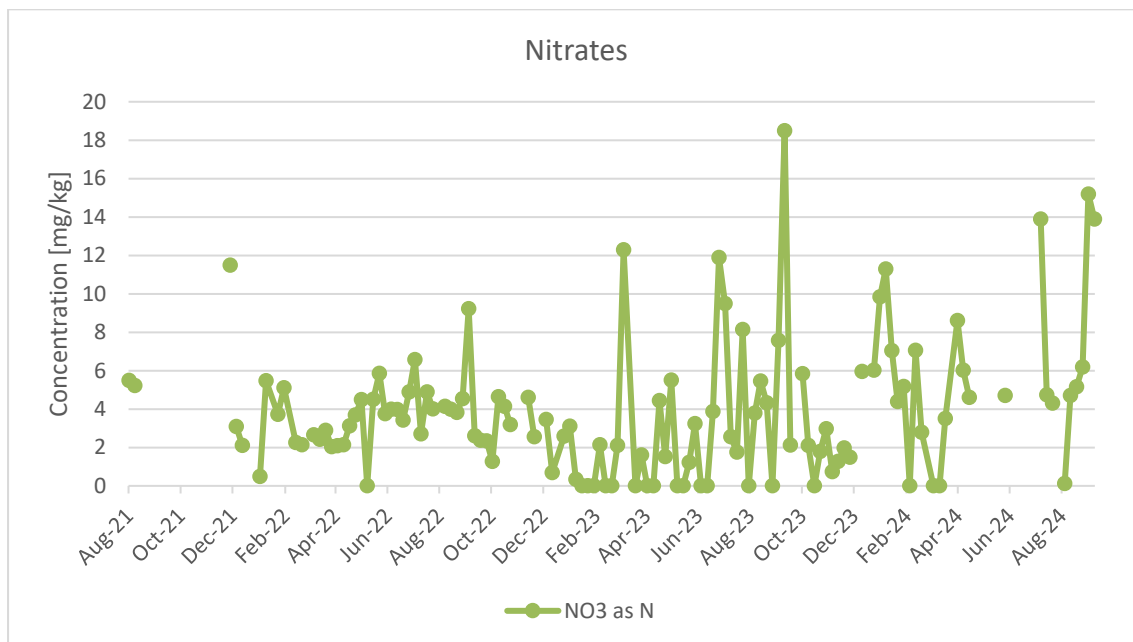


Figure 32: Duvha Ash Water Nitrates

The typical water quality for treatment from the ash dams at Kriel is as indicated in the Figures 33-39 and Table 4 below:

Table 4: Ash water return (Kriel Power Station)

Parameter	Unit	Range	Average	95 th percentile
pH	-	7.4 – 12.23	10.713	11.94
Conductivity	µS/cm	229 - 4640	2628.21	4435
Turbidity	NTU	0.61 – 3.35	1.75	3.19
Calcium Hardness as CaCO ₃	mg/kg	21.3-890	386.58	836
Magnesium Hardness as CaCO ₃	mg/kg	2.47 - 563	58.47	379.8
Total Hardness as CaCO ₃	mg/kg	42.7 – 1348	523.82	1269.7
m-alkalinity	mg/kg	15.5 – 662.6	189.48	545.58
p-alkalinity	mg/kg	0 – 623.1	133.92	335.5
Sodium	mg/kg	193 – 380	327.54	378.3
Nitrate	mg/kg	0.02 – 2.51	0.76	2.44
Potassium	mg/kg	42.7 – 97.5	82.13	96.81
Chloride	mg/kg	78 – 307	111.56	165.6
Fluoride	mg/kg	0.01 – 1.67	0.49	1.47
Sulphate	mg/kg	425 – 1671	923.19	1169.25

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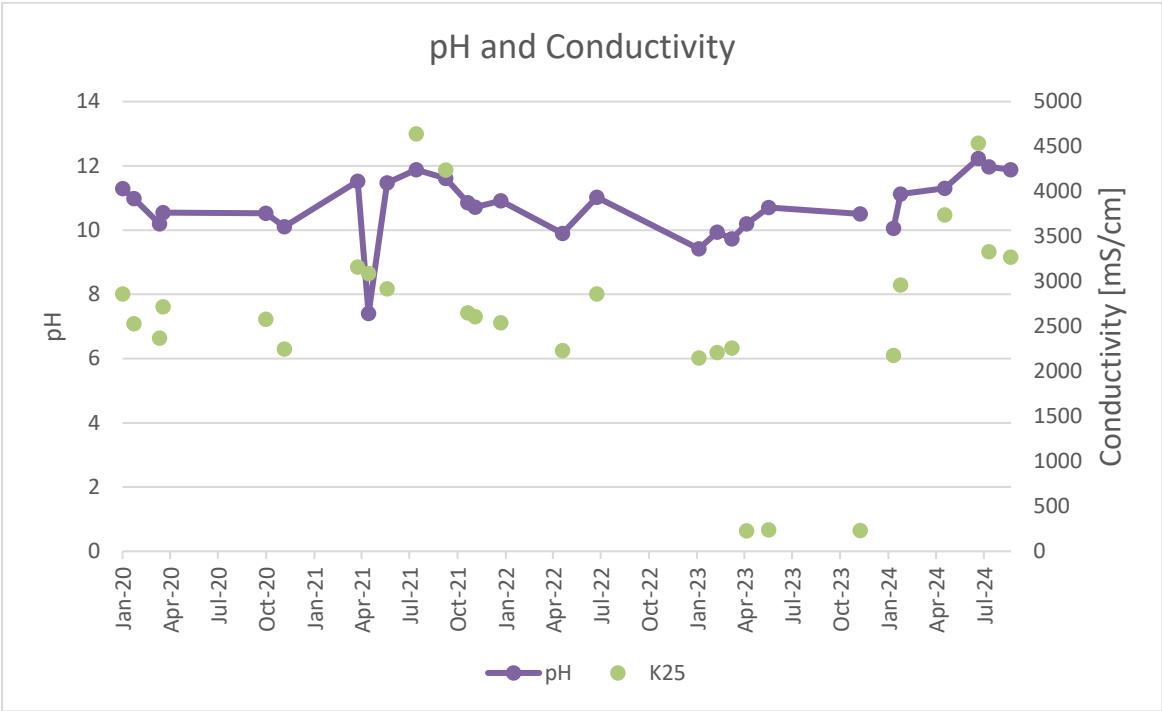


Figure 33: Kriel Ash Water pH and Conductivity

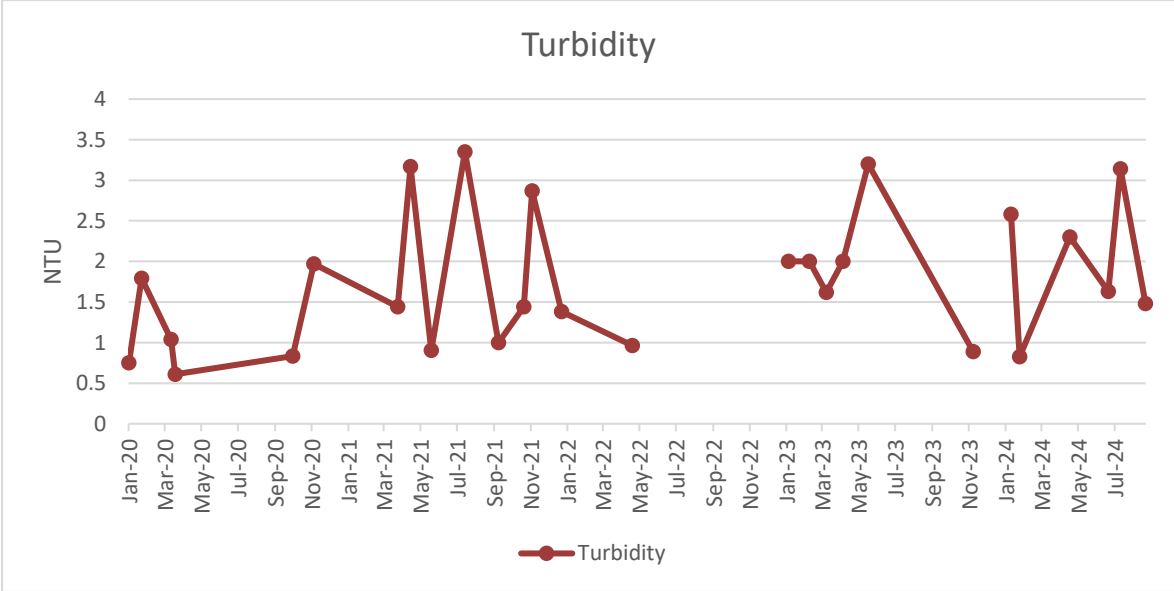


Figure 34: Kriel Ash Water Turbidity

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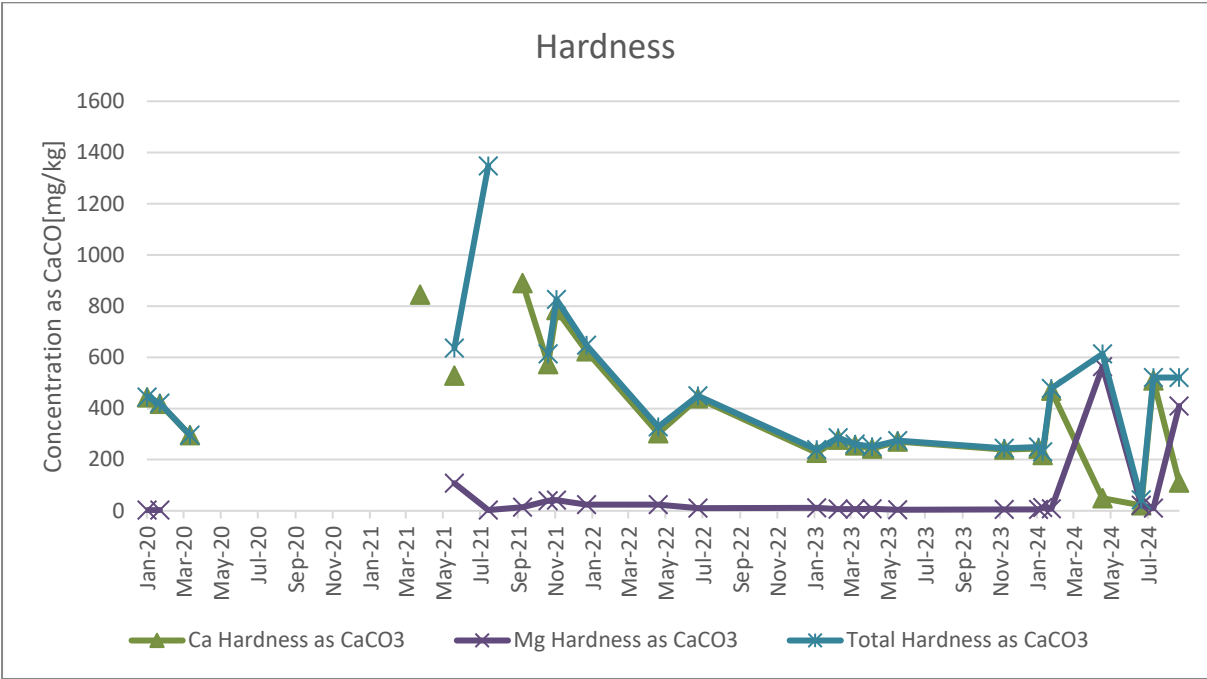


Figure 35: Kriel Ash water Hardness

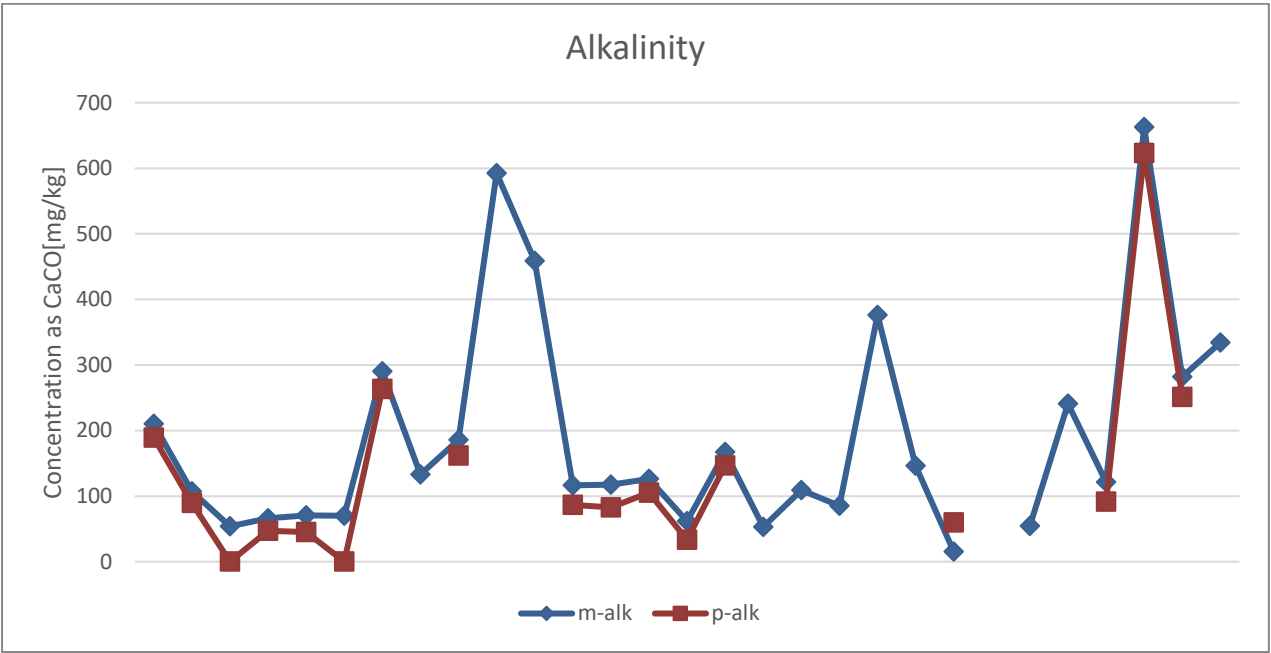


Figure 36: Kriel Ash water Alkalinity

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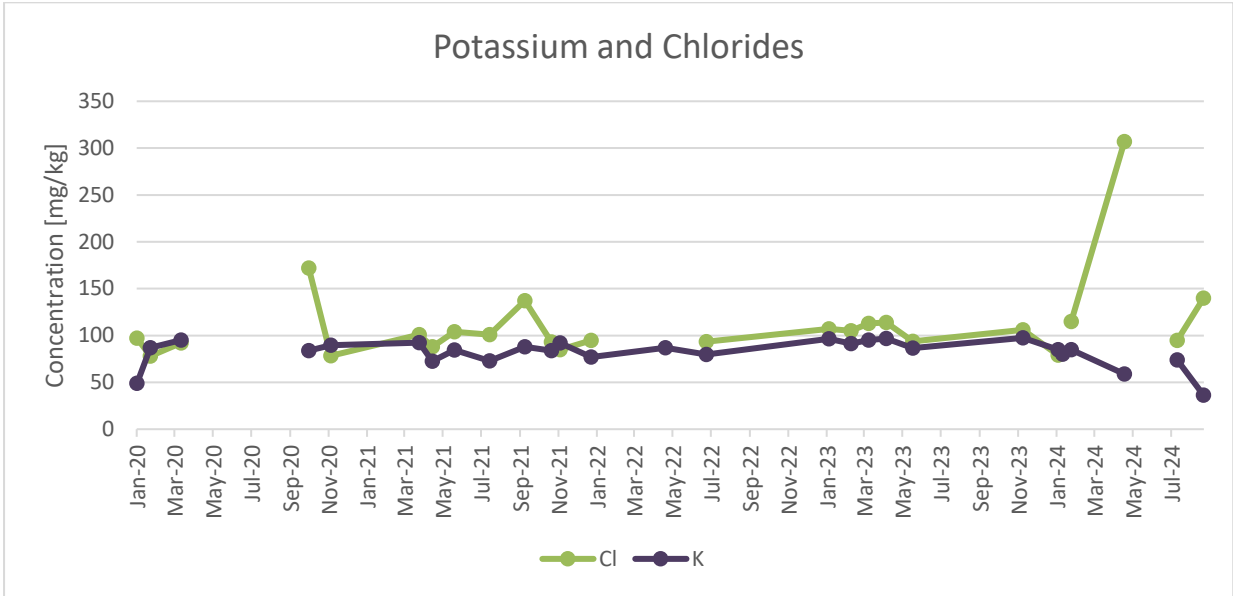


Figure 37: Kriel Ash water Potassium and Chloride concentration

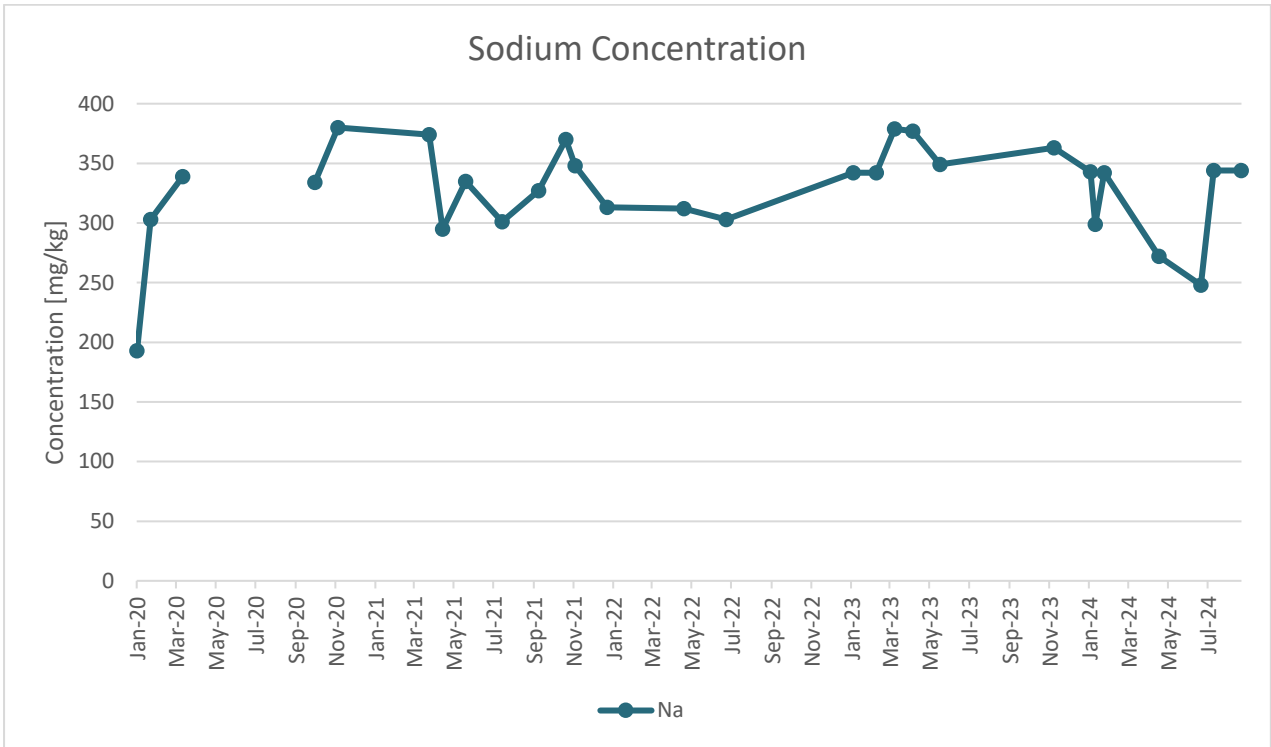


Figure 38: Kriel Ash water sodium concentration

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		RFI Number	E1275CTRTD		

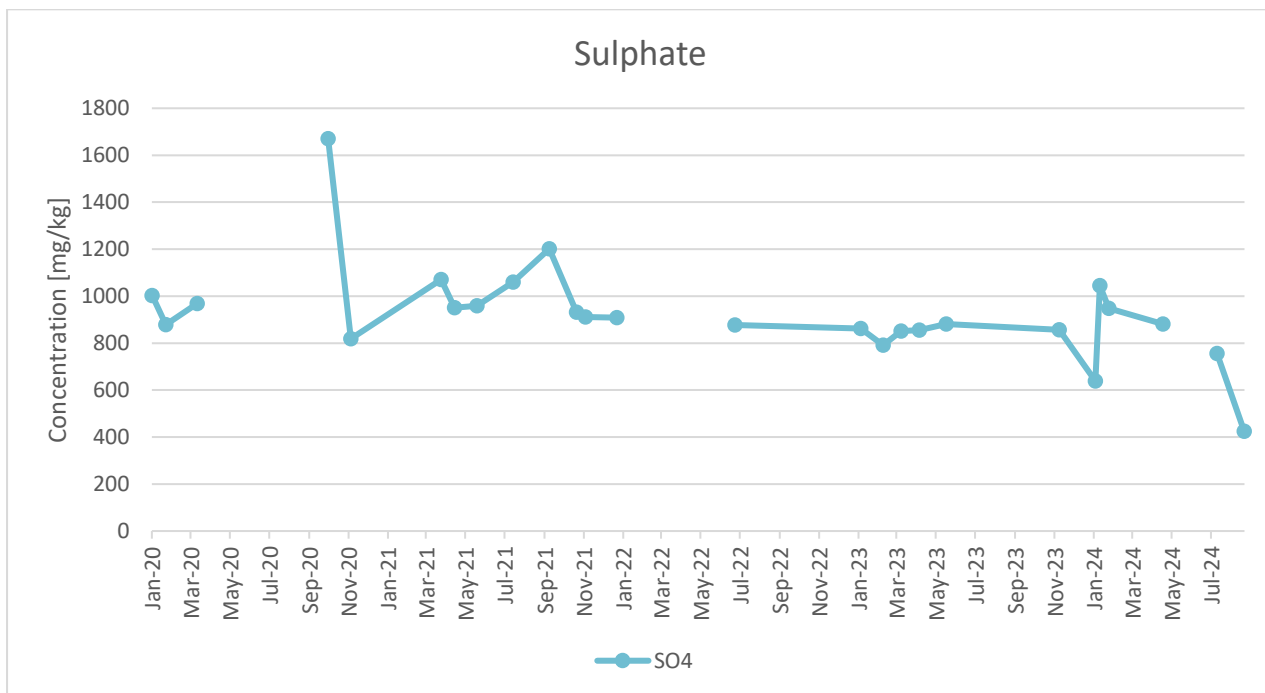


Figure 39: Kriel Ash water sulphate concentration

The typical range of water quality for treatment from the CCW at Kriel is as indicated below:

Table 7: Concentrated Cooling water (Kriel Power Station)

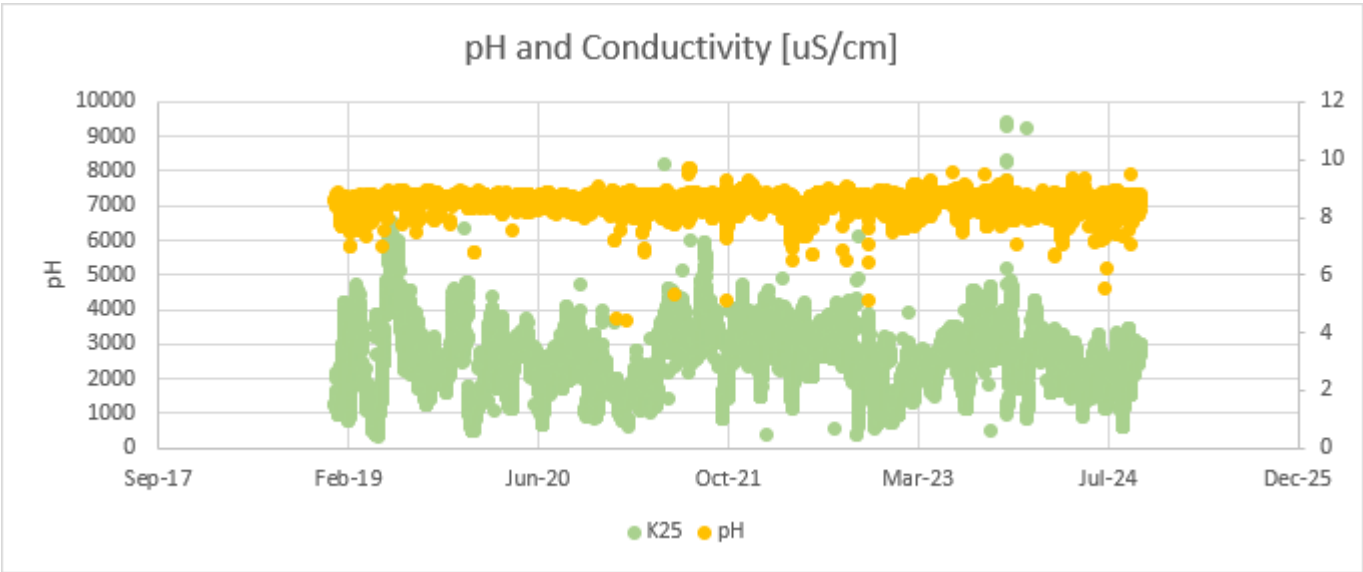
Parameter	Unit	Kriel CW South			Kriel CW north		
		Range	Average	95 th percentile	Range	Average	95 th percentile
pH	-	6.9 - 9.0	8.4	8.6	7.6 - 8.9	8.6	8.8
Conductivity	µS/cm	1.5 - 32680	2393	3440	0.3 – 24560	2448.6	3620
Turbidity	NTU	4.4 - 323	21.1	36.4	2.4 – 253	17.7	32.4
TSS	mg/kg	14.5 - 37.8	25	36.1	10.4 - 31.1	19.6	30.9
CCPP as CaCO ₃	mg/kg	4.2 - 61.8	26.8	45.3	6.5 - 103.8	34.1	62.5

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		Kriel CW South			Kriel CW north		
Calcium Hardness as CaCO ₃	mg/kg	123 - 635	319.4	483	77.5 – 3565	287.3	426.1
Magnesium Hardness as CaCO ₃	mg/kg	4.7 - 575	285.1	479.6	78.1 – 1192	346	597.6
Total Hardness as CaCO ₃	mg/kg	255 - 1120	604.6	911.6			
m-alkalinity	mg/kg	0 - 1236	118.5	168.4	9.8 – 2060	133.6	195.9
p-alkalinity	mg/kg	0 - 50.8	3.3	8.0	0 - 33.4	6.8	12.7
Sodium	mg/kg	101 - 517	274.4	414.6	10.1 – 1131	296.1	454.5
Potassium	mg/kg	25 - 136	72.7	110.2	5.1 – 252	81.1	131.0
Chloride	mg/kg	12.1 – 310	161.4	252.4	16 – 419	180.2	288.0
Sulphate	mg/kg	240 - 1483	762.8	1175.3	23.7 – 1882	759.1	1229.8
Nitrates	mg/kg	1 - 17.6	4.4	7.7	0.2 – 107	5	8
Phosphates	mg/kg	520	520	520			
Silicate at SiO ₂	mg/kg	2 - 20	10.6	15.0	4 – 29	13.1	17
COD	mg/kg	34 - 182	101.8	157.5	27 – 160	111.2	158.5
TOC as C	mg/kg						



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Figure 53: Kriel Cooling water South pH and conductivity

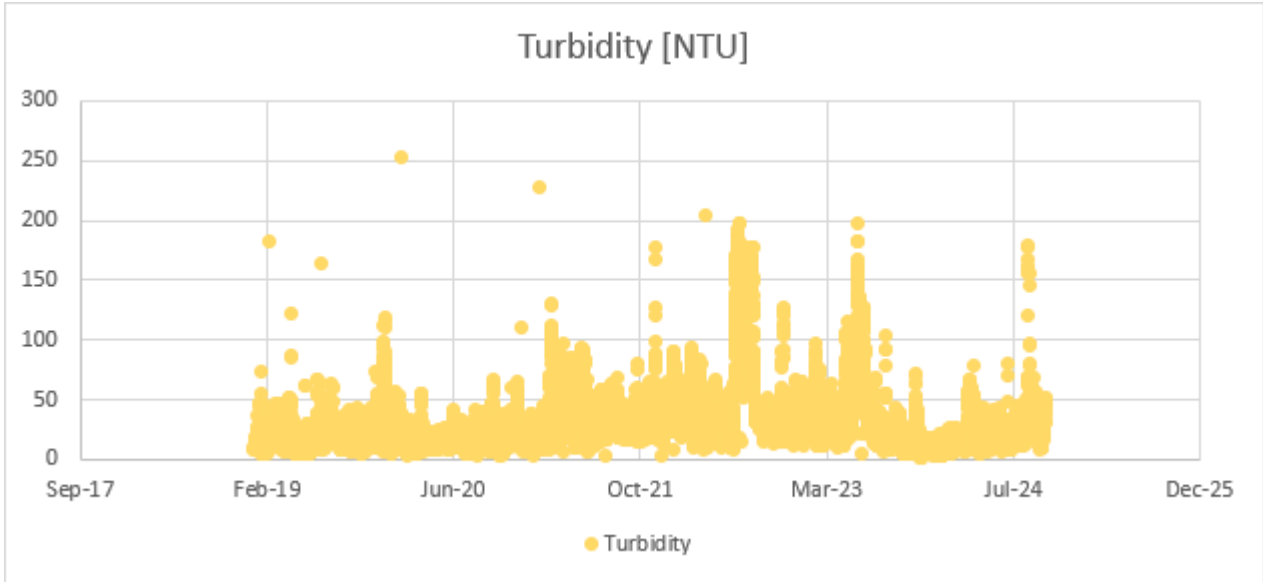


Figure 54: Kriel Cooling water South Turbidity

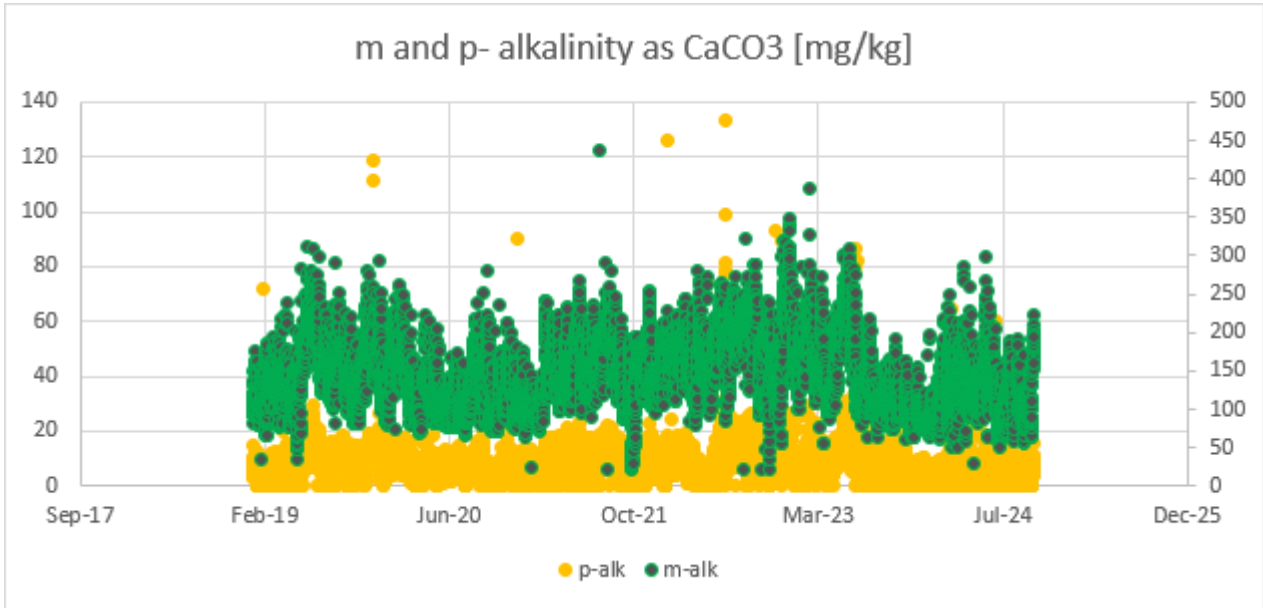


Figure 55: Kriel Cooling water South p-alkalinity and m-alkalinity

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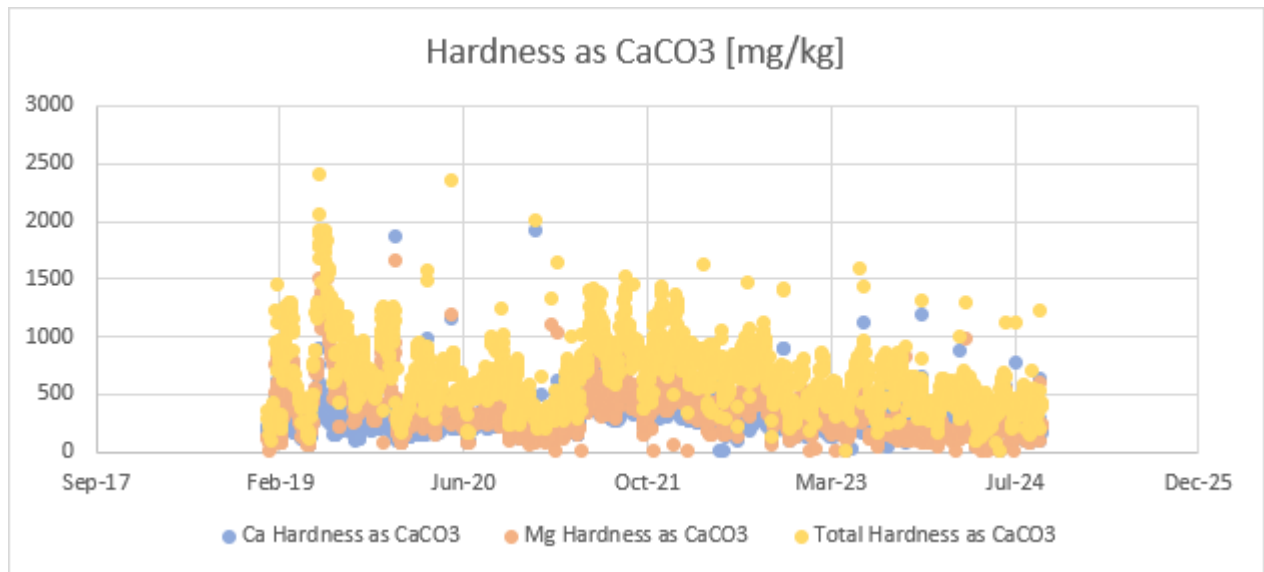


Figure 56: Kriel Cooling water South Hardness

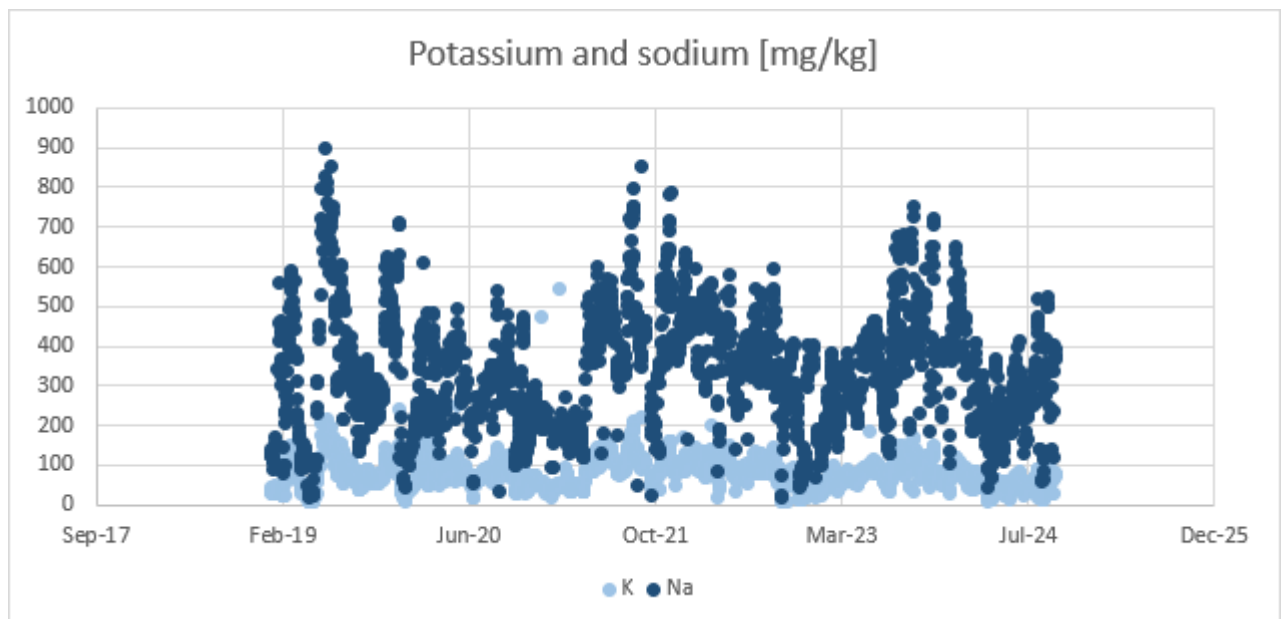


Figure 57: Kriel Cooling water South Potassium and sodium

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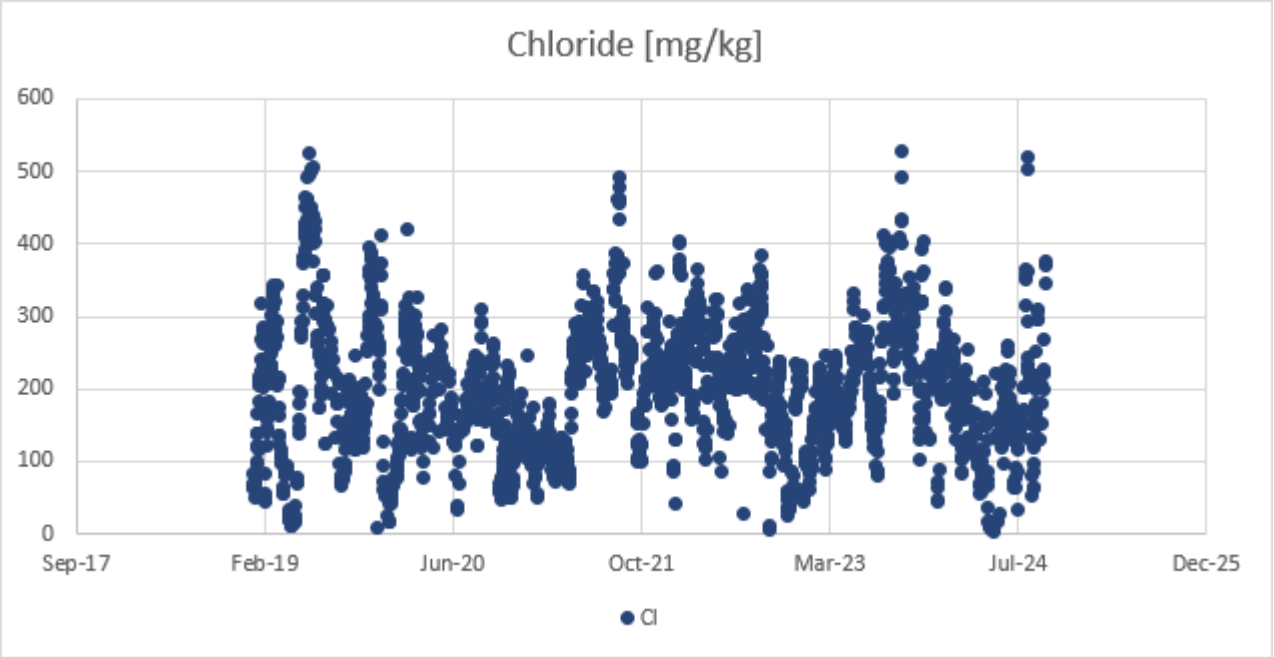


Figure 58: Kriel Cooling water South Chloride

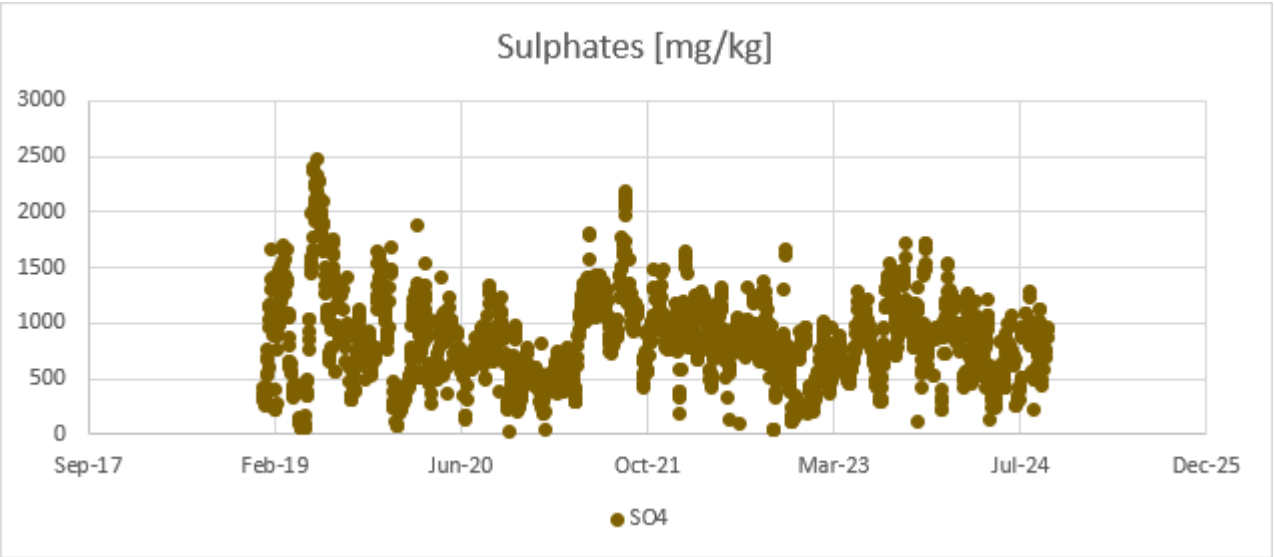


Figure 59: Kriel Cooling water South pH and sulphate

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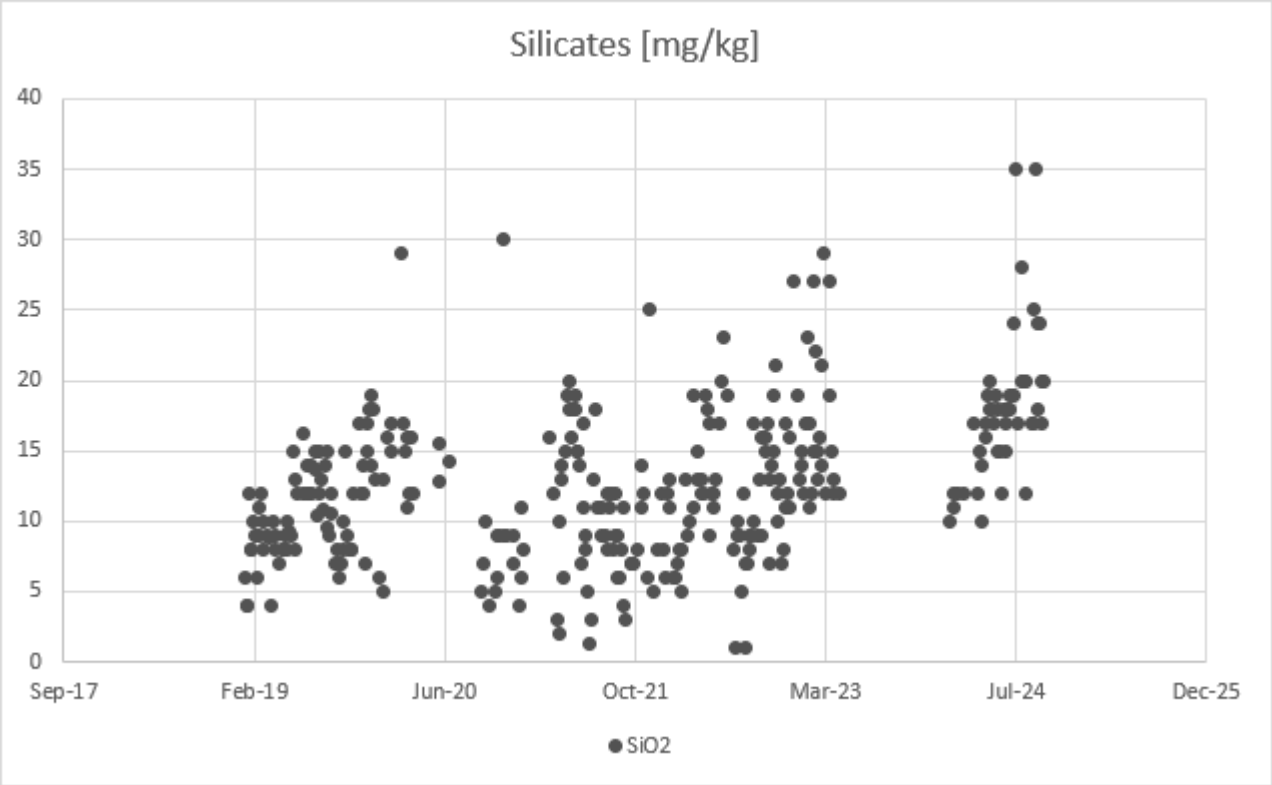


Figure 60: Kriel Cooling water South silicate

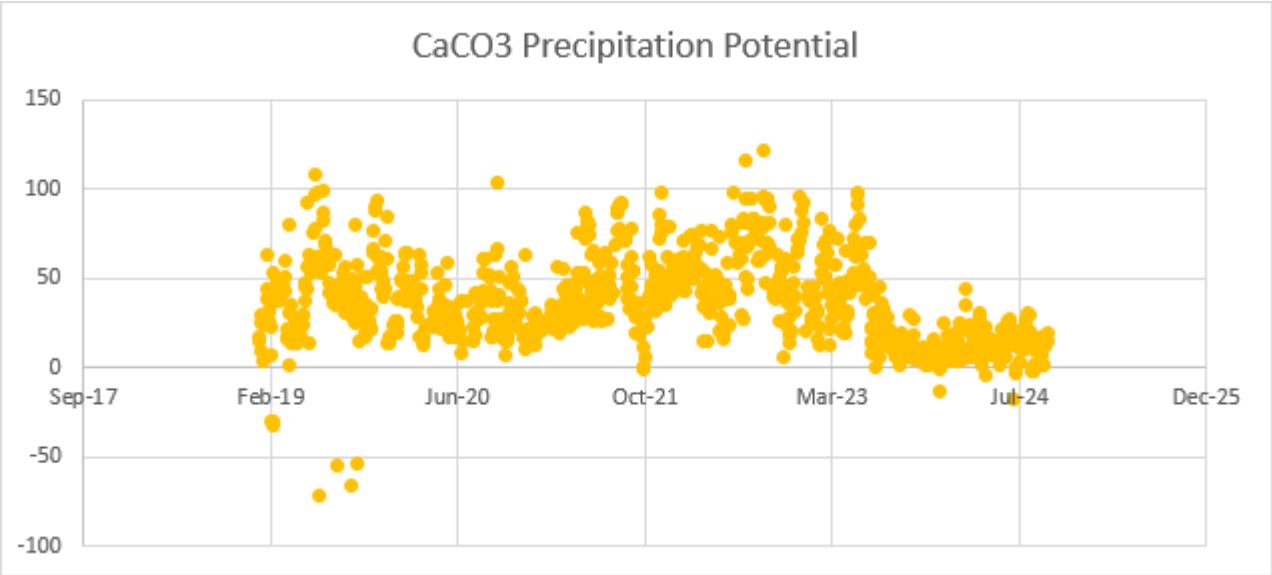


Figure 61: Kriel Cooling water South Calcium Carbonate Precipitation Potential

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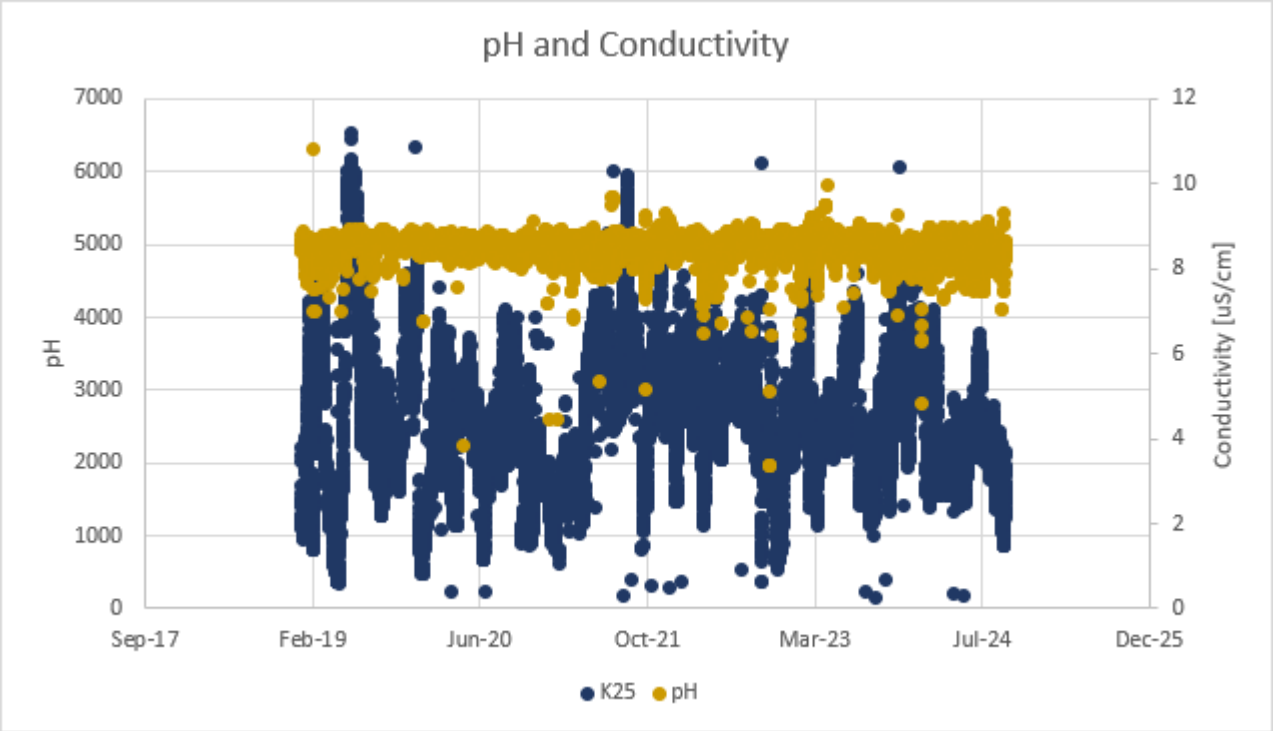


Figure 62: Kriel Cooling water North pH and conductivity

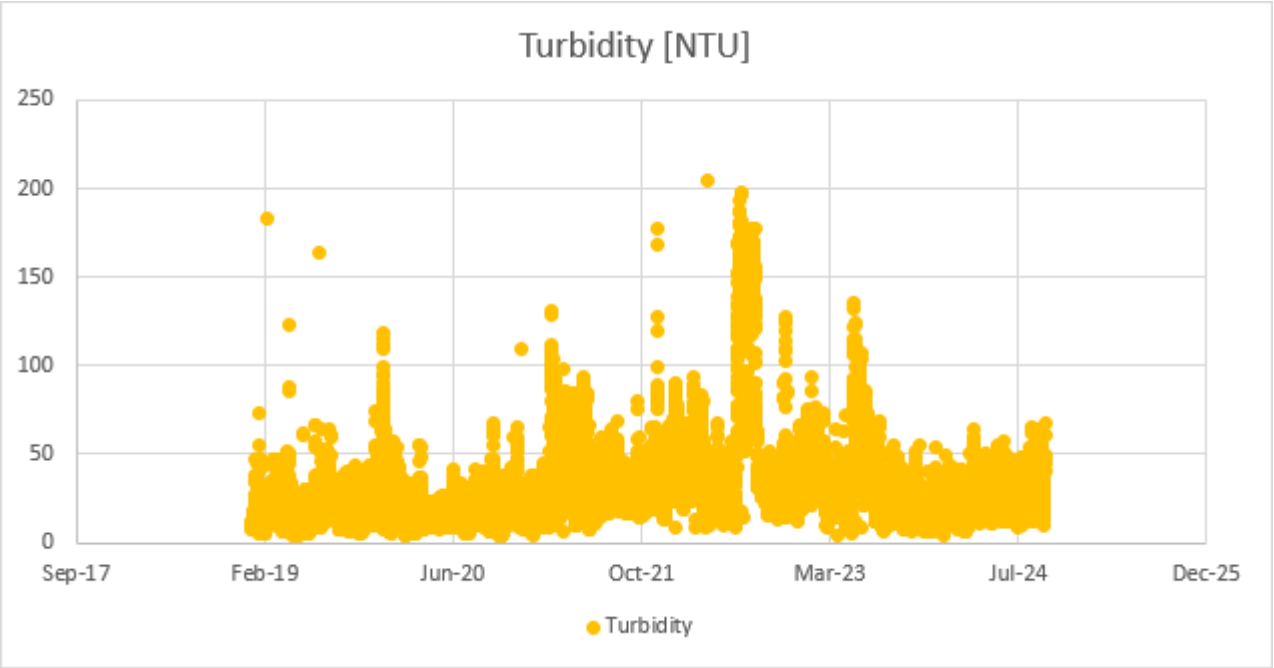


Figure 63: Kriel Cooling water North turbidity

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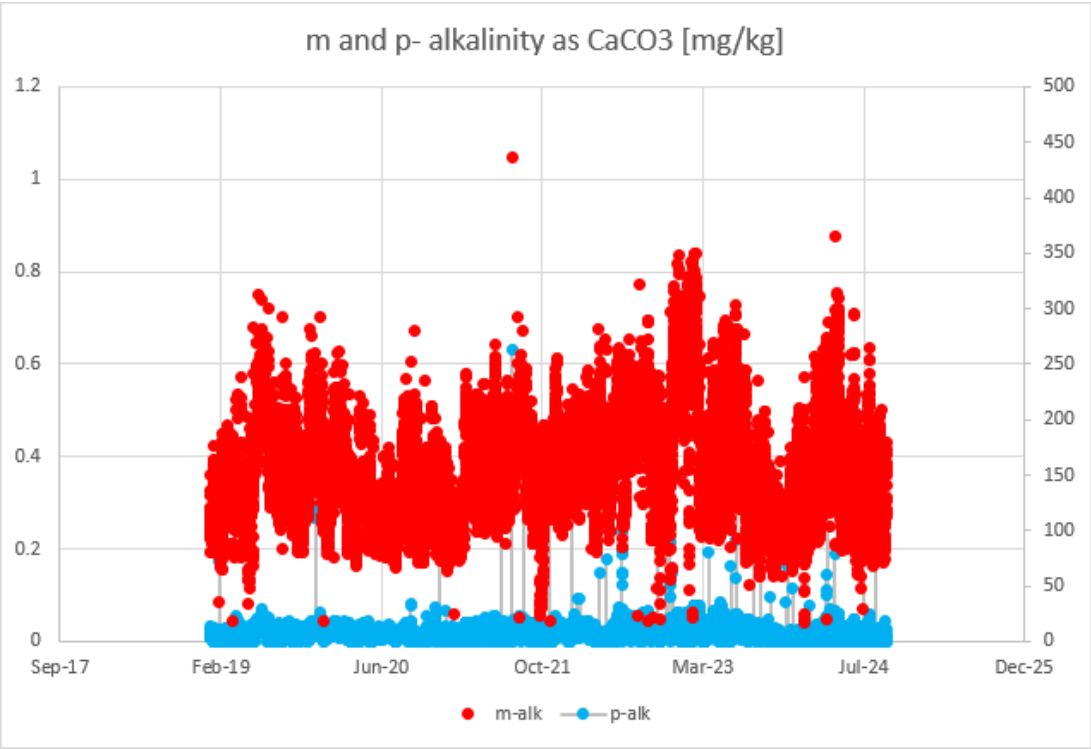


Figure 64: Kriel Cooling water North m-alkalinity and p-alkalinity

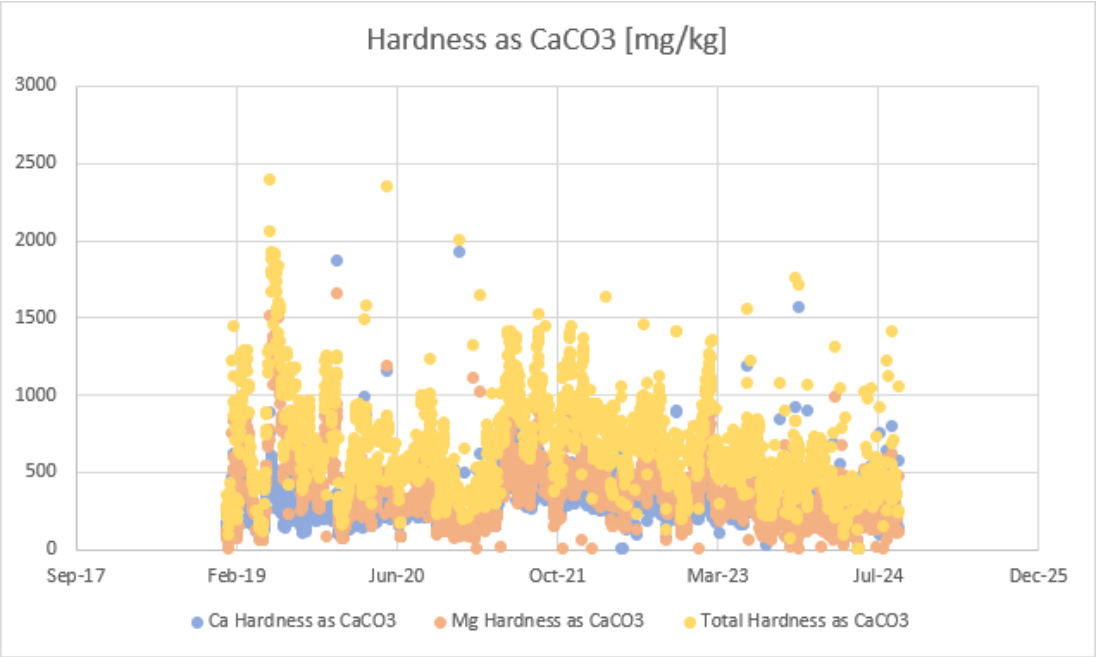


Figure 65: Kriel Cooling water North hardness

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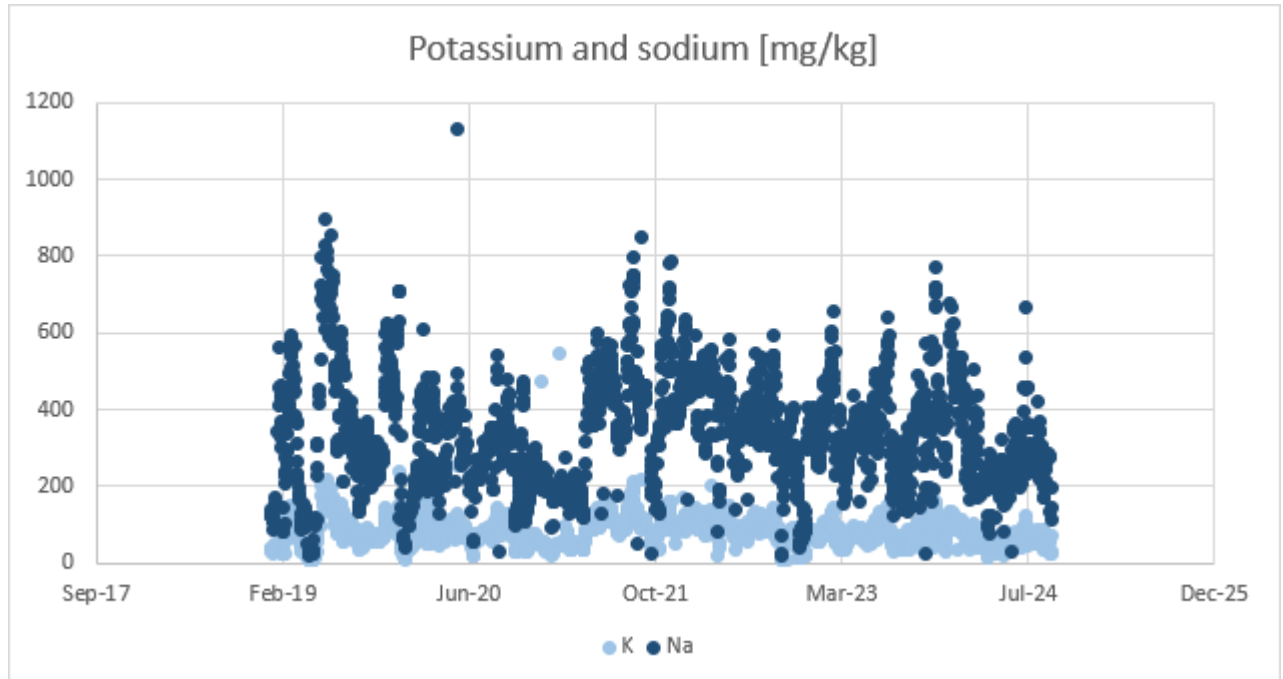


Figure 66: Kriel Cooling water North Potassium and Sodium

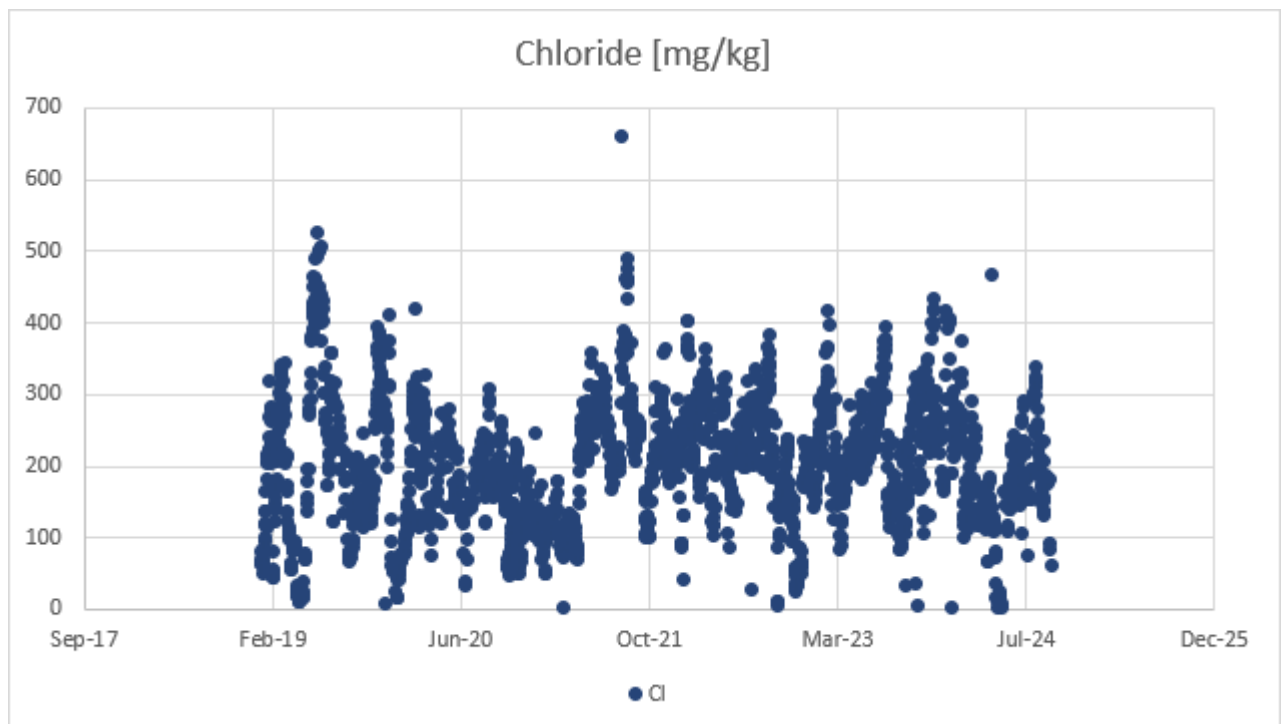


Figure 67: Kriel Cooling water North Chlorides

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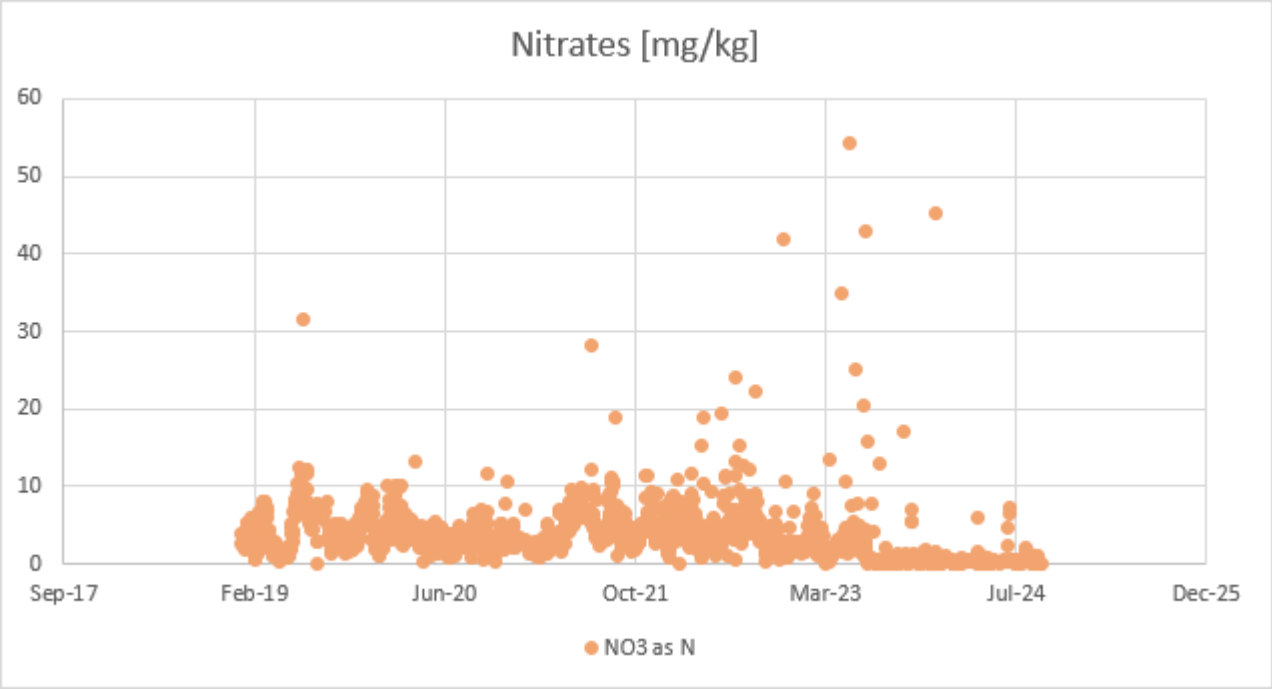


Figure 68: Kriel Cooling water North Nitrates

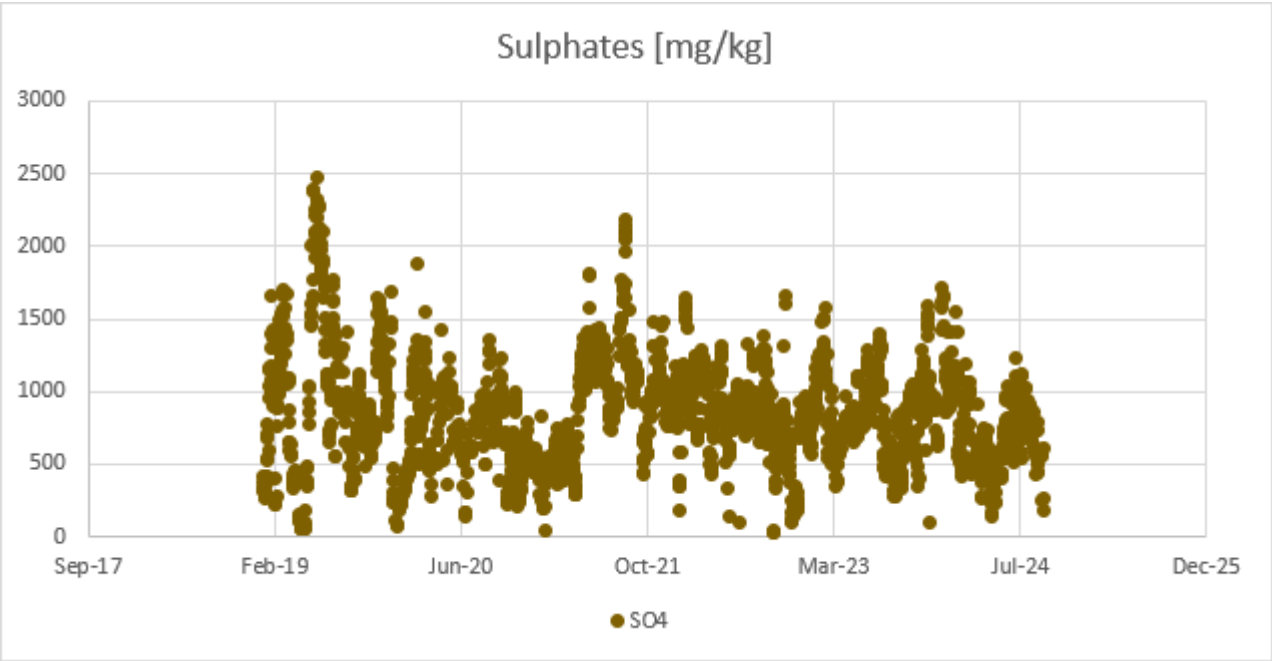


Figure 69: Kriel Cooling water North Sulphates

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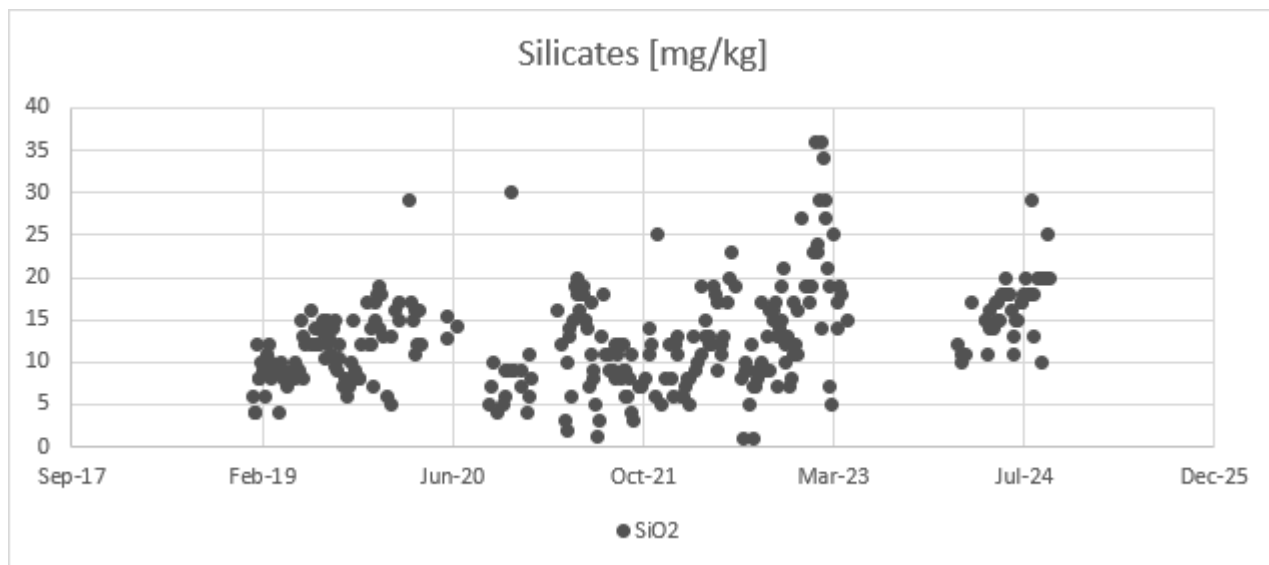


Figure 70: Kriel Cooling water North Silicates

The flow requirement differs for each of the sites from 3 to 6Ml/day.

a. FGD bleedstream

In a drive to reduce the particulate emissions at the newly built power stations, flue gas desulphurisation plants have been built at Kusile and the intention is for another to be built at Medupi. However, the bleedstream from this water has to be treated further. Thermal crystallisation is one of the techniques being utilised to treat this water. This plant has been installed at Kusile. However, it is a very cost intensive plant with extremely high capital and operating costs. An alternative solution must be investigated which could treat this water.

The typical range of water quality for treatment is not known as yet since the analysis of these streams are still in progress. However, the chemical analysis as per the design is in the table below. The flow requirement differs for this plant and has a design of 50 m³/hr and a normal operating flowrate of 25m³/hr. The table below refers to the design parameters for the plant.

Table 5: Designed chemical parameters for the Bleedstream from the FGD plant (Kusile Power Station)

PARAMETER	CONCENTRATION [mg/L ion] BEFORE PRE-TREATMENT
Chloride	30,000
Sulfate	1,500 - 8,000
Sulfite	<20
Nitrate	100 – 1,500

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PARAMETER	CONCENTRATION [mg/L ion] BEFORE PRE-TREATMENT
Fluoride	30 – 200
Calcium	4,000 – 20,000
Magnesium	200 – 5,600
Sodium	75 – 1,200
Iron	30 – 400
Aluminum	50 – 800
Arsenic	0.05 – 3.0
Boron	20 – 40
Boron (as HBO ₃)	
Cadmium	0.04 – 0.5
Cobalt	0.05 – 0.4
Chromium Total	0.3 – 5.0
Copper	0.1 – 0.85
Mercury	0.05 – 0.8
Nickel	0.2 – 6.0
Lead	0.1 – 3.0
Selenium	0.2 – 1.0
Vanadium	0 – 2.4
Zinc	5 – 10
Ammonium	<10 – 100
Ammonia	
COD	100 – 150
pH	4 – 7
TSS	300 – 10,000
Bicarbonate	
Silica	
TOC	

However, the samples from the plant have been tested and certain parameters are less than the designed parameters. Refer to the table below for the last set of samples. Since the intention is to test the water to the design parameters of the plant, the contractor must make allowance for recycle of the concentrate stream in order to cycle up the ions.

Table 6: Chemical operational parameters for the Bleedstream from the FGD plant (Kusile Power Station)

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PARAMETER	UNITS	CONCENTRATION [mg/L ion] BEFORE PRE-TREATMENT
Total Alkalinity (pH>4.5)	mg CaCO ₃ /L	60.2
Bicarbonate Alkalinity	mg CaCO ₃ /L	60.2
Carbonate Alkalinity	mg CaCO ₃ /L	0.00
M Alkalinity (8.3>pH>4.5)	mg CaCO ₃ /L	60.2
P Alkalinity (pH>8.3)	mg CaCO ₃ /L	0.00
Conductivity (Laboratory)	mS/cm	2560
pH (Laboratory)		6.69
Total Hardness	mg CaCO ₃ /L	13215
Calcium Hardness	mg CaCO ₃ /L	2068
Magnesium Hardness	mg CaCO ₃ /L	11147
Total Dissolved Solids (TDS)	mg/L	17779
Suspended Solids (TSS)	mg/L	5528
Temperature	°C	21.0
Chemical Oxygen Demand (COD)	mg O ₂ /L	4000
Ammonia and Ammonium	mg N/L	
Calcium	mg Ca/L	828
Chloride	mg Cl/L	1004
Magnesium	mg Mg/L	2707
Nitrate and Nitrite (TON)	mg N/L	4.14
Potassium	mg K/L	136
Sodium	mg Na/L	1369
Silicon	mg Si/L	34.5
Sulphate	mg SO ₄ /L	9008
Aluminium	mg Al/L	1.33
Antimony	mg Sb/L	
Arsenic	mg As/L	0.06
Barium	mg Ba/L	0.10
Beryllium	mg Be/L	0.01
<i>Boron</i>	mg B/L	68.8
Bromide	mg Br/L	

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PARAMETER	UNITS	CONCENTRATION [mg/L ion] BEFORE PRE-TREATMENT
Cadmium	mg Cd/L	0.002
Chromium	mg Cr/L	0.01
Cobalt	mg Co/L	0.10
Copper	mg Cu/L	0.01
<i>Fluoride</i>	mg F/L	71.7
Iron	mg Fe/L	0.09
Lead	mg Pb/L	0.23
Lithium	mg Li/L	6.86
Total Manganese	mg Mn/L	
Manganese	mg Mn/L	2317
Mercury	mg Hg/L	0.003
Molybdenum	mg Mo/L	0.08
Nickel	mg Ni/L	0.84
Selenium	mg Se/L	1.21
Strontium	mg Sr/L	1.29
Tin	mg Sn/L	0.04
Vanadium	mg V/L	0.96
Zinc	mg Zn/L	0.41
<i>Total Organic Carbon (TOC)</i>	mg C/L	
Total Sulphur	mg S/L	

b. Effluent from the Spiral Reverse Osmosis plant

The resin regeneration and reverse osmosis effluent is sent to the neutralisation sump. From this sump it is further sent for co-disposal with the ash. Legislation passed in 2013, states that brine with a high salt content (TDS>5%), cannot be co-disposed with the ash from 2021 onwards. Hence, a solution is required to treat this water instead of the co-disposal with ash. The typical range of water quality for treatment of the SRO brine is as per table and Figures 40-52 below when the plant was last in service.

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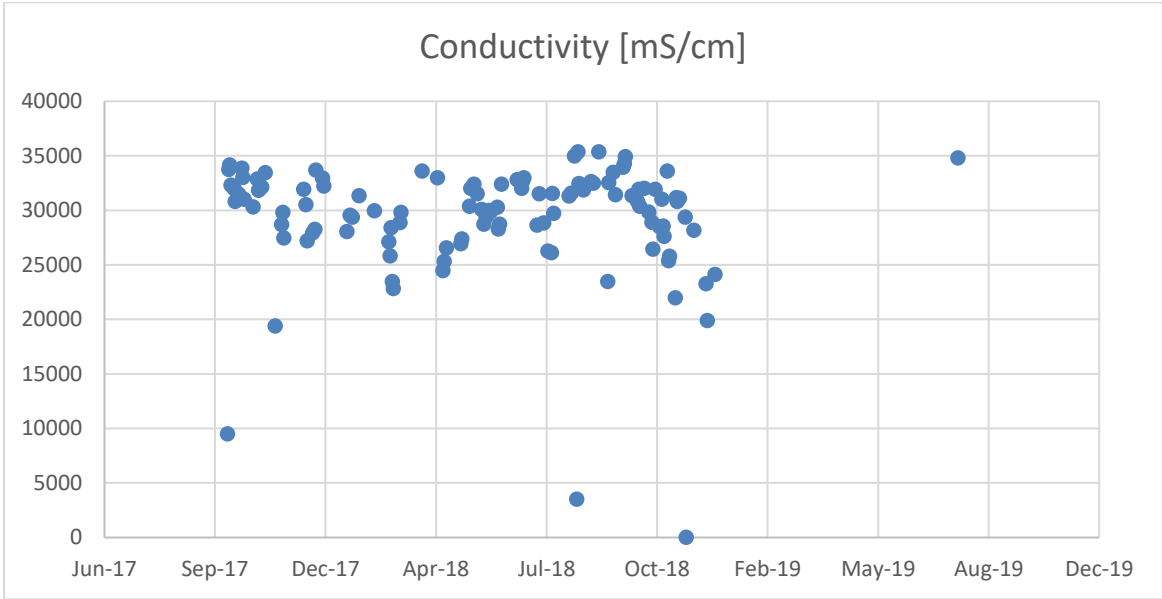


Figure 40: Tutuka SRO brine conductivity

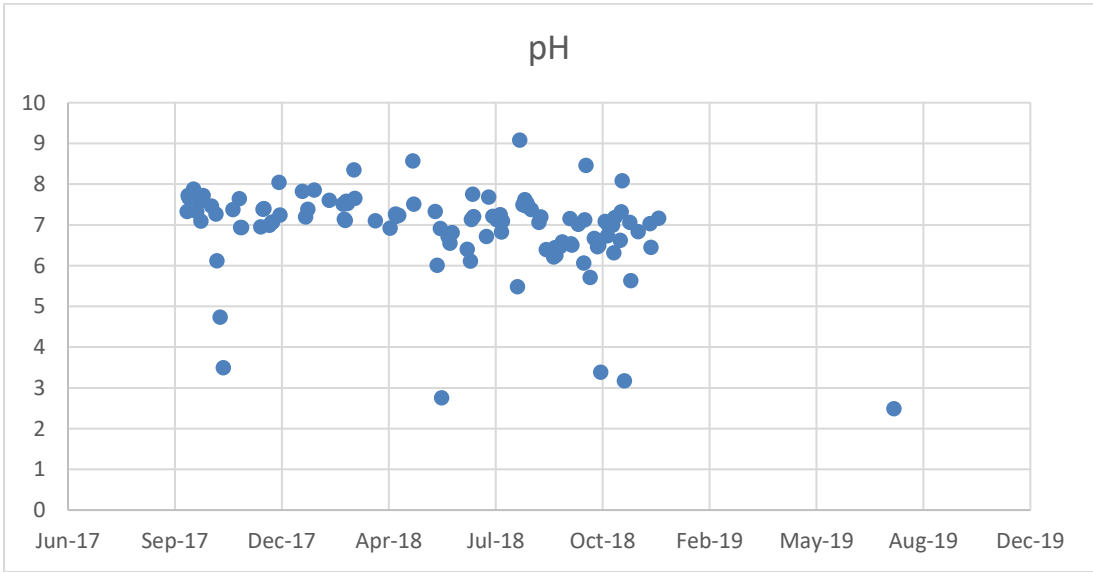


Figure 41: Tutuka SRO brine pH

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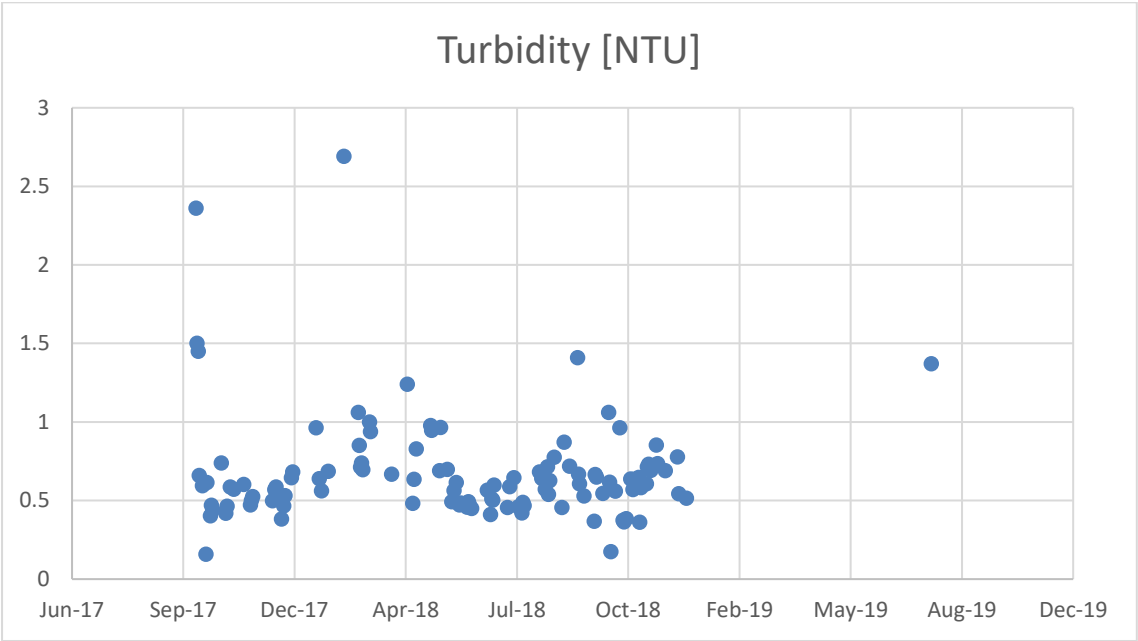


Figure 42: Tutuka SRO brine turbidity

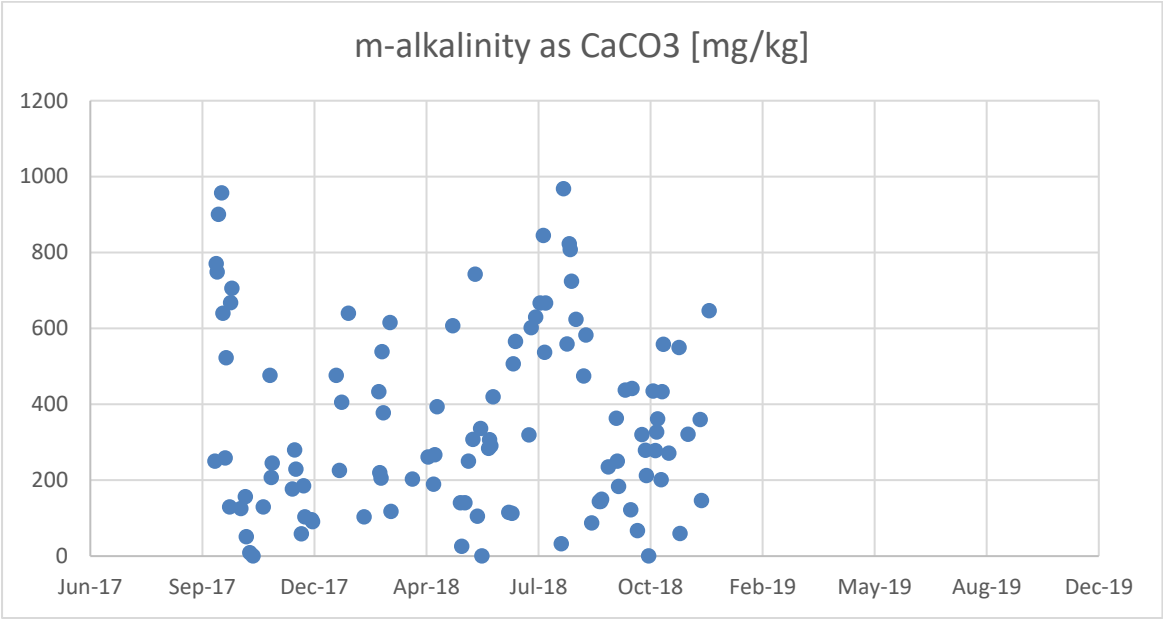


Figure 43: Tutuka SRO brine m-alkalinity

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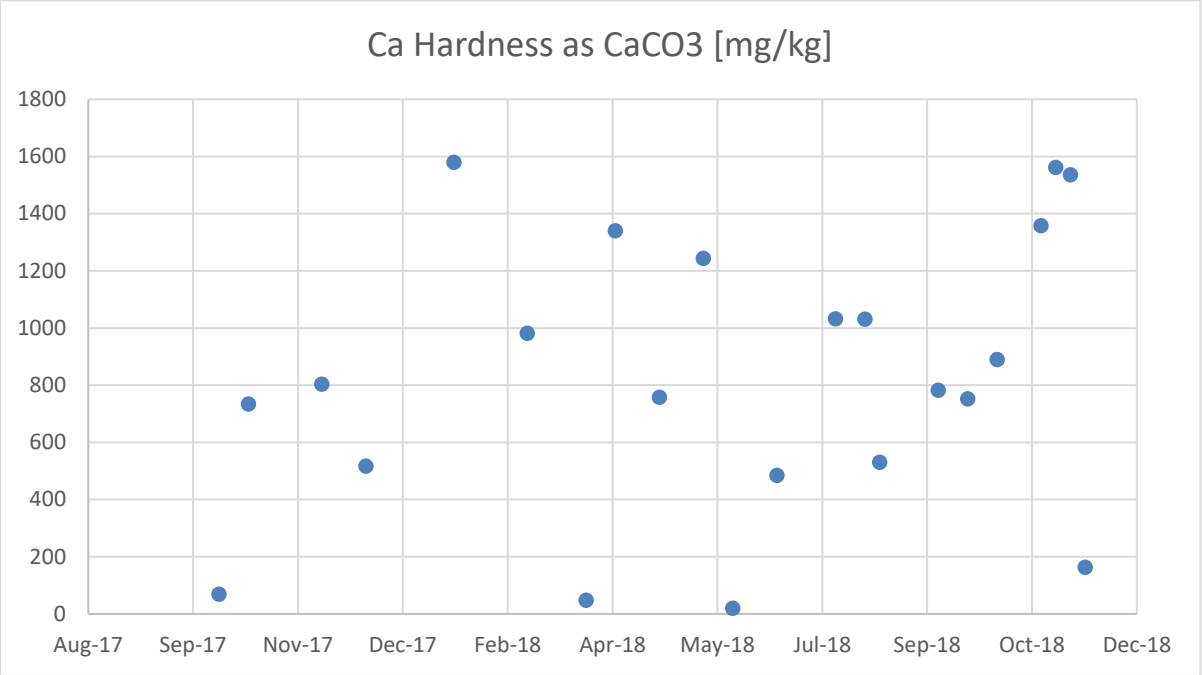


Figure 44: Tutuka SRO Calcium hardness

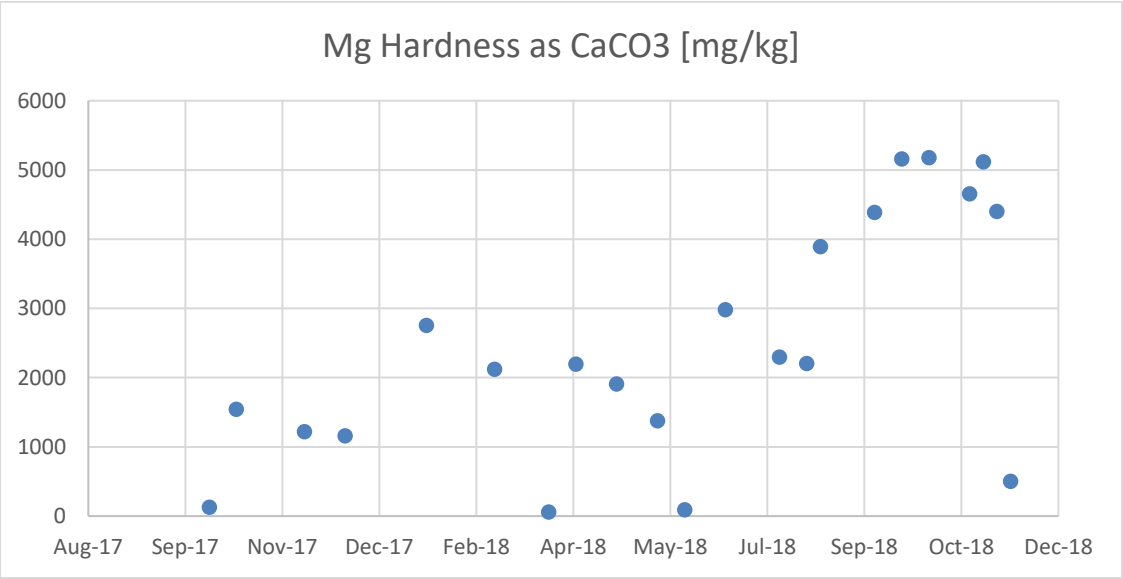


Figure 45: Tutuka SRO brine magnesium hardness

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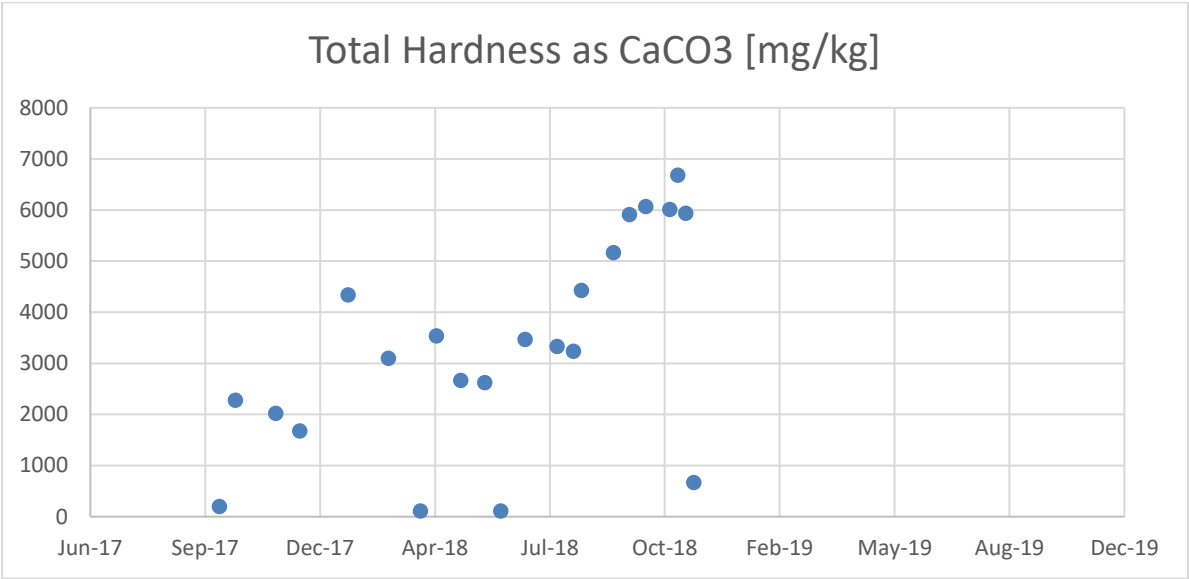


Figure 46: Tutuka SRO total hardness

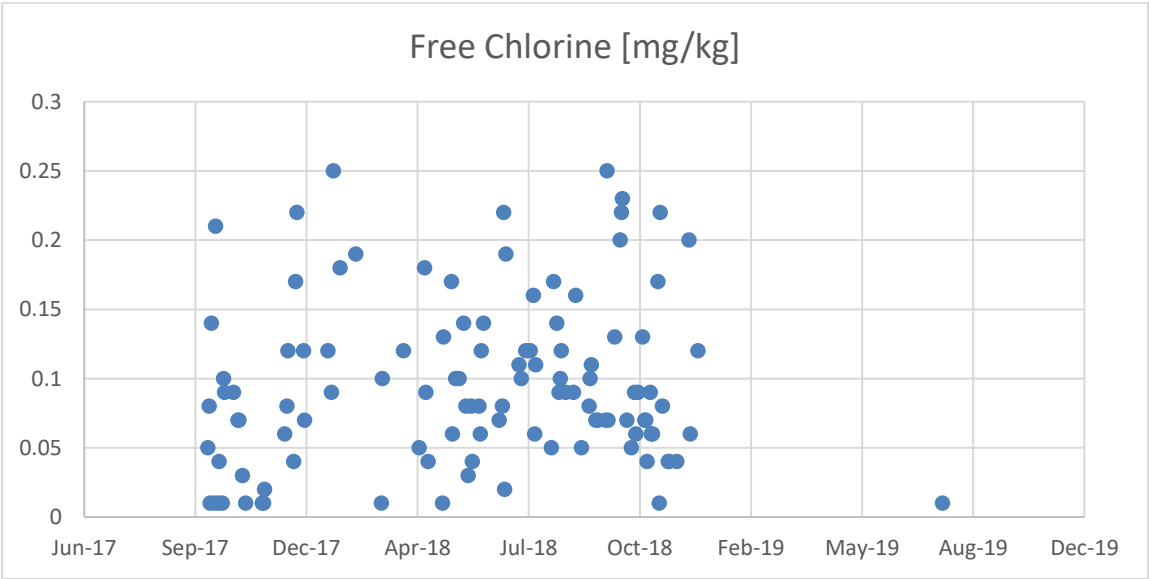


Figure 47: Tutuka SRO brine Free chlorine

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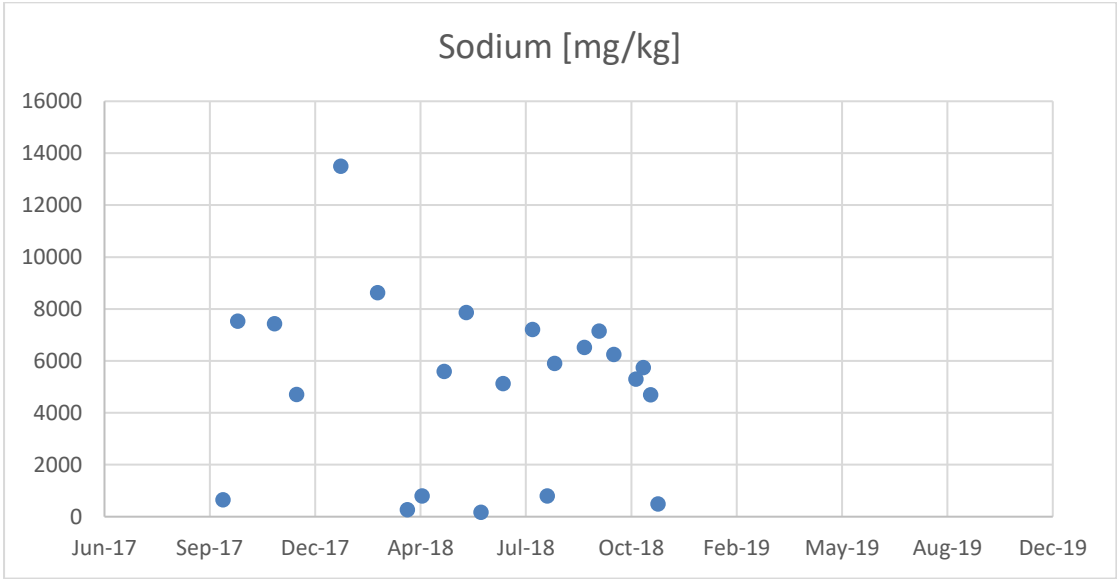


Figure 48: Tutuka SRO sodium concentration

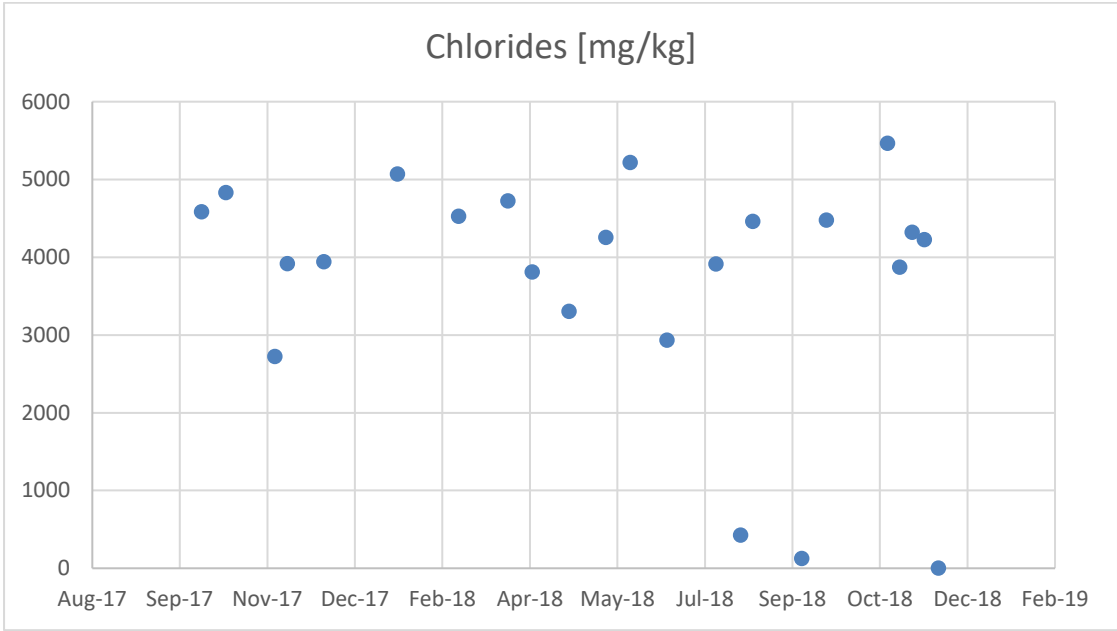


Figure 49: Tutuka SRO chlorides concentration

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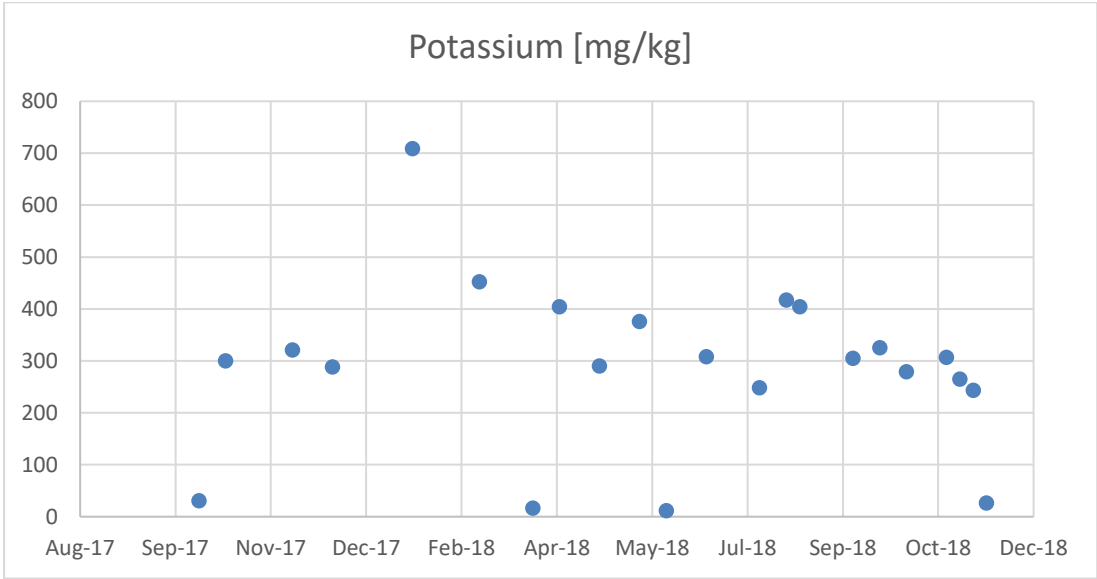


Figure 50: Tutuka SRO potassium concentration

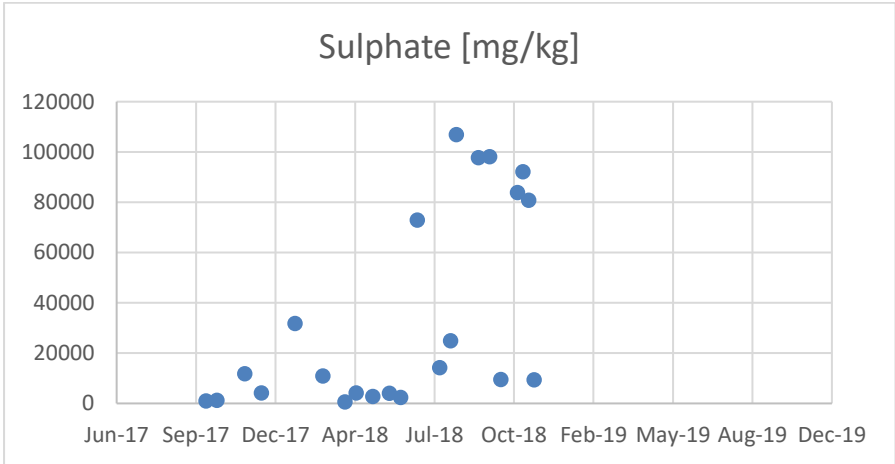


Figure 51: Tutuka SRO sulphate concentration

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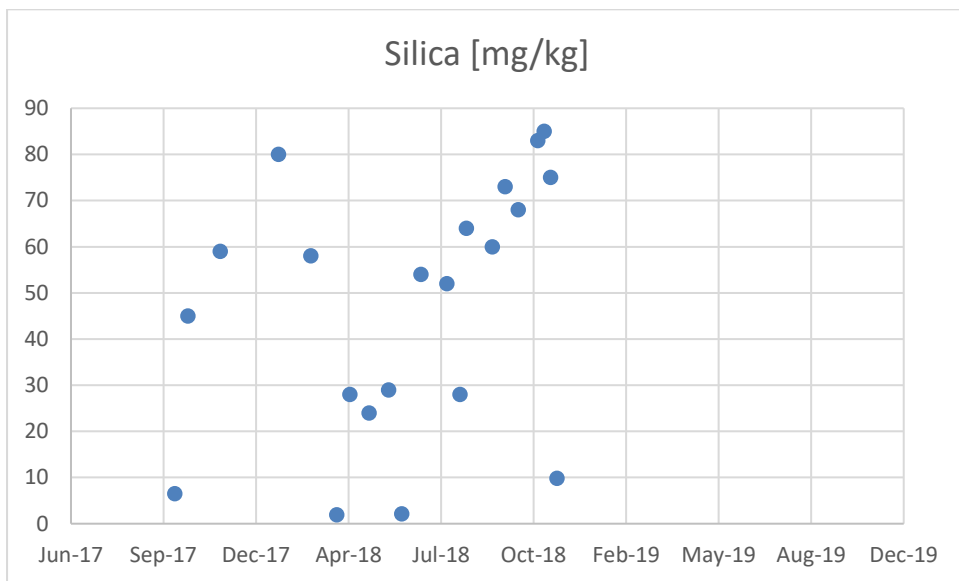


Figure 52: Tutuka SRO silica concentration

a. CW sidestream/blowdown

Water from the concentrated cooling water system is blown down when the water quality is out of specification with respect to the limits in the Eskom Cooling Water Chemistry standard. There are times when the water cannot be blown down because of high water levels in the ash system. The water then concentrates out of specification which exacerbates the scaling potential of the water and results in scaling of the cooling water system. Currently, lime softening treatment has been employed at many stations to treat the concentrated cooling water on a side stream. These plants have however been found to be problematic and are often out of service. Since this water is not as saline as the other waters being tested, this stream will be tested for sensitivity analysis purposes.

The typical range of water quality for treatment from the CCW at Kriel is as indicated below:

Table 7: Concentrated Cooling water (Kriel Power Station)

Parameter	Unit	Kriel CW South			Kriel CW north		
		Range	Average	95 th percentile	Range	Average	95 th percentile

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		Kriel CW South			Kriel CW north		
pH	-	6.9 - 9.0	8.4	8.6	7.6 - 8.9	8.6	8.8
Conductivity	µS/cm	1.5 - 32680	2393	3440	0.3 – 24560	2448.6	3620
Turbidity	NTU	4.4 - 323	21.1	36.4	2.4 – 253	17.7	32.4
TSS	mg/kg	14.5 - 37.8	25	36.1	10.4 - 31.1	19.6	30.9
CCPP as CaCO ₃	mg/kg	4.2 - 61.8	26.8	45.3	6.5 - 103.8	34.1	62.5
Calcium Hardness as CaCO ₃	mg/kg	123 - 635	319.4	483	77.5 – 3565	287.3	426.1
Magnesium Hardness as CaCO ₃	mg/kg	4.7 - 575	285.1	479.6	78.1 – 1192	346	597.6
Total Hardness as CaCO ₃	mg/kg	255 - 1120	604.6	911.6			
m-alkalinity	mg/kg	0 - 1236	118.5	168.4	9.8 – 2060	133.6	195.9
p-alkalinity	mg/kg	0 - 50.8	3.3	8.0	0 - 33.4	6.8	12.7
Sodium	mg/kg	101 - 517	274.4	414.6	10.1 – 1131	296.1	454.5
Potassium	mg/kg	25 - 136	72.7	110.2	5.1 – 252	81.1	131.0

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		Kriel CW South			Kriel CW north		
Chloride	mg/kg	12.1 – 310	161.4	252.4	16 – 419	180.2	288.0
Sulphate	mg/kg	240 - 1483	762.8	1175.3	23.7 – 1882	759.1	1229.8
Nitrates	mg/kg	1 - 17.6	4.4	7.7	0.2 – 107	5	8
Phosphates	mg/kg	520	520	520			
Silicate at SiO ₂	mg/kg	2 - 20	10.6	15.0	4 – 29	13.1	17
COD	mg/kg	34 - 182	101.8	157.5	27 – 160	111.2	158.5
TOC as C	mg/kg						

The typical range of water quality for treatment from the CCW at Kriel is as indicated below:

Table 7: Concentrated Cooling water (Kriel Power Station)

		Kriel CW South			Kriel CW north		
Parameter	Unit	Range	Average	95 th percentile	Range	Average	95 th percentile
pH	-	6.9 - 9.0	8.4	8.6	7.6 - 8.9	8.6	8.8
Conductivity	µS/cm	1.5 - 32680	2393	3440	0.3 – 24560	2448.6	3620

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		Kriel CW South			Kriel CW north		
Turbidity	NTU	4.4 - 323	21.1	36.4	2.4 – 253	17.7	32.4
TSS	mg/kg	14.5 - 37.8	25	36.1	10.4 - 31.1	19.6	30.9
CCPP as CaCO ₃	mg/kg	4.2 - 61.8	26.8	45.3	6.5 - 103.8	34.1	62.5
Calcium Hardness as CaCO ₃	mg/kg	123 - 635	319.4	483	77.5 – 3565	287.3	426.1
Magnesium Hardness as CaCO ₃	mg/kg	4.7 - 575	285.1	479.6	78.1 – 1192	346	597.6
Total Hardness as CaCO ₃	mg/kg	255 - 1120	604.6	911.6			
m-alkalinity	mg/kg	0 - 1236	118.5	168.4	9.8 – 2060	133.6	195.9
p-alkalinity	mg/kg	0 - 50.8	3.3	8.0	0 - 33.4	6.8	12.7
Sodium	mg/kg	101 - 517	274.4	414.6	10.1 – 1131	296.1	454.5
Potassium	mg/kg	25 - 136	72.7	110.2	5.1 – 252	81.1	131.0
Chloride	mg/kg	12.1 – 310	161.4	252.4	16 – 419	180.2	288.0
Sulphate	mg/kg	240 - 1483	762.8	1175.3	23.7 – 1882	759.1	1229.8

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		Kriel CW South			Kriel CW north		
Nitrates	mg/kg	1 - 17.6	4.4	7.7	0.2 – 107	5	8
Phosphates	mg/kg	520	520	520			
Silicate at SiO ₂	mg/kg	2 - 20	10.6	15.0	4 – 29	13.1	17
COD	mg/kg	34 - 182	101.8	157.5	27 – 160	111.2	158.5
TOC as C	mg/kg						

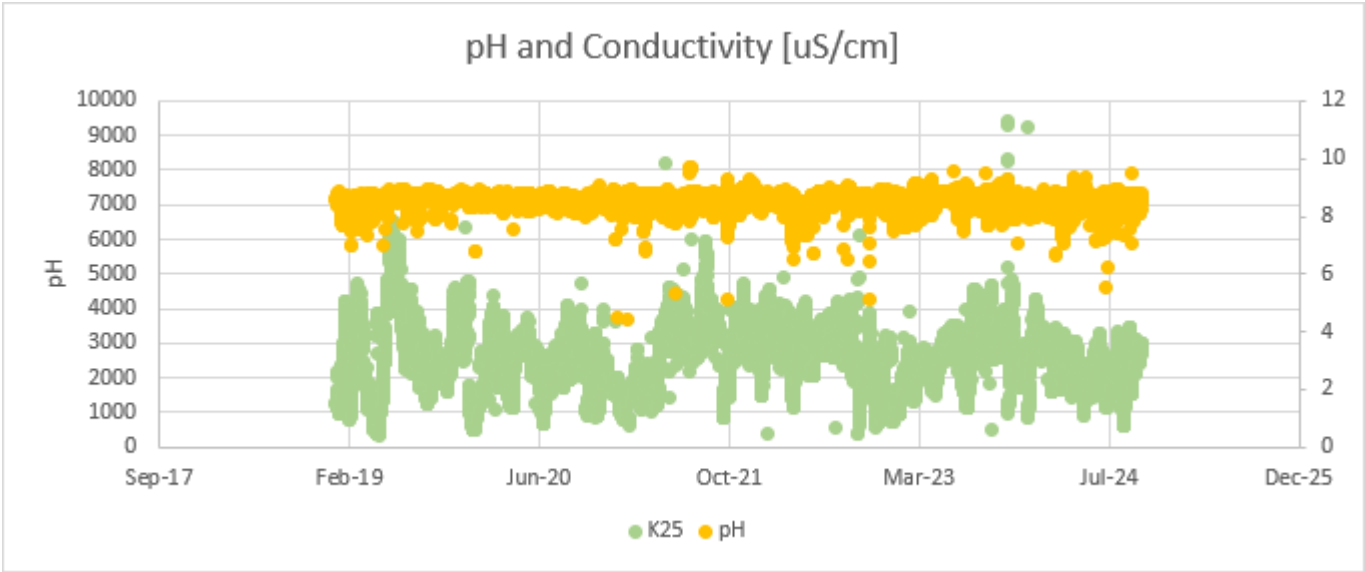


Figure 53: Kriel Cooling water South pH and conductivity

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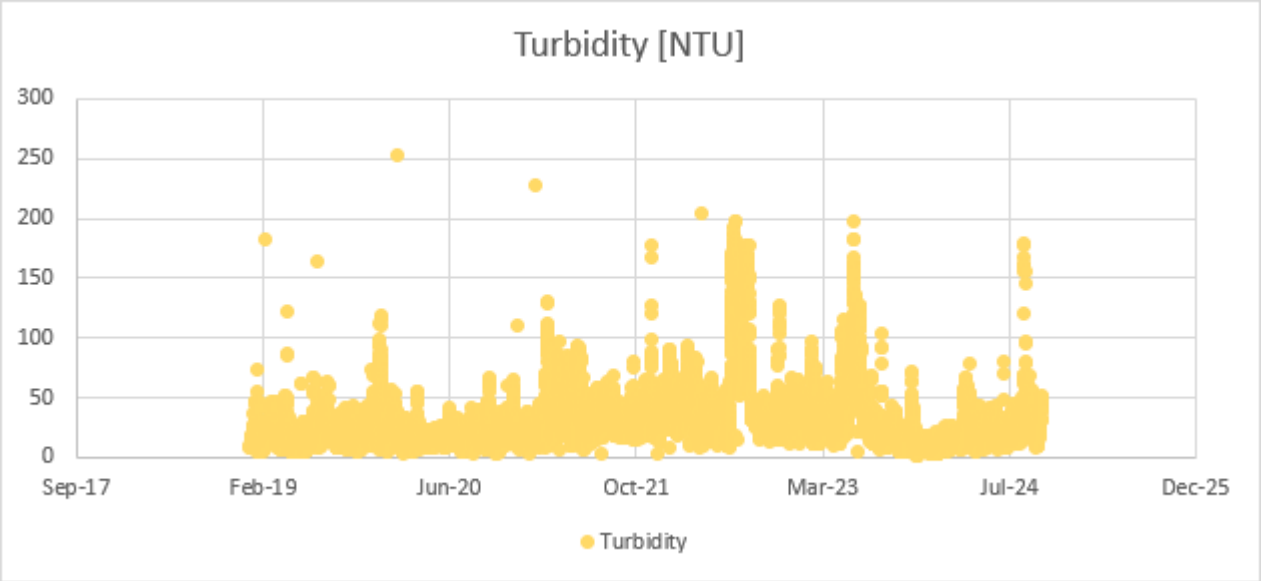


Figure 54: Kriel Cooling water South Turbidity

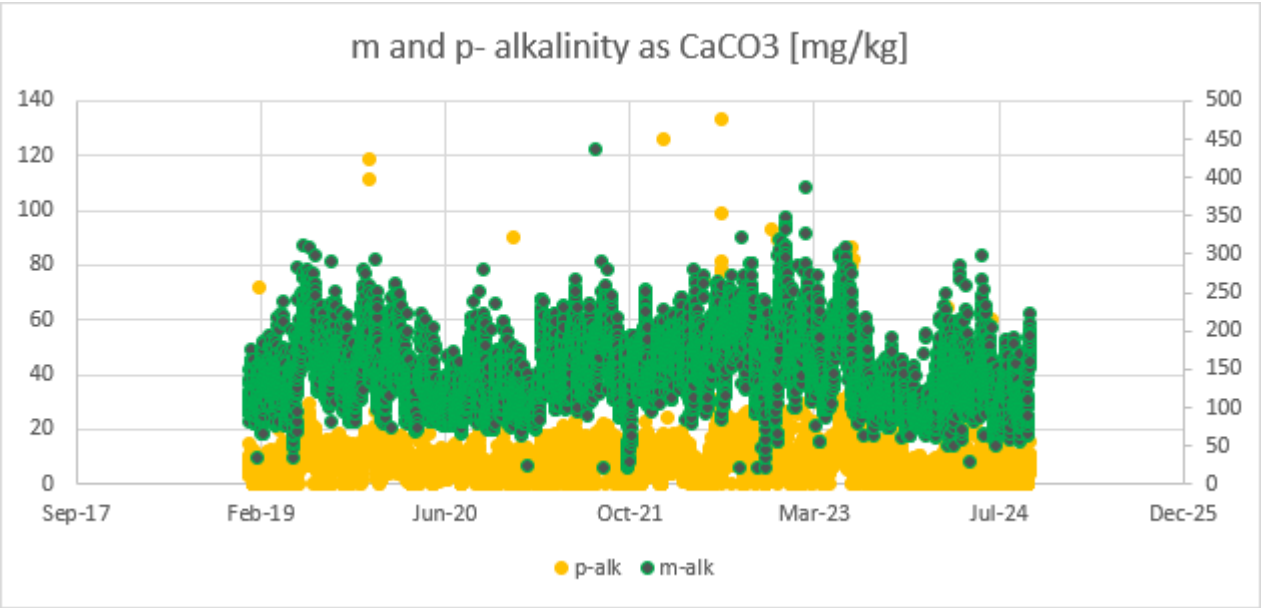


Figure 55: Kriel Cooling water South p-alkalinity and m-alkalinity

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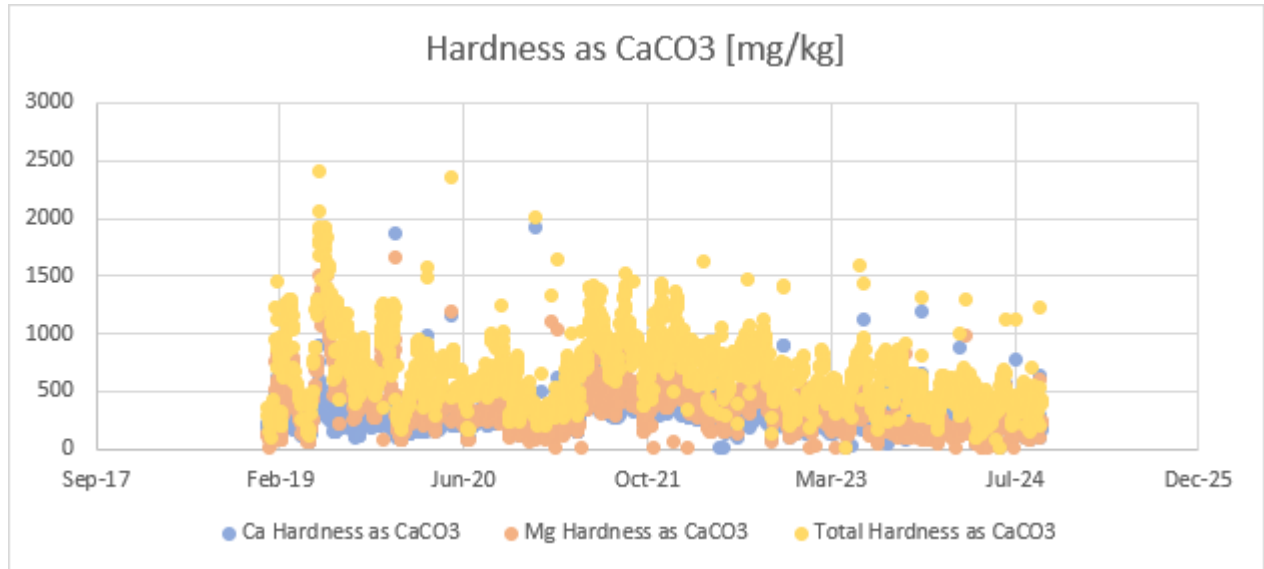


Figure 56: Kriel Cooling water South Hardness

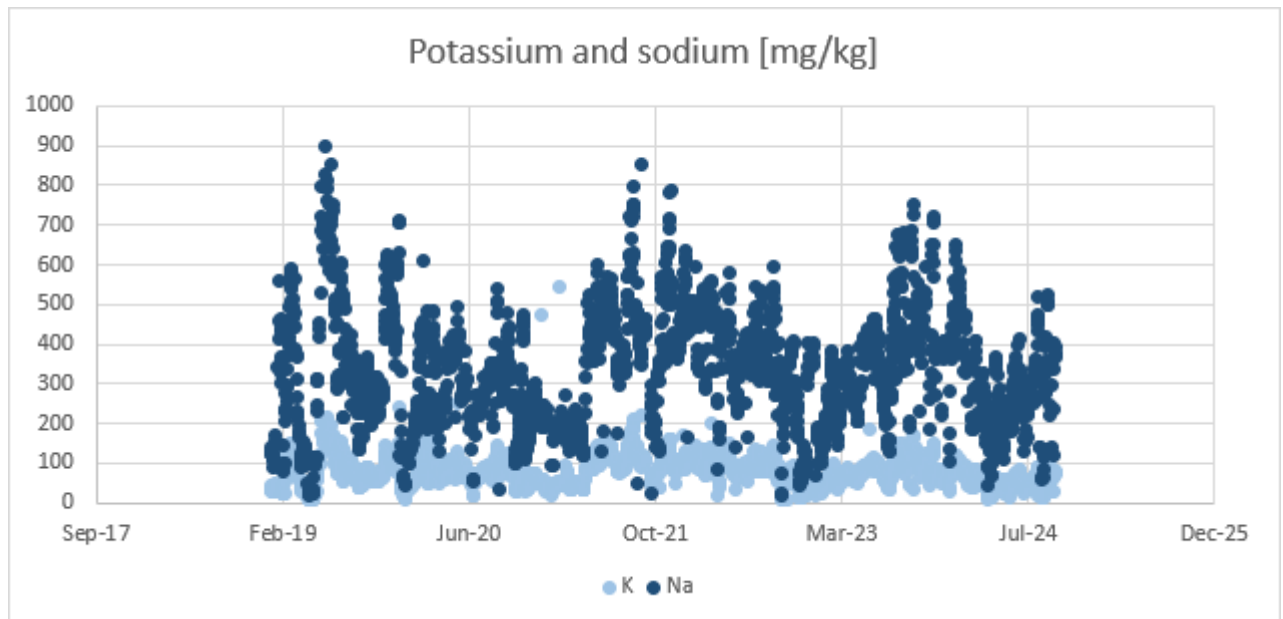


Figure 57: Kriel Cooling water South Potassium and sodium

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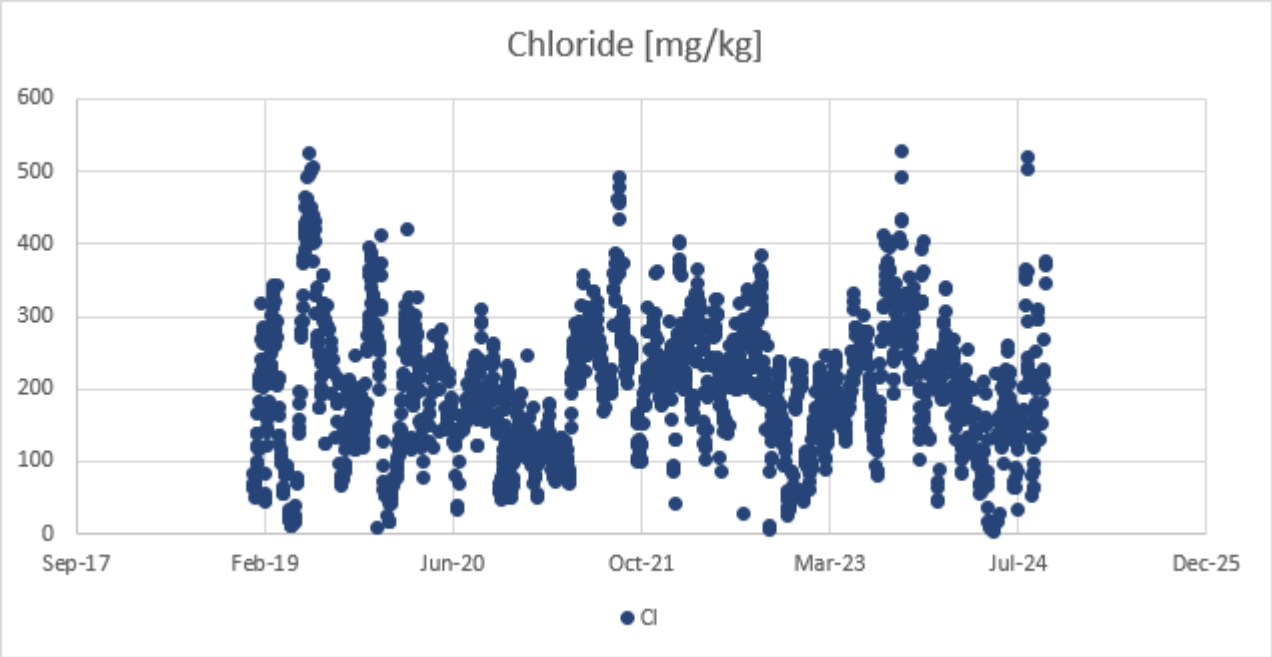


Figure 58: Kriel Cooling water South Chloride

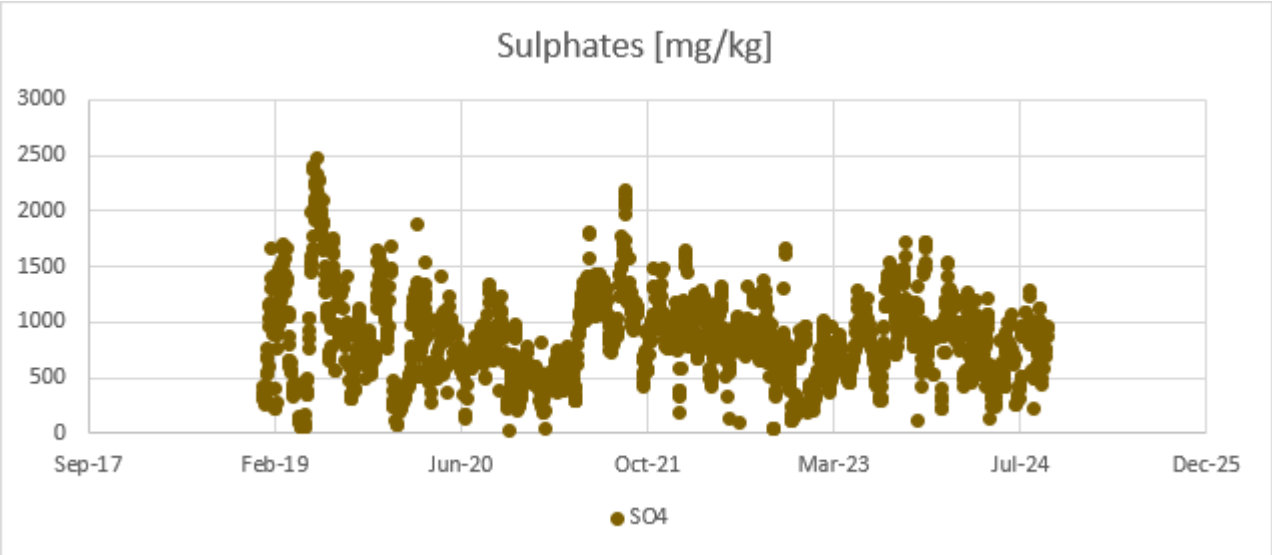


Figure 59: Kriel Cooling water South pH and sulphate

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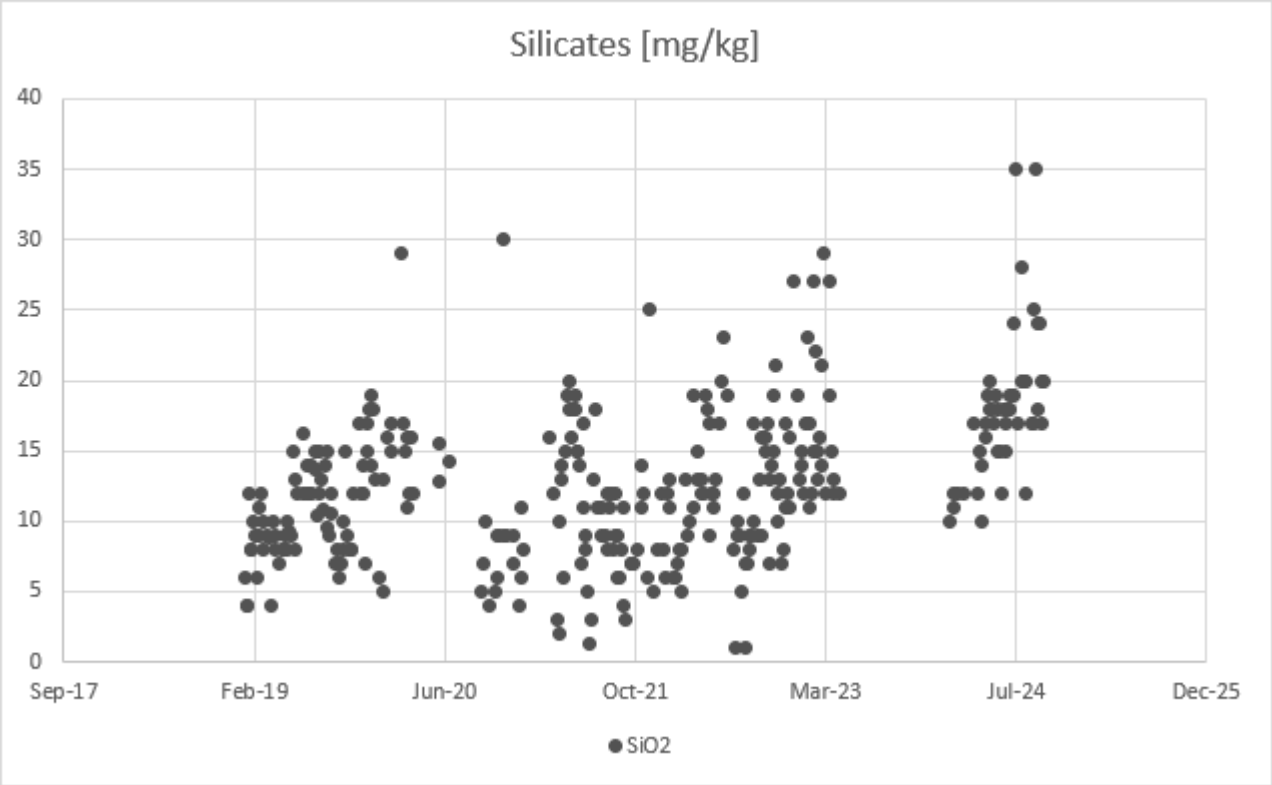


Figure 60: Kriel Cooling water South silicate

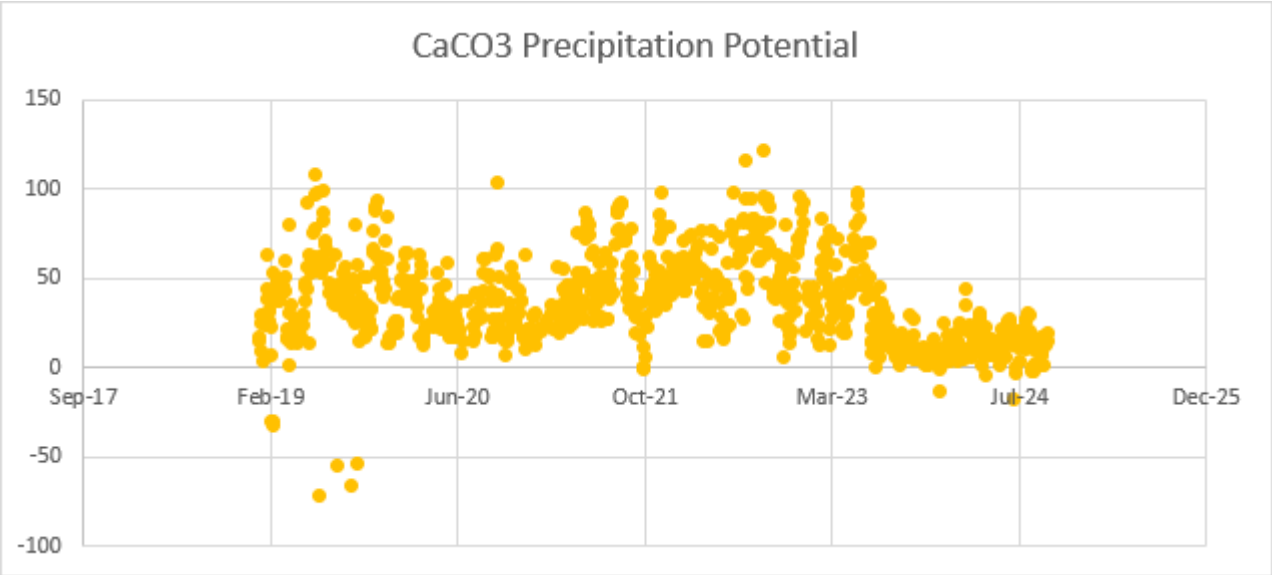


Figure 61: Kriel Cooling water South Calcium Carbonate Precipitation Potential

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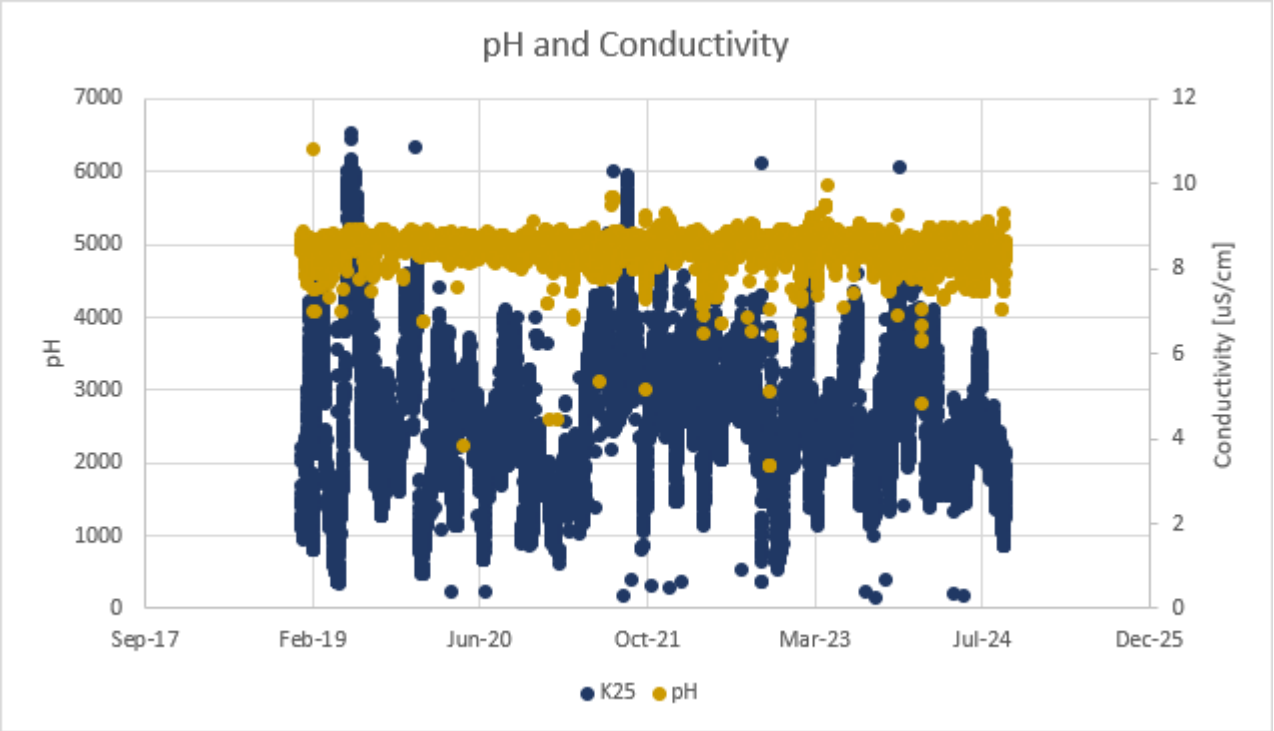


Figure 62: Kriel Cooling water North pH and conductivity

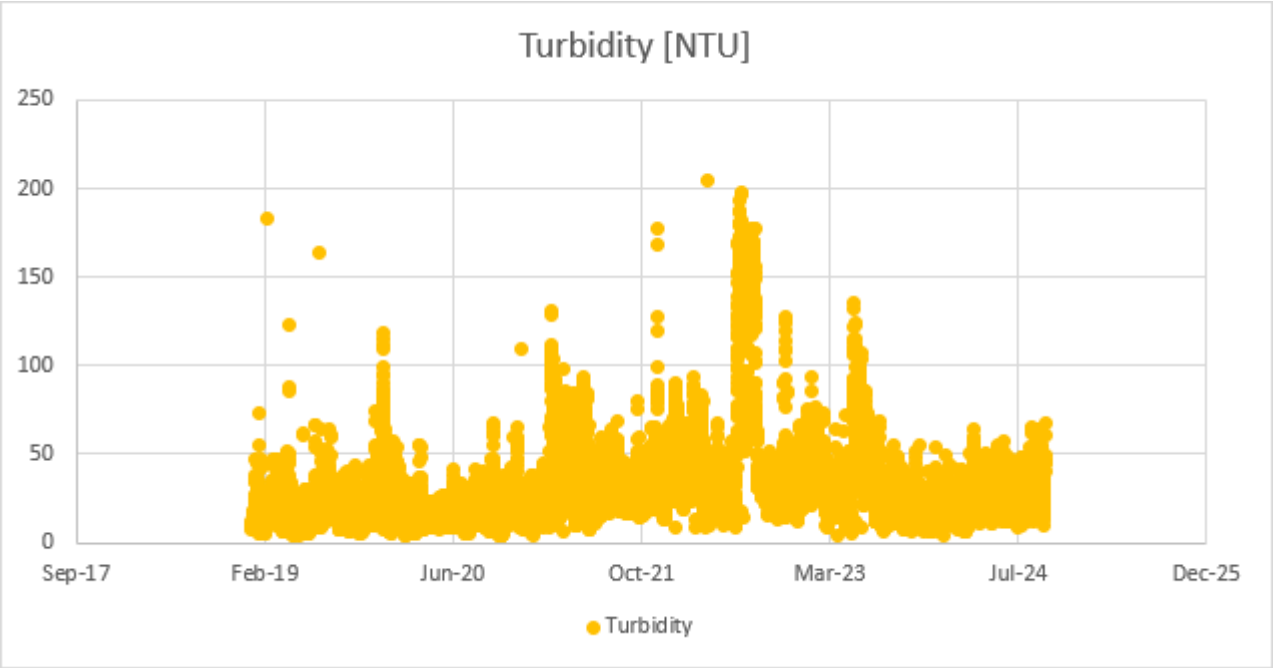


Figure 63: Kriel Cooling water North turbidity

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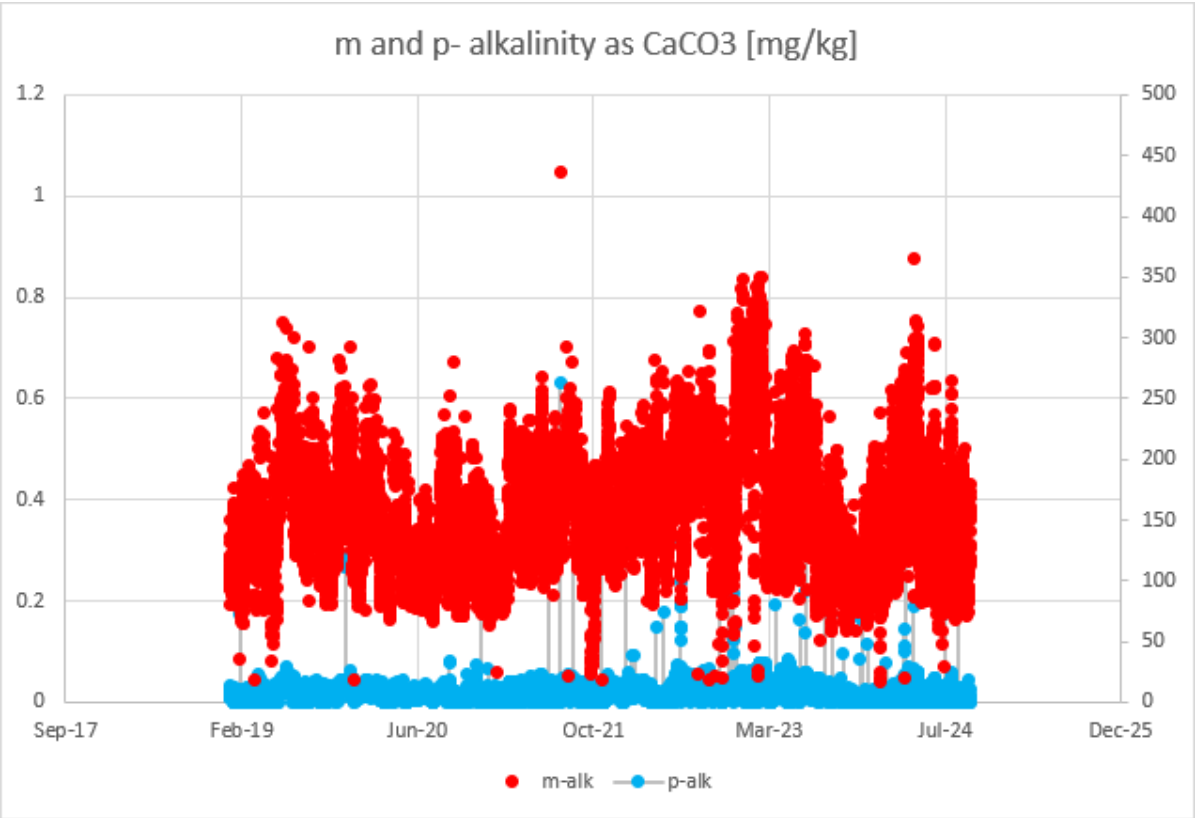


Figure 64: Kriel Cooling water North m-alkalinity and p-alkalinity

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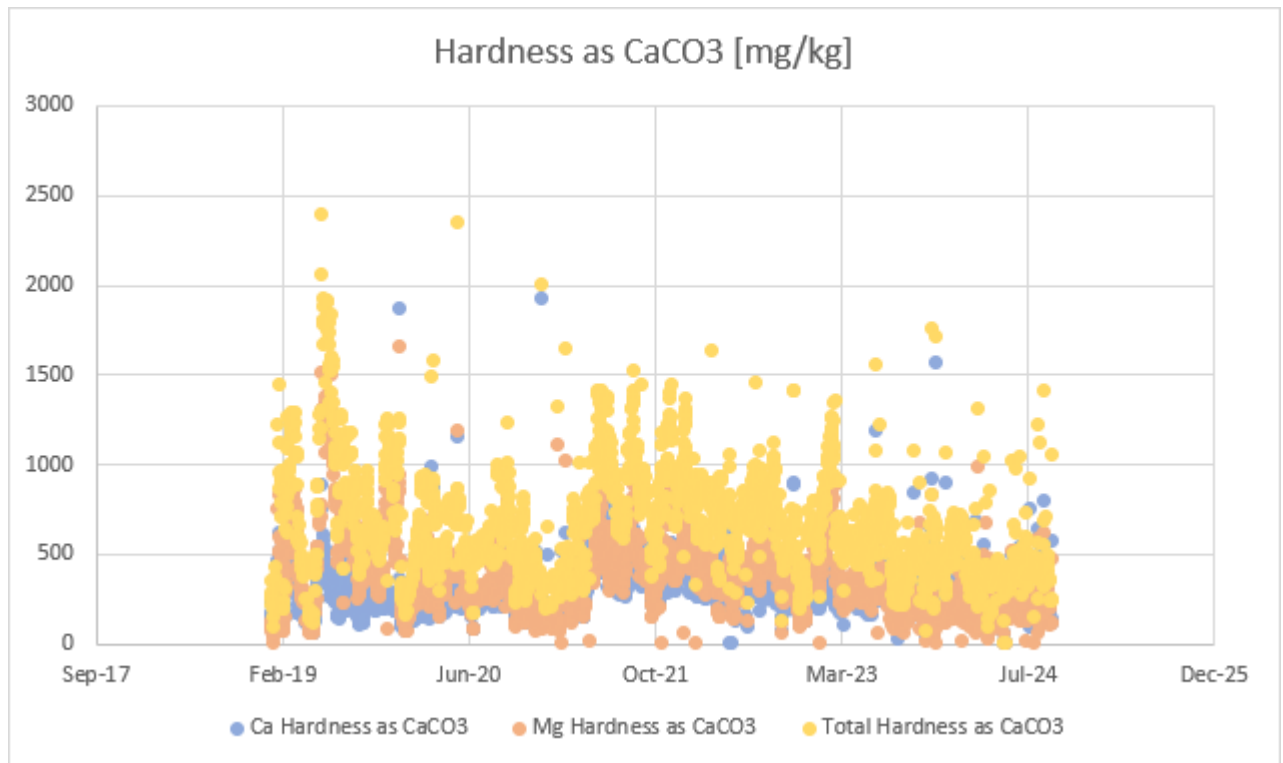
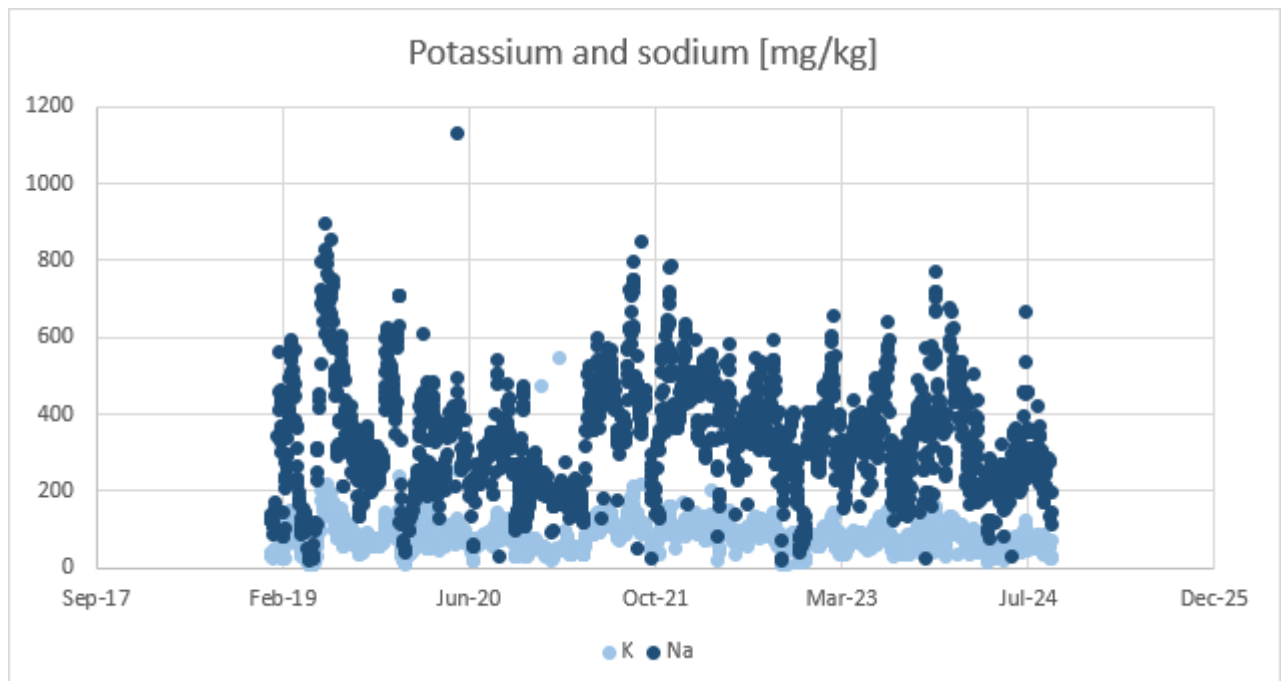


Figure 65: Kriel Cooling water North hardness



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Figure 66: Kriel Cooling water North Potassium and Sodium

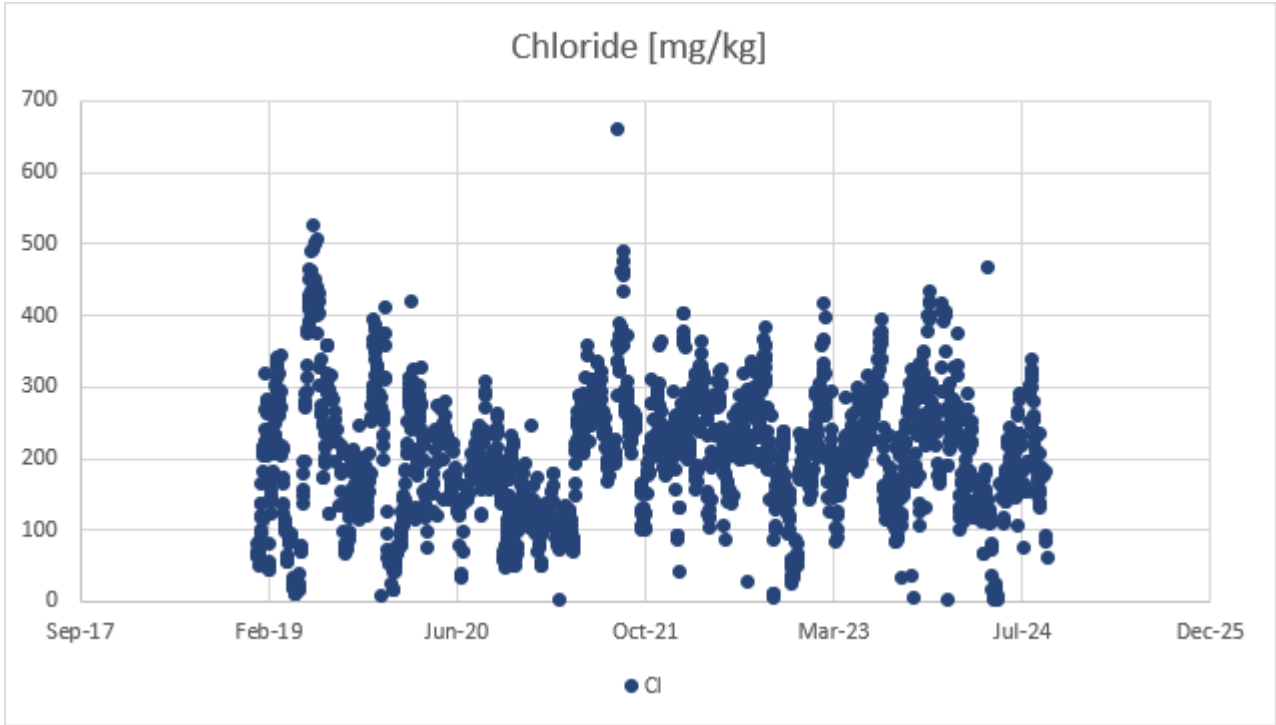


Figure 67: Kriel Cooling water North Chlorides

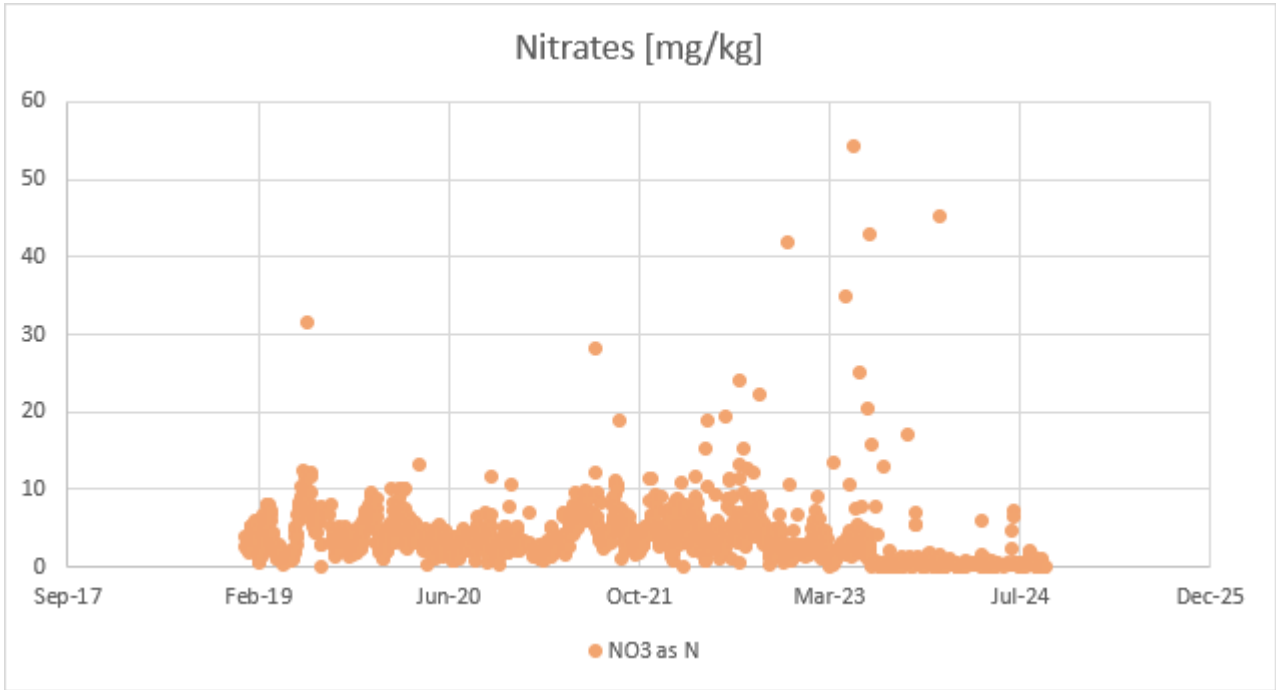


Figure 68: Kriel Cooling water North Nitrates

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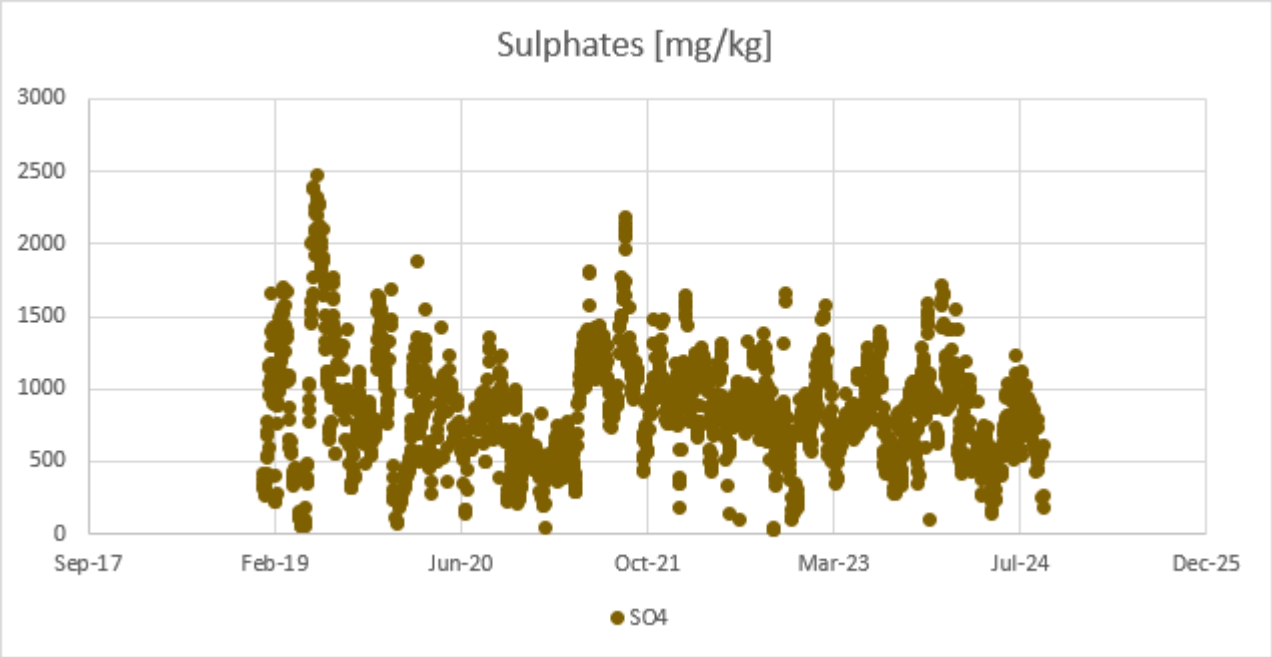


Figure 69: Kriel Cooling water North Sulphates

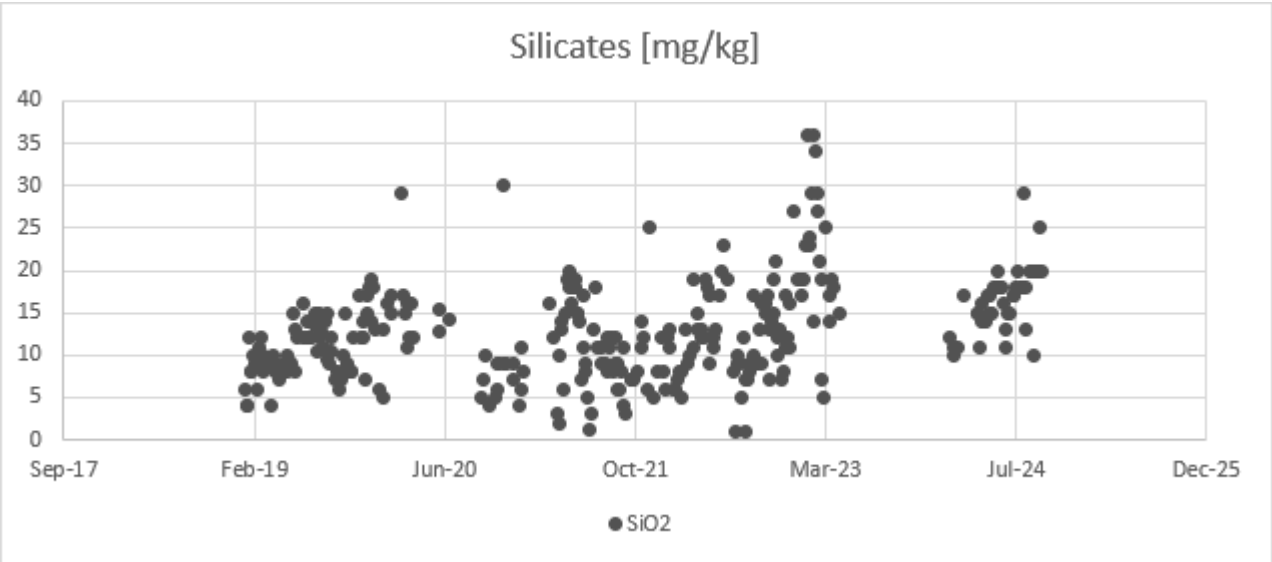


Figure 70: Kriel Cooling water North Silicates

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Table 8: Concentrated Cooling water (Tutuka Power Station)

Parameter	Unit	Tutuka CW East			Tutuka CW west		
		Range	Average	95 th percentile	Range	Average	95 th percentile
pH	-	6.2 – 12.31	8.84	9.54	6.05 – 12	8.91	9.59
Conductivity	µS/cm	292 - 52700	52700	9332	178 – 48209	8512	25734
Turbidity	NTU	1.69 - 359	71.08	191.85	0.872 – 279	33.1	82.5
CCPP as CaCO ₃	mg/kg	0 – 3332	139.9	558	-1.4 – 174.6	52.02	119.2
Calcium Hardness as CaCO ₃	mg/kg	0 – 3332	139.93	558	2.49 – 1740	101.89	340.3
Magnesium Hardness as CaCO ₃	mg/kg	0 – 3449	413.53	1634.75	0 – 2060	301.69	981.2
Total Hardness as CaCO ₃	mg/kg	37.7 - 4960	1063.27	3386	10.4 - 3119	656.28	2319.3
m-alkalinity	mg/kg	0 – 4720	276.89	720	0 – 1528	301.2	604.03
p-alkalinity	mg/kg	0 – 3519	37.64	171.85	0 – 939	36.67	145.12
Sodium	mg/kg	0.01 - 11040	1967.8	6522	0.01 – 5972	1456.25	4719.7
Potassium	mg/kg	0.3 - 1183	109.77	313.6	0.01 – 834	74.2	252.75
Chloride	mg/kg	14.6 – 5080	736.87	3213.5	0 – 8900	753.15	2336.7
Sulphate	mg/kg	0.06 - 34290	3612.68	17164	0 – 16845	2728.02	10136
Nitrates	mg/kg	0.01 – 101	17.35	64.15	0 – 78.9	10.69	46.1
Phosphates	mg/kg	0.01 - 1810	33.59	139.83	0.01 - 1015	11.13	11.26
Silicate at SiO ₂	mg/kg	0.01 - 130	36.65	90	1.3 – 126	20.83	49.98
TOC	mg/kg	0.44 - 135	30.66	76.46	0 – 73	18.78	43.09

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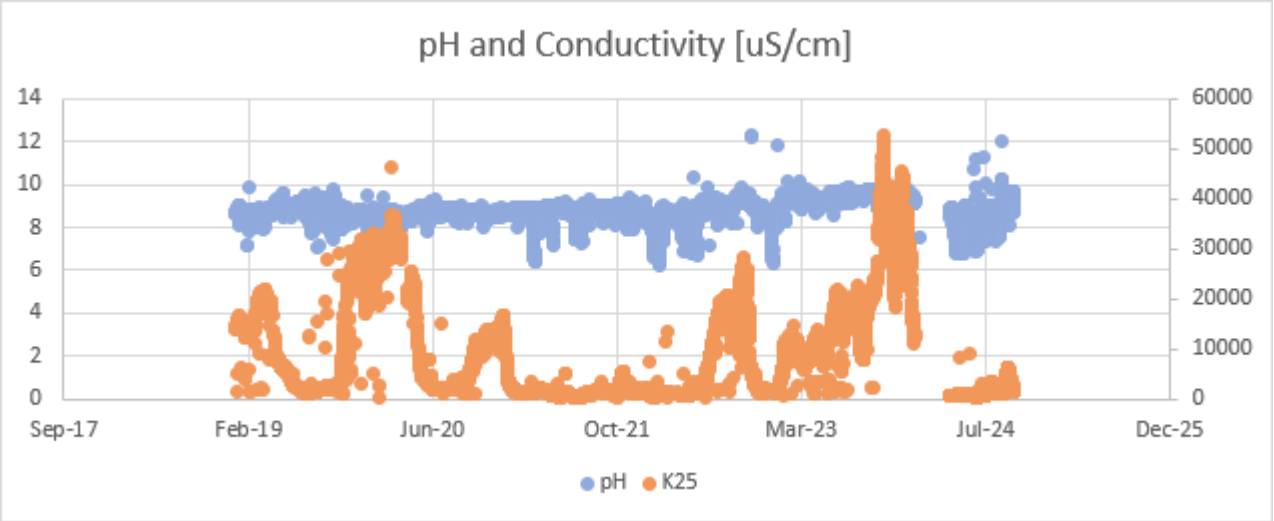


Figure 71: Tutuka Cooling water East pH and Conductivity

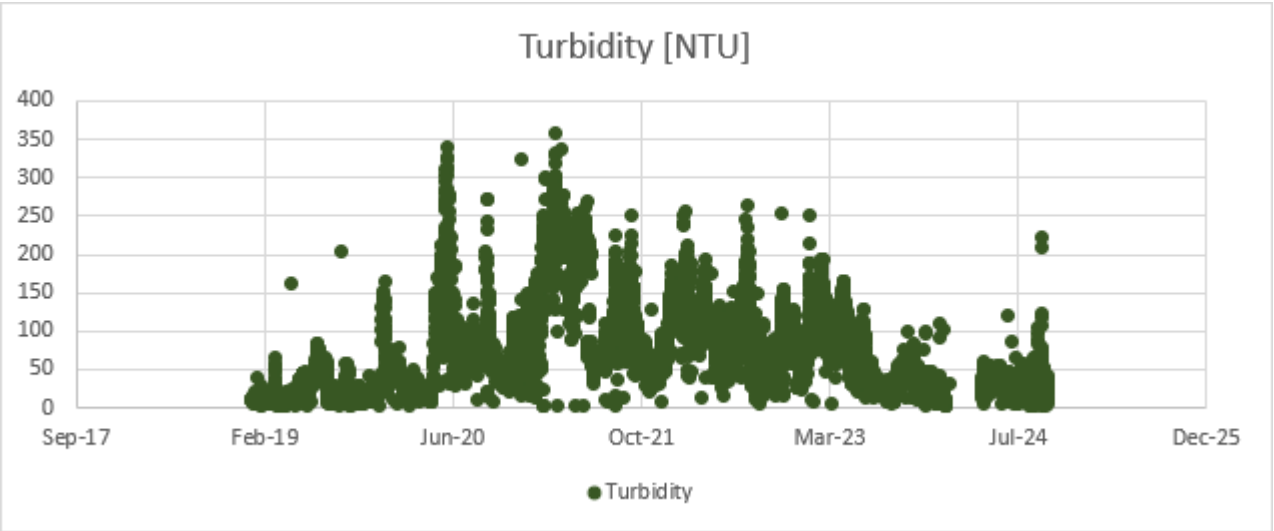


Figure 72: Tutuka Cooling water East Turbidity

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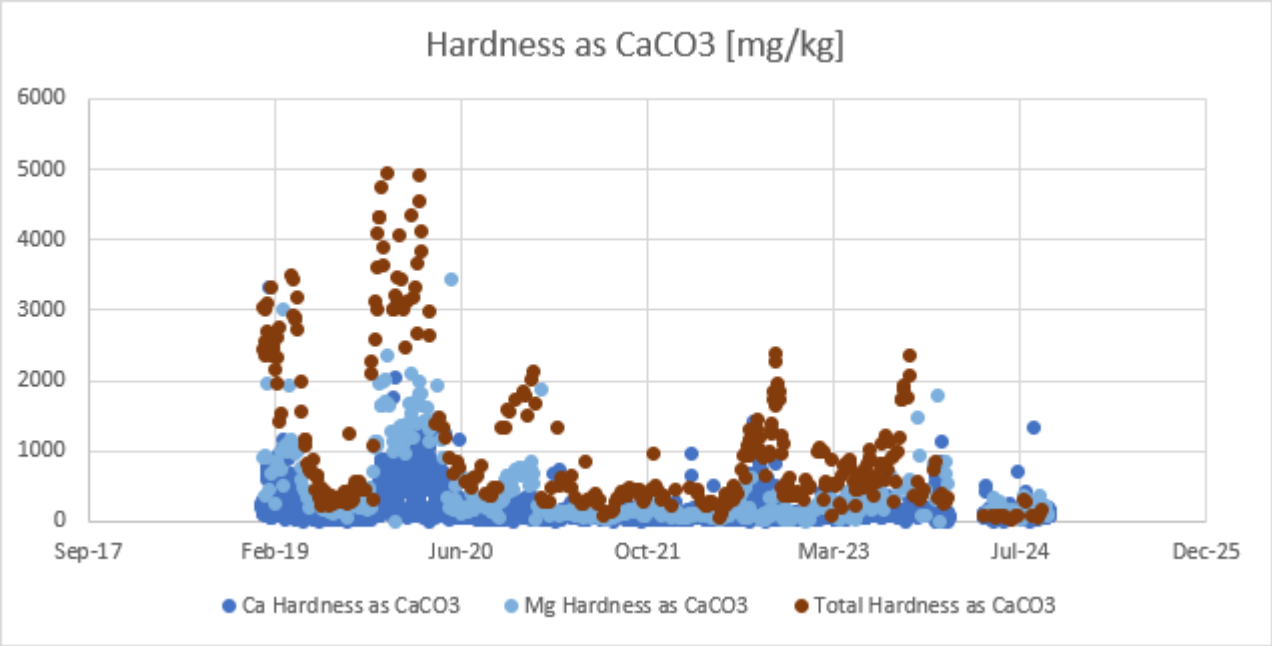


Figure 73: Tutuka Cooling water East Hardness

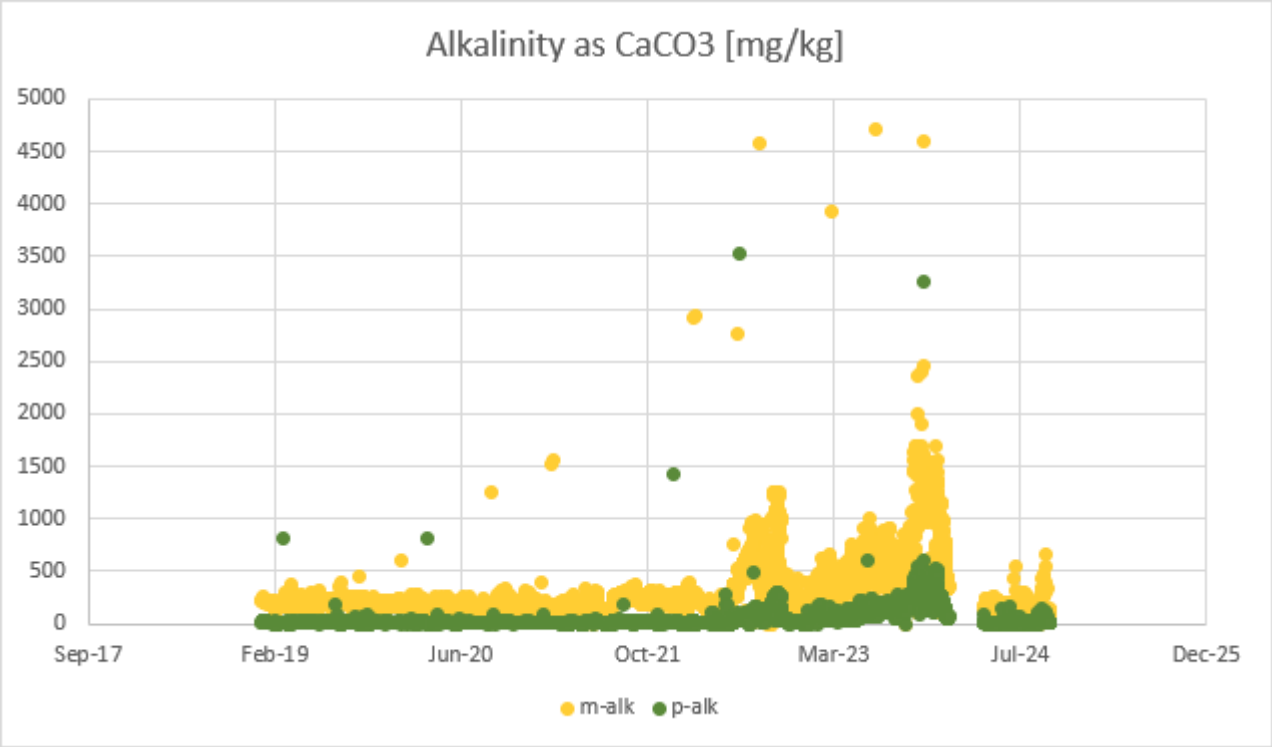


Figure 74: Tutuka Cooling water East Alkalinity

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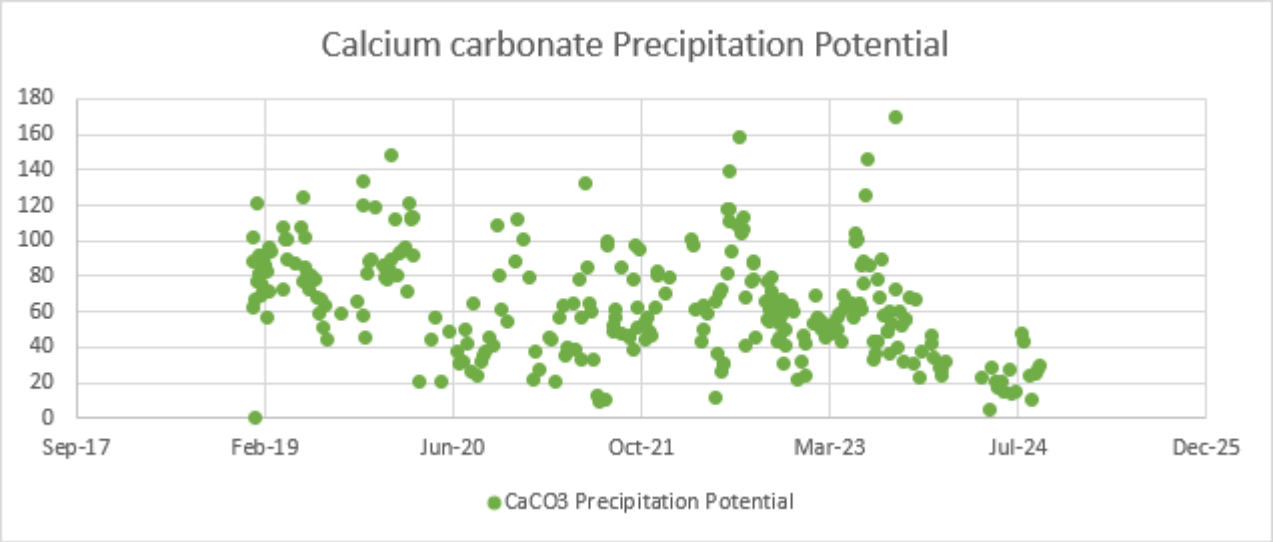


Figure 75: Tutuka Cooling water East Calcium carbonate precipitation potential

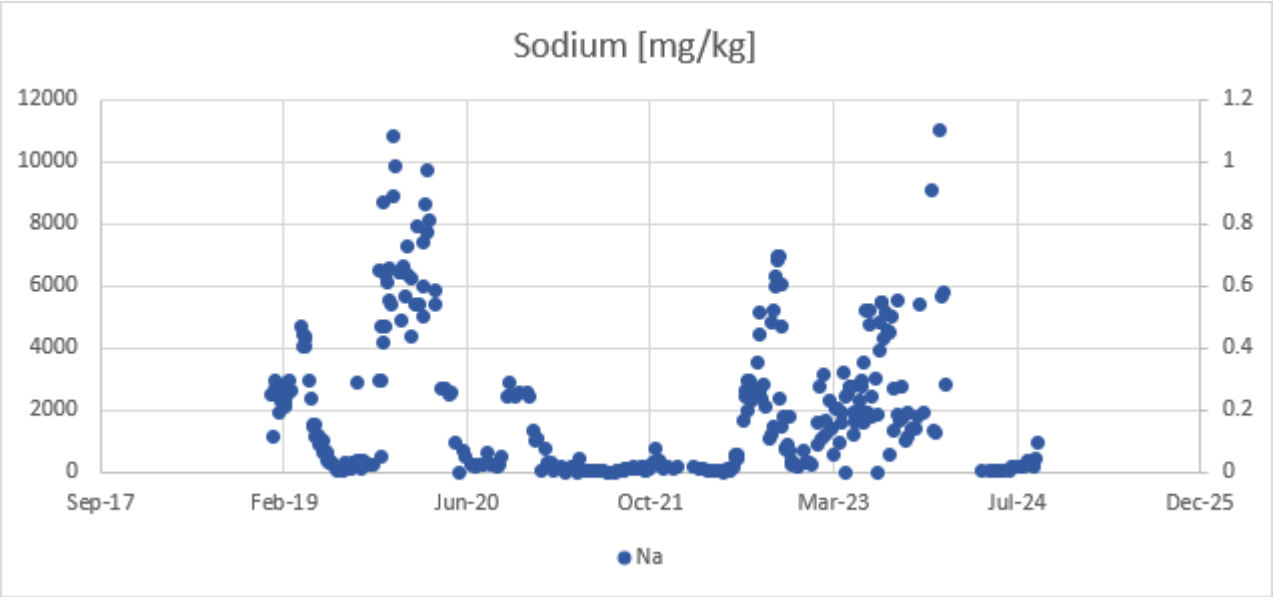


Figure 76: Tutuka Cooling water East Sodium

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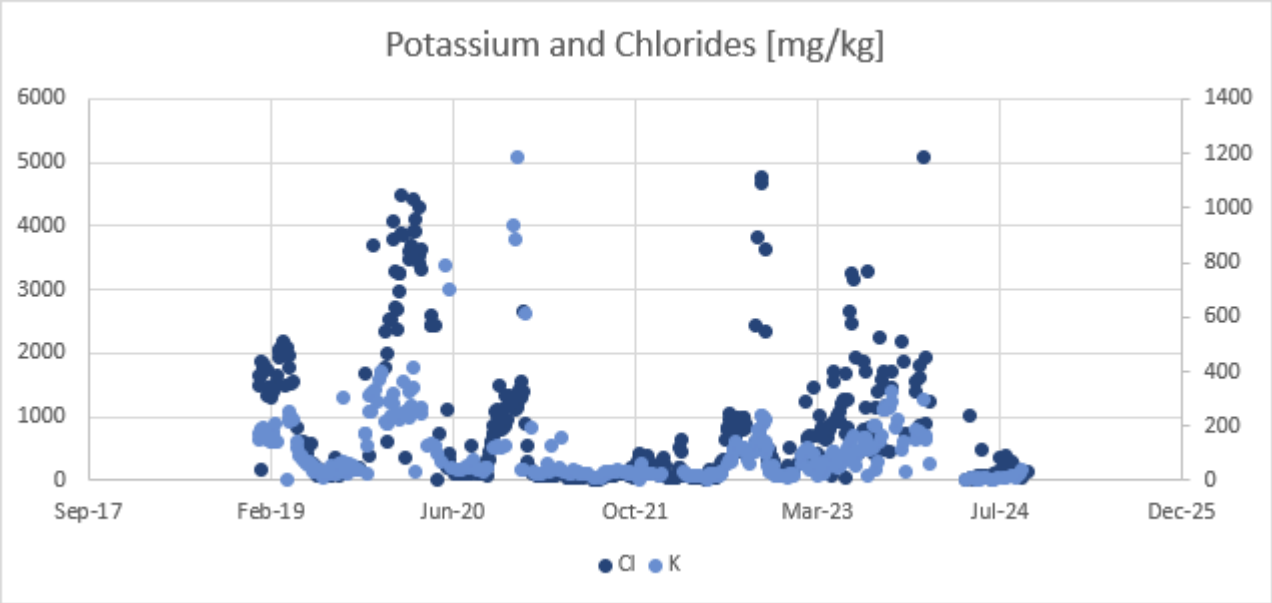


Figure 77: Tutuka Cooling water East Chlorides and Potassium

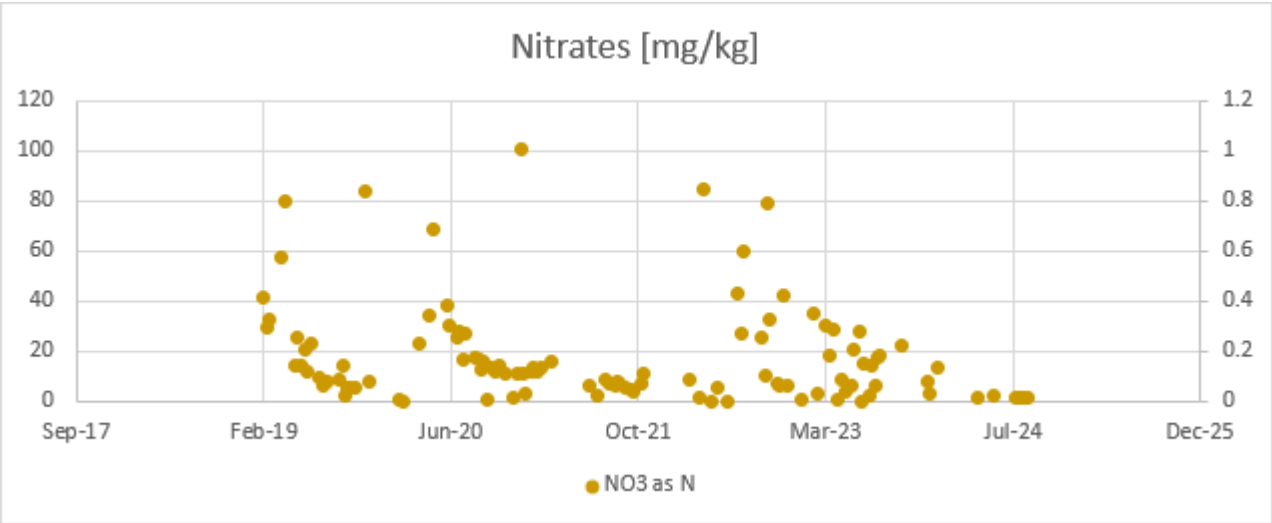


Figure 78: Tutuka Cooling water East Nitrates

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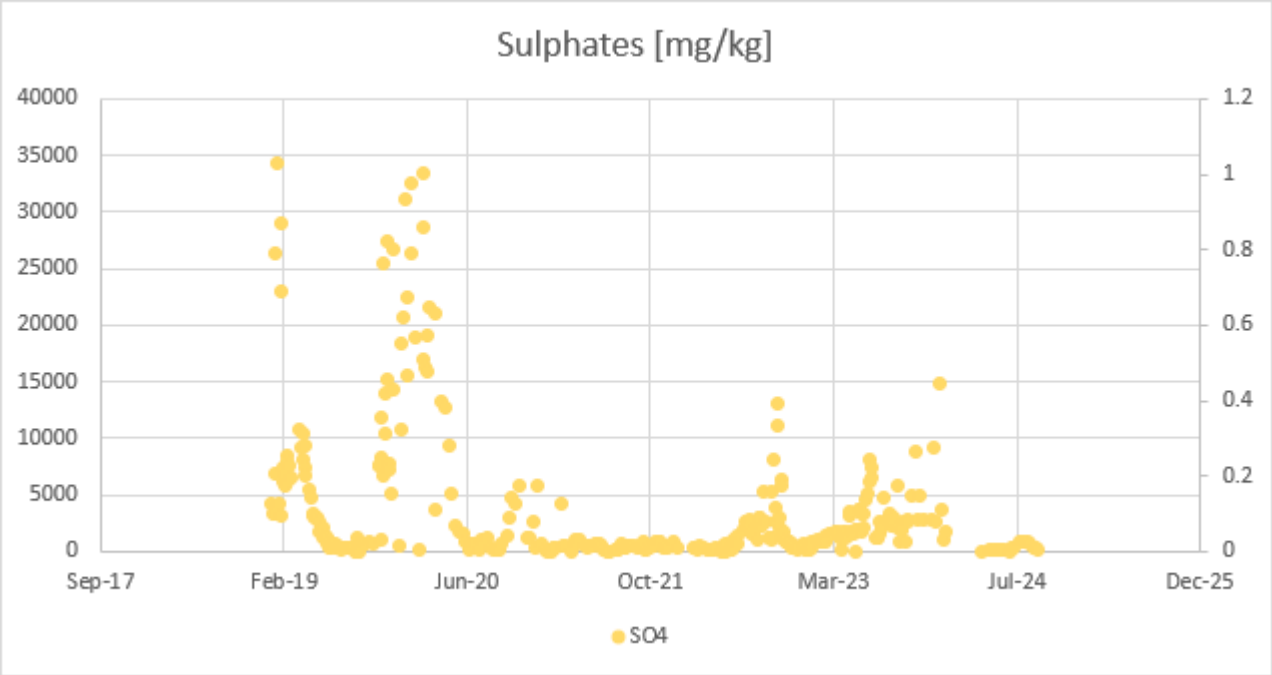


Figure 79: Tutuka Cooling water East Sulphates

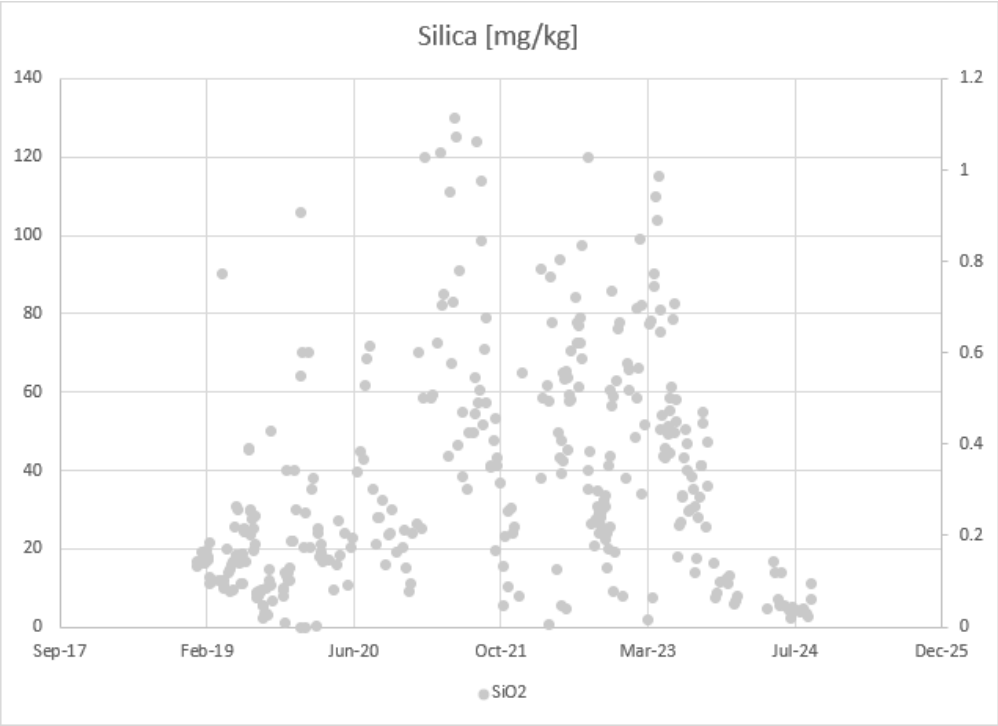


Figure 80: Tutuka Cooling water East Silicates

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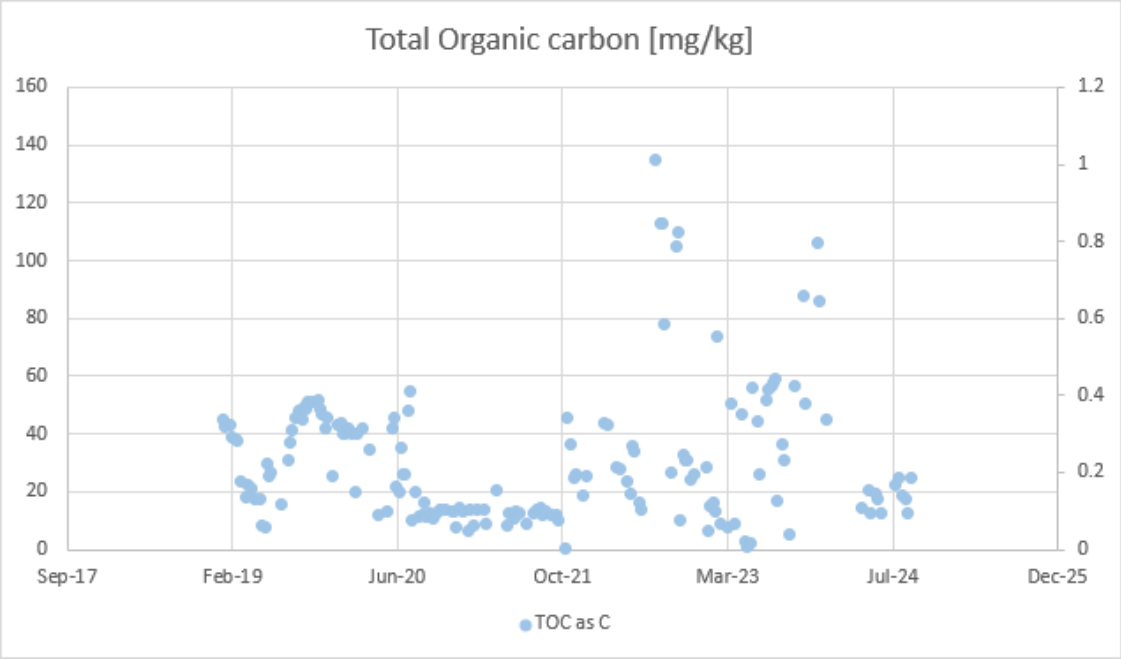


Figure 81: Tutuka Cooling water East Total organic carbon

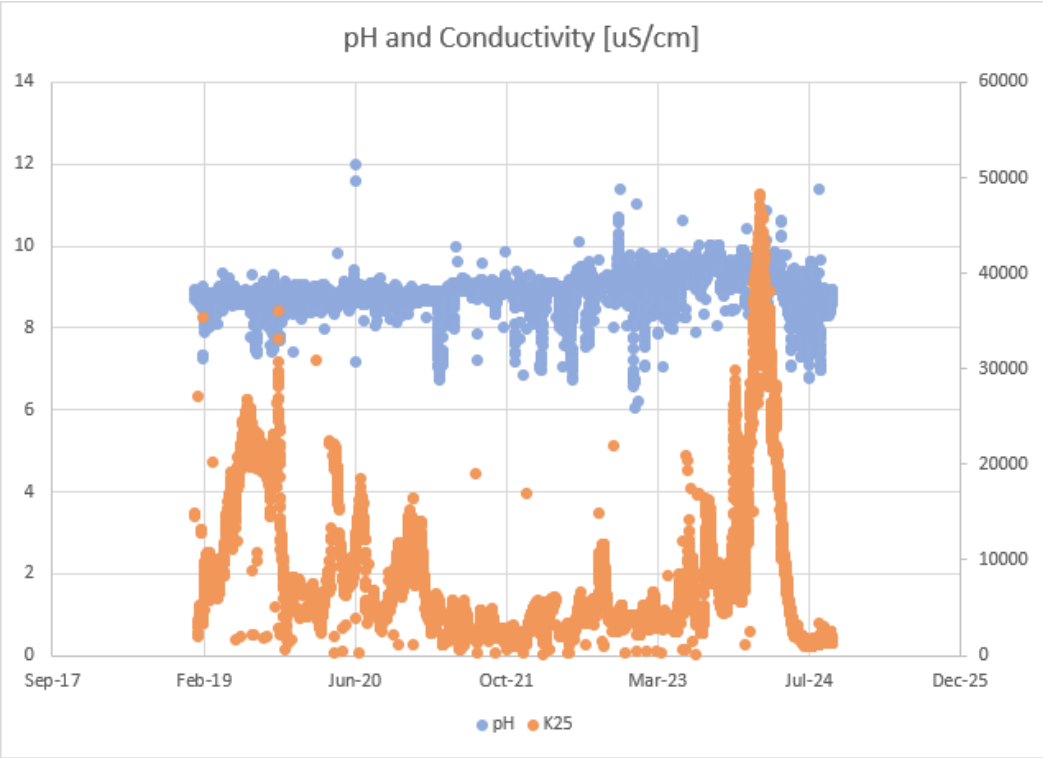


Figure 82: Tutuka Cooling water West pH and conductivity

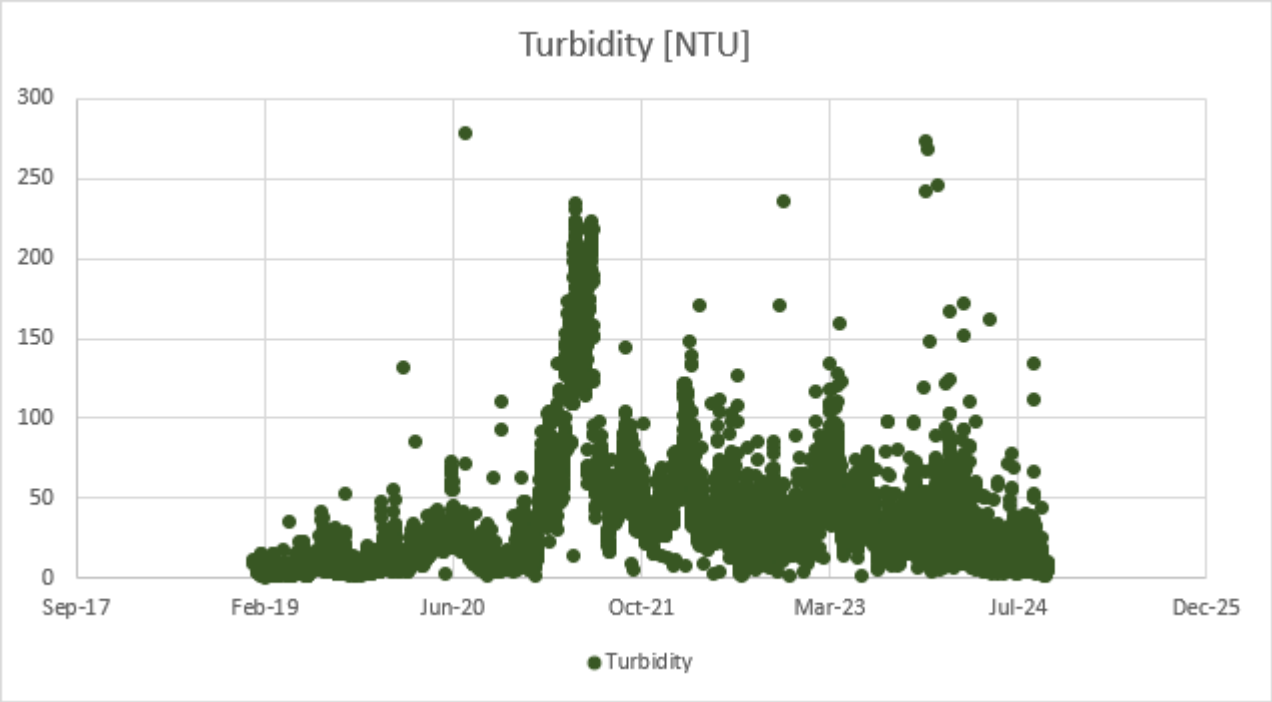


Figure 83: Tutuka Cooling water West turbidity

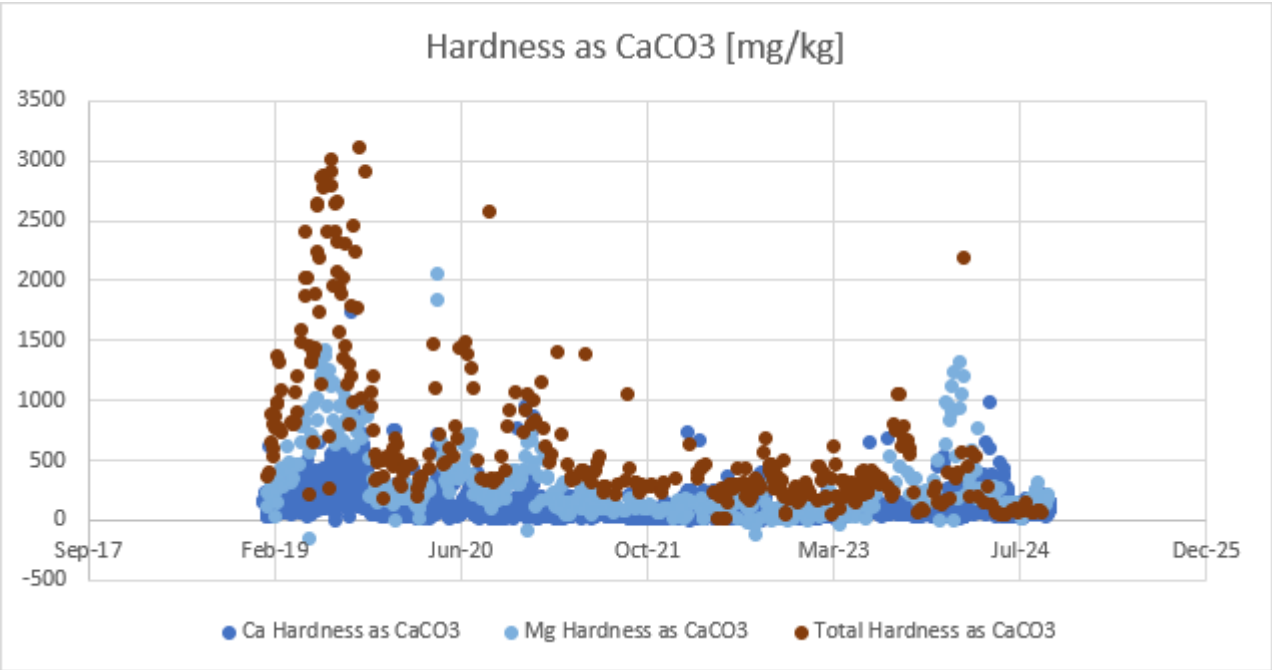


Figure 84: Tutuka Cooling water West Hardness

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Document Identifier	240-72663051	Rev	2
Effective Date	14 March 2025		
Review Date	March 2030		
RFI Number	E1275CTRTD		

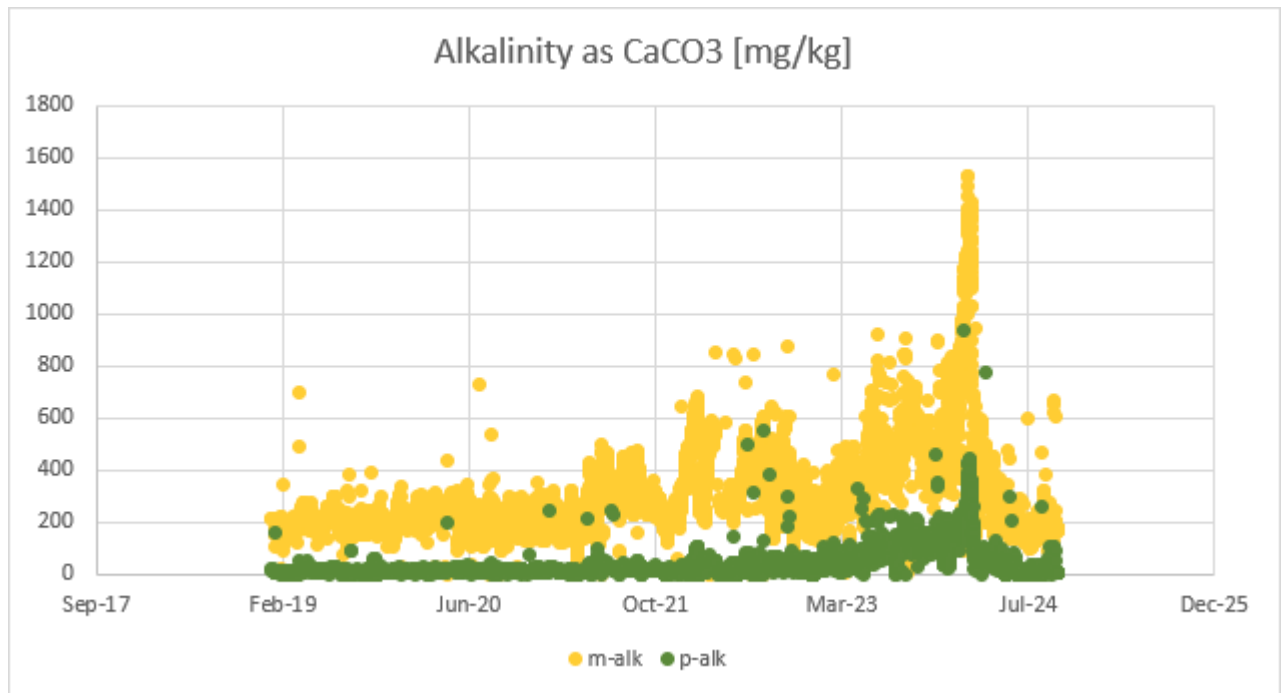


Figure 85: Tutuka Cooling water West alkalinity

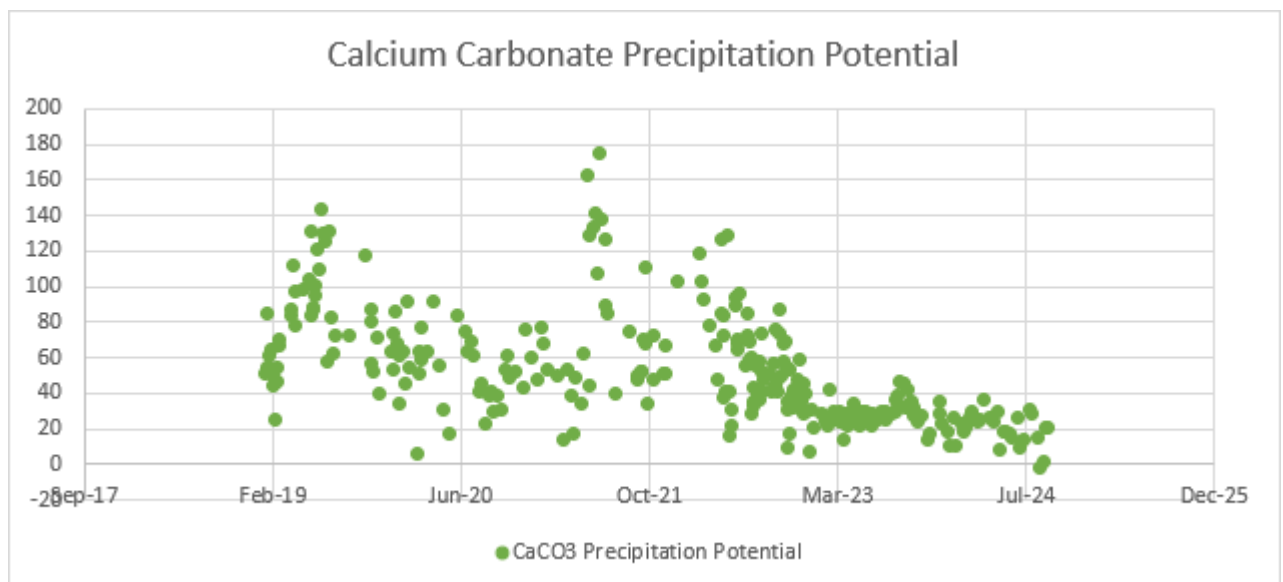


Figure 86: Tutuka Cooling water West Calcium carbonate precipitation potential

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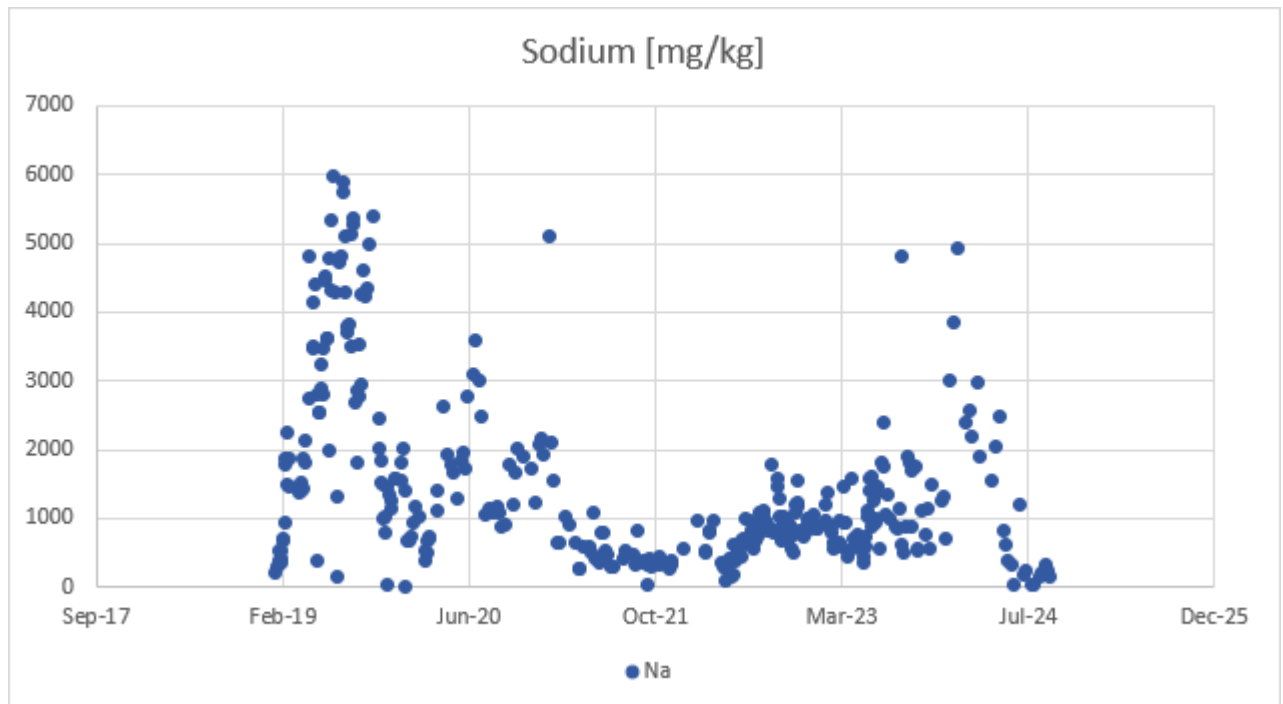


Figure 87: Tutuka Cooling water West sodium

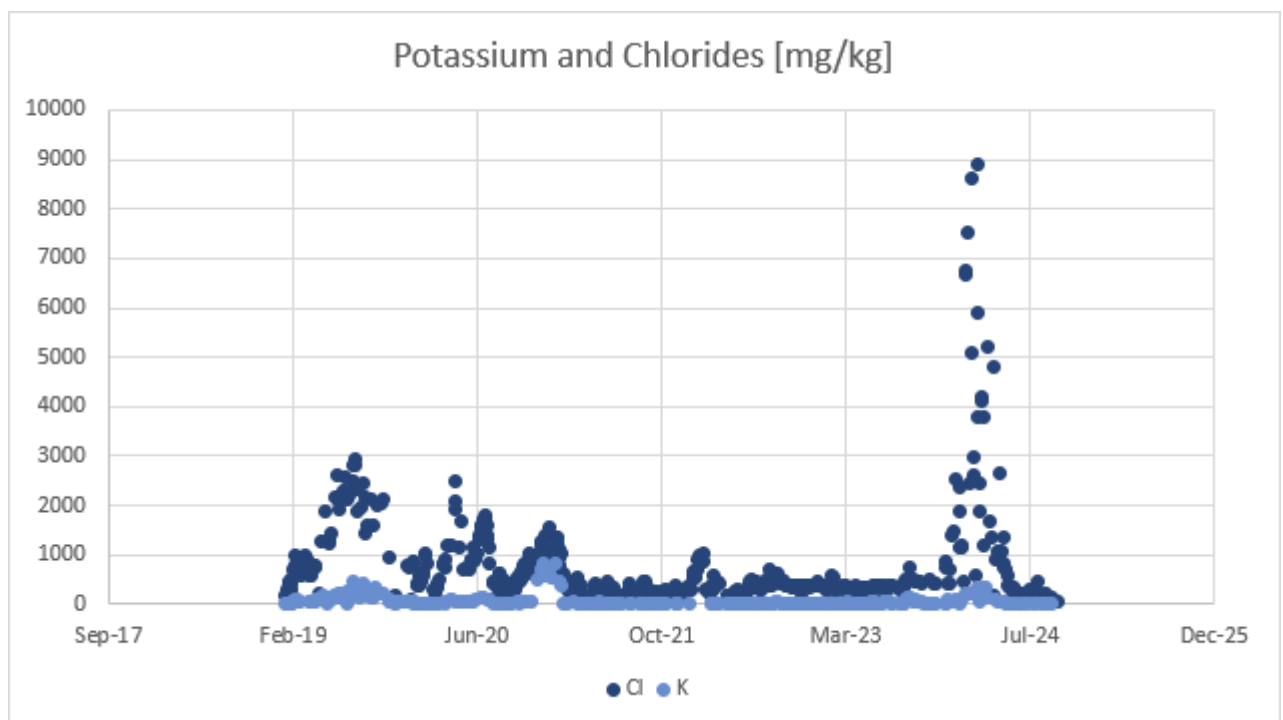


Figure 88: Tutuka Cooling water West Potassium and chlorides

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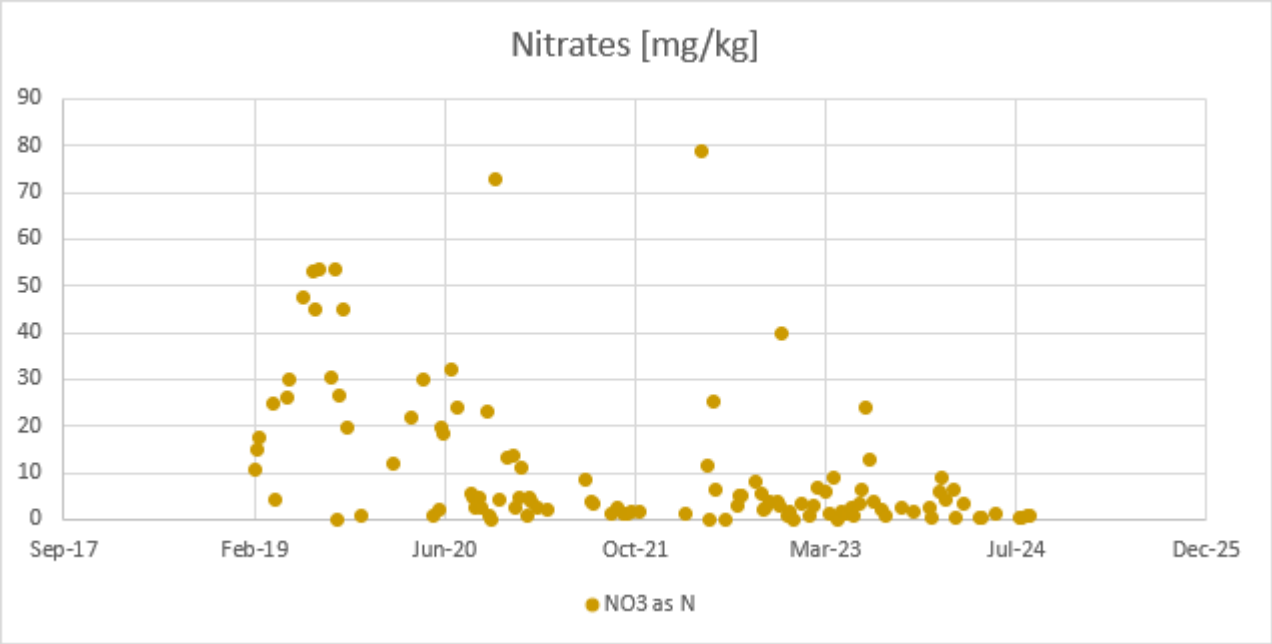


Figure 89: Tutuka Cooling water West Nitrates

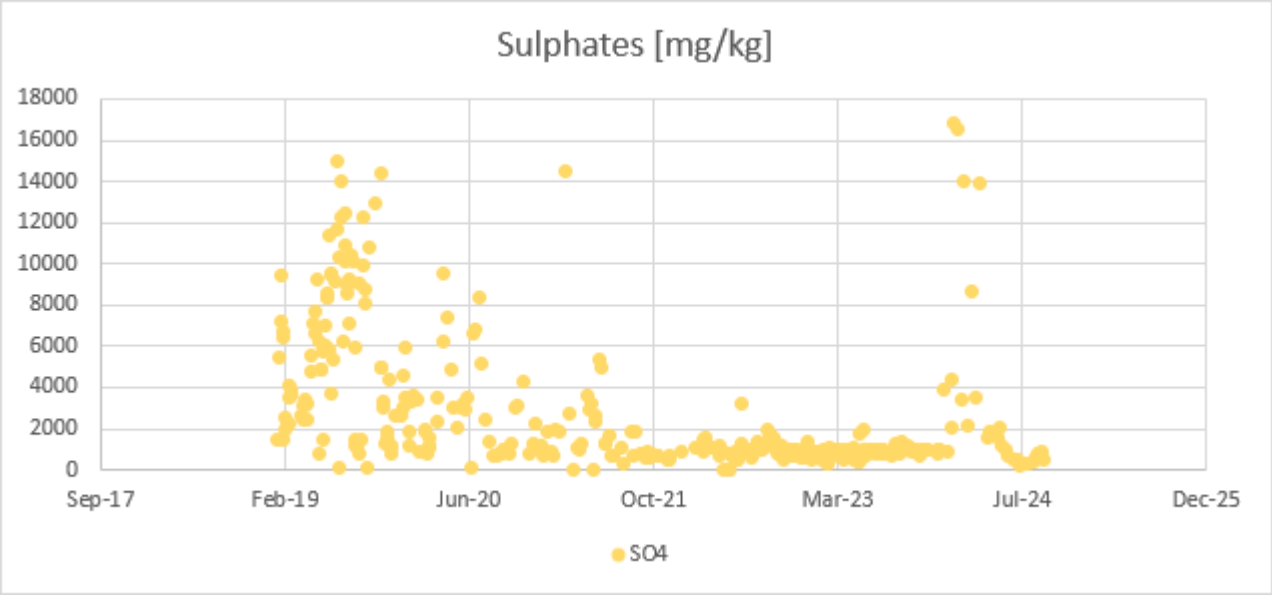


Figure 90: Tutuka Cooling water West sulfates

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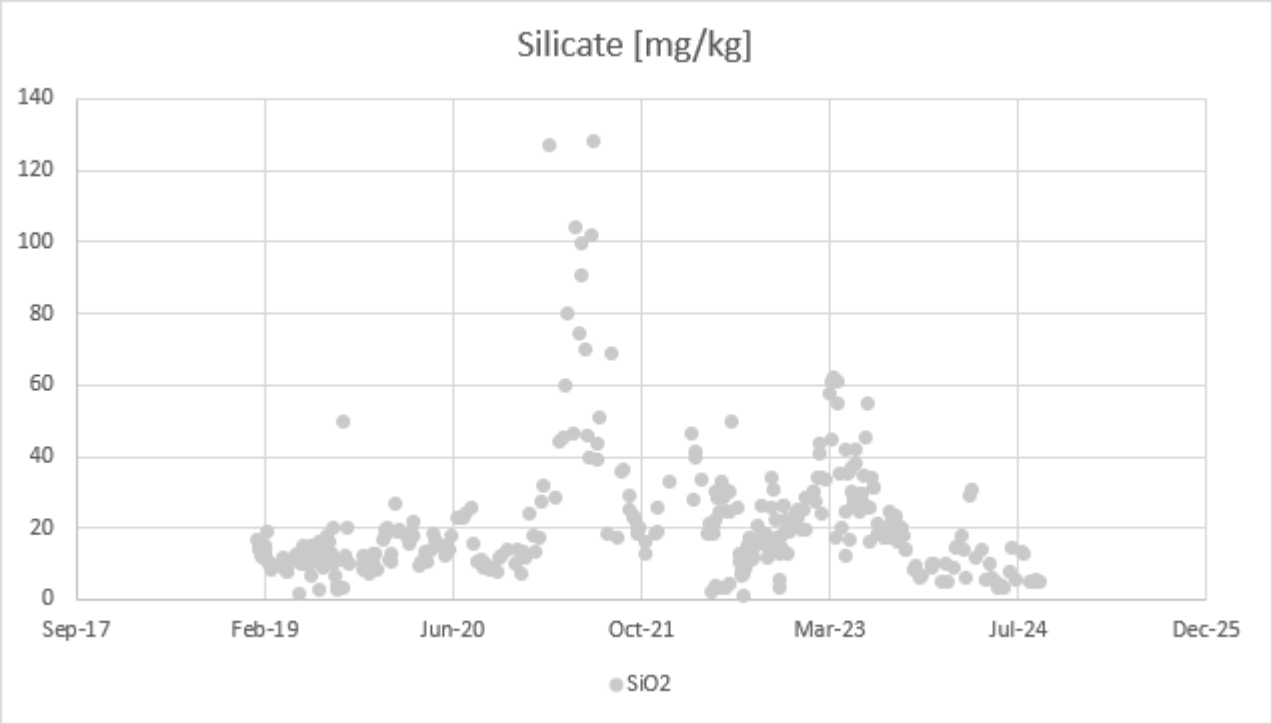


Figure 91: Tutuka Cooling water West silicates

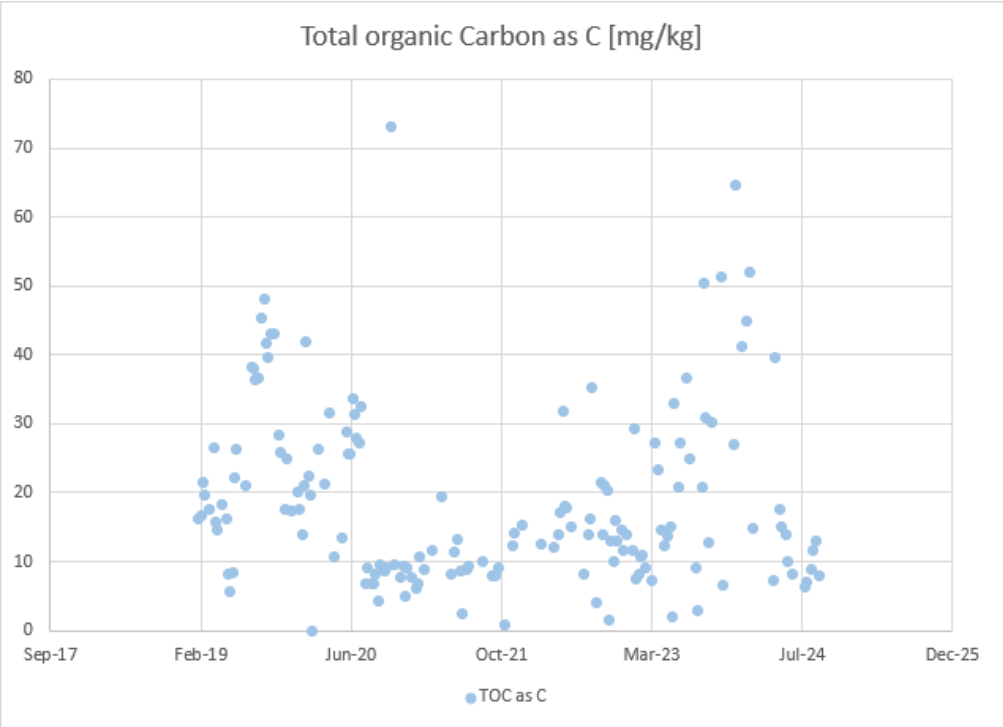


Figure 92: Tutuka Cooling water West total organic carbon

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		Effective Date	14 March 2025		
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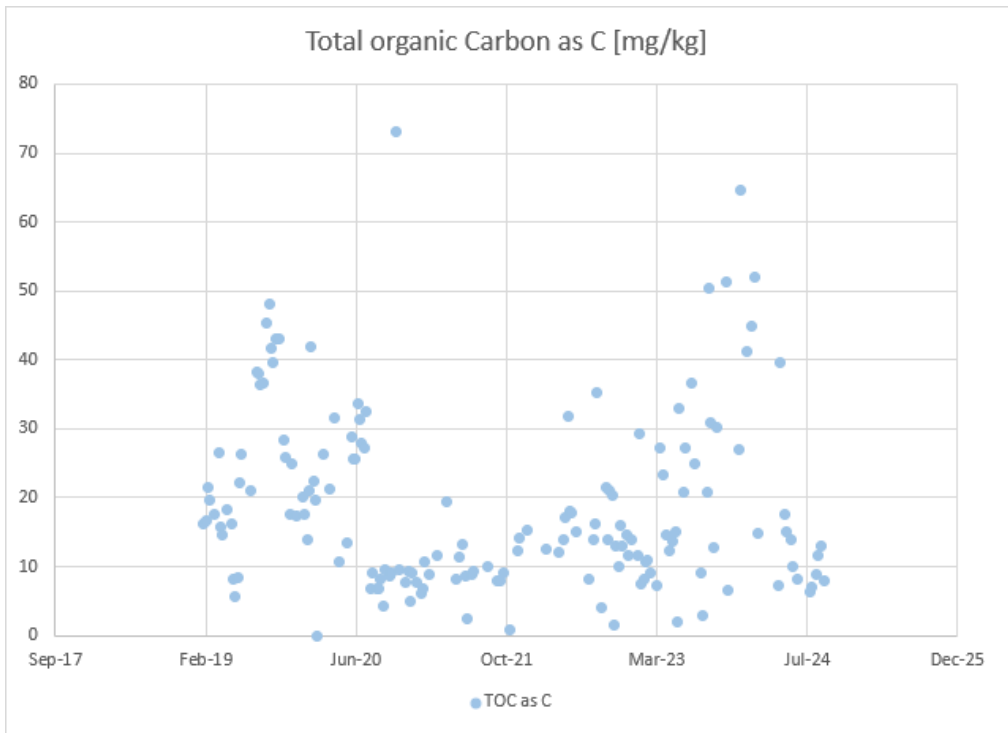


Figure 92: Tutuka Cooling water West total organic carbo

PART B			
RESPONSE SHEET IN TERMS OF A REQUEST FOR INFORMATION			
To be completed by the supplier			
To	Eskom Holdings SOC Ltd	Date	
Attention	<i>Letsibogo Mahlatji</i>		
Tel no		Fax no and /or e-mail address	
From		Address	
Address			
Sender			
Description of the works/goods/services	Request to obtain information on the Ultra -High Purity Reverse Osmosis Technology for the treatment of Wastewater for reuse.		

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		Effective Date	14 March 2025		
		Review Date	March 2030		
		RFI Number	E1275CTRTD		

Please find below our response to Eskom's questions:

No.	Question	Please indicate your response in this column
1.	Name of the Respondent	
2.	The name and contact details of the person appointed by the Respondent as its representative in the event that Eskom needs to contact the company for clarification or further details.	
3.	Company profile and description of key service offerings and capacities.	
4.	Is the respondent/company an existing registered Eskom vendor? (Please provide vendor registration details)	
5.	Provide details on respondent/Company empowerment, localisation credentials (Black Youth & Women Owned Enterprise, BBBEE Enterprise etc)	
6.	Is the company locally based or have a local office in South Africa? If no, indicate if the company is familiar with the requirements of South African State-Owned Companies tendering processes.	

Yours faithfully

Name	Designation	Signature	Date
Telephone number		Fax and/or e-mail address	

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