



Waste Discharge Licence 180-08

Monitoring Report

1 June 2023 to 31 May 2024

Cosmo Howley Project Area



Document Details

Submission Date	30 June 2024
Prepared By	Northern Territory Mining Operations Pty Ltd
Version Number	1
Licence Expiry Date	21 February 2033

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Appendix D NTMO WDL180-08 Performance Improvement Report 2024

Appendix E NTMO WDL180-08 Macroinvertebrate and Sediment Report 2024

1 EXECUTIVE SUMMARY

This Report provides the following information to meet the relevant requirements of waste discharge license 180-08:

- Analysis and interpretation of Northern Territory Mining Operations (NTMO) monitoring data for the period 1 June 2023 to 31 May 2024;
- Discussion and interpretation of results for the biological monitoring program, sediment monitoring plan, ecotoxicology monitoring plan;
- An assessment of environmental impacts resulting from the discharge of treated mine water and;
- Recommendations to necessitate meeting the WDL conditions and improvement of water management strategies.

The environmental impacts of treated mine water actively discharged from Cosmo Howley Project Area (CHPA) are currently regulated by WDL 180-08, which commenced on 22 February 2023 and will expire on the 21 February 2033.

2 MONITORING OBJECTIVE

The monitoring objective for the CHPA under the NT Water Act 1992, is to ensure and maintain environmental quality.

According to the Water Act, it is an offence under section 16 of the Water Act to wilfully cause or cause, directly or indirectly:

- waste to come into contact with water; or
- water to be polluted.

This WDL serves as a regulatory instrument granted under Section 74 of the Water Act 1992 (NT).

2.1 Waste Discharge License Conditions

This monitoring report fulfils the requirements of WDL 180-08 for the period 1 June 2023 – 31 May 2024 as per the following conditions:

39. *The Licensee must complete and provide to the Administering Agency a report of data and information obtained through the implementation and performance of the Monitoring Program (the Monitoring Report), as prescribed by this licence, on the dates specified in Item 13.*
40. *The Licensee must ensure that each Monitoring Report:*
 - 40.1. *is prepared in accordance with the requirements of the Administering Agency 'Guideline for Reporting on Environmental Monitoring' (or any other guideline as adopted by the Administering Agency from time to time);*
 - 40.2. *includes a tabulation, in Microsoft ® Excel ® format or another format requested by the Administering Agency, of all monitoring data required to be collected in accordance with this licence for the preceding 12 month period;*
 - 40.3. *includes a tabulation of monthly and annual contaminant loads discharged from the authorised discharge points specified in Item 5 for the preceding 12 month period. Contaminant loads must be calculated for metals, metalloids, nutrients and other parameters (excluding field parameters) listed in the monitoring program specified in Item 11. The calculations must be based on the daily discharge volume and the concentration of contaminant present in the discharge on that day. On the days when a sample was not taken then the concentration of the contaminant must be estimated using Linear Interpolation methodology;*
 - 40.4. *includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the Licensed Action over a minimum period of three years (of part thereof);*
 - 40.5. *includes a summary of any investigations undertaken by the Licensee in accordance with this licence for the preceding 12 month period; and*
 - 40.6. *includes an assessment of environmental impact from the Licensed Action.*

2.2 Surface Water Monitoring Locations

Surface water monitoring requirements are specified in WDL 180-08.

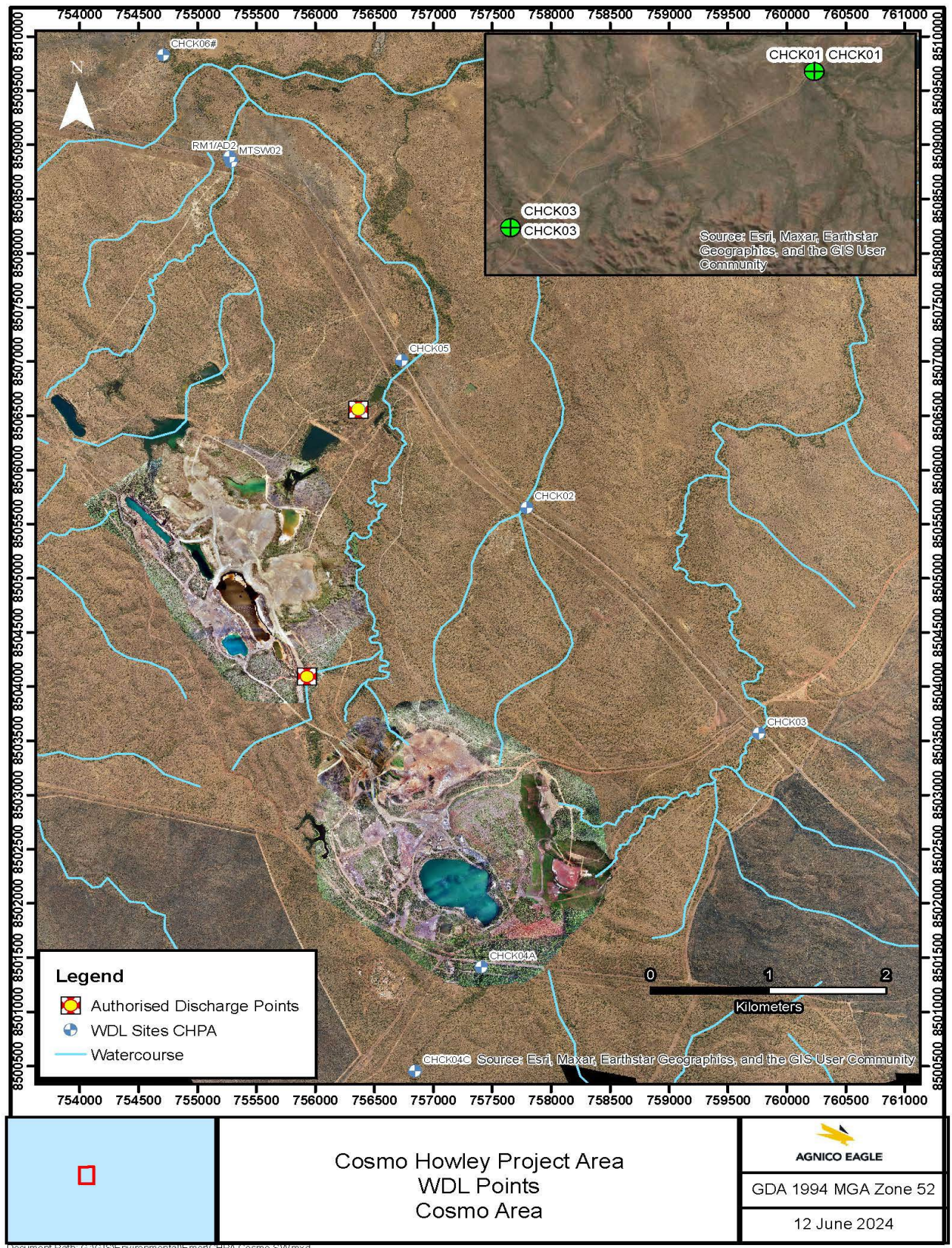


Figure 1 Cosmo Howley Project Area locations of WDL Points

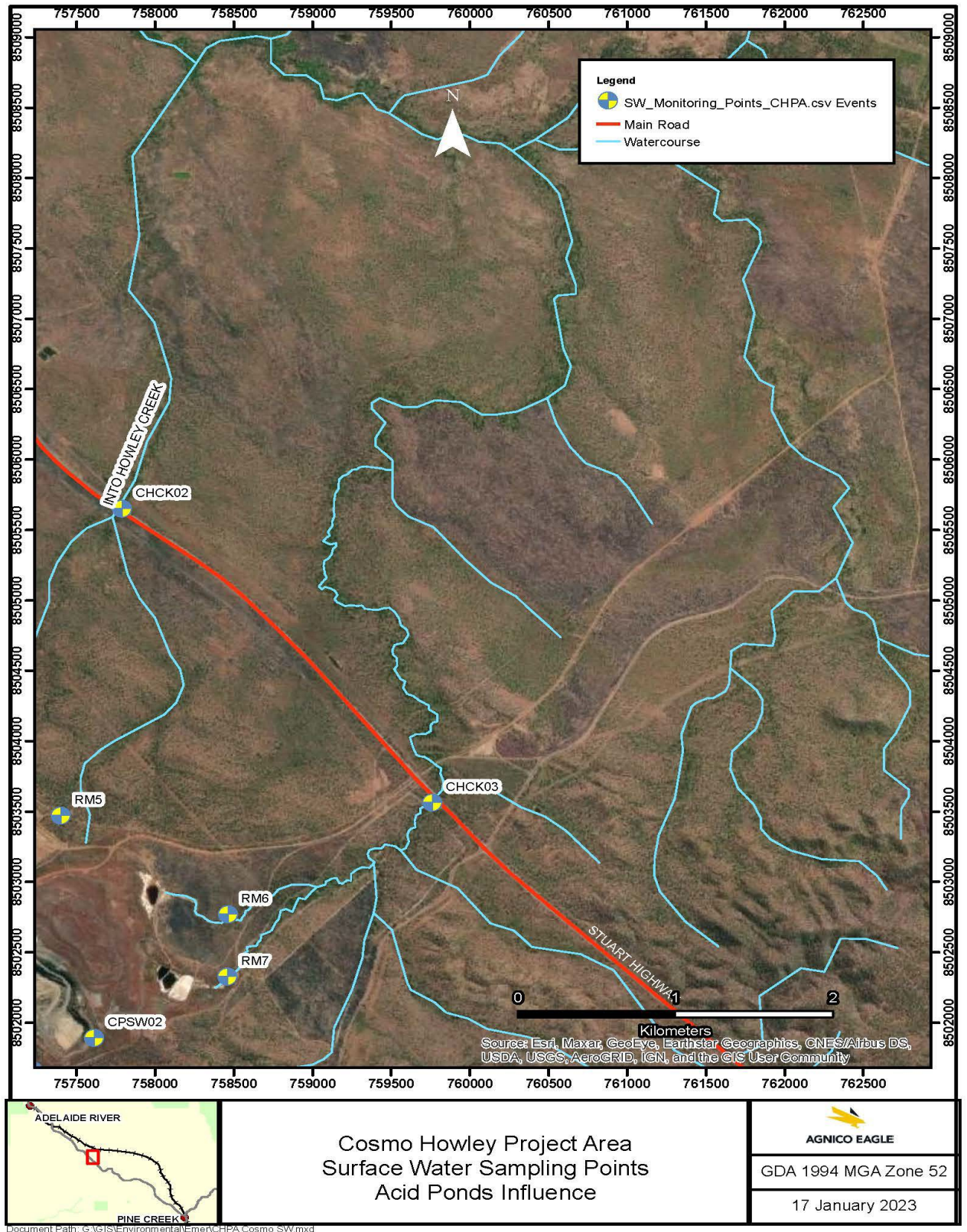


Figure 2 Acid Pond Influence at Cosmo Howley Project Area

2.2.1 COMPLIANCE MONITORING POINTS

Compliance monitoring locations are shown in Table 1.

Table 1 Compliance monitoring locations

Site Code	Location Description	Latitude	Longitude
CHCK06	Monitoring compliance point downstream of the Cosmo Howley mine site at Howley Creek.	-13.469	131.353
CHCK04A	Unnamed tributary of the Daly River (adjacent to Dorat Road).	-13.544	131.378

2.2.2 ENVIRONMENTAL MONITORING POINTS

Table 2 Environmental monitoring locations

Site Code	Location Description	Latitude	Longitude
CHCK01	Howley Creek upstream water quality control point of Cosmo Howley Mine site.	-13.494	131.457
CHCK02	On the Stuart Hwy, upstream of the confluence with Howley Creek.	-13.506	131.382
CHCK03	Upstream of the confluence with Howley creek, downstream of acid Ponds influence.	-13.525	131.400
CHCK05	Discharge point on the Stuart Hwy, just upstream of confluence with Howley Creek.	-13.494	131.372
MTSW02	Tributary of Howley Creek, on the Stuart Hwy, heading towards Darwin.	-13.477	131.358

2.2.3 AUTHORISED DISCHARGE POINTS

Authorised Discharge Points (AD) for CHPA as specified in WDL 180-08, are shown in Table 3. Sites AD1 to AD2 flow into Howley Creek.

Table 3 Authorised discharge locations

Site Code	Location Description	Latitude	Longitude
AD1	Captures Dam 3 siphon discharge before other inputs.	-13.498	131.368

2.3 Sampling Frequencies

Table 4 Compliance points

Sample Locations			Hayes Creek	Howley Creek					
Site Code			CHCK04A	CHCK01#	CHCK02	CHCK03	CHCK05	MTSW02	CHCK06#
Parameter	Units	Analysis Type	Monitoring Frequency						
Field Measurements									
Flow	kL/day	In situ	W	W	W	W	W	W	D
Water Level	m		W	W	W	W	W	W	D
pH	pH units		W	W	W	W	W	W	D
Electrical Conductivity (EC)	µS/cm		W	W	W	W	W	W	D
Dissolved Oxygen (DO)	% saturation		W	W	W	W	W	W	D
Temperature	°C		W	W	W	W	W	W	D
Dissolved Metals									
Aluminium (Al)		Filtered 0.45 µm	F^	F^	F^	F^	F^	F^	F^
Arsenic (As)			F^	F^	F^	F^	F^	F^	F^
Cadmium (Cd)			F^	F^	F^	F^	F^	F^	F^

Chromium (Cr)	µg/L		F^	F^	F^	F^	F^	F^	F^
Cobalt (Co)			F^	F^	F^	F^	F^	F^	F^
Copper (Cu)			F^	F^	F^	F^	F^	F^	F^
Iron (Fe)			F^	F^	F^	F^	F^	F^	F^
Lead (Pd)			F^	F^	F^	F^	F^	F^	F^
Manganese (Mn)			F^	F^	F^	F^	F^	F^	F^
Nickel (Ni)			F^	F^	F^	F^	F^	F^	F^
Selenium (Se)			F^	F^	F^	F^	F^	F^	F^
Uranium (U)			F^	F^	F^	F^	F^	F^	F^
Zinc (Zn)			F^	F^	F^	F^	F^	F^	F^

General Chemistry

Turbidity	NTU	Unfiltered	F^	F^	F^	F^	F^	F^	F^
Total Suspended Solids (TSS)	mg/L		F^	F^	F^	F^	F^	F^	F^
Total Dissolved Solids (TDS)	mg/L		F^	F^	F^	F^	F^	F^	F^
Hardness	(as CaCO ₃)		F^	F^	F^	F^	F^	F^	F^
Carbonate (CO ₃)	mg/L		F^	F^	F^	F^	F^	F^	F^
Bicarbonate (HCO ₃)			F^	F^	F^	F^	F^	F^	F^
Unfiltered Alkalinity (CaCO ₃)			F^	F^	F^	F^	F^	F^	F^
Calcium (Ca)			F^	F^	F^	F^	F^	F^	F^
Magnesium (Mg)			F^	F^	F^	F^	F^	F^	F^
Potassium (K)			F^	F^	F^	F^	F^	F^	F^
Sodium (Na)			F^	F^	F^	F^	F^	F^	F^
Chloride (Cl ⁻)			F^	F^	F^	F^	F^	F^	F^
Sulphate (SO ₄)	F^		F^	F^	F^	F^	F^	F^	

Nutrients

Total Nitrogen (TN)	µg/L	unfiltered	F^	F^	F^	F^	F^	F^	F^
Total Phosphorus (TP)			F^	F^	F^	F^	F^	F^	F^
Total Organic Carbon (TOC)	mg/L		F^	F^	F^	F^	F^	F^	F^

Further Requirements: when a discharge occurs via a discharge point identified in Table 3, samples must be collected weekly and at least once per discharge at all monitoring points where discharges will pass, and from CHCK06 and CHCK01. These samples must be analysed for field measurements, dissolved metals and general chemistry.

Key

D – Daily when creek is flowing

W – Weekly when creek is flowing

F – Fortnightly when creek is flowing and then monthly after cessation of flow.

A – Once annually during wet season.

^ Weekly when discharging and at least once per discharge event

CHCK01 and CHCK06 must be sampled on the same day, when sampling is required.

¹Default ANZECC Trigger Values for Freshwater Upland and Lowland Rivers

²Default ANZG trigger value for 90% species protection

³Default ANZG trigger value for 80% species protection

⁴Site Specific Trigger Values as provided in the Cosmo Howley and Brocks Creek WDL-04 Report 2017.

*Canadian Guideline adopted by ANZECC (2000)

ND – Not Determined

Note: Hardness correction factor may be applied on a per sample basis and in accordance with ANZG 2018 guidelines for cadmium, chromium, lead, nickel and zinc. Hardness correction may also be applied to sulphate in accordance with DITT requirements outlined in the NTMO CHPA WMP 2017-1018 - Final

2.4 Trigger Values

Table 5 Site specific trigger values

			Site Code	CHCK04A	CHCK06
Parameter	Abbreviation	Units	Analysis	SSTV	
Field Measurement					
Flow	N/A	kL/day	In situ	ND	ND
Water Level	N/A	m		ND	ND
pH	pH	pH units		6.0 – 8.0 ¹	6.0 – 8.0 ¹
Electrical Conductivity	EC	µS/cm		250 ¹	700 ⁴
Dissolved Oxygen	DO	% saturation		90 – 120 ¹	45 – 120 ⁴
Temperature	N/A	°C		ND	ND
Dissolved Metals					
Aluminium	Al	µg/L	Filtered (0.45 µm)	150 ³	196 ⁴
Arsenic	As			140 ³	42 ²
Cadmium	Cd			0.8 ³	0.4 ²
Chromium	Cr			40 ³	6 ²
Cobalt	Co			13 ³	13 ²
Copper	Cu			2.5 ³	1.8 ²
Iro	Fe			300 ²	428 ⁴
Lead	Pd			9.4 ³	5.6 ²
Manganese	Mn			3600 ³	2500 ²
Nickel	Ni			17 ³	13 ²
Selenium	Se			34 ³	18 ²
Uranium	U			ND	ND
Zinc	Zn			31 ³	15 ²
General Chemistry					
Turbidity	N/A	NTU	Unfiltered	15 ¹	32 ⁴
Total Suspended Solids	TSS	mg/L		ND	28 ⁴
Total Dissolved Solids	TDS	mg/L		ND	ND
Hardness	N/A	CaCO3		ND	ND
Carbonate (CO3)	N/A	mg/L		ND	ND
Bicarbonate (HCO3)	N/A			ND	ND
Unfiltered Alkalinity (as CaCO3)	N/A			ND	ND
Calcium	Ca			ND	ND
Magnesium	Mg			ND	ND
Potassium	K			ND	ND
Sodium	Na			ND	ND
Chloride	Cl-			13	6 ⁴
Sulphate	SO4			ND	408 ⁴
Nutrients					
Total Nitrogen	TN	µg/L	Unfiltered	350 ¹	350 ¹
Total Phosphorus	TP			10 ¹	10 ¹
Total Organic Carbon	TOC	mg/L		ND	ND

¹Default ANZECC Trigger Values for Freshwater Upland and Lowland Rivers

²Default ANZG trigger value for 90% species protection

³Default ANZG trigger value for 80% species protection

⁴Site Specific Trigger Values as provided in the Cosmo Howley and Brocks Creek WDL-04 Report 2017.

*Canadian Guideline adopted by ANZECC (2000)

N/A – Not Applicable

3 MONITORING METHOD

The monitoring method is detailed in Appendix B.

4 MONITORING RESULTS

This section presents rainfall, authorised discharge events and the monitoring results for the 2023/24 reporting period.

4.1 Rainfall Data

A rain gauge located at Cosmo office is used to collect daily rainfall data onsite. During the current reporting period, maximum rainfall occurred in January. The total rainfall recorded at CHPA is 2008.5 mm as shown in Figure 3.

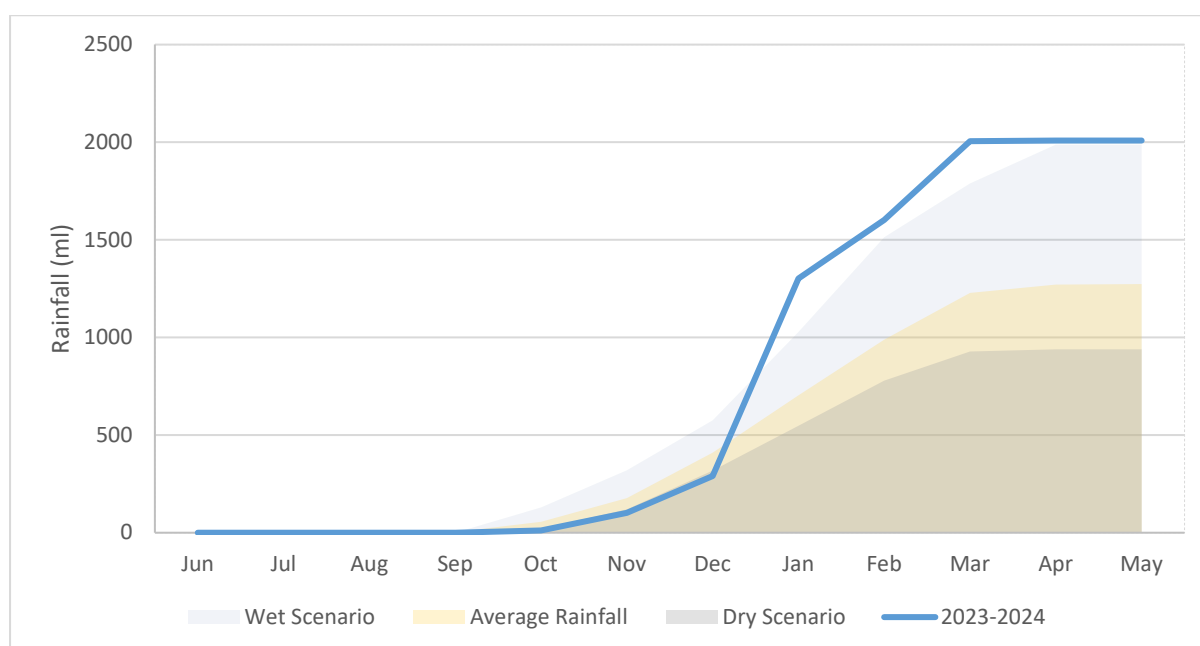


Figure 3 Cosmo Howley Project Area 2016-2024 Rainfall

4.2 Authorised Discharge Events

Monthly discharge reports are submitted to the Administering Agency.

4.2.1 VOLUME OF WATER DISCHARGED

NTMO released 1180.10 mega litres (ML) of water from Dam 3. The quality of discharge is assessed at CHCK05 before the junction of Creek 5 and Howley Creek.

Table 6 Dam 3 discharge volumes 2023/24

Month	Total Discharge Volume (ML)	Average CHCK06		
		EC (µS/cm)	DO%	pH
January	442.04	158	76	6.5
February	501.85	325	81	6.6
March	236.20	196	80	6.5

4.3 Surface Water Monitoring Results

This section presents the surface water results for the 2023/24 reporting period.

All data points have been included in the results section. For all values with '<' concentrations, half the detection limit has been substituted.

4.3.1 FIELD MEASUREMENTS

pH

Table 7 pH results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	pH	6.0 – 8.0	13	6.07	6.49	7.07
CHCK02			12	6.34	6.62	7.13
CHCK03			13	3.33	4.48	5.06
CHCK05			12	2.79	3.95	5.00
MTSW02			11	4.74	6.42	7.09
CHCK06			13	5.43	6.385	7.09
CHCK04A			10	6.34	6.56	6.73

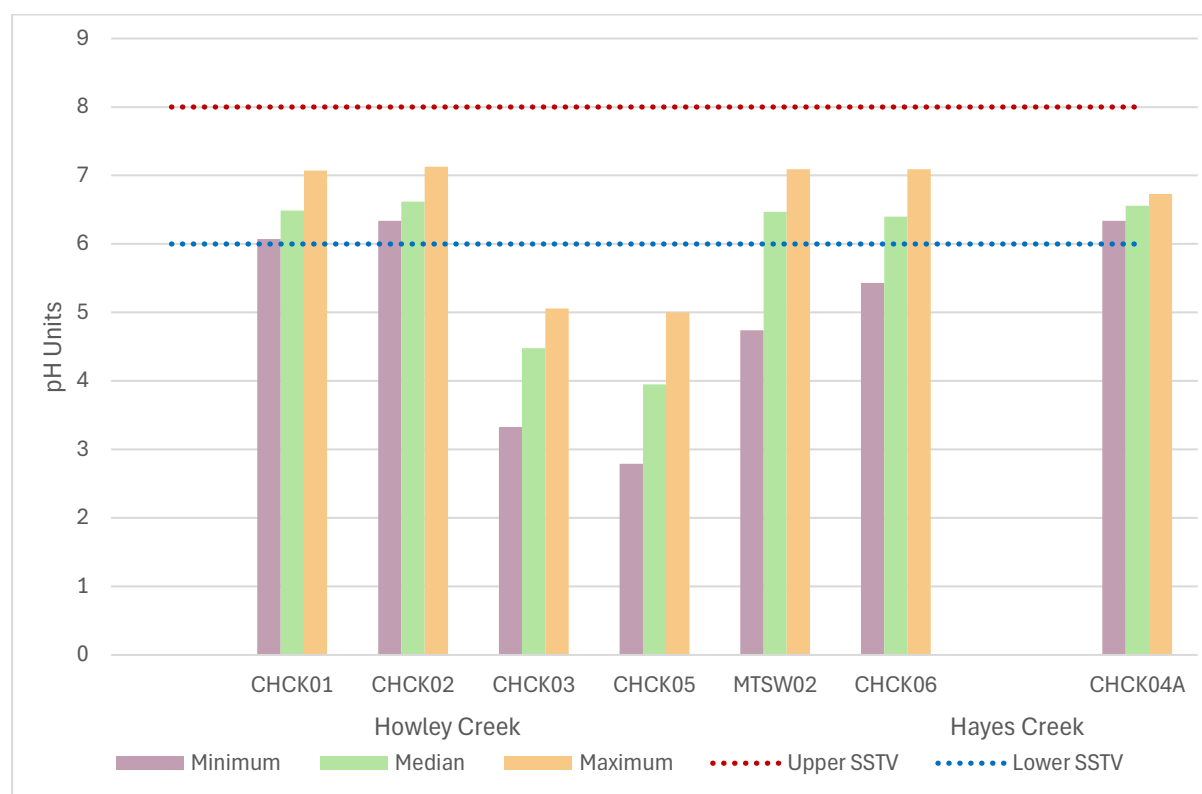


Figure 4 pH results

Electrical Conductivity

Table 8 Electrical conductivity results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µS/cm	700	13	11.3	31.2	123.3
CHCK02			12	36.9	89.0	579.7
CHCK03			13	117.0	417.0	2271
CHCK05			12	104.8	1034.5	3235
MTSW02			11	41.6	281.9	463.3
CHCK06			13	16.9	181.9	470.7
CHCK04A		250	10	116.5	277.1	881.3

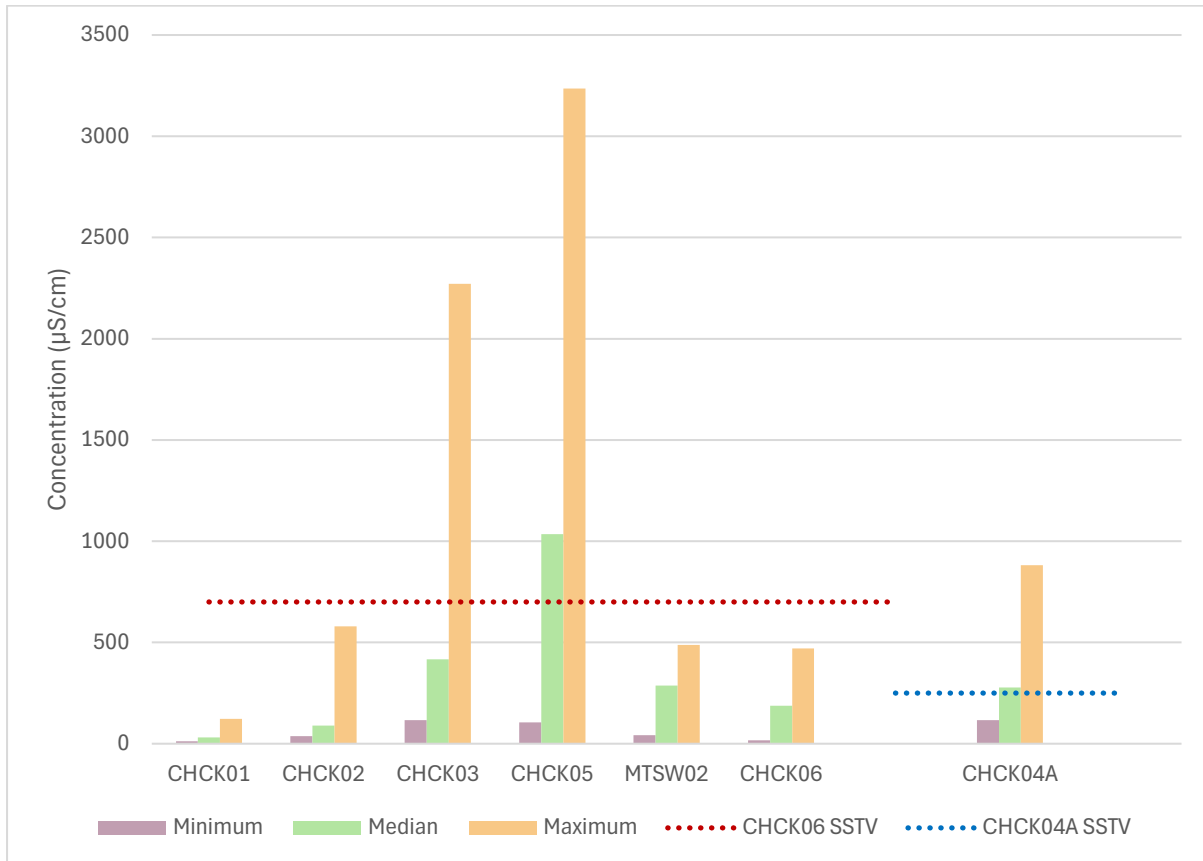


Figure 5 Electrical conductivity

Total Dissolved Solids

Table 9 Total dissolved solids results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	mg/L	N/A	12	7.34	22.65	138.72
CHCK02			11	23.97	52.90	130.20
CHCK03			12	81.16	278.10	1476.2
CHCK05			12	200.18	670.25	2103.0
MTSW02			10	27.07	181.10	302.20
CHCK06			12	10.97	118.35	305.90
CHCK04A			9	75.82	167.83	306.00

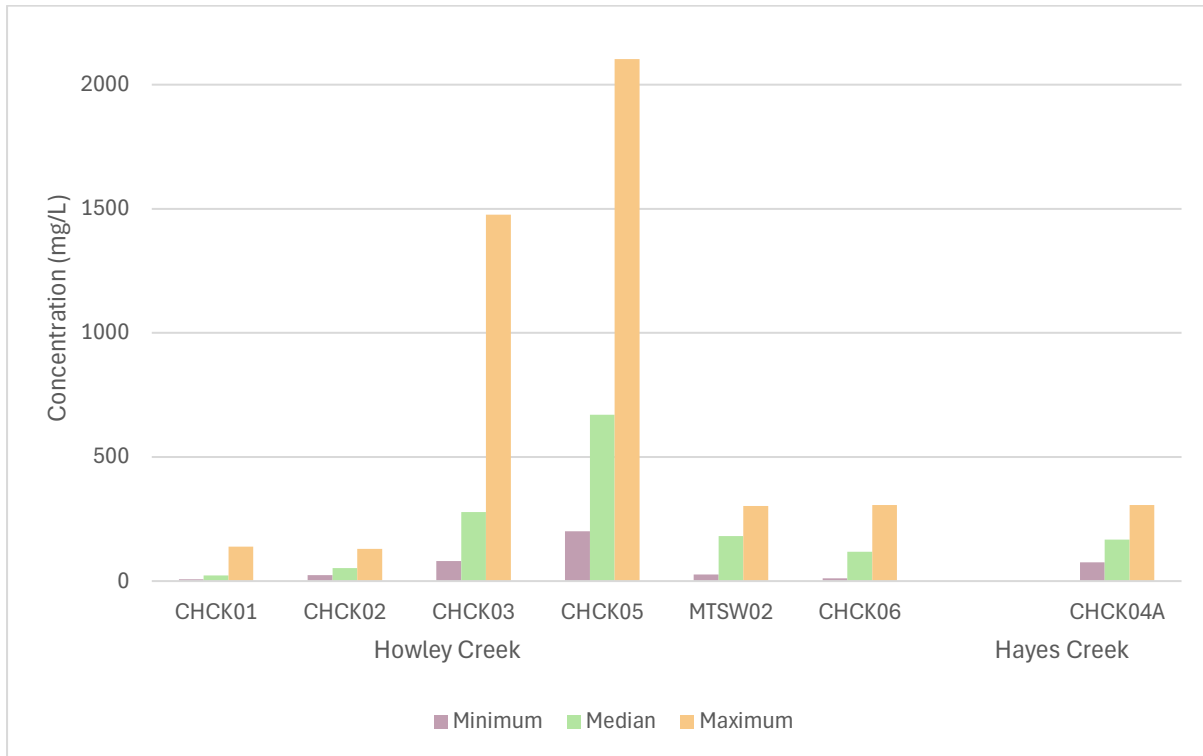


Figure 6 Total dissolved solids results

Dissolved Oxygen

Table 10 Dissolved oxygen results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	% saturated	45 – 120	13	63.1	85.4	104.9
CHCK02			12	35.5	78.9	157.9
CHCK03			13	43.2	91.0	104.0
CHCK05			12	58.1	91.9	108.4
MTSW02			10	7.86	87.5	101.9
CHCK06			12	65.8	83.0	133.0
CHCK04A		90 – 120	9	57.4	93.9	106.8

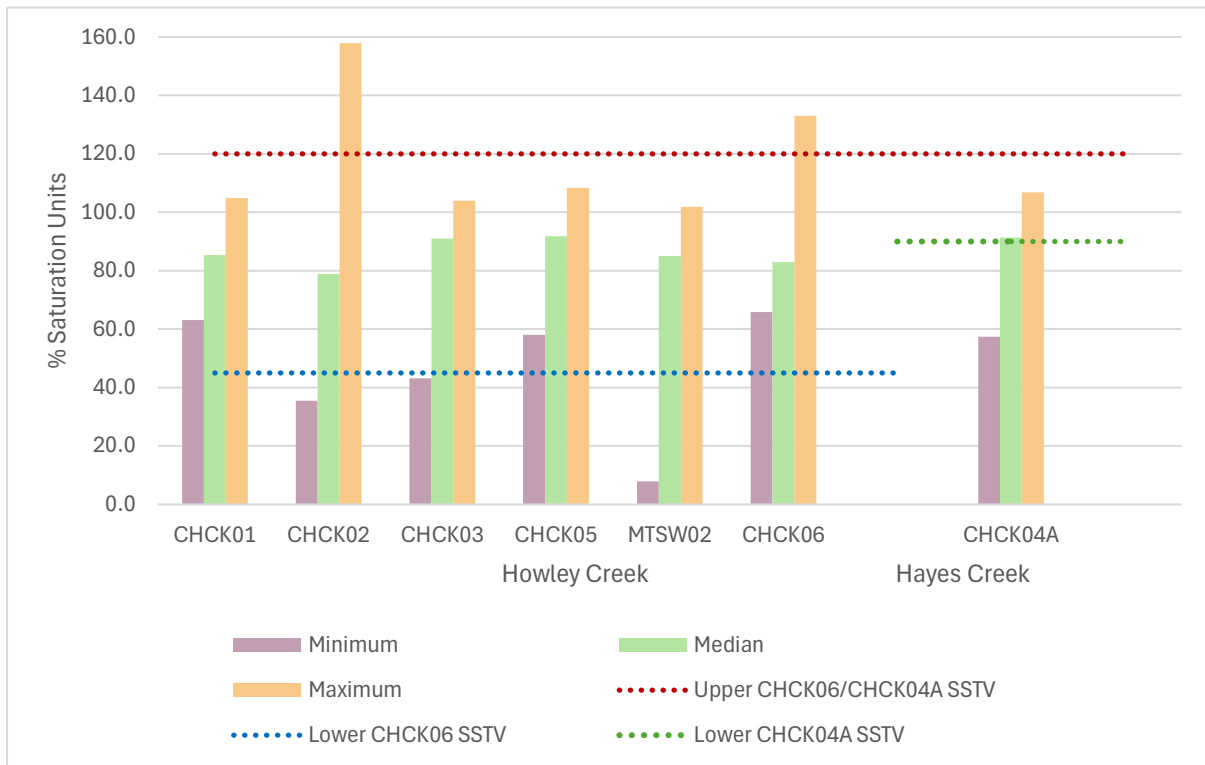


Figure 7 Dissolved oxygen results

4.3.2 DISSOLVED METALS

Aluminium

Table 11 Aluminium results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	196	13	5	20	240
CHCK02			7	5	20	80
CHCK03			13	10	2100	77000
CHCK05			13	1200	7300	65000
MTSW02			6	10	40	90
CHCK06			13	10	40	660
CHCK04A		150	9	5	5	50

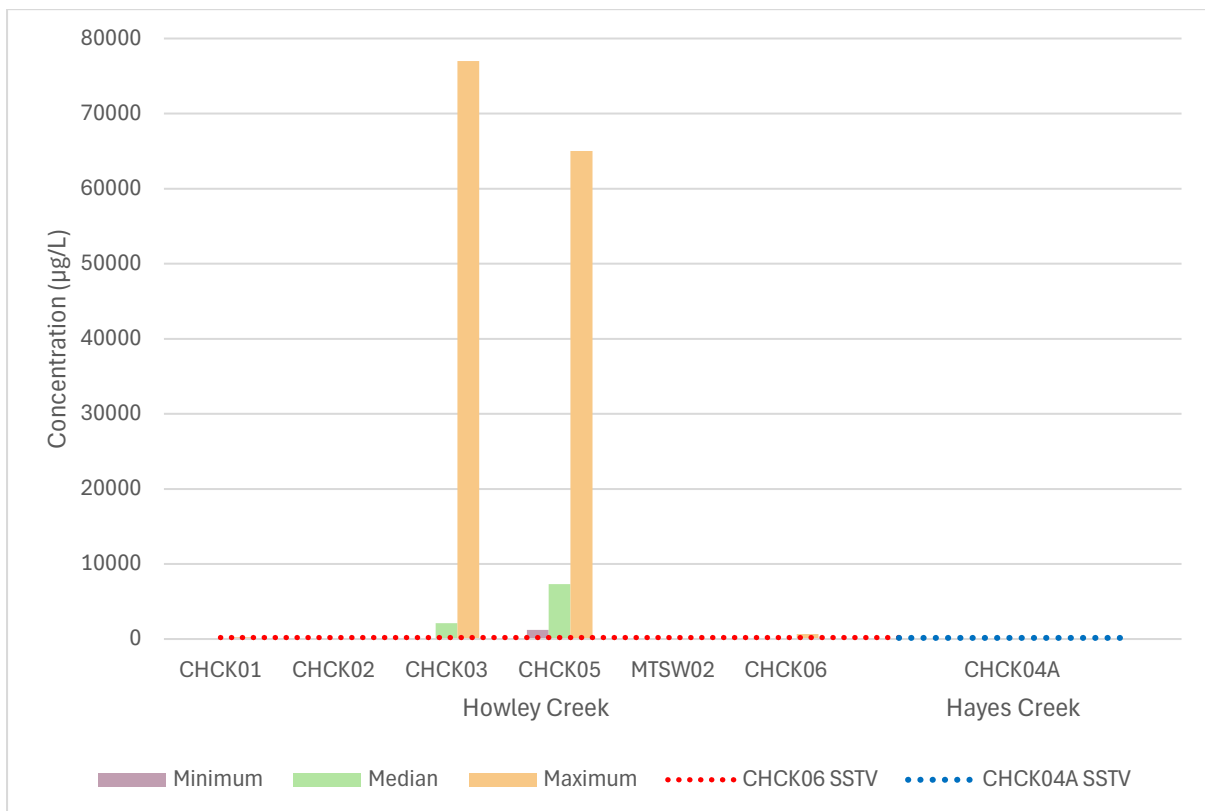


Figure 8 Aluminium results

Arsenic

Table 12 Arsenic results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	42	13	0.5	0.5	0.5
CHCK02			7	0.5	0.5	3.0
CHCK03			13	0.5	0.5	3.0
CHCK05			13	2.0	5.0	7.0
MTSW02			6	0.5	2.0	2.0
CHCK06			13	1.0	1.0	1.0
CHCK04A		140	9	5.0	9.5	26

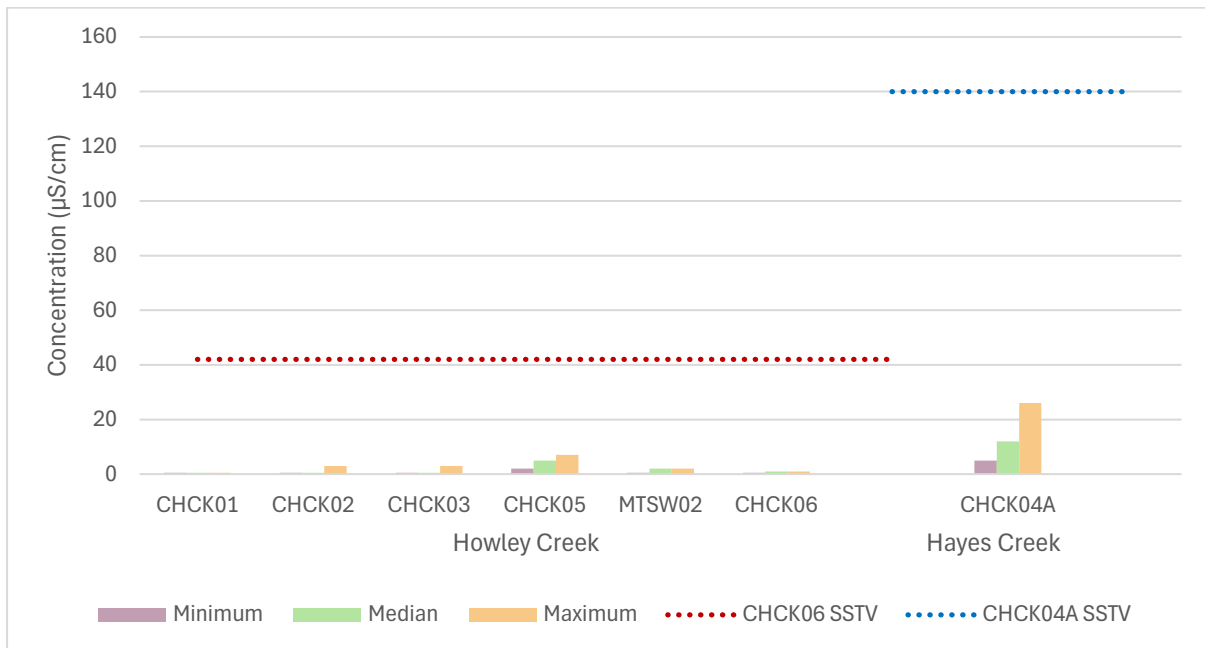


Figure 9 Arsenic results

Cadmium

Table 13 Cadmium results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	0.4	13	0.05	0.05	0.05
CHCK02			13	0.05	0.05	0.05
CHCK03			13	0.10	0.20	2.50
CHCK05			13	0.10	0.90	3.50
MTSW02			6	0.05	0.40	0.70
CHCK06			13	0.05	0.05	0.40
CHCK04A		0.8	9	0.05	0.05	0.05

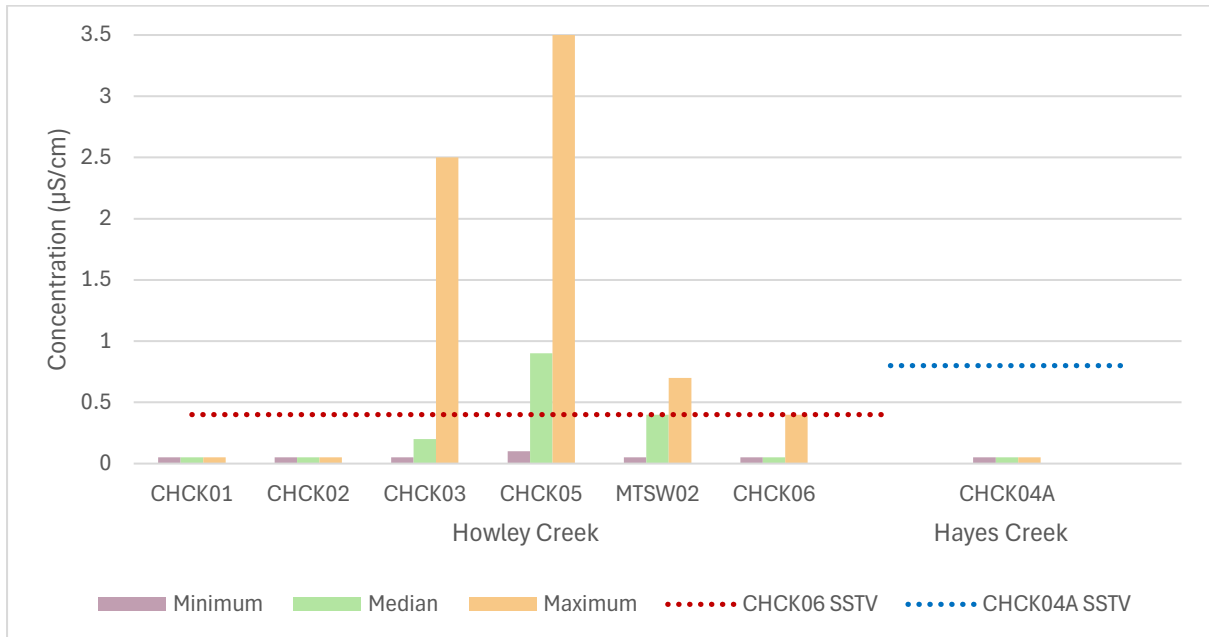


Figure 10 Cadmium results

Chromium

Table 14 Chromium results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	6	13	0.5	0.5	0.5
CHCK02			7	0.5	0.5	0.5
CHCK03			13	1	1	31
CHCK05			13	1	1	12
MTSW02			6	0.5	0.5	0.5
CHCK06			13	0.5	0.5	0.5
CHCK04A		40	9	0.05	0.05	0.05

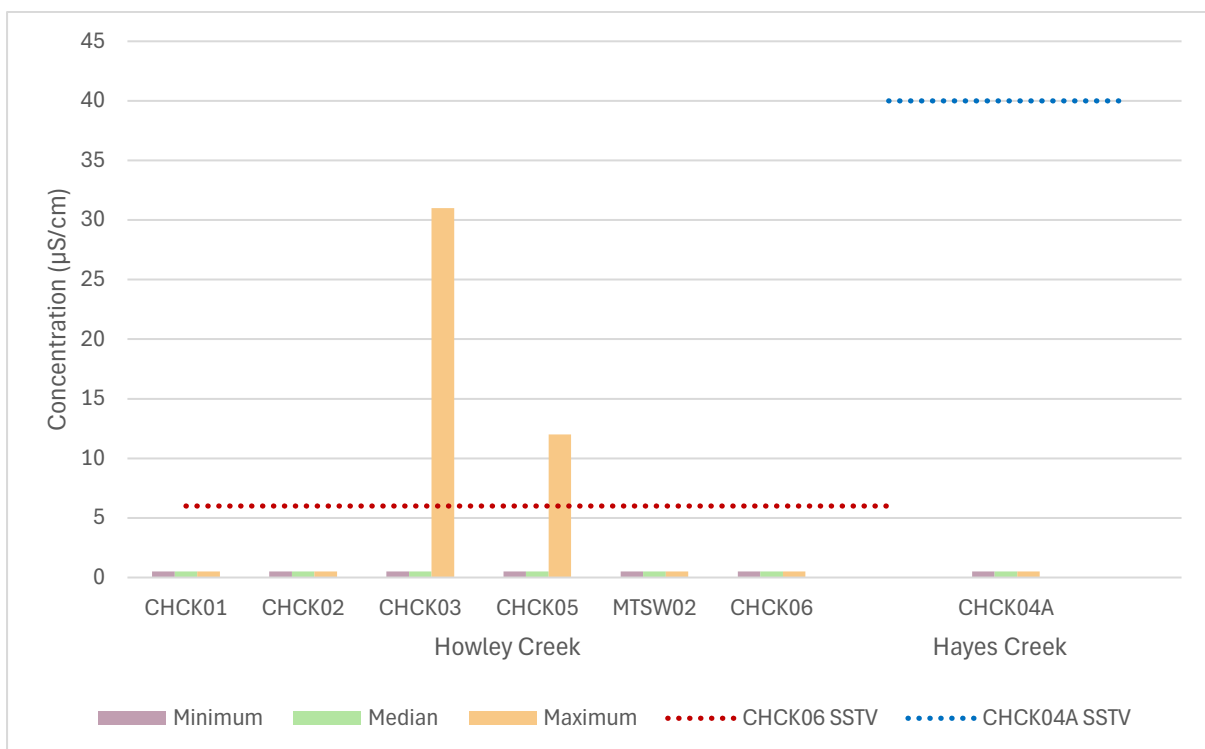


Figure 11 Chromium results

Cobalt

Table 15 Cobalt results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	13	13	0.5	0.5	0.5
CHCK02			7	0.5	0.5	0.5
CHCK03			13	21	54	760
CHCK05			13	65	210	970
MTSW02			6	0.5	48	76
CHCK06			13	0.5	12	110
CHCK04A			9	2	4	7

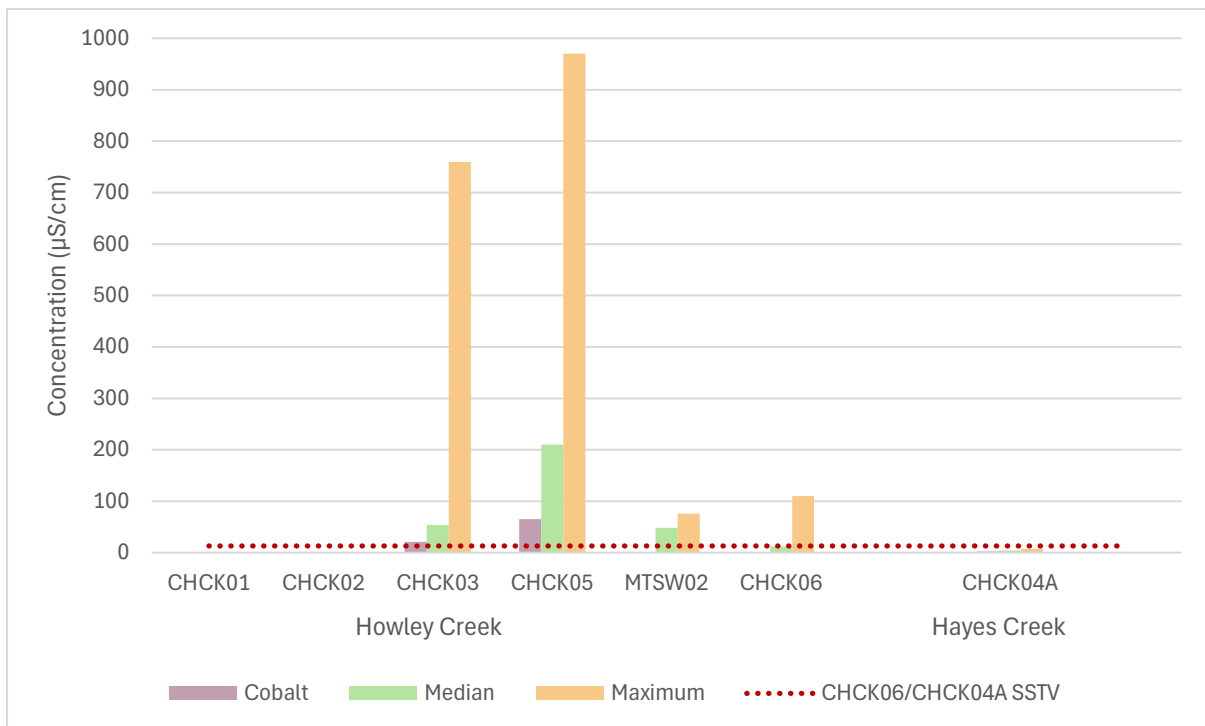


Figure 12 Cobalt results

Copper

Table 16 Copper results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	1.8	13	0.5	0.5	0.5
CHCK02			7	0.5	0.5	0.5
CHCK03			13	1	48	880
CHCK05			13	9	130	900
MTSW02			6	0.05	3	7
CHCK06			13	0.5	3	34
CHCK04A			9	0.5	2	2

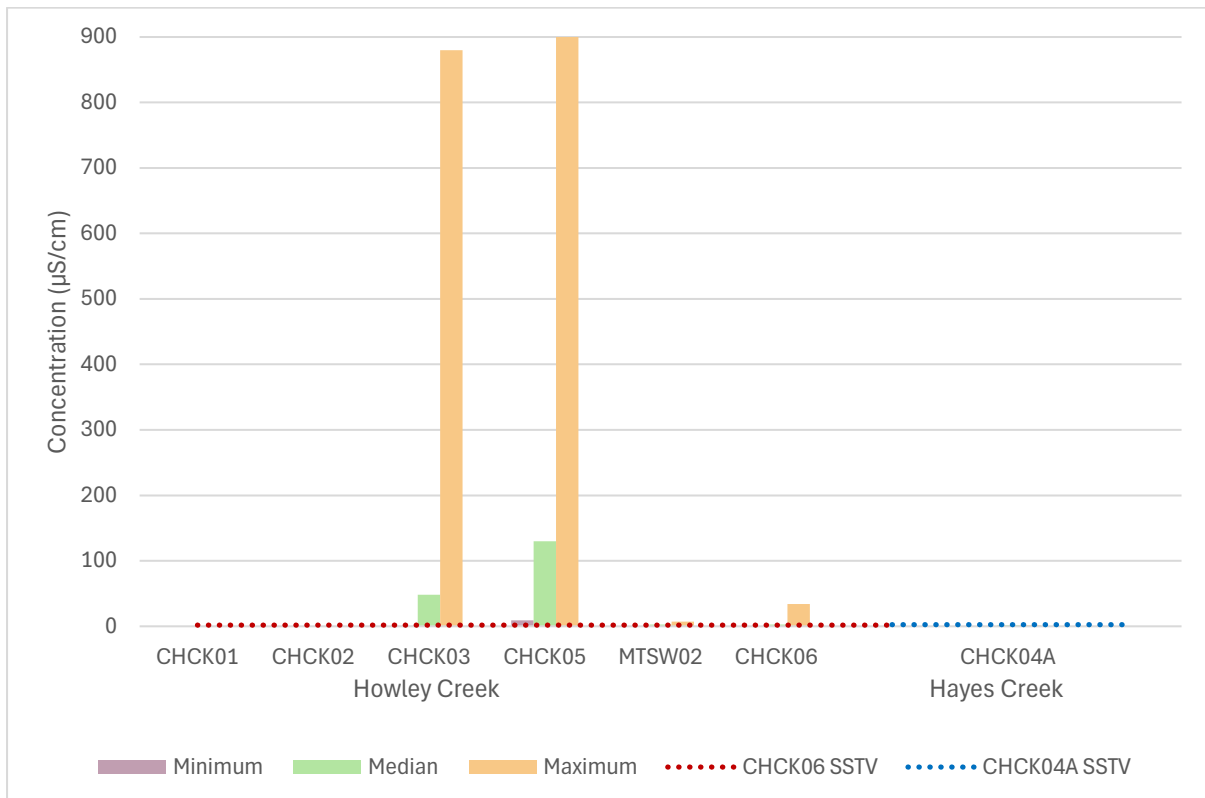


Figure 13 Copper results

Iron

Table 17 Iron results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	428	13	70	150	340
CHCK02			7	30	90	180
CHCK03			13	10	330	6200
CHCK05			13	240	740	11000
MTSW02			6	10	80	280
CHCK06			13	5	50	320
CHCK04A		300	9	10	20	40

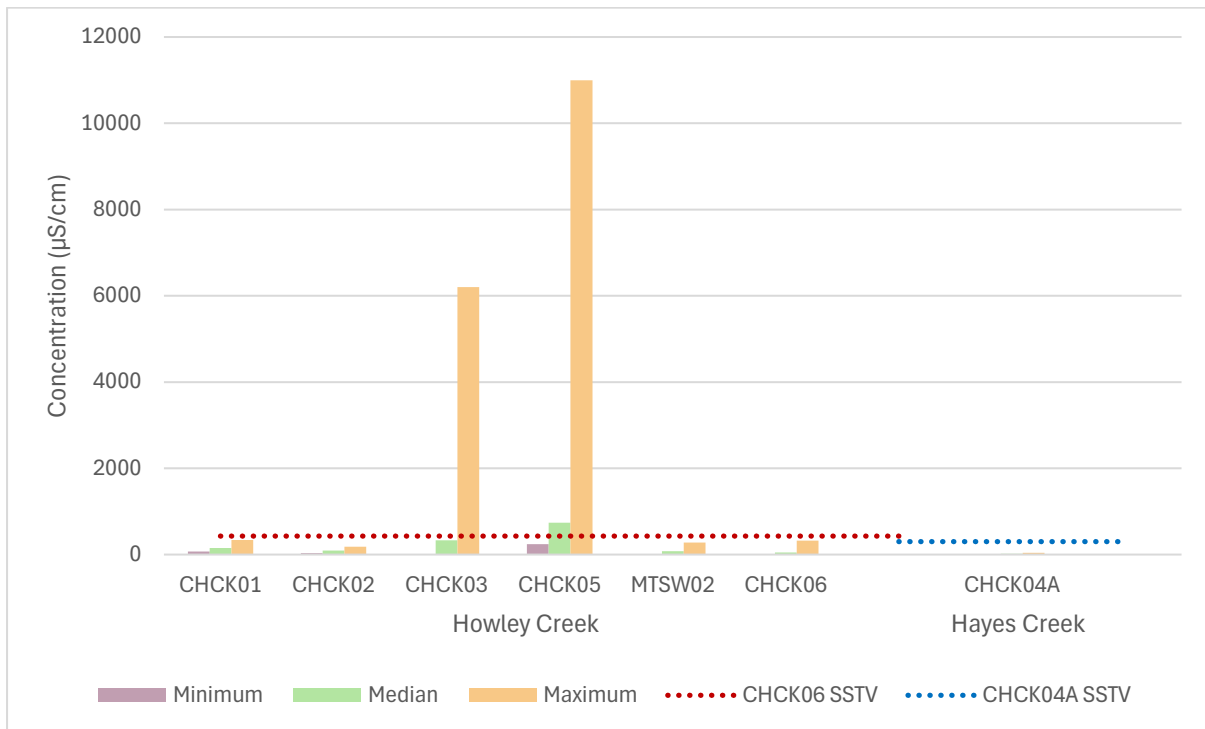


Figure 14 Iron results

Lead

Table 18 Lead results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	5.6	13	0.5	0.5	0.5
CHCK02			7	0.5	0.5	0.5
CHCK03			13	0.5	0.5	4.0
CHCK05			13	0.5	1.0	8.0
MTSW02			6	0.5	0.5	0.5
CHCK06			13	0.5	0.5	0.5
CHCK04A		9.4	9	0.5	0.5	0.5

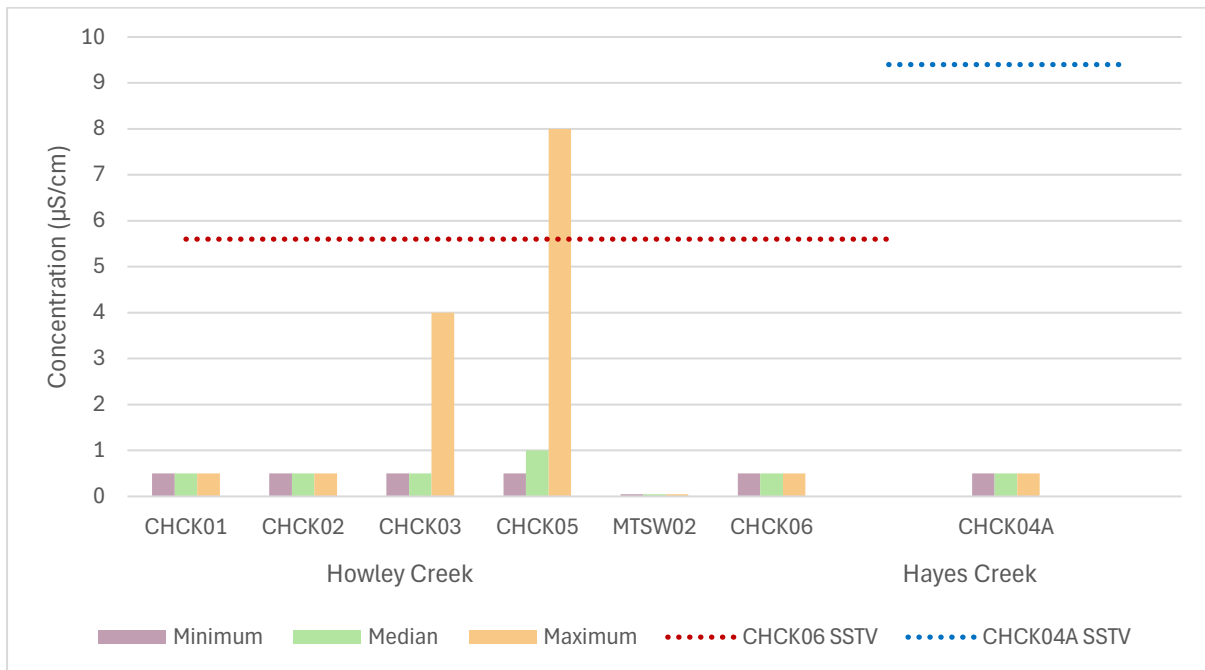


Figure 15 Lead results

Manganese

Table 19 Manganese results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	2500	13	2.5	6	63
CHCK02			7	2.5	3	28
CHCK03			13	440	1200	7600
CHCK05			13	2000	7000	17000
MTSW02			6	33	2300	3400
CHCK06			13	2.5	400	2500
CHCK04A		3600	9	15	110	390

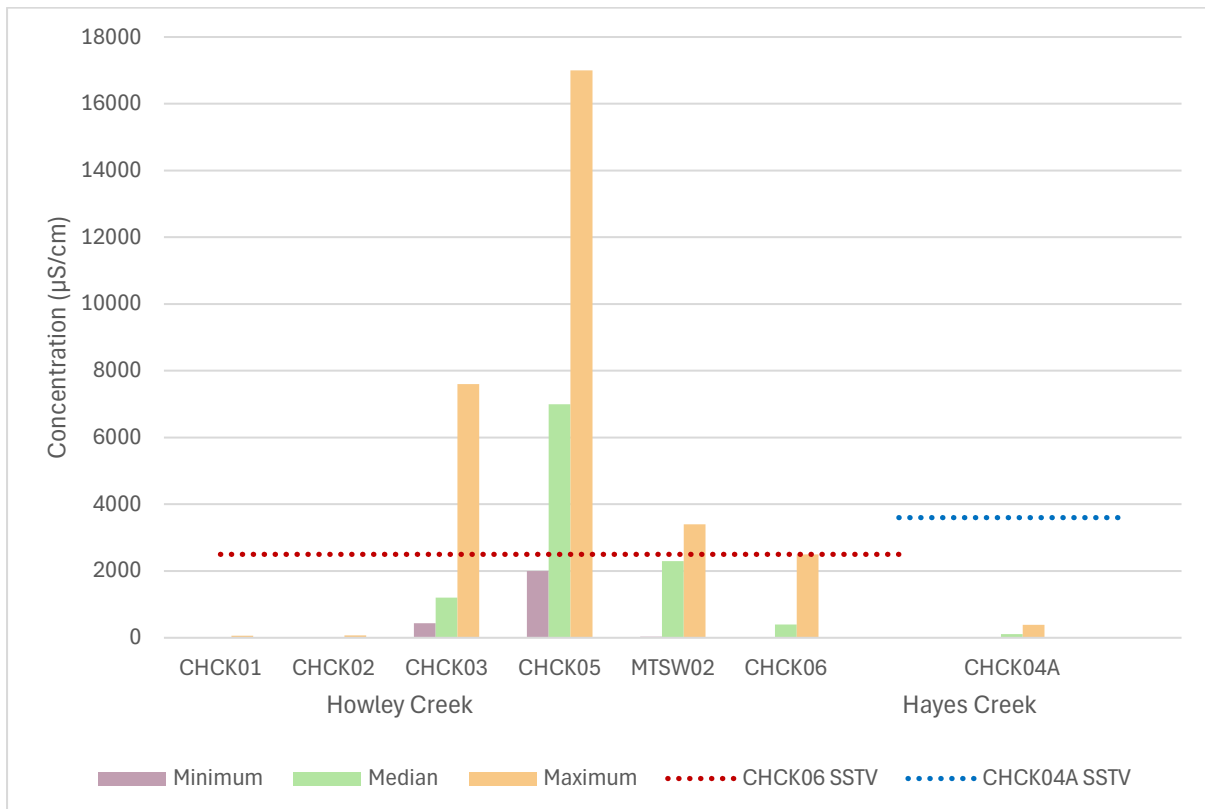


Figure 16 Manganese results

Nickel

Table 20 Nickel results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	13	13	0.5	0.5	0.5
CHCK02			7	0.5	0.5	0.5
CHCK03			13	28	76	1200
CHCK05			13	87	260	1400
MTSW02			6	0.05	35.5	50
CHCK06			13	0.5	15	110
CHCK04A		17	9	1	2	5

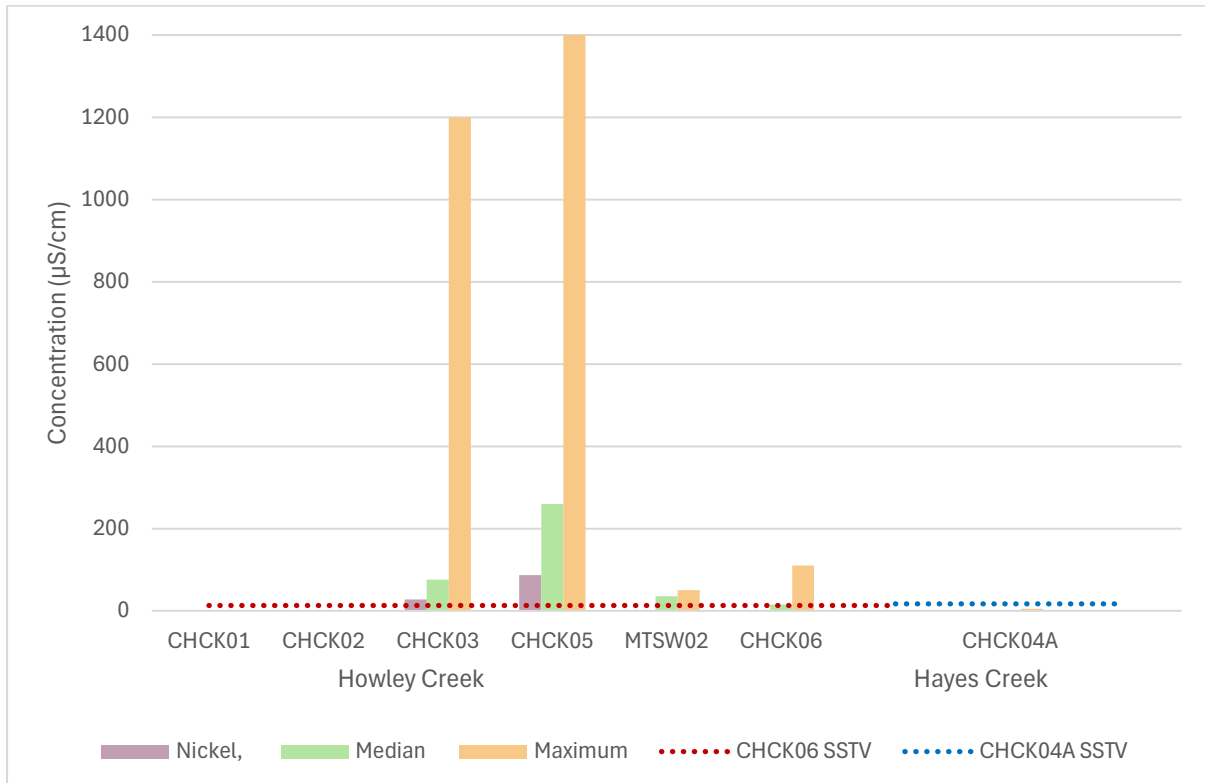


Figure 17 Nickel results

Selenium

Table 21 Selenium results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	18	13	0.5	0.5	0.5
CHCK02			7	0.5	0.5	0.5
CHCK03			13	0.5	0.5	0.5
CHCK05			13	0.5	0.5	0.5
MTSW02			6	0.5	0.5	0.5
CHCK06			13	0.5	0.5	0.5
CHCK04A		34	9	0.5	0.5	0.5

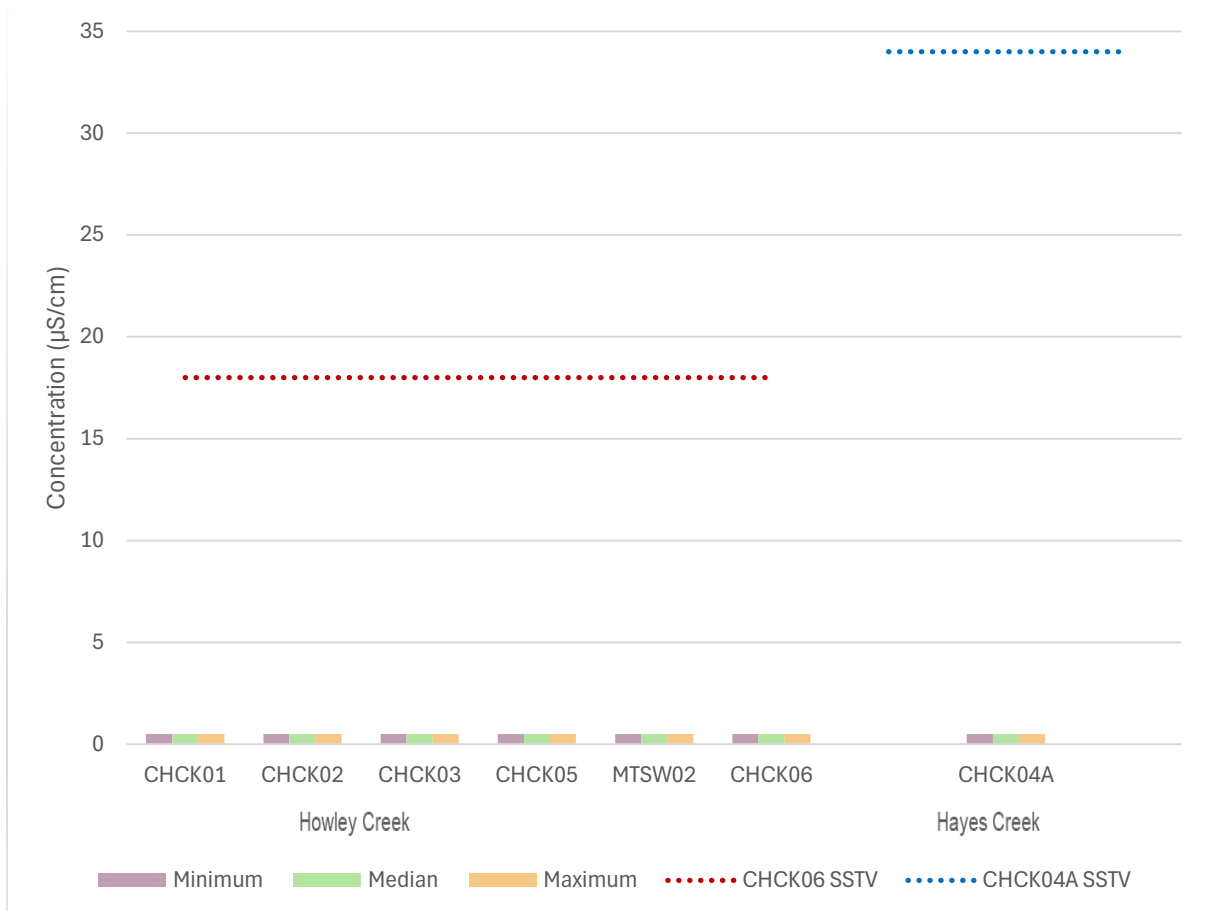


Figure 18 Selenium Results

Zinc

Table 22 Zinc results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	15	13	0.5	2	13
CHCK02			7	0.5	2	5
CHCK03			13	12	37	470
CHCK05			13	60	150	620
MTSW02			6	5	89.5	150
CHCK06			13	2	8	78
CHCK04A		31	9	1	2	10

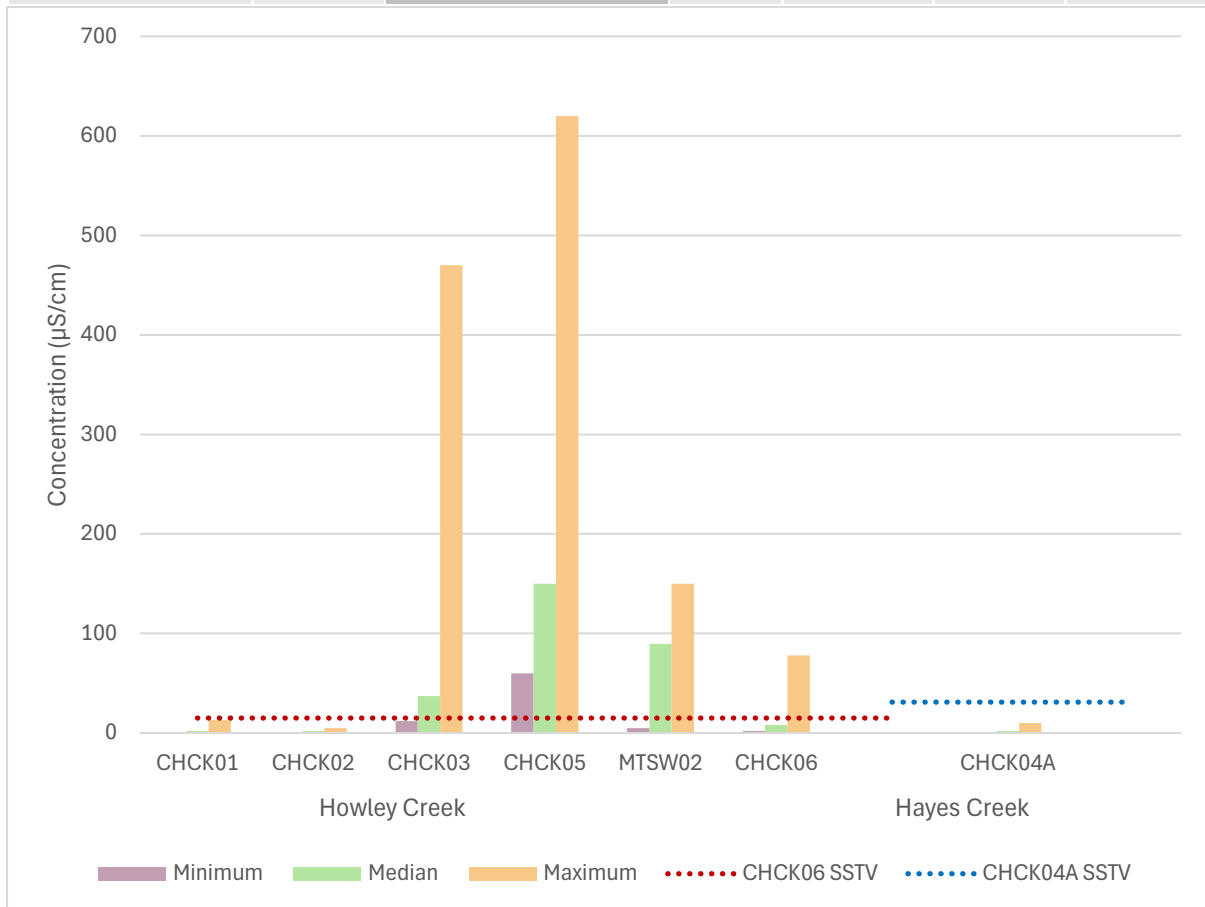


Figure 19 Zinc results

4.3.3 GENERAL CHEMISTRY

Turbidity

Table 23 Turbidity results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	NTU	32	13	3.8	9.6	60
CHCK02			7	3	7.1	15
CHCK03			13	0.6	3.30	24
CHCK05			13	1.20	4.50	54
MTSW02			8	3.2	7.45	30
CHCK06			13	1.8	15	59
CHCK04A		15	9	1.2	5.5	25

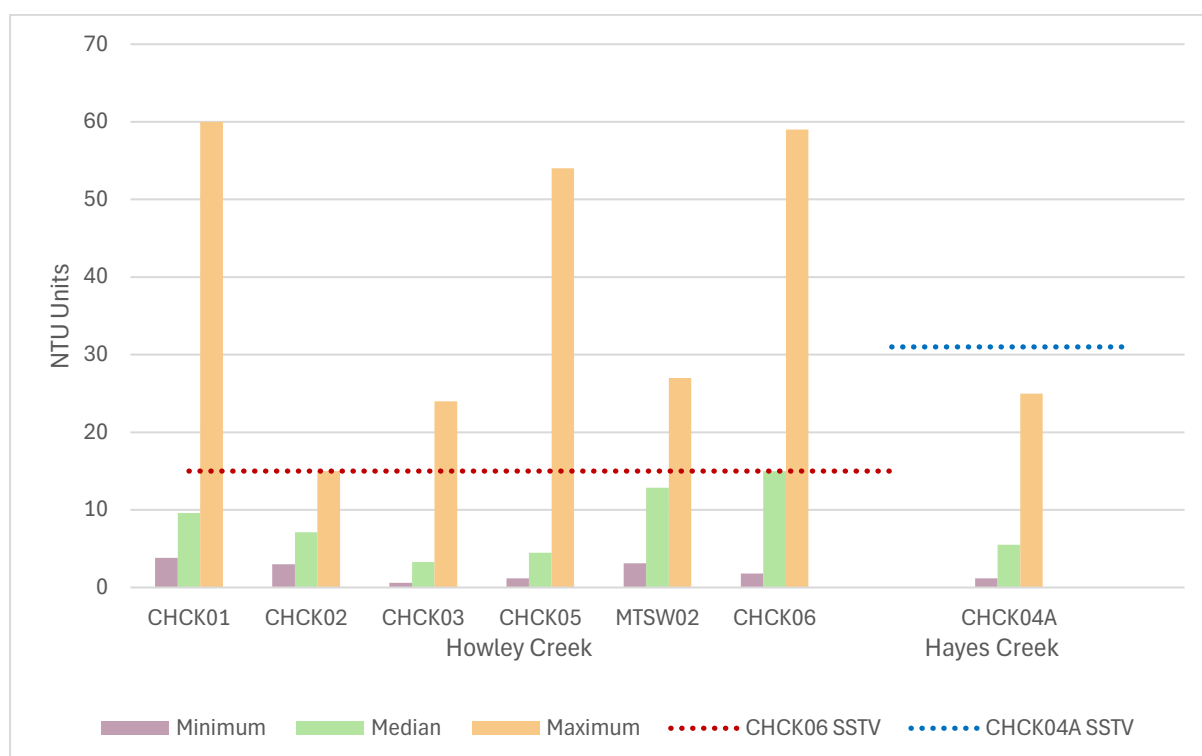


Figure 20 Turbidity results

Total Suspended Solids

Table 24 Total suspended solids results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	mg/L	28	13	5	11	44
CHCK02			7	5	5	28
CHCK03			13	5	15	38
CHCK05			13	5	15	58
MTSW02			6	5	16	39
CHCK06			13	5	17	51
CHCK04A			9	5	5	24

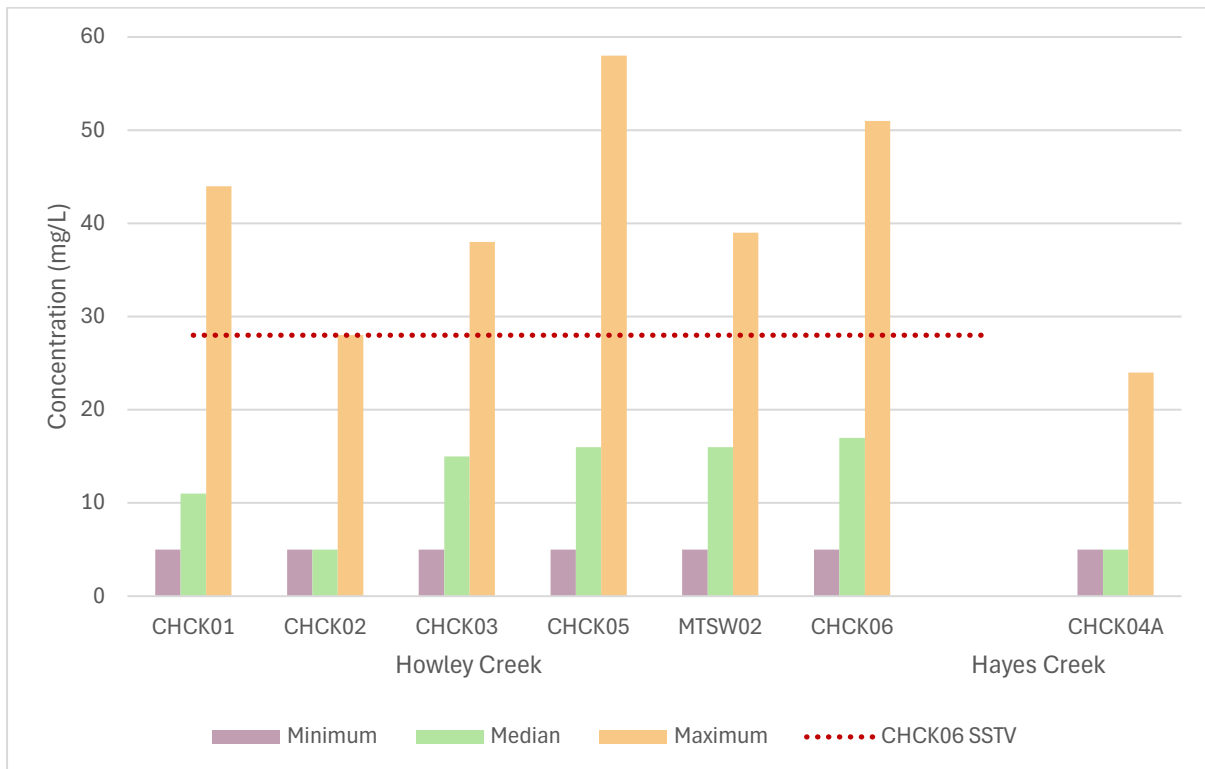


Figure 21 Total suspended solids results

Chloride

Table 25 Chloride results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	mg/L	6	13	0.5	1	4
CHCK02			7	1	1	4
CHCK03			13	0.5	1	4
CHCK05			13	2	4	7
MTSW02			6	0.5	2	10
CHCK06			13	0.5	2	4
CHCK04A		13	9	0.5	2	4

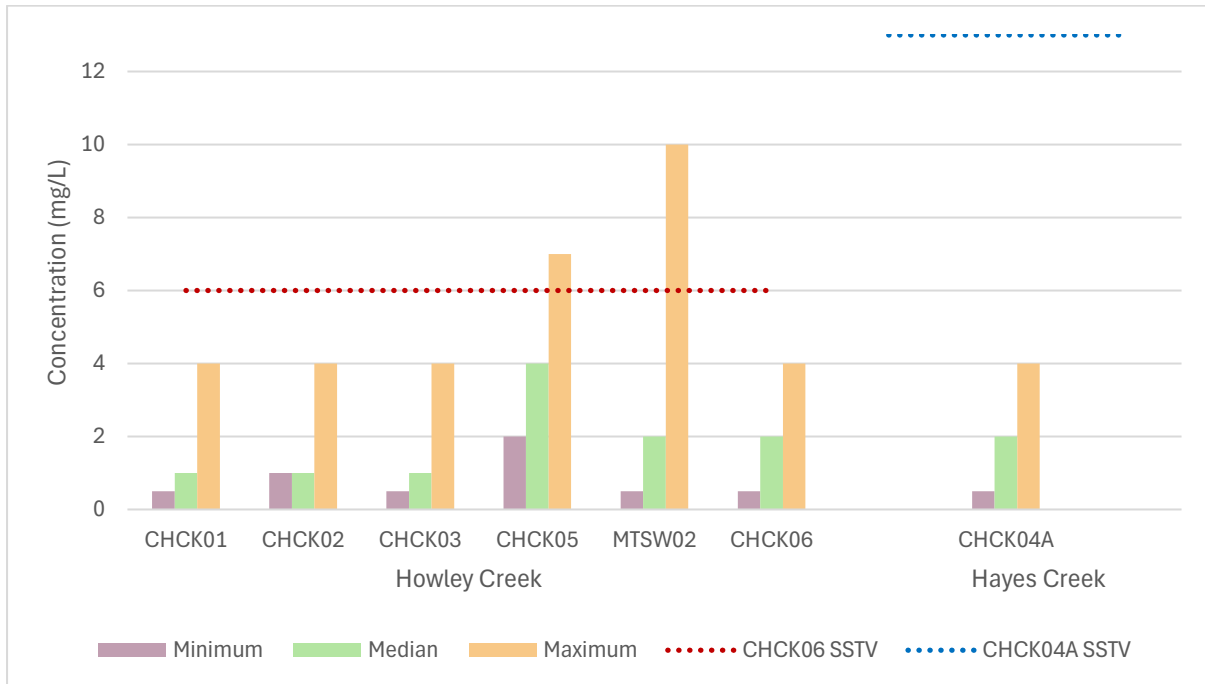


Figure 22 Chloride results

Sulphate

Table 26 Sulphate results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	mg/L	408	13	0.5	0.5	15
CHCK02			7	4	8	51
CHCK03			13	50	210	1400
CHCK05			13	440	640	2100
MTSW02			6	100	94	140
CHCK06			13	0.5	69	200
CHCK04A		N/A	9	42	100	390

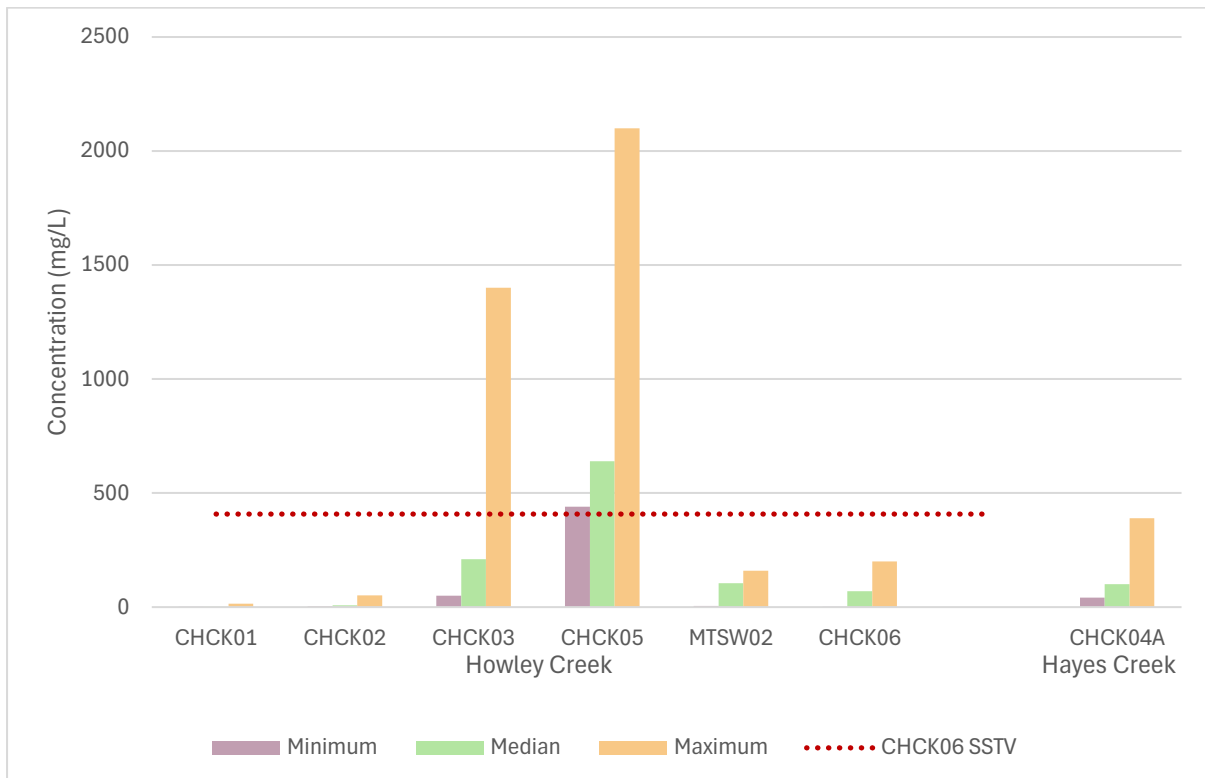


Figure 23 Sulphate results

4.3.4 NUTRIENTS

Total Nitrogen

Table 27 Total nitrogen results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	350	13	50	100	500
CHCK02			7	200	200	300
CHCK03			13	100	100	300
CHCK05			13	50	200	400
MTSW02			6	50	200	300
CHCK06			13	0.05	0.2	0.3
CHCK04A			9	100	200	300

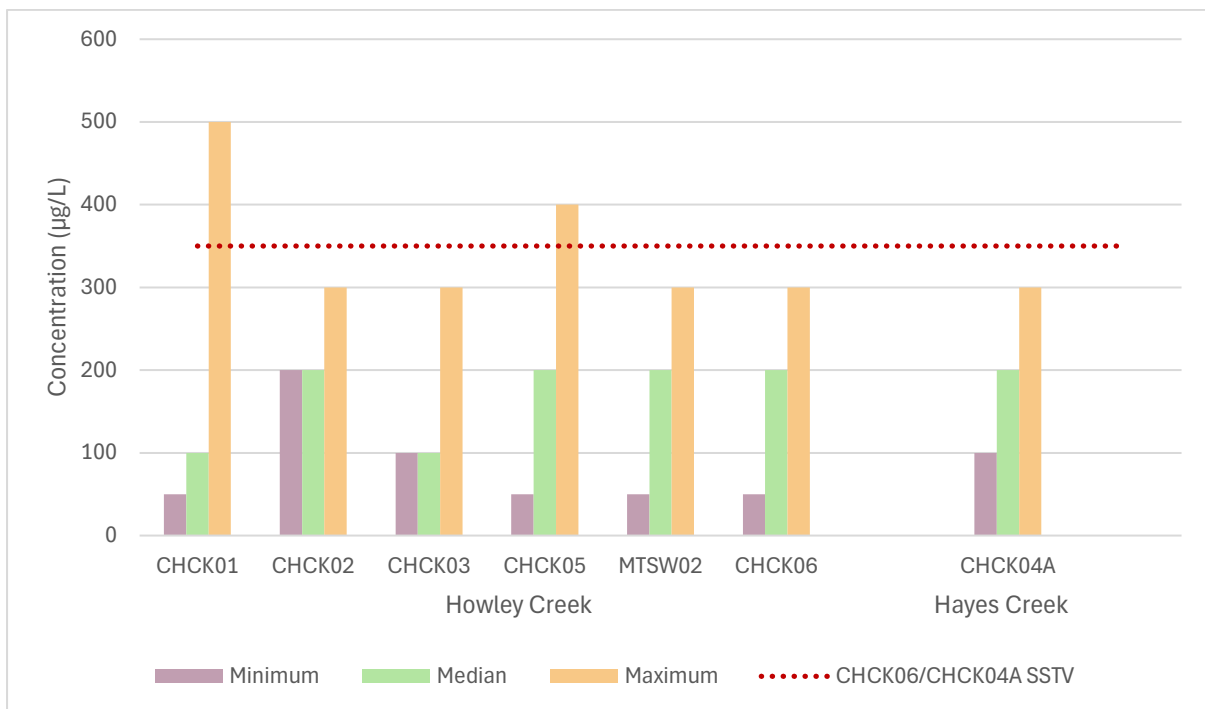


Figure 24 Total nitrogen results

Total Phosphorus

Table 28 Total phosphorus results

Site	Units	CHCK06/CHCK04 SSTV	Count	Minimum	Median	Maximum
CHCK01	µg/L	10	13	5	30	70
CHCK02			7	10	20	40
CHCK03			13	5	10	50
CHCK05			13	5	5	20
MTSW02			6	10	20	40
CHCK06			13	10	20	40
CHCK04A			9	10	30	80

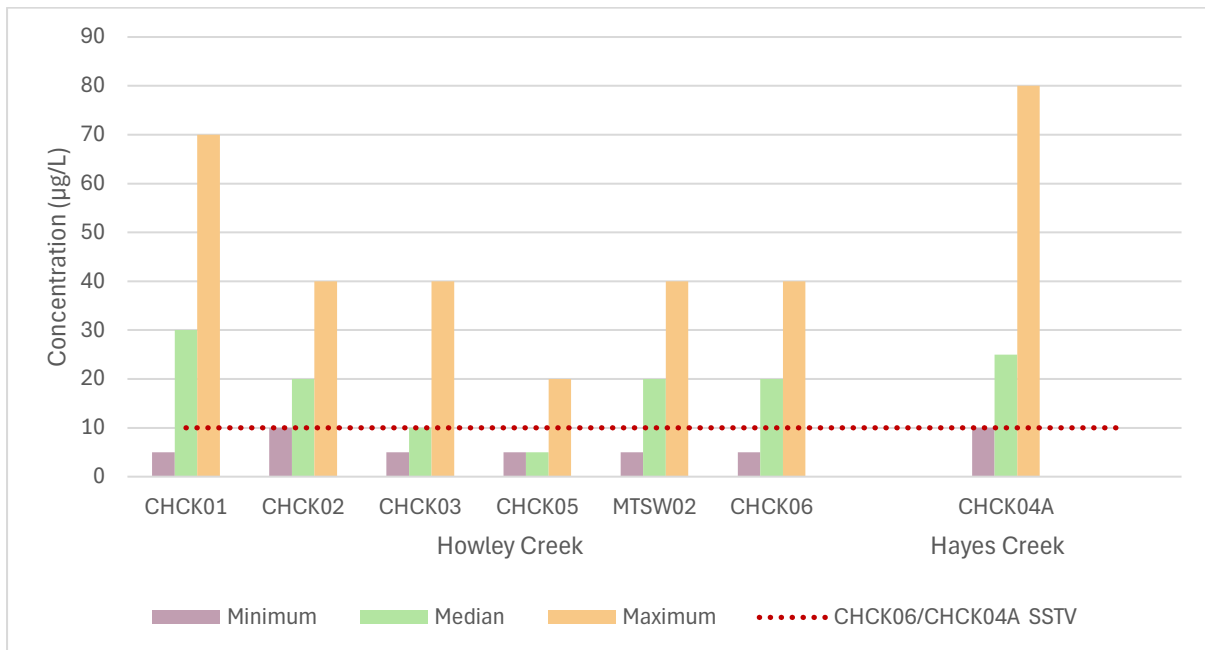


Figure 25 Total phosphorus results

4.4 CHCK06 Long Term Water Quality Trend

Table 29 CHCK06 median water quality comparison (2019 to 2024)

Analyte	Units	CHCK06 SSTV	Median					
			2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
pH	pH units	6.0 – 8.0	7.4	6.76	6.48	6.79	6.68	6.385
EC	µS/cm	700	538	657	114.5	274	227	181.9
Dissolved Oxygen	% saturated	45 – 120	73	59.5	71.8	87.15	87.4	83
Aluminium	µg/L	196	20	20	35	25	40	40
Arsenic		42	1	1	2	1.5	2	0
Cadmium		0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Chromium		6	<1	<1	<1	0.5	3	1
Cobalt		13	3	10	5	7.5	12	12
Copper		1.8	2	2	1	1.5	2	3
Iron		428	48	42	76	50	50	50
Lead		5.6	<1	<1	<1	<1	<1	1
Manganese		2500	295	690	275	455	530	400
Nickel		13	11	18	9.5	11	13	15
Selenium		18	<1	<1	<1	<1	<1	1
Uranium		N/A	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Zinc		15	8	7.5	5.5	9	13	8
Turbidity	NTU	32	15	30	25	12	11	15
Total Suspended Solids	mg/L	28	5	31.5	15	18	17	17
Chloride		6	3	3	2	2	3	2
Sulphate		408	140	230	87.5	87.5	120	69
Total Nitrogen	µg/L	350	400	200	200	300	100	250
Total Phosphorus		10	<5	<5	<5	<5	<5	2

4.5 Ecotoxicological Results

The ecotoxicological results can be found in appendix C.

4.6 Macroinvertebrate and Sediment Results

The macroinvertebrate and sediment results can be found in appendix E.

5 DISCUSSION AND INTERPRETATION OF RESULTS

The monitoring objectives for the CHPA WDL-180-08 are:

- Environmental quality is to be maintained and managed and;
- Pollution, or environmental harm resulting from pollution, is to be controlled.

5.1 Hayes Creek Analysis

CHCK04A receives surface runoff and seepage from the Cosmo ROM Pad and old heap leach.

Electrical conductivity levels consistently exceeded the threshold at CHCK04A throughout the reporting period however, remained below three times the SSTV. Figure 5 shows the median value being 277.3 µg/L, surpassing the 250 µg/L SSTV.

The SSTV limit for total phosphorus consistently exceeded at CHCK04A and also exceeded at CHCK04C (Figure 24). The median value for each site measured 30 µg/L, surpassing the SSTV trigger value is 10 µg/L.

5.2 Howley Creek Analysis

The outlier data observed in CHCK03, CHCK05, and CHCK06, marked by notably heightened levels of dissolved metals can be attributed to the absence of rainfall during the preceding week, following a month of heavy rainfall (Figure 3). CHCK03 and CHCK05 receive surface water runoff and seepage Cosmo waste rock dump and mine water dam, respectively, and the absence of rainfall prevented dilution, contributing to the exceedances. In contrast, sampling conducted on days with high levels of rainfall, either close to or on the day of sampling, displayed the minimum concentrations of dissolved metals.

Aluminium data shown in Figure 8 displays an exceedance at displayed in concentration of 660 µg/L, coinciding with the outlier sampling event during which CHCK03 and CHCK05 exhibited aluminium concentrations of 77,000 µg/L and 65,000 µg/L, respectively.

The exceeded concentrations of cobalt (Figure 12), nickel (Figure 17), and zinc (Figure 18) detected at site CHCK06 are primarily attributed to the influence of CHCK03 and CHCK05, with some contribution from MTSW02.

Copper exceedances can be attributed to CHCK03 and CHCK05 influences as seen in the Figure 13.

The application of hardness correction factors may be conducted on a per-sample basis, aligning with the guidelines outlined in the ANZG 2018 for cadmium, chromium, lead, nickel, and zinc. This decreased the exceedances that occurred for cobalt, nickel, and zinc.

In most instances, MTWS02 mirrors CHCK06's levels due to their proximity. However, Figure 21 reveals that chloride exceeds in MTWS02, reaching a maximum of 10, surpassing its SSTV of 6. Conversely, CHCK06's chloride level significantly decreases, remaining below the SSTV, indicating downstream dilution.

Total phosphorus data shows CHCK01 median total phosphorus high than that of CHCK06, with a median value of 30 µg/L in Creek 1 compared to 20 µg/L in Creek 6, this finding suggests a potential upstream contribution to the total phosphorus load observed in Creek 6.

6 CONCLUSION AND IMPROVEMENTS

A total of 23 exceedances occurred at CHPA. Elevated metal concentrations have the potential to induce stress in aquatic flora and fauna. However, field observations did not reveal any signs of impacted aquatic habitats, such as visible algal blooms, fish mortality, or other adverse effects on aquatic organisms or flora. Monitoring of CHCK06 and CHCK04A will continue according to the schedule outlined in the WDL to promptly identify any immediate environmental harm.

The details outlining improvements can be found in Appendix D.

7 CERTIFICATION

WDL180-08 Condition 52. The licensee must ensure that each Monitoring Report is prepared in consultation with a Qualified Professional to determine the relevance of the information being provided as it relates to the waste discharge component of the site and in the format described in the National Water Quality Management Strategy, Australian Guidelines for Water Quality Monitoring and Reporting.

I, **Dong (Sam) Yang** (Superintendent – Environment, RPEQ, MAusIMM CP) declare that I am aware that Part 9 of *Mining Management Act 2001 (As in force at 31 December 2018)* makes it an offence for a person to know the document contains misleading information and the person knows the official is acting in an official capacity.

I am aware that registered professional engineer (RPEQ) must act with honesty, integrity, fairness, without unjustified discrimination and with due respect for the rights of others and the laws of the communities in which engineering services are supplied.

Signature	
Date	

8 ABBREVIATIONS

Acronym	Description
ANZECC	Australian and New Zealand Environment and Conservation Council
CHCK	Cosmo Howley Creek
CHPA	Cosmo Howley Project Area
NTMO	NT Mining Operations
ROM	Run of mine
SSTV	Site Specific Trigger Value
WDL	Waste discharge license
WRD	Waste rock dump

9 APPENDICES