Real-Time Water Quality Deployment Report

Teck Duck Pond Operations

2020

Government of Newfoundland & Labrador
Department of Environment, Climate Change & Municipalities
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

Introduction

Real-time monitoring (RTWQ) of surface and groundwater quality on the Teck: Duck Pond Operations site (Teck DPO) is carried out by the Department of Environment, Climate Change and Municipalities (ECCM), Water Resources Management Division (WRMD). This work is undertaken in circumstances where industrial development has the potential to impact water bodies. The RTWQ program consists of more than 30 stations across the province from Voisey's Bay to St. Lawrence and Stephenville to St. John's.

RTWQ work at Teck DPO has been ongoing since 2006 with the installation of three monitoring stations: East Pond Brook (abbreviated EPB) station, Tributary to Gill's Pond Brook (abbreviated TGPB) station, and Monitoring Well after Tailings Dam A station.

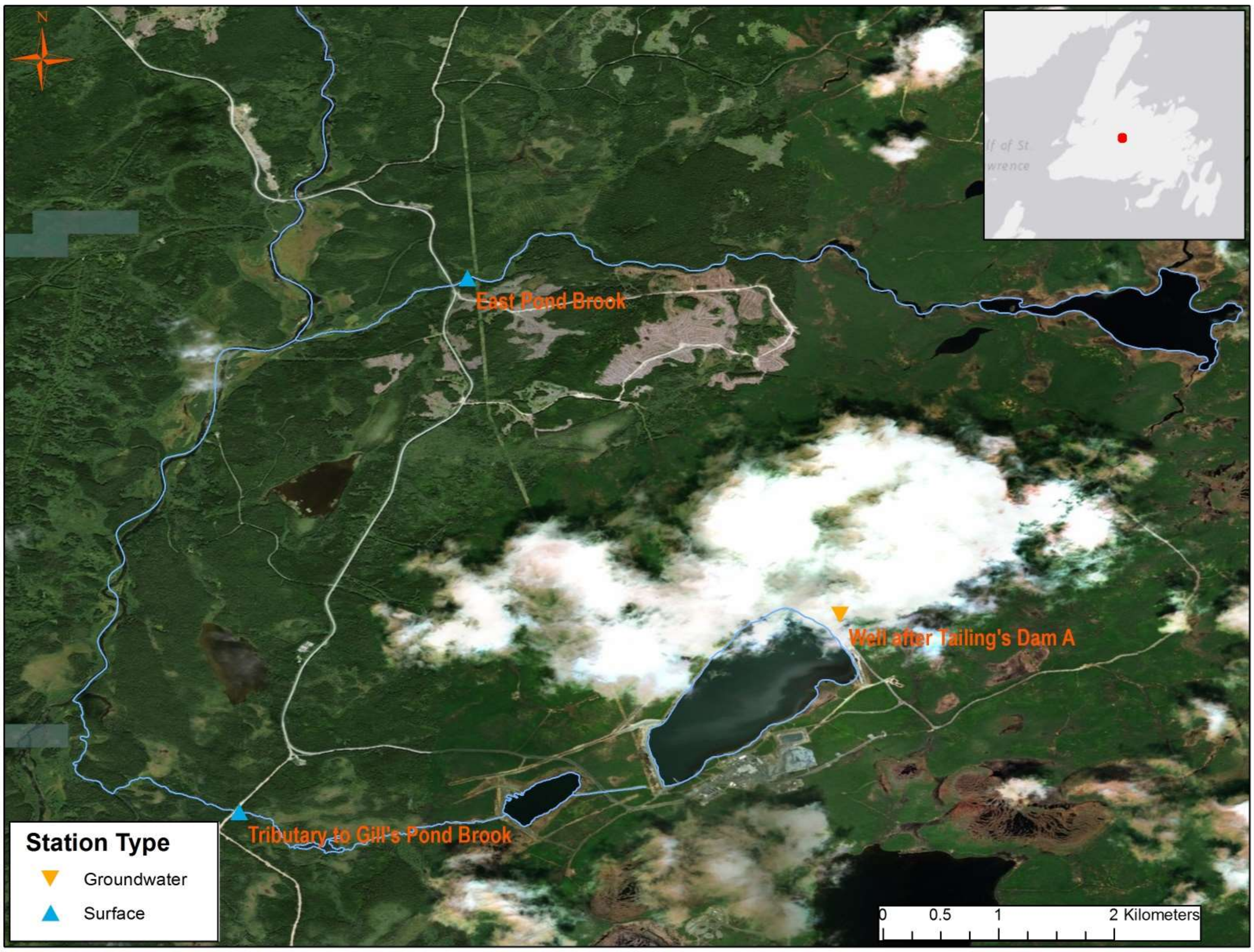


Photo 1: Aerial photo of Teck DPO project site and water quality stations

These stations, identified in Photo 1, were situated to observe water quality at key locations over the course of the Teck DPO project. EPB station was placed to intercept potential seepage from underneath flow control structures that maintain the tailings management area. TGPB is placed to observe water quality following the ultimate discharge of treated effluent from the polishing pond into the environment. Well after Tailings Dam A is also located in the East Pond Brook watershed, but is immediately adjacent to the flow control structure that ensures the tailings management area drains towards the polishing pond and the eventual discharge point above TGPB station.

In this report, notable events and trends from 2020 are identified and discussed in relation to previous years. Thorough statistical analysis is intentionally avoided in favour of brief summary statistics.

Methods and Procedures

Work under the RTWQ program is conducted according to the *Protocols Manual for Real-Time Water Quality Monitoring in NL*[1]. This document outlines the procedures, methods, and QAQC regimen used by all staff involved in the RTWQ program at all stations, province wide. For surface water monitoring, water quality instrumentation – in this case the Hydrolab DS5X multi-parameter sonde – is deployed on six-week intervals with *in situ* data validation at the beginning and end of deployment using an equivalent and freshly calibrated multi-parameter sonde. A grab sample is collected at the start of a deployment as an independent indicator of data quality.

Due to the narrow confines of a 2” monitoring well, insertion of additional instruments into the well for verification purposes results in considerable changes to the well chemistry. As a result, data validation is restricted to capturing a grab sample immediately prior to insertion of newly-calibrated monitoring equipment in the well. Protocol requires a volume equivalent to three well casings to be purged from the well prior to sampling. This process flushes stagnant water from the well and ensures that the water being observed is aquifer water.

In the next section, long-term data from both the surface and groundwater monitoring networks are presented as line and boxplots. Guidelines set by the *Canadian Council of Ministers of the Environment (CCME)* for Aquatic Life and site-specific guidelines are indicated by dashed lines. Grab sample data for pH, specific conductivity, and turbidity is presented as black dots in the same figures. Boxplots are presented to illustrate how water quality parameters change from year to year.

Summary statistics are presented for each surface and groundwater parameter in the next section. Each table lists the 2020 median, minimum, and maximum values. *Average median* values for each parameter are calculated from the median values of each previous year and are provided in the same tables and labelled as *average* for simplicity. Median values are preferred throughout this report as a more robust indicator of central tendency than average values, especially given the highly skewed nature of environmental data.

Results and Discussion

The following pages provide interpretation of water quality events and trends observed at each real-time water quality monitoring station at Teck DPO in 2020.

[1] https://www.gov.nl.ca/eccm/files/waterres-rti-rtwq-nl-rtwq-manual.pdf

Surface Water Network

The surface water network at Teck DPO consists of EPB and TGPB stations which are discussed in this section.

Water Temperature

Water temperatures in 2020 were higher than median temperatures from the previous years (see Table 1). This is likely annual variation and of no immediate concern.

Major transmission issues followed by cable failure after damage from a tree resulted in a loss of data from EPB from January to May 2020. As a result, the median temperature value may be skewed. Water temperatures are summarized in Table 1.

Table 1: Water Temperature at Teck DPO

Station	Segment	Median	Min	Max
East Pond Brook	Average	4.64	-0.32	29.05
	2020	12.69	0.01	28.15
Gills Pond Brook	Average	4.31	-0.45	27.8
	2020	5.13	0	27.57

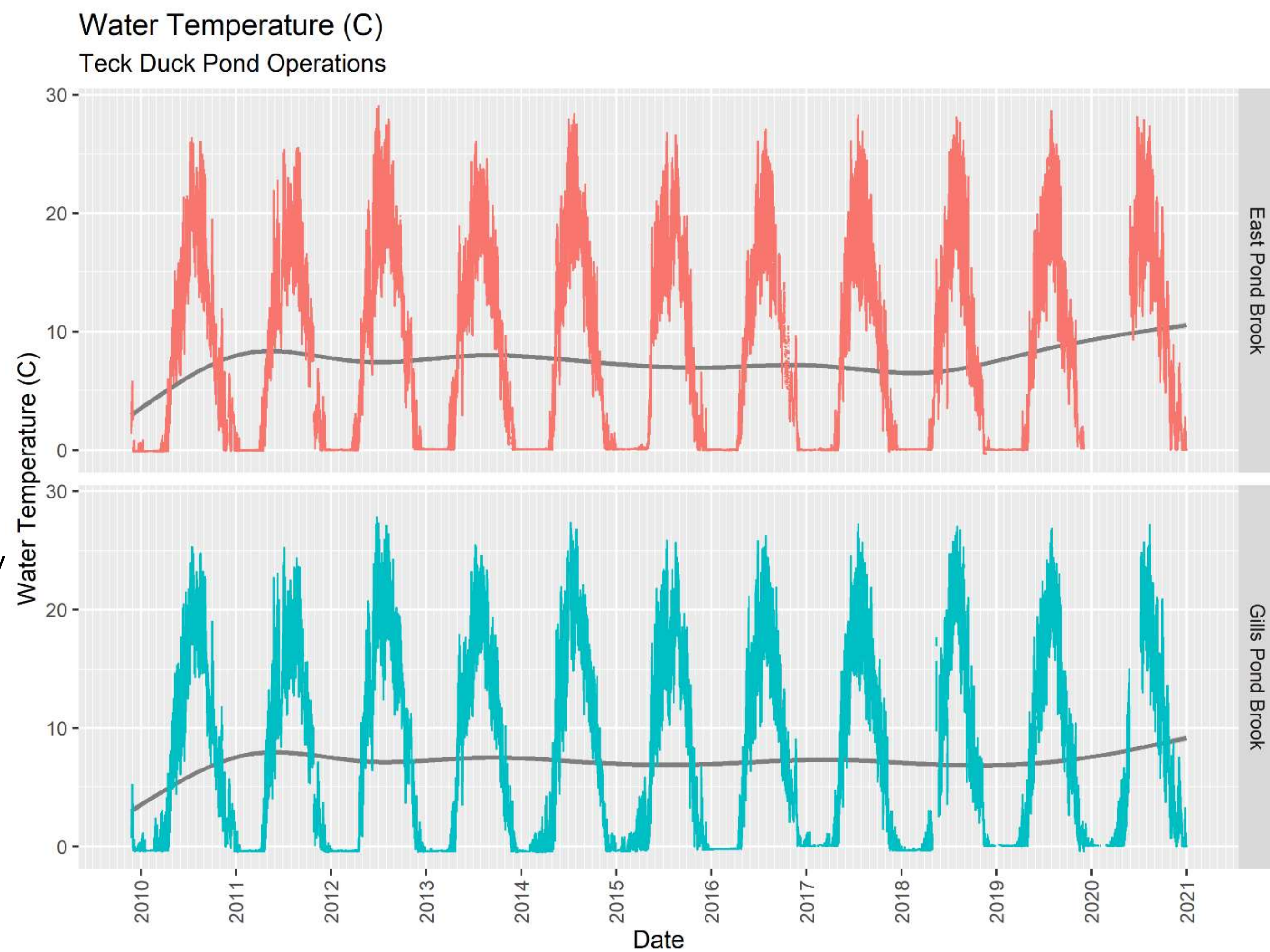


Figure 1: Water Temperature at Teck DPO

Figure 2 shows the range in water temperatures at EPB and TGPB stations since 2010. In that time span, 2020 was on par with other average years at TGPB, but EPB was warmer. This is due to the skewed dataset as data from January to May was not available.

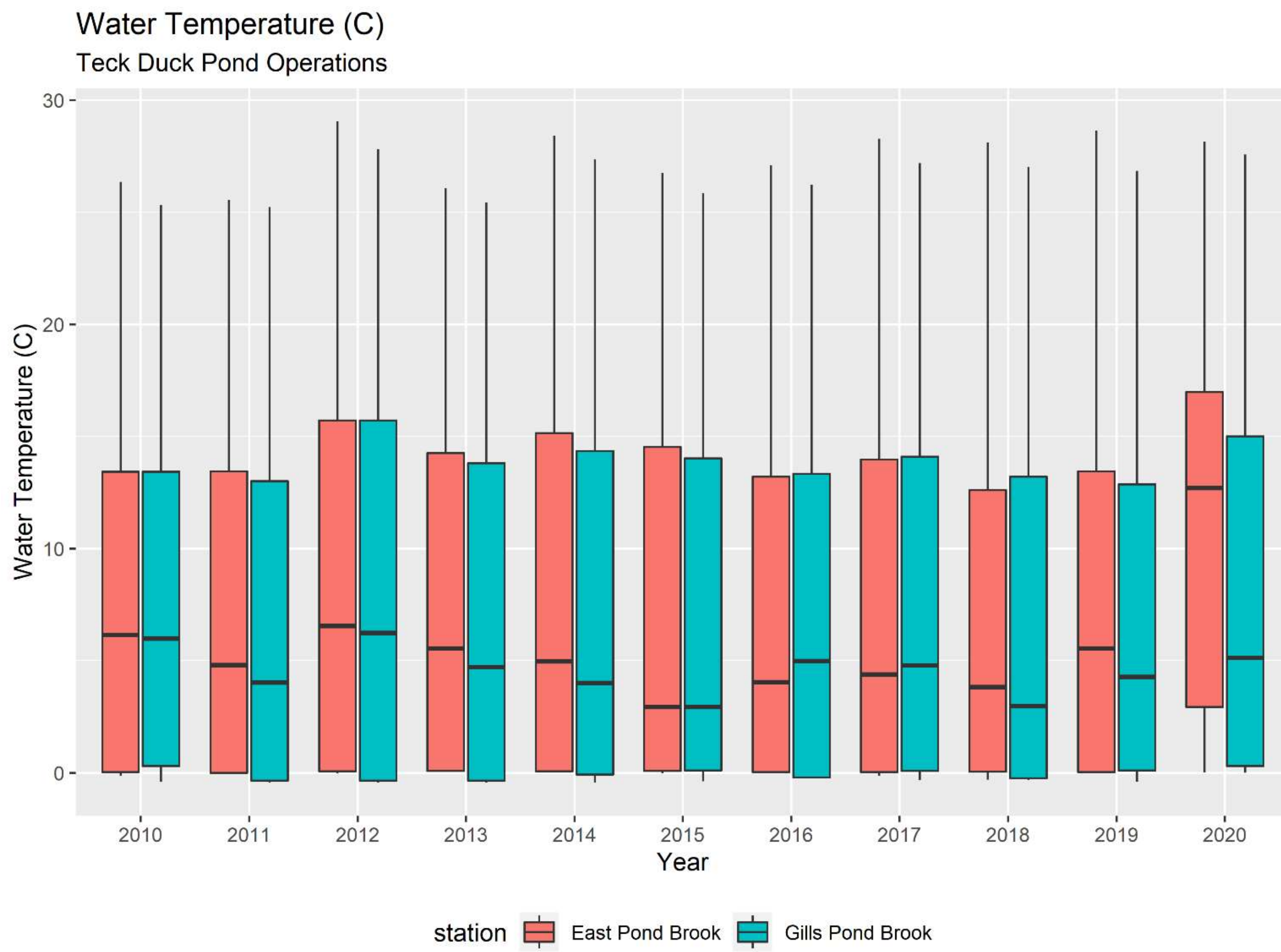


Figure 2: Boxplots of water temperature at Teck DPO from 2010 to 2020

pH

Median pH values observed at EPB and TGPB stations in 2020 are not meaningfully different from values observed in the previous years (Table 2).

Figure 3 shows that pH levels at East Pond Brook typically fall at, or somewhat below, the CCME guidelines for the protection aquatic organisms (dashed lines). pH levels at Gill's Pond Brook typically fall at, or somewhat above, CCME guidelines. The 2020 data was consistent with this trend as TGPB recorded higher pH values than EPB.

Ambient waters on the island of Newfoundland tend to be acidic due to natural geological and ecological characteristics. As such, the ambient waters of East Pond Brook are slightly acidic. Gills Pond Brook waters, however, are highly influenced by treated effluent discharged from an upstream polishing pond. These waters are treated to maintain a near-basic pH of 7.0

Table 2: pH at Teck DPO

Station	Segment	Median	Min	Max
East Pond Brook	Average	6.51	4.94	7.47
	2020	6.60	5.46	7.30
Gills Pond Brook	Average	6.82	5.5	7.69
	2020	6.84	5.77	7.54

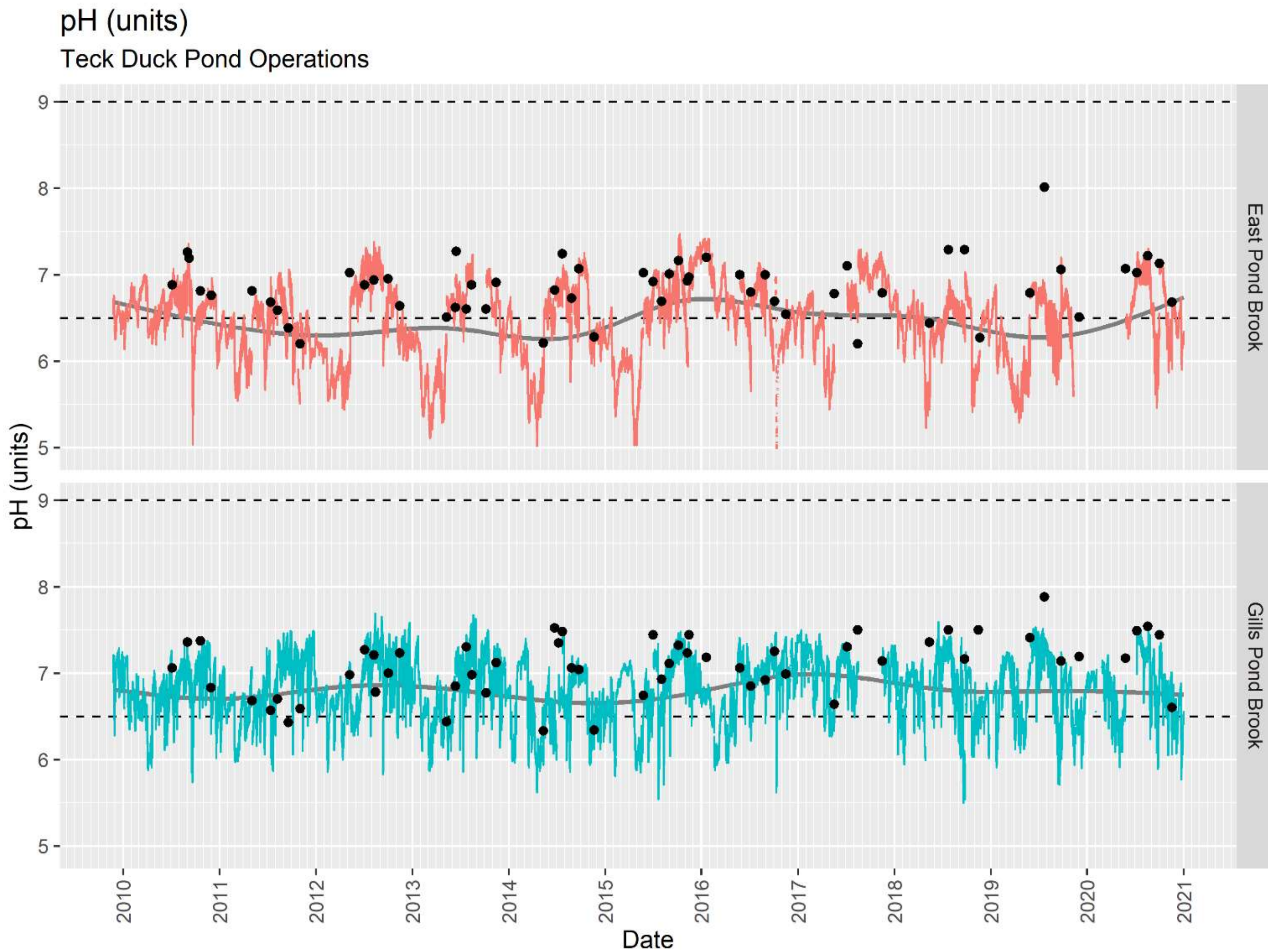


Figure 3: pH at Teck DPO

pH values in 2020 were somewhat higher than those observed at East Pond Brook in 2018 and 2019, but 2020 Tributary to Gills Pond Brook data was on par with 2018 and 2019 data, as seen in Figure 4. Median annual pH values at East Pond Brook reached a historical low in 2019, but rose again in 2020.

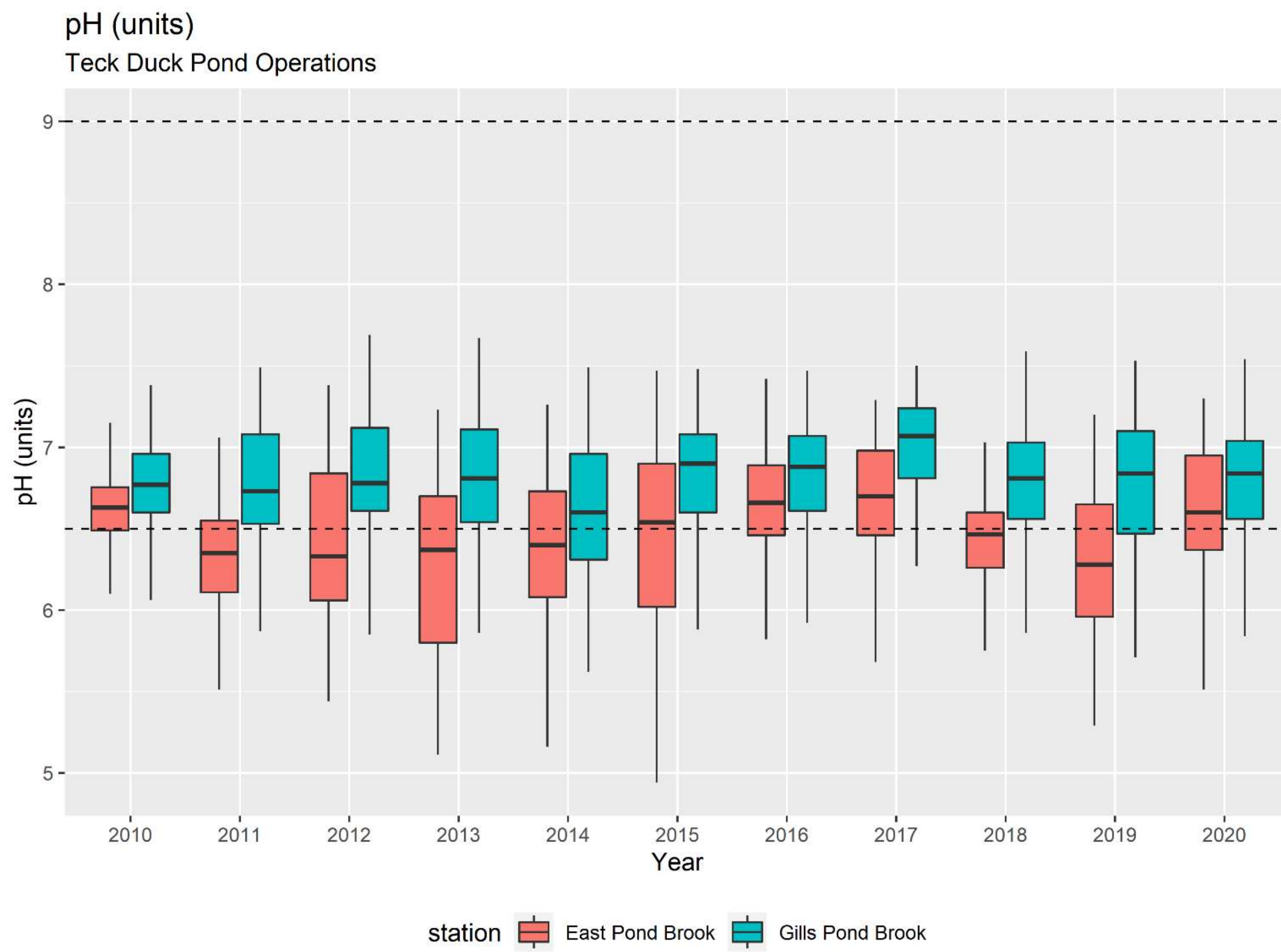


Figure 4: Boxplots of pH at Teck DPO from 2010 to 2020

Specific Conductivity

In Table 3, median specific conductivity values at East Pond Brook in 2020 were on par with the levels seen over the previous years. Tributary to Gills Pond Brook 2020 data was relatively lower than levels seen over the previous years.

A slow and long term rising trend in conductivity previously observed in East Pond Brook data, is not as evident in 2020, as shown by the trend line in Figure 5. The driving force behind this increase may be related to a number of factors such as atmospheric deposition of dust from industrial activity in the area, soil disturbance form nearby logging activities, or movement of dissolved solid-laden groundwater from the tailings management area higher in the watershed.

Table 3: Specific conductivity at Teck DPO

Station	Segment	Median	Min	Max
East Pond Brook	Average	27.0	6.3	97.3
	2020	29.8	13.6	48.7
Gills Pond Brook	Average	431	7.4	1771
	2020	278	21.8	964

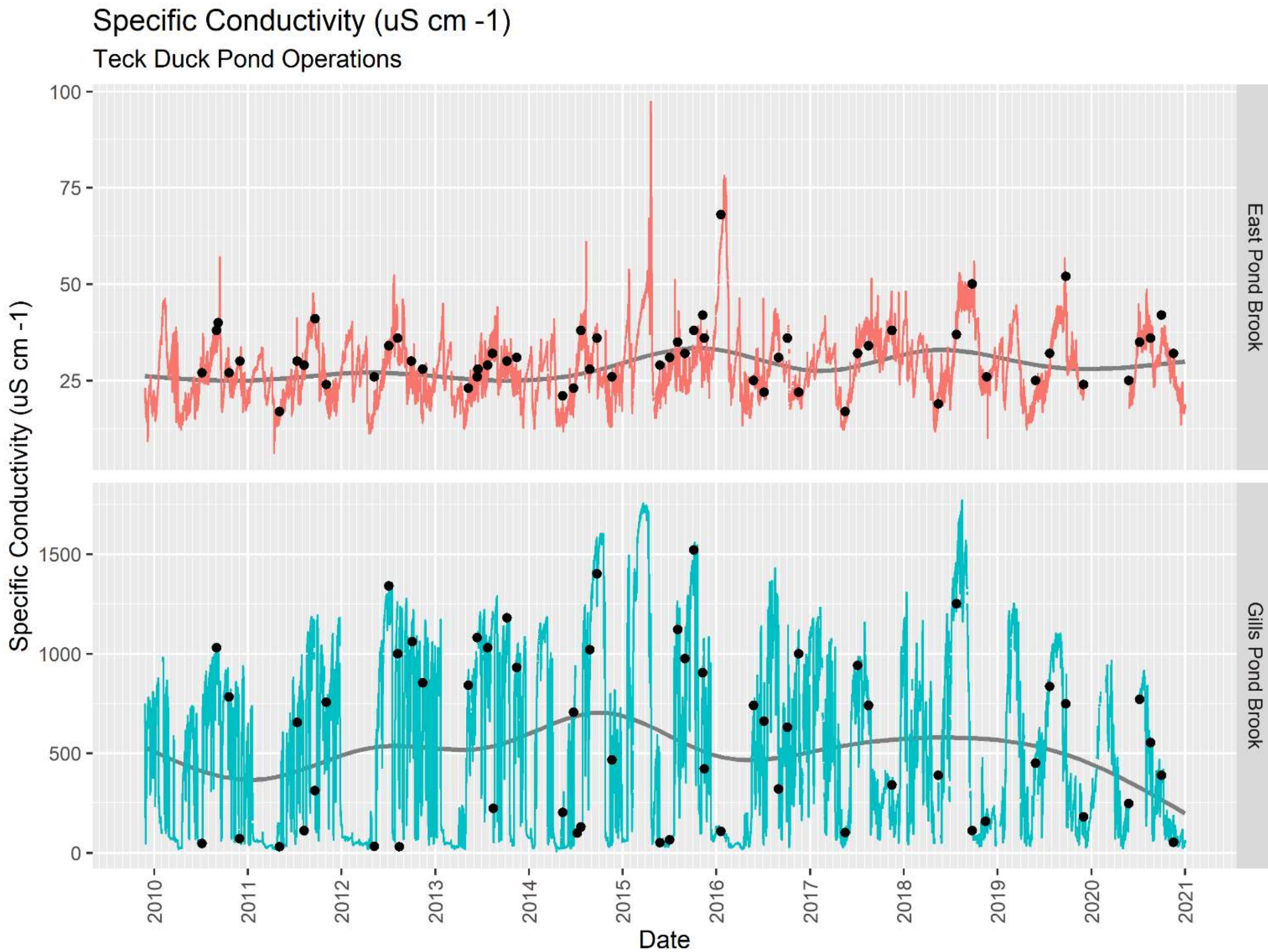


Figure 5: Specific Conductivity at Teck DPO

The influence of polishing pond effluent on water quality in Gill's Pond Brook is evident in Figure 6. Without polishing pond effluent, specific conductivity levels at EPB and TGPB stations would report values similar to one another. Specific conductivity at TGPB station, however, is substantially higher than EPB station which barely registers on the plot to the right.

0

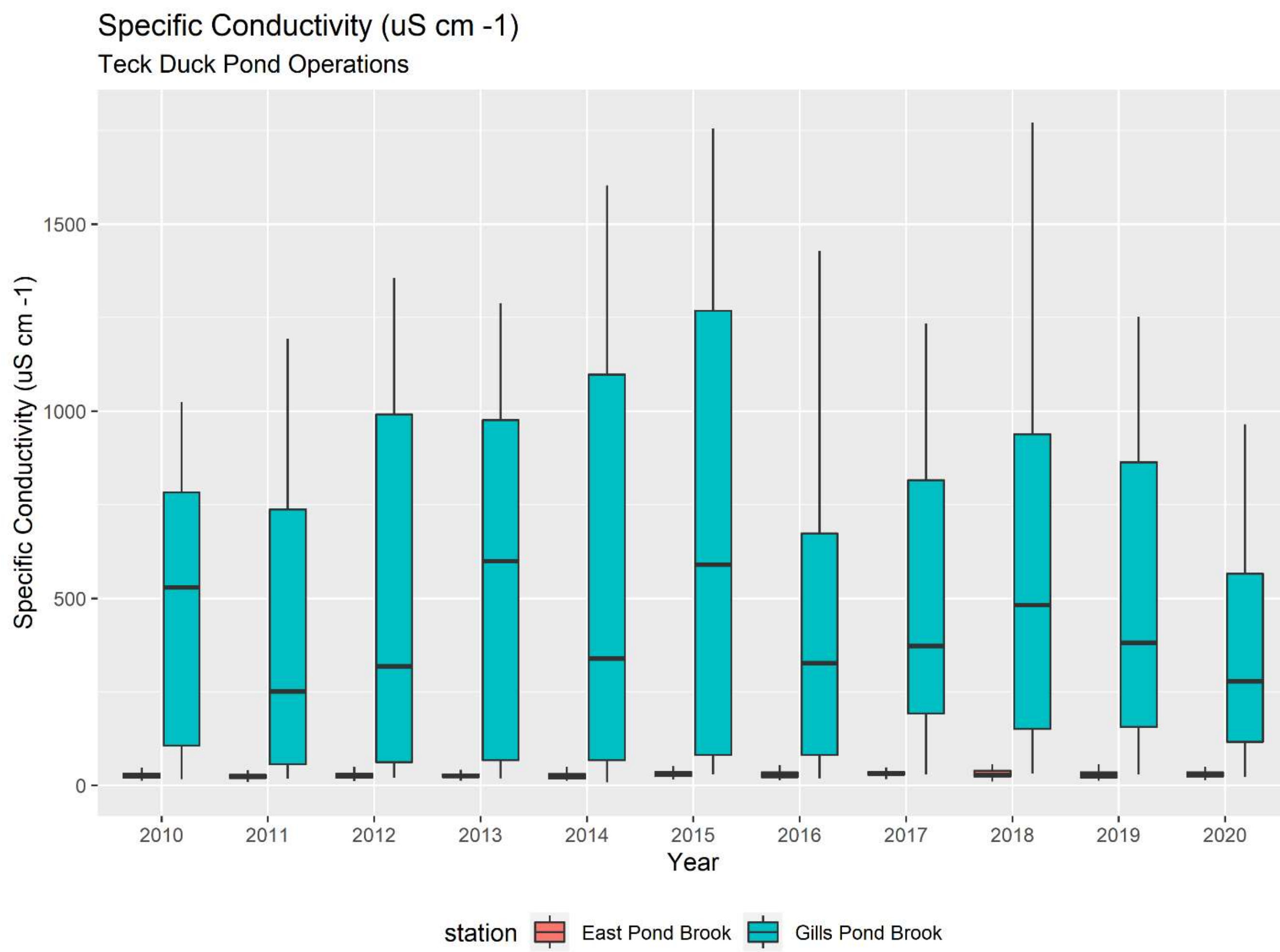


Figure 6: Boxplots of specific conductivity at Teck DPO from 2010 to 2020

Dissolved Oxygen

Dissolved oxygen concentrations in 2020 were lower overall at both stations compared to the previous years (Table 4). However, both stations recorded higher minimum values in 2020 than in the historical data.

In 2020, all dissolved oxygen values were found to be above the CCME Aquatic Life Guideline for other life stages (6.5mg/L), but below the guideline for early stages (9.5 mg/L) during the warmer seasons when water can hold less oxygen (Figure 7). Guidelines are indicated on Figure 7 by dashed lines.

Table 4: Dissolved Oxygen at Teck DPO

Station	Segment	Median	Min	Max
East Pond Brook	Average	11.88	6.94	14.44
	2020	9.89	7.4	14.3
Gills Pond Brook	Average	11.68	6.41	14.38
	2020	11.26	7.34	13.81

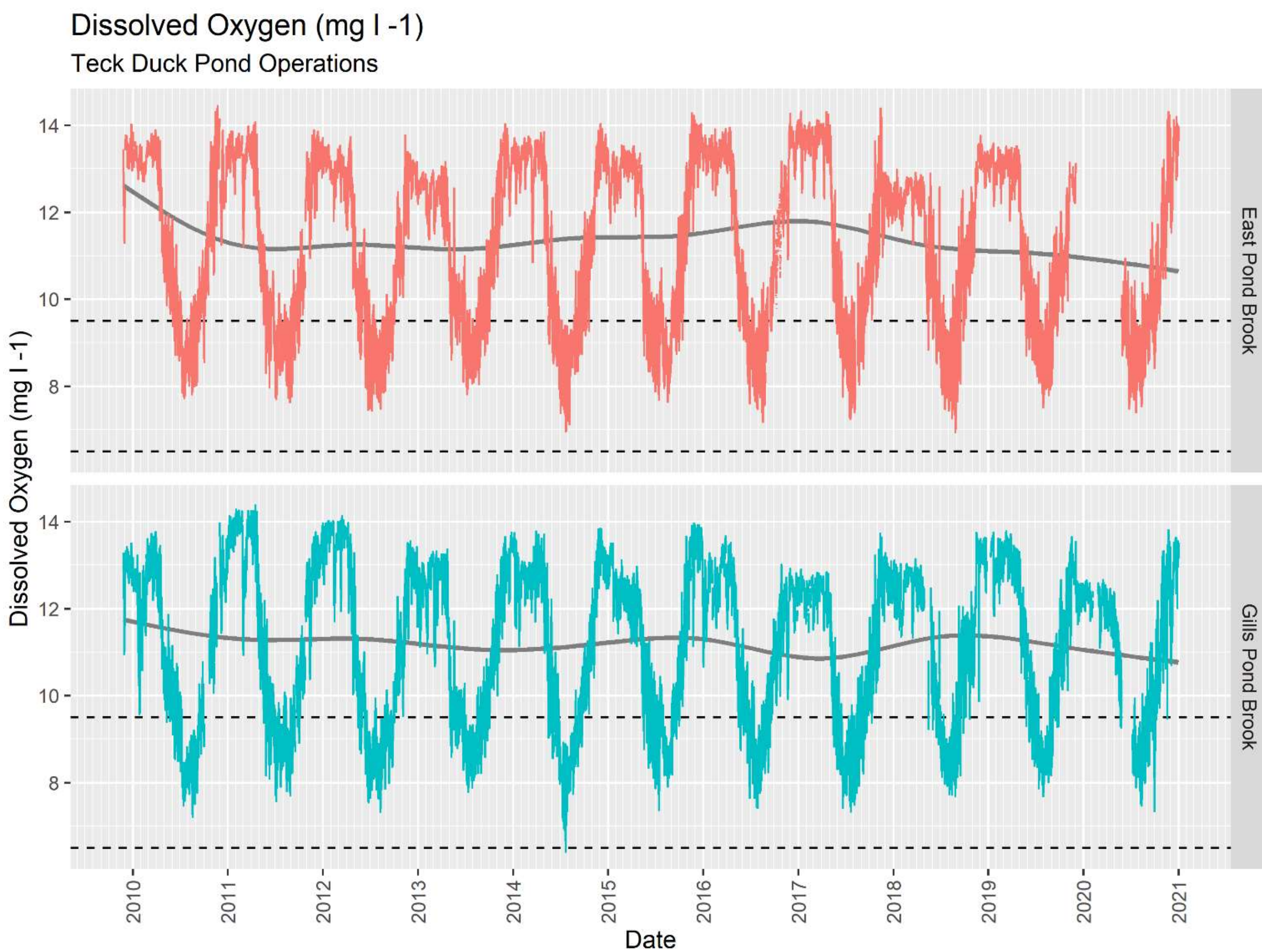


Figure 7: Dissolved oxygen at Teck DPO

As seen in Figure 8, dissolved oxygen concentrations have not changed in any considerable up- or downward trend since monitoring began. East Pond Brook's 2020 data is an exception, with significantly lower than normal oxygen levels. This is due to skewed 2020 data, with more data during the warmer summer months and no data from the cooler January to May months to affect the median.

Each box, which represents the central 75% of values, is generally greater than the least-conservative CCME guideline of 9.5 mg/l for the protection of aquatic biota in early life stages (black, dashed lines).

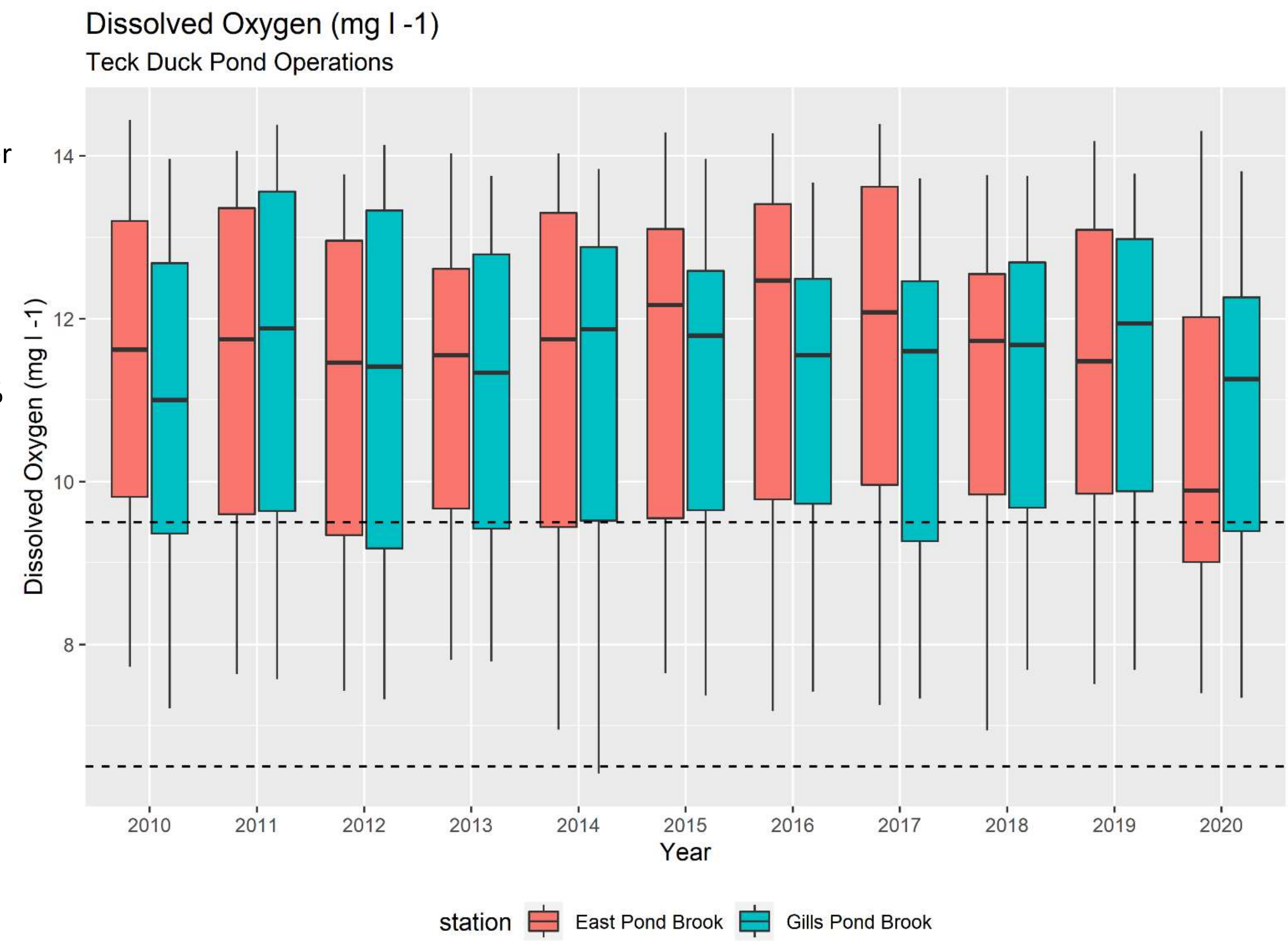


Figure 8: Boxplots of dissolved oxygen at Teck DPO from 2010 to 2020

Turbidity

Turbidity levels at both Gill's Pond Brook and East Pond Brook stations are generally very low (Table 5).

Despite median values of 0 NTU historically, Figure 9 shows that there are some notable periods of higher turbidity. At TGPB station, these periods are especially obvious from 2010 to mid-2014 and again in 2016. Following this period, turbidity events became fewer in number and lower in magnitude. In 2020, EPB reported a small level of background turbidity, with sporadic increases. GPB reported an abnormally low maximum value for the second year in a row. Only a small number of turbidity events were encountered at either station and were short in duration.

Table 6: Turbidity at Teck DPO

Station	segment	Median	Min	Max
East Pond Brook	Average	0	0	1789
	2020	0.2	0	1063
Gills Pond Brook	Average	0	0	1635
	2020	0	0	202.5

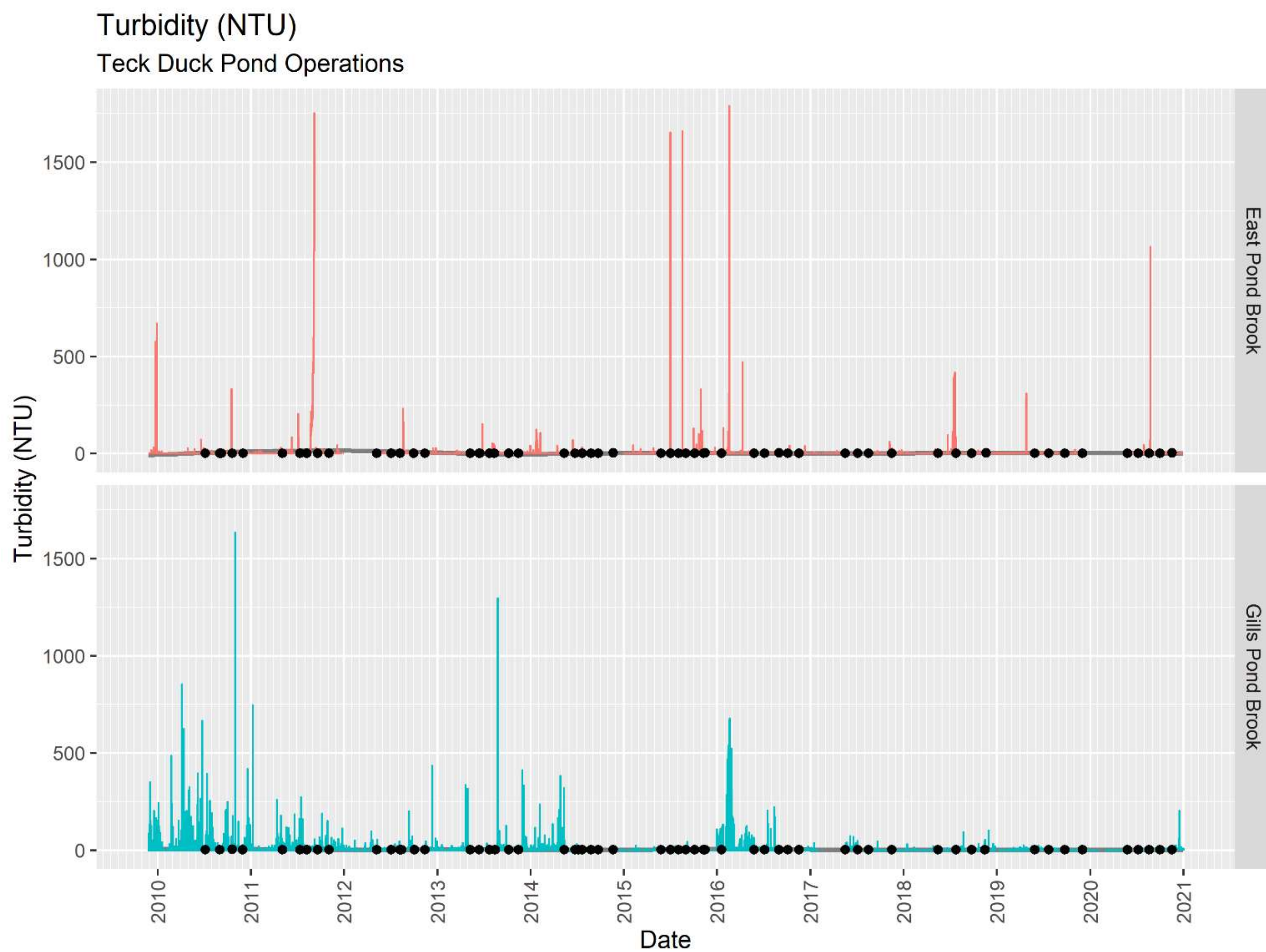


Figure 9: Turbidity at Teck DPO

The long-term characteristics of turbidity at the Teck DPO sites are seen in Figure 10. Within each boxplot, a central, horizontal black bar indicates median turbidity. Median values are generally located at 0 NTU, except for East Pond Brook in 2016, 2017 and 2019. Those three years seemed to indicate a rising trend in turbidity. The 2020 median value is lower than 2019. The upper range of turbidity values at East Pond Brook showed steady increases from 2015 to 2018. The 2019-2020 values show a decline, indicating a decreasing trend.

The mechanisms responsible for this increase and more recent decrease are not known but possible explanations could be closure work at Teck DPO or logging work occurring in the area.

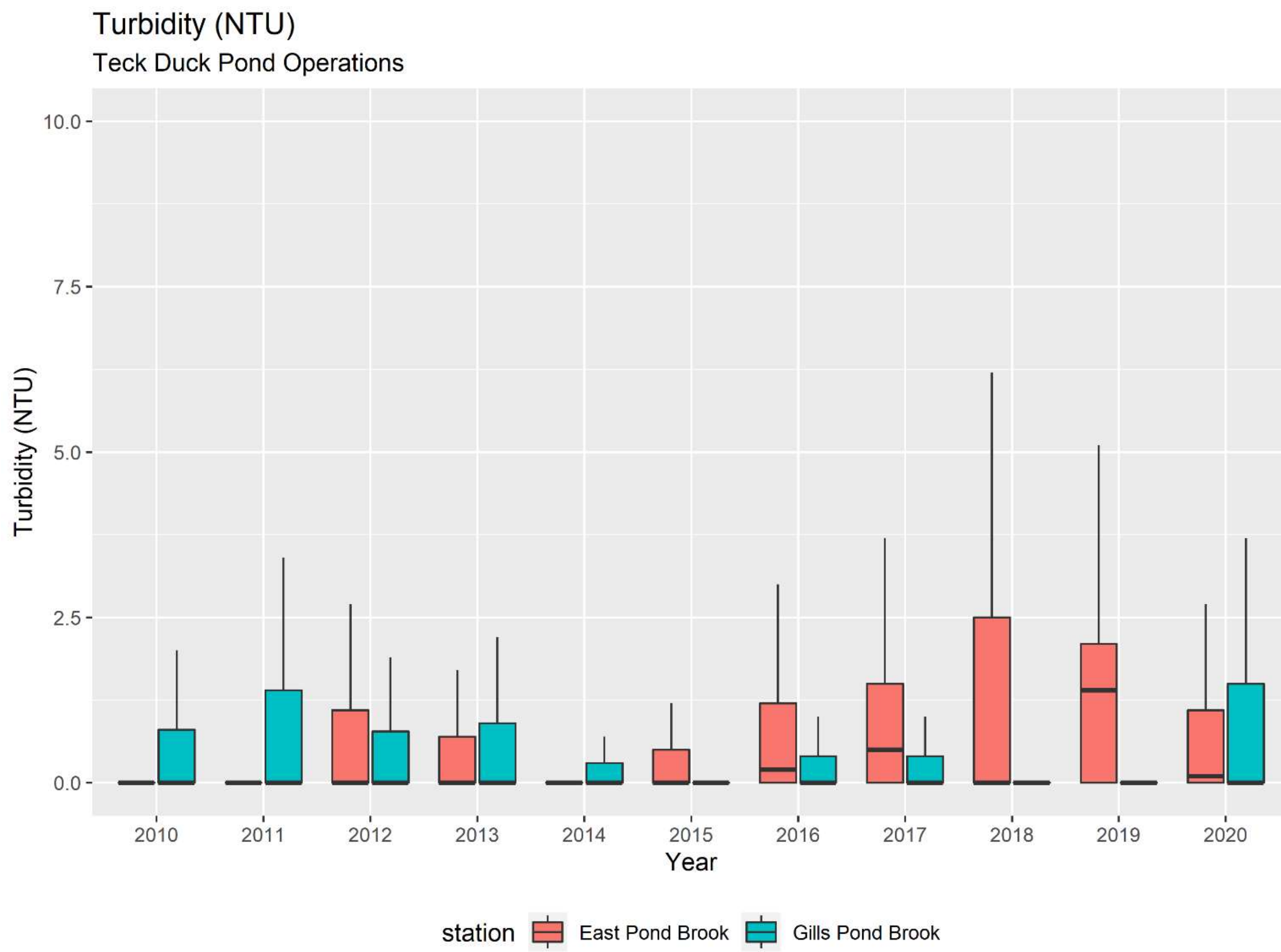


Figure 10: Boxplots of turbidity at Teck DPO from 2010 to 2020

Well after Tailings Dam A

This section presents groundwater quality parameters from a location immediately adjacent to the northeastern downgradient edge of the tailings management area.

Water Temperature

In 2020 water temperatures fell within a range of 1.41°C, according to Table 7. These temperatures fall within historical ranges.

Figure 11 shows that annual low temperatures tend to occur in mid-July and annual high temperatures tend to occur in mid-December. The 2020 data followed this trend while recording the lowest temperature on record.

Table 7: Water Temperature at Well after Tailings Dam, Teck DPO

Segment	Median	Min	Max
Average	5.31	4.51	6.13
2020	5.33	4.46	5.87

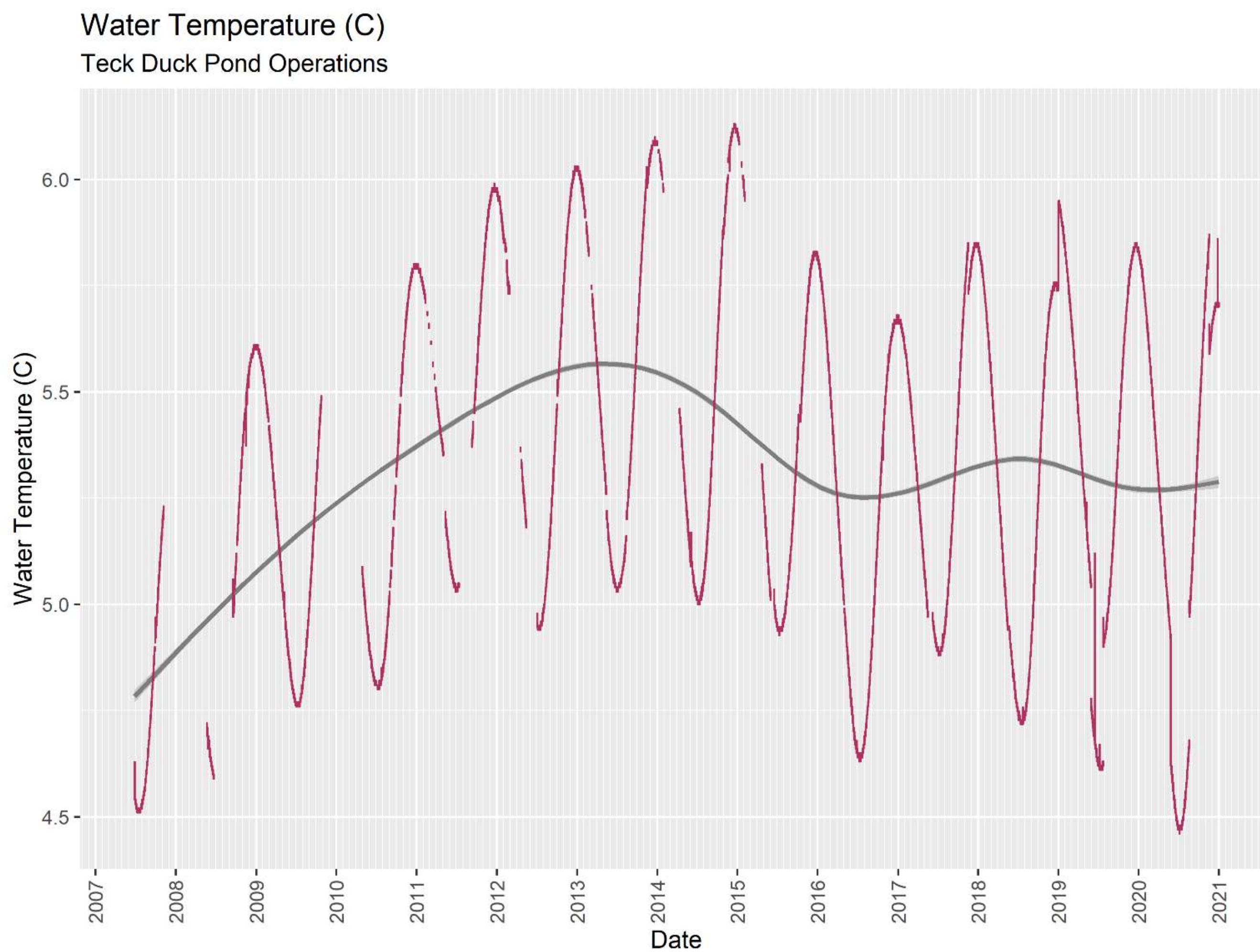


Figure 11: Water temperature at Well after Tailings Dam, Teck DPO

Figure 12 shows the consistency of water temperatures from 2008 to 2020 where there is considerable overlap in ranges from one year to the next. No notable trend is obvious at this time.

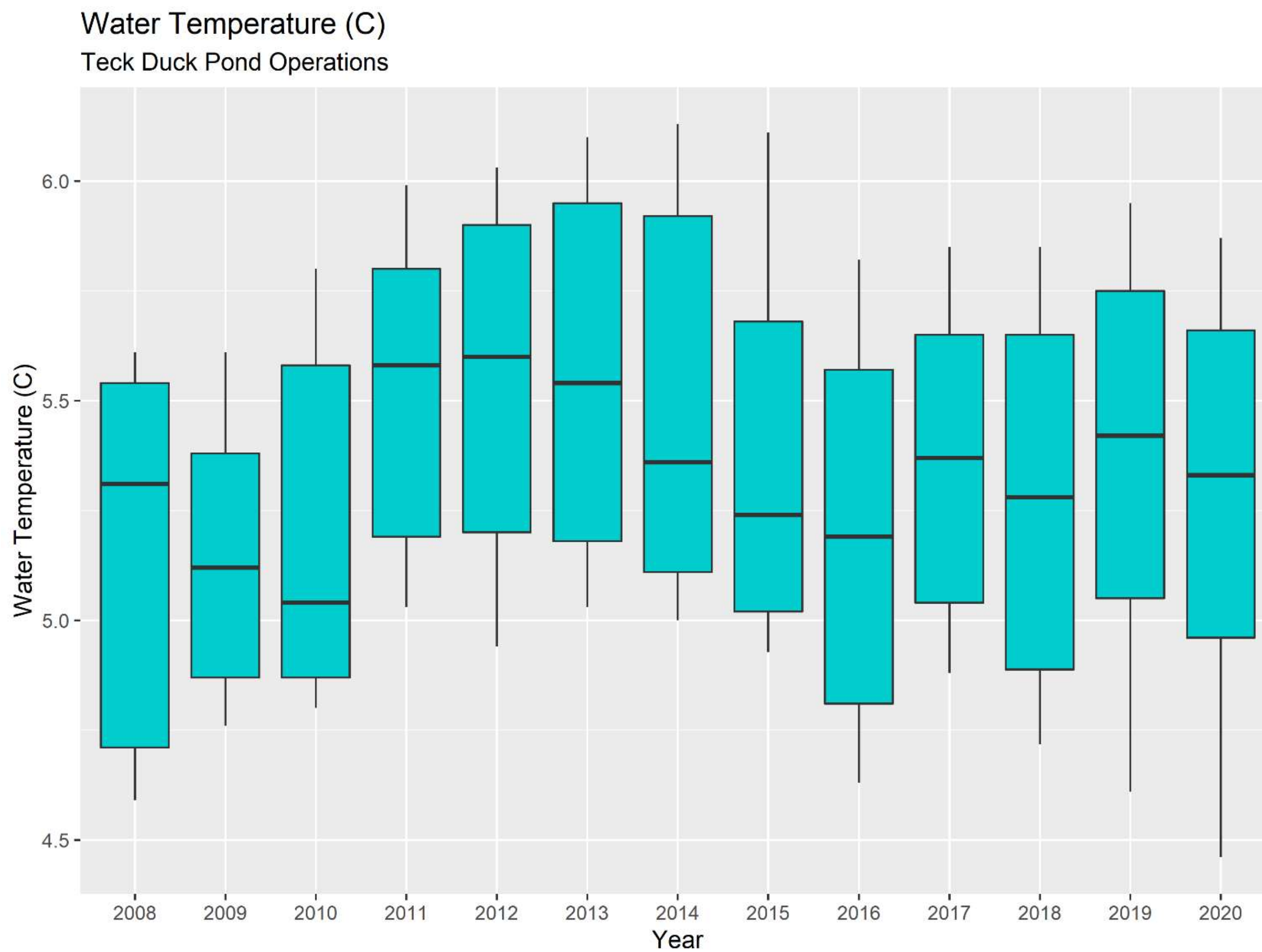


Figure 12: Boxplots of water temperature at Well after Tailings Dam, Teck DPO, from 2008 to 2020

pH

In 2020, median pH was similar to the median pH calculated from previous years, though the 2020 range was lower than the historical values (Table 8).

Readily apparent in Figure 13 is the long period of time it takes for pH to stabilize in the well following routine maintenance. This effect can be attributed to factors such as sensor stabilisation or chemical change resulting from aquifer water being pulled into the borehole. The rising trend can take upwards of a month to stabilize.

Table 8: pH at Well after Tailings Dam, Teck DPO

Segment	Median	Min	Max
Average	8.57	7.15	9.42
2020	8.69	7.05	8.87

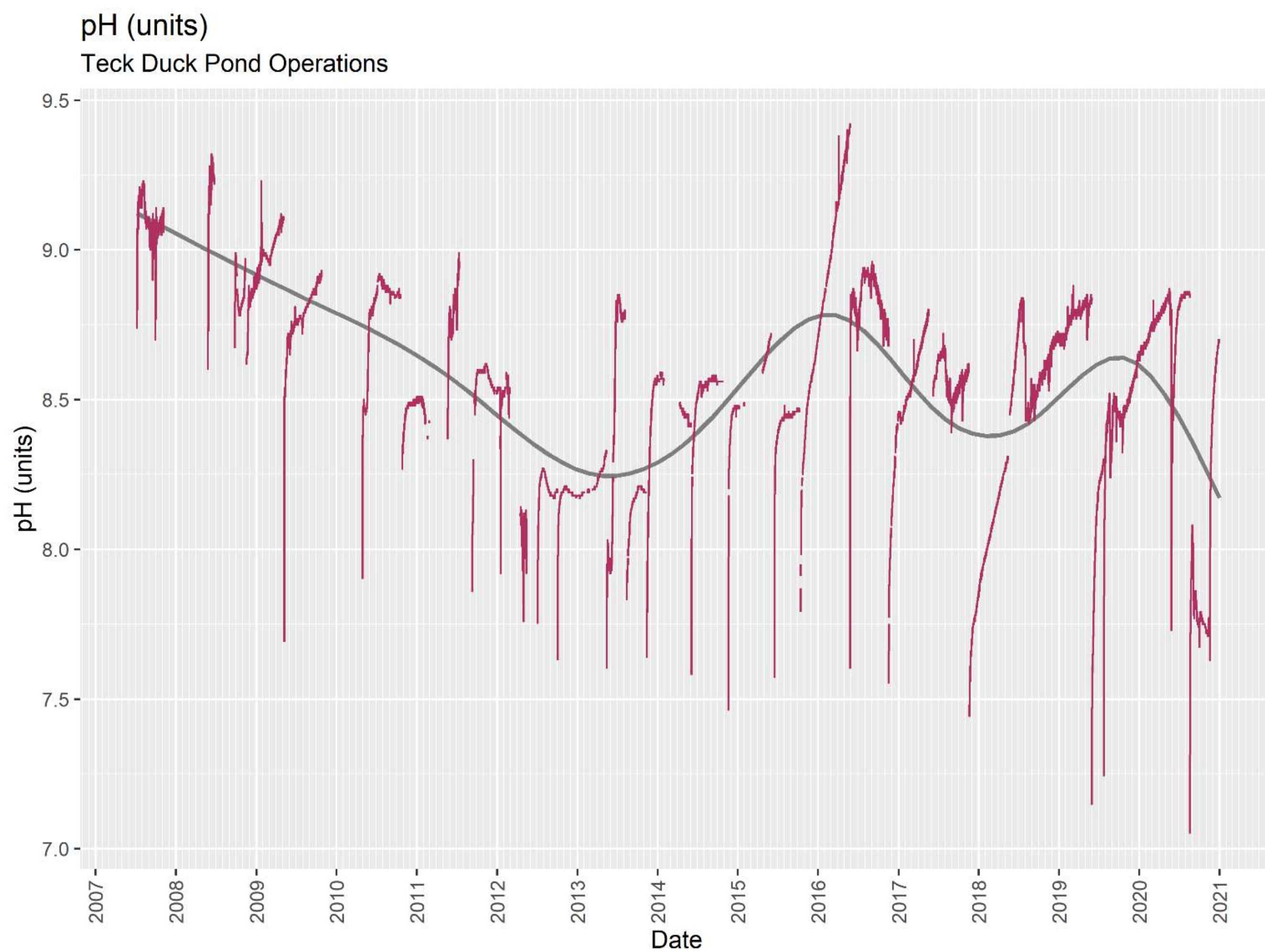


Figure 13: pH at Well after Tailings Dam, Teck DPO

The variance observed in Figure 13 makes it challenging to pick out trends or overall changes in pH. Figure 14 offers a clearer view of pH over time.

pH levels within the well tend to be alkaline in nature. Median levels between 2017 and 2019 were relatively stable with varying ranges, but the 2020 data is slightly higher and data falls within a very large range.

Interestingly, Figure 14 appears to mirror an opposite and inverse relationship with water temperature (Figure 11). In years where water temperature is cooler, pH levels tend to be more alkaline and when water is warmer, conditions appear to be more acidic. It is unclear if this is coincidental or if there is an actual relationship between the two parameters at this location.

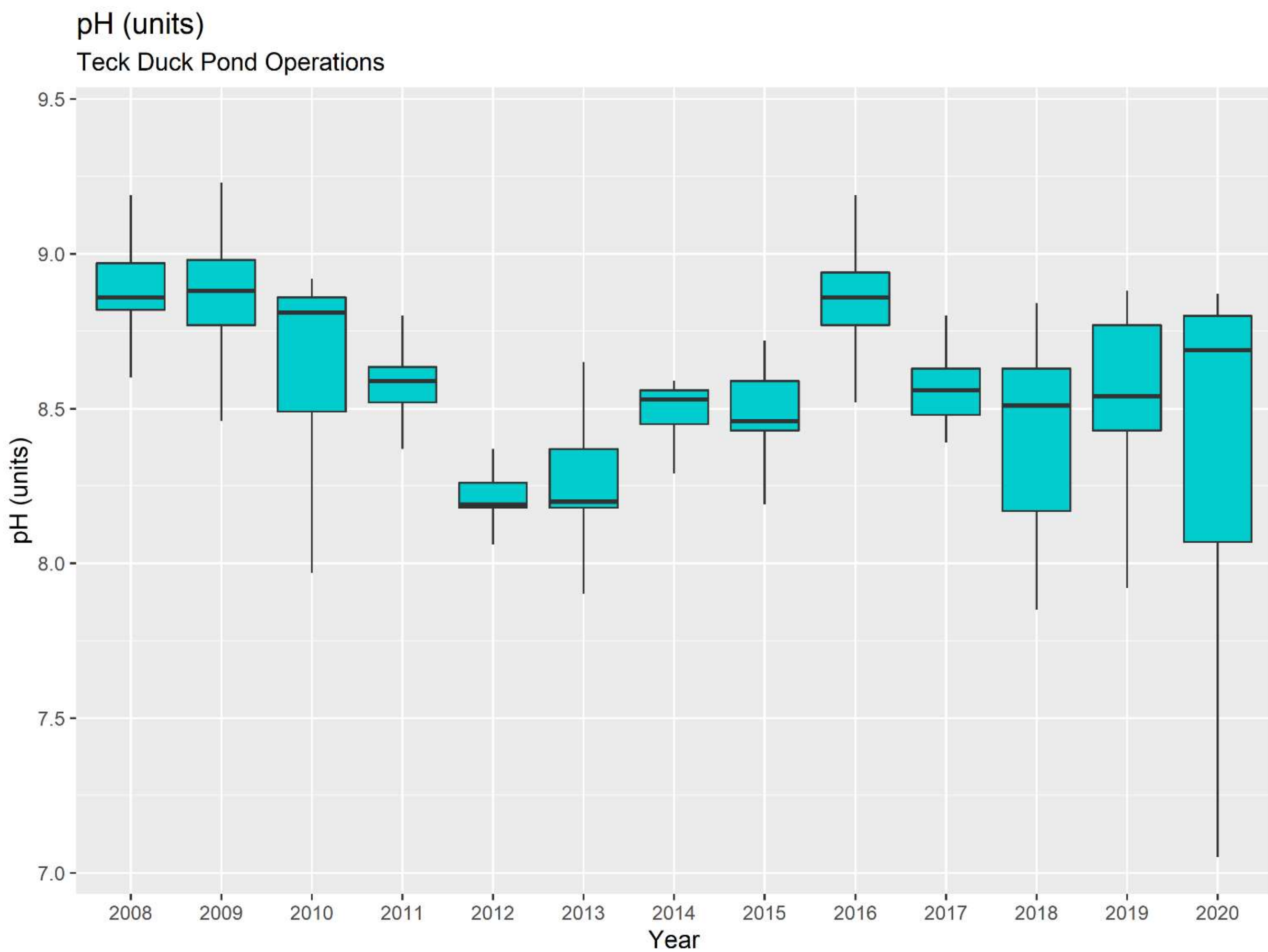


Figure 14: Boxplots of pH at Well after Tailings Dam, Teck DPO, from 2008 to 2020

Specific Conductivity

In 2020, specific conductivity values continued to rise above historical values, as seen in Table 9. However, data from 2019-2020 now shows a distinct downward trend after peaking in late 2018 (Figure 15).

A plateau phase from 2014 to late 2015 was observed prior to a rising trend from 2016 to 2018. At this time, water level in the tailings management area was lowered to perform long-term stabilization work. A lower water level and deposition of materials may have resulted in the sudden increase in conductivity. However, levels show a slight decline in 2019-2020.

Table 9: Specific conductivity at Well after Tailings Dam, Teck DPO

Segment	Median	Min	Max
Average	789	210	989
2020	894	860	921

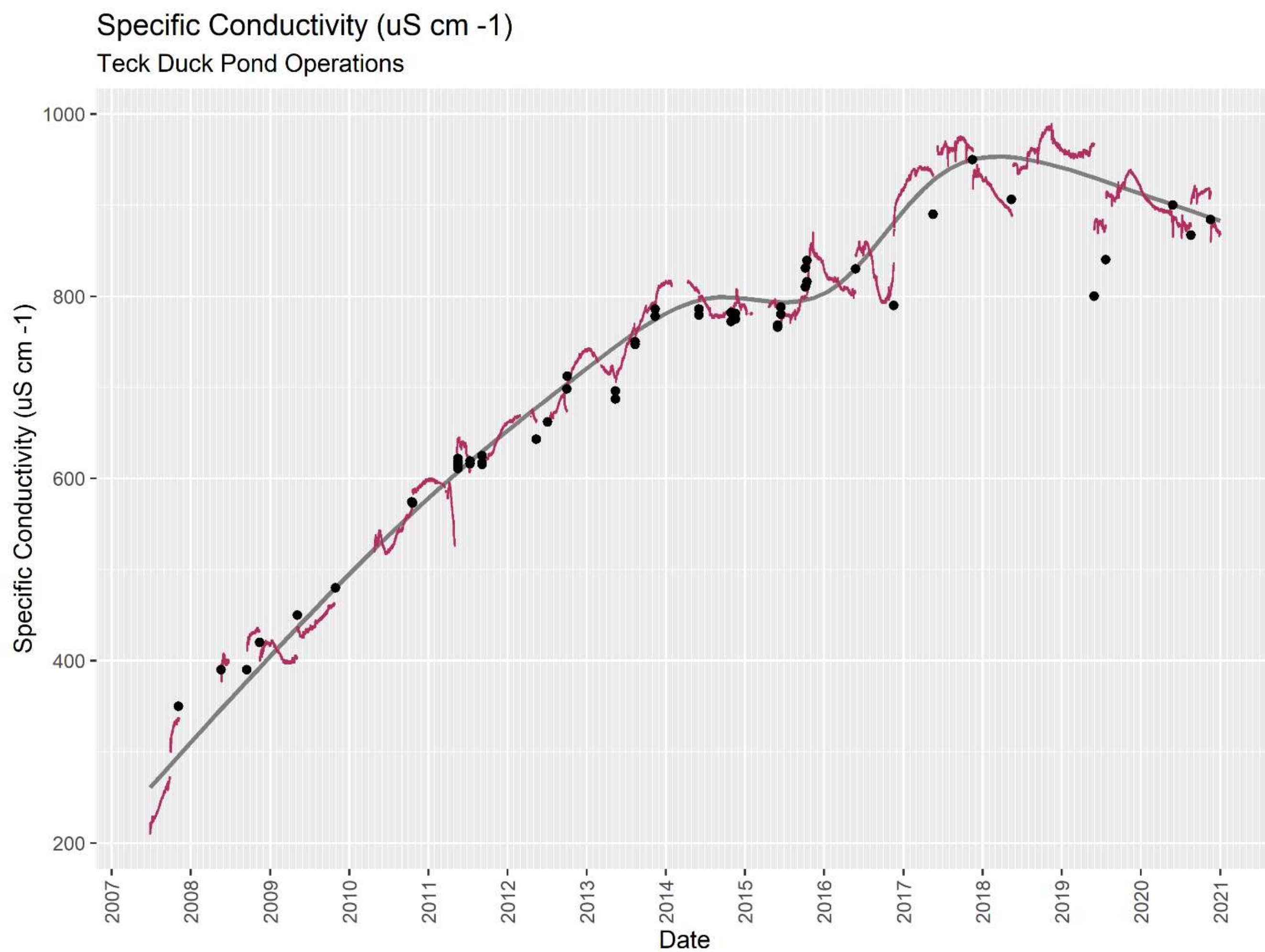


Figure 15: Specific Conductivity at Well after Tailings Dam, Teck DPO

In Figure 16, data from 2017-2019 show a distinct and separate data plateau from that seen from 2014 to 2016. Median values are significantly higher in 2017-2019. This may have resulted from work within the tailings management area as discussed in the previous Figure 15. Data from 2020 show a noticeable drop in levels from 2019.

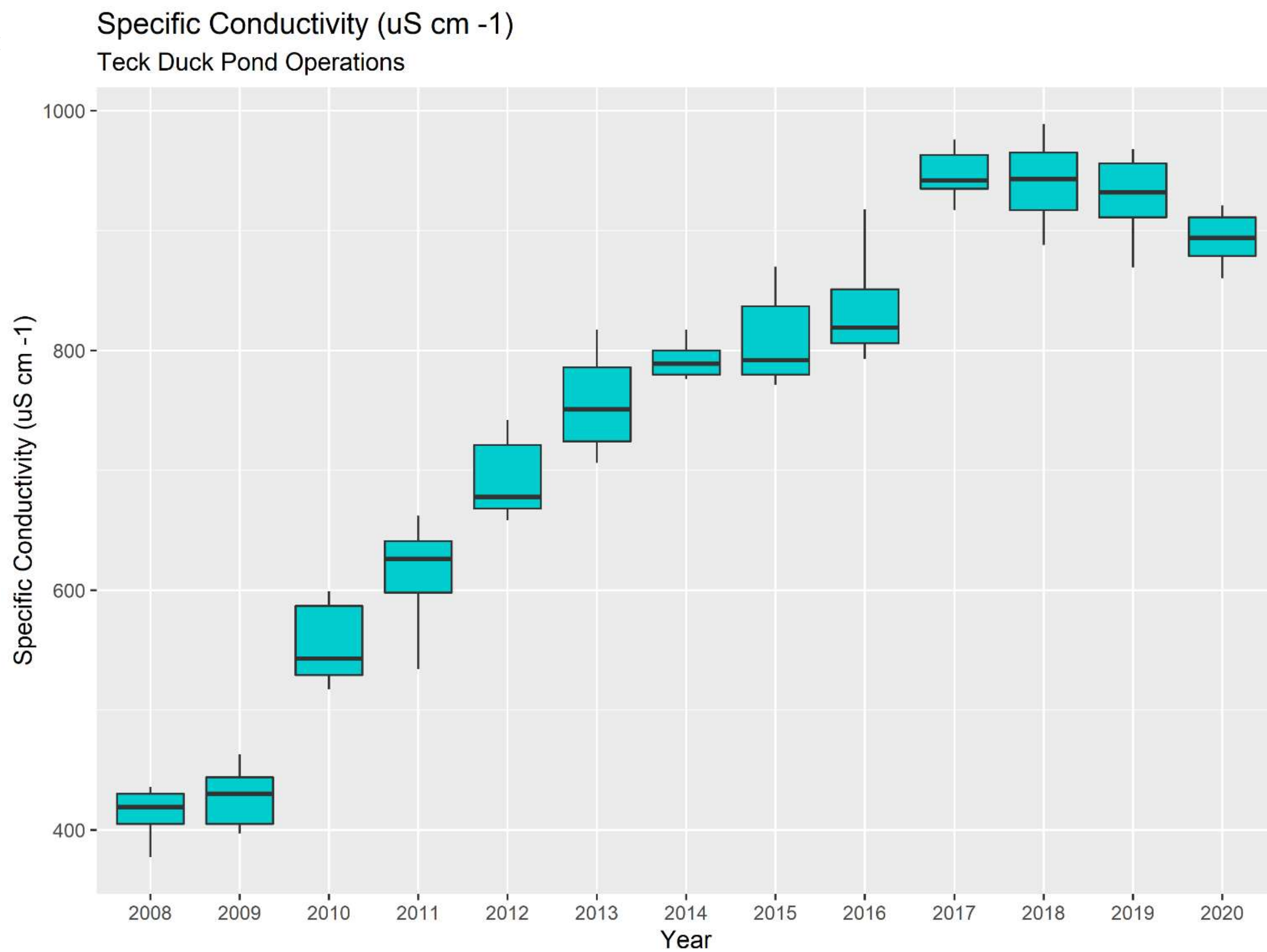


Figure 16: Boxplots of specific conductivity at Well after Tailings Dam, Teck DPO , from 2008 to 2020

Oxidation-Reduction Potential (ORP)

Conditions within the well are predominantly reductive with highly negative values (Table 10).

Much like pH, ORP tends to take a number of days to settle following routine maintenance as depicted in Figure 17. From 2007 to 2016, post-maintenance ORP values were found to be oxidative (> 0 mV) for a brief period before quickly falling to reductive levels (< 0 mV).

There is an indication that ORP values are becoming more reductive over time. From 2015 to 2019, stable ORP values began to fall lower and even post-maintenance ORP values were no longer oxidative. In 2020, ORP values showed an increase, and again were found to be oxidative for a short time post-maintenance. This may be evidence of a changing trend within the system.

Table 10: ORP at Well after Tailings Dam, Teck DPO

Segment	Median	Min	Max
Average	-281	-480	99.0
2020	-420	-462	2

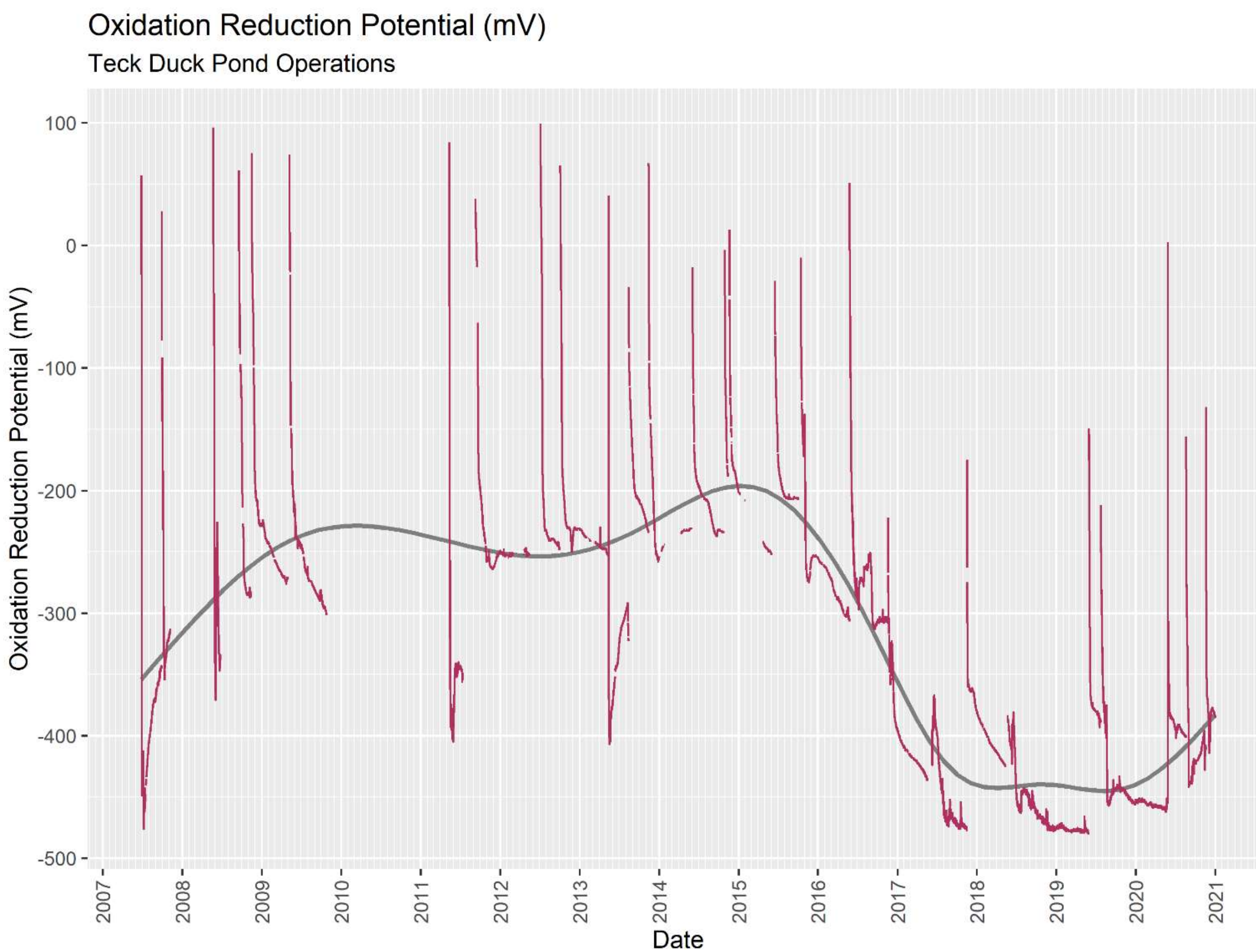


Figure 17: ORP at Well after Tailings Dam, Teck DPO

Figure 18 readily shows a continuous decline in ORP from 2016 to 2019, but an increase in 2020. This increase follwos a period of decline from 2016-2019 in specific conductivity and could be indicative of a particular chemical change in the aquifer.

Notably, the change from 2016 to 2017 was significant, with a continuing downward trend 2017-2019 followed by the increase in 2020.

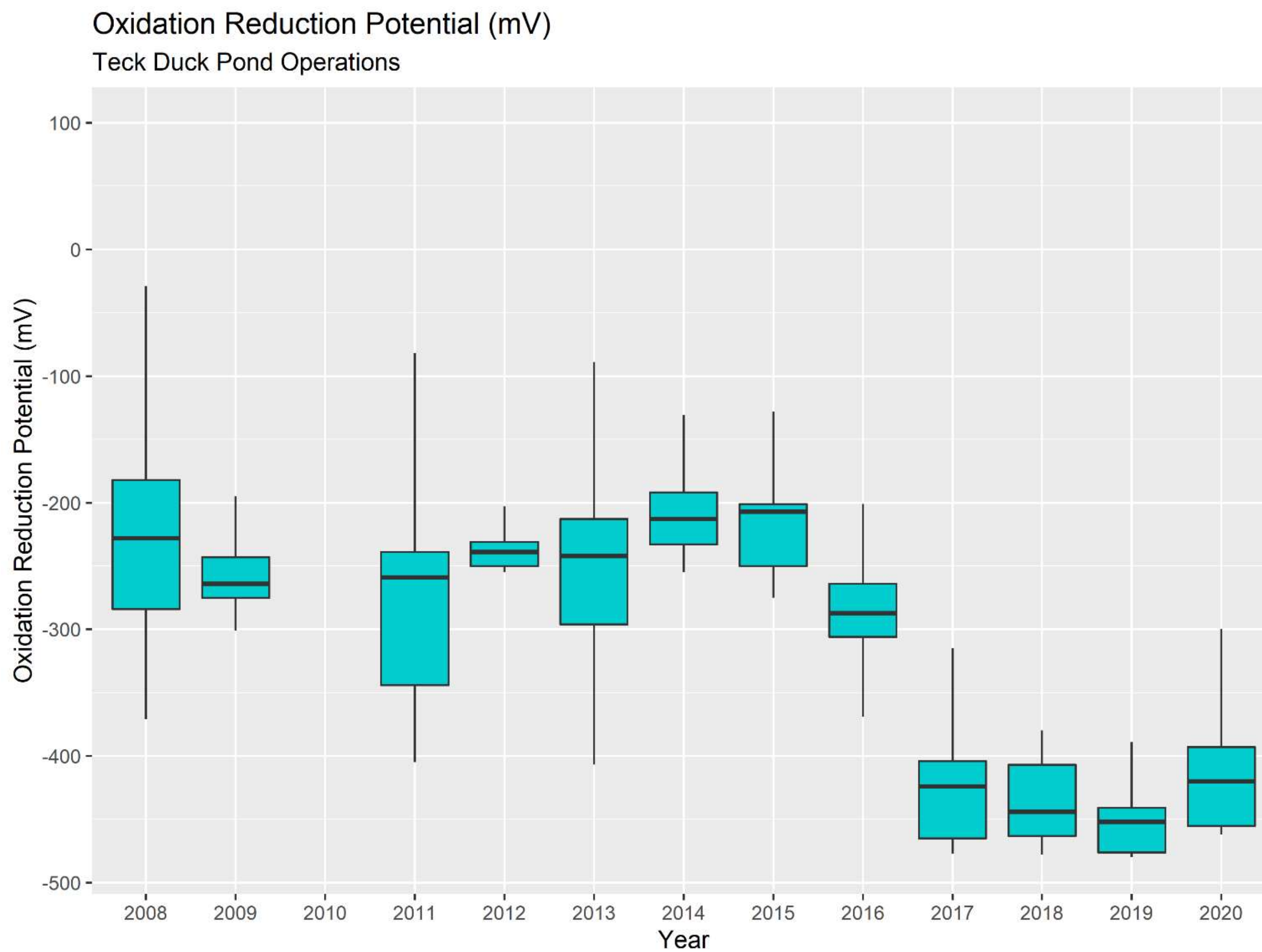


Figure 18: Boxplots of ORP at Well after Tailings Dam, Teck DPO, from 2008 to 2020

Water Elevation

Water elevation indicates the surface of the aquifer above sea level. Water level peaked in 2009 and declined until 2017 when a small uptick was observed in the latter part of 2017 into mid-2018 (Figure 19) before continuing to decline once again into 2020.

In 2020, water level showed very little variance (0.416m).

Table 11: Water elevation at Well after Tailings Pond, Teck DPO

Segment	Median	Min	Max
Average	270.778	270.311	271.208
2020	270.66	270.391	270.807

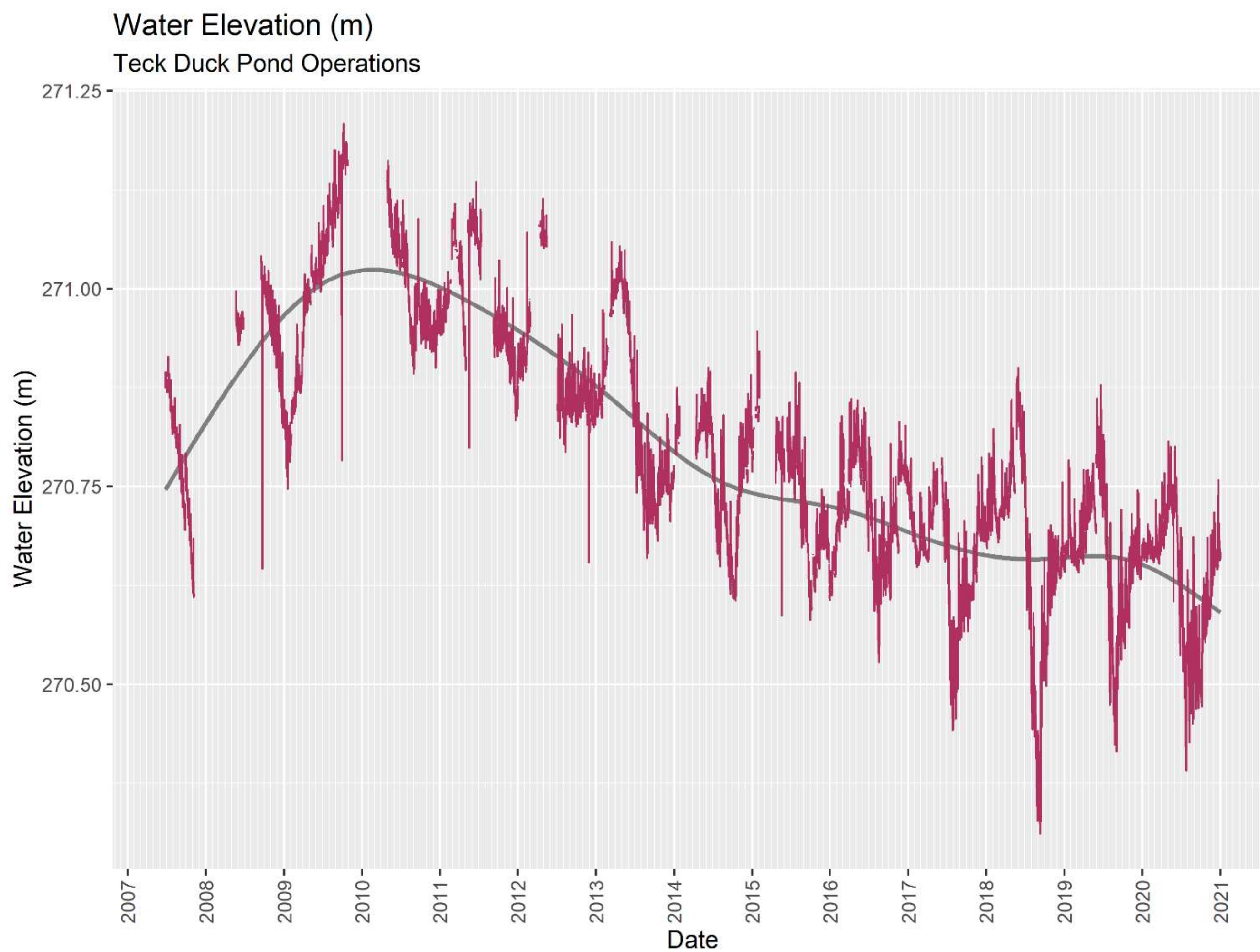


Figure 19: Water elevation at Well after Tailings Pond, Teck DPO

Figure 20 illustrates the long-term decline in water level from 2009 to 2017, the uptick observed in 2018, and the continued decline into 2020.

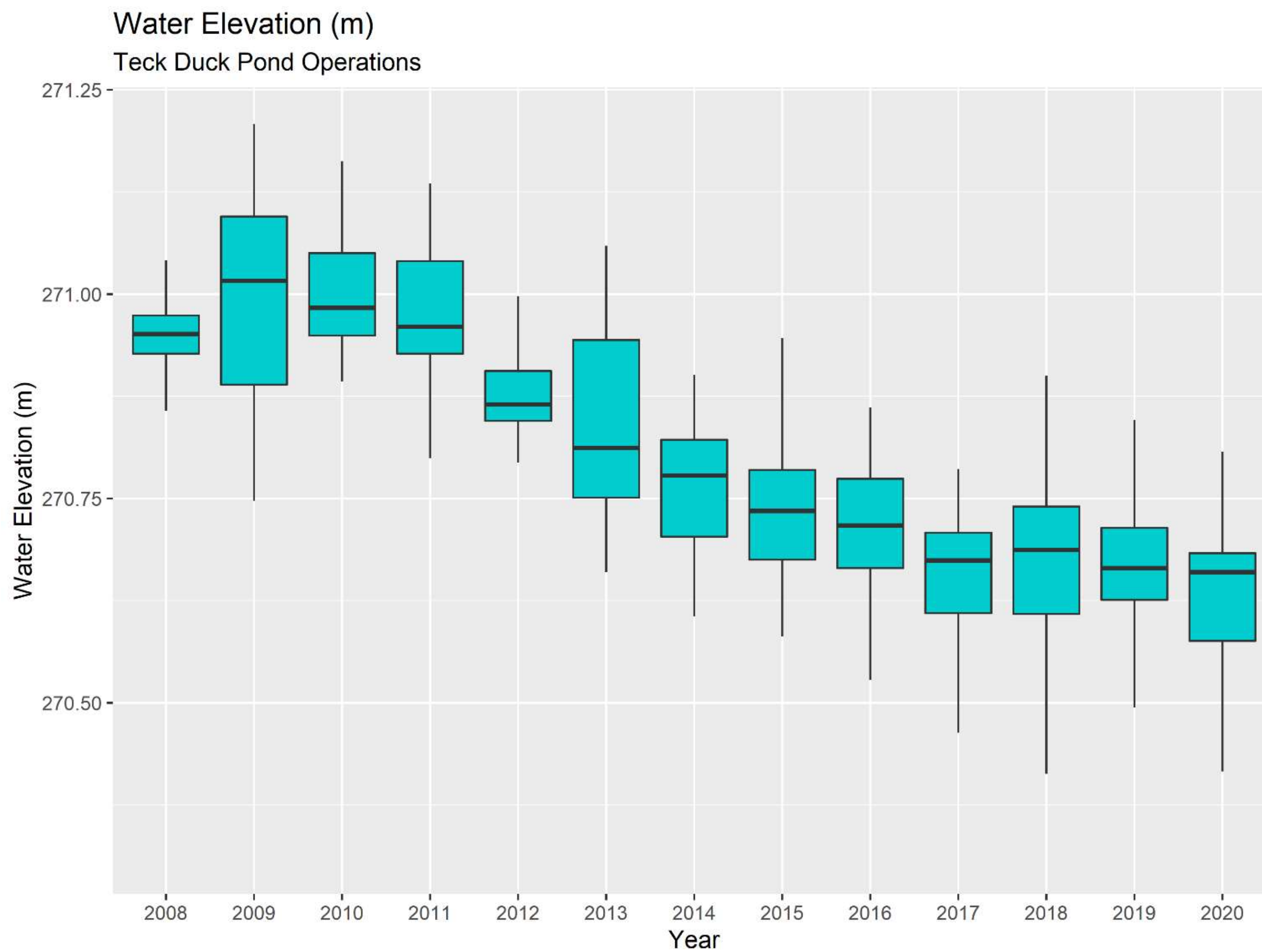


Figure 20: Boxplots of water elevation at Well after Tailings Pond, Teck DPO, from 2008 to 2020

Conclusion and Path Forward

Site closure and remediation work continued into 2020. Efforts that are being made to ensure long-term stability of the tailings management area could be implicated in some changes at each monitoring station, especially Well after Tailings Dam A. At this station, variations in pH, specific conductivity, and ORP were observed from 2017 to 2020. These changes in particular could be related to water level reductions in the adjacent waterbody where work is ongoing. As water level is lowered, additional acid-generating mill waste material is exposed. Once water levels are allowed to rise, these parameters should stabilize.

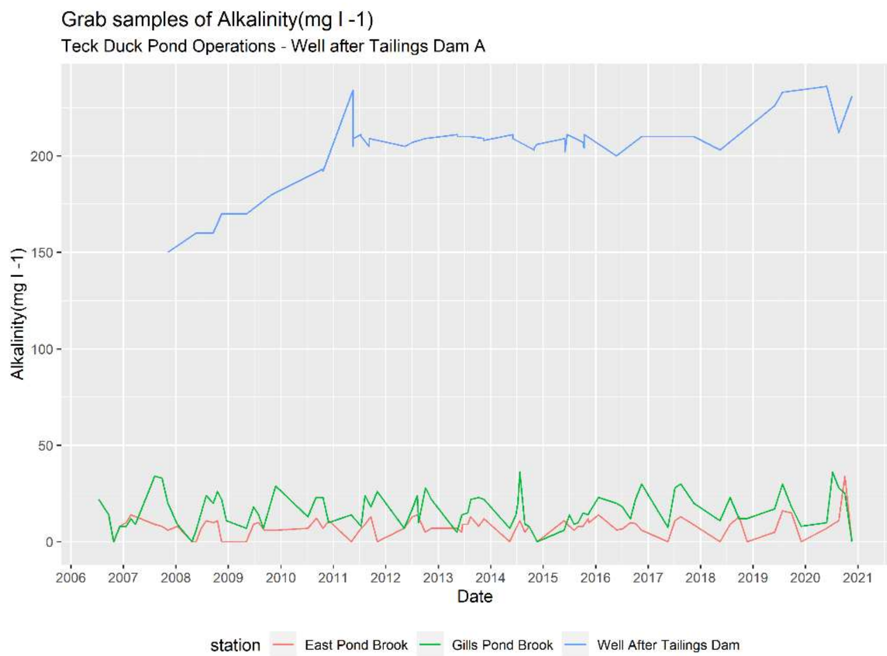
Tailings Dam A was constructed to direct flow from the tailings management area westward towards the Gills Pond watershed. Some changes in water quality may eventually be seen at the EPB station as seepage, identified by the Well after Tailings Dam A station, or make its way northeast towards the East Pond watershed on its original course.

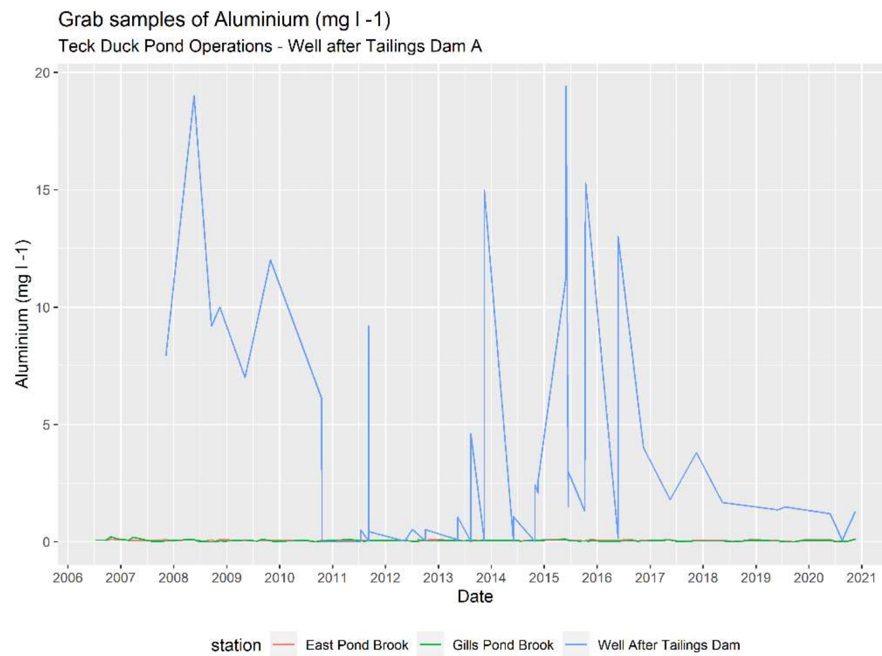
Water quality at East Pond Brook and Tributary to Gills Pond Brook were mostly within range of previous years.

Monitoring efforts will continue for the duration of closure work and potentially longer if determined to be beneficial. In 2021, ECCM will aim to replace the monitoring gear at Well after Tailings Dam A.

Appendix

The following figures present grab sample results taken at East Pond Brook, Tributary to Gill's Pond Brook, and Well after Tailings Dam A stations. No discussion is provided for this section; graphs are provided for information purposes only.





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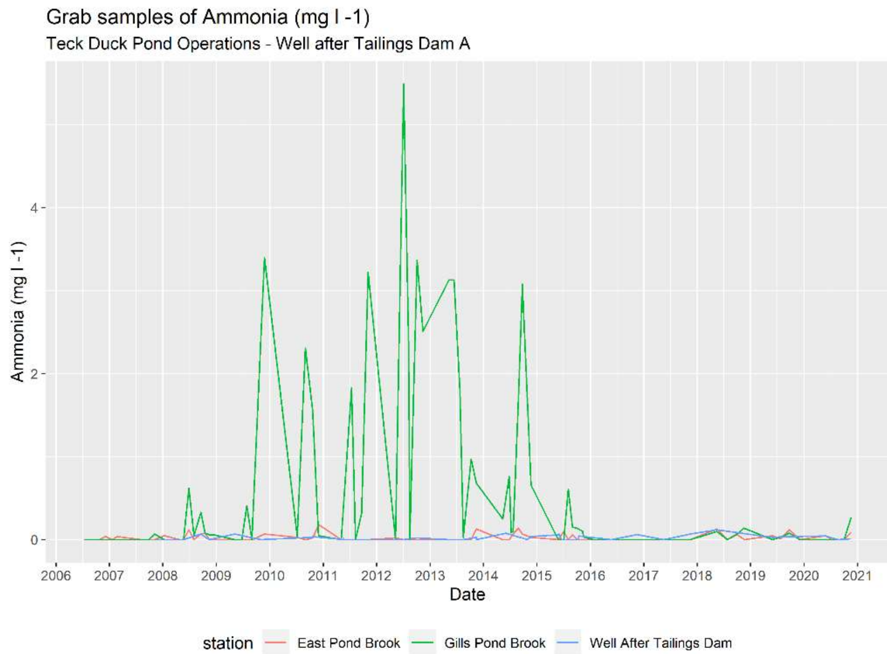
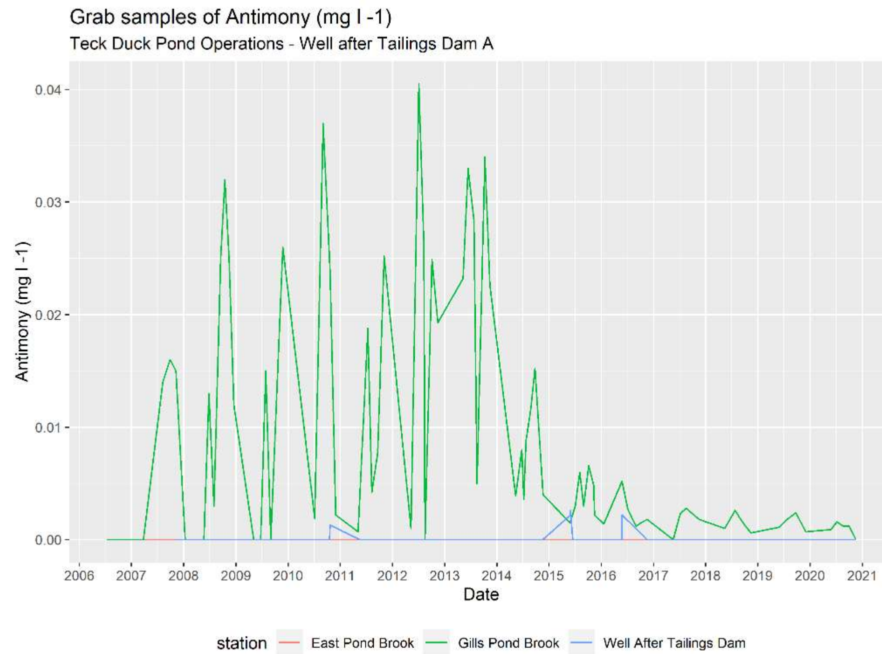
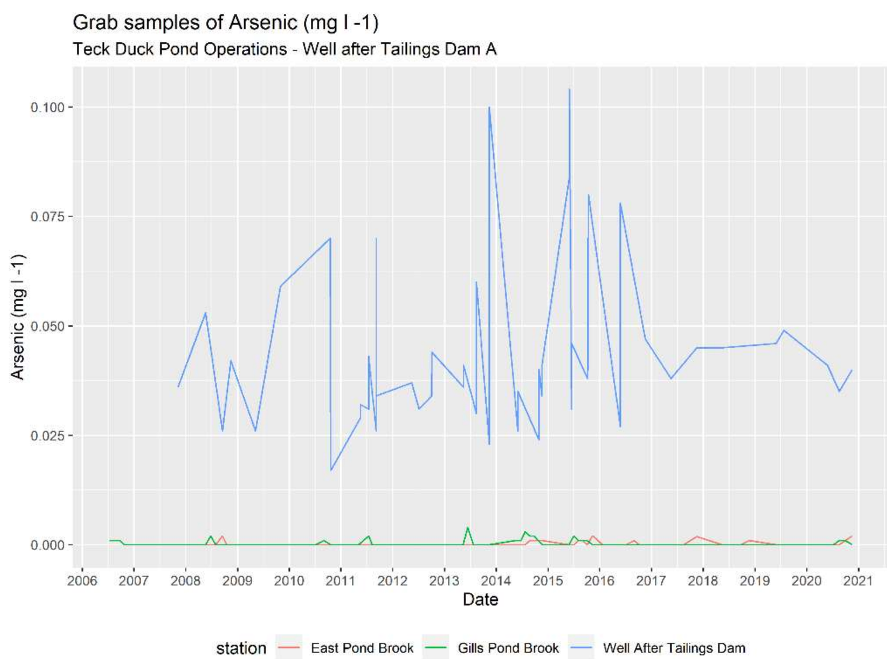


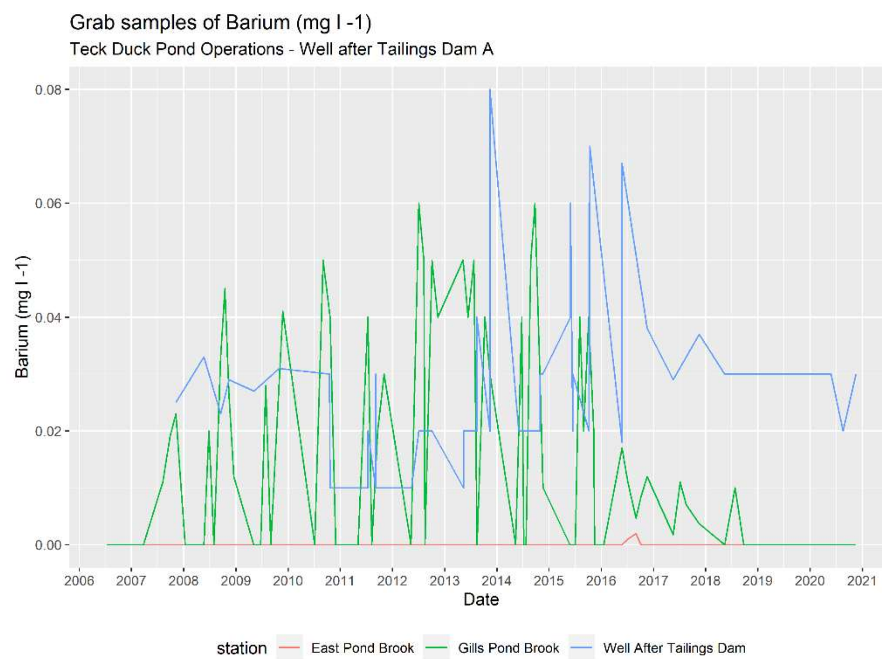
Grab samples of Ammonia (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Ammonia (mg l -1)
0
2
4
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam



Grab samples of Antimony (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Antimony (mg l -1)
0.00
0.01
0.02
0.03
0.04
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam

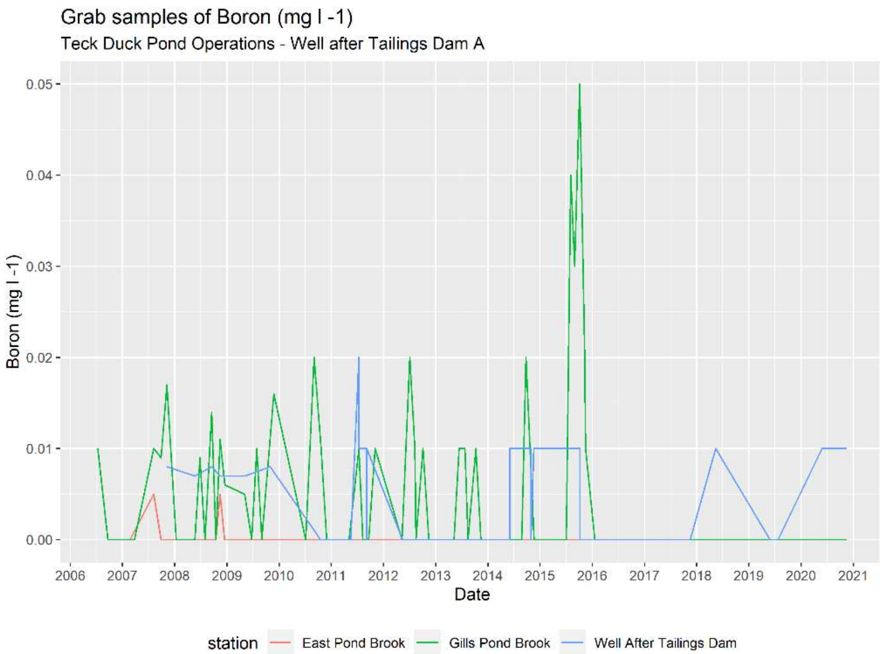


Grab samples of Arsenic (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Arsenic (mg l -1)
0.000
0.025
0.050
0.075
0.100
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam

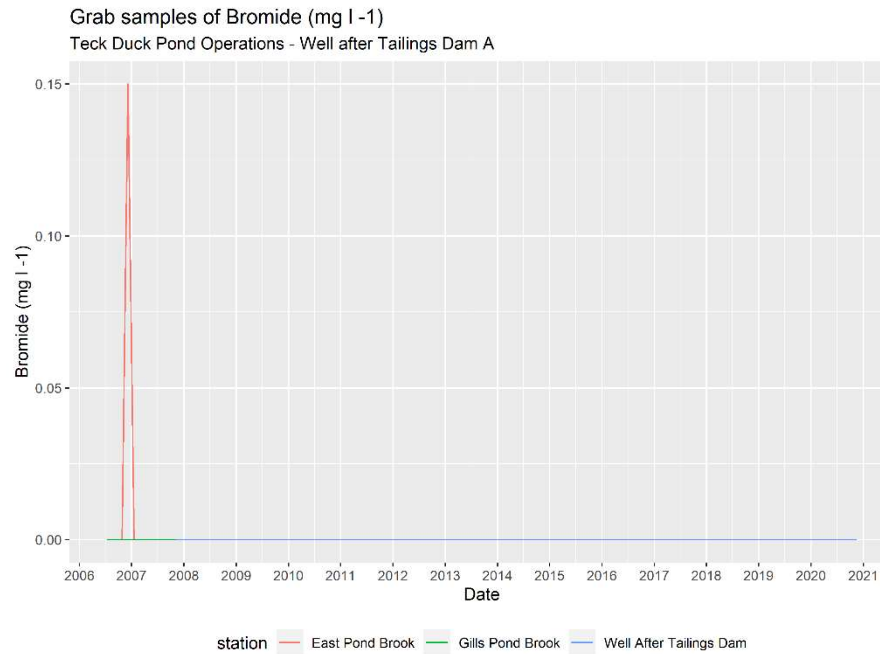


Grab samples of Barium (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Barium (mg l -1)
0.00
0.02
0.04
0.06
0.08
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam

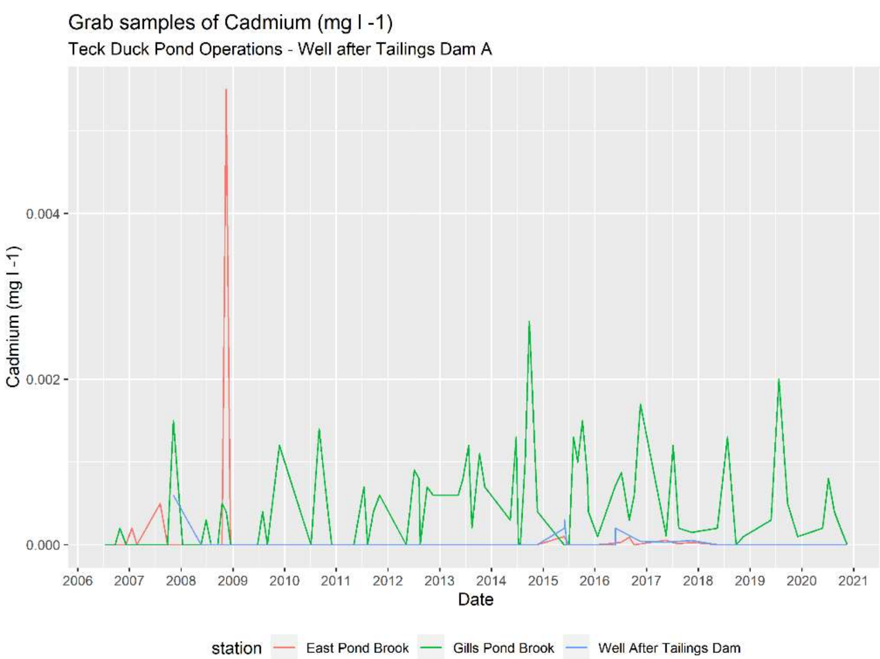
Appendix



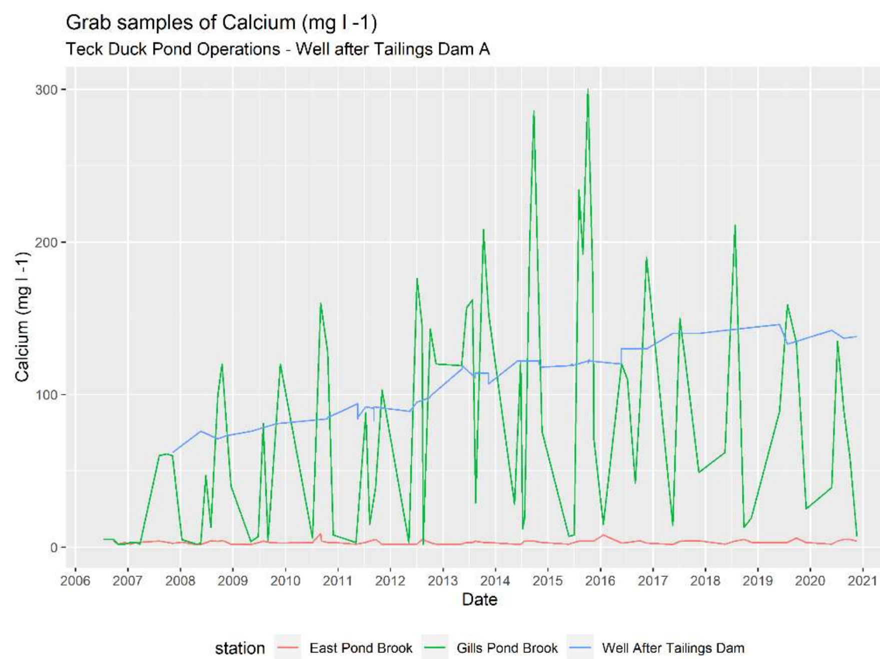
Grab samples of Boron (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Boron (mg l -1)
0.00
0.01
0.02
0.03
0.04
0.05
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam



Grab samples of Bromide (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Bromide (mg l -1)
0.00
0.05
0.10
0.15
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam

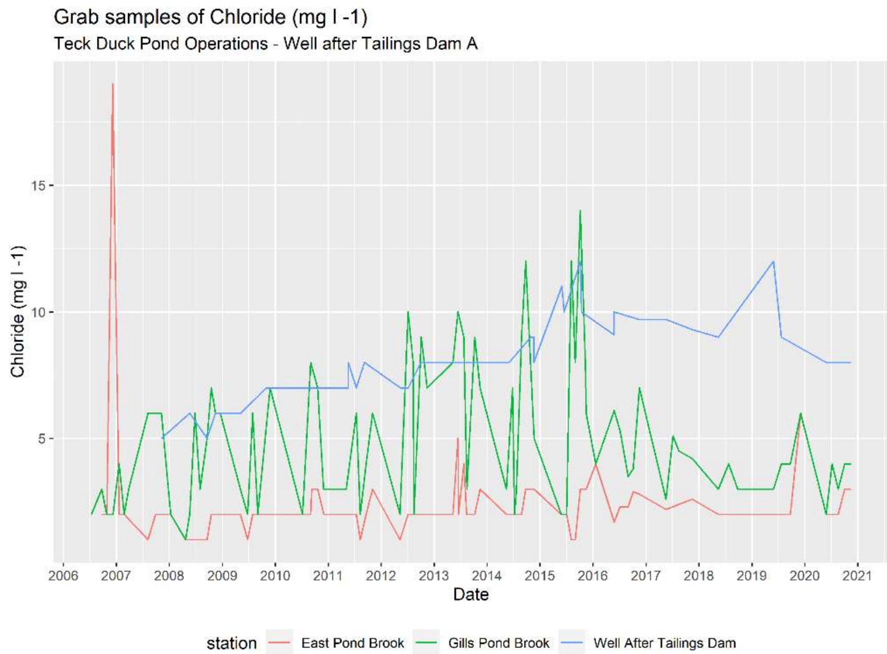


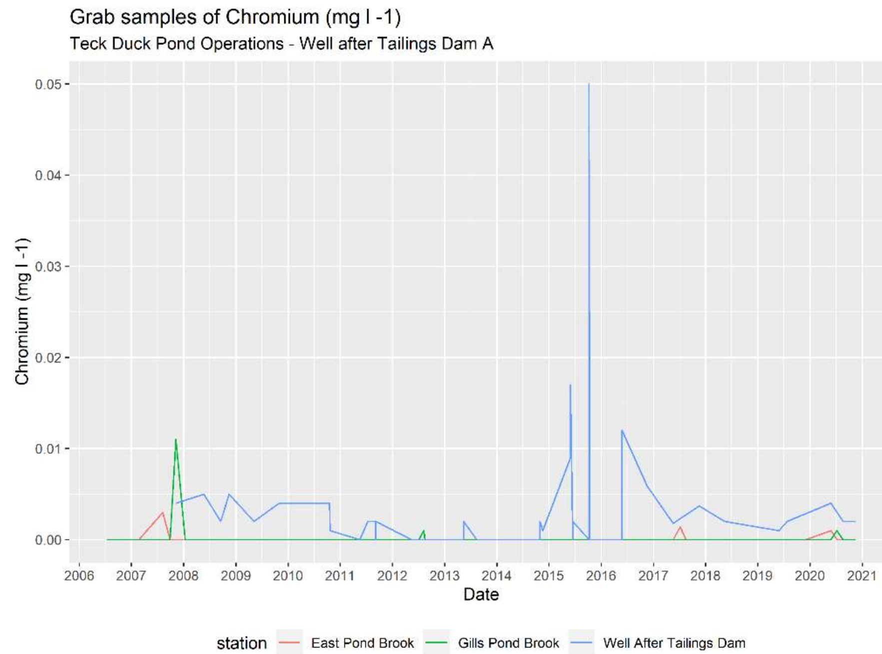
Grab samples of Cadmium (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Cadmium (mg l -1)
0.000
0.002
0.004
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam

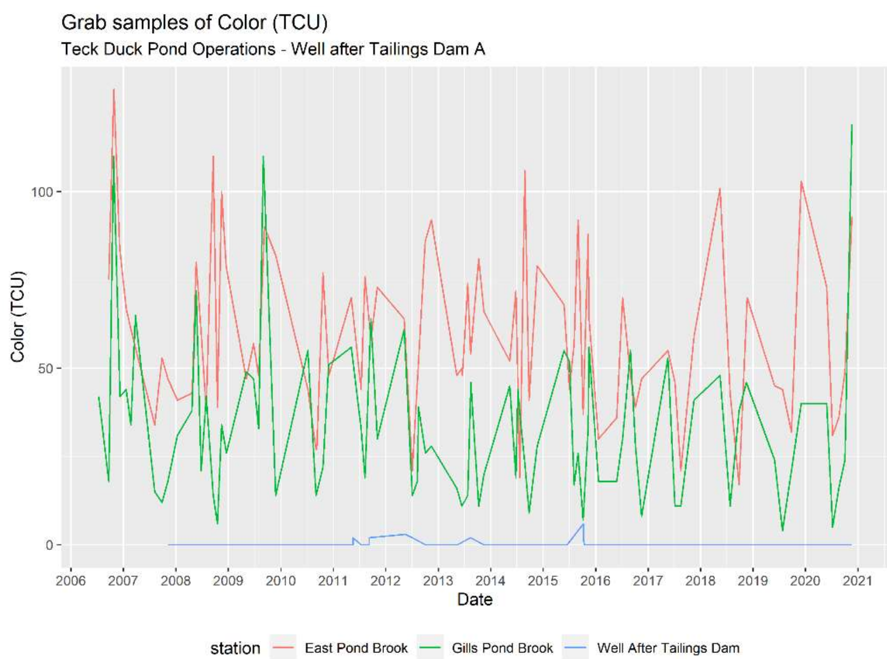


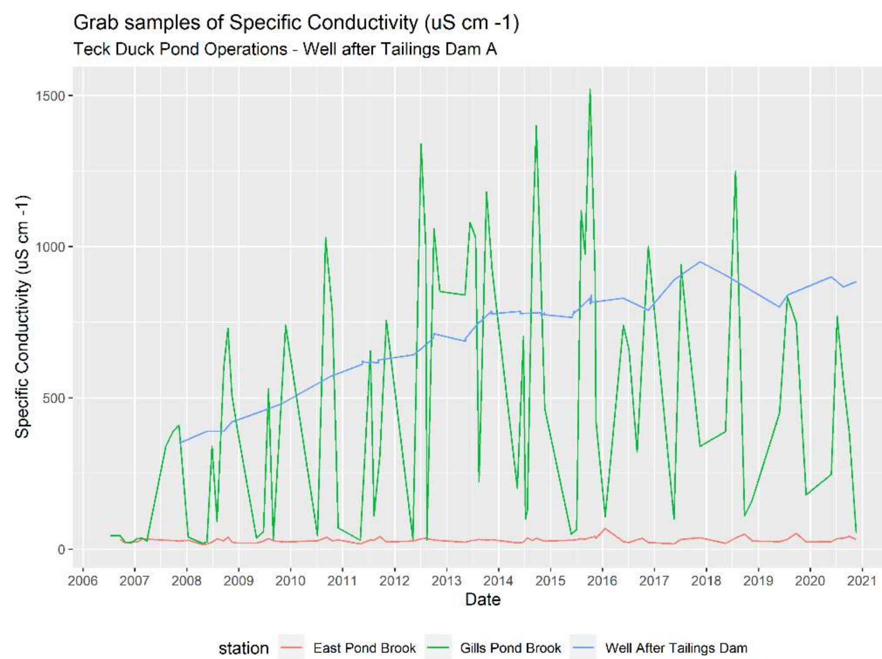
Grab samples of Calcium (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Calcium (mg l -1)
0
100
200
300
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam

Appendix

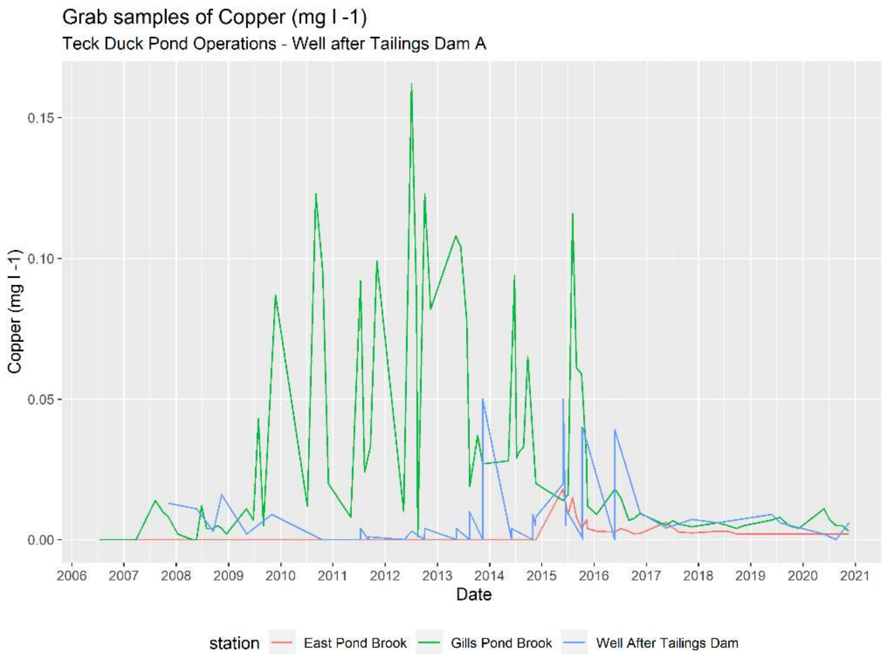

Grab samples of Chloride (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Chloride (mg l -1)
15
10
5
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam

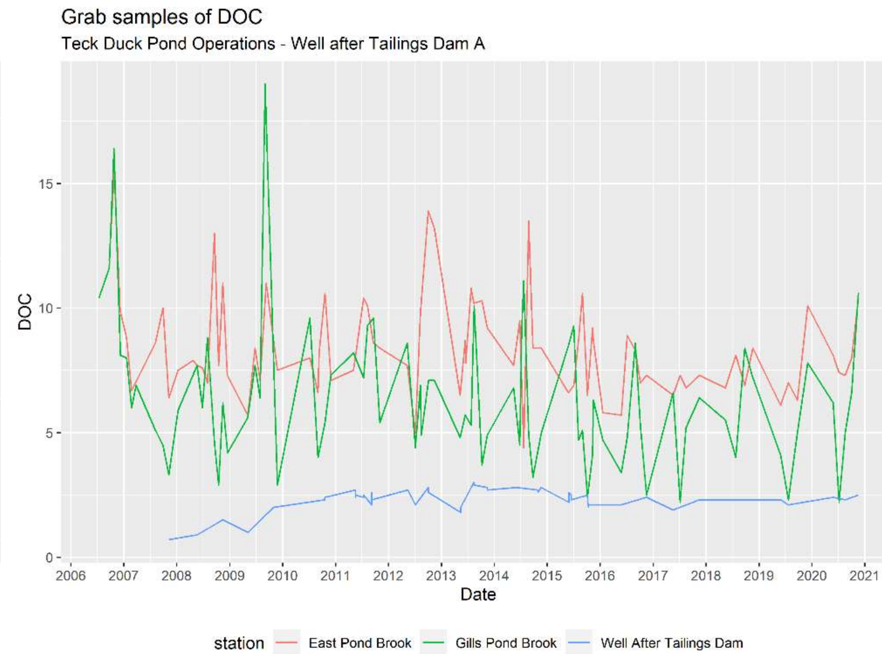

Grab samples of Chromium (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Chromium (mg l -1)
0.05
0.04
0.03
0.02
0.01
0.00
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam

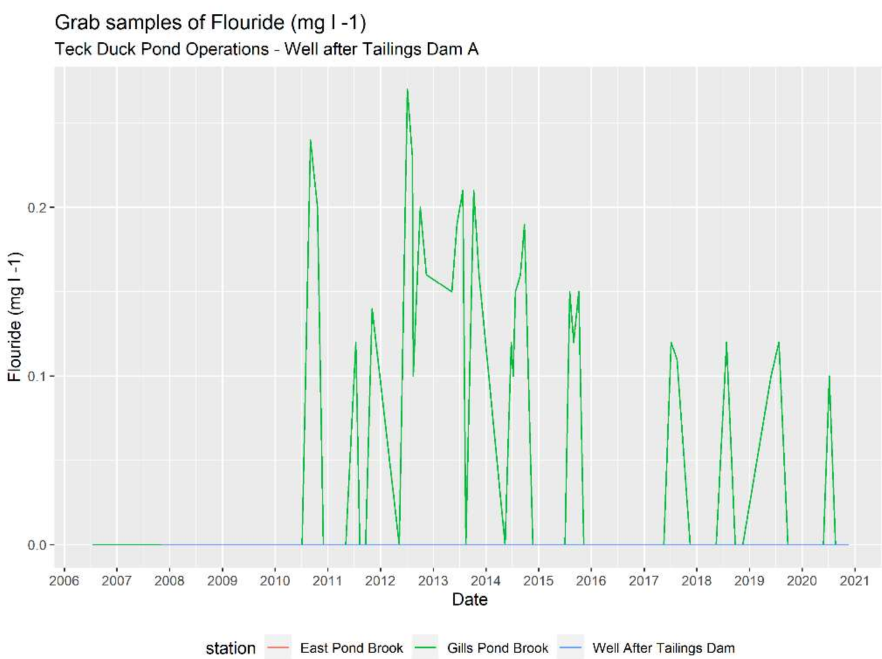

Grab samples of Color (TCU)
Teck Duck Pond Operations - Well after Tailings Dam A
Color (TCU)
100
50
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam

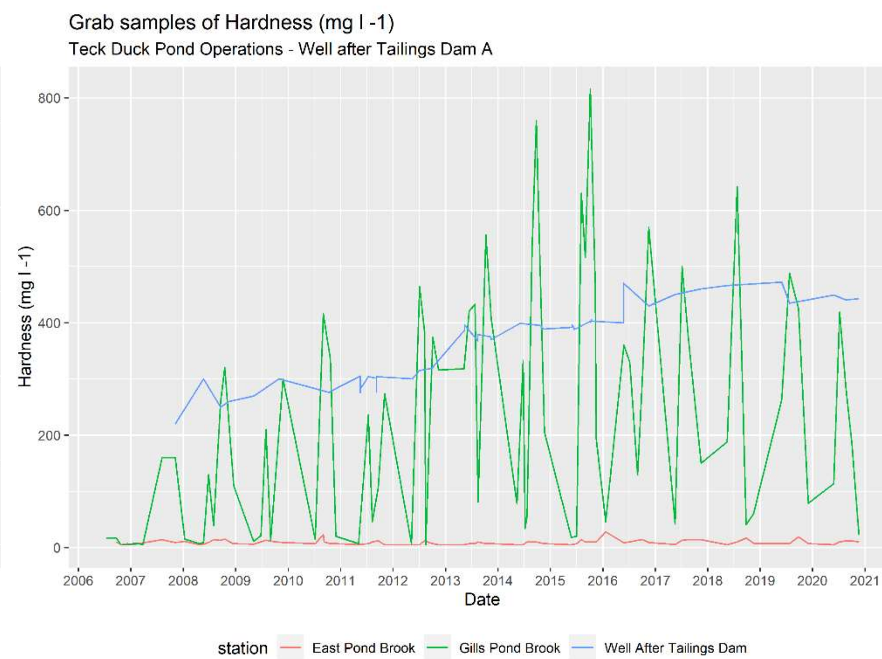

Grab samples of Specific Conductivity (uS cm -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Specific Conductivity (uS cm -1)
1500
1000
500
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam

Appendix

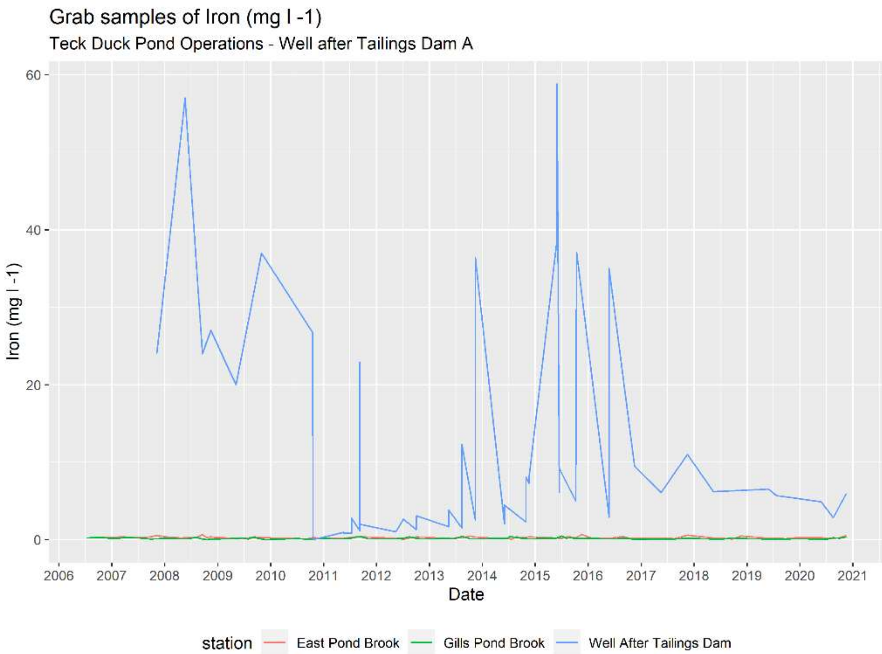

Grab samples of Copper (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Copper (mg l -1)
0.15
0.10
0.05
0.00
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam


Grab samples of DOC
Teck Duck Pond Operations - Well after Tailings Dam A
DOC
15
10
5
0
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam

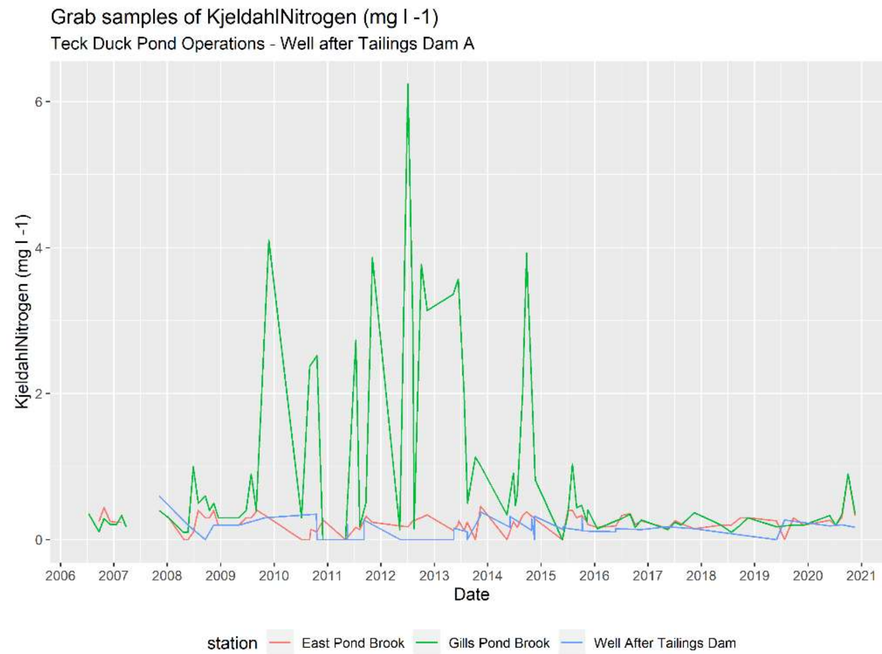

Grab samples of Flouride (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Flouride (mg l -1)
0.2
0.1
0.0
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam


Grab samples of Hardness (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Hardness (mg l -1)
800
600
400
200
0
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam

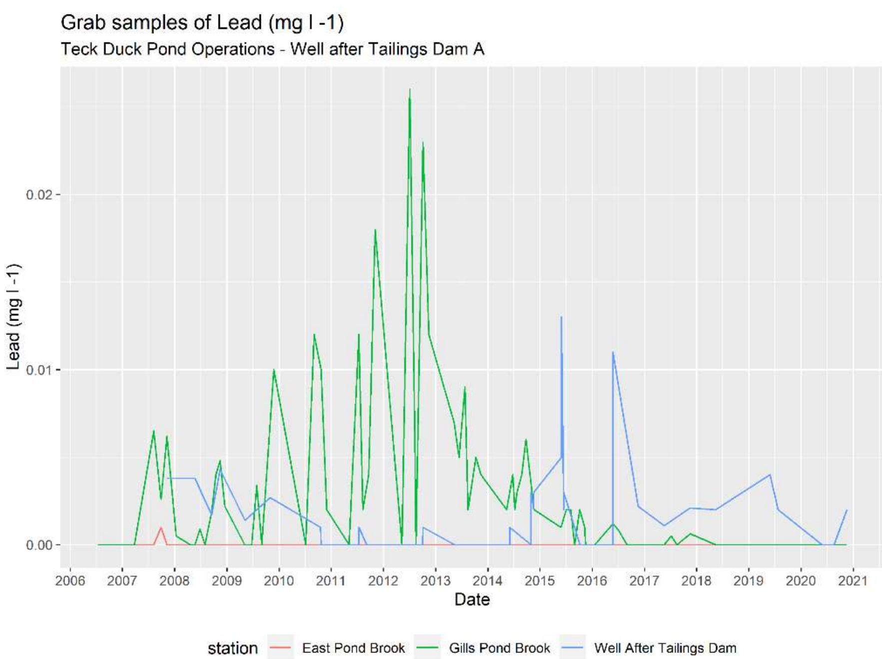
Appendix



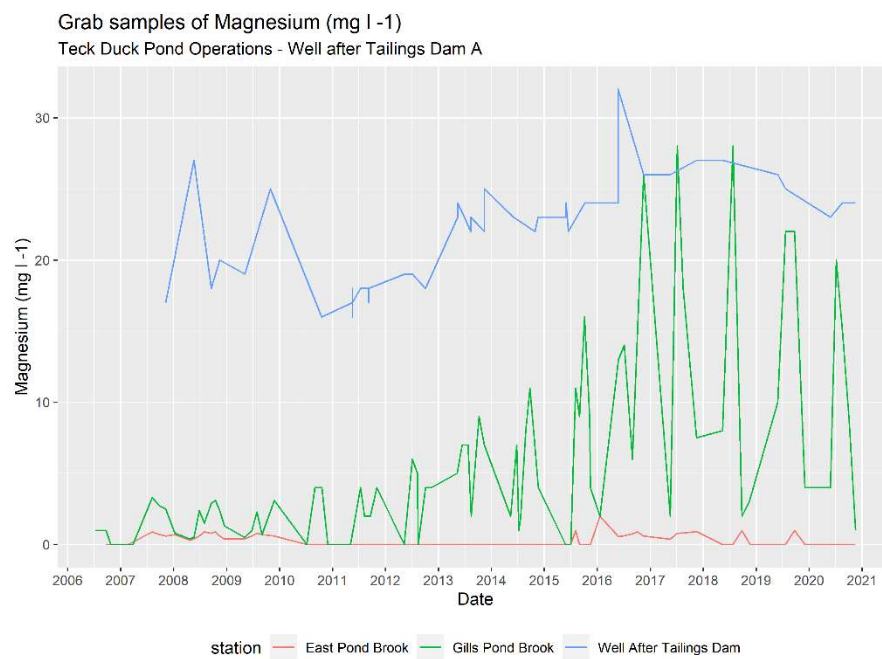
Grab samples of Iron (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Iron (mg l -1)
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam



Grab samples of KjeldahlNitrogen (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
KjeldahlNitrogen (mg l -1)
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam

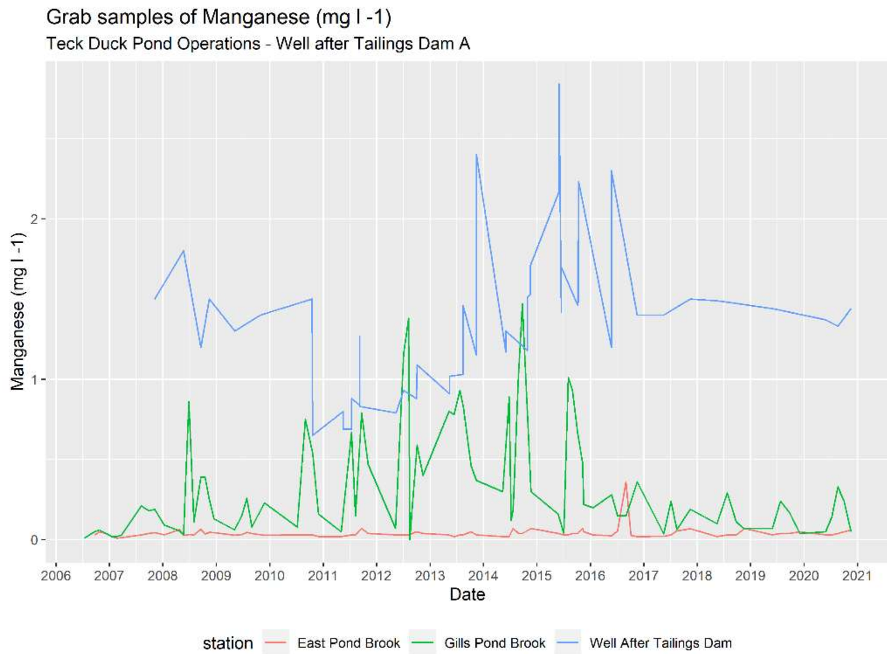


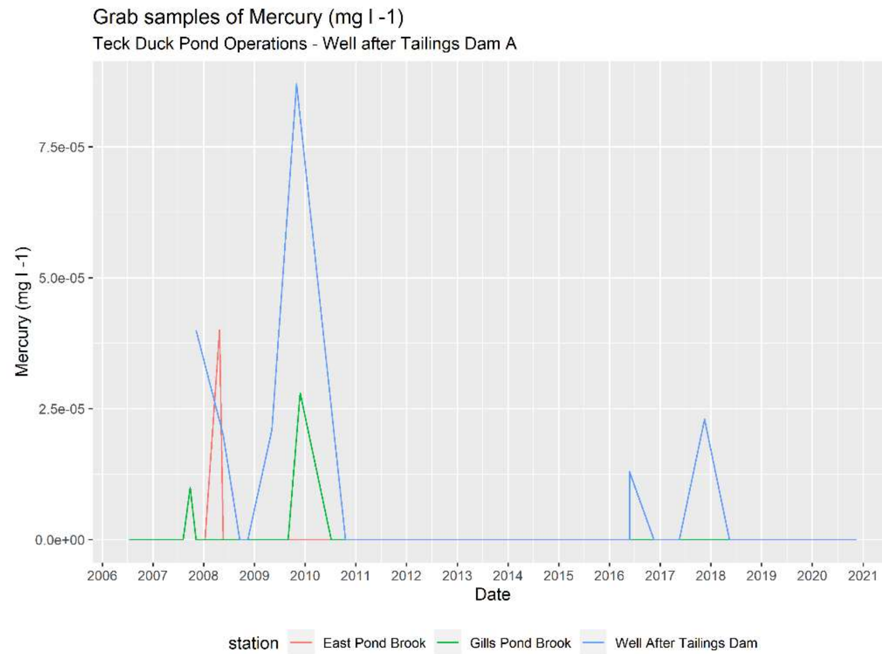
Grab samples of Lead (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Lead (mg l -1)
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam

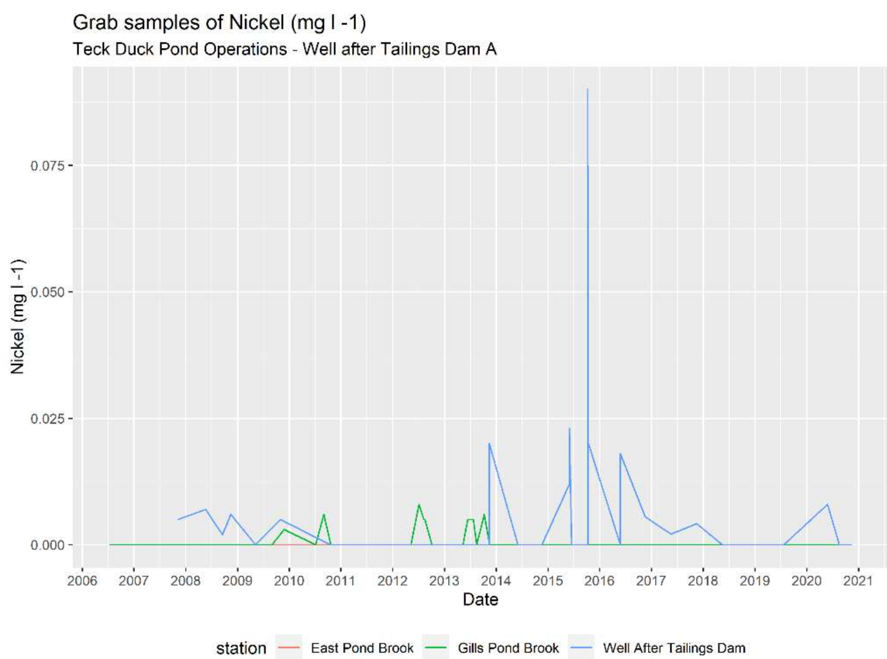


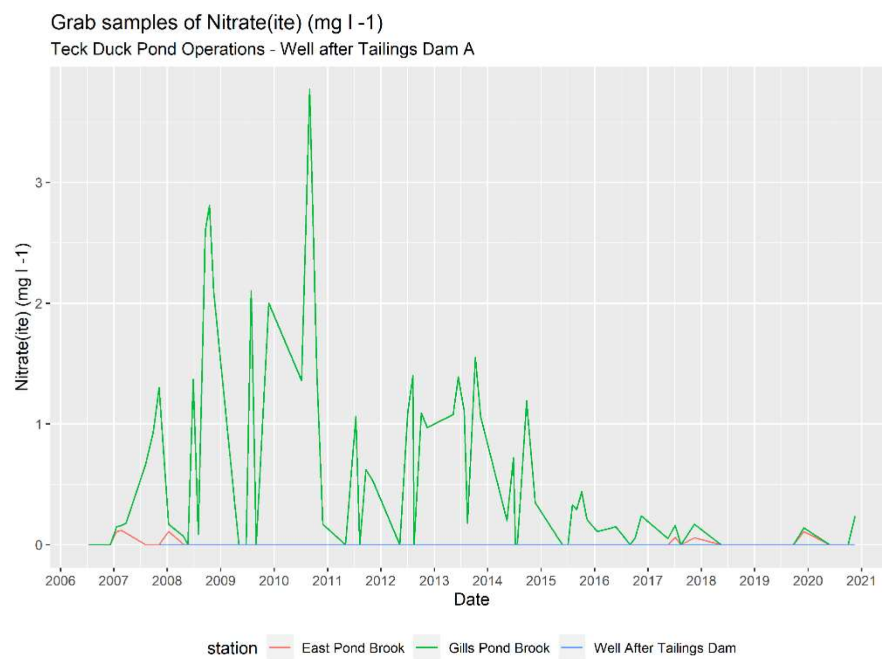
Grab samples of Magnesium (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Magnesium (mg l -1)
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam

Appendix


Grab samples of Manganese (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Manganese (mg l -1)
0
1
2
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam


Grab samples of Mercury (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Mercury (mg l -1)
0.0e+00
2.5e-05
5.0e-05
7.5e-05
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam


Grab samples of Nickel (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Nickel (mg l -1)
0.000
0.025
0.050
0.075
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam


Grab samples of Nitrate(ite) (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Nitrate(ite) (mg l -1)
0
1
2
3
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Date
station
East Pond Brook
Gills Pond Brook
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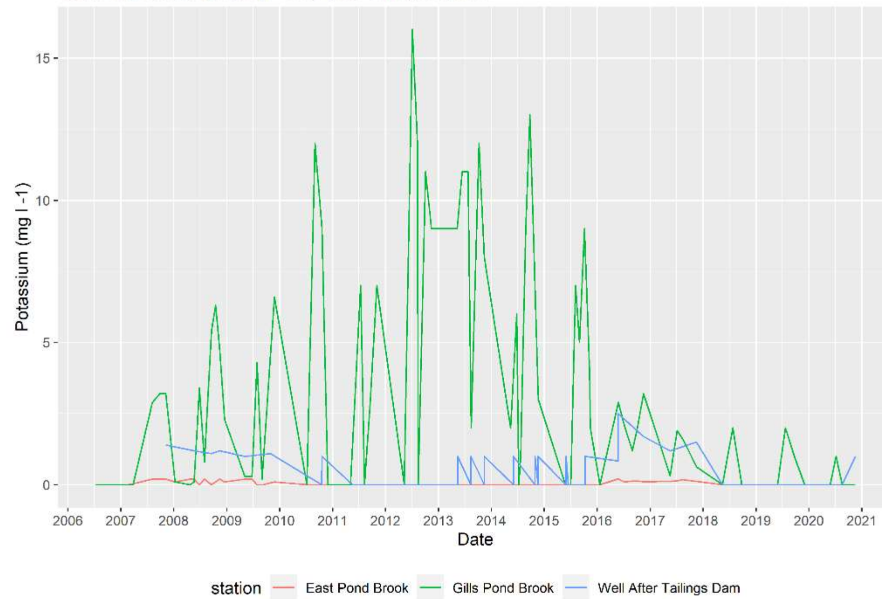
Appendix

Grab samples of pH (units)

Teck Duck Pond Operations - Well after Tailings Dam A

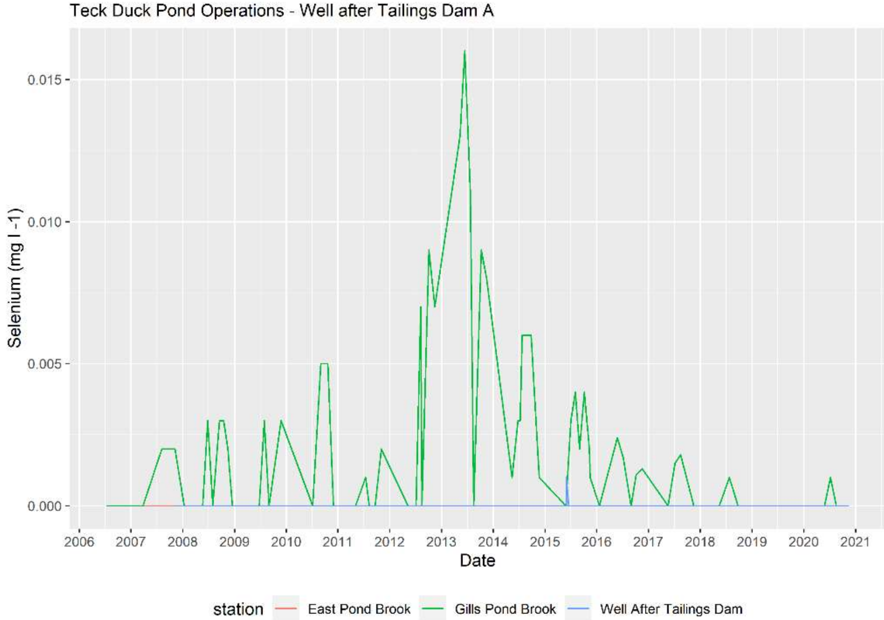
Grab samples of Potassium (mg l -1)

Teck Duck Pond Operations - Well after Tailings Dam A



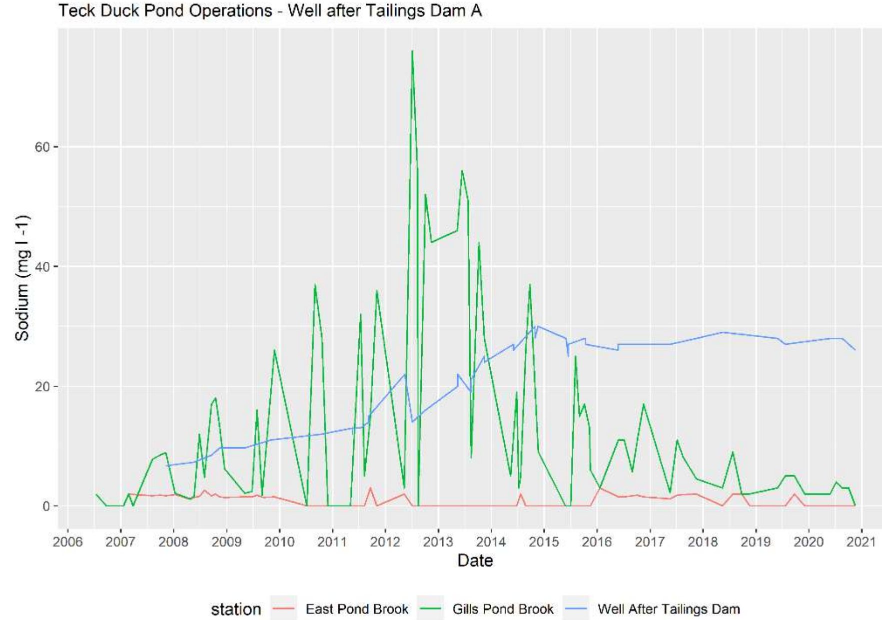
Grab samples of Selenium (mg l -1)

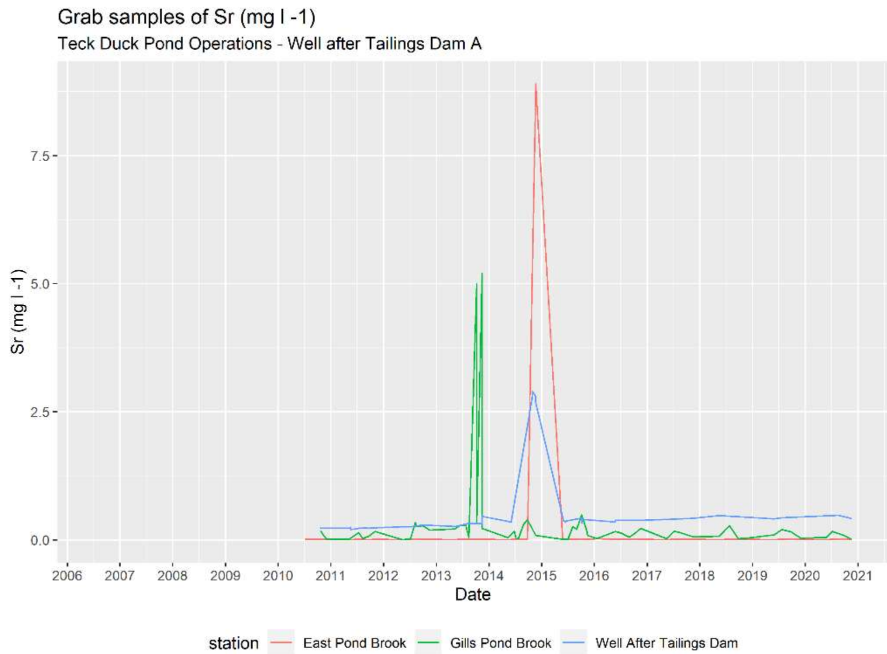
Teck Duck Pond Operations - Well after Tailings Dam A

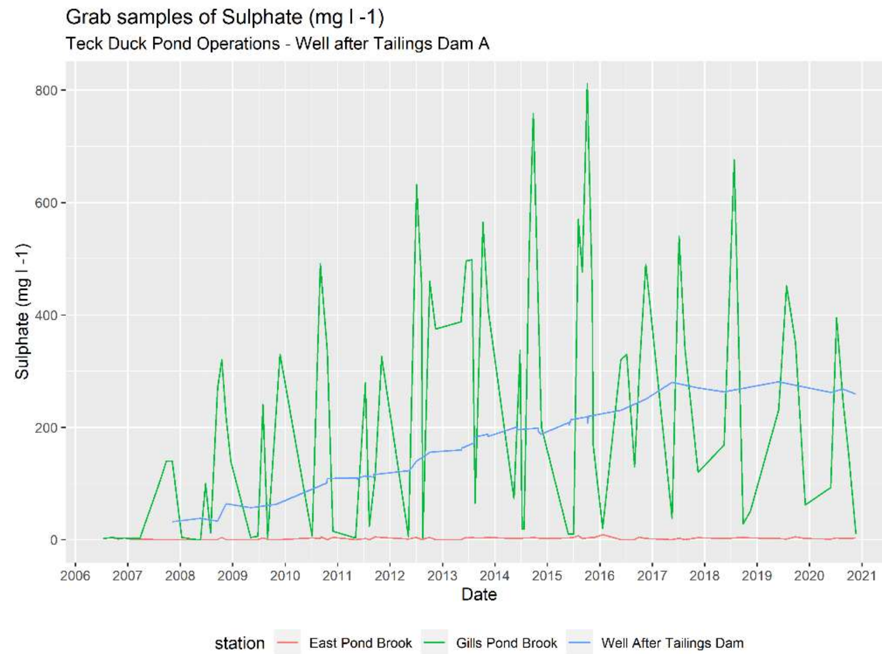


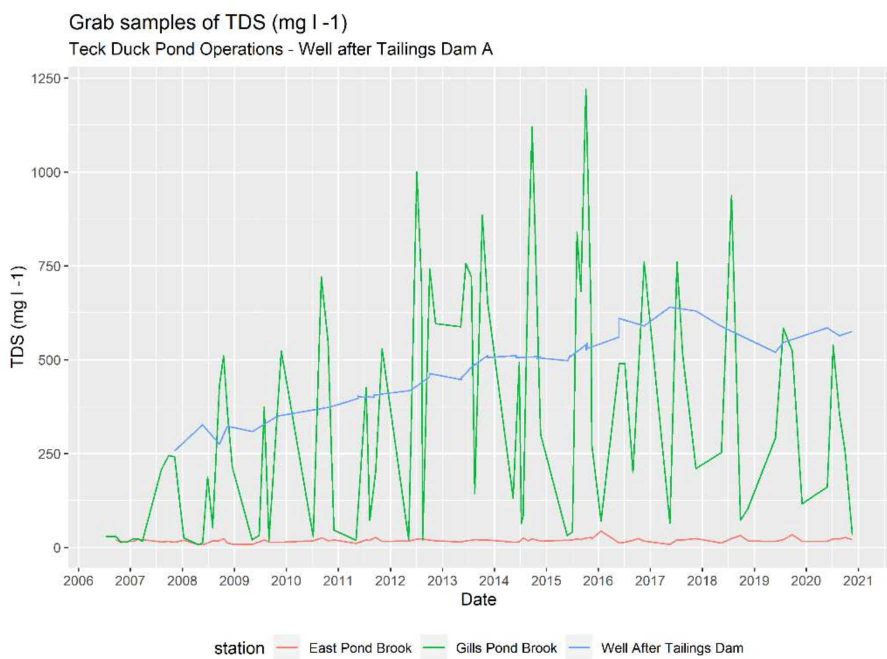
Grab samples of Sodium (mg l -1)

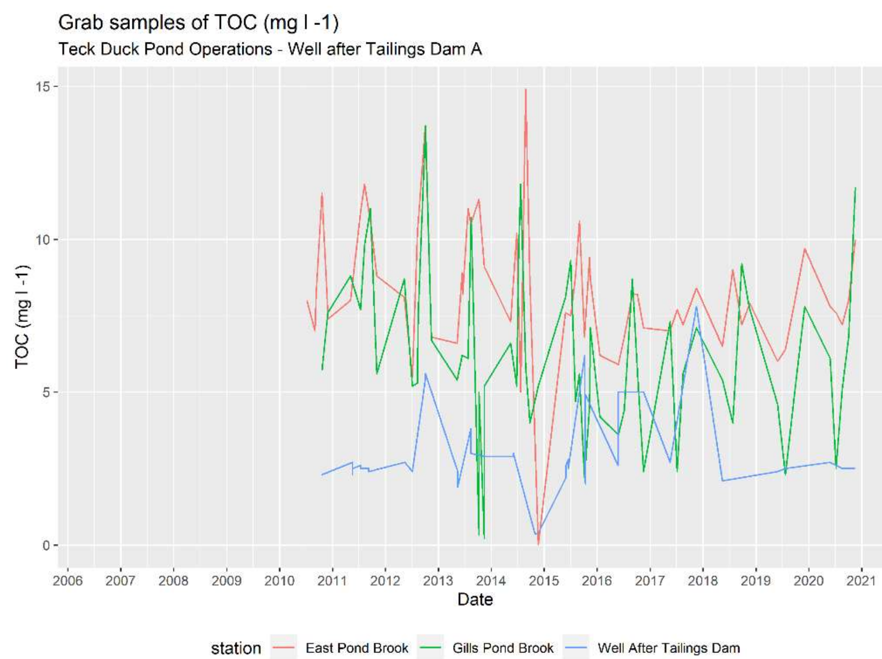
Teck Duck Pond Operations - Well after Tailings Dam A




Grab samples of Sr (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Sr (mg l -1)
0.0
2.5
5.0
7.5
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam


Grab samples of Sulphate (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Sulphate (mg l -1)
0
200
400
600
800
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam


Grab samples of TDS (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
TDS (mg l -1)
0
250
500
750
1000
1250
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station
East Pond Brook
Gills Pond Brook
Well After Tailings Dam


Grab samples of TOC (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
TOC (mg l -1)
0
5
10
15
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station
East Pond Brook
Gills Pond Brook
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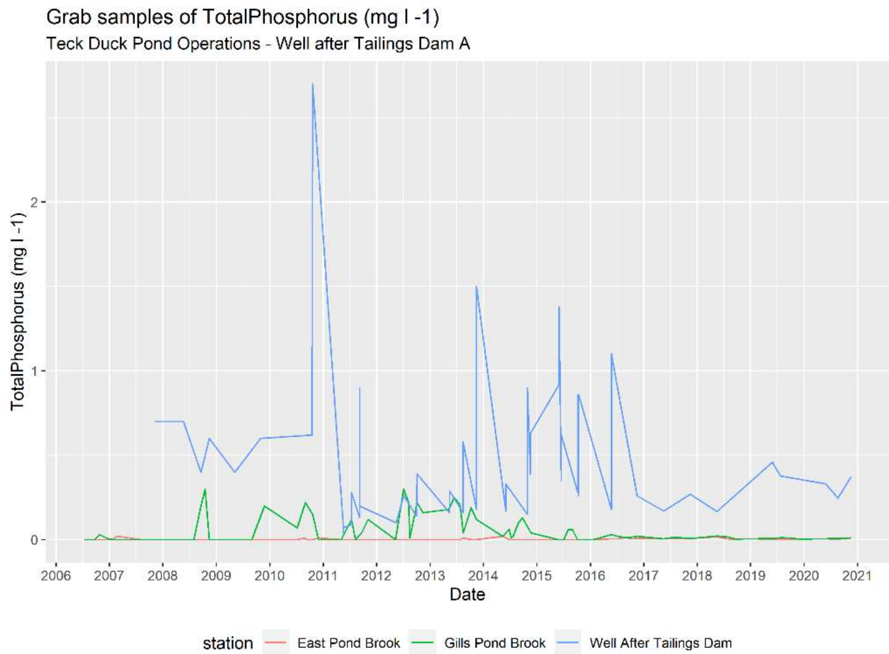
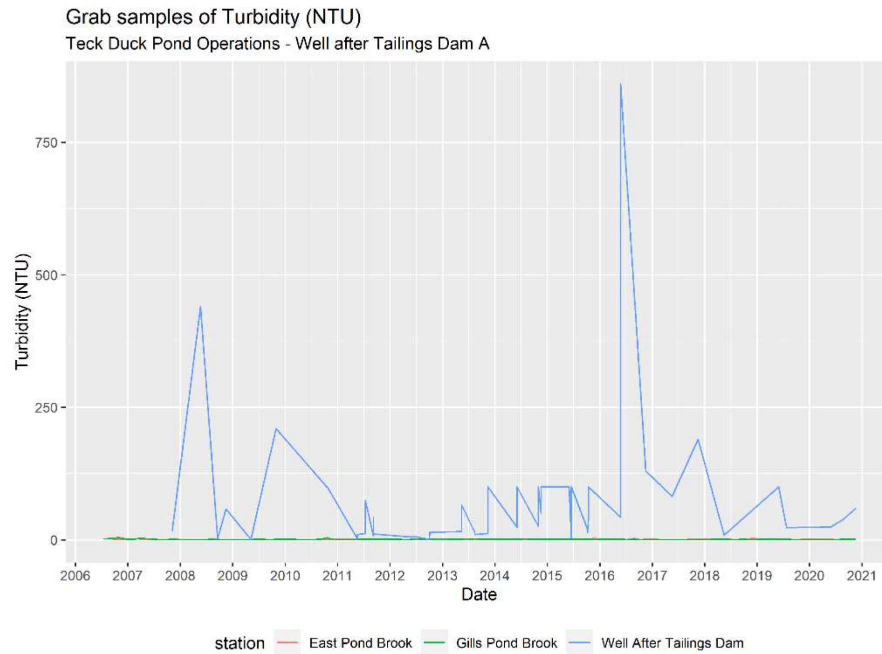
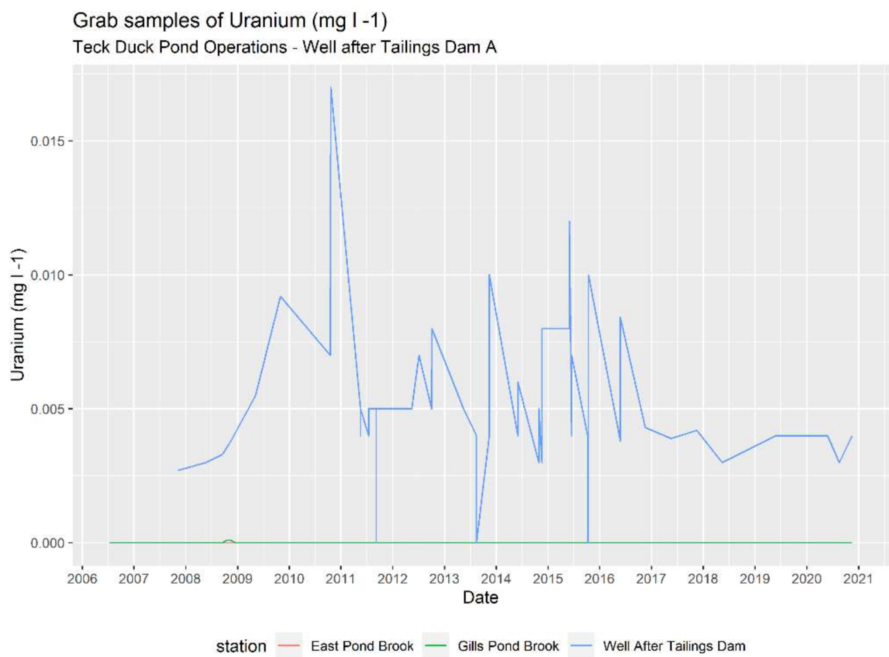
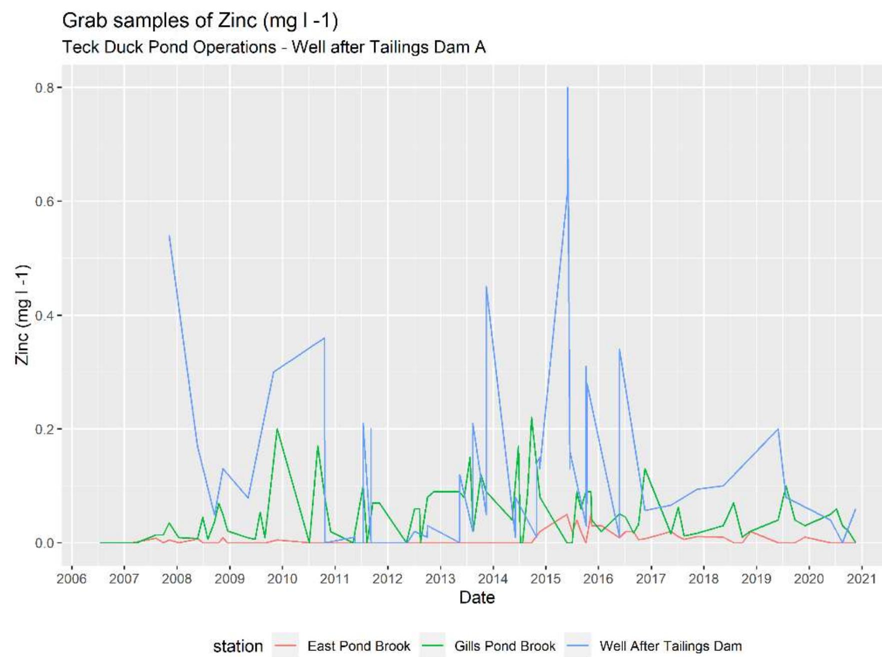

Grab samples of TotalPhosphorus (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
TotalPhosphorus (mg l -1)
0
1
2
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam


Grab samples of Turbidity (NTU)
Teck Duck Pond Operations - Well after Tailings Dam A
Turbidity (NTU)
0
250
500
750
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam


Grab samples of Uranium (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Uranium (mg l -1)
0.000
0.005
0.010
0.015
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam


Grab samples of Zinc (mg l -1)
Teck Duck Pond Operations - Well after Tailings Dam A
Zinc (mg l -1)
0.0
0.2
0.4
0.6
0.8
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Date
station East Pond Brook Gills Pond Brook Well After Tailings Dam