

CDOT EISENHOWER-JOHNSON MEMORIAL TUNNEL WATER QUALITY UPDATE 2009-2020

March 2021

Executive Summary

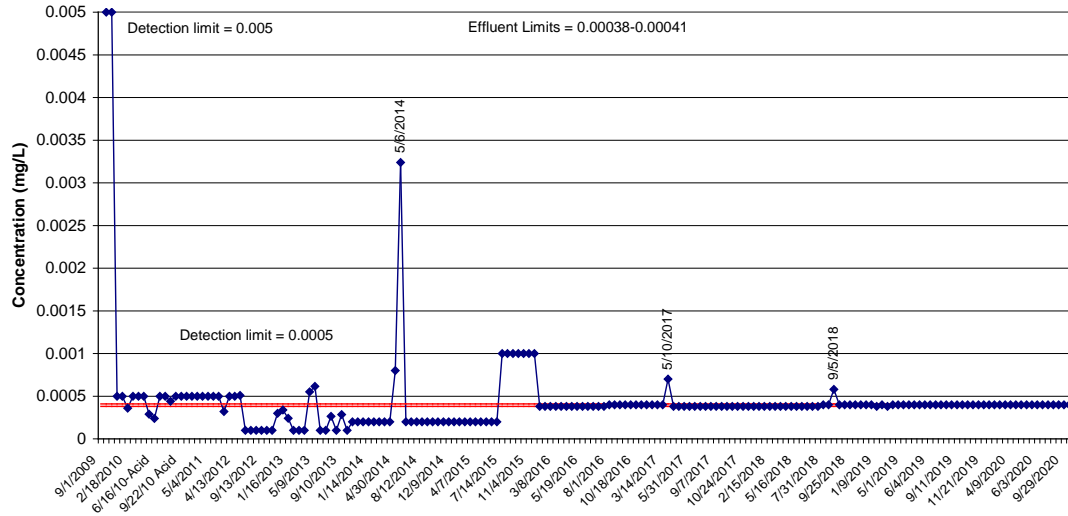
- Water quality remained relatively consistent in recent years at EJMT
- Lead and zinc concentrations exceeded Outfall 001 effluent limits once in 2020
- Exceedances at 001 correlated with tunnel seepage and EFF-002
- Chloride concentrations show an increasing trend of exceedance at Outfall 001
- South tunnel seep line indicated higher lead, manganese, and chloride concentrations
- Tunnel seepage main line is showing increasing seasonal chloride concentrations
- Effluent EFF-002 shows an increasing copper, zinc, and chloride concentration trend
- Conductivity (dissolved salts) shows seasonal increases at Center West Lift
- Clear Creek concentrations remained low and below stream water quality standards



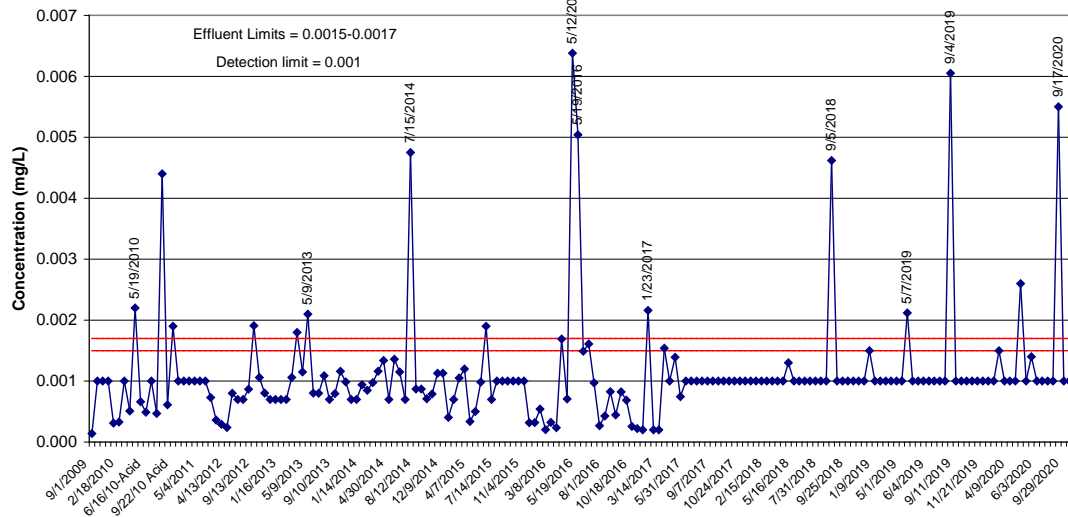
Flume Outfall 001 Data Results

Cadmium and Lead - low concentrations with occasional lead exceedances

Flume 001 Outfall Dissolved Cadmium
2009 to 2020



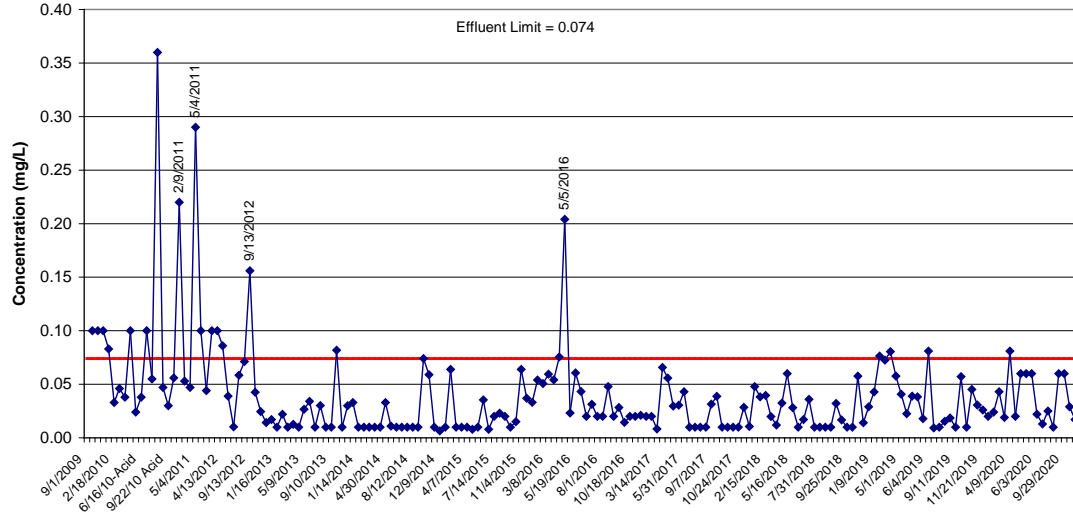
Flume 001 Outfall Dissolved Lead
2009 to 2020



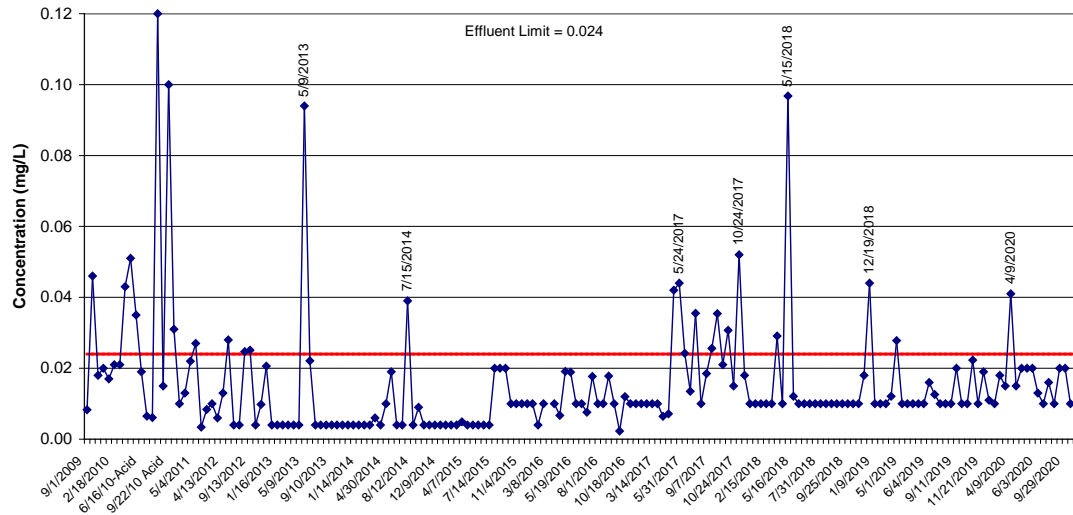
Flume Outfall 001 Data Results

Dissolved Iron and Zinc - low concentrations with occasional zinc exceedances

Flume 001 Outfall Dissolved Iron
2009 to 2020



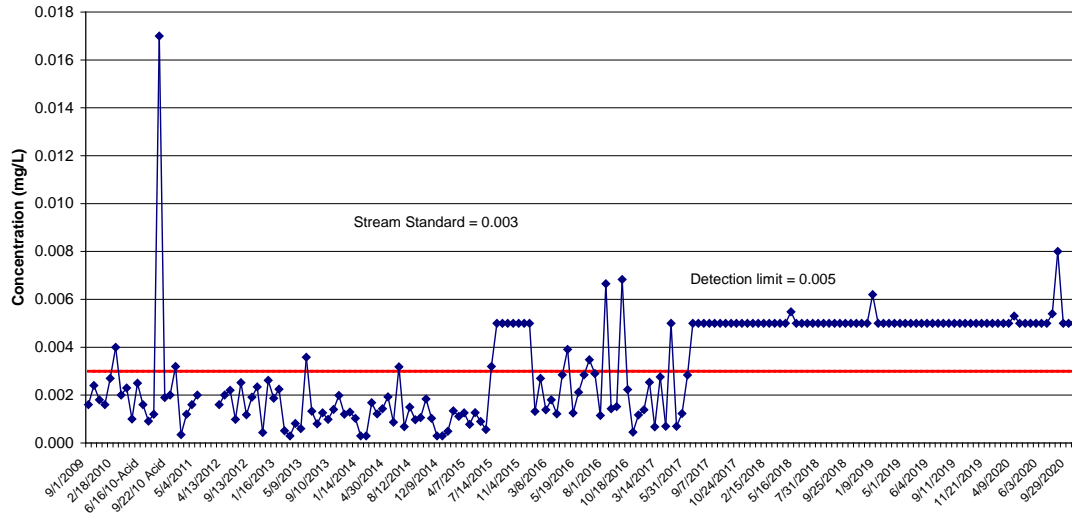
Flume 001 Outfall Dissolved Zinc
2009 to 2020



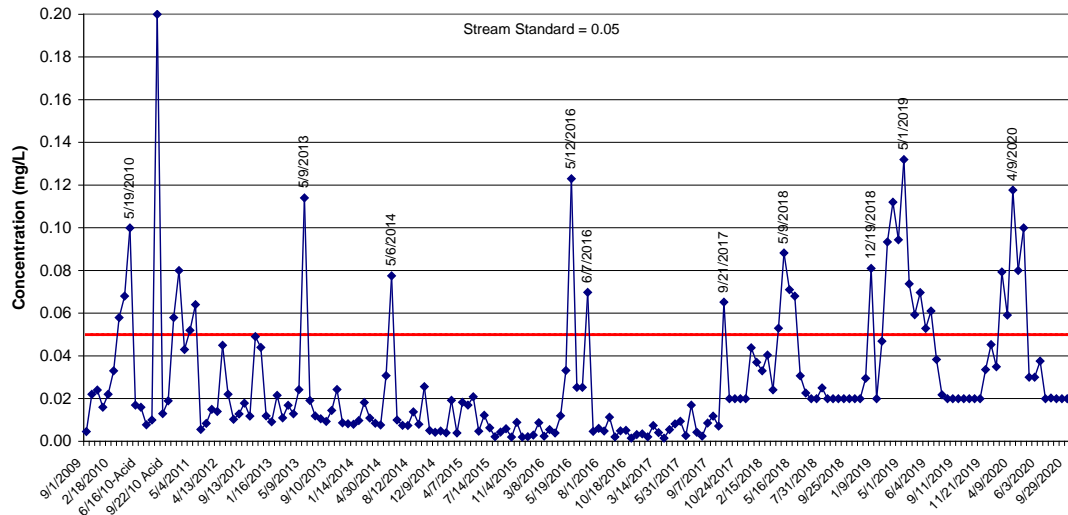
Flume Outfall 001 Data Results

Copper and Manganese - low concentrations with occasional manganese exceedances

Flume 001 Outfall Dissolved Copper
2009 to 2020



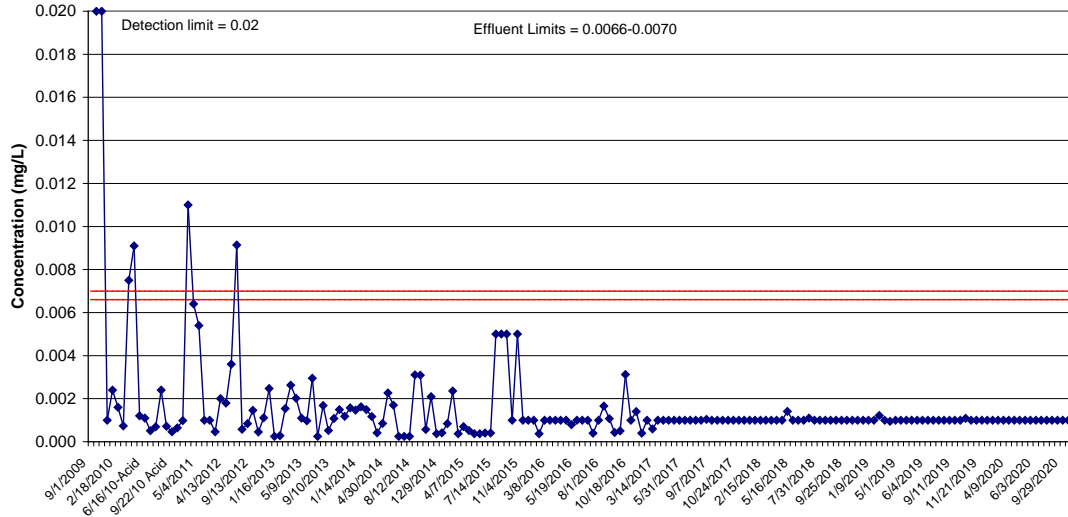
Flume 001 Outfall Dissolved Manganese
2009 to 2020



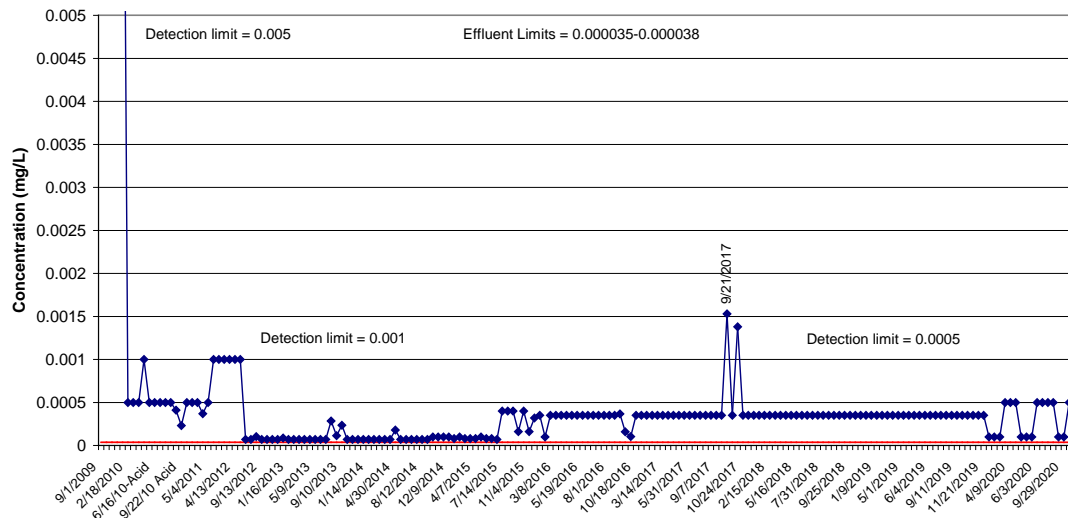
Flume Outfall 001 Data Results

Selenium and Silver – concentrations remained low below reporting limits

Flume 001 Outfall Dissolved Selenium
2009 to 2020



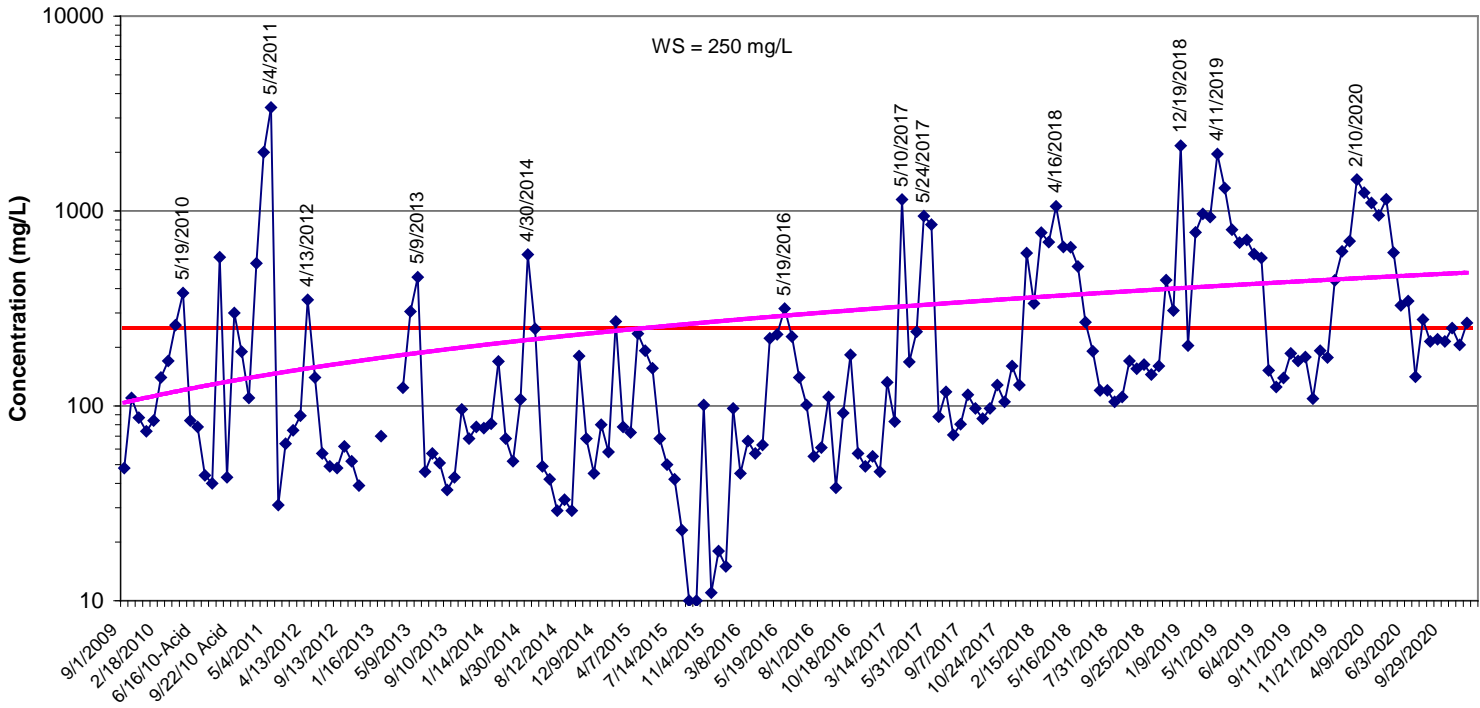
Flume 001 Outfall Dissolved Silver
2009 to 2020



Flume Outfall 001 Data Results

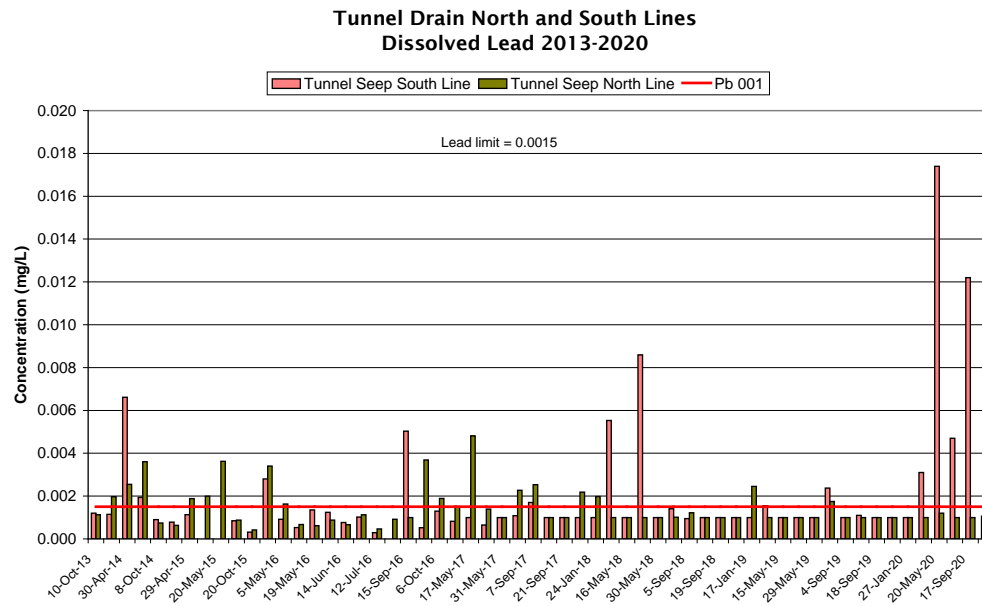
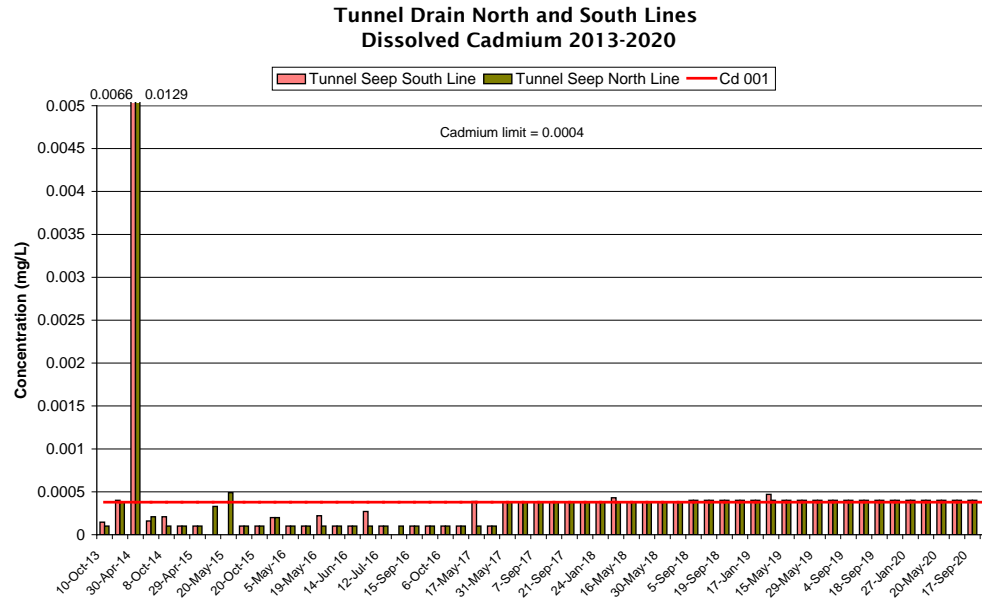
Chloride concentrations were seasonally high (winter and spring) associated with road salts

Flume 001 Outfall Chloride Trend 2009 to 2020



Tunnel Drain North and South Line Data Results

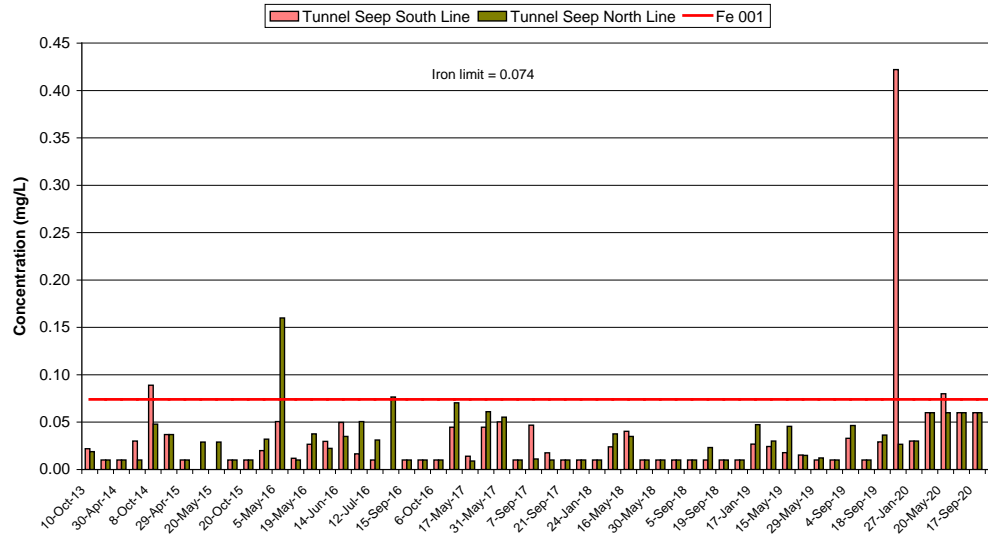
Cadmium and Lead – concentrations remained low in 2020 with South line lead spikes



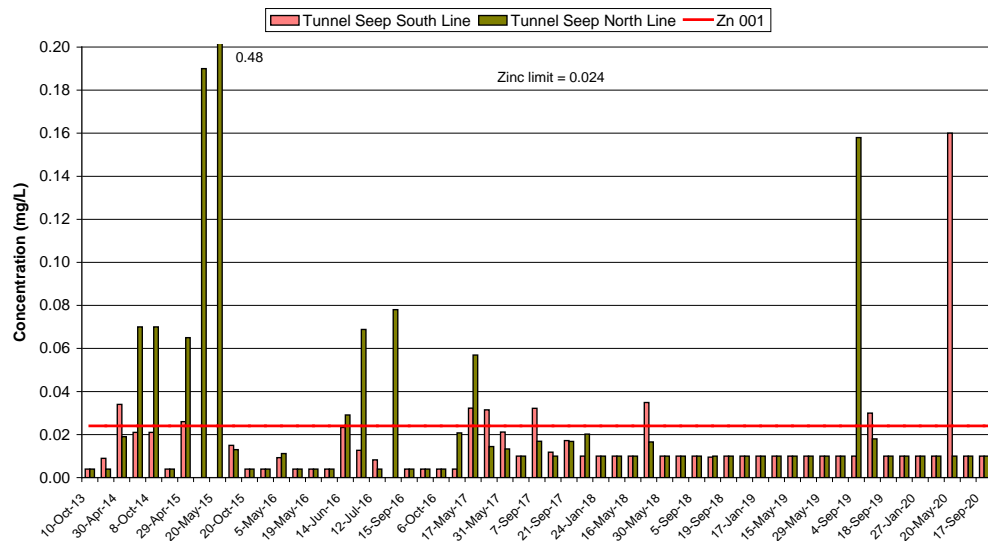
Tunnel Drain North and South Line Data Results

Iron and Zinc – concentrations remained low in 2020

Tunnel Drain North and South Lines
Dissolved Iron 2013-2020



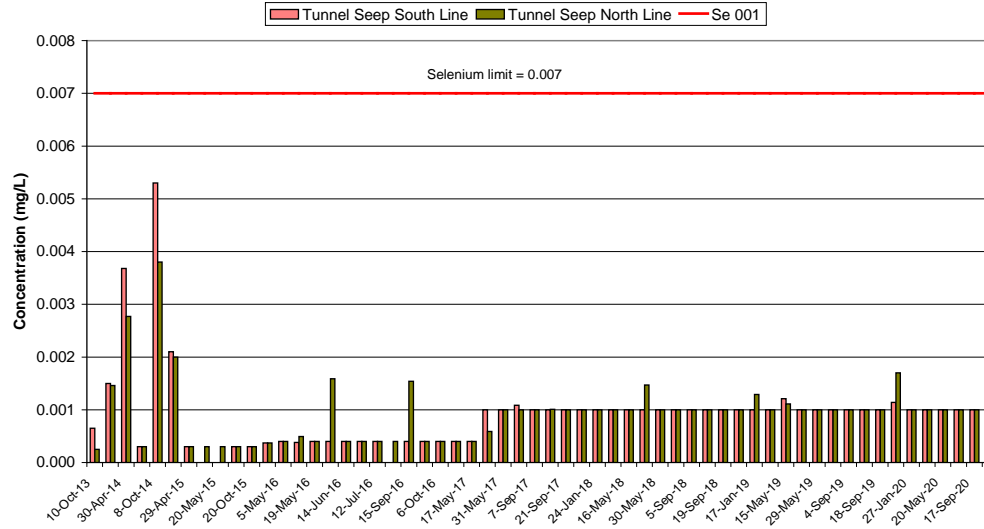
Tunnel Drain North and South Lines
Dissolved Zinc 2013-2020



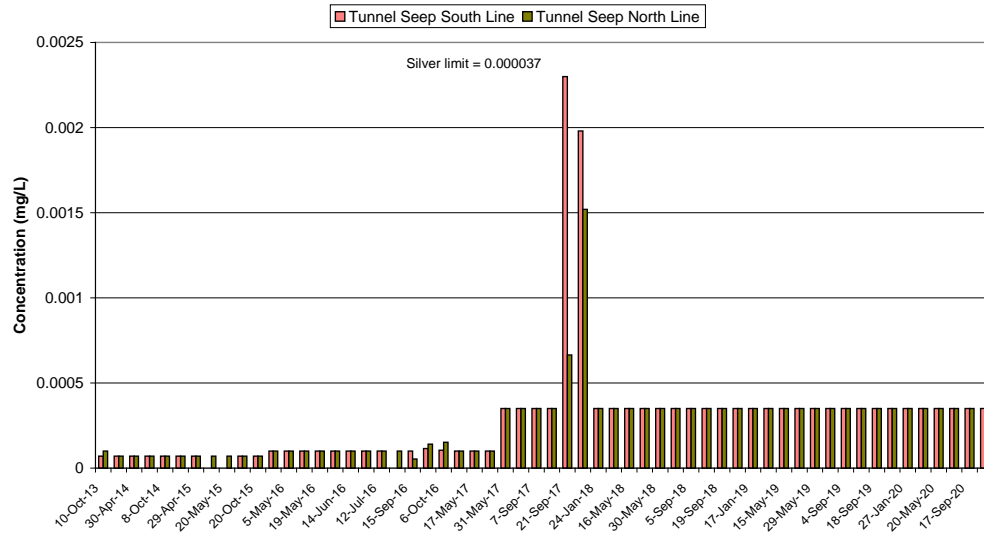
Tunnel Drain North and South Line Data Results

Selenium and Silver – concentrations remained low in 2020

Tunnel Drain North and South Lines
Dissolved Selenium 2013-2020

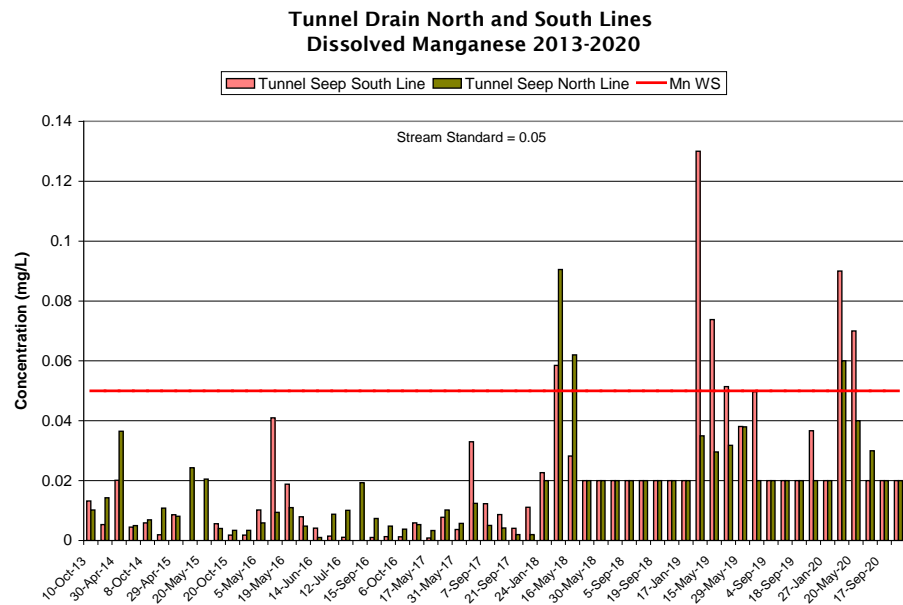
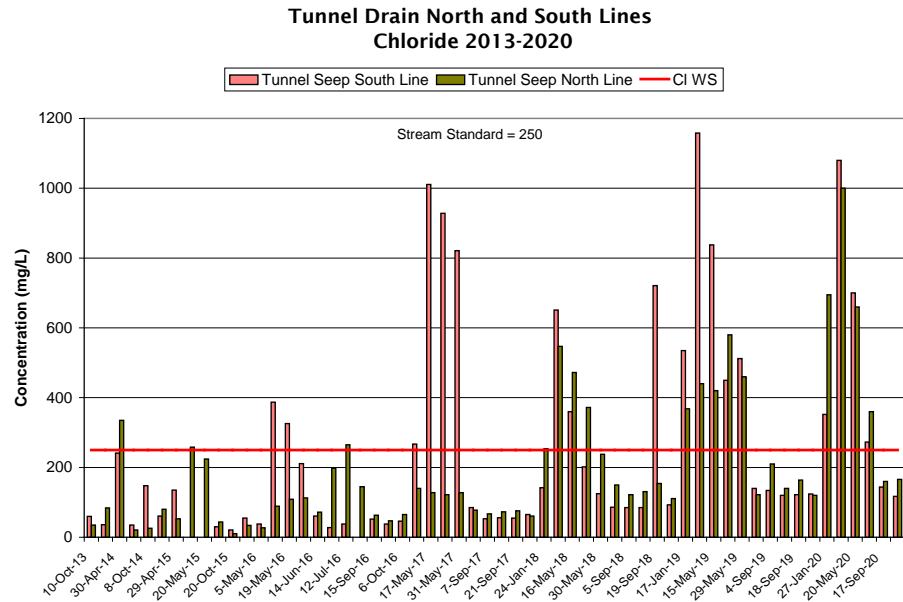


Tunnel Drain North and South Lines
Dissolved Silver 2013-2020



Tunnel Drain North and South Line Data Results

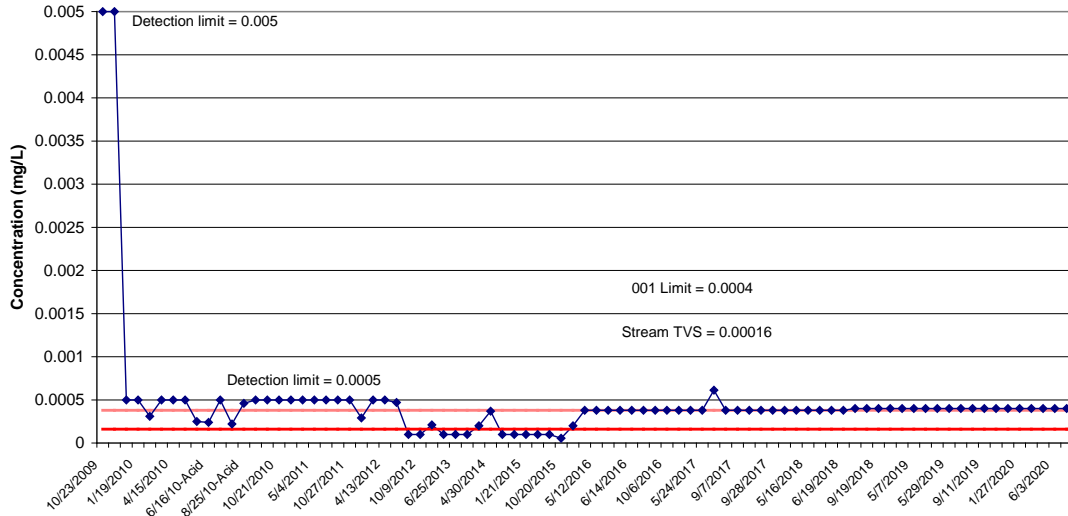
Chloride and Manganese - increasing chloride with South line showing higher manganese in May



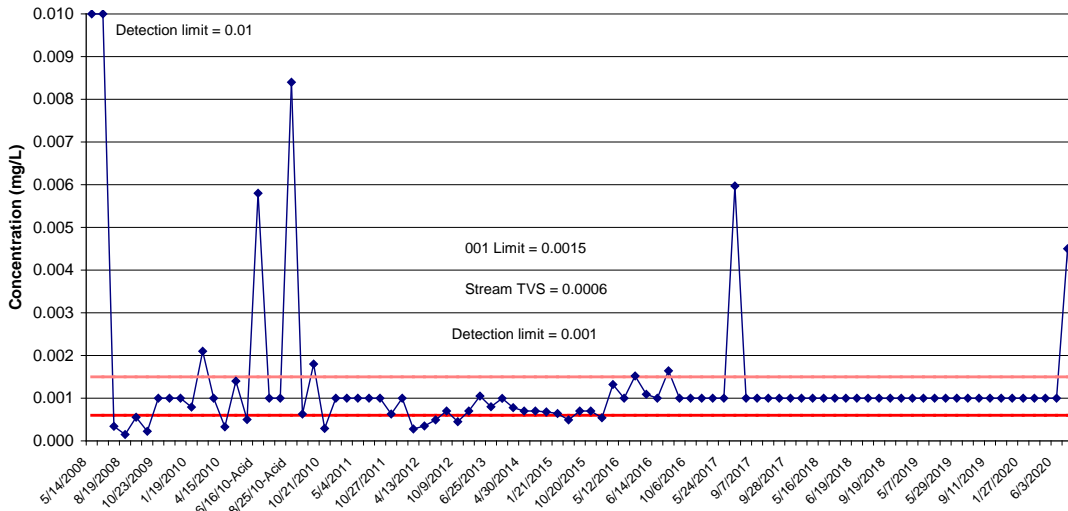
Tunnel Seep Mainline TS-1 Data Results

Cadmium and Lead – concentrations remained low in 2020

TS-1 Dissolved Cadmium
2009 to 2020



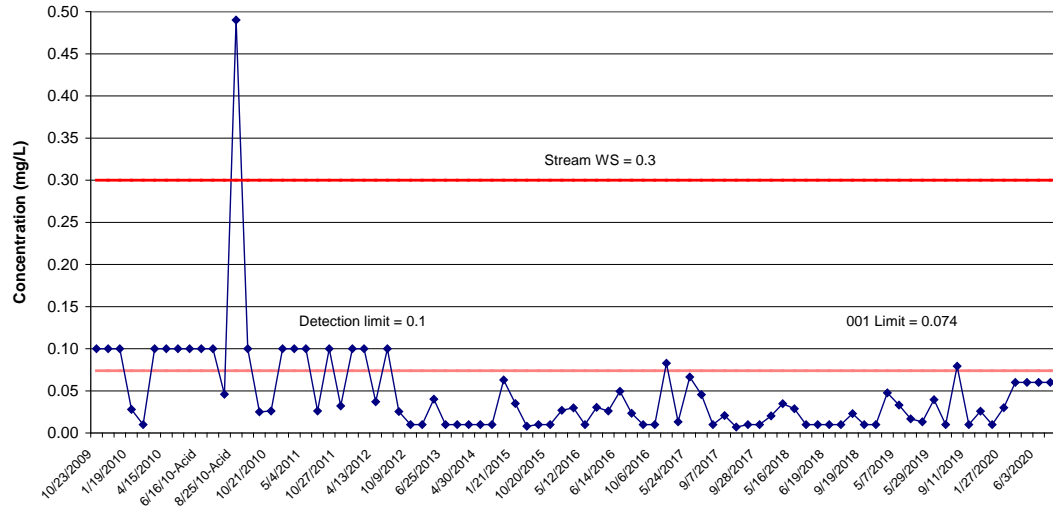
TS-1 Dissolved Lead
2008 to 2020



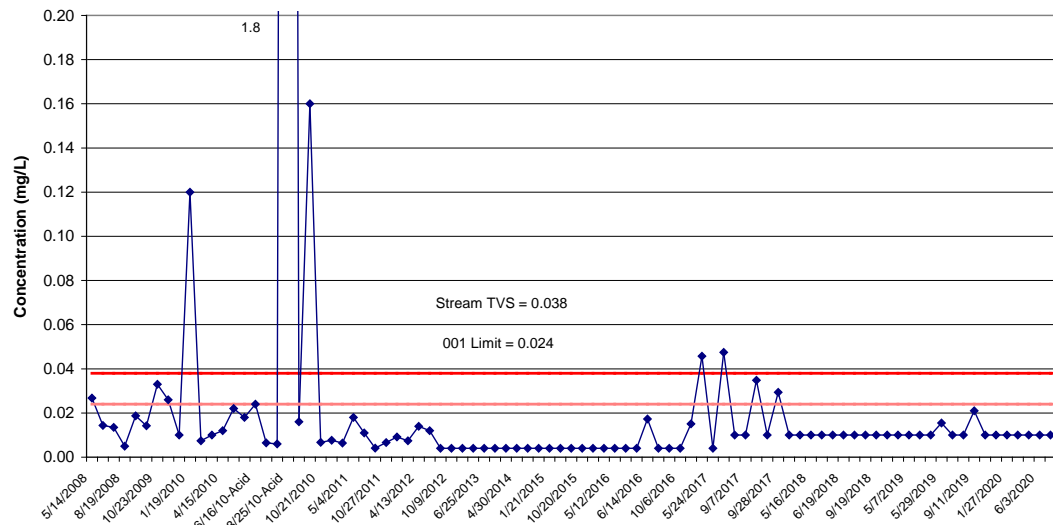
Tunnel Seep Mainline TS-1 Data Results

Iron and Zinc – concentrations remained low in 2020

TS-1 Dissolved Iron
2009 to 2020



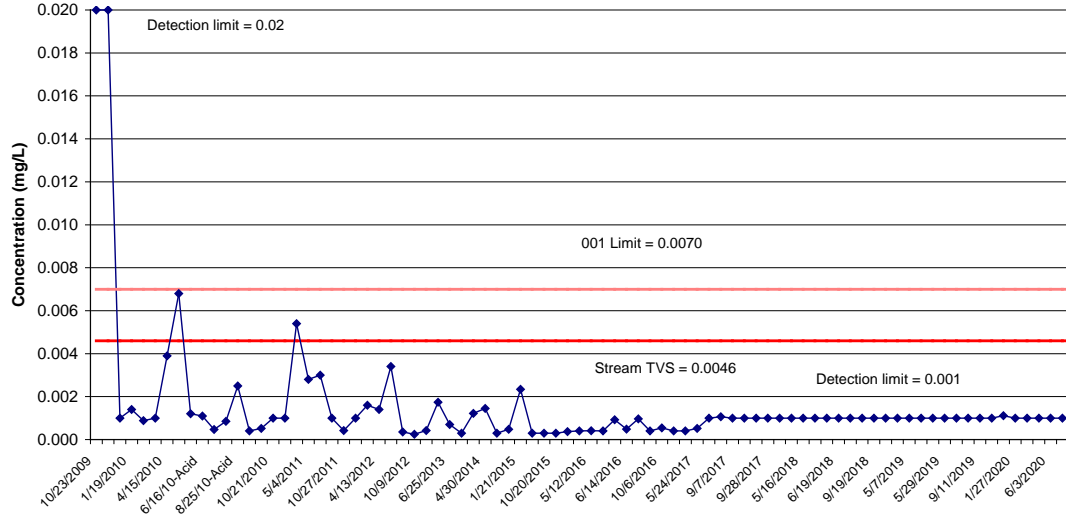
TS-1 Dissolved Zinc
2008 to 2020



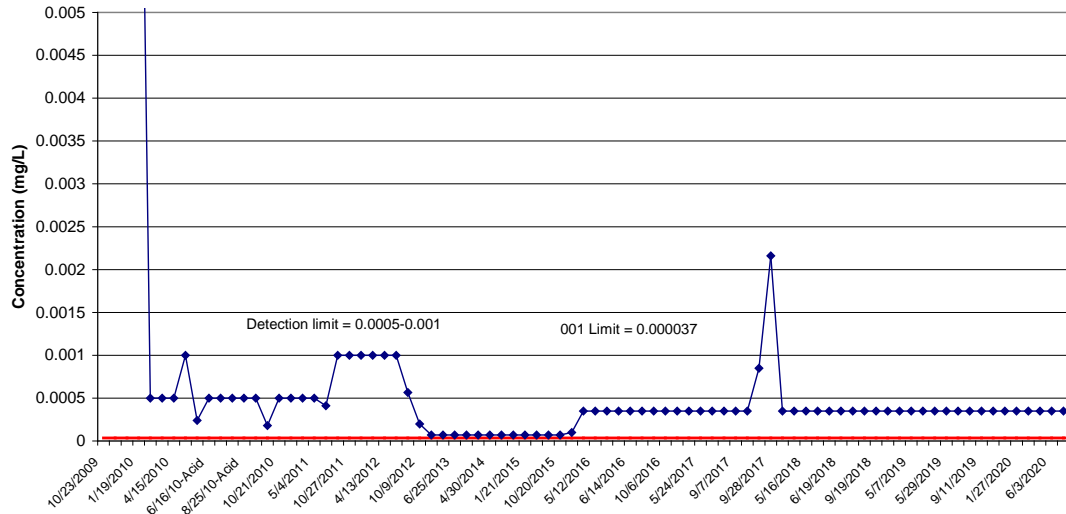
Tunnel Seep Mainline TS-1 Data Results

Selenium and Silver – concentrations remained low in 2020

TS-1 Dissolved Selenium
2009 to 2020



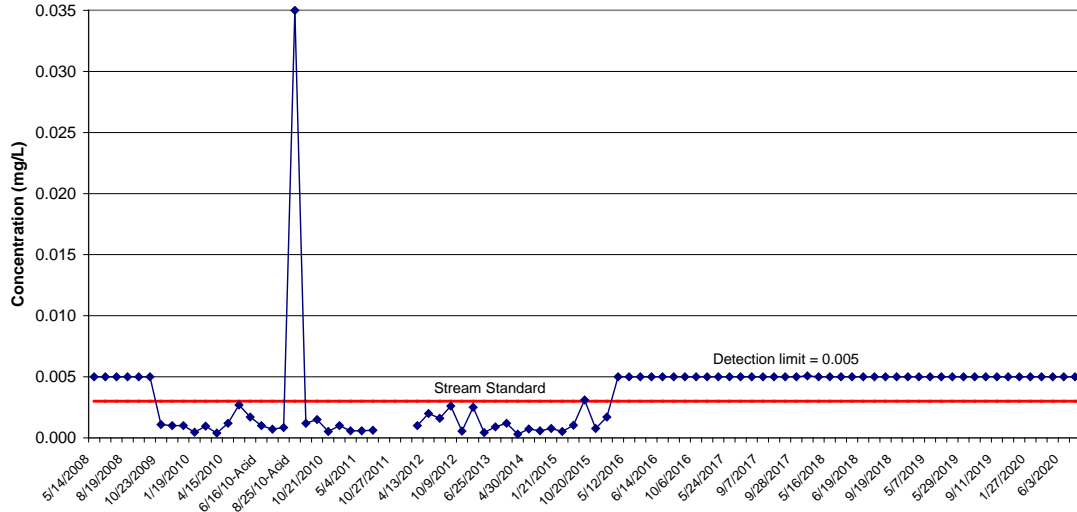
TS-1 Dissolved Silver
2009 to 2020



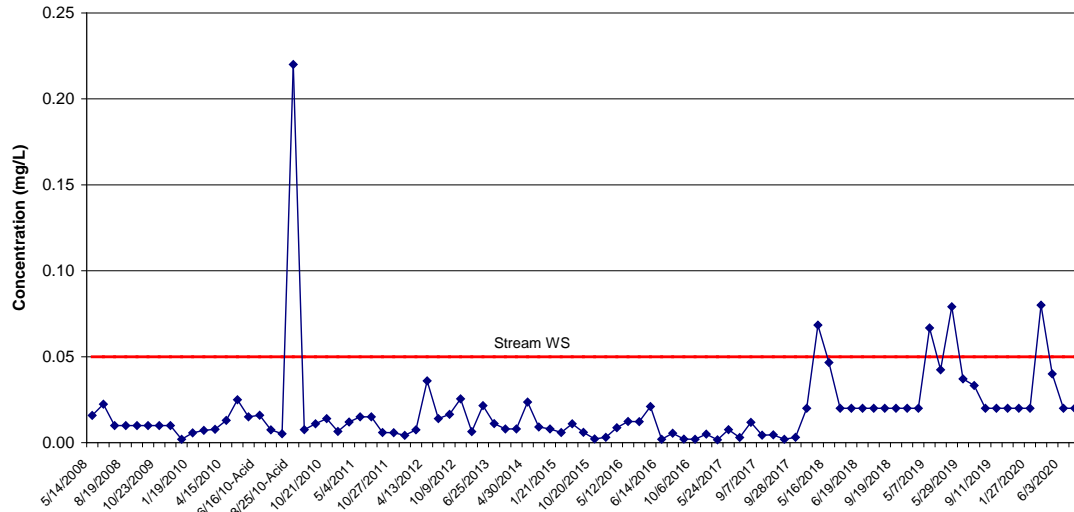
Tunnel Seep Mainline TS-1 Data Results

Copper and Manganese – concentrations remained low in 2020

TS-1 Dissolved Copper
2008 to 2020



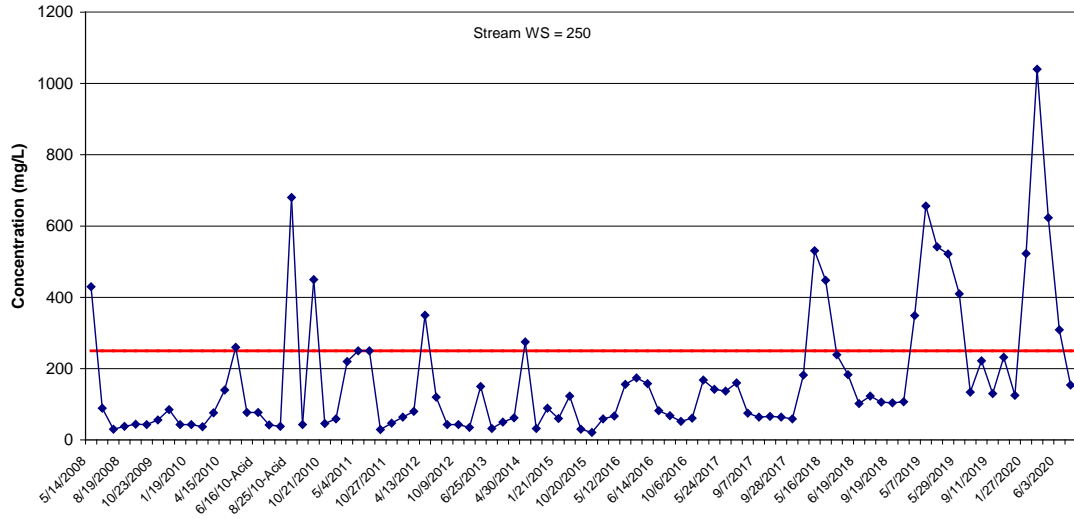
TS-1 Dissolved Manganese
2008 to 2020



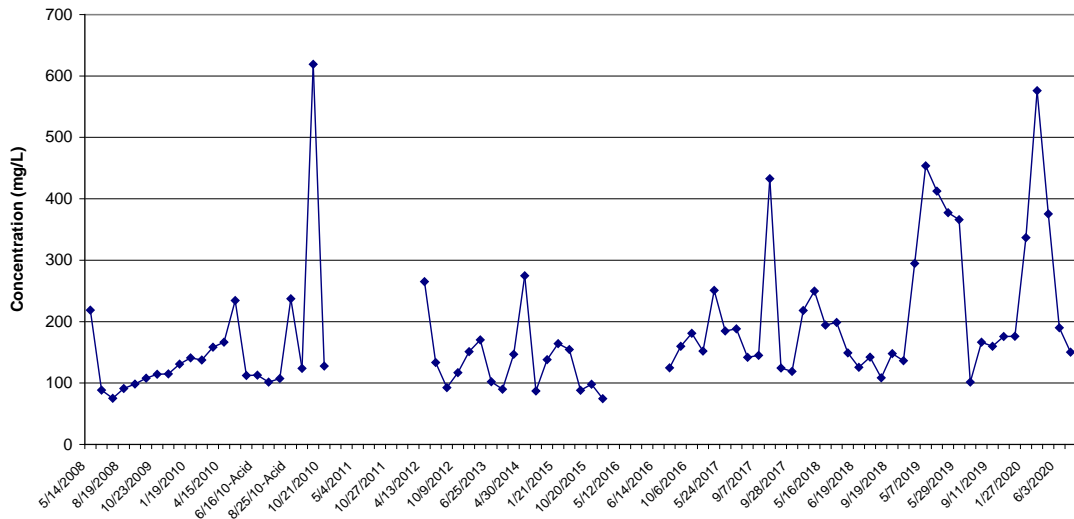
Tunnel Seep Mainline TS-1 Data Results

Chloride and Hardness – chloride concentrations were higher in May

**TS-1 Chloride
2008 to 2020**



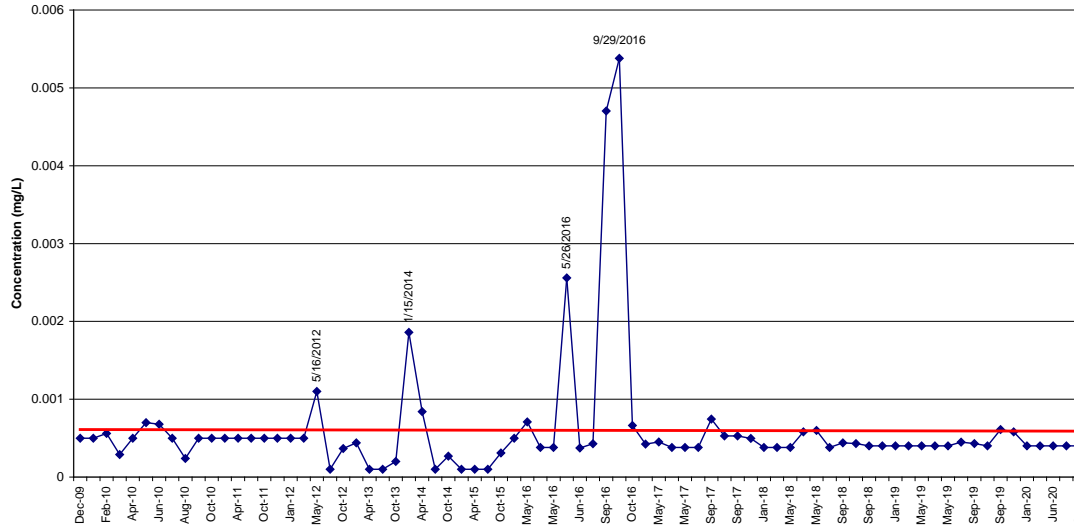
**TS-1 Hardness
2008 to 2020**



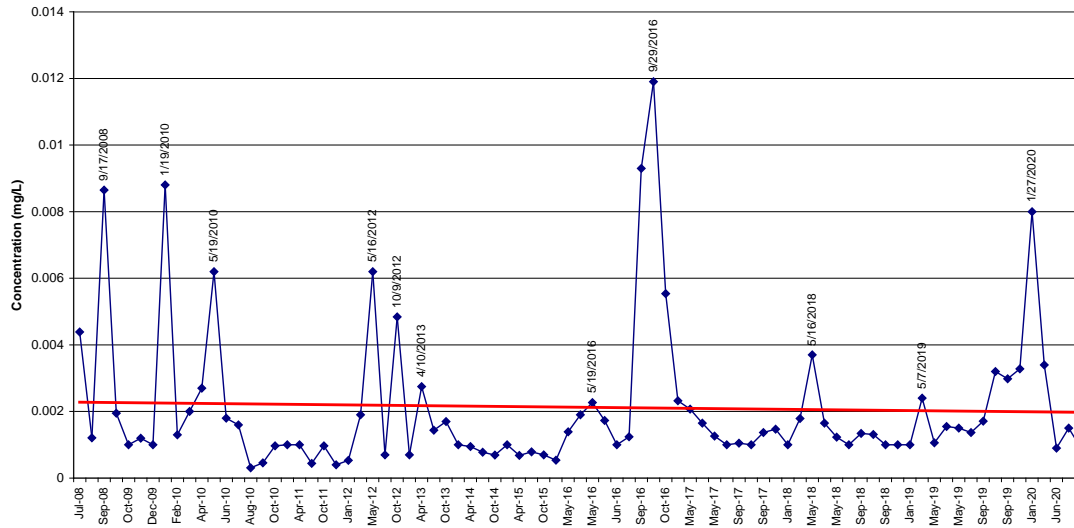
Treated Effluent Outfall EFF-002 Data Trends

Cadmium and Lead – concentrations show a decreasing trend

EFF-002 Dissolved Cadmium Trend
2009 to 2020



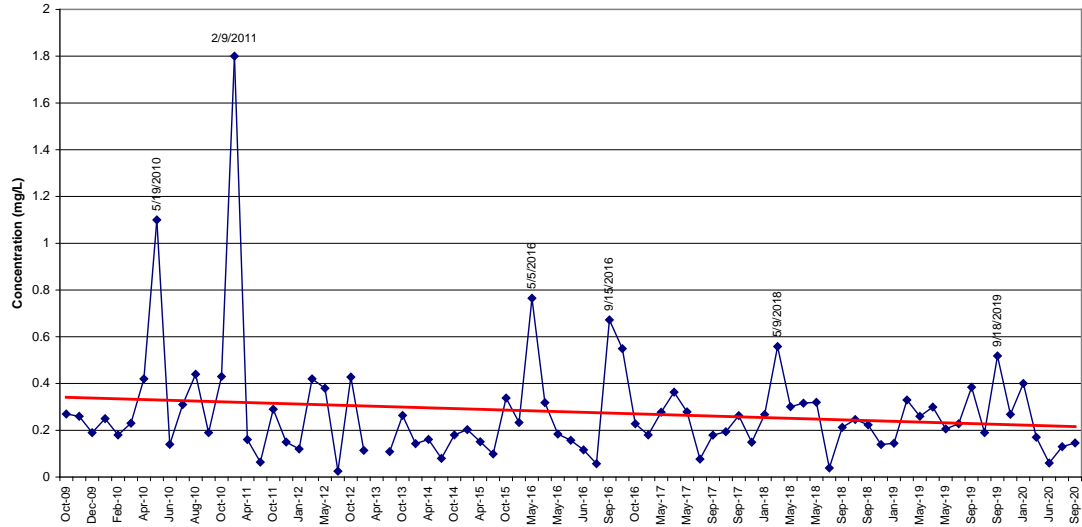
EFF-002 Dissolved Lead Trend
2008 to 2020



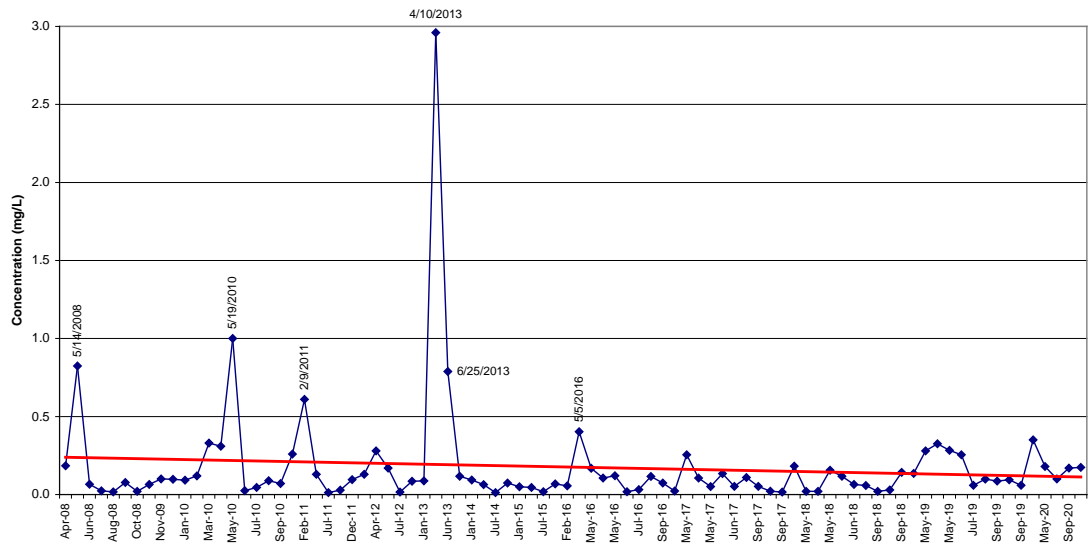
Treated Effluent Outfall EFF-002 Data Trends

Iron and Manganese - concentrations show a decreasing trend

EFF-002 Dissolved Iron Trend
2009 to 2020

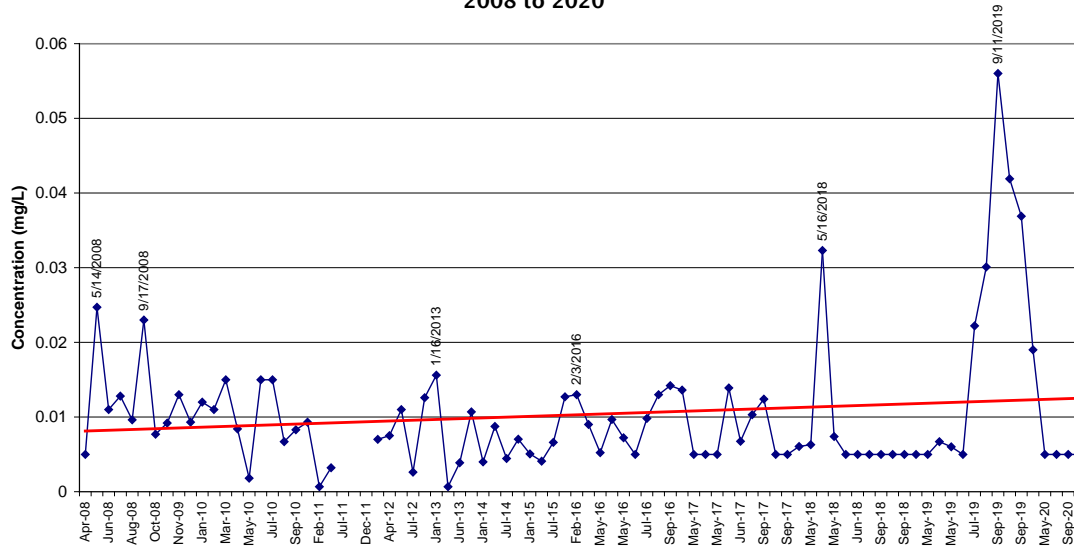


EFF-002 Dissolved Manganese Trend
2008 to 2020

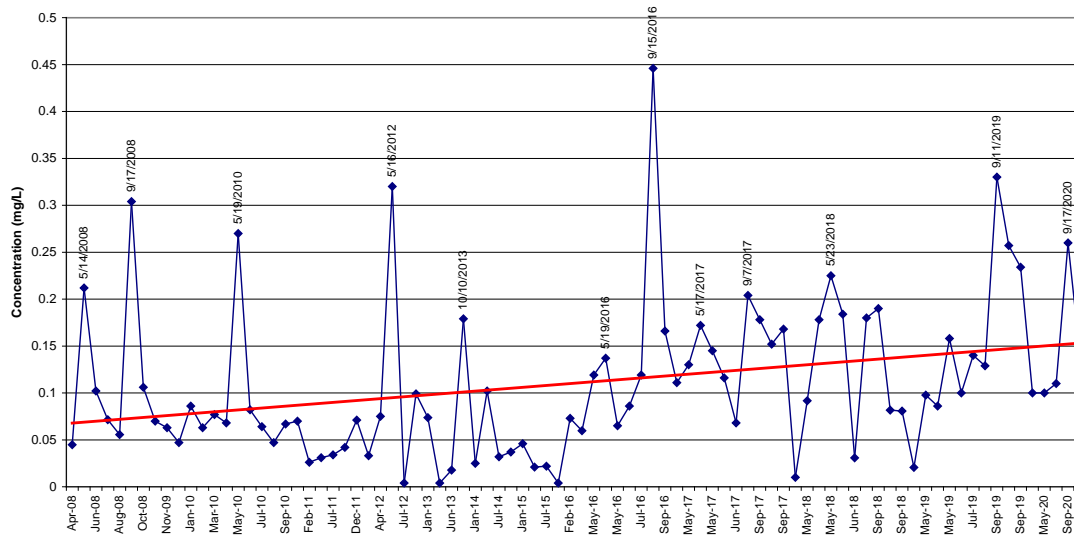


Treated Effluent Outfall EFF-002 Data Trends Copper and Zinc – increasing concentration trend

EFF-002 Dissolved Copper Trend
2008 to 2020



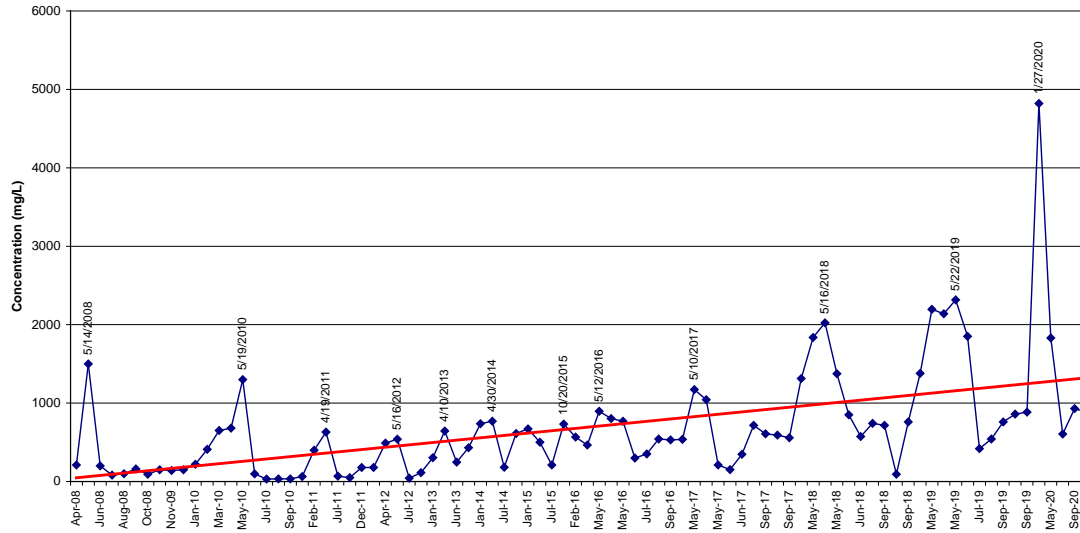
EFF-002 Dissolved Zinc Trend
2008 to 2020



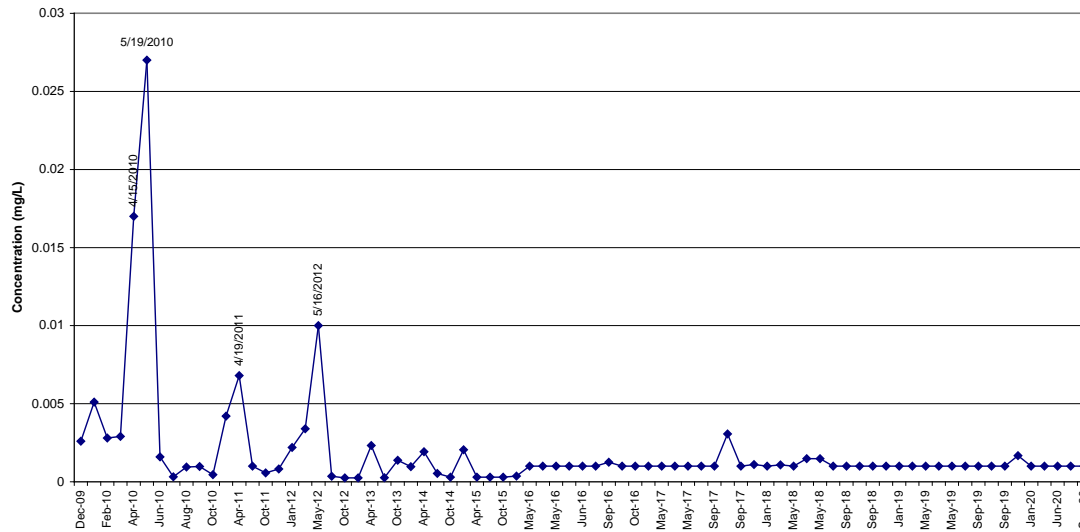
Treated Effluent Outfall EFF-002 Data Trends

Chloride and Selenium – increasing chloride trend

EFF-002 Chloride Trend
2008 to 2020



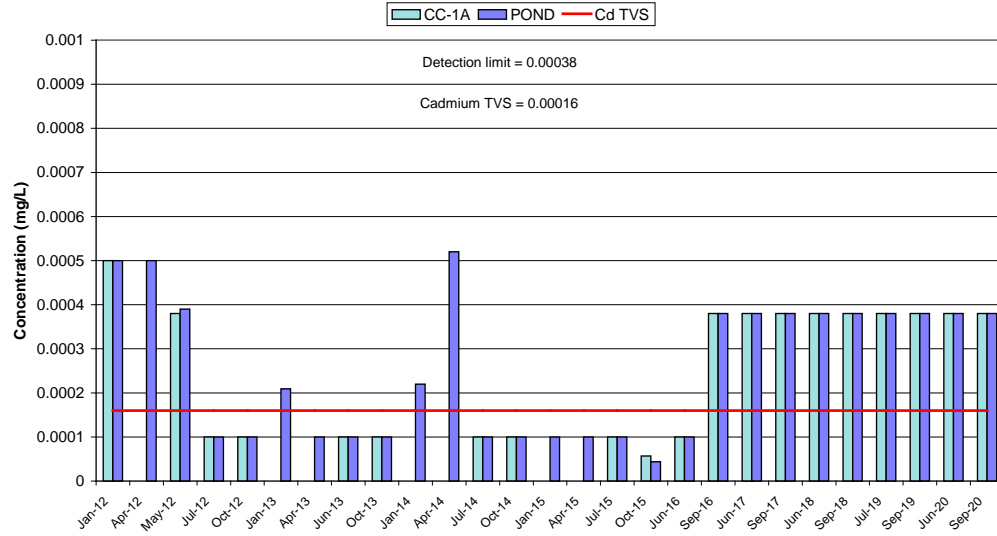
EFF-002 Dissolved Selenium
2009 to 2020



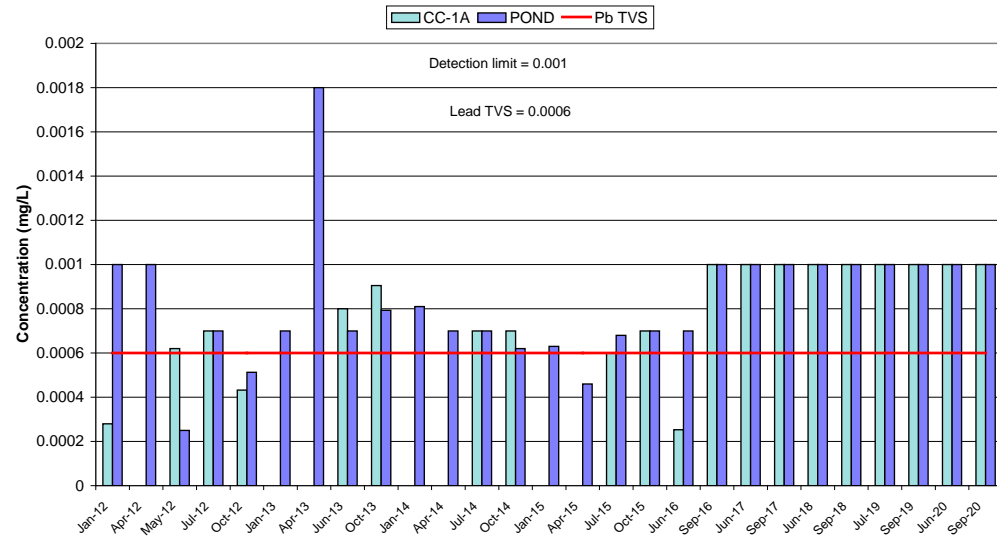
Clear Creek CC-1A and Pond Data Results

Cadmium and Lead – concentrations remained low in 2020

**Clear Creek Dissolved Cadmium
2012-2020**



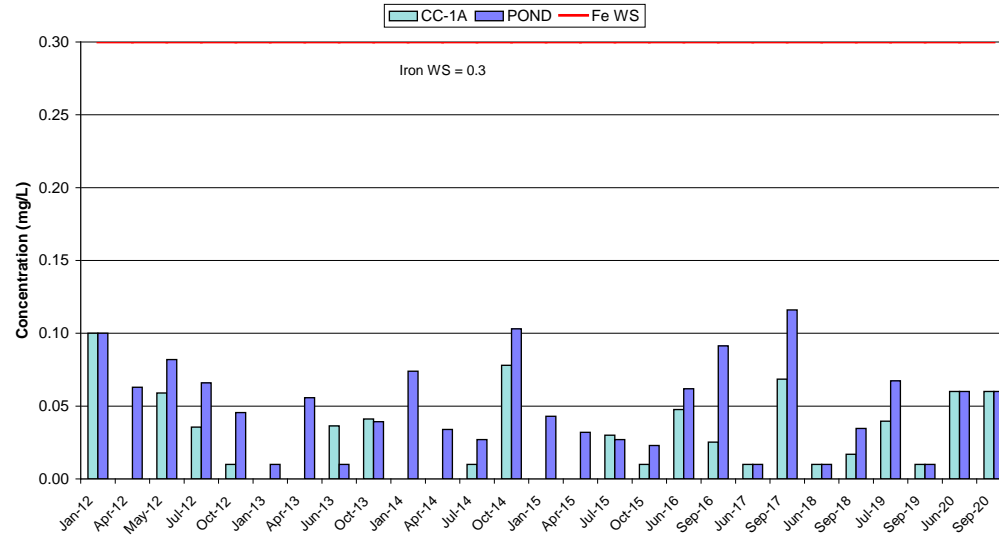
**Clear Creek Dissolved Lead
2012-2020**



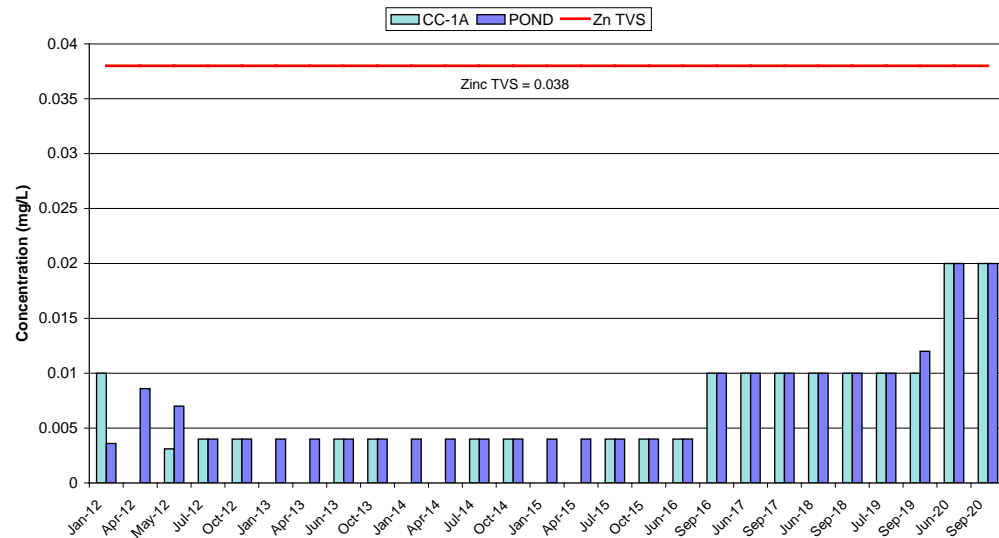
Clear Creek CC-1A and Pond Data Results

Iron and Zinc - concentrations remained low in 2020

Clear Creek Dissolved Iron
2012-2020



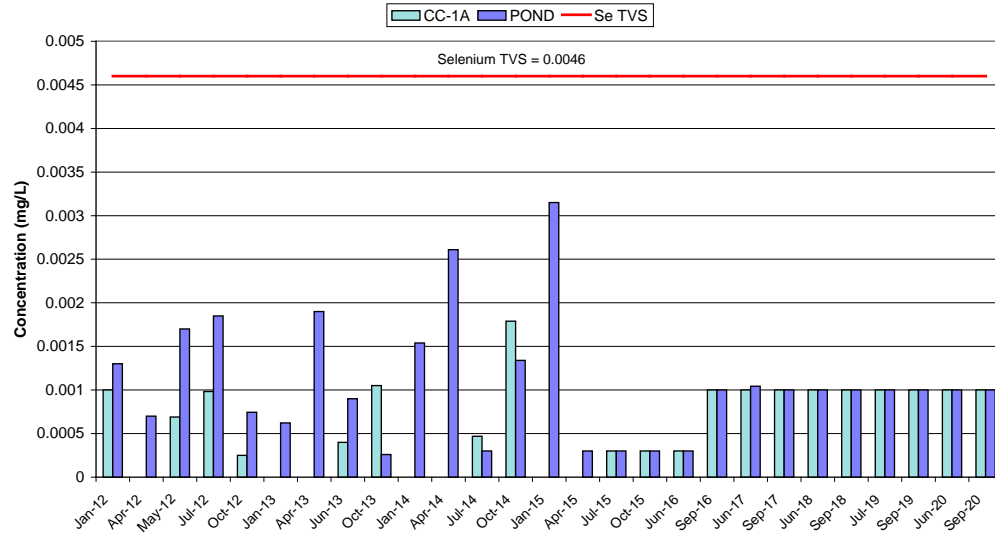
Clear Creek Dissolved Zinc
2012-2020



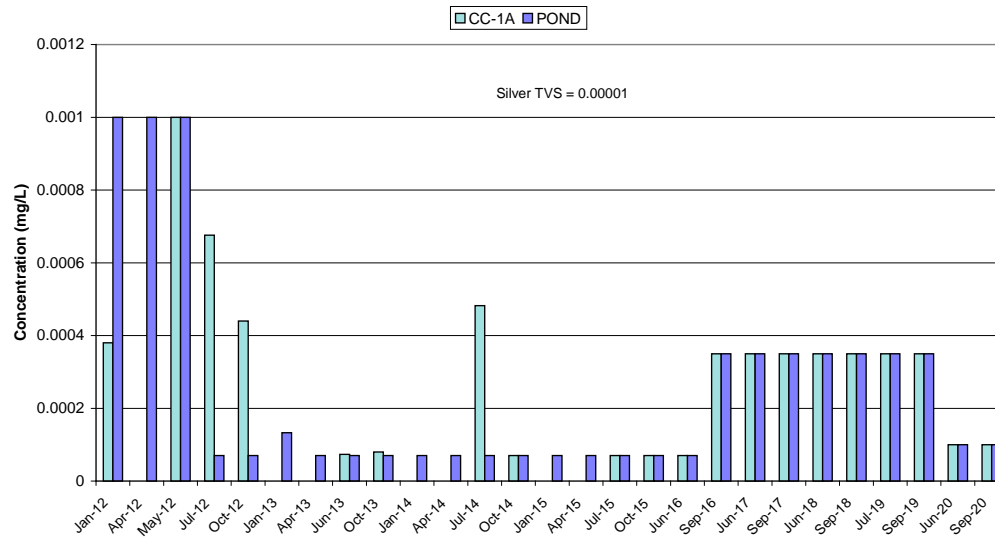
Clear Creek CC-1A and Pond Data Results

Selenium and Silver – concentrations remained low in 2020

Clear Creek Dissolved Selenium
2012-2020



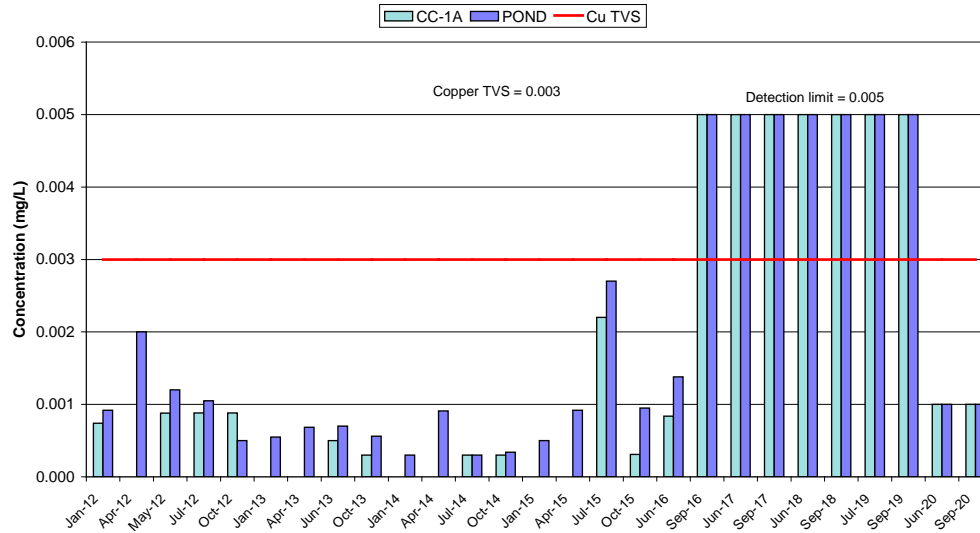
Clear Creek Dissolved Silver
2012-2020



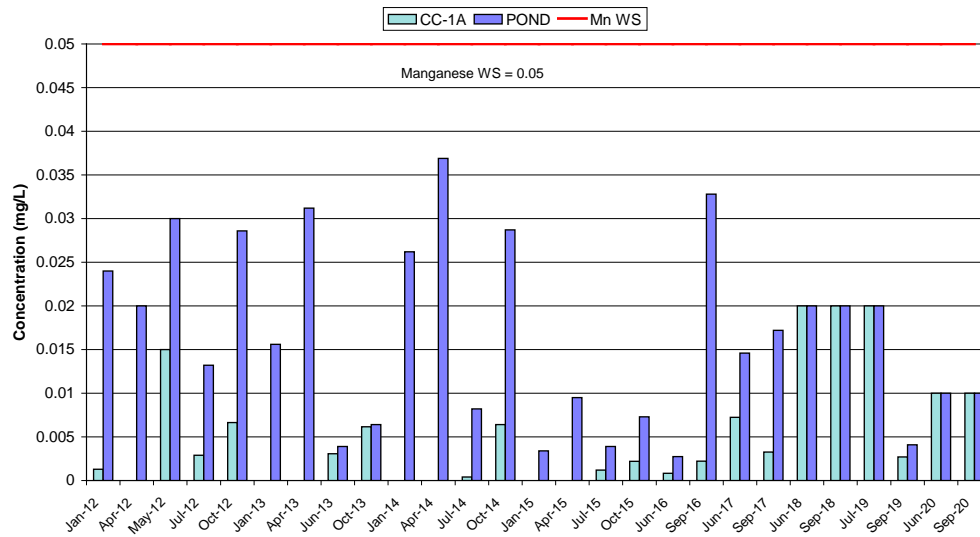
Clear Creek CC-1A and Pond Data Results

Copper and Manganese – concentrations remained low in 2020

Clear Creek Dissolved Copper
2012-2020

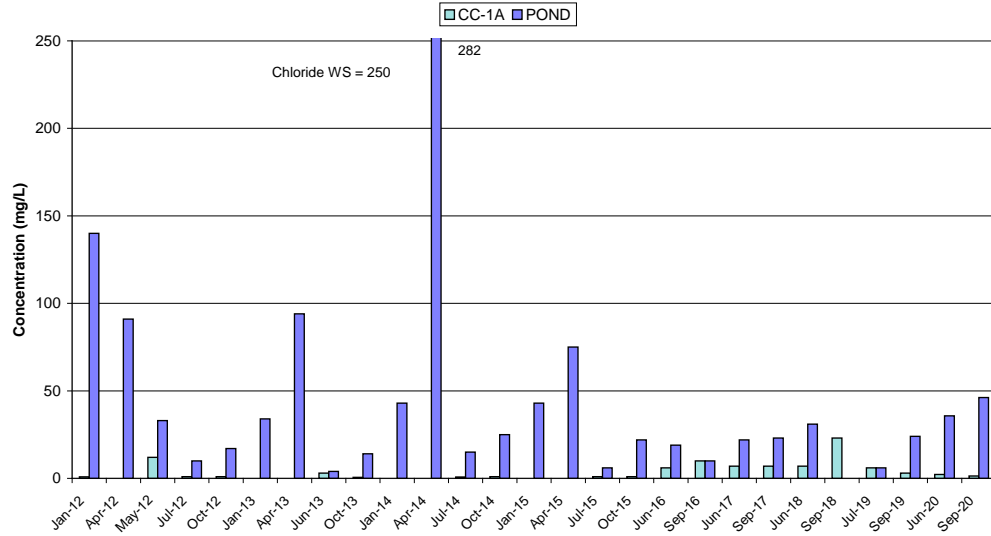


Clear Creek Dissolved Manganese
2012-2020

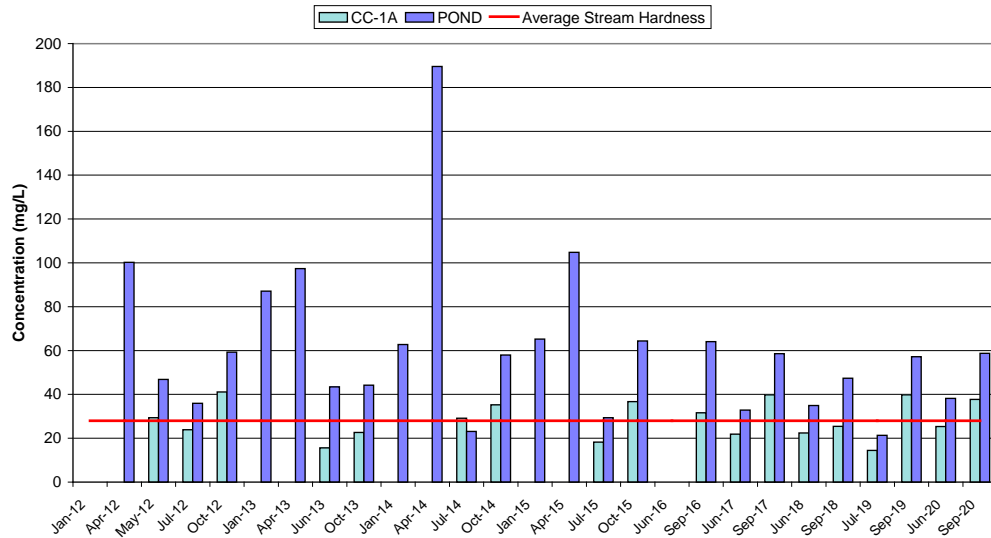


Clear Creek CC-1A and Pond Data Results Chloride and Hardness

Clear Creek Chloride
2012-2020

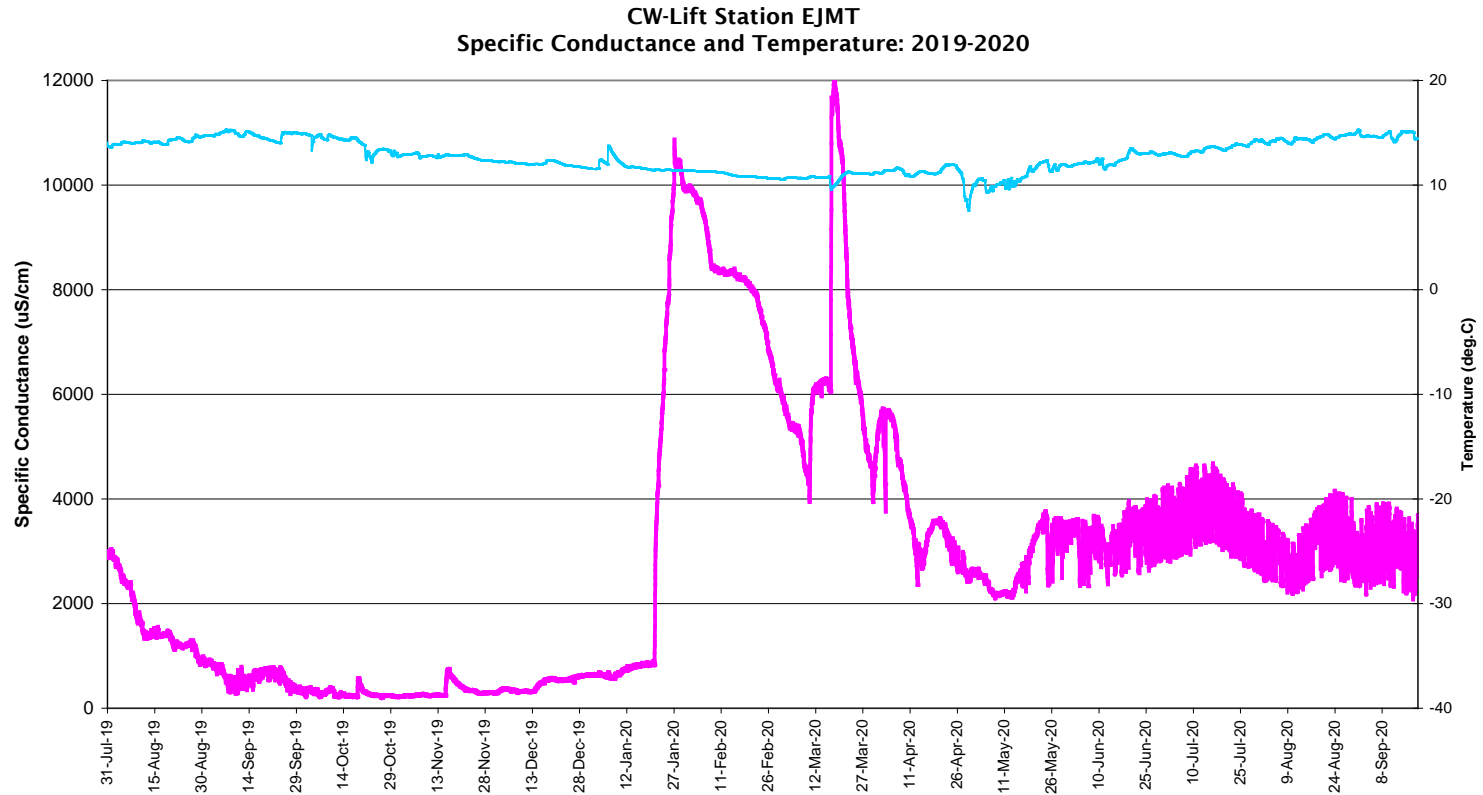


Clear Creek Hardness
2012-2020



Center West Lift Specific Conductance Data Results

Seasonally high in winter and spring



Center West Lift Specific Conductance Data Results 2014-2020

