Memorandum

DATE: January 24, 2017

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COPY TO:

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SUBJECT: **Seaside Lagoon Effluent Limits and RPA Review**

INTRODUCTION

The Seaside Lagoon has received a Tentative Order of its NPDES permit (No. CA0064297) from the Los Angeles Regional Water Quality Control Board (Regional Board) containing new effluent limits for metals and carrying over the final effluent limits for certain conventionals and non-conventionals. A review and comparison of the Regional Board's analysis and effluent limits calculation and a determination of compliance probability is described in this document.

REASONABLE POTENTIAL ANALYSIS

For priority pollutants such as metals and cyanide, the Regional Board compares the maximum detected effluent concentration (MEC) and the maximum detected ambient concentration (B) to the lowest applicable water quality objective (WQO) to determine whether effluent limits should be assigned. This is called a reasonable potential analysis or RPA. LWA performed the analysis using the same date ranges as the Regional Board: an effluent dataset extending from May 2011 – September 2015, and the ambient dataset extended from August 2010 – September 2015. LWA's results were the same as the Regional Board's as summarized below

- Antimony, beryllium, chromium, chromium VI, nickel, and lead did not exceed the water quality objectives and therefore were not assigned effluent limits.
- Arsenic required effluent limits due to ambient exceedances (at RSW-001).
- Cadmium, copper, mercury, selenium, silver, thallium, zinc and cyanide required effluent limits due to effluent exceedances, although the more recent dataset (2014 onward) for cadmium and cyanide have no exceedances of the WQO.
- The Regional Board's datasets contain lead concentrations reported in units of µg/L at values varying by a factor of $10^{\wedge 6}$, suggesting a units reporting error. An ambient

concentration was reported at 500 µg/L (with a MDL of 0.003 µg/L). The original lab reports should be reviewed to verify whether the ambient maximum is actually 0.5 µg/L.

EFFLUENT LIMITS CALCULATION

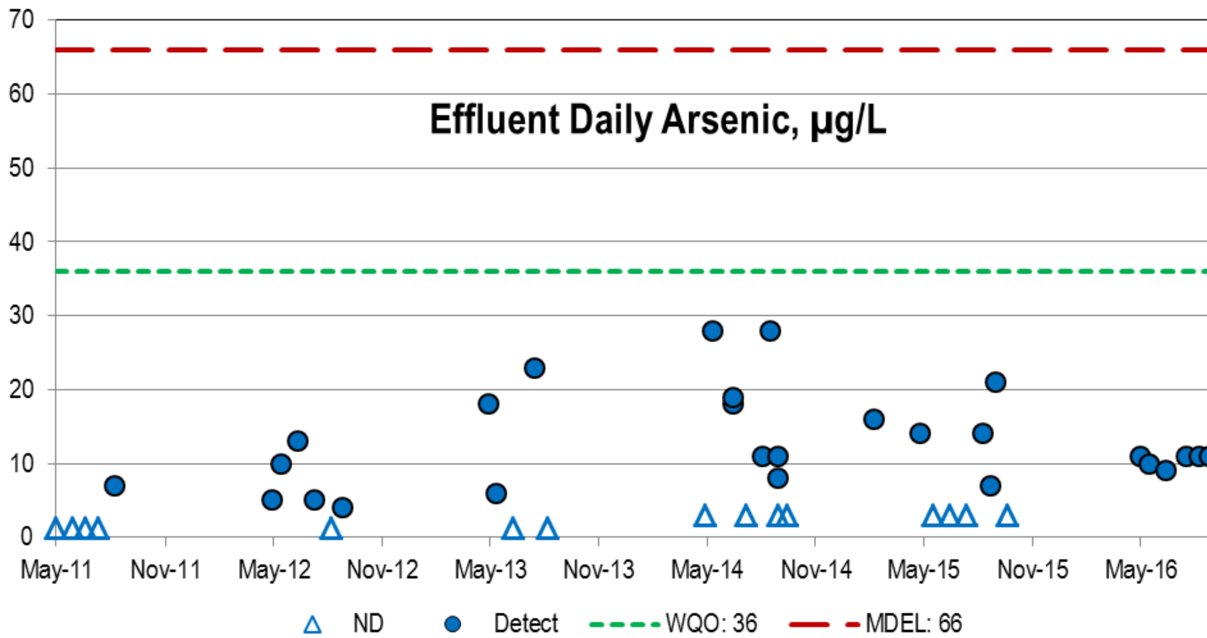
The Regional Board calculated effluent limits for metals using the water quality objectives adjusted by the effluent dataset coefficient of variation. The calculation was repeated by LWA and the resulting numeric effluent limits were compared. The Regional Board's calculations and resulting effluent limits appear to be correct.

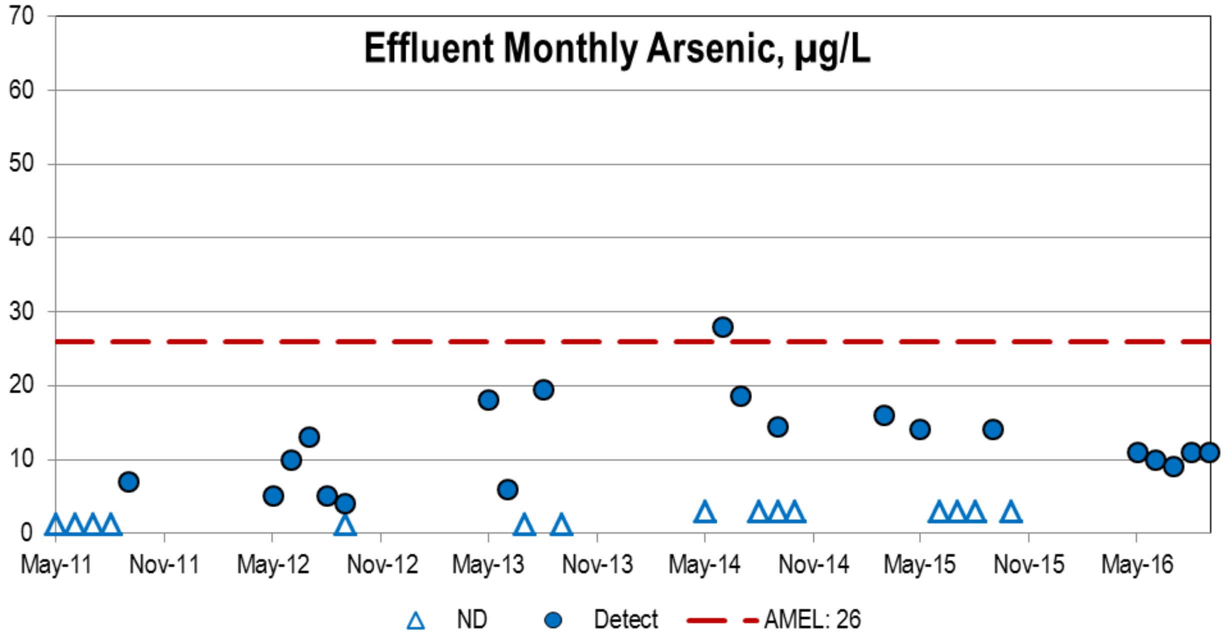
COMPLIANCE WITH PROPOSED EFFLUENT LIMITS

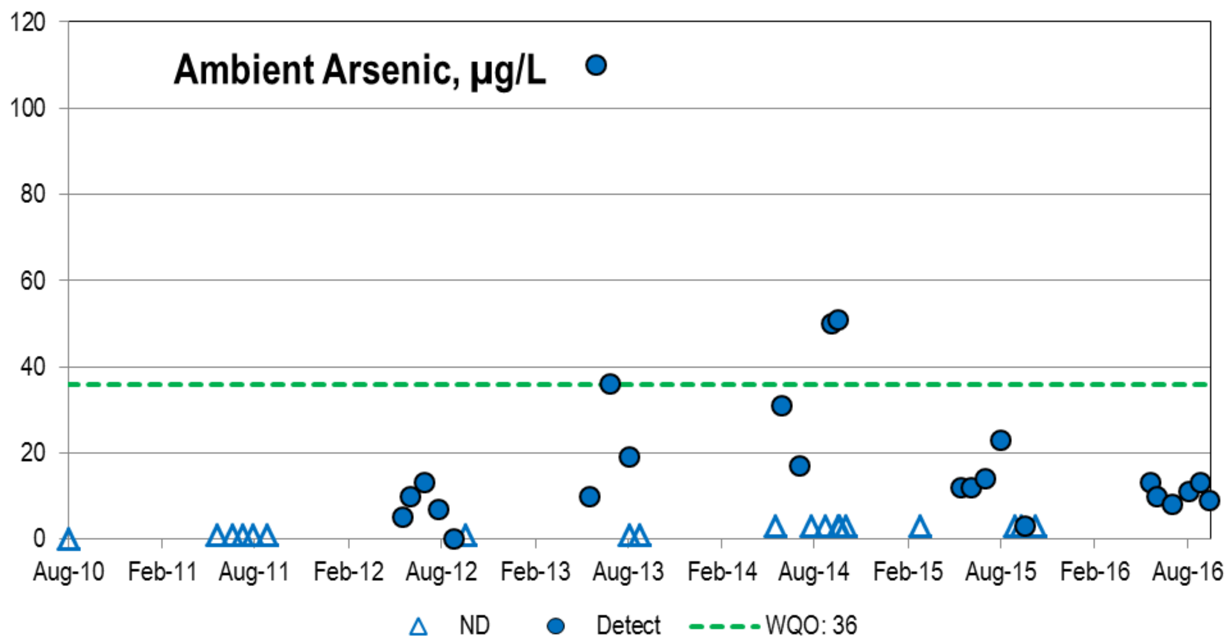
The daily and monthly effluent data and ambient data for metals, conventional, and non-conventional pollutants were graphed from August 2010/May 2011 to September 2016 in the following sections with the lowest water quality objective and the assigned effluent limits.

Arsenic

The graphs below present the effluent dataset used to determine reasonable potential (May 2011–September 2015) as well as the most recent data available (through September 2016). The more recent dataset (May 2014-September 2014) was used to determine the probability of future compliance. Three ambient arsenic concentrations exceeded the water quality objective, the latest in September 2014. Neither the daily or monthly average effluent concentrations have exceeded the assigned effluent limits between May 2014 – September 2016.

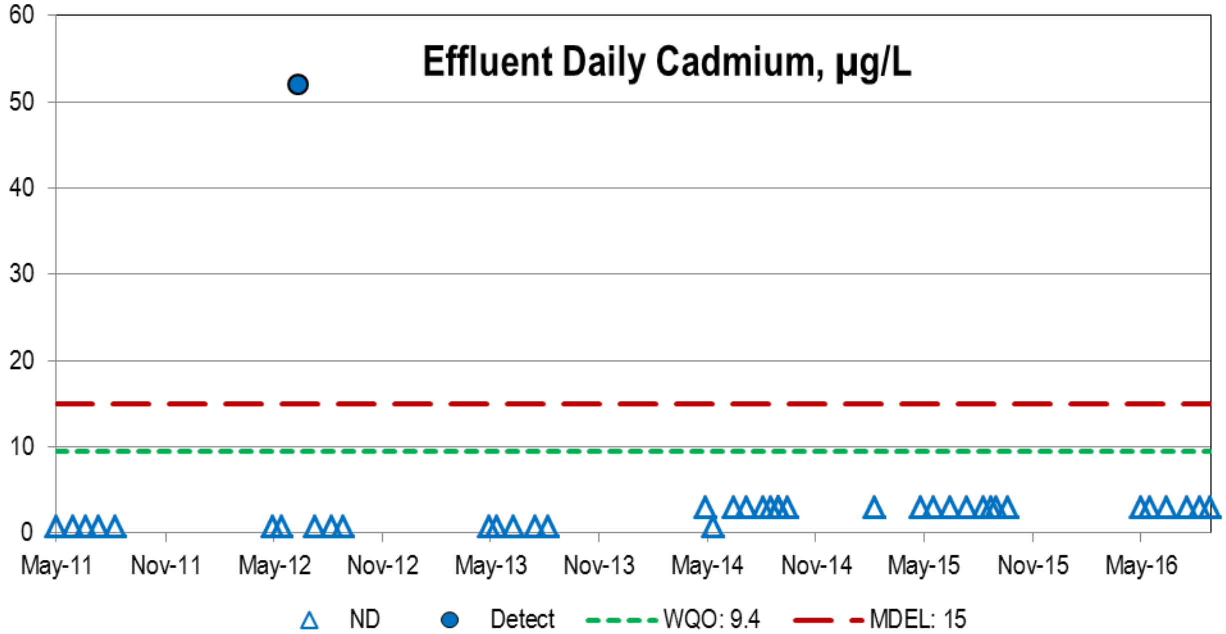


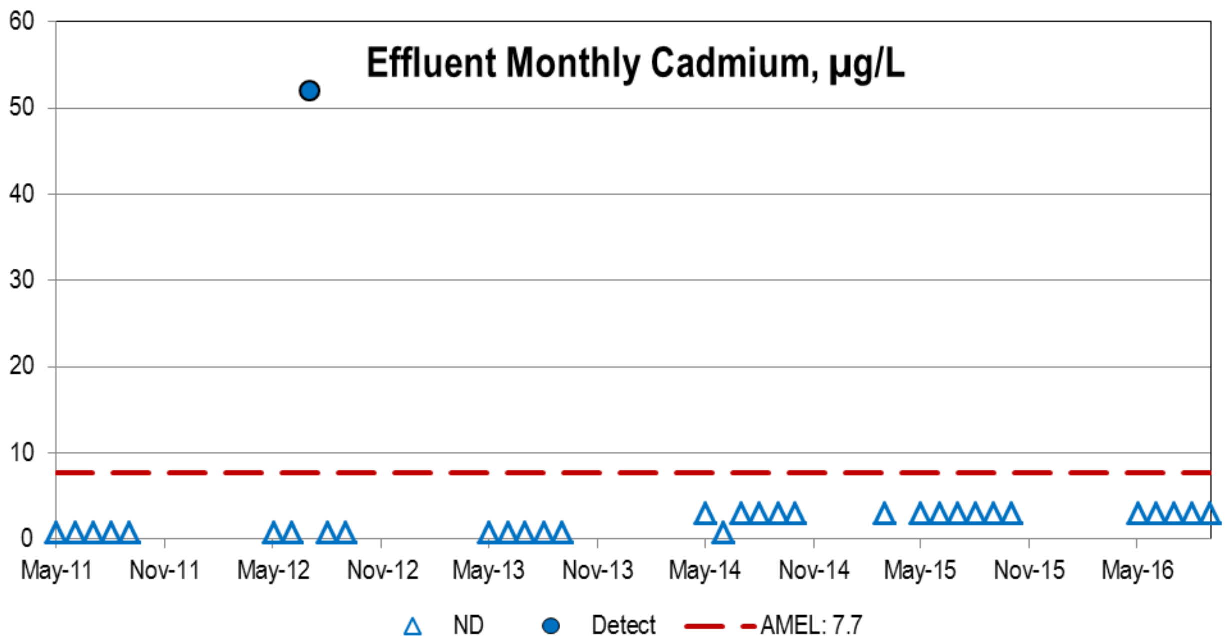




Cadmium

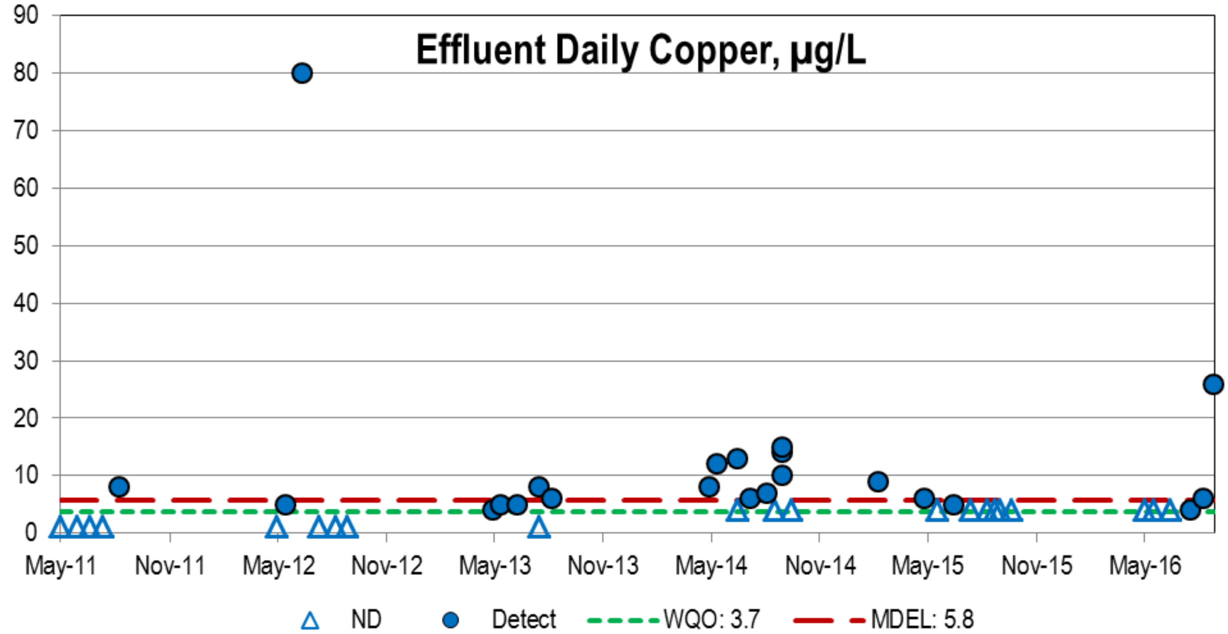
The graphs below present the effluent dataset used to determine reasonable potential (May 2011–September 2015) as well as the most recent data available (through September 2016). The more recent dataset (May 2014-September 2014) was used to determine the probability of future compliance. The effluent and ambient cadmium datasets are non-detected between May 2014 – September 2016. The data are all below detection limits, except for one value, and the reporting limit is well below the effluent limits as well.

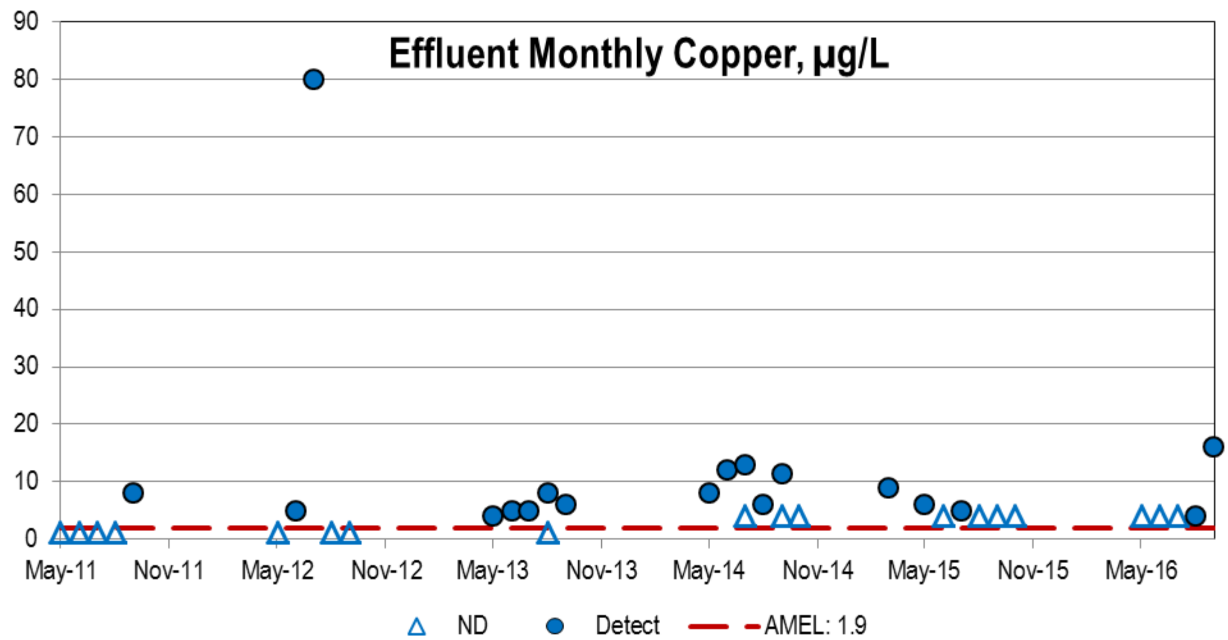




Copper

The graphs below present the effluent dataset used to determine reasonable potential (May 2011 – September 2015) as well as the most recent data available (through September 2016). The more recent dataset (May 2014-September 2014) was used to determine the probability of future compliance. Every detected copper concentration reported between May 2014 – September 2016 has exceeded the water quality objective. The most recently reported value is the second highest, while the reporting limit is greater than the AMEL, causing all detected values to exceed the assigned AMEL. Therefore it is likely that copper will have difficulty complying with the effluent limits in the Tentative Order.


Effluent Daily Copper, µg/L
90
80
70
60
50
40
30
20
10
0
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
ND
Detect
WQO: 3.7
MDEL: 5.8


Effluent Monthly Copper, µg/L
90
80
70
60
50
40
30
20
10
0
May-11
Nov-11
May-12
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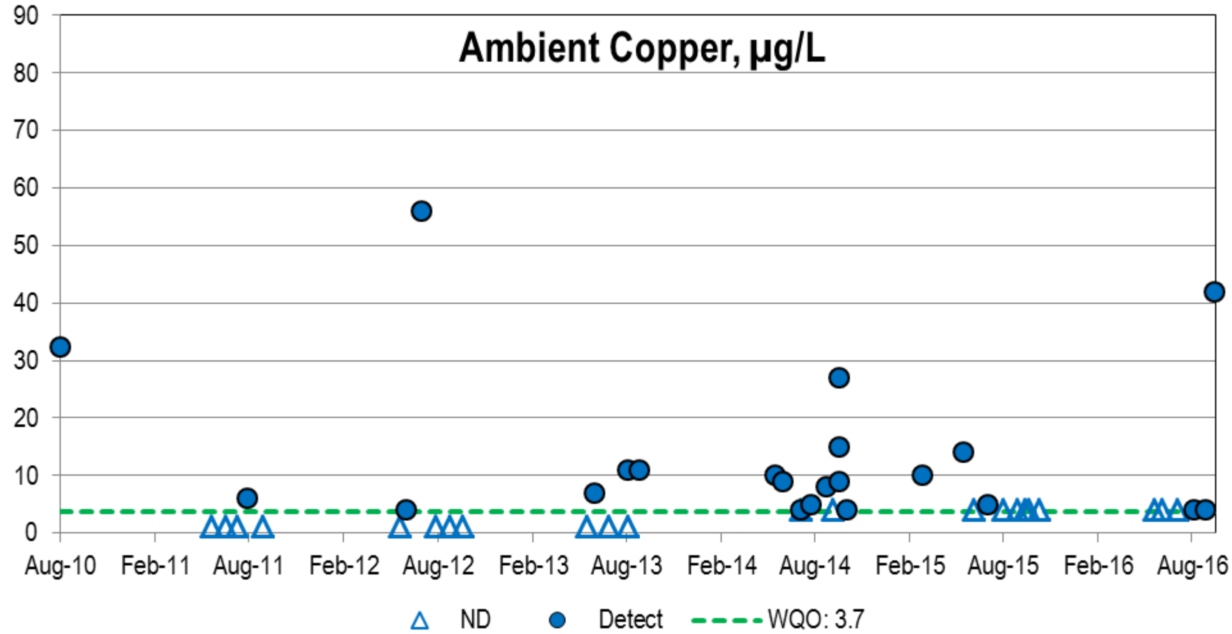
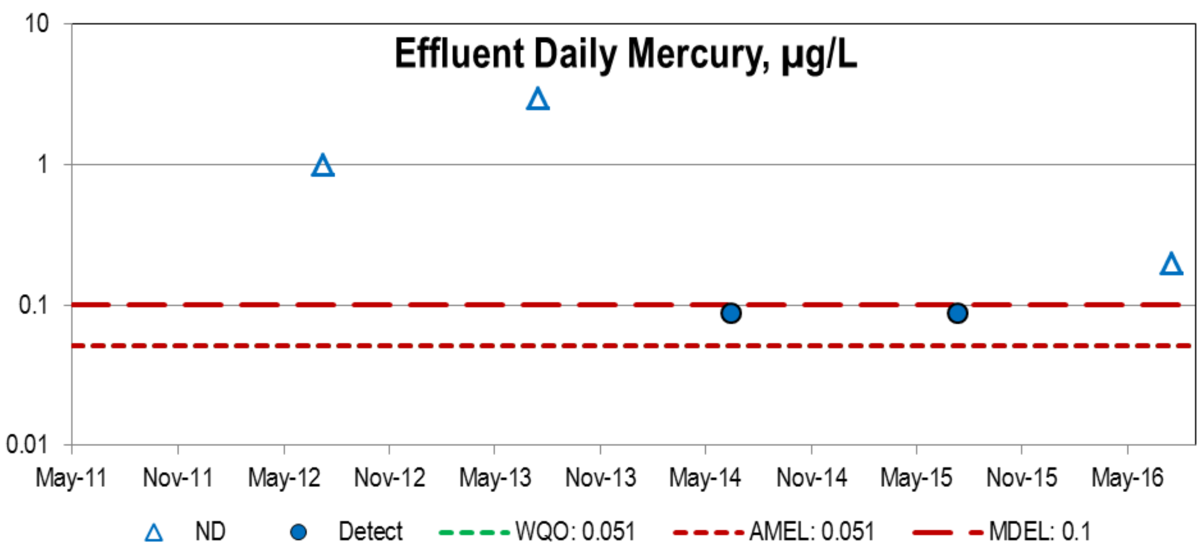
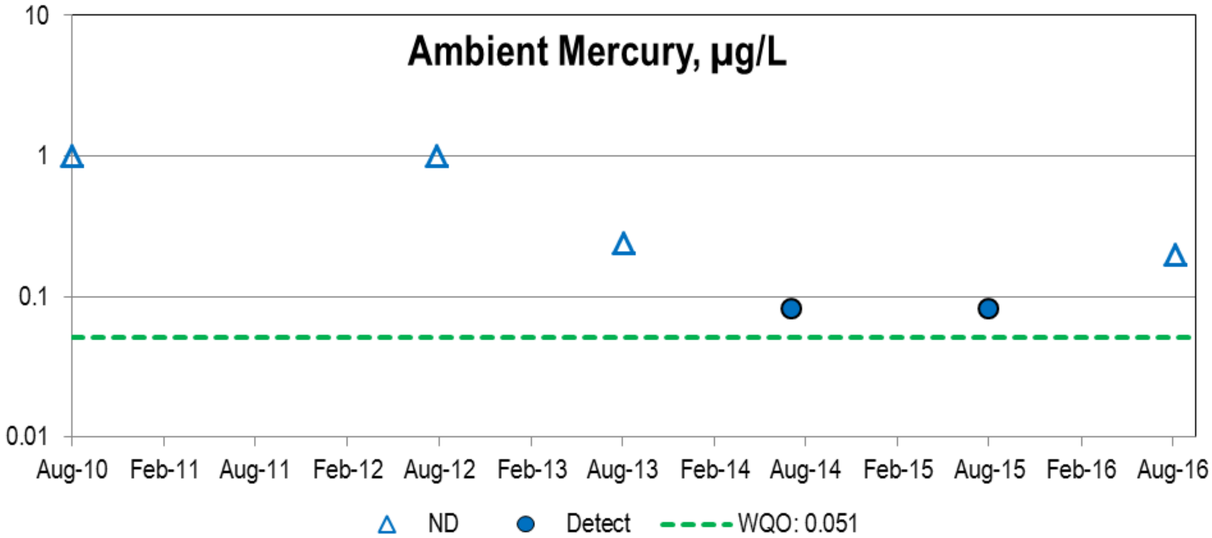
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
ND
Detect
AMEL: 1.9



Mercury

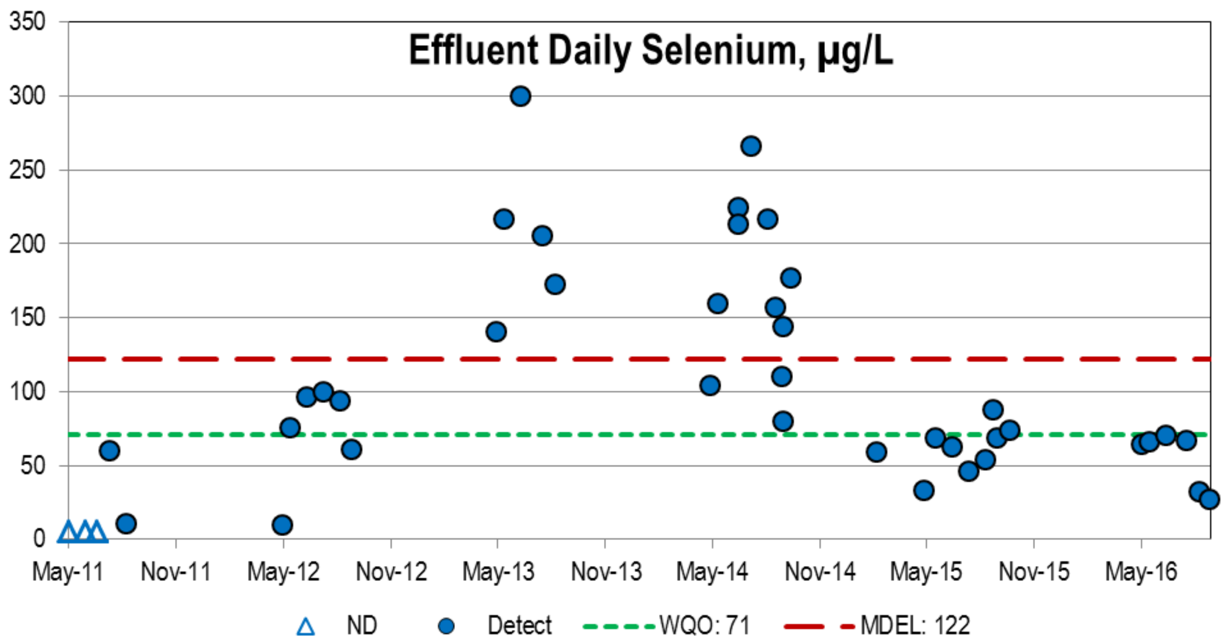
The graphs below present the effluent dataset used to determine reasonable potential (May 2011 – September 2015) as well as the most recent data available (through September 2016). The more recent dataset (May 2014-September 2014) was used to determine the probability of future compliance. Only three mercury concentrations were reported between May 2014 – September 2016, two of which exceed the water quality objective and AMEL (which are the same value). Mercury may have difficulty complying with the effluent limits in the Tentative Order.

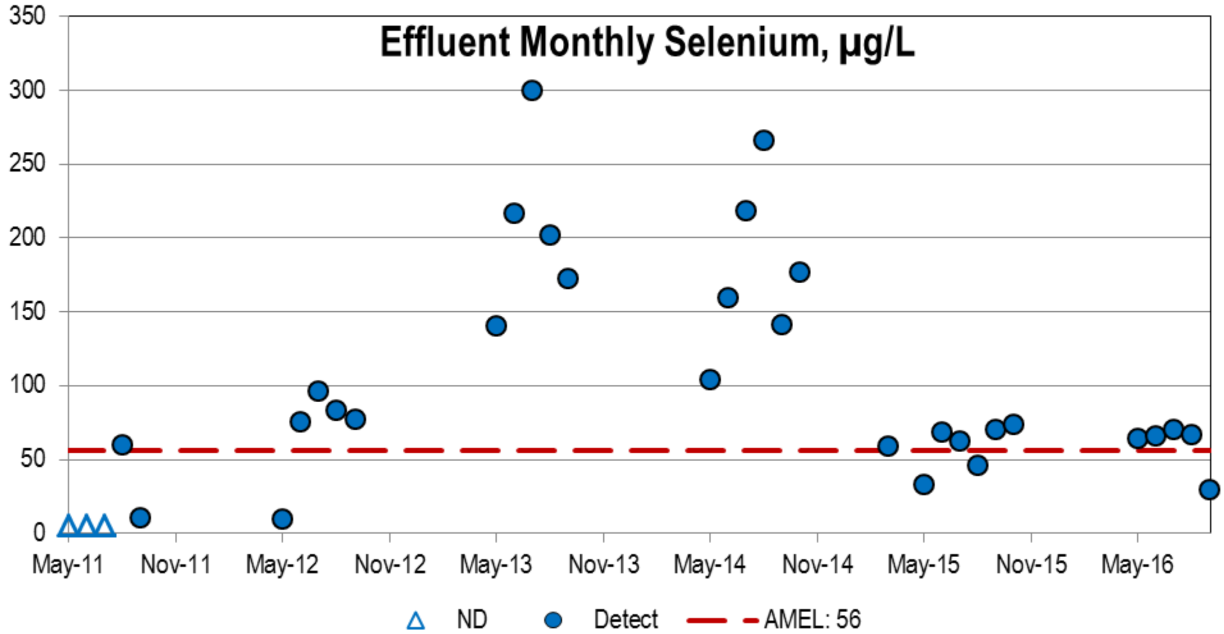


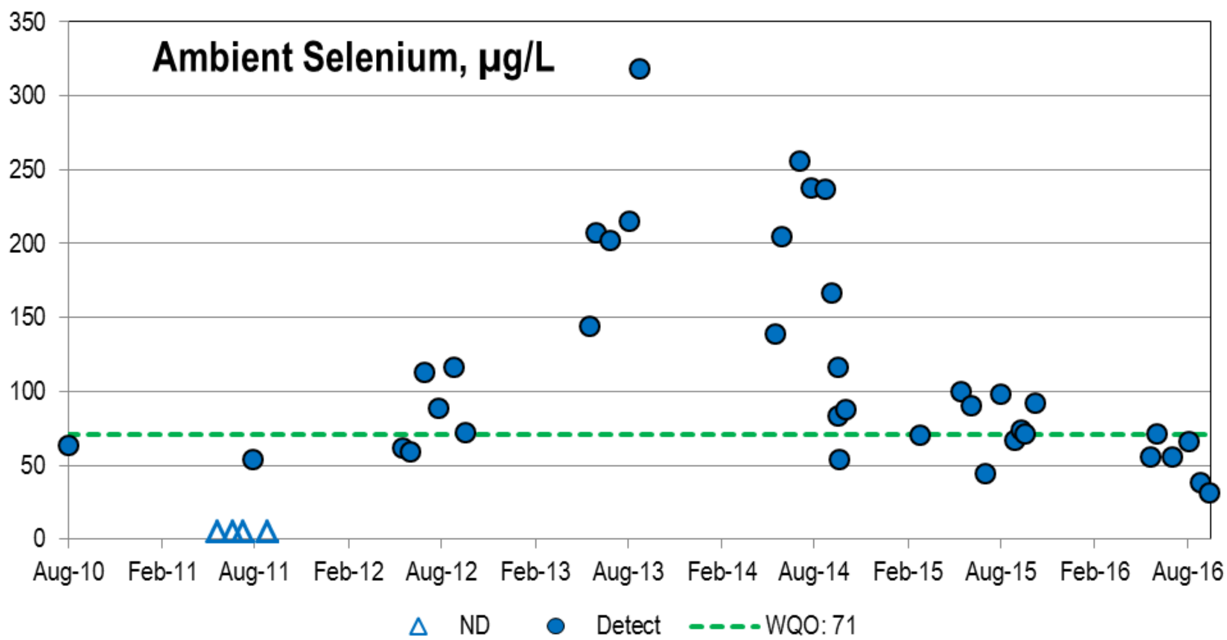


Selenium

The graphs below present the effluent dataset used to determine reasonable potential (May 2011 – September 2015) as well as the most recent data available (through September 2016). The more recent dataset (May 2014-September 2014) was used to determine the probability of future compliance. Selenium concentrations reported before October 2014 tended to exceed the assigned MDEL and AMEL, however selenium has remained below the MDEL since October 2014. Selenium continues to exceed the AMEL. Therefore, selenium may have difficulty complying with the AMEL in the Tentative Order.

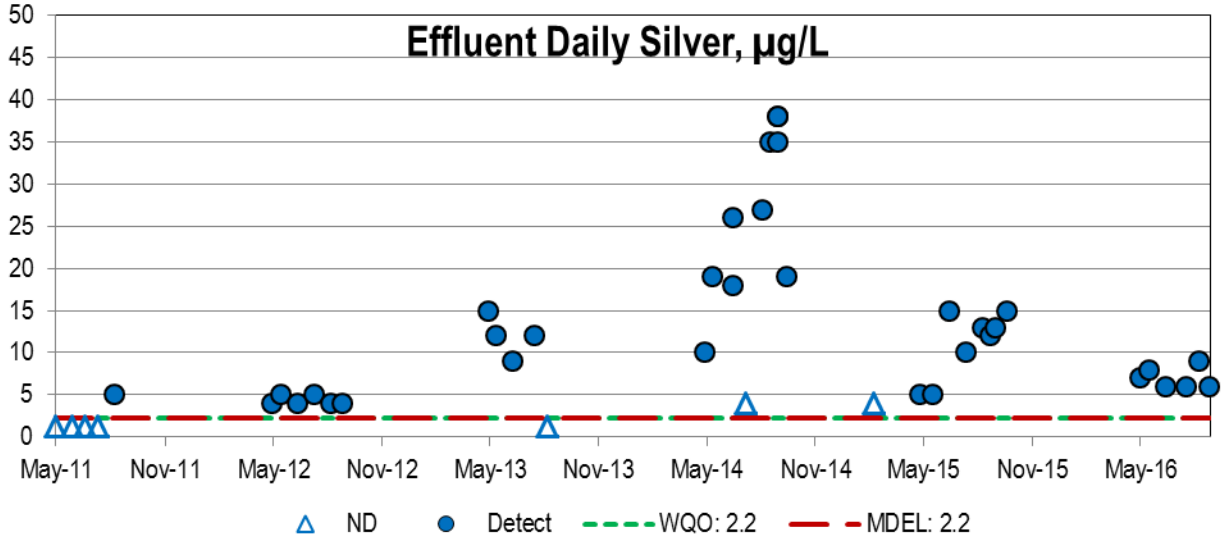


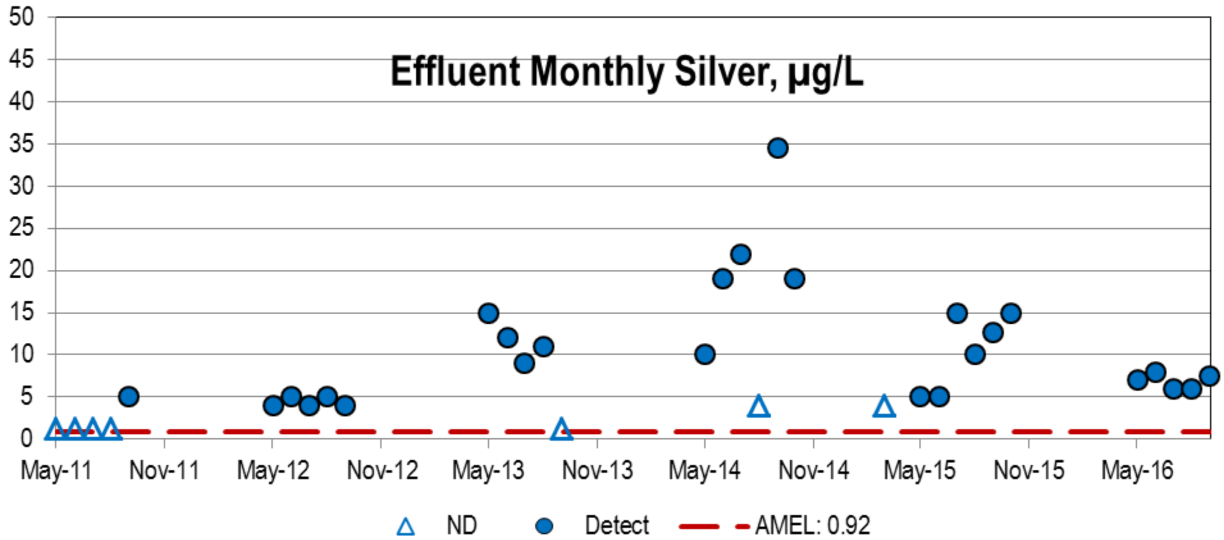


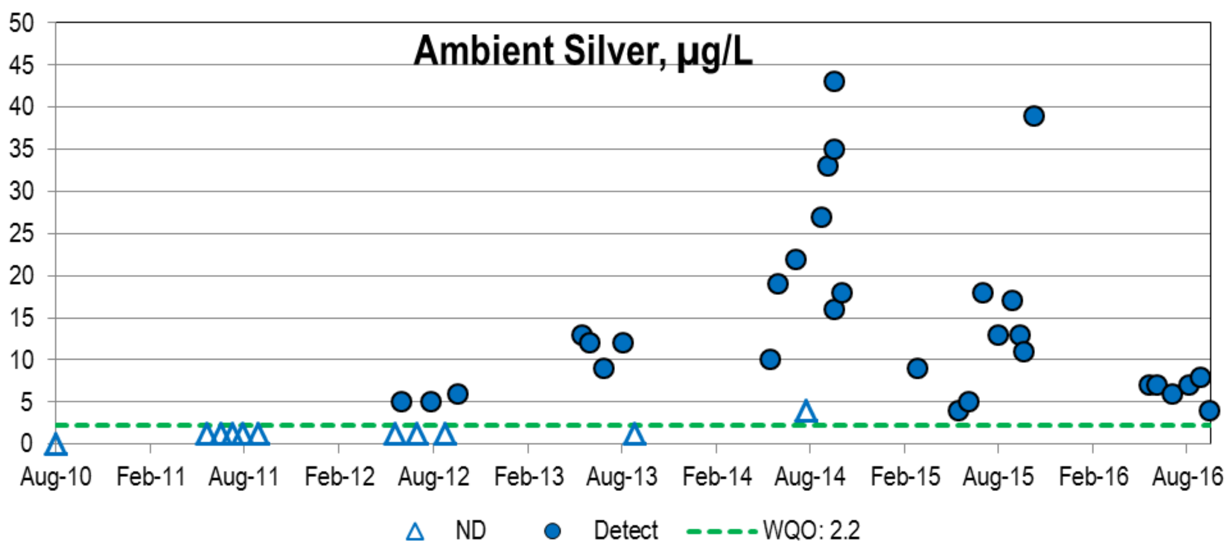


Silver

The graphs below present the effluent dataset used to determine reasonable potential (May 2011 – September 2015) as well as the most recent data available (through September 2016). The more recent dataset (May 2014-September 2014) was used to determine the probability of future compliance. Silver concentrations dropped significantly after October 2014, however detected concentrations still exceed the assigned MDEL and AMEL. Silver will not be able to consistently comply with the AMEL and MDEL assigned in the Tentative Order.

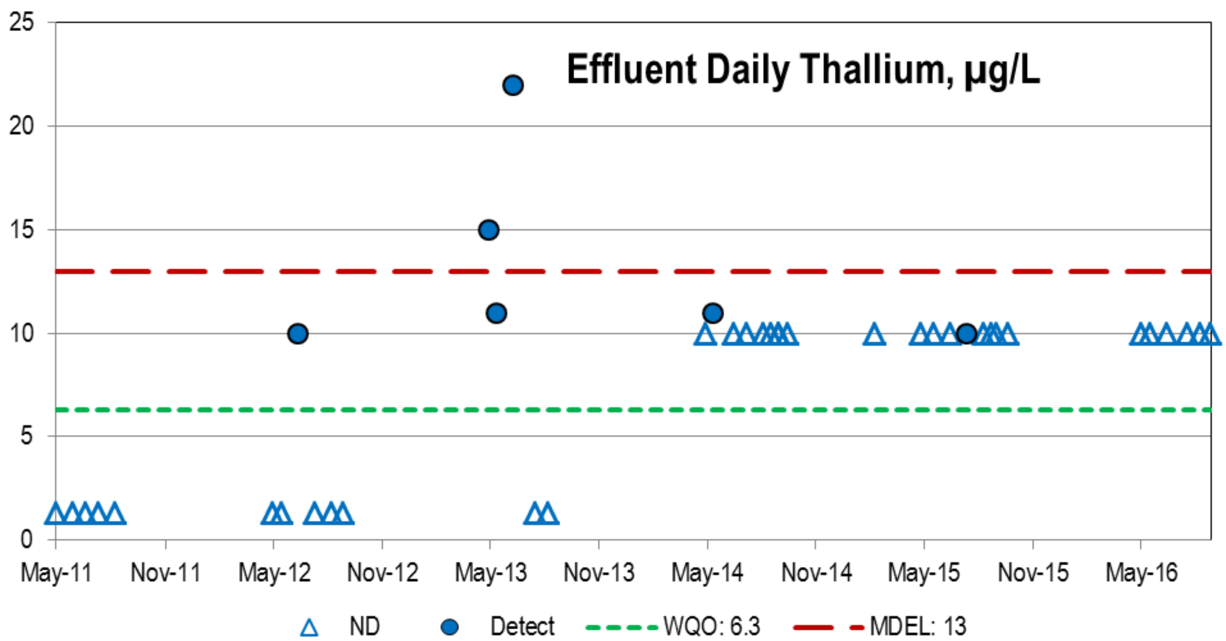

Effluent Daily Silver, µg/L
50
45
40
35
30
25
20
15
10
5
0
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
ND
Detect
WQO: 2.2
MDEL: 2.2

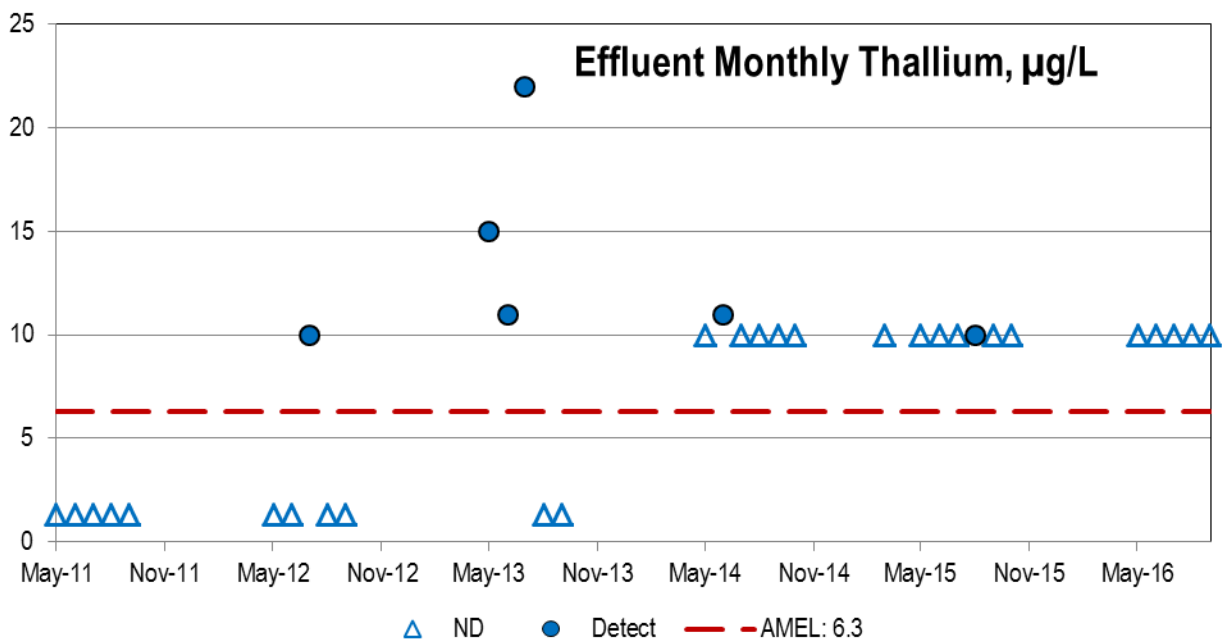

Effluent Monthly Silver, µg/L
50
45
40
35
30
25
20
15
10
5
0
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
ND
Detect
AMEL: 0.92


Ambient Silver, µg/L
50
45
40
35
30
25
20
15
10
5
0
Aug-10
Feb-11
Aug-11
Feb-12
Aug-12
Feb-13
Aug-13
Feb-14
Aug-14
Feb-15
Aug-15
Feb-16
Aug-16
ND
Detect
WQO: 2.2

Thallium

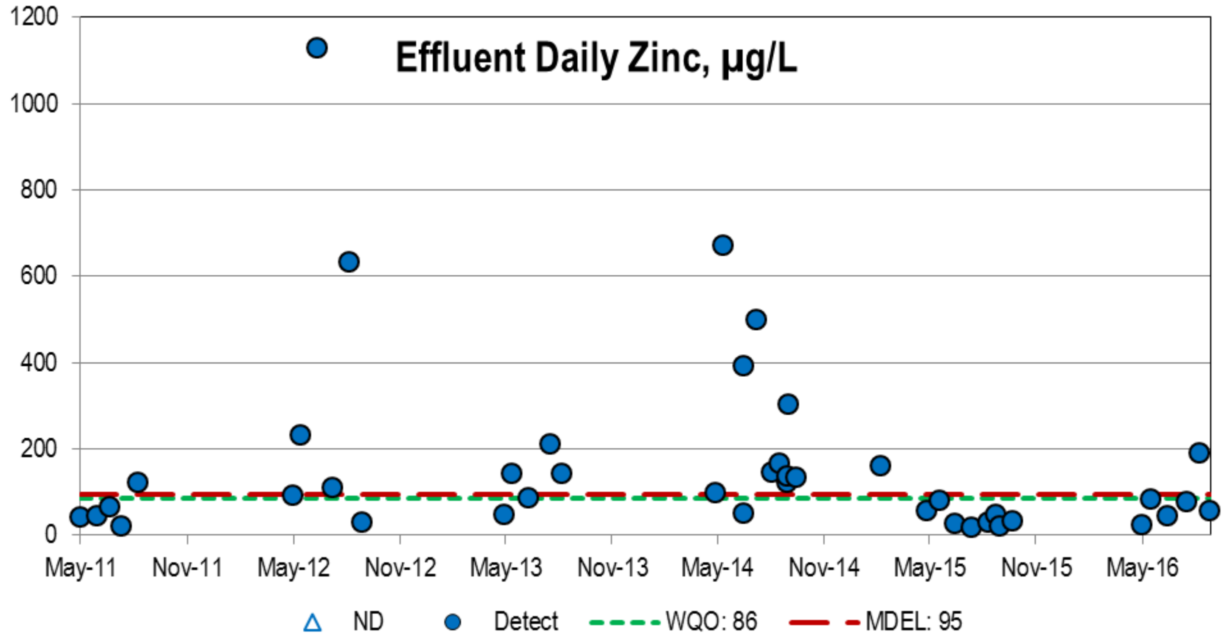
The graphs below present the effluent dataset used to determine reasonable potential (May 2011 – September 2015) as well as the most recent data available (through September 2016). The more recent dataset (May 2014-September 2014) was used to determine the probability of future compliance. The effluent thallium dataset contains only one detected value, reported at the reporting limit, between May 2014 – September 2016, while the ambient dataset is all non-detected during that time period. Non-detected values cannot trigger exceedances; however, reporting limits above the effluent limits make the likelihood of exceedances greater. Thallium was non-detected in the influent on the day of the detected effluent concentration, at the same reporting limit (10 µg/L).

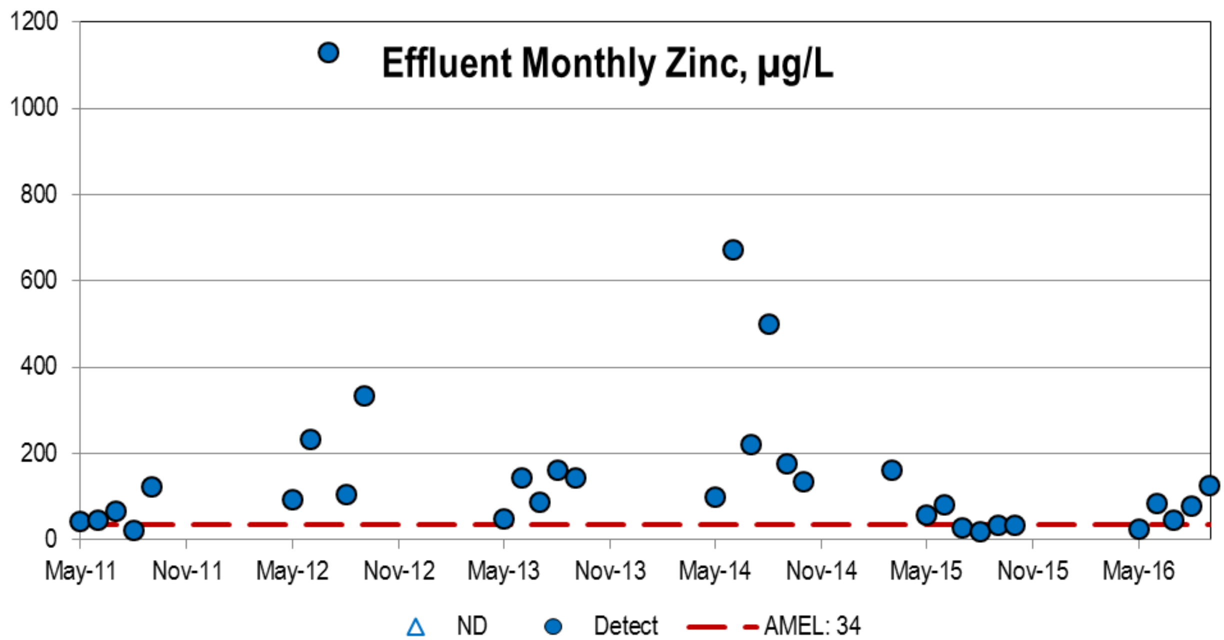


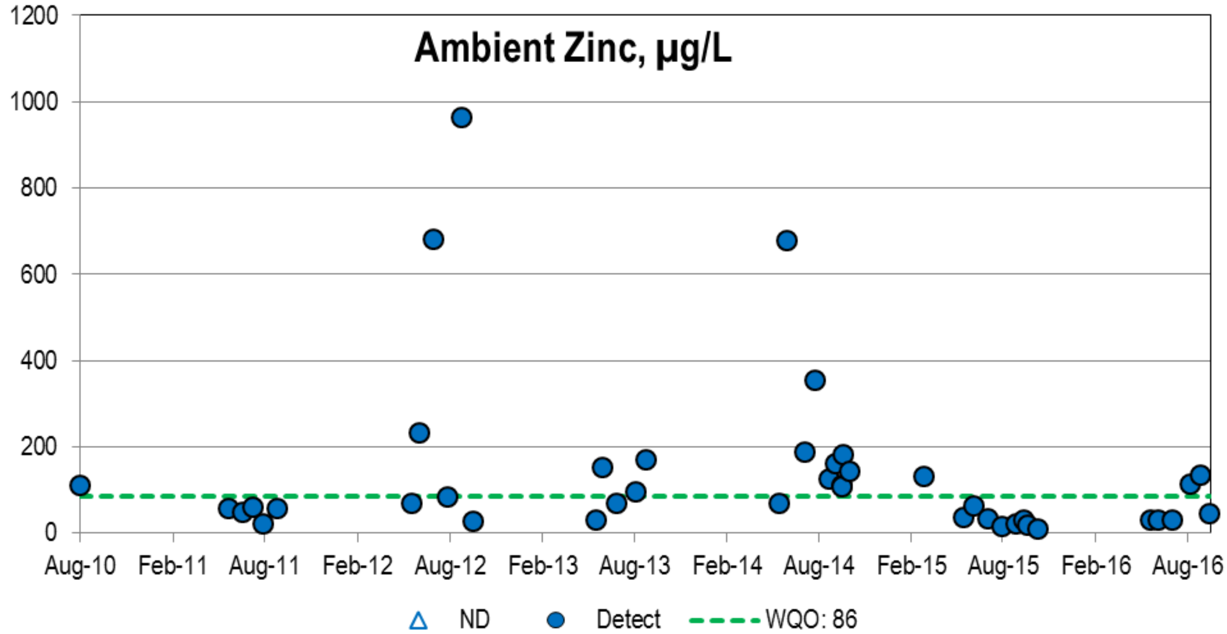


Zinc

The graphs below present the effluent dataset used to determine reasonable potential (May 2011 – September 2015) as well as the most recent data available (through September 2016). The more recent dataset (May 2014-September 2014) was used to determine the probability of future compliance. Zinc concentrations dropped after October 2014, with only two detected concentrations exceeding the Tentative Order MDEL since then, although the average monthly concentrations continued to exceed the AMEL. Consistent compliance with the AMEL and MDEL for zinc in the Tentative Order is unlikely.

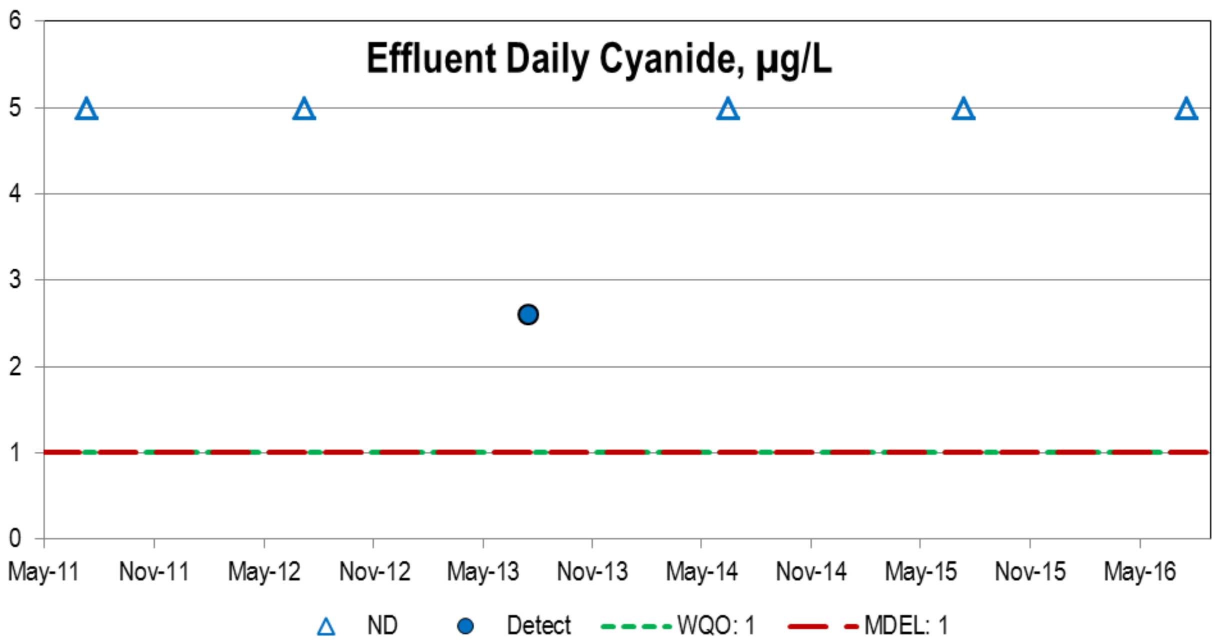






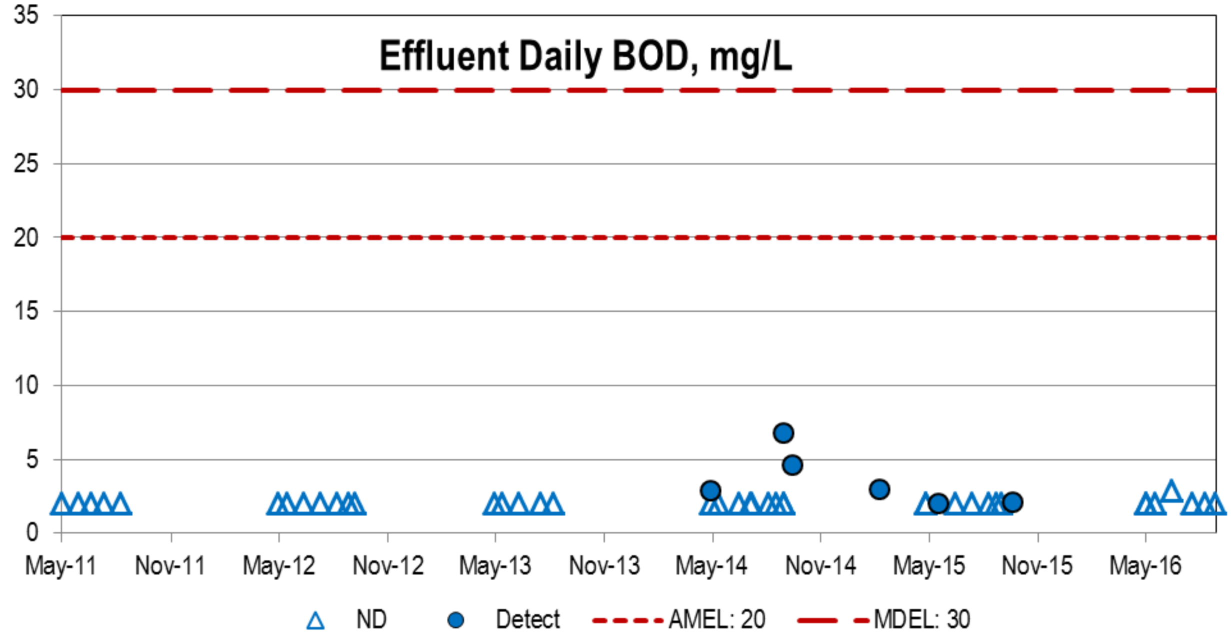
Cyanide

The graphs below present the effluent dataset used to determine reasonable potential (May 2011 – September 2015) as well as the most recent data available (through September 2016). The more recent dataset (May 2014-September 2014) was used to determine the probability of future compliance. Only three cyanide data points were available between May 2014 – September 2016, all non-detected in effluent and ambient. Non-detected values cannot trigger exceedances, however reporting limits above the effluent limits make the likelihood of exceedances greater. The reporting limit is significantly above the effluent limits, which would result in non-compliance if cyanide is ever detected, as it was in August 2013.



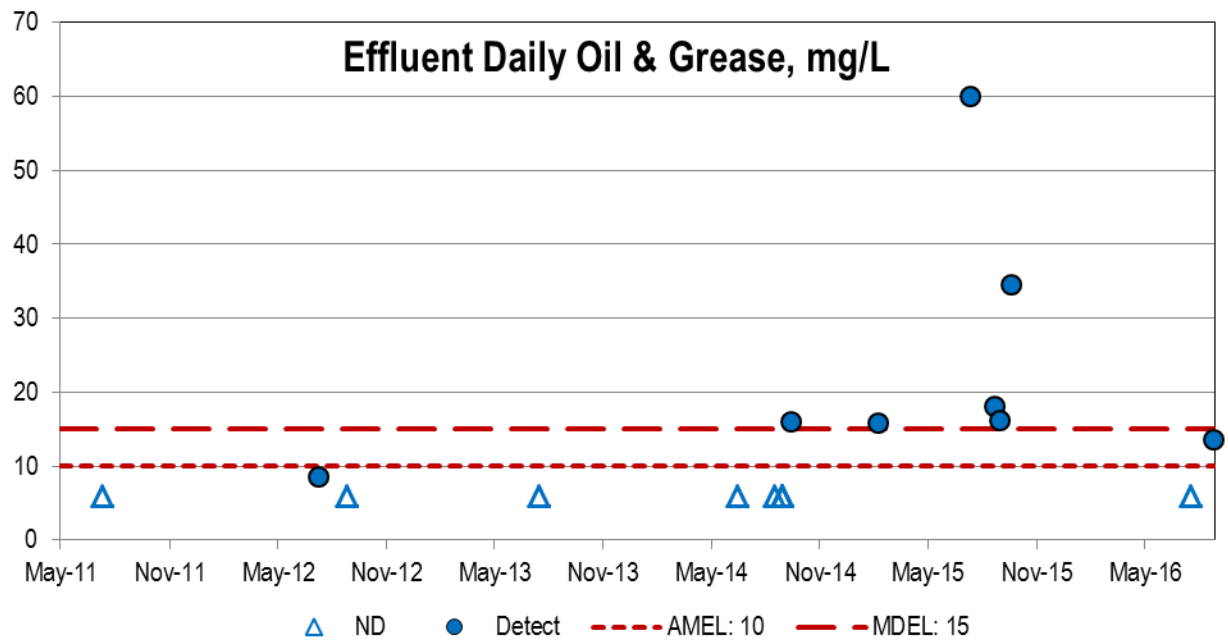
BOD

The effluent limits from the previous permit were carried over into the Tentative Order.



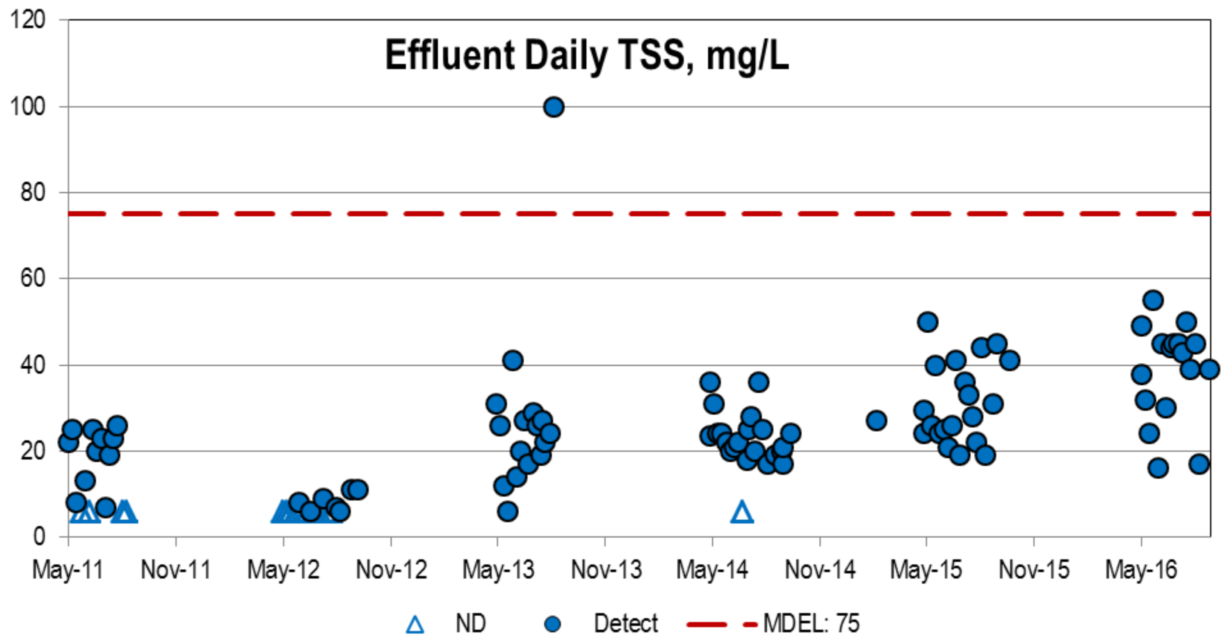
Oil and Grease

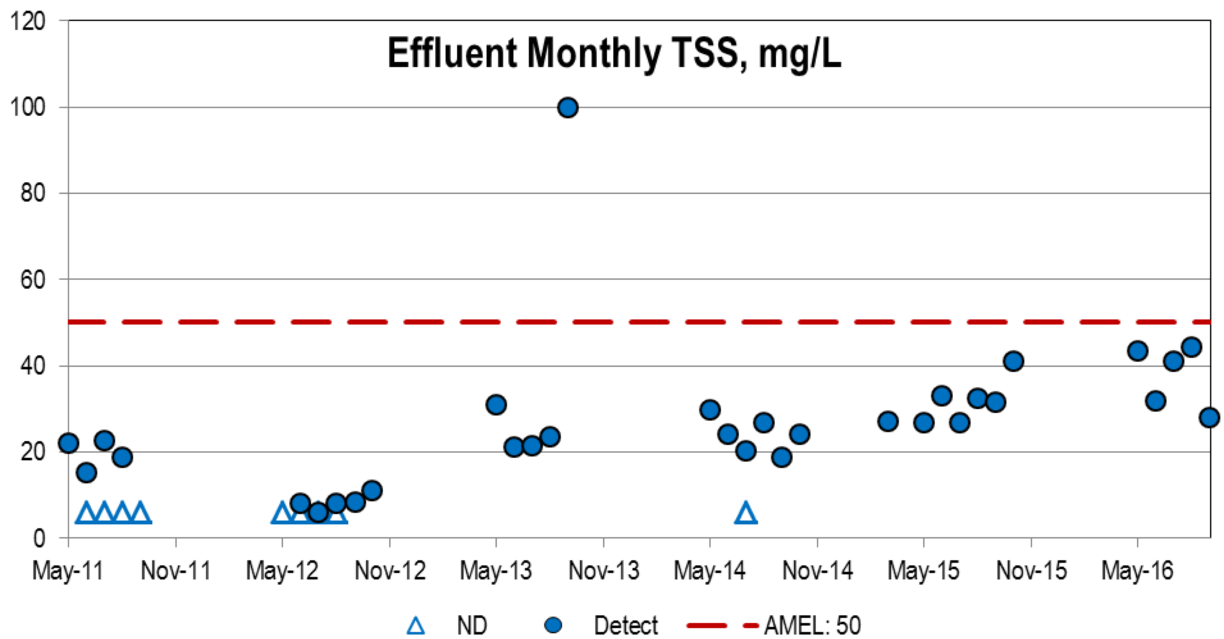
The effluent limits from the previous permit were carried over into the Tentative Order. Oil and Grease concentrations have exceeded the proposed effluent limits repeatedly between May 2014 – September 2016, therefore the likelihood of compliance is low.



Total Suspended Solids

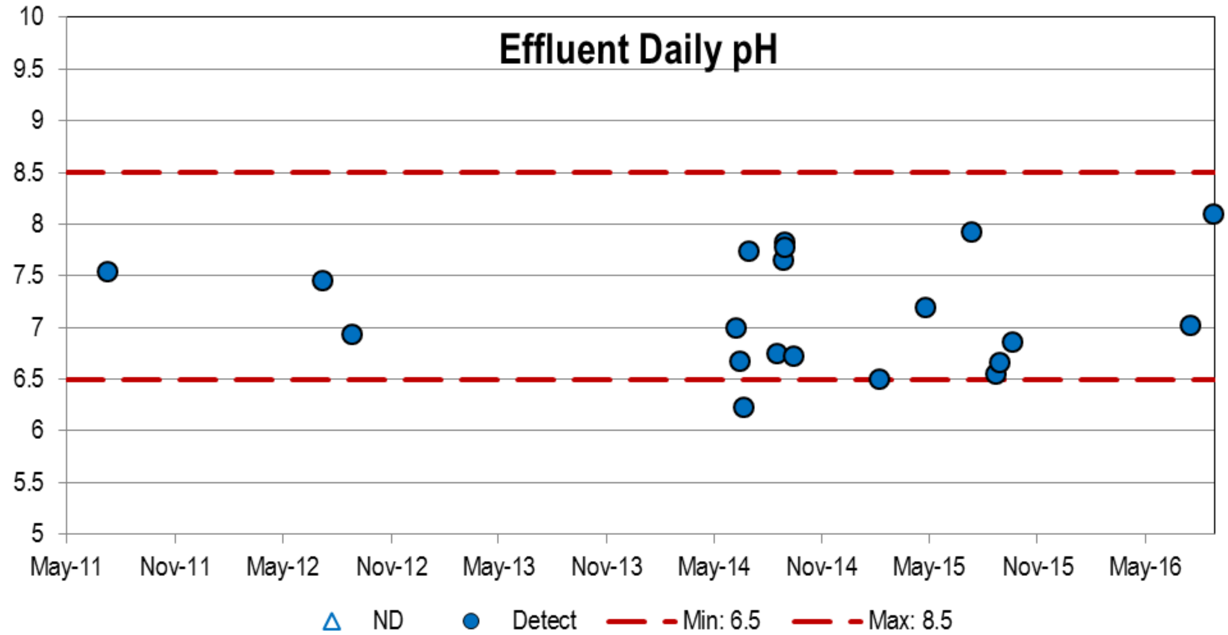
The TSS effluent limits from the previous permit were carried over into the Tentative Order. While no exceedances have been observed after September 2013, TSS values appear to be trending upward.





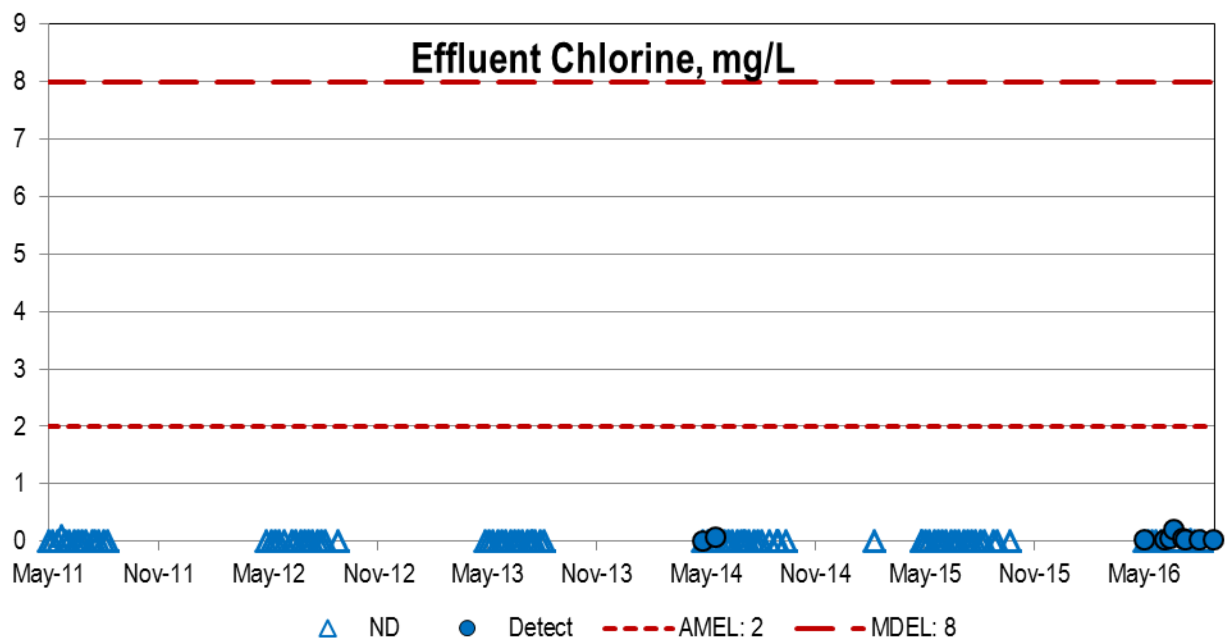
pH

The effluent limits from the previous permit were carried over into the Tentative Order. pH has exceeded the lower limit of 6.5 and occasionally come close to exceeding again since May 2014.



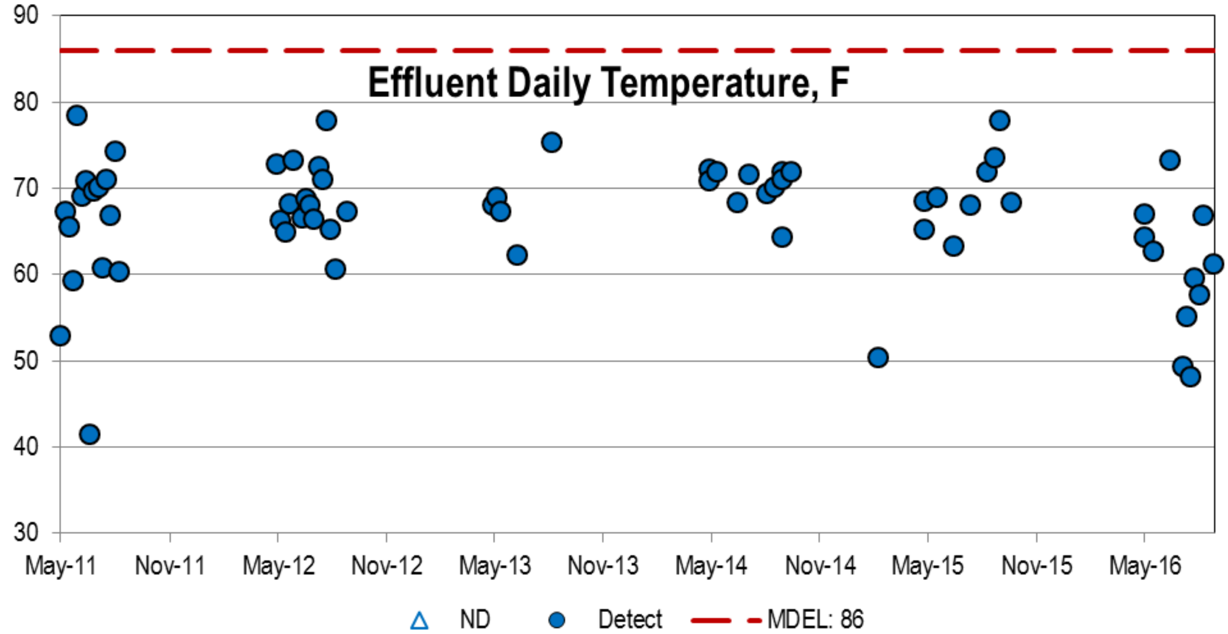
Chlorine

The effluent limits from the previous permit were carried over into the Tentative Order.



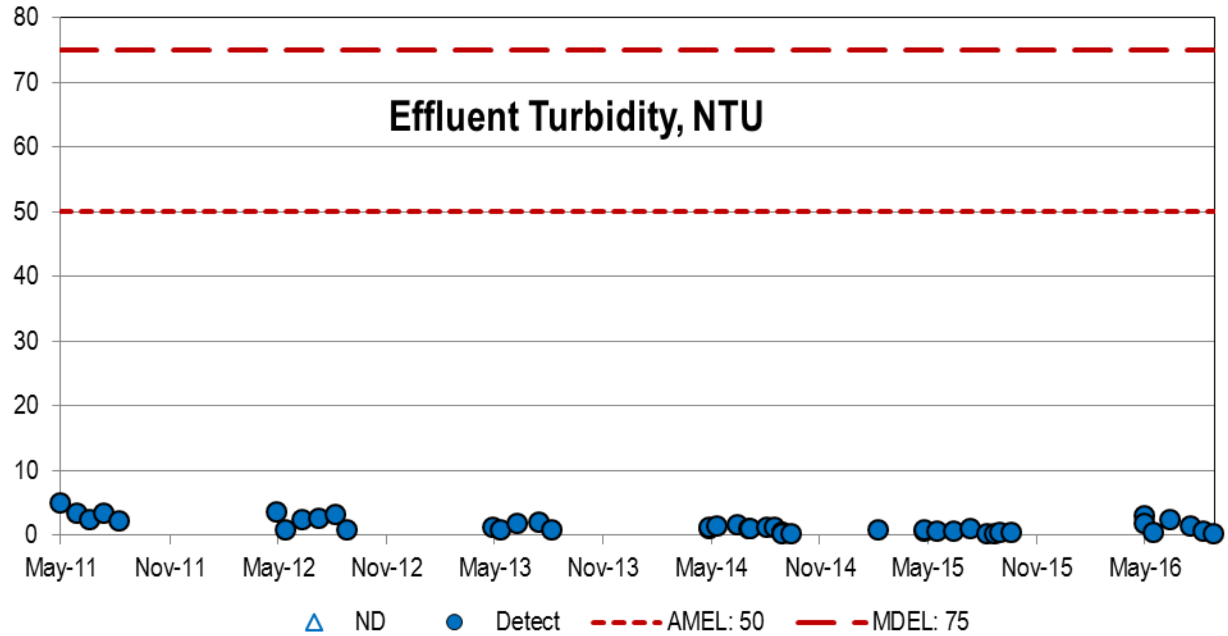
Temperature

The effluent limits from the previous permit were carried over into the Tentative Order.



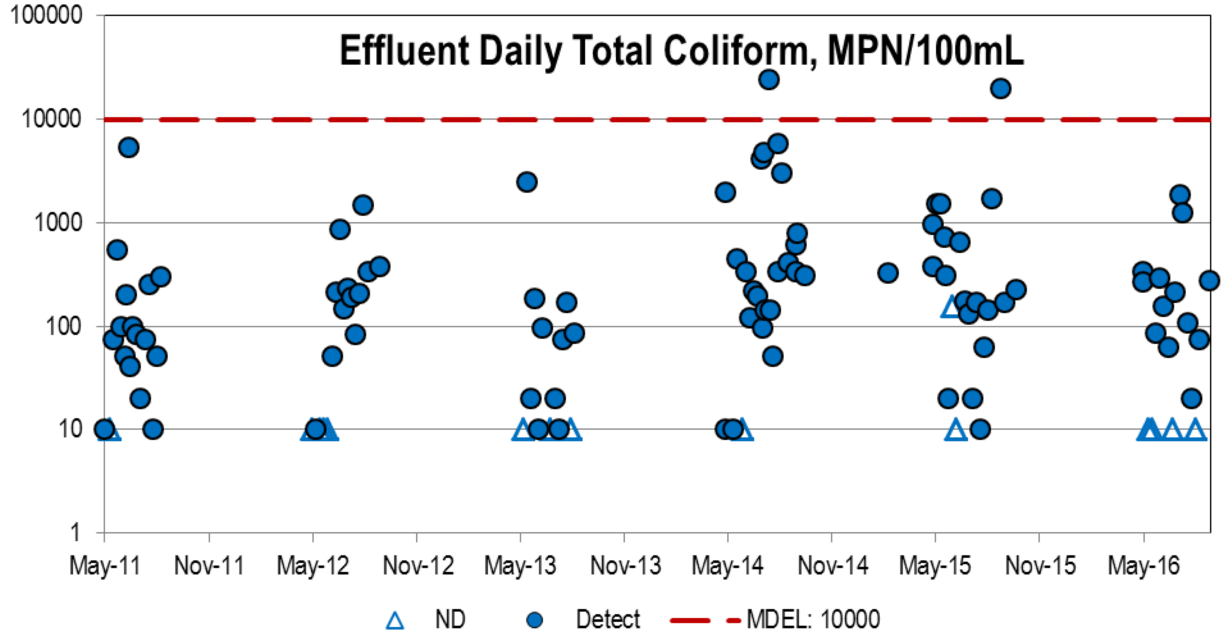
Turbidity

The effluent limits from the previous permit were carried over into the Tentative Order.

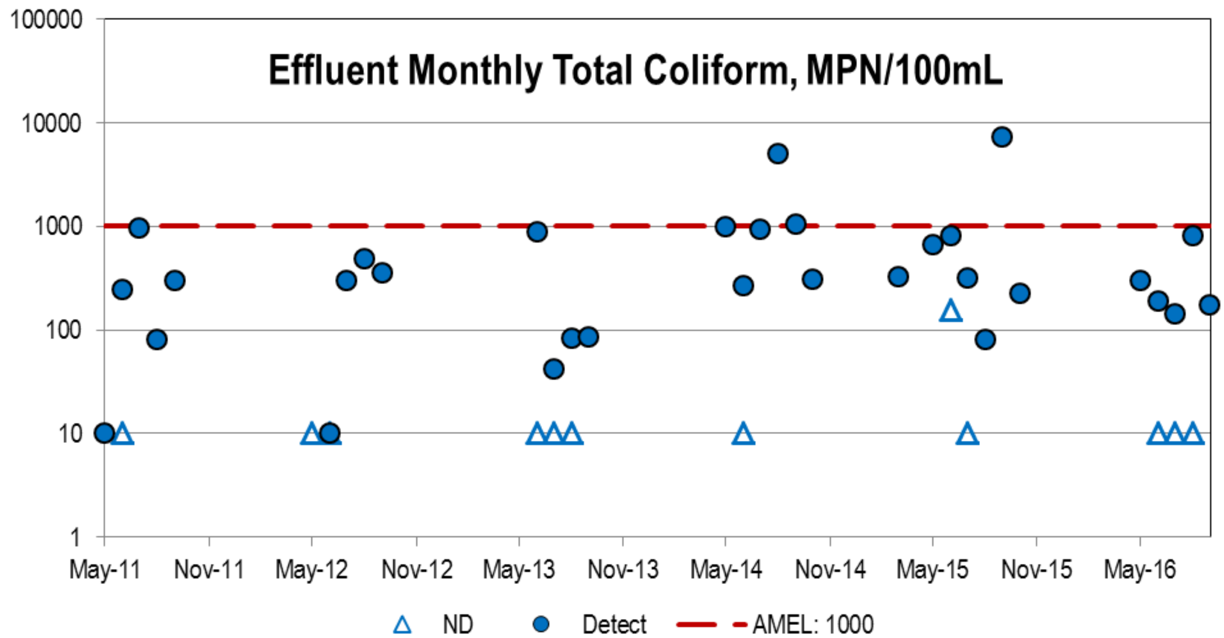


Total & Fecal Coliform, Enterococcus

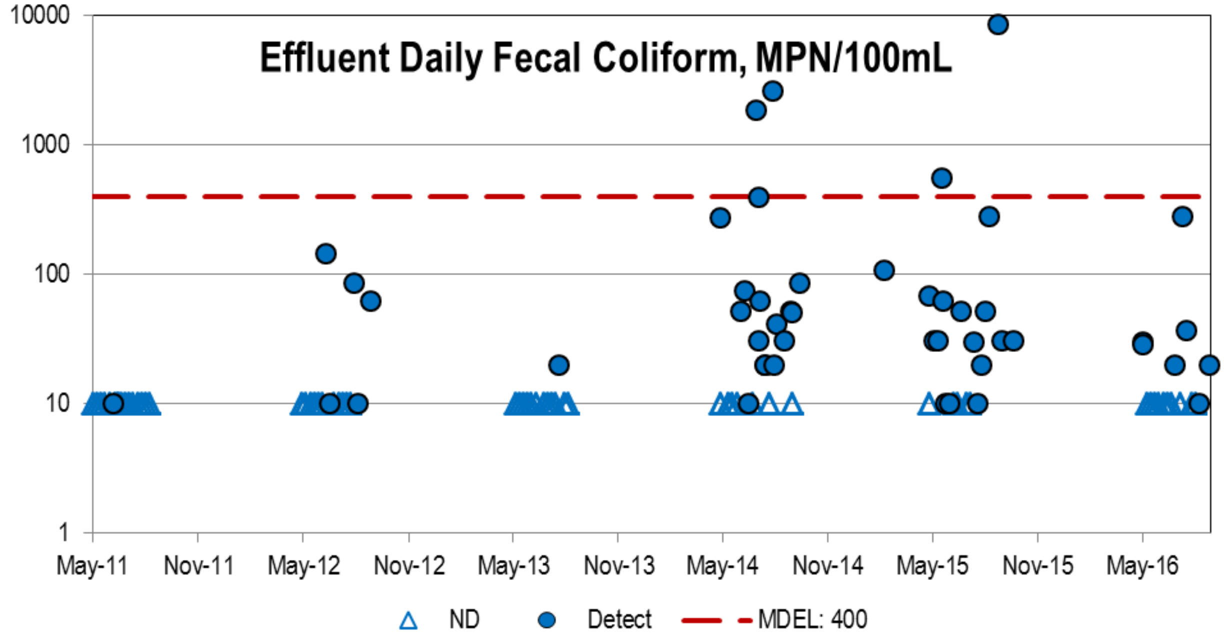
The effluent limits from the previous permit were carried over into the Tentative Order. The most recent data (2016) have not exceeded the effluent limits, although previous data have occasionally been significantly higher (note the log-normal scale of the bacterial data graphs below).

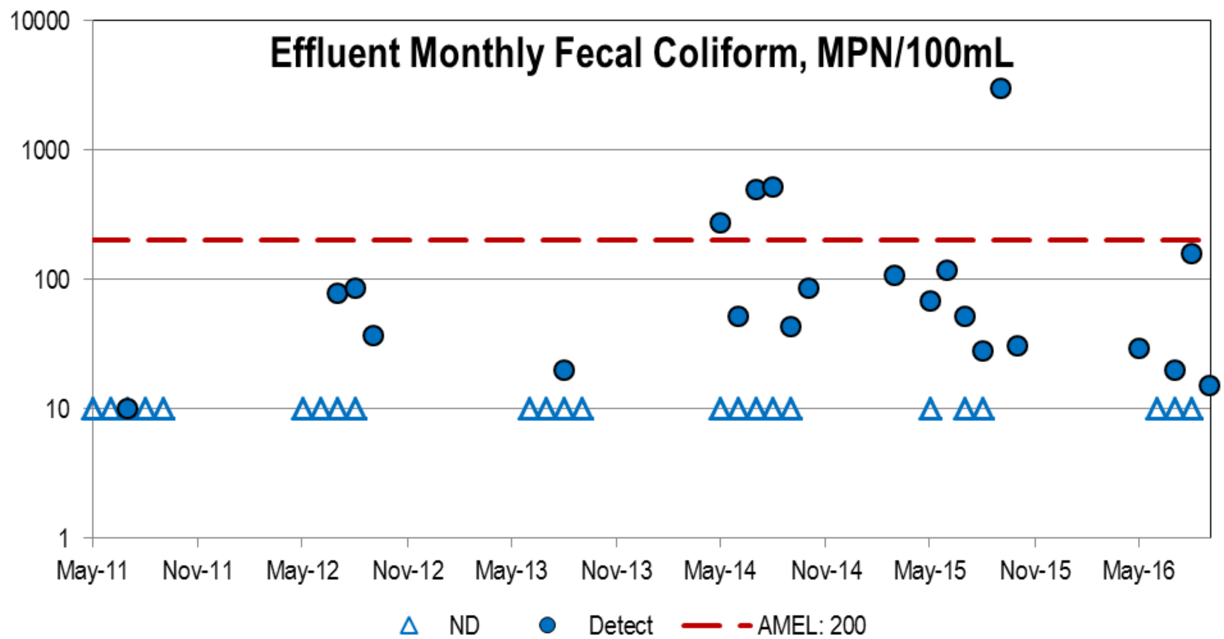


Effluent Daily Total Coliform, MPN/100mL
100000
10000
1000
100
10
1
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
ND
Detect
MDEL: 10000



Effluent Monthly Total Coliform, MPN/100mL
100000
10000
1000
100
10
1
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
ND
Detect
AMEL: 1000


Effluent Daily Fecal Coliform, MPN/100mL
10000
1000
100
10
1
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
ND
Detect
MDEL: 400


Effluent Monthly Fecal Coliform, MPN/100mL
10000
1000
100
10
1
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
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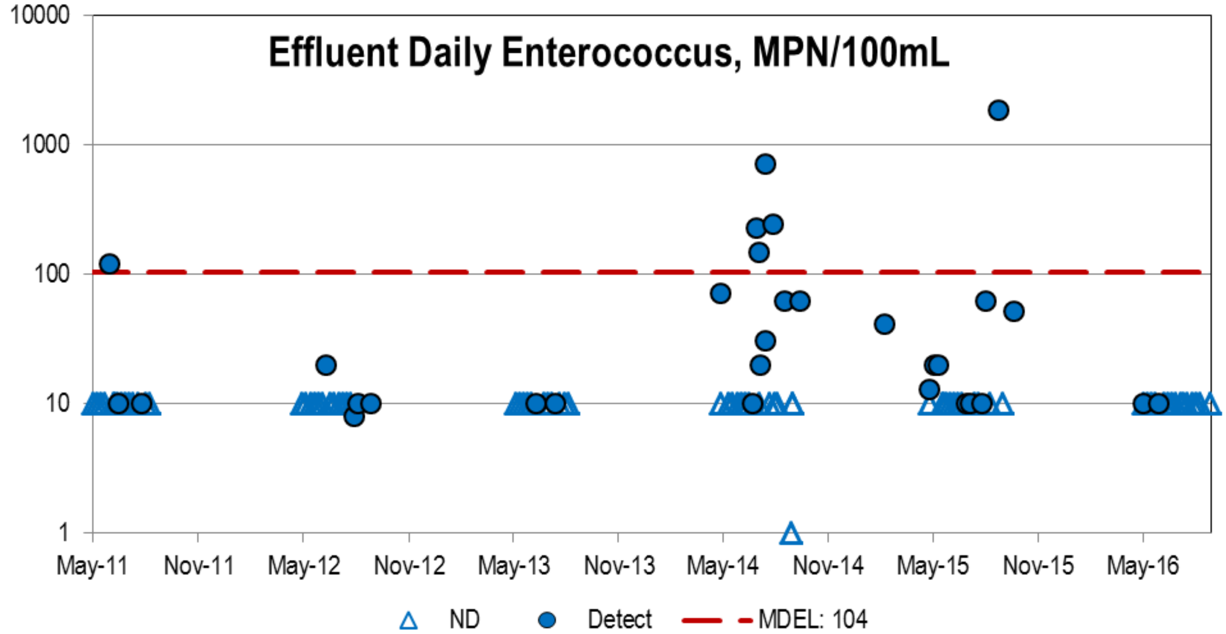
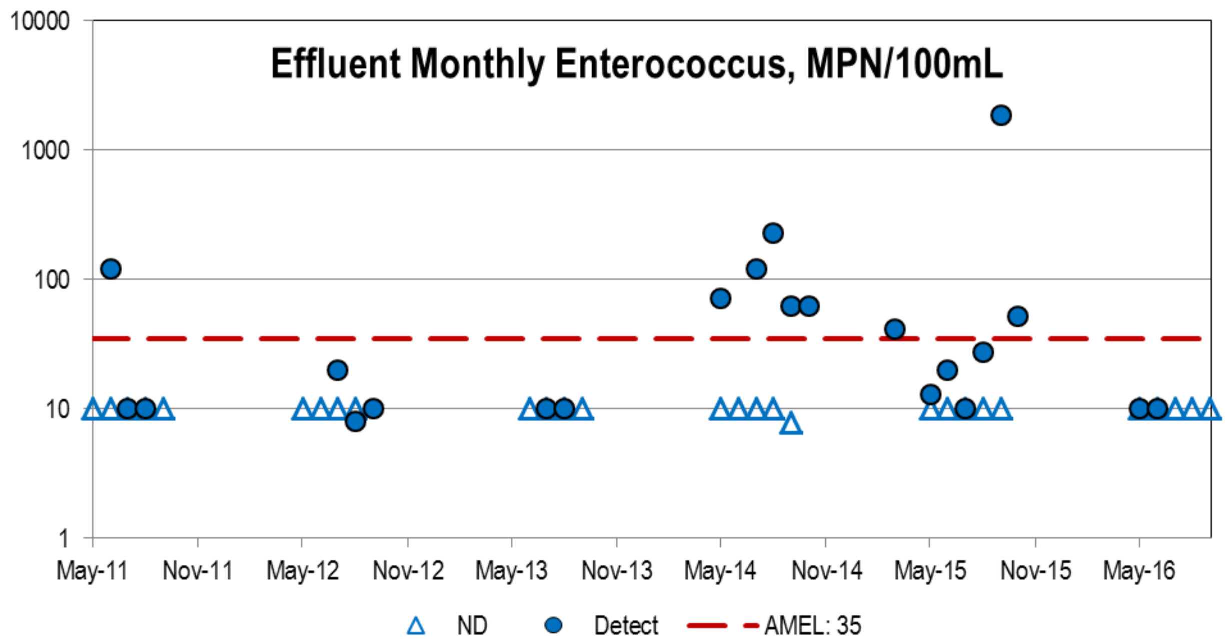
Nov-15
May-16
ND
Detect
AMEL: 200





SUMMARY OF COMPLIANCE ASSESSMENT

Table 1 summarizes the effluent limits, probability of compliance, maximum effluent concentrations (MEC), and reporting limits (RL) for the compliance concerns noted above. New effluent limits (those not carried over from the 2010 permit) are shown in bold. Of those new limits, the Seaside Lagoon discharge will have difficulty consistently complying with proposed effluent limits for copper, selenium (AMEL), silver and zinc. There are insufficient recent data to determine the likelihood of compliance for mercury, thallium and cyanide.

Effluent concentrations of TSS have exceeded the effluent limits only once since 2011. However, long-term TSS concentrations appear to be increasing in effluent and receiving water, which may lead to exceedances during this permit term.

As shown in Table 1, a statistical analysis was performed to determine the probability of compliance with the Tentative Order's daily and monthly effluent limits, using data beginning no earlier than May 2014.

Table 1. Probability of compliance for constituents with compliance concerns

	Tentative Order		Probability of Compliance[b]			
Constituent	AMEL	MDEL	AMEL	MDEL	MEC	RL
Oil & Grease, mg/L	10	15	47.3%	63.0%	60.1	6
Copper, µg/L	**1.9**	**5.8**	27.1%	66.4%	26	4
Mercury, µg/L	**0.051**	**0.10**	-	-	0.088	0.2
Selenium, µg/L	**56**	**122**	43.3%	98.4%	88[a]	5.7
Silver, µg/L	**0.92**	**2.2**	0.1%	2.1%	15[a]	4
Thallium, µg/L	**6.3**	**13**	-	-	10	10
Zinc, µg/L	**34**	**95**	20.6%	58.9%	190[a]	-
Total Coliform, MPN/100mL	1,000	10,000	77.3%	96.7%	24,196	10
Fecal Coliform, MPN/100mL	200	400	86.0%	91.8%	8,664	10
Enterococcus, MPN/100mL	35	104	81.8%	89.9%	1,850	10

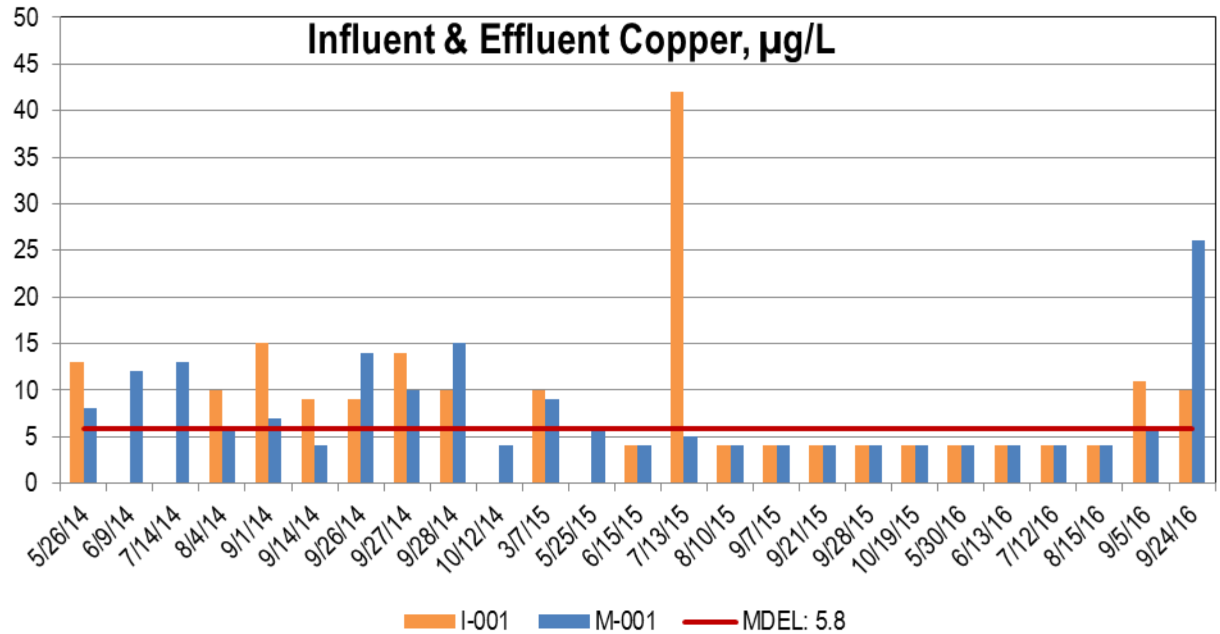
[a] From data collected after October 2014.
[b] Without the effect of intake credits. Intake credits are assessed below.

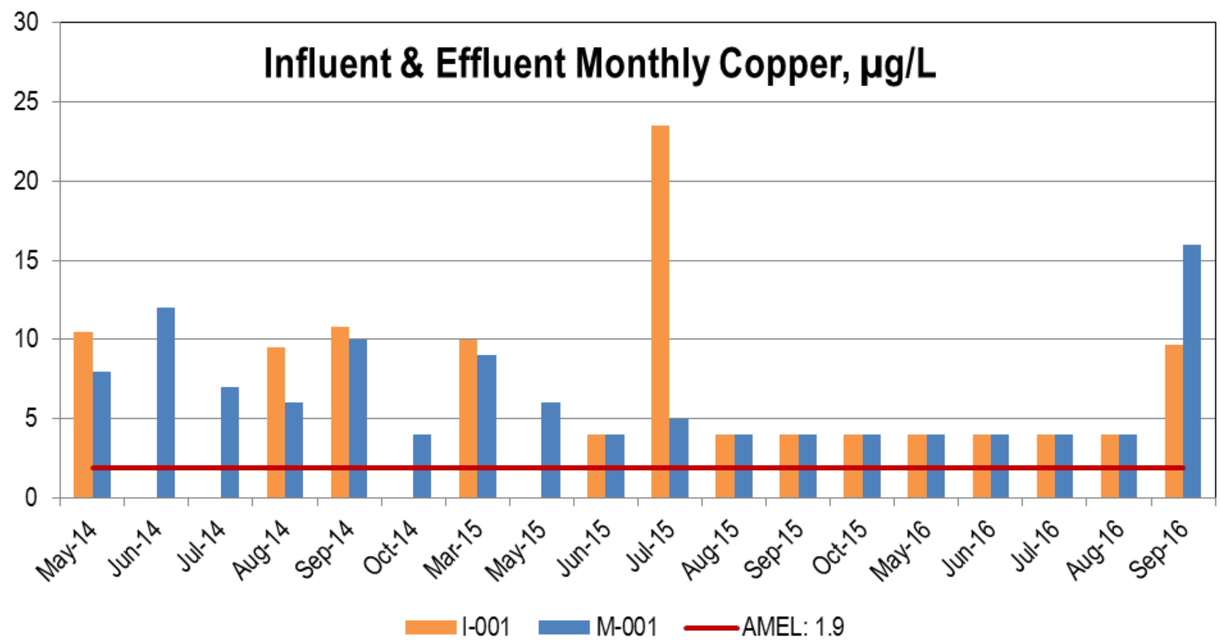
ASSESSMENT OF COMPLIANCE THROUGH INTAKE CREDITS

Where applicable, influent data were graphed with recent effluent data (2014-2016) to show the effect of intake credits on compliance. An analysis of the effect of intake credits on each constituent is shown below.

Copper

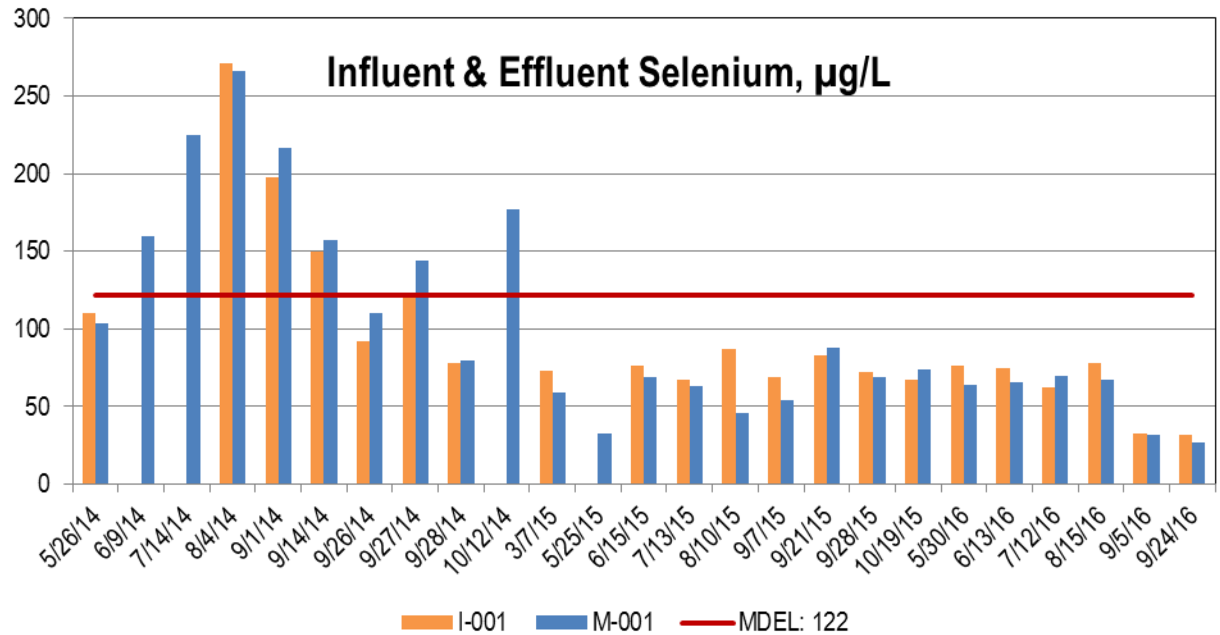
Intake credits are allowed for copper. Three daily effluent results exceeded the MDEL when no influent data were available. The percent daily compliance without intake credits is 52% (12 exceedances), and with intake credits 76% (6 exceedances). The percent monthly compliance is 44% (10 exceedances), and with intake credits 72% (5 exceedances).

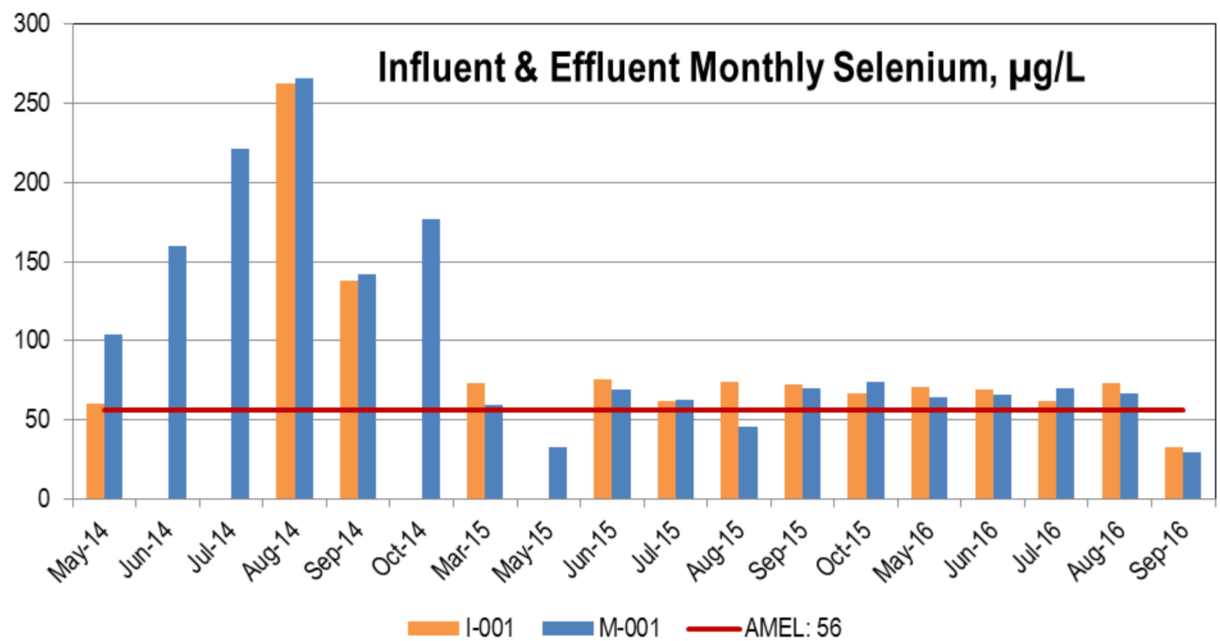




Selenium

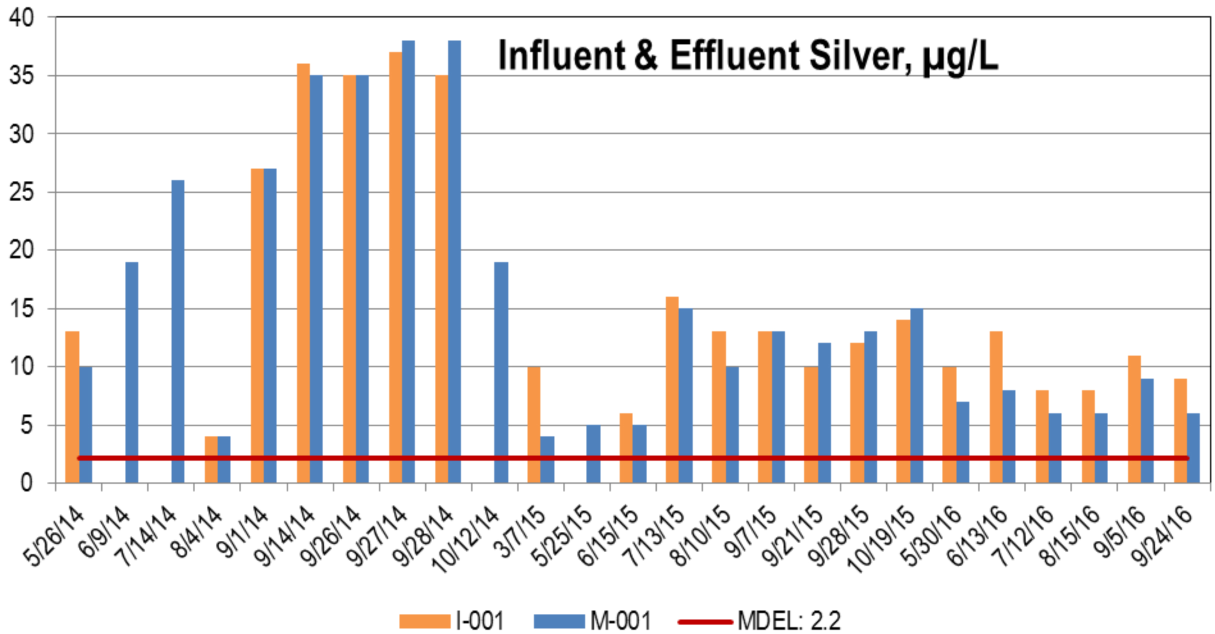
Intake credits are allowed for selenium. As shown in the column graphs below, three daily effluent results exceeded the MDEL when no influent data were available. The percent daily compliance without intake credits is 72% (7 exceedances), and with intake credits 76% (6 exceedances). The percent monthly compliance is 17% (15 exceedances), and with intake credits 50% (9 exceedances). Therefore, although intake credits improve the probability of consistent compliance, the effluent will still have difficulty consistently complying with the proposed effluent limits.

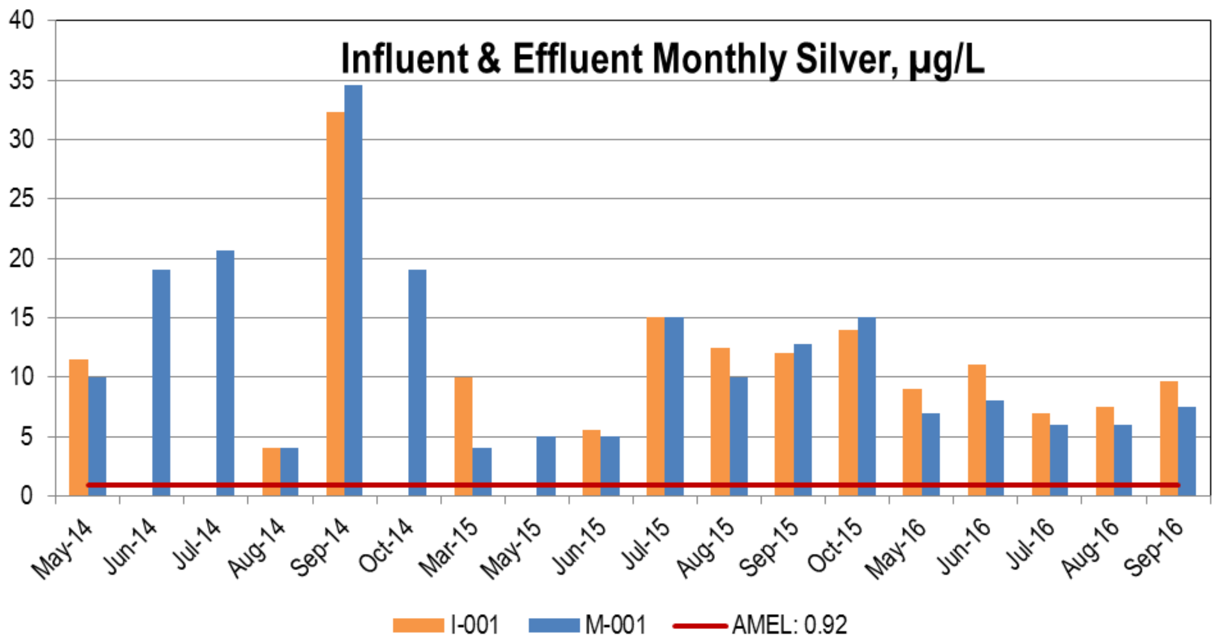




Silver

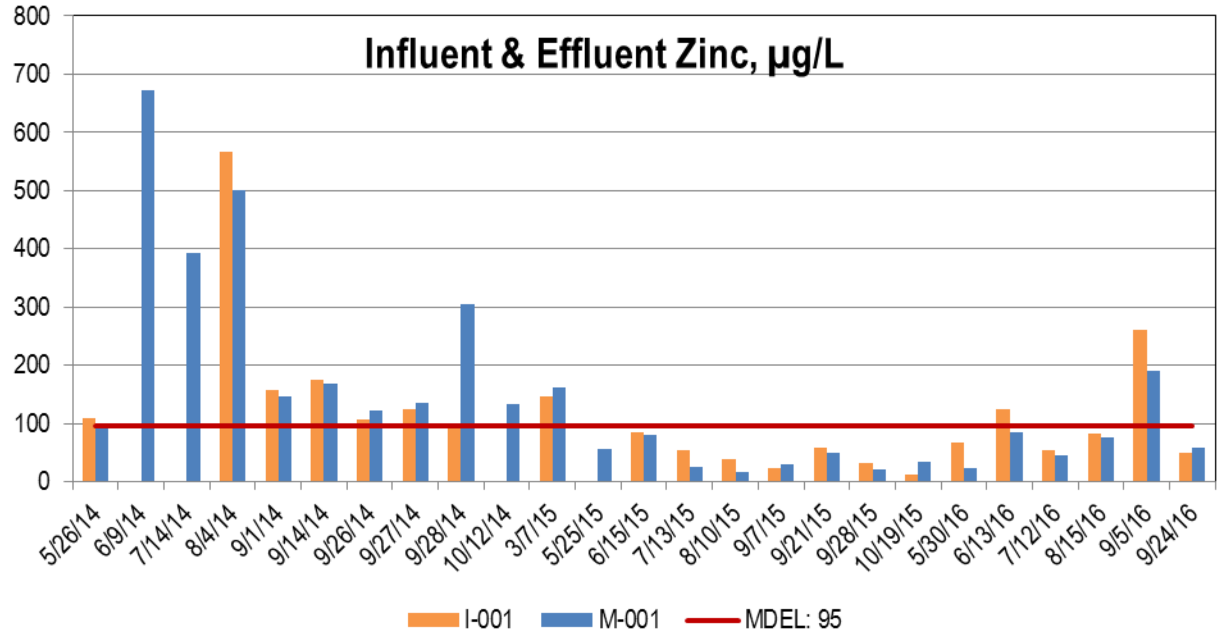
Intake credits are allowed for silver. As shown in the column graphs below, four daily effluent results exceeded the MDEL when no influent data were available. The percent daily compliance without intake credits is 16% (21 exceedances), and with intake credits 64% (9 exceedances, 4 of which occurred after October 2014). The percent monthly compliance is 11% (16 exceedances), and with intake credits 61% (7 exceedances). Therefore, although intake credits improve the probability of consistent compliance, the effluent will still have difficulty consistently complying with the proposed effluent limits.

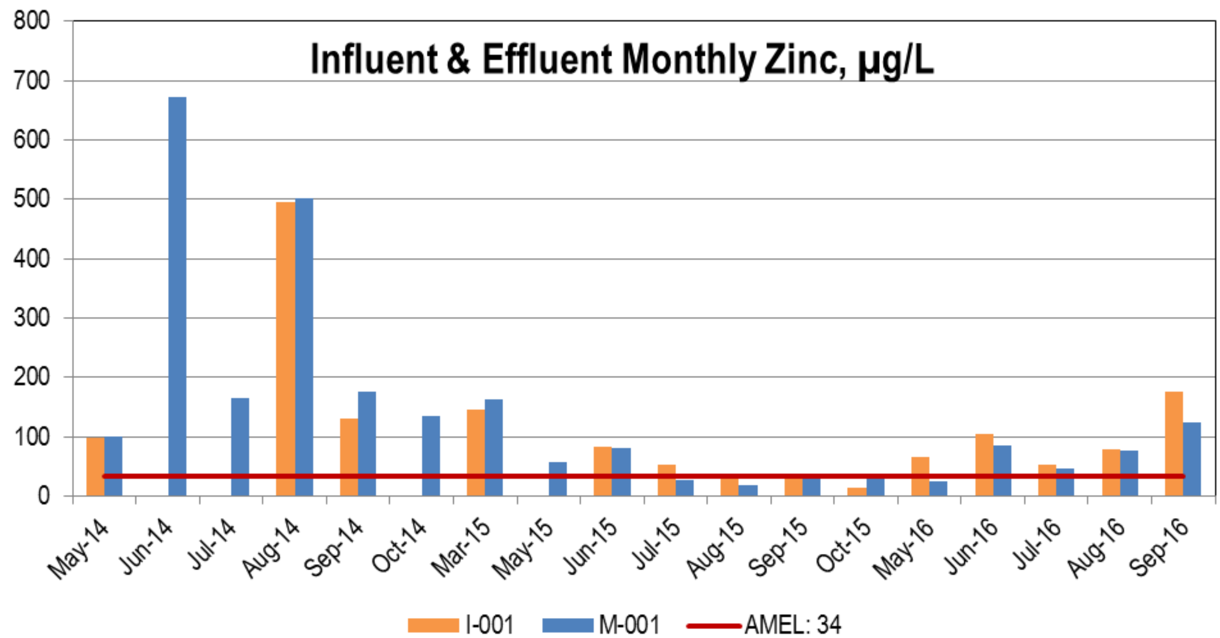




Zinc

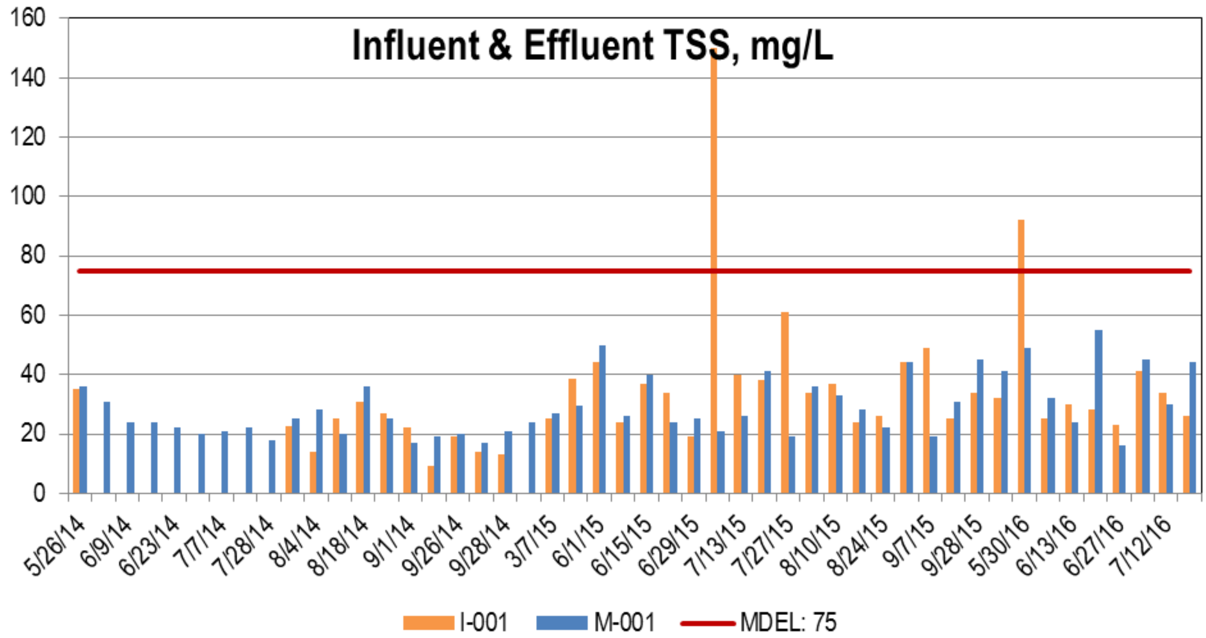
Intake credits are allowed for zinc. As shown in the column graphs below, three daily effluent results exceeded the MDEL when no influent data were available. The percent daily compliance without intake credits is 52% (12 exceedances), and with intake credits 72% (7 exceedances, 1 of which occurred after October 2014). The percent monthly compliance is 28% (13 exceedances), and with intake credits 56% (8 exceedances).

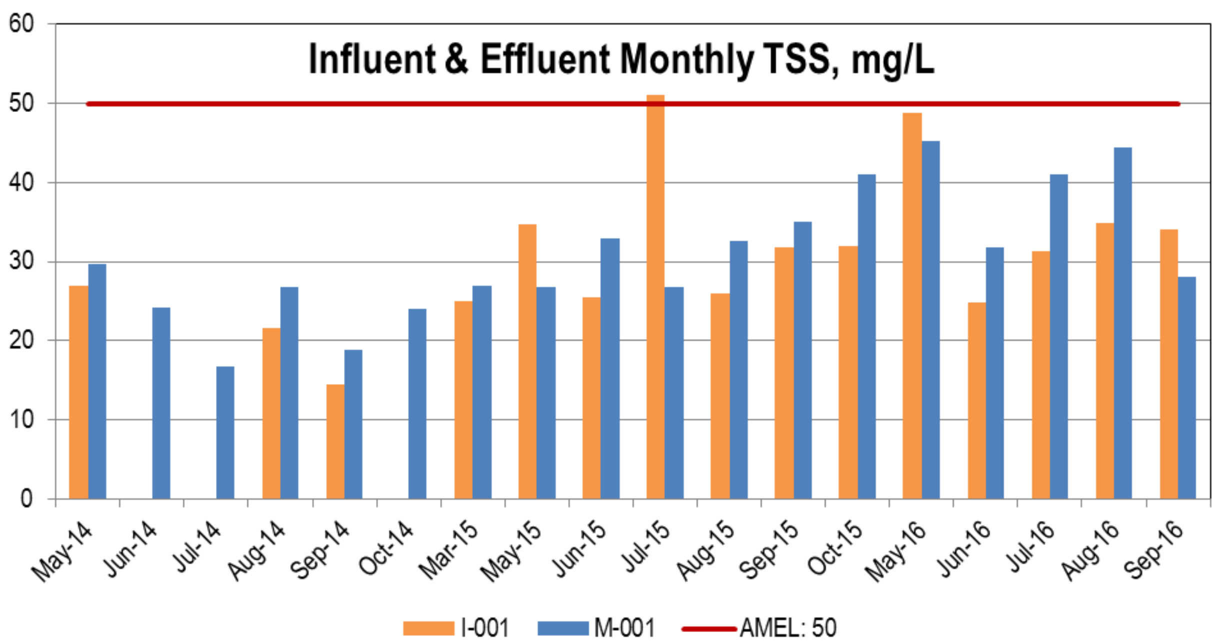




Total Suspended Solids

Although no effluent limits would have been exceeded between 2014-2016, the influent TSS data were reviewed to determine whether compliance could be assisted by intake credits, which are allowed for TSS. As shown in the column graphs below, the daily influent concentrations have been higher than the corresponding effluent concentrations 38% of the time and monthly 27% of the time, suggesting that intake credits may assist with compliance should the effluent ever exceed, but this cannot be guaranteed.





For each constituent, a few effluent concentrations did not have corresponding influent concentrations (June 2014, July 2014, May 2015). If these influent data points had been available, the effect of intake credits on percent compliance may have been higher. A summary of the potential effect of intake credits on compliance is shown in Table 2.

Table 2. Effect of Intake Credits on Compliance Between 2014-2016

	Daily, MDEL[a]		Monthly, AMEL[b]	
	% Compliance **Without** Intake Credits	% Compliance **With** Intake Credits	% Compliance **Without** Intake Credits	% Compliance **With** Intake Credits
Copper	52%	76%	44%	72%
Selenium	72%	76%	17%	50%
Silver	16%	64%	11%	61%
Thallium	100%	100%	78%	83%
Zinc	52%	72%	28%	56%

[a] For metals, there were 25 effluent and 21 influent daily data points available for this analysis.
[b] There were 18 effluent and 14 influent monthly data points available for this analysis

WATER QUALITY COMPARISON

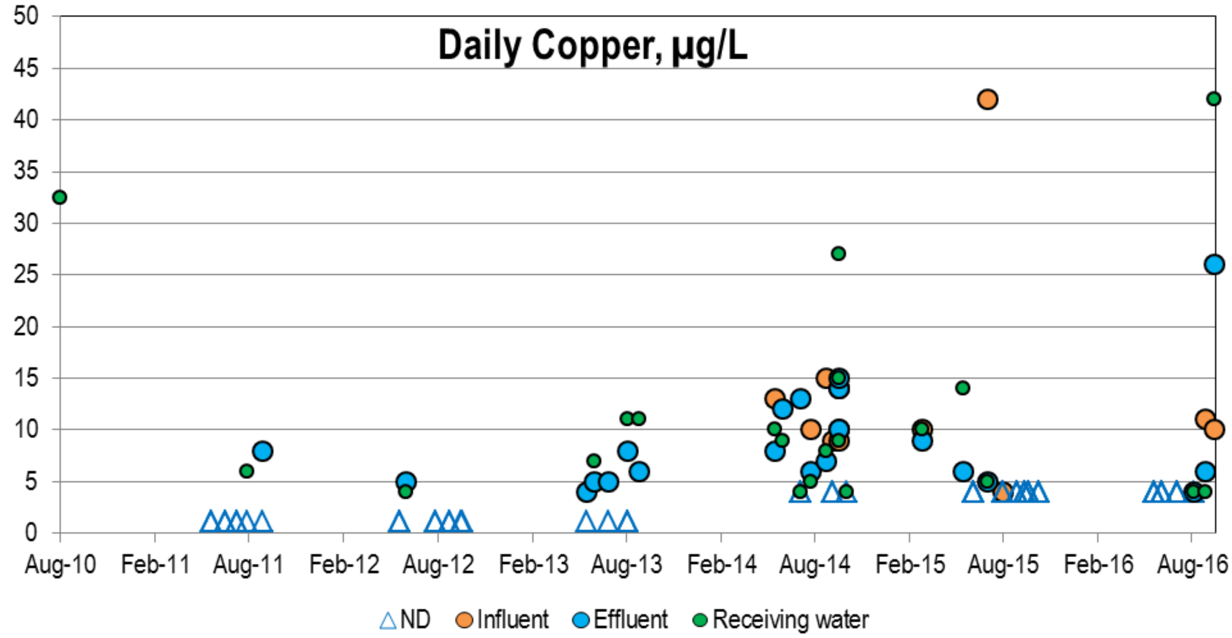
The influent, effluent and receiving water data were graphed for copper, selenium, silver, zinc and TSS. This was done to get a better understanding of the sources of each constituent and if there is a possibility that a process occurs in the lagoon that changes the constituent concentrations.

A statistical regression analysis of differences between the 2014-2016 datasets was performed using Minitab statistical software. The R^2 values shown in Table 3 represent the results of the analysis. A R^2 value closer to 100% indicates that the two datasets are statistically similar, while a R^2 value closer to 0% indicates that the two datasets are statistically different. These results are shown in bold, because they indicate the likelihood of some effect causing a statistical change in water quality between the influent, effluent and/or receiving water.

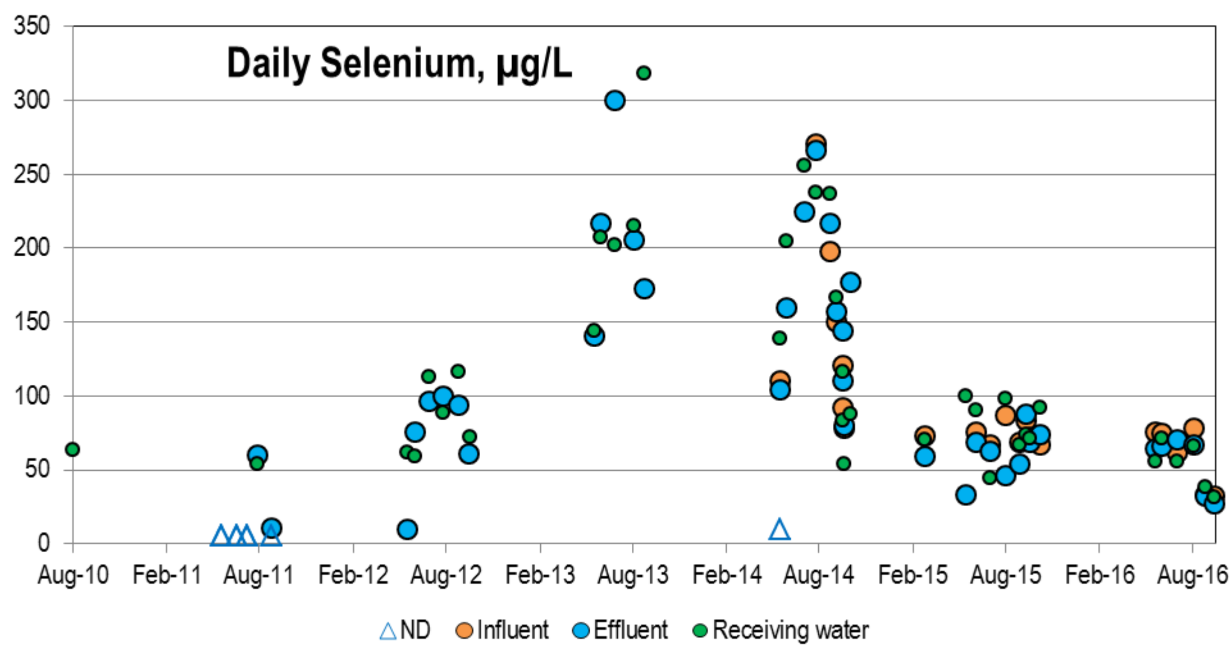
Table 3. Regression Analysis Result (R^2) – Dataset Similarity from 2014-2016

	Effluent versus Influent	**Effluent versus Receiving Water**	**Influent versus Receiving Water**
Arsenic	Different	Different	Different
Nickel	Different	Similar	Similar
Copper	Different	Similar	Different
Selenium	Similar	Similar	Similar
Silver	Similar	Similar	Similar
Zinc	Similar	Similar	Similar
TSS	Different	Different	Different

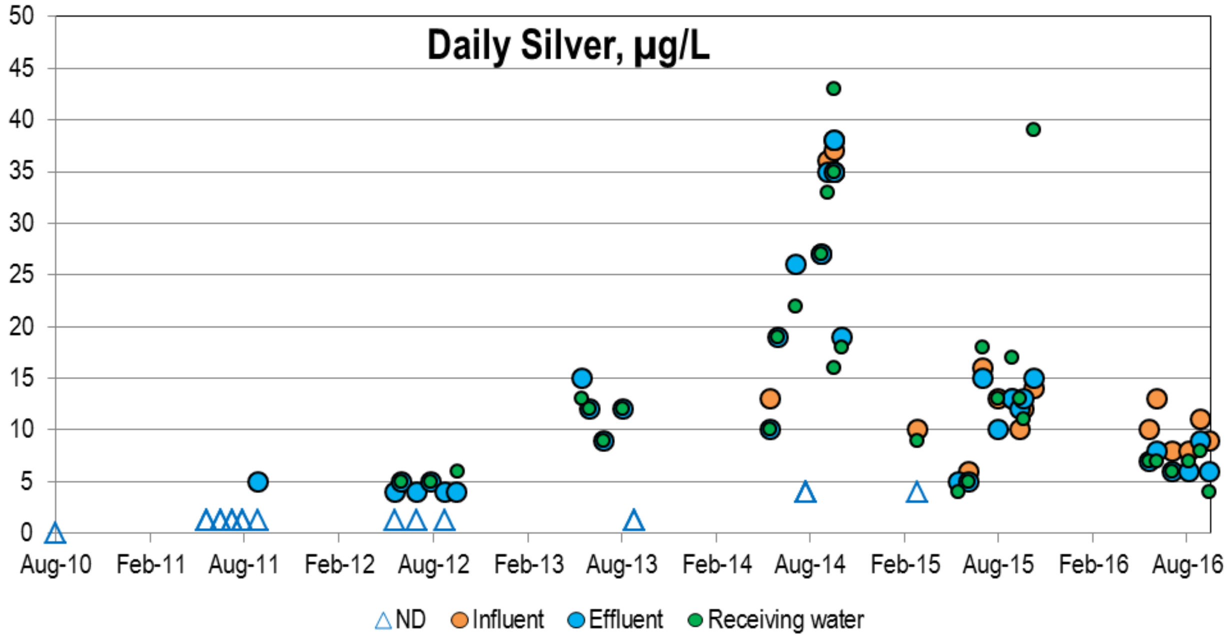
Copper and TSS concentrations in influent, effluent and/or receiving water showed significant differences in this analysis. The three datasets are graphed below (influent data were only available beginning in 2014).

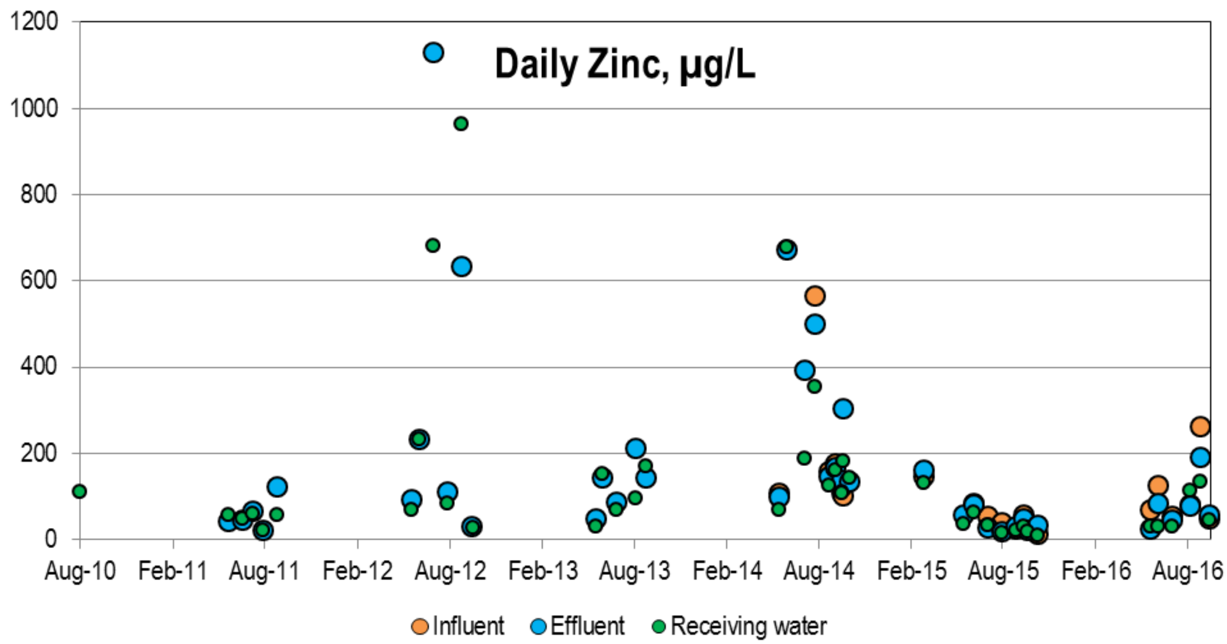


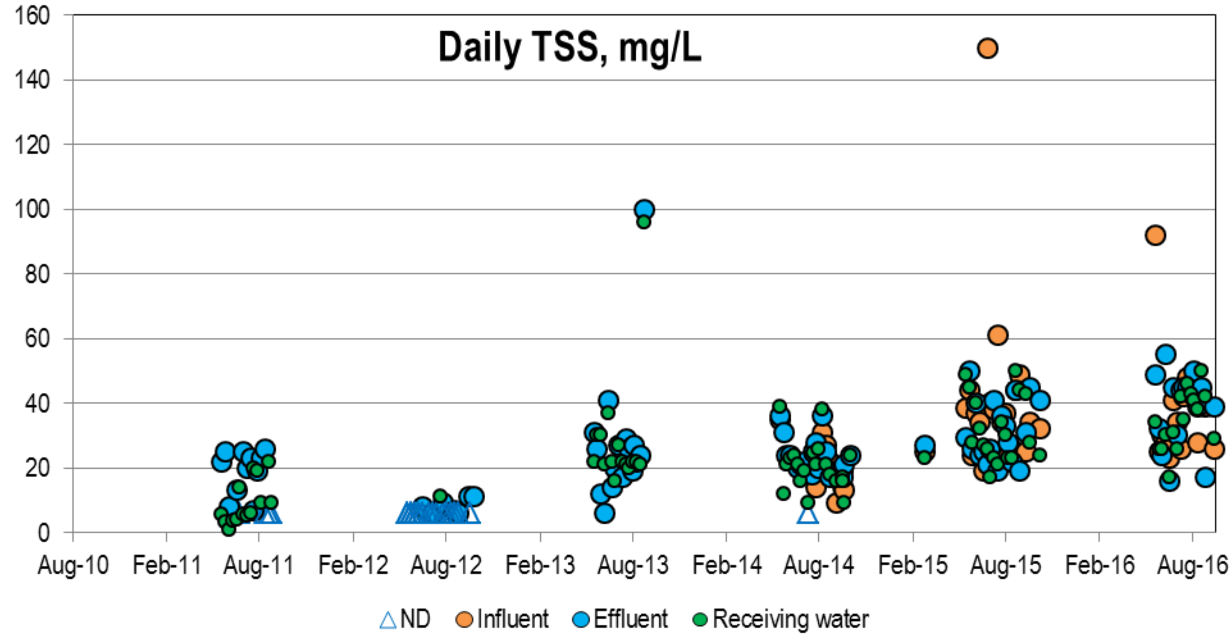
Daily Copper, µg/L
50
45
40
35
30
25
20
15
10
5
0
Aug-10
Feb-11
Aug-11
Feb-12
Aug-12
Feb-13
Aug-13
Feb-14
Aug-14
Feb-15
Aug-15
Feb-16
Aug-16
ND
Influent
Effluent
Receiving water



Daily Selenium, µg/L
350
300
250
200
150
100
50
0
Aug-10
Feb-11
Aug-11
Feb-12
Aug-12
Feb-13
Aug-13
Feb-14
Aug-14
Feb-15
Aug-15
Feb-16
Aug-16
ND
Influent
Effluent
Receiving water


Daily Silver, µg/L
50
45
40
35
30
25
20
15
10
5
0
Aug-10
Feb-11
Aug-11
Feb-12
Aug-12
Feb-13
Aug-13
Feb-14
Aug-14
Feb-15
Aug-15
Feb-16
Aug-16
ND
Influent
Effluent
Receiving water


Daily Zinc, µg/L
1200
1000
800
600
400
200
0
Aug-10
Feb-11
Aug-11
Feb-12
Aug-12
Feb-13
Aug-13
Feb-14
Aug-14
Feb-15
Aug-15
Feb-16
Aug-16
Influent
Effluent
Receiving water



A graph of the historic TSS concentrations from 6-60 µg/L is shown below. This shows that the datasets are not similar, although the data clusters appear similar on a larger scale.