Snow Disposal Site Monitoring
2017 Data Report - Draft

Introduction

The Municipality of Anchorage (MOA) and the State of Alaska Department of Transportation and Public Facilities (DOT) are currently authorized to discharge stormwater from their combined Municipal Separate Storm Sewer System (MS4) to receiving waters as co-permittees (Permittees) under Alaska Pollutant Discharge Elimination System (APDES) Permit No. AKS-052558. During the second term of the Permit the Permittees were required to retrofit or build at least two snow disposal sites according to criteria developed by the MOA Watershed Management Section (WMS) "regarding siting, design and operation and/or using infiltration, evapotranspiration or reuse techniques", and to "quantitatively assess the effectiveness of their retrofits by measuring changes in chloride and turbidity in melt water..", documenting their evaluation results in a report. This was completed and reported in 2013.

In the third term of the Permit the permittees are required to quantitatively "assess the effectiveness of their retrofits by measuring changes in chloride and turbidity in melt water at least twice during the permit term and must document results in a final project report to be submitted in the fourth annual report." During the first year of the permit term there was very little snow fall and the snow disposal sites were not used. During the latter part of the winter in the second year Anchorage received sufficient snow to transport to disposal sites. Subsequently, during the spring of the second year, 2017, the first of two monitoring projects was performed.

Site Descriptions

The Tudor snow storage site is located southwest of the intersection of Tudor Road and Campbell Air Strip Road. Tudor site meltwater discharges into an unnamed branch of Chester Creek.

The Spruce Street snow storage facility is located south of Dowling Road between Elmore Road and Spruce Street. Refer to Figures C1, C2, and C3 taken from the monitoring plan.

Two types of BMPs have been installed at the Tudor site. The first is an expansion of the pilot study V-swales that now encompass the entire area where snow is placed in windrows. As the snow melts, particulates that cause turbidity are retained within the swales. The V-pad discharges into the second BMP, a detention pond, which further removes solids by settling and serves to ameliorate the peak chloride concentrations.

The Spruce Street site was constructed in 2012 with V-swale technology on the snow pad and a retention pond to receive melt water from the entire snow storage site. The pond discharges through a weir into a second small settling pond before it is dispersed into an adjacent wetland.

Bischofberger 2/15/2018, Watershed Management Services

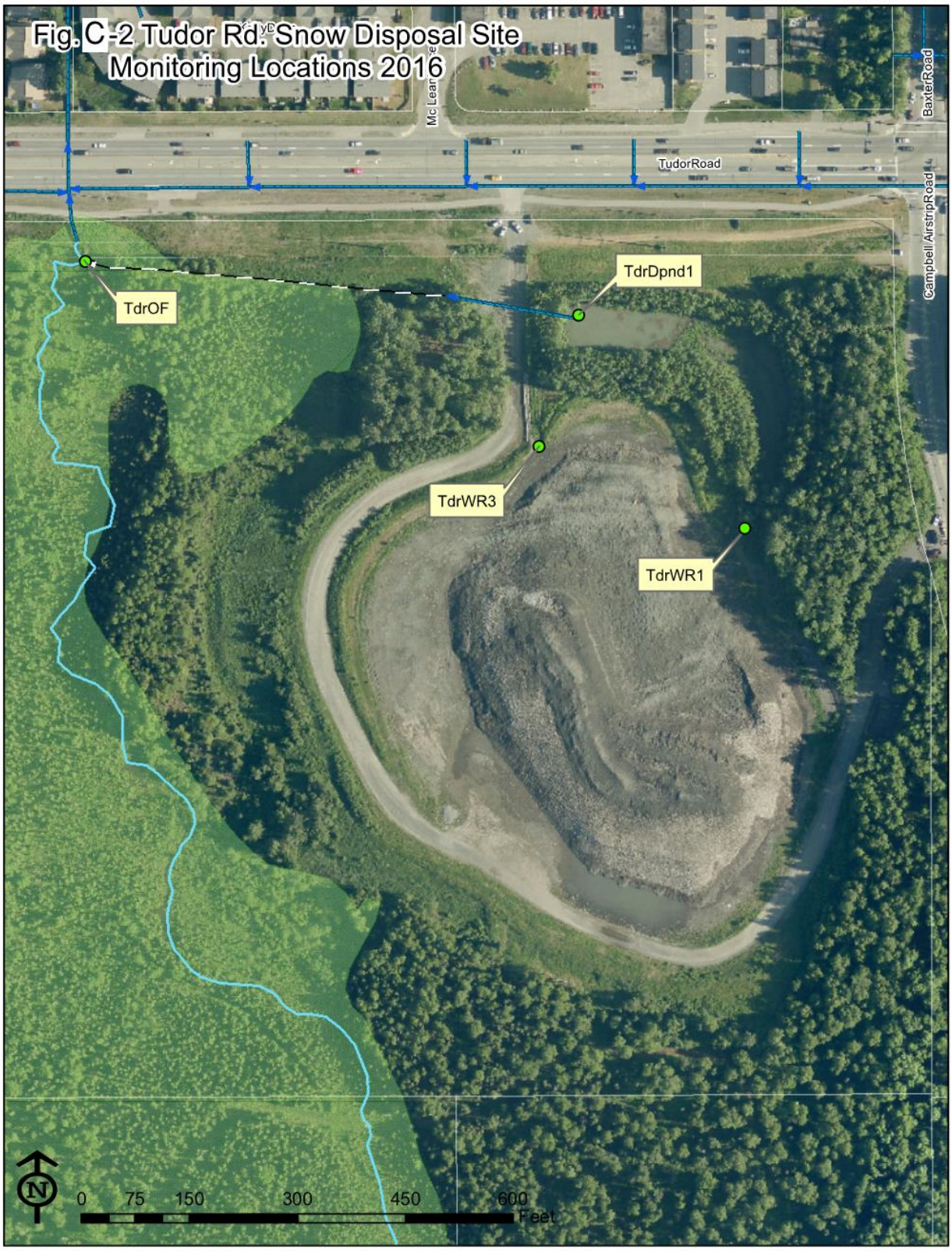


Fig. C-2 Tudor Rd. Snow Disposal Site
Monitoring Locations 2016
McLeary Ave
BaxterRoad
TudorRoad
Campbell AirstripRoad
TdrDpnd1
TdrOF
TdrWR3
TdrWR1
N
0 75 150 300 450 600
Feet

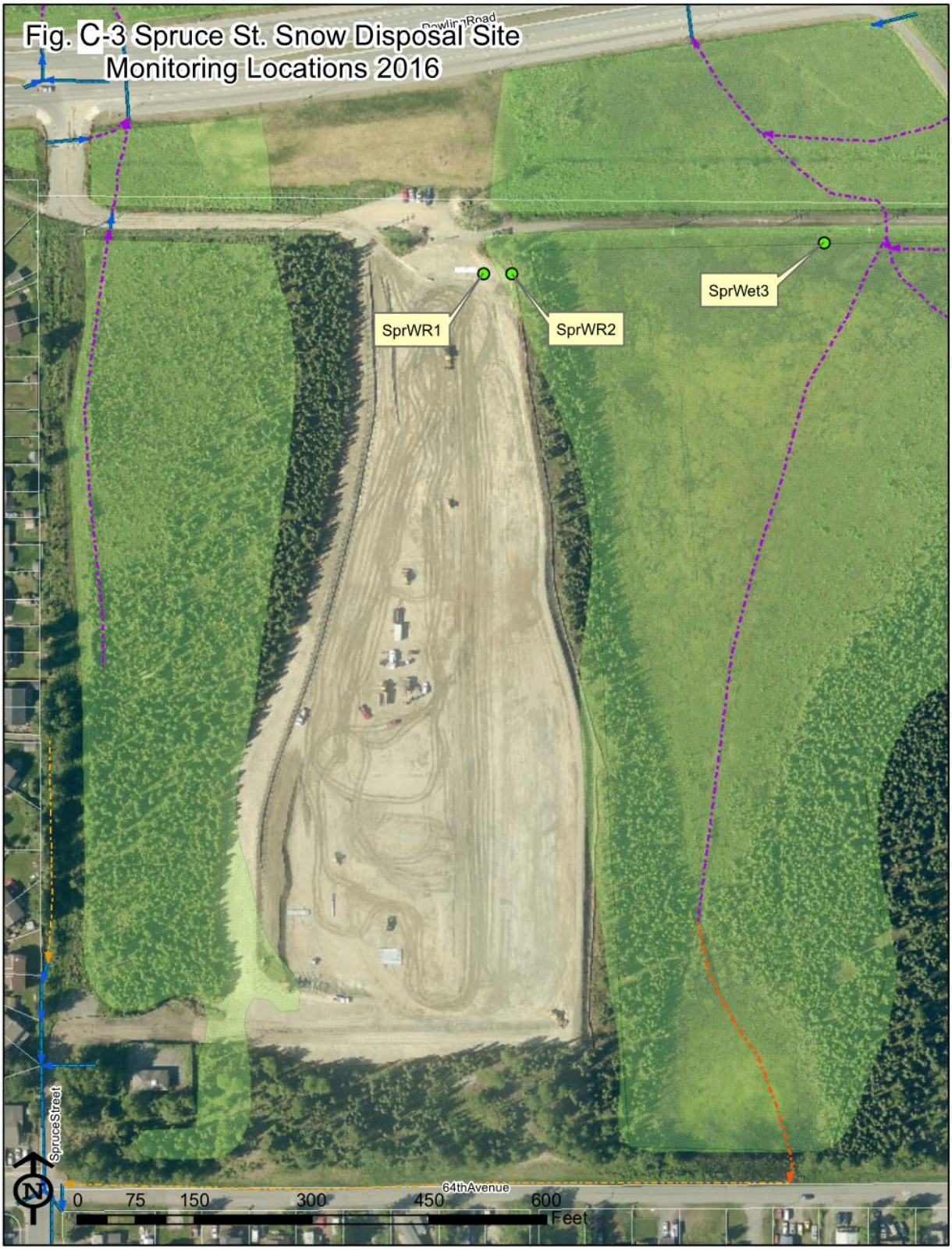
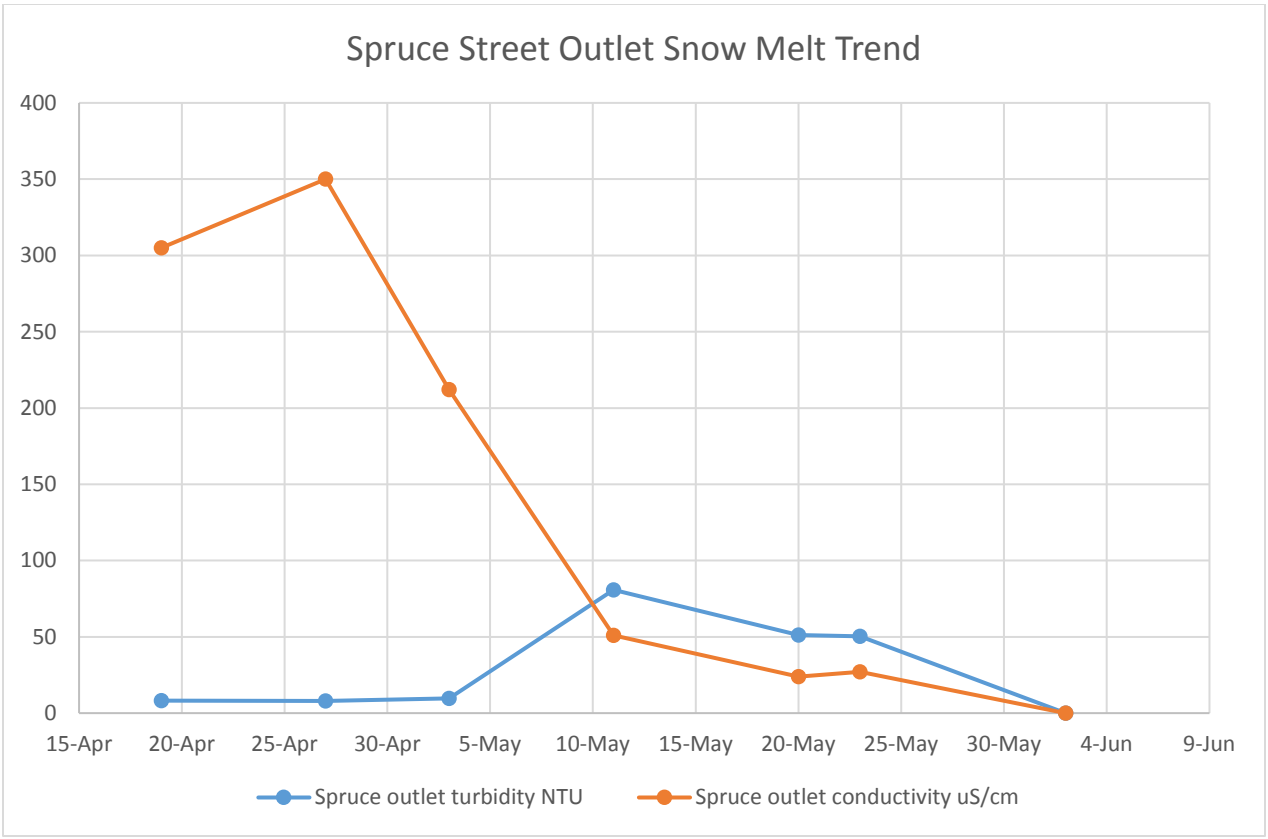
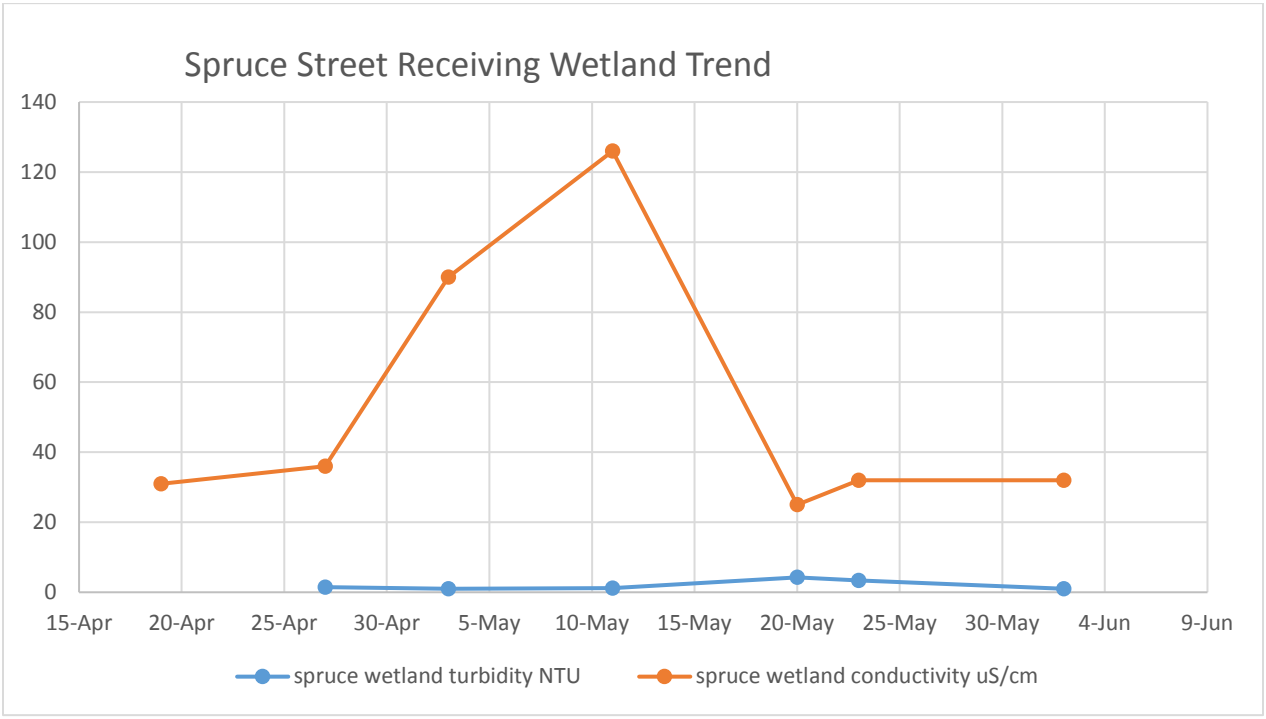


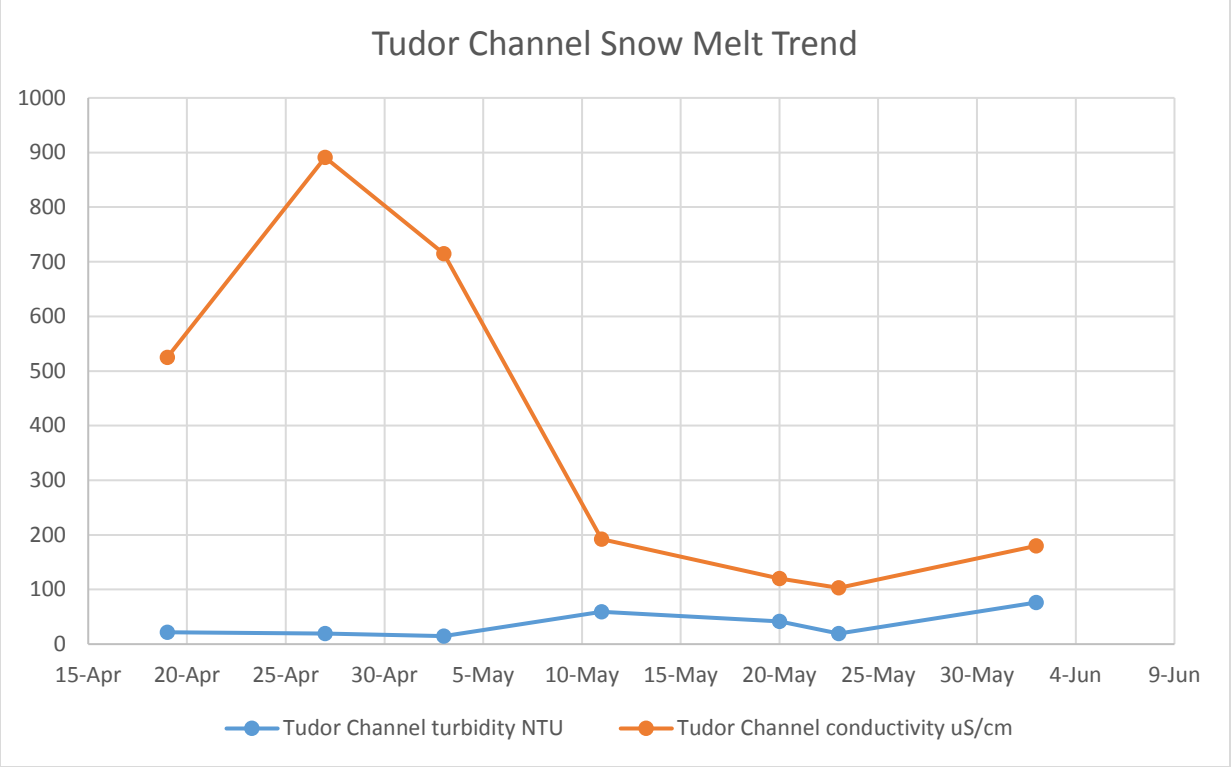
Fig. C-3 Spruce St. Snow Disposal Site
Monitoring Locations 2016
SprWR1
SprWR2
SprWet3
SpruceStreet
64thAvenue
0
75
150
300
450
600
Feet

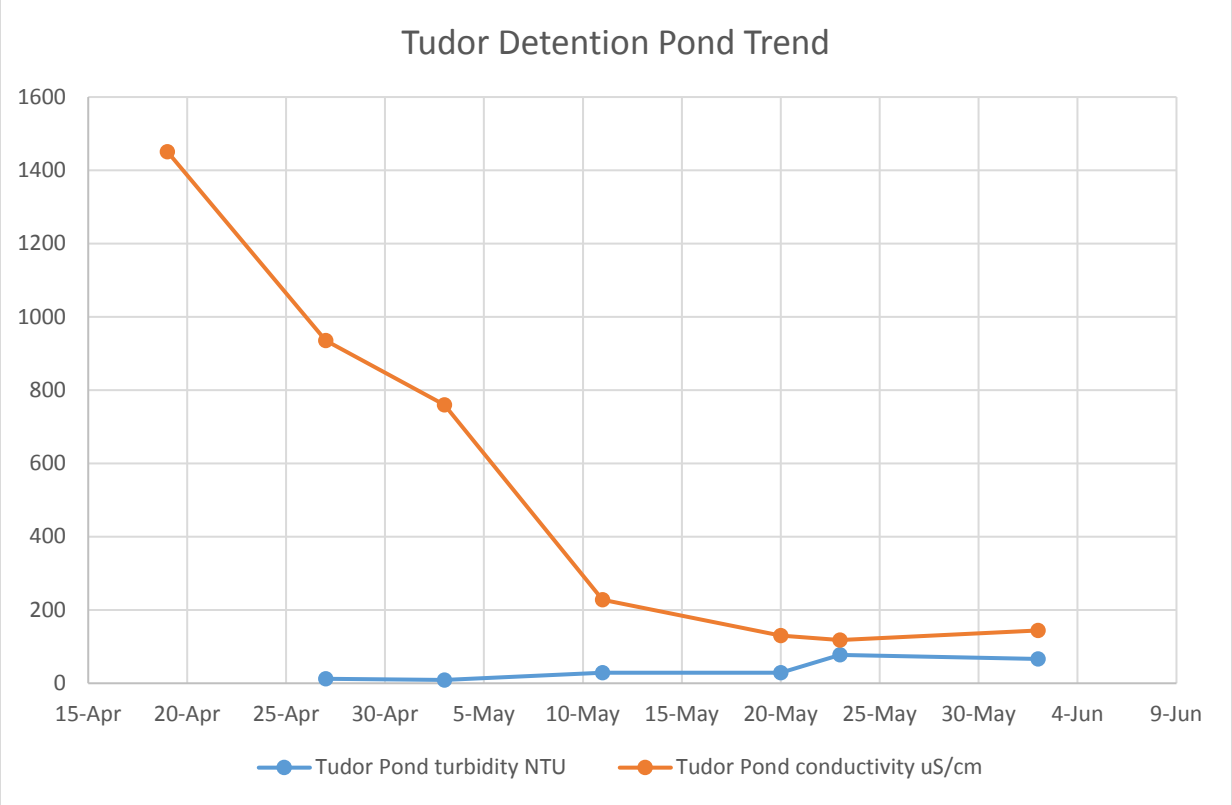
Data Summary

2017 Snow Site Monitoring							Two Sites:	Tudor Snow Dump
Analytes:	turbidity, conductivity, pH							Spruce Snow Dump
Date	Site	ID	turb (NTU)	Cond (uS/cm)	pH	temp C		
4/19/2017	Spruce outlet	SprWR1	8.24	305	6.47	10.2		
	Spruce wetlnd	SprWet3	*	31	8.27	12.1		
	Tudor channel	TU01	22	525	6.68	10.5		
	Tudor pond	TU04	*	1451	6.53	8.7		
	Blank		0	7	3.97	17.9		
			* Suspect due to meter reset error					
4/27/2017	Spruce outlet	SprWR1	7.98	350	6.48	13.4		
	Spruce wetlnd	SprWet3	1.45	36	5.38	14.8		
	Tudor channel	TU01	19.5	891	6.59	9.4		
	Tudor pond	TU04	12.6	935	6.85	11		
	Blank		0.34	7	4.02	17.6		
5/3/2017	Spruce outlet	SprWR1	9.72	212	7.5	13.1		
	Spruce wetlnd	SprWet3	1	90	7.03	16.8		
	Tudor channel	TU01	14.7	715	6.71	11.3		
	Tudor pond	TU04	9.1	760	7.04	12.7		
	Blank		18	0	8.08	20.0		
	Calib pH 7				6.84			97%
	Calib Cond 1000			1078				108%
5/11/2017	Spruce outlet	SprWR1	20.8	51	8.63	14.4		
	Spruce wetlnd	SprWet3	1.23	126	7.3	23.2		
	Tudor channel	TU01	59.4	192	7.09	15.3		
	Tudor pond	TU04	28.4	228	7.24	18.1		
	Blank		0.21	0	7.81	23.1		
	Calib Cond 1000			1091				109%
5/20/2017	Spruce outlet	SprWR1	51.1	24	7.8	7.4		
	Spruce wetlnd	SprWet3	4.25	25	7.62	10.5		
	Tudor channel	TU01	41.8	120	8.63	6.38		
	Tudor pond	TU04	29.1	130	8.17	6.9		
	Blank		0.18			11.1		
	Calib Cond 1000			1126				112.6%
5/23/2017	Spruce outlet	SprWR1	50.3	27	7.55	13.9		
	Spruce wetlnd	SprWet3	3.39	32	7.01	18.9		
	Tudor channel	TU01	19.3	103	7.37	10.4		
	Tudor pond	TU04	77.4	118	7.42	17.5		
	Blank		0.17	0	7.63	19.8		
	Calib Cond 1000			1116				111.6%
6/2/2017	Spruce outlet	SprWR1	dry	dry	dry	dry		
	Spruce wetlnd	SprWet3	1.02	32	7.93	21.5		
	Tudor channel	TU01	76.2	180	7.04	14.3		
	Tudor pond	TU04	66.7	144	7.28	20.0		
	Blank		0.27	0	7.82	24.4		


Spruce Street Outlet Snow Melt Trend
400
350
300
250
200
150
100
50
0
15-Apr
20-Apr
25-Apr
30-Apr
5-May
10-May
15-May
20-May
25-May
30-May
4-Jun
9-Jun
Spruce outlet turbidity NTU
Spruce outlet conductivity uS/cm


Spruce Street Receiving Wetland Trend
140
120
100
80
60
40
20
0
15-Apr
20-Apr
25-Apr
30-Apr
5-May
10-May
15-May
20-May
25-May
30-May
4-Jun
9-Jun
spruce wetland turbidity NTU
spruce wetland conductivity uS/cm


Tudor Channel Snow Melt Trend
1000
900
800
700
600
500
400
300
200
100
0
15-Apr
20-Apr
25-Apr
30-Apr
5-May
10-May
15-May
20-May
25-May
30-May
4-Jun
9-Jun
Tudor Channel turbidity NTU
Tudor Channel conductivity uS/cm


Tudor Detention Pond Trend
1600
1400
1200
1000
800
600
400
200
0
15-Apr
20-Apr
25-Apr
30-Apr
5-May
10-May
15-May
20-May
25-May
30-May
4-Jun
9-Jun
Tudor Pond turbidity NTU
Tudor Pond conductivity uS/cm

Discussion

Site sampling began April 19, 2017 once snow melt was under way and moisture was readily visible in the snow pack. At the Spruce Street snow site melt conductivity – the surrogate for chloride - was rising. Conductivity peaked in the outlet on April 27th and in the wetland on May 11 and then declined steadily. It was monitored until flow stopped at the outfall. Conductivity numbers ranged from 27 to 350 microSiemens/centimeter (uS/cm) at the outfall and 31 to 126 uS/cm in the wetland.

Turbidity at Spruce Street was not rising at the start of the sampling period. It peaked on May 11th and then steadily declined. The turbidity values ranges from 8.2 to 81 Nephelometic Turbidity Units (NTU) at the outfall and 1.0 to 4.2 in the wetland.

At Tudor snow site melting was farther along. Conductivity in the channel was rising when sampling started, and it peaked shortly thereafter on April 27th. Conductivity in the pond had already peaked and was steadily declining. Conductivity values ranged from 103 to 891 uS/cm in the channel and 118 to 1451 uS/cm in the pond. Starting earlier at the Tudor site to collect samples is planned for the next sampling event.

Turbidity at Tudor was still low and rising. The channel was still rising slightly at the end of the sampling period, and the range was 14 to 60. Another week or two of sampling would have helped to demonstrate the full turbidity range – this will be taken into account for the next sampling event.

Overall, conductivity and turbidity values in the two sites were in line with past results. In 2013, chloride levels at Spruce peaked around 130 mg/L and chloride levels at Tudor were 1000mg/L. Turbidity at Spruce peaked around 20 NTU and turbidity at Tudor peaked at 500 NTU.

There were some notable deviations in this monitoring activity compared to the monitoring plan developed in 2015. One of the sampling sites at Spruce was not sampled – the weir (SprWR1) was omitted because it was very close to the outfall, and there was no discernable value in measuring both locations. The outfall was chosen to represent both locations. One of the sampling sites at Tudor was also not sampled – the second distributed weir (TdrWR1), because access to it was blocked by the snow pile. Of note, the outfall site (TdrOF) was not omitted, but it did not have any flow. The other variance from the sample plan was that flow was not measured, it was not needed for the analyses and should have been deleted from the monitoring plan. Finally, there were some miscellaneous errors (relics) in the monitoring plan which were missed in the plan update, they will be corrected prior to additional sampling.

Assuming 2017-18 is a normal snow year, a second sampling event will be performed in the spring of 2018. A summary report of both years will evaluate snow site controls and be submitted with the annual report.

References:

MOA, 2015, *Quality Assurance Plan Appendix C. Snow Storage Site Retrofit Monitoring Plan*

MOA, 2013*, Anchorage Snow Disposal Sites: 2013 Evaluation*

Attachment A

Field Notes

2 4/19/17 3:40pm Sno Site Mon NB

Tudor turb 22.0 pH 6.68
channel C 525 µS/cm T 10.5°C
Tudor turb 22.1* pH 6.57
pond C 145 µS/cm T 8.7
no outflow

~~Sprue~~ ~~turb~~ ~~8.24~~
Sprue turb 8.24 pH 6.47
outlet C 305 T 10.2
~~wetland~~
east turb 8.24* pH 5.27
C 31 T 12.14

Blank turb 0 pH 3.97
C 7 T 17.9

Sites look good - snow appears to have been melting for about 1 week with outflow to wetland/pond

*suspect

4/27/17 Sno Site Mon NB/TT 3

Sprue Sno Site
outlet
turb 2.98 pH 6.48
cond 350 µS/cm T 13.4°C
east
turb 1.45 pH 5.38
cond 36 T 14.82°C

Tudor
channel
turb 19.5 pH 6.59
cond 891 µS/cm T 9.43°C
pond
turb 12.6 pH 6.85
cond 935 T 11.03°C
no outflow
Blank
turb 0.34 pH 4.02
cond 7 T 17.6°C

both sites are in good operating condition - BMPs in place

Rite in the Rain

5/3/17 Sno Site Monitoring

cal C 1078/1000 = 107.8%
~~blank~~ pH 6.84/7 = 97%

Spruce
outlet turb 9.72 pH 7.50
C 212 T 55.5°F (13.1)
wet turb 1.00 pH 7.03
C 90 T 62.2°F (16.8)

Tudor
channel turb 14.7 pH 6.71
C 715 T 52.3°F (11.3)
pond turb 9.10 pH 7.04
C 760 T 54.9°F (12.7)

blank turb 0.18 pH 8.08
C 0 T 67.2°F ~~(19.6)~~ 20.0

(°C) calc

5/11/17 SnowSite Monitoring

Spruce
outlet turb 20.8 ~~NTU~~ pH 8.63
C 51 ~~mS~~ µS/cm T 58.1°F (14.4)
wetland turb 1.23 pH 7.30
C 126 µS/cm T 73.8 (23.2)

Tudor turb 59.4 pH 7.09
out C 192 T 60.0°F (15.5)

pond turb 28.4 pH 7.24
C 228 T 64.6 (18.1)

blank turb 0.21 pH 7.81
~~cal~~ C 0 T 73.5 (23.1)
cal 1091 µS/cm / 1000 109.1%

(°C) calc

Rite in the Rain

6 5/20/17 Sno Site Monitoring

Tudor				
channel	turb	41.8	pH	8.63
	Cond	120	T	43.5 (6.38)
pond	turb	29.1	pH	8.17
	C	130	T	44.4 (6.4)
blank	turb	.18	pH	—
	C	—	T	—
std	C	1126	T	52° (11.1)
Spruce outlet	turb	51.1	pH	2.89
	C	24	T	45.4 (7.4)
wetland	turb	4.28	pH	7.62
	C	25	T	50.9 (10.5)
blank	turb	.19	pH	8.86
	C	0	T	50.5 (10.3)

(°C) calc

5/23/17 Snow Site Monitoring

blank	turb	0.17	pH	7.63
	C	0		67 (19.8)
Cond std		1116/1000		
Tudor outlet channel	turb	193	pH	7.37
	C	103	T	59.7 (10.4)
pond	turb	77.4	pH	7.42
	C	118	T	63.5 (17.5)
Spruce outlet	turb	50.3	pH	2.55
	C	27	T	57.0 (13.9)
wetland	turb	339 / 32	pH / T	7.01 / 66 (18.9)

(°C) calc

Rite in the Rain

6/2/17 Sno Site Monitoring

Tudor [illegible]

channel	turb	76.2	pH	7.04
	C	180	T	51.7 (14.3)
pond	turb	66.7	pH	7.28
	C	141	T	67.8 (20.0)

Spruce

outfall	turb	—	pH	—
	C	—	T	—
wetland	turb	1.02	pH	7.93
	C	32	T	70.7 (21.5)
blank	turb	0.27	pH	7.89
	C	0.0	T	76.0 (24.4)
std	C	1127/1000		

(°C) calc