

# HAINES BOROUGH STORMWATER INFRASTRUCTURE REPORT



February 2019

ACWA Grant # 18-09

Prepared by:

Takshanuk Watershed Council



## ACKNOWLEDGEMENTS

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Haines Borough Public Works Staff including Scott Bradford, Dennis Durr, Will Hickman, and Brad Ryan for their assistance in identifying stormdrain locations and flow directions.

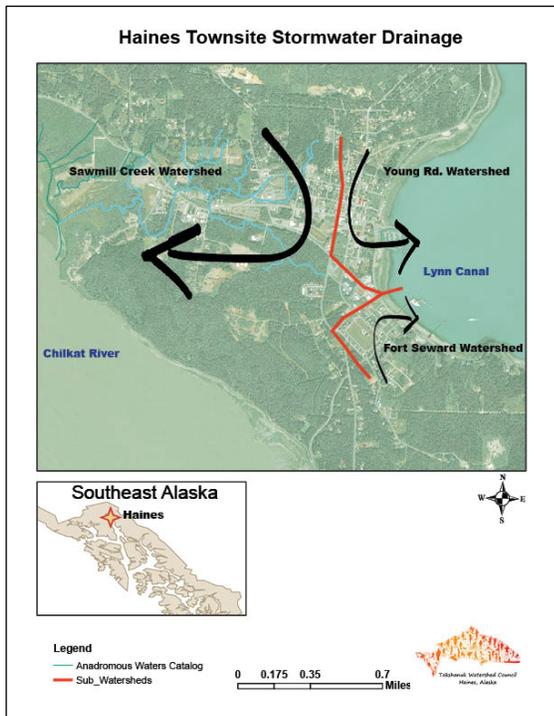
Holly Smith, Haines Borough Planner, for her assistance in incorporating the stormwater infrastructure map elements into the Borough's ArcGIS online mapper.

John Hudson, Southeast Alaska Watershed Coalition, for providing BMP recommendations and design assistance.

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## INTRODUCTION

Haines is a small community with approximately 2,500 residents, the majority of which live in or around the Haines townsite. The townsite covers approximately 850 acres of mostly low lying land on the Chilkat Peninsula isthmus and is bound by the Chilkat River to the west and the Lynn Canal to the east. Most development has been focused within the Haines townsite and has included stormwater infrastructure such as stormdrains, drainage ditches, and inlet and outlet pipes with many conveying



**Figure 1: The approximate sub-watersheds and direction of stormwater flow in the Haines townsite.**

stormwater discharge directly into either Lynn Canal or Sawmill Creek, which flows into the Chilkat River (Fig.1). Prior to this assessment there was no comprehensive map showing the location and direction of flow of the stormwater infrastructure within the Haines townsite.

Stormwater, which is the excess surface flow from rain and snowmelt that does not infiltrate, picks up pollutants such as trash, chemicals, oils, and dirt/sediment as it is conveyed from its source to its outlet. These pollutants can impact surrounding water quality and were noted as potential concerns in the 2007 Sawmill Creek Water Quality Monitoring Strategy report prepared by the Takshanuk Watershed Council (TWC, 2007). Although Sawmill Creek has since been moved from an Alaska Department of Environmental Conservation (ADEC) Category 4b (impaired water with other pollution controls) to a Category 2 (attaining water quality), it is still a concern to protect and maintain the water quality and aquatic habitat of Sawmill Creek and the surrounding watersheds. To date, limited water quality assessment

data has been collected in Lynn Canal and data that has been collected consists of ADEC Beach monitoring focused on fecal coliform and enterococcus bacteria, which are not target pollutants of stormwater runoff.

This survey looked to identify the stormwater inlets, outlets, direction of flow, contributing drainage area, and sediment-source areas to better inform stormwater management within the Haines Townsite. Maps with all information collected are available on the Haines Borough's website.

## METHODS

The TWC used a Garmin GPS map 60CSx handheld Global Positioning System (GPS) to collect the location of all stormdrains, inlets, and outlets within the Haines townsite. The townsite was divided into sub-watersheds as defined from previous knowledge of stormwater flow direction and then confirmed through survey data collection. The Haines Townsite Stormwater Mapping Inventory and Assessment data sheet (Appendix C) was utilized in the field to collect all data. Each point of interest was given a unique number and coded in the GPS according to its type. Photo documentation was collected of notable features and numbered according to the GPS site number.

Back at the office GPS data points were uploaded to ArcMap 10.3 and projected in the WGS 1984 coordinate system. Each of the mapped sub-watersheds is described in more detail in this report. The size of the drainages and contributing area of outlets were estimated using the measuring tool in ArcMap 10.3. For the purposes of this assessment, a sub-watershed is defined as an area in which all stormwater run-off is collected and transported to a single discharge point or waterbody.

The recent Haines Harbor upgrade drainage plans and Port Chilkoot Cruise Ship dock upgrades were georeferenced and incorporated into the map.

## DESCRIPTION BY SUB-WATERSHED

### *Young Road Sub-watershed*



The Young Road sub-watershed is approximately 150 acres and is bound by Mt. Ripinski to the north and Lynn Canal to the east. The main direction of flow in this sub-watershed is south and then east with a final discharge into Lynn Canal. This sub-watershed includes the downtown business district of Haines and contains the majority of impervious surface within the Haines townsite (Fig 2).

There are two identified locations where stormwater best management practices (BMP's) could be utilized.

1. Top of Young Road: Most of the roads above Young Rd. are not paved and contribute sediment into the Young Rd. drainage system. Additionally, the location of a gravel

extraction pit at the head of Young Rd. could pose as a potential sediment source area.

Recommended BMP:

- The ditches and culverts that contribute stormwater into Young Rd. should be evaluated for the potential of a bioswale or similar green infrastructure technique that would allow sediment and pollutants to settle out before entering the Young Rd. drainage system.



Figure 3: Harbor Outlet Contributing Area.

2. Haines Harbor outlet culvert: Through upgrades to the Haines Harbor waterfront area a new culvert has been installed at the southern end of the Harbor parking lot (Image



Image 1: Outlet culvert at Harbor parking lot, looking north

1). This culvert drains the majority of stormwater flowing from downtown Haines bound by 3<sup>rd</sup> Ave and Willard St. This area encompasses approximately 55 acres. Stormwater is conveyed into a single “mega ditch” that flows along Mission St. and connects with the new Harbor drainage system (Fig. 3). BMP’s that are already in place in this system include a grate in the ditch at the southern corner of Mission St. and 1<sup>st</sup> Ave to collect large debris and an oil-water separator within the new Harbor drainage system that filters stormwater before it outlets onto the beach. The oil-water separator, however, does not trap sediment from the stormwater.

Recommended BMP:

- Explore options for dispersing stormwater from the outlet of the harbor culvert into adjacent tidelands. The intact tidelands in this area could act as a sediment and pollutant retention area that would reduce these inputs into Lynn Canal. See Image 2 that shows a stitched-together panorama of the outlet. Currently the flow is not dispersing and is directed back into the



Image 2: Panorama of the Harbor outlet culvert



however it should be monitored to ensure these remains sufficient.

2. DOT Yard: Sawmill Creek was diverted through a culvert running perpendicular to the DOT yard driveway (Image 4). The year this occurred is unknown. The driveway and parking area is not paved and drains into a grate at the top of the culvert. This is a significant sediment source for Sawmill Creek. This sediment source was listed in the 2009 Sediment Sources for Sawmill Creek report (TWC, 2009) and 2014 Haines and Skagway Area Restoration Opportunities Report (TWC, 2014).



Image 4: DOT Yard Culvert Location

Recommended BMP:

- The DOT culvert should be either replaced with a closed-top culvert or removed and the stream daylighted with additional BMP's such as a bioswale and/or riparian buffer to reduce the input of sediment into the channel.

3. Union St. AWC Ditch: The ditch running along Union St. next to the Alaska Marine Lines shipping yard is listed in the Anadromous Waters Catalog for Coho Salmon (Image 5). Road sediment and sediment-laden snow gets deposited in this ditch. Image 6 provides an example of the amount of sediment that is plowed into this channel. This sediment source was listed in the 2009 Sediment Sources for Sawmill Creek report (TWC, 2009).



Image 4: Union St. ditch near AML facility

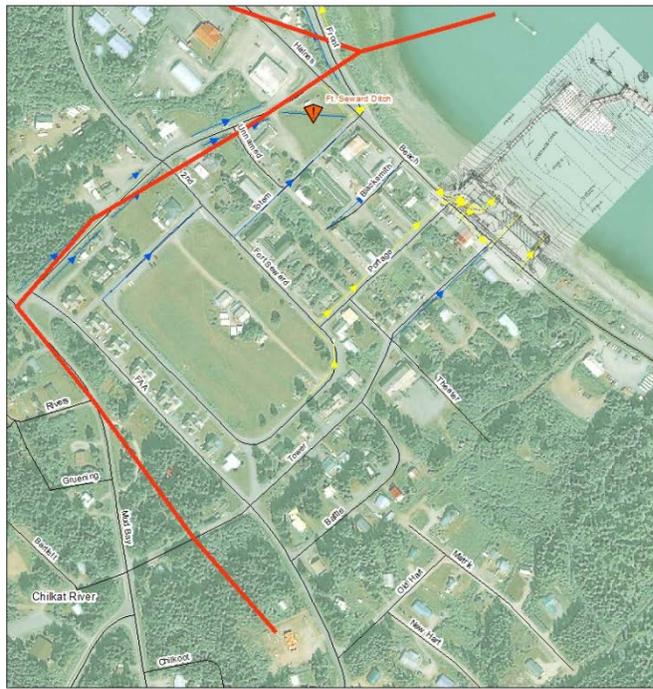
Recommended BMP:

- Explore options for rerouting the AWC listed ditch along Union St. near the AML facility. There have been discussions with ADFG about possible relocation of the AWC listed ditch to reduce sediment input. Alternative locations should be evaluated.

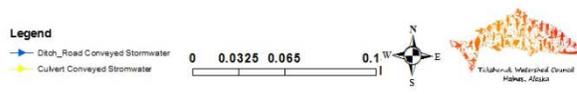


Image 3: Culvert outlet at the AML driveway along Union St.

*Fort Seward Sub-Watershed*



**Fort Seward Sub-Watershed**



**Figure 5: Fort Seward sub-Watershed**

The Fort Seward sub-watershed is the smallest of the three townsite drainages covering approximately 45 acres (Fig. 5). Flow from around the Fort Seward Parade Grounds is directed mainly through ditch or road surface to a series of culverts about outlets at the Cruise Ship dock. Plans for the newest renovations of the Cruise Ship dock are included in the map. There are three main outlets that discharge stormwater onto the beach and into Lynn Canal. A fourth outlet collects ditch runoff from Mud Bay rd. and directs it to the beach at the corner of Totem and Beach rd. Two snow removal bioswales have been installed by TWC through ACWA grant 17-04 at the top corners of the Parade Grounds. This BMP was identified in the Haines Borough Snow Removal Plan (TWC & SAWC, 2015).

We have identified one location where stormwater best management practices (BMP's) could be utilized.

1. The diagonal drainage ditch at the bottom of Mud Bay rd. discharges a substantial amount of stormwater onto the beach, through a culvert under Beach Rd. This location would be well suited for a bioswale or sediment-retention wetland to allow sediment to settle out before reaching its outlet on the beach of Lynn Canal. The vegetation on the beach does allow for some filtration and dissipation of flow, however reducing pollutants before they reach the beach would be ideal from a water quality standpoint.

**CONCLUSION**

Urbanization and the increase in impervious surfaces reduces the ability of stormwater to infiltrate into soil. This often increases the velocity of the runoff and can result in erosion that picks up pollutants such as trash, chemicals, oils, and dirt/sediment as it is conveyed from its source to its outlet. The instillation of BMP's help reduce the impact of stormwater runoff by allowing it to slow-down, sediments and pollutants can be retained, and water to infiltrate into the soil. For communities such as Haines, that receive an average of 49 inches of rain per year, the instillation of BMP's can help improve the surrounding water quality (US Climate Data, 2019).

The TWC recognizes that as new stormwater information is available the maps and data presented in this document may need to be updated. This is not intended to be a static document, but rather improved as additional stormwater information is collected.

## STORMWATER RESOURCES

- ADEC Resources for Stormwater & Water Quality:  
<http://dot.alaska.gov/stwddes/desenviron/resources/stormwater.shtml>
- EPA National Menu of Best Management Practices (BMPs) for Stormwater:  
<https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#edu>

## REFERENCES

ADFG (2018) Fish Resource Monitor. Anadromous Waters Catalog.

<https://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=main.interactive>

TWC (2007) Water Quality Monitoring Strategy, Sawmill Creek, Haines, Alaska. Takshanuk Watershed Council. Funding through Alaska Department of Environmental Conservation, Alaska Clean Water Actions grant report 08-11.

TWC (2009) Sediment Sources in the Sawmill Creek Watershed Haines, Alaska. Takshanuk Watershed Council. Funding through Alaska Department of Environmental Conservation, Alaska Clean Water Actions grant report 09-10.

TWC (2014) Haines and Skagway Area Restoration Opportunities Report. Takshanuk Watershed Council.

TWC & SAWC (2015). Haines Borough Snow Removal Plan. Takshanuk Watershed Council and Southeast Alaska Watershed Coalition. Funding through Alaska Department of Environmental Conservation, Alaska Clean Water Actions grant.

US Climate Data (2019) U.S. Climate Data – Temperature, Precipitation, Sunshine, Snowfall. Retrieved from: <https://www.usclimatedata.com/climate/haines/alaska/united-states/usak0101>

## APPENDIX A

Survey data collected in 2018.

Name	Comment	Elevation	Category	Road
1	08-JUN-18 9:25:55In	91.21	INLET	Young. Rd.
2	08-JUN-18 9:28:30Cbc	71.023	CB	Young. Rd.
3	08-JUN-18 9:29:53Cbc	65.014	CB	Young. Rd.
4	08-JUN-18 9:35:34Cbc	54.2	CB	Young. Rd.
5	08-JUN-18 9:40:35In	52.277	INLET	Young. Rd.
6	08-JUN-18 9:48:52Cbc	43.385	CB	Young. Rd.
7	08-JUN-18 9:50:47Cbc	40.741	CB	Young. Rd.
8	08-JUN-18 9:52:11Cbc	38.338	CB	Young. Rd.
9	08-JUN-18 9:53:18Cbc	41.222	CB	Young. Rd.
10	08-JUN-18 10:06:13Cbr	42.904	CB	Lynnview
11	08-JUN-18 10:08:12Cbr	43.385	CB	Lynnview
12	08-JUN-18 10:10:10Cbr	42.904	CB	Lynnview
13	08-JUN-18 10:17:14Cbr	45.548	CB	Lynnview
14	08-JUN-18 10:19:23Cbr	42.904	CB	Lynnview
15	08-JUN-18 10:21:46Cbr	42.904	CB	Lynnview
16	08-JUN-18 10:25:23Cbr	41.703	CB	Lynnview
17	08-JUN-18 10:26:24Cbr	41.462	CB	Lynnview
18	08-JUN-18 10:28:55Cbr	39.78	CB	View
19	08-JUN-18 10:29:36Cbr	40.741	CB	View
20	08-JUN-18 10:31:45Cbr	40.501	CB	View
21	08-JUN-18 10:33:31Cbr	42.904	CB	View
22	08-JUN-18 10:35:30Cbc	45.067	CB	2nd Ave

23	08-JUN-18 10:37:25Out	43.625	OUTLET	View
24	08-JUN-18 10:40:25Cbc	46.509	CB	2nd Ave
25	14-JUN-18 13:14:22Cbr	17.67	CB	4th Ave
26	14-JUN-18 13:19:47Cbr	17.91	CB	4th & Main
27	14-JUN-18 13:23:02Out/in	19.352	OUT/IN	4th Ave
28	14-JUN-18 13:26:42Ditch/Out	20.554	OUTLET	4th & Dalton
29	14-JUN-18 13:28:27Ditch/in	20.313	INLET	4th & Dalton
30	14-JUN-18 13:33:27Ditch/in/out	23.678	OUT/IN	4th & Union
31	14-JUN-18 13:36:03Cb	25.12	CB	4th & Union
32	14-JUN-18 13:39:31In/out	25.36	OUT/IN	4th & Union
33	14-JUN-18 13:42:09In/out	23.438	OUT/IN	4th Ave
34	14-JUN-18 13:45:13Cbr	26.081	CB	4th Ave
35	14-JUN-18 13:46:42Out	25.841	OUTLET	4th Ave
36	14-JUN-18 13:53:42Cbr	28.004	CB	4th Ave
37	14-JUN-18 13:59:10Out	29.446	OUTLET	4th Ave
38	14-JUN-18 14:02:53In	30.167	INLET	4th & View
39	14-JUN-18 14:04:01Cbr	29.686	CB	4th & View
40	14-JUN-18 14:06:57Cbr	28.965	CB	4th & View
41	14-JUN-18 14:07:57Out	28.965	OUTLET	4th & View
42	14-JUN-18 14:11:30Cbr	30.648	CB	View
43	14-JUN-18 14:14:11Cbr	29.446	CB	View
44	14-JUN-18 14:18:02Cbr	31.849	CB	3rd & View
45	14-JUN-18 14:20:18Cbr	29.927	CB	3rd Ave
46	14-JUN-18 14:23:27Cbr	29.686	CB	3rd Ave

47	14-JUN-18 14:25:57Out	29.206	OUTLET	3rd Ave
48	14-JUN-18 14:28:10Cbr	28.725	CB	3rd Ave
49	14-JUN-18 14:30:37In	28.244	INLET	3rd Ave
50	14-JUN-18 14:31:45Cbr	28.004	CB	3rd Ave
51	14-JUN-18 14:33:23Out	27.283	OUTLET	3rd & Union
52	09-JUL-18 13:19:05Cbr	-10.208	CB	4th & Main
53	09-JUL-18 13:22:50Cbr	-2.518	CB	3rd & Main
54	09-JUL-18 13:28:06Cbr	5.653	CB	3rd & Dalton
55	09-JUL-18 13:30:09Cbr	7.095	CB	3rd & Dalton
56	09-JUL-18 13:35:10Cbr	11.421	CB	Dalton
57	09-JUL-18 13:37:00cb	12.863	CB	3rd Ave
58	09-JUL-18 13:39:34Cb	12.383	CB	3rd Ave
59	09-JUL-18 13:41:32Cb	15.026	CB	3rd & Union
60	09-JUL-18 13:48:40Cbr	24.88	CB	2nd Ave
61	09-JUL-18 14:01:16In	13.584	INLET	View
62	09-JUL-18 14:02:29Out	14.786	OUTLET	View
63	09-JUL-18 14:08:47Cbr	14.305	CB	Union
64	09-JUL-18 14:12:12Cbr	3.25	CB	Front
65	09-JUL-18 14:16:40Out	4.692	OUTLET	Front
66	09-JUL-18 14:17:21In	2.289	INLET	Front
67	09-JUL-18 14:19:17Out	2.529	OUTLET	Front
68	09-JUL-18 14:21:07In	2.289	INLET	Front
69	09-JUL-18 14:41:14In	6.134	INLET	Front
70	09-JUL-18 14:45:46Out	5.653	OUTLET	Front
71	09-JUL-18 14:47:13In	6.134	INLET	Front

72	09-JUL-18 14:48:06	Out	3.731	OUTLET	Front
73	09-JUL-18 14:50:08	In	5.653	INLET	Front
74	09-JUL-18 14:52:34	Out	6.134	OUTLET	Front
75	09-JUL-18 14:55:01	Out	3.49	OUTLET	Front
76	09-JUL-18 14:55:56	Out	2.049	OUTLET	Front
77	09-JUL-18 14:56:44	In	4.452	INLET	Front
78	09-JUL-18 15:06:29	In	5.413	INLET	Front
79	09-JUL-18 15:09:50	Cbr	16.949	CB	Dalton
80	09-JUL-18 15:12:13	Out	6.134	OUTLET	Dalton & Front
81	09-JUL-18 15:15:37	Cbc	28.965	CB	2nd Ave
82	09-JUL-18 15:17:03	Cbc	32.089	CB	2nd Ave
83	09-JUL-18 15:18:12	Cbr	30.648	CB	2nd Ave
84	09-JUL-18 15:19:32	Cbc	28.004	CB	2nd & Dalton
85	09-JUL-18 15:20:34	Cbr	29.446	CB	Dalton
086A	16-JUL-18 14:25:12	In	16.228	INLET	Union
87	16-JUL-18 14:28:00	Out	12.383	OUTLET	6th
88	16-JUL-18 14:32:10	Out	10.941	OUTLET	6th & Dalton
89	16-JUL-18 14:32:58	In	11.181	INLET	6th & Dalton
90	16-JUL-18 14:43:38	Out	11.902	OUTLET	6th
91	16-JUL-18 14:47:59	Out	11.902	OUTLET	6th
92	16-JUL-18 14:49:57	In	13.825	INLET	6th
93	16-JUL-18 15:08:34	Cbr	19.592	CB	5th & Main
94	16-JUL-18 15:09:53	Cbr	20.073	CB	5th & Main
95	16-JUL-18 15:13:11	Cbr	20.554	CB	5th & Main
96	16-JUL-18 15:16:45	Cbr	20.073	CB	6th & Main

97	16-JUL-18 15:18:33Cbr	18.631	CB	6th & Main
98	16-JUL-18 15:22:32Cbr	18.391	CB	6th & Main
99	16-JUL-18 15:28:59Cbc	13.584	CB	Main
100	16-JUL-18 15:30:41Cbc	14.305	CB	Main
101	16-JUL-18 15:31:22Cb	13.104	CB	Main
102	16-JUL-18 15:32:59Cbc	12.863	CB	Main
103	16-JUL-18 15:35:44cb	13.344	CB	Main
104	16-JUL-18 15:37:17Cbc	13.344	CB	Main
105	16-JUL-18 15:40:58Cbr	11.662	CB	Main
106	16-JUL-18 15:59:37Cbr	23.918	CB	3rd & Main
107	16-JUL-18 16:02:59Cbr	24.88	CB	2nd & Main
108	16-JUL-18 16:04:21Cbr	25.601	CB	2nd & Main
109	16-JUL-18 16:06:39Cbr	25.36	CB	2nd & Main
110	16-JUL-18 16:09:14Cbr	26.802	CB	2nd & Main
111	16-JUL-18 16:13:12Cbr	22.957	CB	Main
112	16-JUL-18 16:14:30Cb	22.476	CB	1st & Main
113	16-JUL-18 16:17:07Cbc	13.825	CB	Main & Front
114	16-JUL-18 16:18:32Cbr	13.344	CB	Main & Front
115	16-JUL-18 16:22:10Cbr	23.197	CB	Main
116	16-JUL-18 16:23:51Cbc	26.802	CB	Main
117	25-SEP-18 13:19:15Cbr	18.631	CB	Townhouse
118	25-SEP-18 13:27:51Cbr	15.267	CB	Willard
119	25-SEP-18 13:29:51Cbr	15.267	CB	2nd & Willard
120	25-SEP-18 13:35:28CB	14.546	OUT/IN	2nd & Willard
121	25-SEP-18 13:39:48Cbr	15.267	CB	2nd & Willard

122	25-SEP-18 13:40:36Cbr	15.267	CB	2nd & Willard
123	25-SEP-18 13:45:00Cbr	12.623	CB	2nd
124	25-SEP-18 13:46:49Cbr	10.7	CB	2nd
125	25-SEP-18 13:55:35Cbr	9.258	CB	2nd
126	25-SEP-18 13:57:00Cbr	9.499	CB	2nd & Mission
127	25-SEP-18 14:00:37Out	8.297	OUTLET	2nd & Mission
128	25-SEP-18 14:01:57Cbr	8.778	CB	2nd & Mission
129	25-SEP-18 14:04:30Cbr	9.739	CB	2nd
130	28-SEP-18 15:37:02Out	-15.976	OUTLET	Harbor
131	03-OCT-18 13:33:48Cbr	10.22	CB	1st
132	03-OCT-18 13:34:56Cbr	9.979	CB	1st
133	03-OCT-18 13:35:24Cbr	10.22	CB	1st
134	03-OCT-18 13:37:23Cbr	11.181	CB	Willard
135	03-OCT-18 13:38:29Cbr	8.537	CB	1st
136	03-OCT-18 13:41:00Cbr	9.258	CB	1st
137	03-OCT-18 13:44:45Cbr	8.057	CB	1st
138	03-OCT-18 13:46:31Cbr	7.095	CB	1st & Mission
139	03-OCT-18 13:48:06In	7.095	INLET	1st & Mission
140	03-OCT-18 13:52:51Cbr	8.297	CB	1st
141	03-OCT-18 14:01:18Cbr	9.499	CB	Haines Hwy
142	03-OCT-18 14:03:58Cbr	8.537	CB	Haines Hwy
143	03-OCT-18 14:07:00Cbr	8.297	CB	Haines Hwy
144	03-OCT-18 14:08:24Cbr	8.778	CB	Haines Hwy
145	03-OCT-18 14:10:45Cbr	7.816	CB	Haines Hwy
146	03-OCT-18 14:12:09Cbr	8.297	CB	2nd

147	02-NOV-18 14:50:03Cbr	0	CB	Fort Seward
148	02-NOV-18 14:52:04Cbr	0	CB	Fort Seward
149	02-NOV-18 14:56:55Out	0	Outlet	Beach
151	02-NOV-18 15:07:17Cbc	0	CB	Beach
153	02-NOV-18 15:08:30Cbc	0	CB	Beach
154	02-NOV-18 15:08:57Cbc	0	CB	Beach
155	02-NOV-18 15:09:27Cbc	0	CB	Beach
156	02-NOV-18 15:09:54Cbc	0	CB	Beach
159	02-NOV-18 15:11:50Cbc	0	CB	Beach
160	02-NOV-18 15:45:09Out	0	Outlet	Front
161	02-NOV-18 15:46:50Out	0	Outlet	Front
162	27-NOV-18 15:05:27Cbc	0	CB	Front
163	27-NOV-18 15:06:04Cbc	0	CB	Front
164	27-NOV-18 15:07:37Cbc	0	CB	Front
165	27-NOV-18 15:08:33Cbc	0	CB	Front
166	27-NOV-18 15:09:00Cbc	0	CB	Front
167	27-NOV-18 15:12:04Cbc	0	CB	Front
168	27-NOV-18 15:13:01Cbc	0	CB	Front
169	27-NOV-18 15:13:50Out	0	Outlet	Front
170	27-NOV-18 15:14:23Cbc	0	CB	Front
171	27-NOV-18 15:14:58Cbc	0	CB	Front
172	27-NOV-18 15:16:08Cbc	0	CB	Front
173	27-NOV-18 15:19:10Out	0	Outlet	Front & Beach
174	27-NOV-18 15:20:11Cbc	0	CB	Haines Hwy
175	27-NOV-18 15:20:49Cbc	0	CB	Haines Hwy

176	27-NOV-18 15:23:04Cbc	0	CB	Front
177	Manual Addition	0	CB	Portage
178	Manual Addition	0	CB	Portage
179	Manual Addition	0	CB	Portage
180	Manual Addition	0	CB	Portage
181	Manual Addition	0	CB	Fort Seward
182	Manual Addition	0	Outlet	Beach
183	Manual Addition	0	CB	Beach & Portage
184	Manual Addition	0	Outlet	Beach
185	Manual Addition	0	CB	Beach

## APPENDIX B

Photos of sites not previously mentioned in report.



Site 8: Corner of Young rd. & Lynnview



Site 27: 4<sup>th</sup> Ave. outlet & inlet



Site 29: 4<sup>th</sup> & Dalton. Culvert has been damaged and sediment is being deposited in the drainage ditch.



Site 30: 4<sup>th</sup> & Union. Multiple outlet pipes into ditch



Site 35: 4<sup>th</sup> Ave. Outlet and inlet pipes show high sedimentation.



Site 61: View St. Outlet with highly erosive ditch.

**APPENDIX C**

Stormwater survey data collection sheet.

Haines Townsite Stormwater Mapping Inventory/Assessment						
Date:			Investigators:			
Time of Last Rain: <i>Circle one</i>	<24hrs	Location of Survey Start:				
	<48hrs					
	>48hrs	Area Receiving:	stream/river	woodland	ditch	
	>72hrs	<i>Circle one</i>	wetland	swale	other:	
GPS Code- <b>CB</b> : Catchbasin, stormdrain <b>C</b> -curb, <b>R</b> -road <b>OF</b> : outflow <b>IF</b> : inflow <b>SS</b> : sediment source						
Map of Survey Area: <i>include start location, road names, GPS point #'s, photo #'s, flow direction, catchbasin inflow/outflow pipe size, depth, condition, sediment sources, BMP's in place, any other notable features</i>						
Comments:						