Kensington Mine
2018 Annual Report

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For:
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3. Mountain Goat Population Monitoring near the Kensington Mine, Alaska – February, 2017, ADFG
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References

1. Coeur Alaska, Inc., 2018, Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2018.
2. Coeur Alaska, Inc., 2018, Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary 2017 Volume 2: Water Quality Data.

Introduction

The Kensington Mine is owned and operated by Coeur Alaska, Inc. (Coeur) a wholly owned subsidiary of Coeur Mining. The project is located on the western and southern flanks of Lions Head Mountain; between Berners Bay and Lynn Canal; and in the drainages of Johnson, Sherman, and Slate Creeks (See Figure 1-2). Coeur has prepared this annual report to comply with requirements of the U.S. Forest Service (USFS) Plan of Operations (POO) for the Kensington Mine.

The Kensington Mine received authorization under the POO on June 13, 2005. The Final Supplemental Environmental Impact Statement, U.S. Forest Service Record of Decision and all necessary major permits were issued prior to year-end 2005. Coeur issued construction contracts and ground breaking was initiated during July 2005.

Following a suspension of construction activities during the litigation process for the 404 Permit, construction activities at the Tailings Treatment Facility (TTF) that resumed in 2009 were completed in the third quarter of 2010 and operations of the facility began in June of 2010. Gold production operations continued throughout 2018 consistent with the approved POO.

Section 1.0 contains a synopsis of the activities conducted at the Kensington Mine during calendar year 2018, and Section 2.0 contains projections of activities planned for calendar year 2019.

Summary of 2018 Activities

1.0 Public Safety

Public access to the mine site is managed as defined in the established Public Access Control Plan. Public access to the site must be controlled to ensure the safety of the public. Hazards such as truck traffic, blasting, barge and tug operations, and earthwork could result in physical harm to unauthorized visitors.

During 2018, personnel accessed the site via boat and rotary wing aircraft. Agency inspections and other public personnel generally accessed the site by fixed winged aircraft and boat.

Supplies and equipment for the facility are delivered by barge to the Slate Creek Cove Marine Terminal.

2.0 Construction Activities

The Tailings Treatment Facility (TTF) Stage 3 construction occurred during 2018. Stage 3 construction consisted of raising the existing dam by 25 feet along with the construction of a final closure spillway. The final closure spillway was constructed with Roller Compacted Concrete (RCC) and structural concrete.

Construction of a power house building to house new primary generator engines was completed in 2018. The current generators are planned to be replaced with a new power plant consisting of four (4) new Electro Motive Diesel (EMD) 3728 Kilowatt (kW) diesel-fired engines. One of the four engines will be used as a backup while three operate continuously. Transition from the existing generators to the new EMD generators is planned for the 1st quarter of 2019.

A carpenter shop was completed in the camp area in 2018. Carpentry supplies and tools are planned to be located in the shop. The carpenter shop that is currently located at Pit-4 is planned to be dismantled in 2019.

Graphitic Phyllite that was excavated during the construction of the stage 1 and 2 Tailings Treatment Facility is currently stored in sealed containments at Pit 4 and the Mud dump area. A pug mill plant was commissioned in 2016 and operated in 2018 to help facilitate the mixing of the graphitic phyllite with cement prior to placement into underground open stopes as final disposal of the material. Approximately 36,554 tons of graphitic phyllite was mixed in the pug plant and placed within the underground stopes in 2018.

The majority of the surface disturbance associated with construction was completed in 2005 and 2006 as outlined in the project disturbance summary Table 1. No additional wetlands were filled during 2018. No new disturbance occurred in 2018.

2.1 Storm Water Controls

Operations on both the Jualin and Comet sides of the Kensington Mine were conducted in compliance with the Storm Water Pollution Prevention Plan (SWPPP) requirements. Both temporary construction Best Management Practices (BMPs) and sediment pond BMPs were utilized to control excess sediment production from disturbed areas that otherwise might enter waters of the state. A full description of storm water controls can be found in the Storm Water Pollution Prevention Plan (SWPPP) for the Kensington Gold Project, August 2016. Coverage was gained under the new MSGP 2015 general permit number AKR06000 during 2015 and continued in 2018.

Sediment ponds and silt fences were maintained, and existing check dams were also maintained throughout the site. Designs for these construction BMPs are discussed in the SWPPP. Most operational (long-term) sediment ponds were constructed during 2005, and all were constructed as designed in the SWPPP Addendum B.

The nature of construction BMPs is transitory; i.e., they change in response to site conditions and the rapidly evolving ground conditions encountered during construction. Therefore, designs are dependent on site conditions, which may change day by day.

Operational BMP sediment ponds have been implemented throughout the site as described in the site SWPPP.

In addition to SWPPP monitoring and inspections, site receiving water monitoring was also conducted in accordance with the current site APDES permit to further document compliance with state water quality standards. Receiving water sampling data are discussed below under APDES monitoring (section 9.1).

2.2 Corps of Engineers Wetland Disturbance

An annual summary of wetland areas impacted and reclaimed is a requirement of the Corps of Engineers (COE) 404 fill permit. Wetland areas impacted are tallied in Table 2. Overall, total fill in waters of U.S. as of December 2018 is 77.6 acres. No additional wetland fill occurred in 2018.

2.3 Access Corridors

Road improvements during 2018 were an ongoing priority of the project. Continued road surfacing and interim reclamation seeding were major improvements to the road projects in 2018. The maintenance of storm water BMPs along the Jualin and Kensington access corridors were also a major ongoing priority for 2018.

3.0 Mine Operations

3.1 Ore Production

Mine operations occurred in all 12 months during 2018. Approximately 651,515 tons of ore was mined in 2018.

3.2 Development Rock Production

A total of approximately 368,569 tons of development rock was mined in 2018. Approximately 166,119 tons of development rock was brought to the surface and placed into stockpiles and 202,450 tons were placed underground as backfill. Development rock sample results for 2018 are contained in Table 4.

3.3 Dust Suppression Activities

Road watering was conducted as required via a water wagon to control any fugitive dust. Dust suppression activities occurred on a limited number of occasions during the summer months of 2018.

3.4 Surface and Underground Drilling

A total of 153,668 feet of core drilling was completed in the period of January through December of 2018. The drilling was comprised of production and exploration programs.

The 2018 underground production drilling program included 65,713 feet. This drilling was completed by contracted drilling company using NQ and HQ core drill tooling. This program was accessed in the Kensington up-ramp and down-ramp.

The 2018 underground exploration drilling program total drill footage was 87,955 feet. This was also completed under a drilling contract and used NQ and HQ core tooling. The underground exploration drilling was completed from various drill stations including the 520 level, 990 level, and 1170 level exploration drill sites.

The 2018 surface exploration drilling program consisted of seven drill holes for a total drilled footage of 2,345.5 feet. The drilling was completed from two drill pads, both located on private land.

4.0 Mill Operations

Mill operations occurred in all 12 months during 2018. Approximately 664,707 tons of ore was processed through the mill facility in 2018.

4.1 Gold Production

Approximately 19,317 tons of concentrate was shipped from the Kensington mine to an off-site refinery. Of the 19,317 tons of concentrate shipped off-site, approximately 113,138 ounces of gold was contained. In addition to the gold contained in the concentrate, the gravity circuit within the mill facility produced approximately 3,631 ounces of gold for a total gold production of 116,770 ounces in 2018.

4.2 Tailing Production

Approximately 393,501 tons of tailings were conveyed to the Tailings Treatment Facility and 215,465 tons of tailings were conveyed to the underground paste plant for disposal in the underground stopes during 2018. Tailings samples were collected in each of the four quarters of 2018 and there results are contained in Table 5.

5.0 Solid/Hazardous Waste Generation and Transport

An Integrated Waste Management and Disposal Plan dated August 2018 provides a description for the disposal of wastes from the Kensington Mine in accordance with the regulations in 18 AAC 60. A Waste Management Permit was issued by ADEC on September 20, 2013.

Solid waste was generated from the Comet and Jualin sides of the Kensington Mine, including: incinerator ashes, construction debris, worn cable, tires, and scrap metal. This material was managed in accordance with the approved ADEC Waste Management Permit. These materials were shipped to Juneau, then transported to disposal facilities or otherwise managed according to controlling regulations and permits.

Hazardous waste, including Universal waste, generated at the site included:

- Lead/acid, nickel, cadmium, and lithium ion batteries
- Florescent and metal halide lamps
- Paint and paint related waste

- Wastes associated with the assay laboratory
- Water Treatment Plant laboratory waste
- Computer backup power supplies

6.0 Tailings Treatment Facility

Following the favorable decision from the Supreme Court, the Army Corp of Engineers (ACOE) issued Permit Modification POA-1990-592-M6 and lifted the suspension of Permit Modification POA-1190-592-M on August 14, 2009. Construction activities on the tailings treatment facility began after the issuance of the permit modification and continued until the 3rd quarter of 2010 at which time operation of the facility began. Operation of the facility began in June of 2010 and continued throughout 2018.

Engineering and permitting of the Stage 3 dam raise was conducted in 2016 and 2017 with a final design report being submitted to Alaska Dam Safety, ADNR, and Forest Service on April 31, 2017. A Certificate of Approval to Modify a Dam was issued by ADNR on May 2, 2018.

7.0 Compliance

No notices of violations were issued to Coeur Alaska during 2018. All reporting was completed as required by permit conditions. One component of this document is the reporting of spills. Each spill that occurred during 2018 was taken very seriously and all site resources were utilized, as appropriate for each occurrence. The spills were all properly reported and cleaned up in accordance with ADEC guidelines (Table 3).

During the 2018 year, the following six guidelines were updated in various aspects of environmental management at the site to ensure permit compliance:

- Bear Avoidance SOP
- Hazardous and Non-Hazardous Waste Handling SOP
- Spill Response Notification SOP
- Purchasing New Products or Chemicals or Materials SOP
- Environmental Samples Shipping SOP
- Hazardous Waste Manifest Procedure SOP

The Intelex tracking system was populated with new and/or revised permit requirements and reminders during 2018. The tracking system sends email reminders to employees responsible for the completion of the permit requirements to ensure site permit compliance.

8.0 Reclamation

No permanent concurrent reclamation was performed in 2018; however, interim seeding stabilization associated with topsoil stockpiles, road ditches, area adjacent to Tailings Treatment Facility, access roads, and tailings conveyance pipeline route was performed as a BMP under the approved SWPPP plan.

Approval was issued by the Forest Service and State of Alaska for the revised reclamation plan dated April 2013. A financial guarantee in the amount of $28,727,011 was submitted and approved by the Forest Service in 2013. An amendment was approved by ADNR for the Pit-4 waste rock stockpile and an additional financial guarantee for $195,988 was posted on October 2, 2017 for the reclamation plan amendment. No amendments were completed in 2018.

8.1 Revegetation Test Plots

Revegetation test plots were constructed in July of 2013 in the Snow-Slide Gulch area to evaluate the reclamation methods proposed in the reclamation and closure plan. Reclamation test plot monitoring was conducted early summer through late fall of 2018. All sites demonstrated stable conditions with slight to no erosion noted. When compared to 2017, in 2018 more coverage occurred. The highest percent coverage in 2018 was 95, whereas in 2017 the greatest percent cover was 50. Plot #3 demonstrated the greatest percent coverage with a peak of 95. However, the majority of the coverage can be attributed to alder establishment. As suspected, Plot #3 also demonstrated the highest stability of the three plots. Plot #1 demonstrated the second highest percentage of grass growth and the second most stable soil. In 2018, Plot #2 exhibited the least amount of grass growth and the least stable soil conditions. The monitoring results are contained in attachment 4. On-going monitoring of the test plots are planned for 2019.

9.0 Monitoring

9.1 APDES

The Alaska Pollutant Discharge Elimination System (APDES) permit number AK0050571 was renewed in 2017 with the new permit being issued on August 1, 2017. Results of the extensive monitoring program are contained in the Kensington Gold Project APDES permit AK-005057-1 Volume 1: Aquatic Resource Surveys and Volume 2: Water Quality Data of the APDES Annual Water Quality Monitoring Summary 2018 (Coeur, 2018). These reports will be submitted to the US Forest Service, Juneau under separate cover.

9.2 Fresh Water

Fresh water monitoring requirements are contained within the USFS POO. Monitoring performed for the APDES permit are summarized in the Kensington Gold Project APDES Permit AK-005057-1 Annual Water Quality Monitoring Summary 2018 Volume 2. Water Quality Data are inclusive of the requirements under the USFS POO. This report will be submitted to the Forest Service, Juneau and the Alaska Department of Environmental Conservation (ADEC) under separate cover, as the APDES 2018 Annual Report.

9.3 Water Usage

Under requirements of the ADNR water rights, certain water usage and stream flow submittals are prepared. Some of these filings are made monthly while others are submitted quarterly. These reports are available at ADNR offices, Juneau.

9.4 Aquatic Resource Surveys

The USFS POO references aquatic resource surveys, which are to include:

- Annual photographs of stream habitat types.
- Fish surveys and minnow trapping in Upper Slate Lake.
- Salmon escapement surveys in Sherman, Slate, and Johnson Creeks.

Annual photographs of stream habitat types are included in the Kensington Gold Project APDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2018.

Adult salmon escapement surveys were performed in 2018 on Sherman, Slate, and Johnson Creeks. Tabulations of these data are presented in the Kensington Gold Project APDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2018. These reports will be submitted to the Forest Service, Juneau under separate cover.

9.5 Marine

The Forest Service Plan of Operations Appendix 4.d. contains a marine monitoring program for Berners Bay.

Between April 17 and May 14, one hundred and thirty nine marine mammal observation surveys were completed aboard the M/V Majestic Fjord (see Table 2). The official eulachon run transportation regulations as determined by Coeur Alaska and NMFS were put into effect on April 24, 2018. Special measures taken during the eulachon run included: having a marine observer on the vessel during all trips and maintaining a maximum speed of 13 knots within Berners Bay. Regular transit speed is approximately 21-25 knots. Transportation vessel trips during the eulachon run were limited to three trips daily (see Table 1). No more than three round trips per day were conducted during the 2018 eulachon spawning window.

A total of 2439 Steller sea lions were counted during the observation period; 2179 of these sightings (89.3%) occurred within Berners Bay. The vast majority (98.1%) of the 381 harbor seal sightings also occurred within Berners Bay. Most of these sightings were at pinniped haul out areas, such as the entrance to Slate Cove and Point Saint Mary. Gatherings of over 30 harbor seals on haul outs were observed. Pinniped activity was highest on May 1 through May 5. No recordable encounters with marine mammals occurred during the 2018 eulachon spawning season. Please refer to Attachment 1 for additional information related to the marine surveys.

9.6 Air

During the reporting period, bi-annual Facility Operating Reports, including fuel use summaries, were submitted to the Fairbanks office of ADEC Air Permits Program (610 University Avenue) in compliance with ADEC air quality permits. These reports are not reproduced here, but can be provided upon request.

9.7 Archeology

Surface disturbance activities within historic areas were completed during 2005. No additional surface disturbance occurred in 2018.

Archaeological testing, monitoring, and data recovery activities were conducted at the Kensington-Jualin mine during 2013. A final report was submitted in January 2016.

Training was conducted for all new employees as part of the new-hire environmental awareness training program in addition to the recurring annual refresher training for all Coeur employees in 2018. Additionally, all construction workers were provided this training as part of the construction environmental awareness training program. Newly hired employees and construction workers are not allowed to work on-site until they receive this training. The training clearly states Coeur Alaska's policy regarding unauthorized collections from private and public lands. Approximately 1500 hours of training, which included the Cultural Resource training was conducted in 2018 with employees and contractors.

9.8 Tailings Treatment Facility Ecological Monitoring Plan

The Tailings Treatment Facility Ecological Monitoring Plan was revised in June 2013 and an approval of the plan was received from the Forest Service in June of 2013. The tailings habitability study was commenced in August of 2013 as described in the approved plan. On-going monitoring was conducted by AK Fish and Game in 2018 and results will be presented in the Kensington Gold Project APDES permit AK-005057-1 Volume 1: Aquatic Resource Surveys (Coeur, 2018).

9.9 Berners Bay Transportation Plan

Marine vessel transport occurred between Juneau and Slate Cove or Comet Beach. Heavy equipment and supplies were transported via barge or landing craft and were received at Slate Cove or Comet Beach. Additionally, mine employees were transported via boat and were also received at Slate Cove. Marine waters located around the marine facilities discussed above were open to public access.

It is a requirement of the Berners Bay Transportation Policy, Mitigation, and BMP Plan to collect information on company marine vessel encounters with special fish, marine mammals, and important bird species during the eulachon spawning season in Berners Bay. This information is documented in Attachment 1.

9.10 Development Rock, Borrow Source, and Tails Material

Development rock and tailing sampling for acid base accounting (ABA) is a requirement of the POO. Development Rock sample results for 2018 are contained in Table 4. Development rock acid-base accounting results indicate minimal potential to generate acid rock drainage.

Quarterly tailings sample results for acid base accounting is contained in Table 5. Acid-base accounting results indicate that the tailings solids are net-neutralizing, thus minimal potential exists for acid rock drainage.

The following background information is included in the SEIS for the site development rock and tailings:

Waste Rock:
SAIC (1997) compiled ABA results for 108 samples originally reported by Geochemica Inc. and Kensington Venture (1994) and SRK (1996b) (Figure 3-1). Seventy-five samples were representative of waste rock in the expected development area (Group 1A and 1B samples), while the remainder represented waste rock from nearby areas outside the expected development area (Group 2 samples). All samples had NP:AP values exceeding 3, and 42 of the 75 Group 1 samples had NP:AP values greater than 50, indicating minimal potential to generate acid rock drainage.

Tailings:
Acid-base accounting tests showed the tailing solids to be net-neutralizing. As sulfide is removed from the tailings during processing, this material is more strongly neutralizing than waste rock produced during project operations (SRK, 1996b). Montgomery Watson (1996b) determined the total sulfur content to be 0.04 percent, corresponding to an NP: AP of 83, while SRK (1996b) measured total sulfur content of 0.02 percent, corresponding to an NP:AP of 166. As is the case for ore and waste rock characterization, potential acidity was conservatively determined based on total sulfur, rather than sulfide sulfur, concentration.

The ABA results for the current development rock and tailings are consistent with what was seen in the background samples as they all have a very high neutralization potential to acid potential. All samples had NPR values, calculated as NP/AP, exceeding 2. According to the Mine Environment Neutral Drainage Program, samples with an NPR>2 are considered non-acid forming.

9.11 Construction/Excavation Dewatering (Non-Stormwater)

No construction/excavation dewatering (Non-Stormwater) occurred at the site during 2018.

Groundwater intercepted in the mine workings is treated and discharged to Sherman creek. This discharge is authorized under ADEC APDES permit AK-005057-1.

Tailings water was decanted and pumped from the TTF to the TTF Water Treatment Plant (WTP) where it was treated and discharged to East Fork of Slate Creek. This discharge is authorized under ADEC APDES permit AK-005057-1.

9.12 Tailings Treatment Facility Monitoring

Monitoring of the TTF was conducted according to the approved Operation and Maintenance (O&M) manual dated December 2012. The O & M Manual describes procedures for operating the Lower Slate Lake Tailings Dam under normal and extreme reservoir level and flow conditions. Additionally, the O&M manual describes the daily, weekly and quarterly inspections that are required to be conducted at the dam along with any actions and maintenance activities that are necessary as a result of the inspection observations.

9.13 Wildlife

9.13.1 ADFG Goat Monitoring

Mountain goat monitoring in the Lions Head Mountain area associated with the Kensington Mine has been conducted intermittently since the late 1980's, in part to help determine potential future mine impacts on this population. The latest ADFG goat study is included as Attachment 3. Additionally, ADFG is planning on presenting the results of the study at the annual project meeting.

9.13.2 Terrestrial Wildlife Monitoring – Slate Lakes Basin

Wildlife Monitoring was conducted during 2018 in accordance with the Kensington Project Terrestrial Wildlife Monitoring Plan. This plan was designed to ensure that environmental impacts to wildlife resources in the Slate Lakes basin area are mitigated during both construction and operation of the Kensington Project and that the reclamation process includes a plan to support and encourage use by local wildlife. See Attachment 2 for the 2018 Terrestrial Wildlife Report.

10.0 Avalanche Safety Plan

Coeur Alaska maintains an avalanche hazard awareness and mitigation safety plan during the winter season. A qualified Avalanche Program Coordinator is retained to:

- Identify and quantify the snow avalanche safety hazard
- Prepare recommendations on managing that hazard
- Train employees and contractors in pertinent requirements of the resulting safety plan
- Prepare daily hazard forecasts and perform potential avalanche control activities

Because of the steep terrain adjacent to the site and large quantities of snow-fall, risk avoidance cannot be accomplished in all cases. Therefore, an active avalanche risk mitigation program has been conducted at the site. This involves the use of explosives to initiate controlled release of smaller avalanches so as to reduce the risk of naturally triggered larger and more destructive avalanches.

During 2018, minimal active control work was required or performed due to the limited quantity of snowfall during the year. During the 2018 reporting period,

- Areas of avalanche risk were placarded
- Crews were informed of avalanche hazards and the appropriate responses to those hazards

- Avalanche rescue equipment was located on-site
- Crews were trained in their role in avalanche rescue operations and the use of the rescue equipment – as appropriate

During the reporting period, site activities were not curtailed as a result of identified avalanche hazards and no personnel were caught or injured in avalanches.

11.0 Dam Safety Oversight Status

A Certificate of Approval to Operate a Dam for the stage 2 dam was issued by Department of Natural Resources (DNR) – Alaska Dam Safety (ADS) on December 22, 2017 and a Certificate of Approval to Modify a Dam was issued on May 2, 2018.

An Annual Performance Report dated June 22, 2018 was prepared by Golder Associates for the Lower Slate Lake Tailings Dam. This report was submitted to DNR - ADS in 2018.

Projected Activities for 2019

Key Issues and Permitting Activities

Graphitic Phyllite that was excavated during the construction of the stage 1 and 2 Tailings Treatment Facility are currently stored in sealed containments at Pit 4 and the Mud dump area. A pug mill plant was commissioned in 2016 and approximately 35,600 tons of graphitic phyllite was mixed with cement and placed in underground stopes in 2018. The remaining graphitic phyllite that is currently being temporarily stored in the sealed containments is planned to be mixed with cement and waste rock in the pug plant and placed into open stopes as backfill.

Water quality monitoring from the toe of the stockpile located at the north end of the TTF will continue in 2018. Monitoring will continue until such time as the seepage from the stockpile is similar to background water quality results and approval is received from the Forest Service and State of Alaska to discontinue the monitoring.

Four field-scale test cells were constructed in August of 2013 to assess the environmental stability of the graphitic phyllite material. The testing program is aimed at providing an evaluation of the weathering behavior of the graphitic phyllite present at the TTF west abutment under ambient conditions. On-going water quality monitoring of these field cells occurred during 2018.

1.0 Public Safety

No revisions to the Public Access Control Plan are contemplated for 2018.

2.0 Mine Operations

Ore production is planned throughout the entire year of 2018.

On-going construction of the Jualin exploration portal and down ramp will continue throughout 2018 in order to access a mineralized vein system. This vein system lies between the historic Jualin workings developed in the early 1920's, and the existing Kensington portal system. On-going exploration drilling from the exploration development will continue in 2018.

3.0 Mill Operations

Mill Operations are planned to be at full production throughout 2018.

4.0 Tailings Treatment Facility

A certificate of approval to modify a dam was issued by Alaska Dam Safety on May 9, 2018. Construction of the stage 3 dam raise for the tailings facility was mostly completed in 2018. A low –level outlet valve and structure is outstanding and is planned to be constructed in the second quarter of 2019 along with the installation of a second diversion pipeline. Both of these activities are planned to be completed by the third quarter of 2019.

5.0 Access Corridors

Most access road and corridor upgrades were completed in 2006. Road maintenance of the access corridors will continue in 2018.

6.0 Reclamation

No final reclamation is anticipated to occur in 2018. On-going monitoring of the revegetation test plots will continue throughout 2018.

7.0 Surface Exploration

A five-year surface exploration work plan was submitted to the Forest Service in April 2017 for the 2018 through 2022 drilling seasons. Exploration drilling is planned to be conducted following approval from the Forest Service and completion of the Environmental Assessment for the five-year work plan.

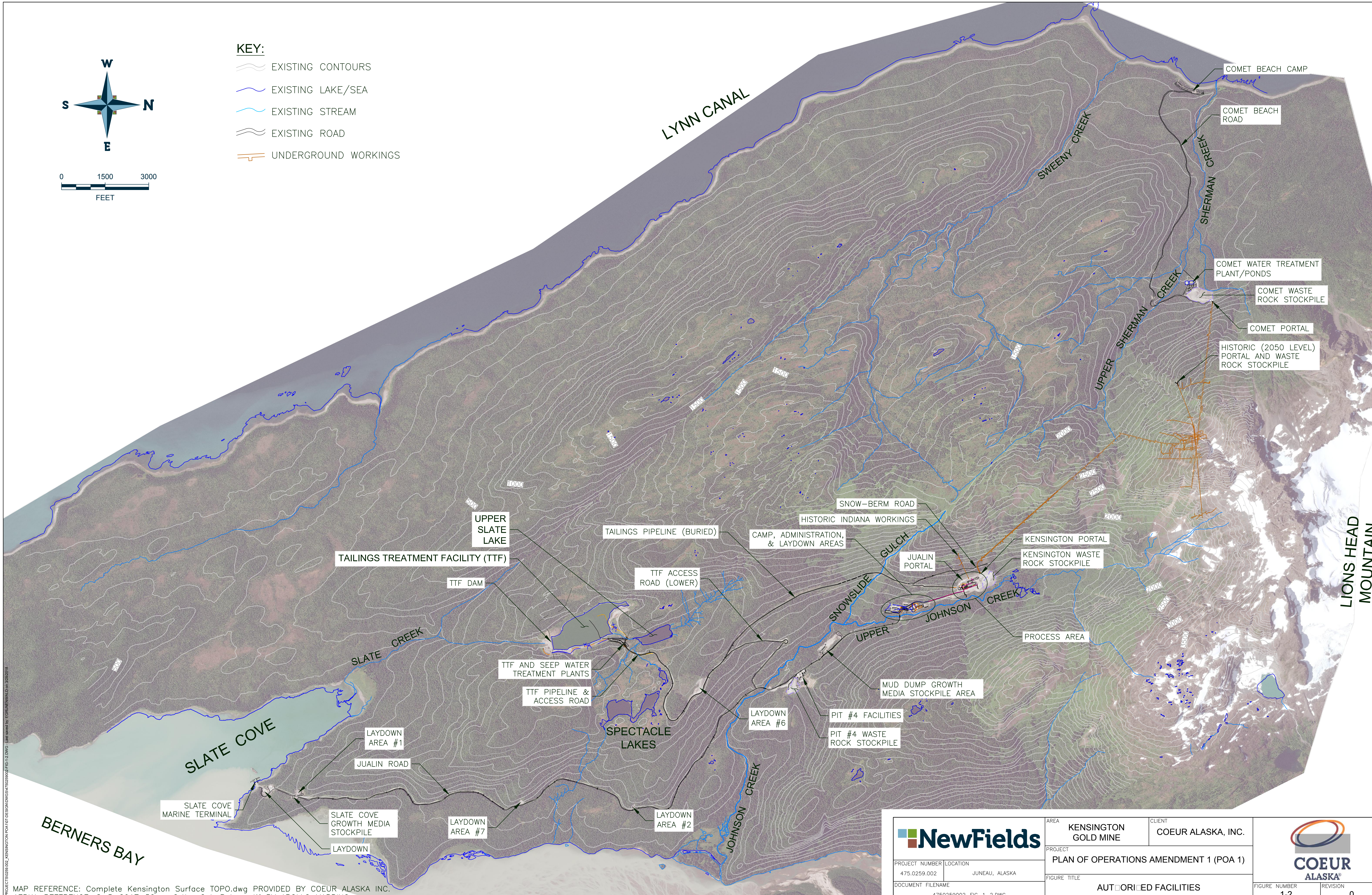
8.0 Proposed Modifications to Monitoring Plans for 2019

No further revisions to the monitoring plans are anticipated for 2019.

9.0 Bonding

A financial guarantee in the amount of $28,727,011 was submitted and approved by the Forest Service in 2013. An additional financial guarantee in the amount of $1,096,894 is planned to be posted in January 2019 to account for inflation for the three year extension of the reclamation plan and cost estimate.

Figures



KEY:
EXISTING CONTOURS
EXISTING LAKE/SEA
EXISTING STREAM
EXISTING ROAD
UNDERGROUND WORKINGS
W
S
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E
0
1500
3000
FEET
LYNN CANAL
SWEENY CREEK
SHERMAN CREEK
UPPER SHERMAN CREEK
COMET BEACH CAMP
COMET BEACH ROAD
COMET WATER TREATMENT PLANT/PONDS
COMET WASTE ROCK STOCKPILE
COMET PORTAL
HISTORIC (2050 LEVEL) PORTAL AND WASTE ROCK STOCKPILE
LIONS HEAD MOUNTAIN
SNOW–BERM ROAD
HISTORIC INDIANA WORKINGS
CAMP, ADMINISTRATION, & LAYDOWN AREAS
KENSINGTON PORTAL
KENSINGTON WASTE ROCK STOCKPILE
JUALIN PORTAL
GULCH
SNOWSLIDE
UPPER JOHNSON CREEK
PROCESS AREA
TAILINGS PIPELINE (BURIED)
UPPER SLATE LAKE
TAILINGS TREATMENT FACILITY (TTF)
TTF DAM
TTF ACCESS ROAD (LOWER)
SLATE CREEK
TTF AND SEEP WATER TREATMENT PLANTS
TTF PIPELINE & ACCESS ROAD
MUD DUMP GROWTH MEDIA STOCKPILE AREA
PIT #4 FACILITIES
PIT #4 WASTE ROCK STOCKPILE
LAYDOWN AREA #6
SPECTACLE LAKES
SLATE COVE
LAYDOWN AREA #1
JUALIN ROAD
SLATE COVE MARINE TERMINAL
SLATE COVE GROWTH MEDIA STOCKPILE
LAYDOWN AREA #7
LAYDOWN AREA #2
LAYDOWN
JOHNSON CREEK
BERNERS BAY
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AREA
KENSINGTON GOLD MINE
CLIENT
COEUR ALASKA, INC.
PROJECT
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PROJECT NUMBER
475.0259.002
LOCATION
JUNEAU, ALASKA
DOCUMENT FILENAME
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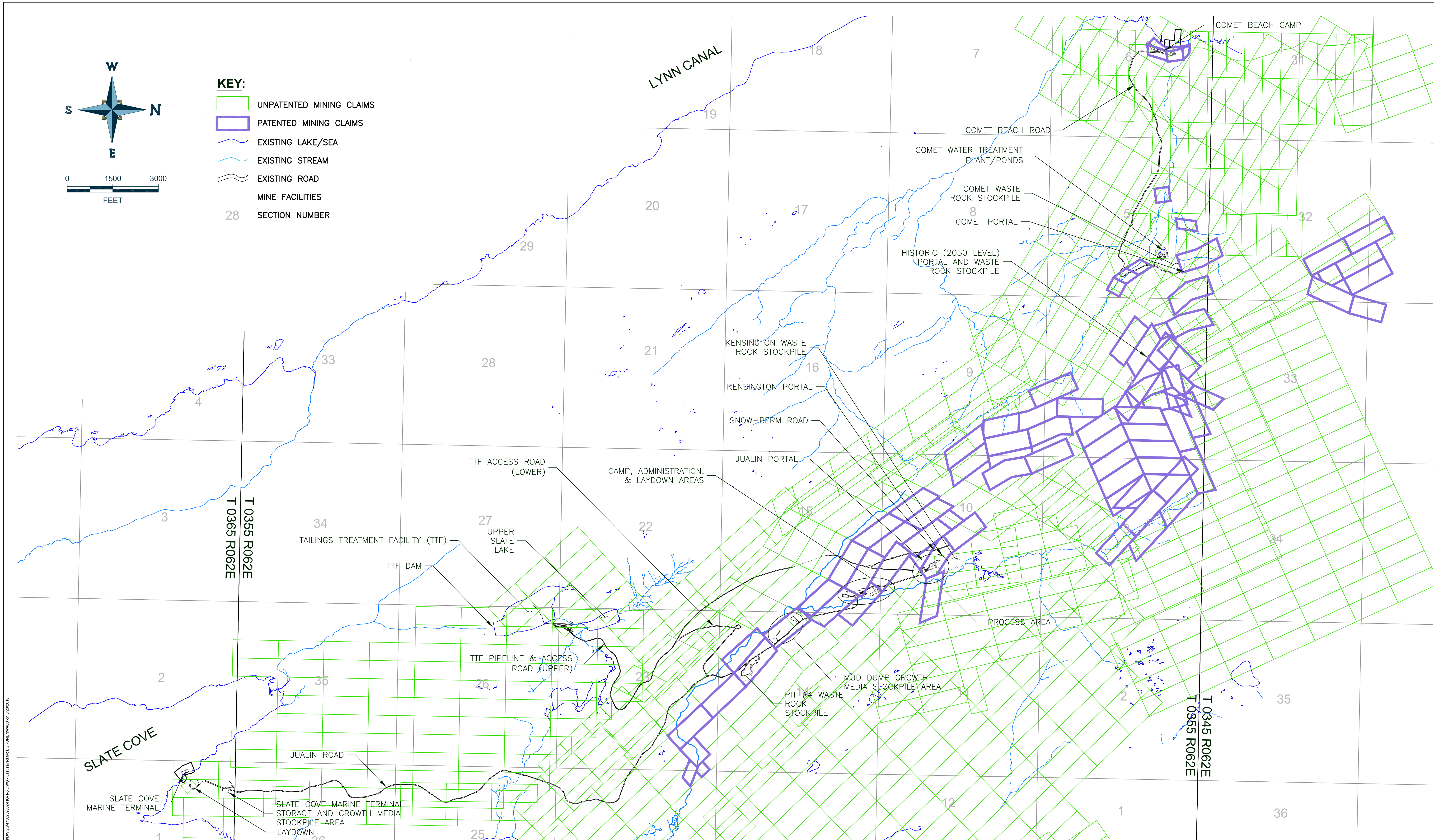

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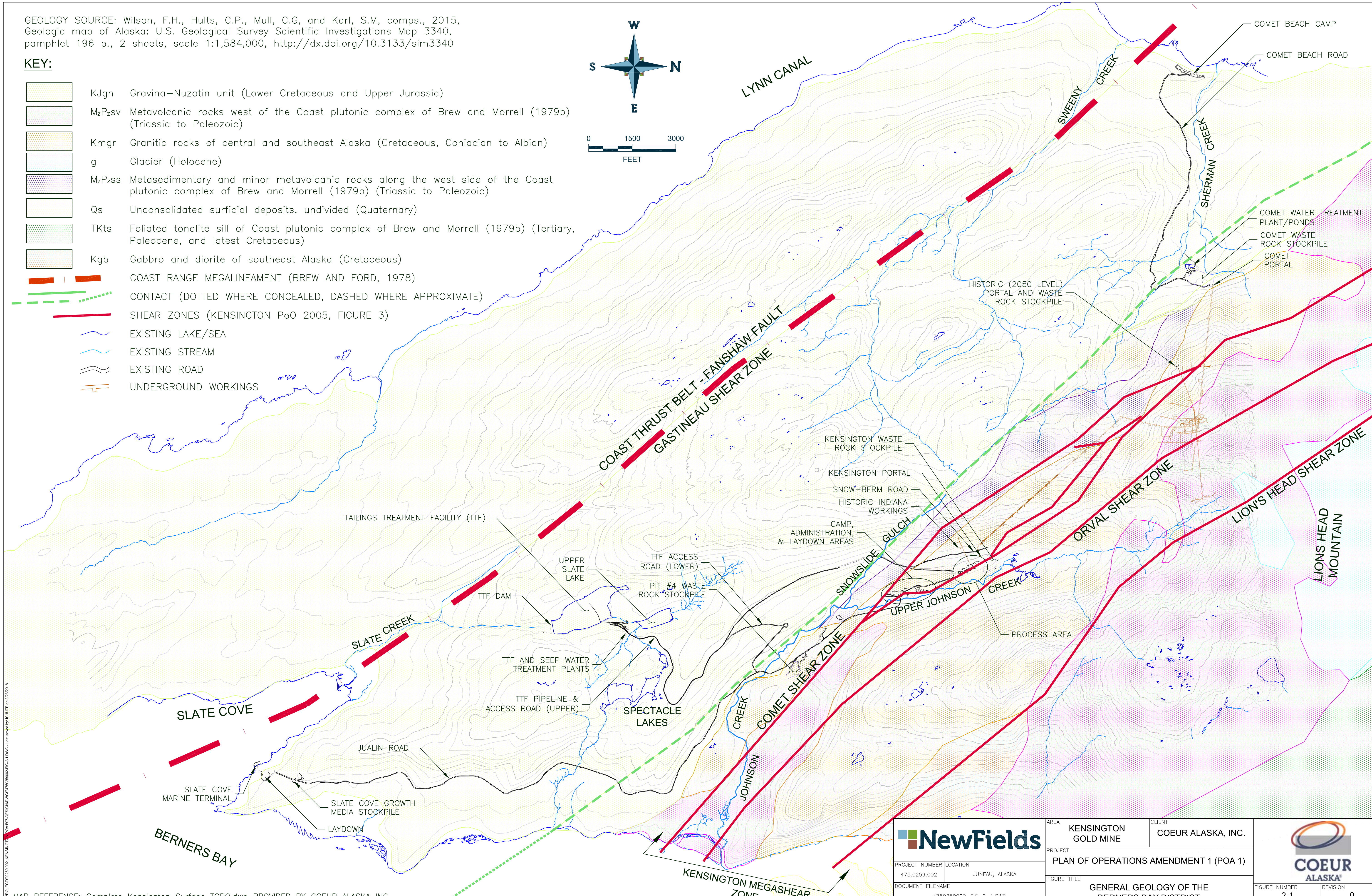
GEOLOGY SOURCE: Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, comps., 2015, Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, pamphlet 196 p., 2 sheets, scale 1:1,584,000, http://dx.doi.org/10.3133/sim3340
KEY:
KJgn Gravina—Nuzotin unit (Lower Cretaceous and Upper Jurassic)
MzPzsv Metavolcanic rocks west of the Coast plutonic complex of Brew and Morrell (1979b) (Triassic to Paleozoic)
Kmgr Granitic rocks of central and southeast Alaska (Cretaceous, Coniacian to Albian)
g Glacier (Holocene)
MzPzss Metasedimentary and minor metavolcanic rocks along the west side of the Coast plutonic complex of Brew and Morrell (1979b) (Triassic to Paleozoic)
Qs Unconsolidated surficial deposits, undivided (Quaternary)
TKts Foliated tonalite sill of Coast plutonic complex of Brew and Morrell (1979b) (Tertiary, Paleocene, and latest Cretaceous)
Kgb Gabbro and diorite of southeast Alaska (Cretaceous)
COAST RANGE MEGALINEAMENT (BREW AND FORD, 1978)
CONTACT (DOTTED WHERE CONCEALED, DASHED WHERE APPROXIMATE)
SHEAR ZONES (KENSINGTON PoO 2005, FIGURE 3)
EXISTING LAKE/SEA
EXISTING STREAM
EXISTING ROAD
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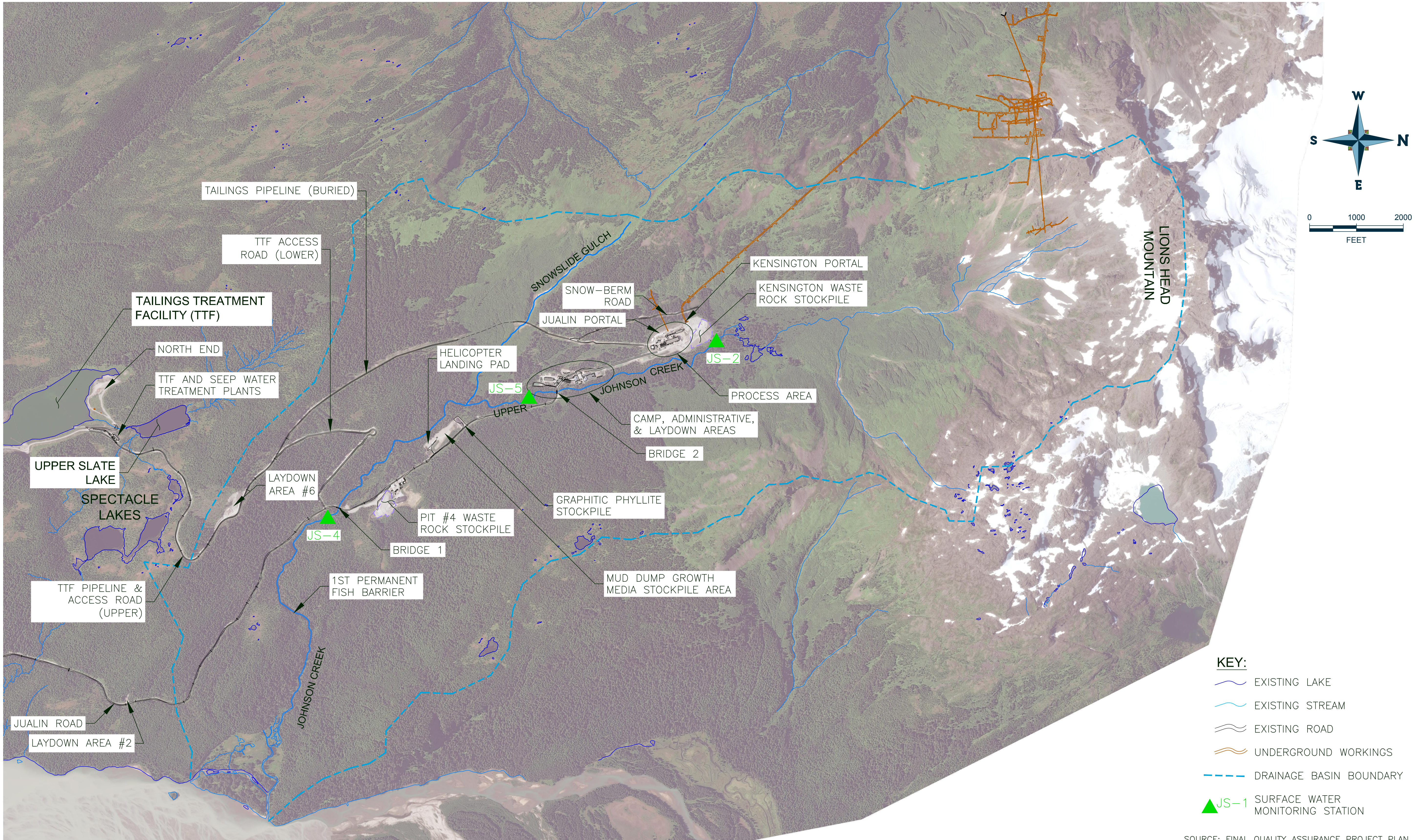
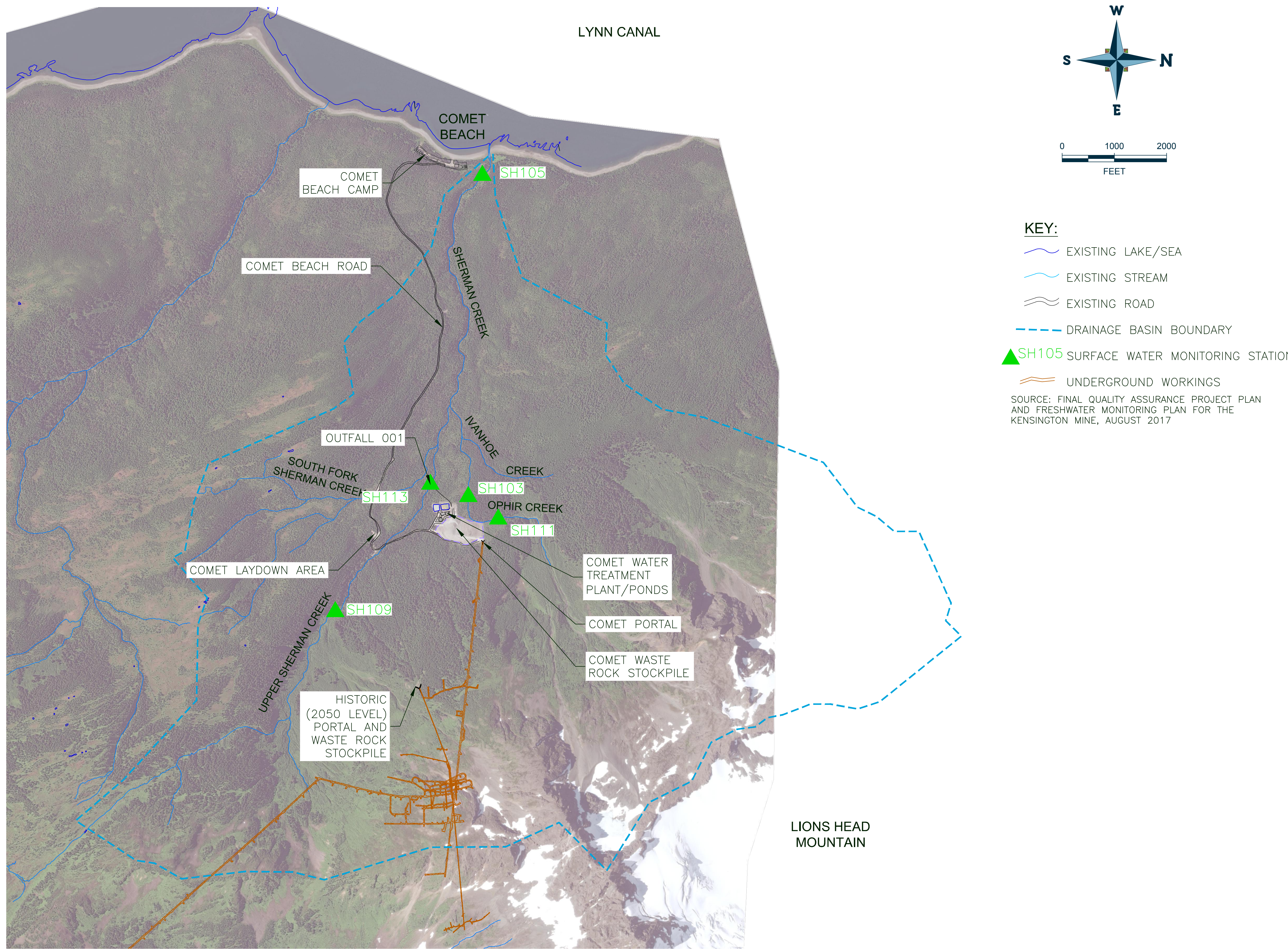
3000
FEET
LYNN CANAL
SWEENY CREEK
SHERMAN CREEK
COMET BEACH CAMP
COMET BEACH ROAD
COMET WATER TREATMENT PLANT/PONDS
COMET WASTE ROCK STOCKPILE
COMET PORTAL
HISTORIC (2050 LEVEL) PORTAL AND WASTE ROCK STOCKPILE
COAST THRUST BELT - FANSHAW FAULT
GASTINEAU SHEAR ZONE
KENSINGTON WASTE ROCK STOCKPILE
KENSINGTON PORTAL
SNOW—BERM ROAD
HISTORIC INDIANA WORKINGS
CAMP, ADMINISTRATION, & LAYDOWN AREAS
SNOWSLIDE GULCH
TAILINGS TREATMENT FACILITY (TTF)
UPPER SLATE LAKE
TTF ACCESS ROAD (LOWER)
PIT #4 WASTE ROCK STOCKPILE
TTF DAM
UPPER JOHNSON CREEK
PROCESS AREA
ORVAL SHEAR ZONE
LION'S HEAD SHEAR ZONE
LIONS HEAD MOUNTAIN
SLATE CREEK
TTF AND SEEP WATER TREATMENT PLANTS
TTF PIPELINE & ACCESS ROAD (UPPER)
SPECTACLE LAKES
COMET SHEAR ZONE
SLATE COVE
JUALIN ROAD
JOHNSON CREEK
SLATE COVE MARINE TERMINAL
SLATE COVE GROWTH MEDIA STOCKPILE
LAYDOWN
BERNERS BAY
KENSINGTON MEGASHEAR ZONE
MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
NewFields
AREA KENSINGTON GOLD MINE
CLIENT COEUR ALASKA, INC.
PROJECT PLAN OF OPERATIONS AMENDMENT 1 (POA 1)
PROJECT NUMBER 475.0259.002
LOCATION JUNEAU, ALASKA
DOCUMENT FILENAME 4750259002—FIG—2—1.DWG
FIGURE TITLE GENERAL GEOLOGY OF THE BERNERS BAY DISTRICT
FIGURE NUMBER 2-1
REVISION 0
COEUR ALASKA



SOURCE: FINAL QUALITY ASSURANCE PROJECT PLAN AND FRESHWATER MONITORING PLAN FOR THE KENSINGTON MINE, AUGUST 2017

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8–5–2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.
PROJECT NUMBER: 475.0259.002 / LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)	COEUR ALASKA
DOCUMENT FILENAME: 4750259002–FIG–2–2.DWG	FIGURE TITLE: JO□NSON CREEK DRAINAGE MONITORING STATIONS	FIGURE NUMBER: 2-2 / REVISION: 0



MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

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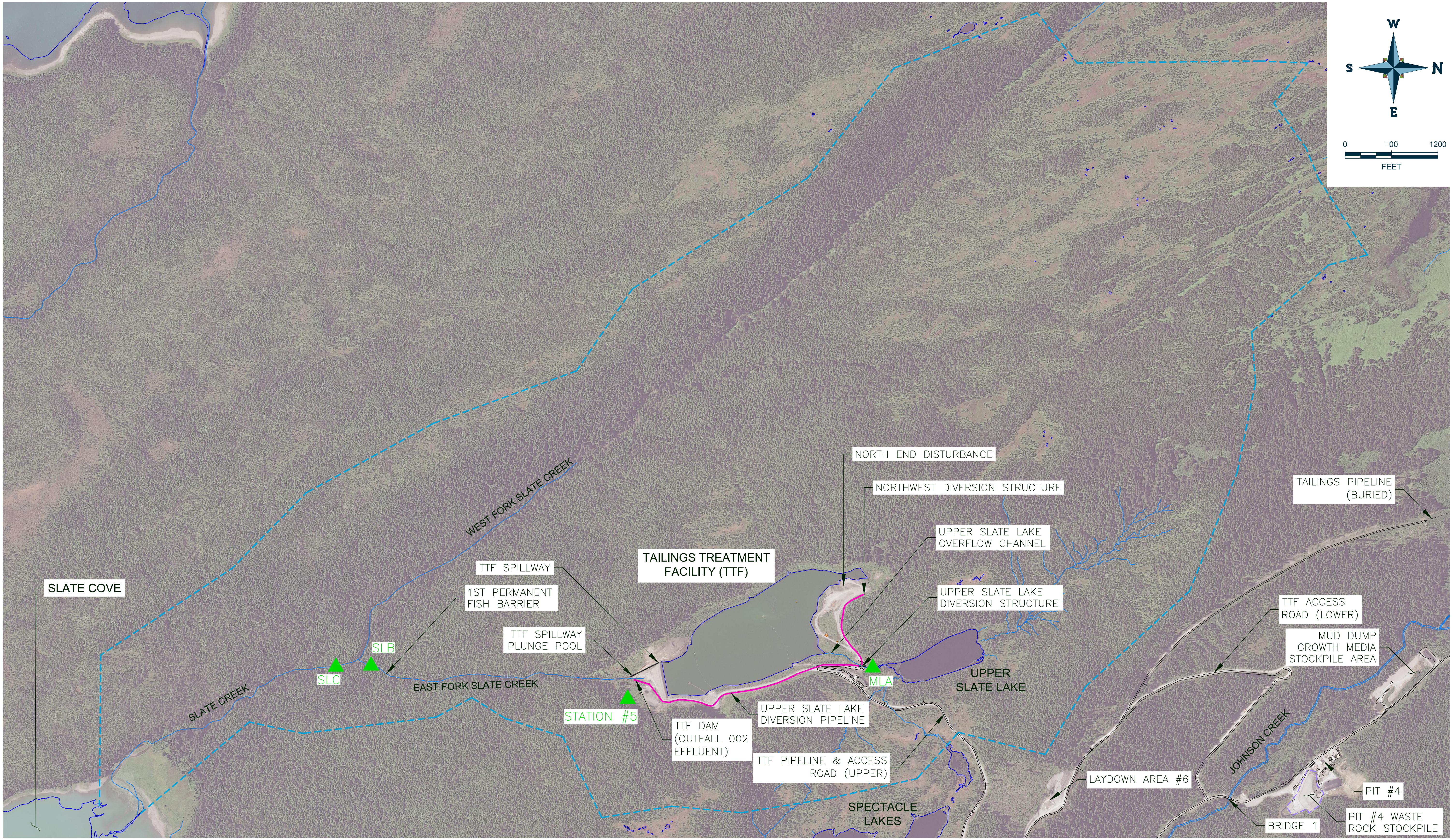
NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.	COEUR ALASKA
PROJECT NUMBER: 475.0259.002 / LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)		
DOCUMENT FILENAME: 4750259002-FIG-2-3.DWG	FIGURE TITLE: SHERMAN CREEK DRAINAGE MONITORING STATIONS		FIGURE NUMBER: 2-3 / REVISION: 0



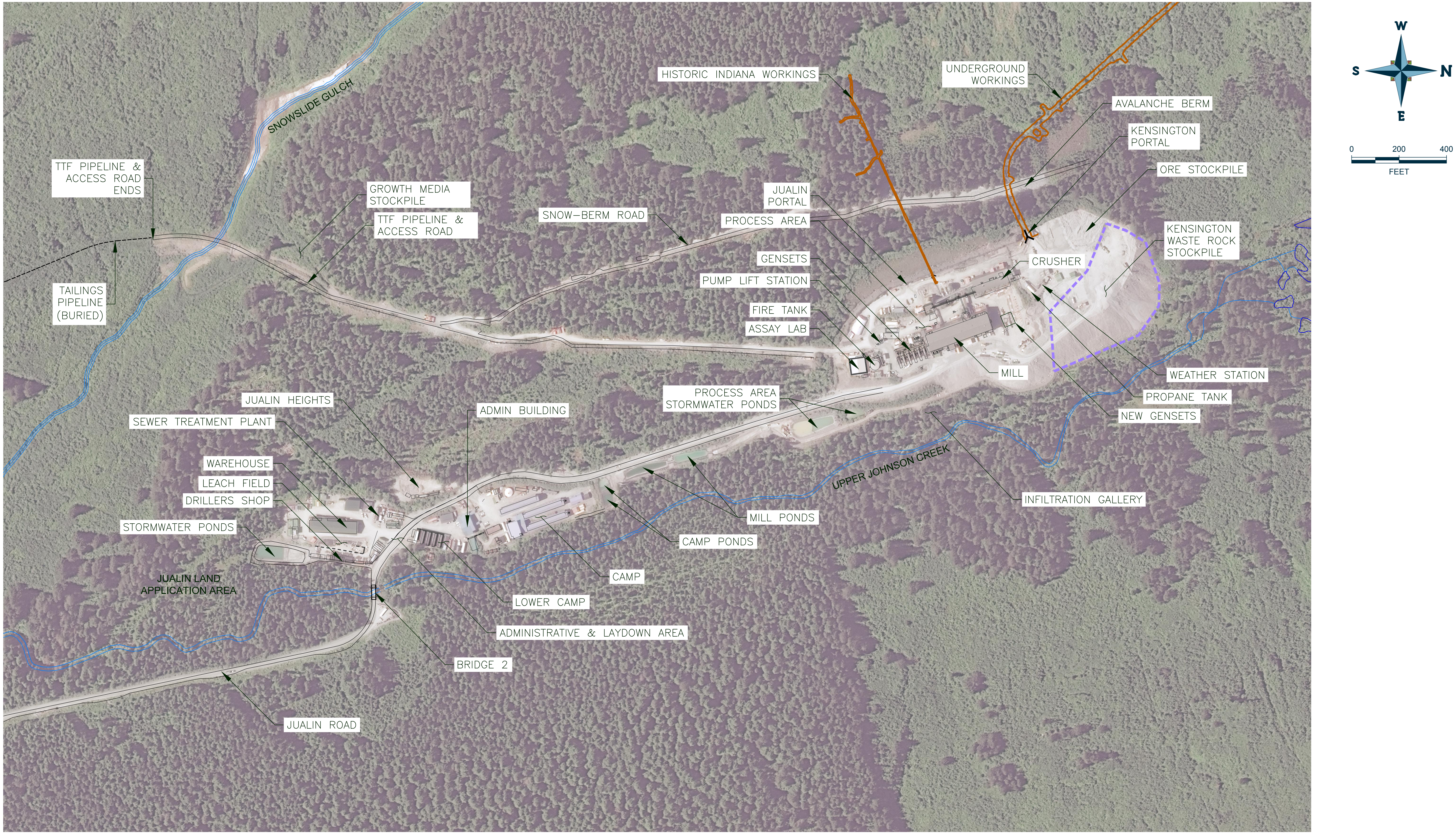
KEY:

- EXISTING LAKE
- EXISTING STREAM
- EXISTING ROAD
- DIVERSION PIPELINE
- DRAINAGE BASIN BOUNDARY
- JS-1 SURFACE WATER MONITORING STATION

SOURCE: FINAL QUALITY ASSURANCE PROJECT PLAN AND FRESHWATER MONITORING PLAN FOR THE KENSINGTON MINE, AUGUST 2017

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.	COEUR ALASKA
PROJECT NUMBER: 475.0259.002 / LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)		
DOCUMENT FILENAME: 4750259002-FIG-2-4.DWG	FIGURE TITLE: SLATE CREEK DRAINAGE MONITORING STATIONS		FIGURE NUMBER: 2-4 / REVISION: 0

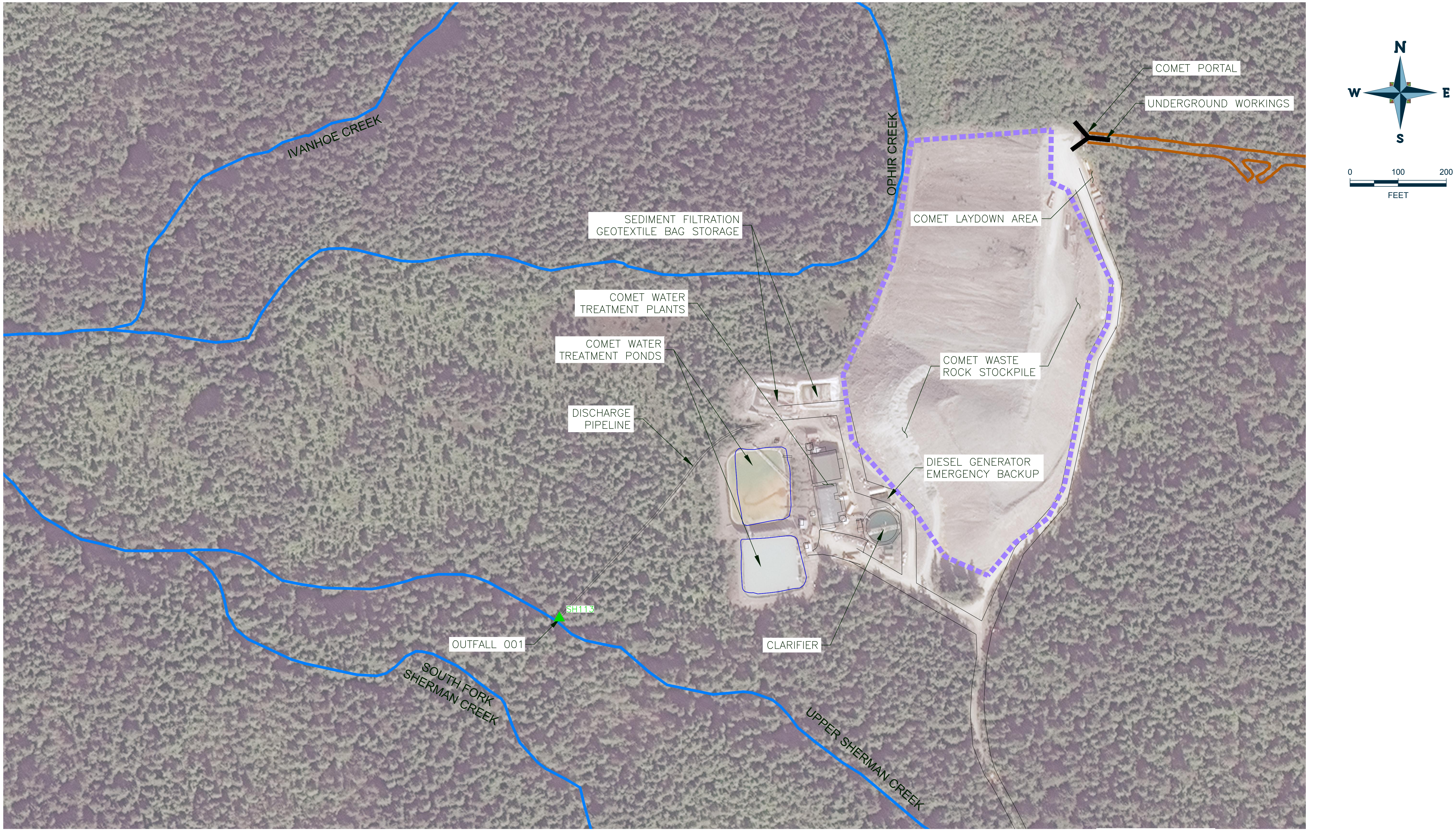


KEY:

- EXISTING LAKE
- EXISTING STREAM
- EXISTING ROAD
- UNDERGROUND WORKINGS
- WASTE ROCK STORAGE

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8–5–2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.	COEUR ALASKA
PROJECT NUMBER: 475.0259.002 / LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)		
DOCUMENT FILENAME: 4750259002–FIG–3–1.DWG	FIGURE TITLE: E☐ISTING FACILITIES - JUALIN AREA DETAIL		FIGURE NUMBER: 3-1 / REVISION: 0



KEY:

- EXISTING LAKE
- EXISTING STREAM
- EXISTING ROAD
- UNDERGROUND WORKINGS
- WASTE ROCK STORAGE

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

S:\PROJECTS\0259.002_KENSINGTON POA1\07-DESIGN\DWGS\4750259002-FIG-3-2.DWG - Last saved by: AGAETA on 4/11/2018

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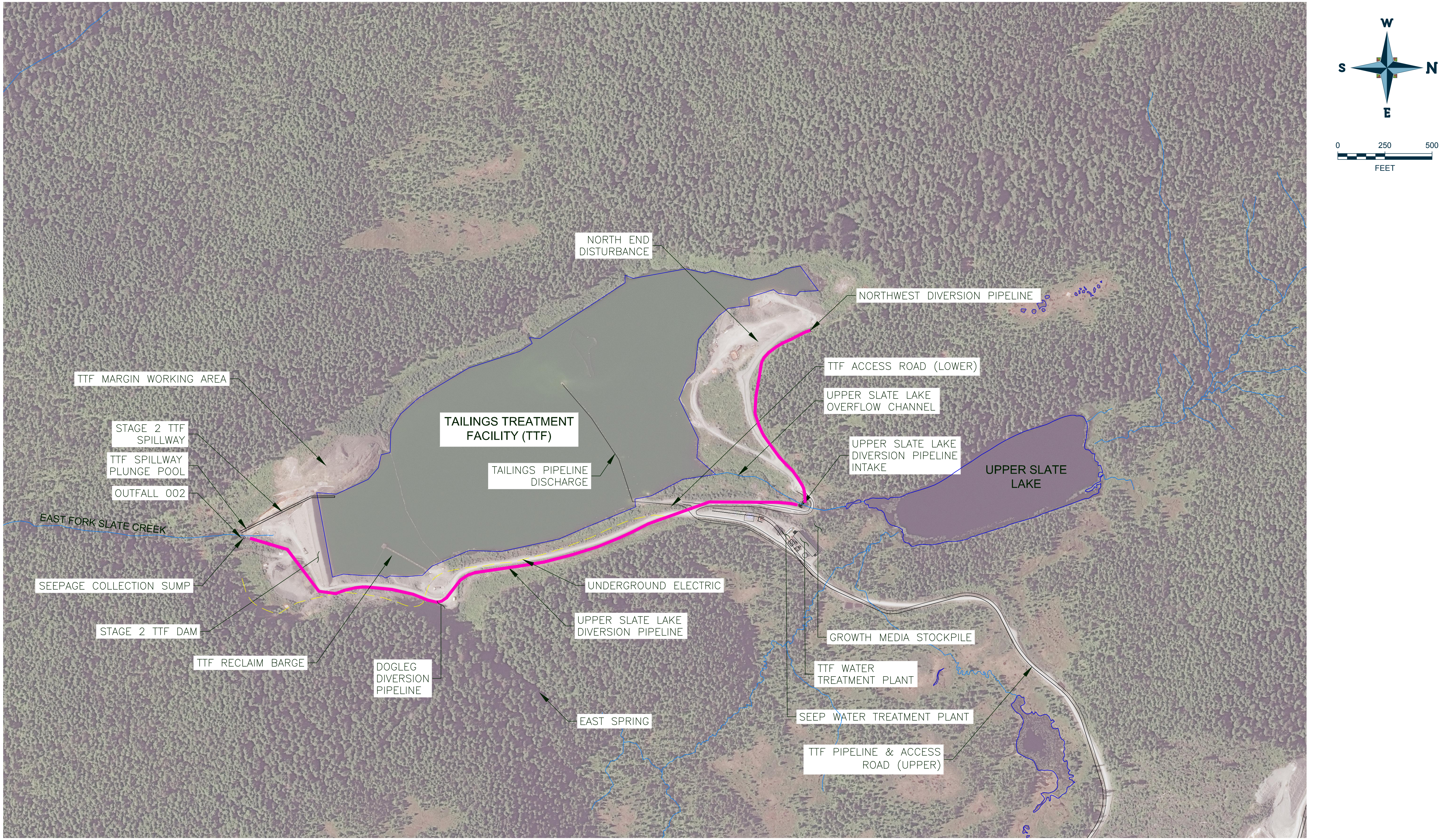
PROJECT NUMBER: 475.0259.002 / LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)		
DOCUMENT FILENAME: 4750259002–FIG–3–2.DWG	FIGURE TITLE: E□ISTING FACILITIES - COMET AREA DETAIL		FIGURE NUMBER: 3-2 / REVISION: 0



KEY:

- EXISTING LAKE
- EXISTING STREAM
- EXISTING ROAD
- EXISTING ALCAN POWERLINE
- EXISTING DIVERSION PIPELINE

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.	COEUR ALASKA
PROJECT NUMBER: 475.0259.002 / LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)		
DOCUMENT FILENAME: 4750259002-FIG-3-3.DWG	FIGURE TITLE: E□ISTING FACILITIES - SLATE LAKES AREA DETAIL		FIGURE NUMBER: 3-3 / REVISION: 0

KEY:

EXISTING WRS

EXISTING STREAM

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.
PROJECT NUMBER: 475.0259.002	LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)
DOCUMENT FILENAME: 4750259002-FIG-3-4.DWG	FIGURE TITLE: EXISTING FACILITIES - PIT #4 DETAIL	FIGURE NUMBER: 3-4
COEUR ALASKA		REVISION: 0

AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.	COEUR ALASKA®
PROJECT NUMBER: 475.0259.002 / LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)		
DOCUMENT FILENAME: 4750259002-FIG-3-5.DWG	FIGURE TITLE: E□ISTING FACILITIES - SLATE CO□E MARINE TERMINAL DETAIL		FIGURE NUMBER: 3-5 / REVISION: 0

Tables

Table 1 Kensington Mine - Surface Disturbance

Mine Facilities		Existing Parcel Disturbance Area
Parcel Number	Name	Acres
1	Comet Beach Camp	1.8
2	Comet Beach Road	5.9
3	Comet Laydown Area	0.4
4	Comet Waste Rock Stockpile	9.5
5	Comet Water Treatment Plant/Ponds	3.2
7	Historic 2050 Level Portal Development and Waste Rock Storage	1.5
8	Process Area	14.5
8A	Snow Berm Road	3.2
9	Kensington Waste Rock Storage	4.7
11	Storm Water Ponds	2.5
12	Pumphouse	0.1
13	Jualin Road & Ponds	25.6
14	Bulk Fuel Depot	0.8
15	Warehouse Area	3.4
16	Jualin Laydown #3	0.5
17	Administration Area	3.4
18	Laydown Area #1	2.1
19	Laydown Area #2	0.5
20	Pit #4 Waste Rock Stockpile	11.1
22 & 23	TTF Access Road (Upper and Lower)	14.2
24	Tailings Treatment Facility (TTF)	60.2
25	TTF Margin Working Area	15.9
27	TTF Pipeline & Access Road	13.2
28	TTF Dam Plunge Pool Area & Graphitic Phyllite Remediation	7.2
29A	Slate Creek Cove Marine Terminal Storage and Growth Media Stockpile Area	4.2
29B	Slate Cove Marine Terminal	0.7
31	Mud Dump Growth Media Stockpile Area	6.9
32	Laydown Area #6	2.7
33	Laydown Area #7	0.5
34	Slate Cove Growth Media Stockpile	1.8
36	TTF and Seep Water Treatment Plants (WTPs)	1.4
38	Land Application Area	15.7
Total Acres		**239.3**

Note:

Parcel 38 for land application area covers 15.7 acres but that acreage is not disturbed.

Table 2 - Kensington Gold Project – Wetlands Disturbance

Area	Description	Status 2018	Permitted Acres of Fill in Waters of the U.S. per 2005 Permit Table 1	Actual Waters of U.S. Acres Filled as of December 2018	Requested Acres of Total Fill in Waters of the U.S. 2009 update	Fill Volume (Cubic Yards)	Acres to be Reclaimed as Wetlands or Waters
1	Kensington Comet Beach Camp	Existing / Permitted	0	0	0	0	NA
2	Kensington Access Road	Existing / Permitted	0.9	0	0	0	NA
3	Kensington Borrow Pit #1	Not built	0.3	0	0	0	NA
4	Kensington Development Rock Stockpile Expansion	Existing / Permitted	5.1	4.5	4.5	220,000	8
5	Kensington Water Treatment Plant & Ponds and Expansion Area	Existing / Permitted	2.6	2.9	3.5	85,000	3.5
6	Kensington Snow / Topsoil Stockpile	Existing / Permitted	2.1	0	2.1	10,000	2.1
7	Kensington 2050 Level Portal Dev. Rock Storage	Existing / Permitted	0	0	0	0	0
8	Jualin Process Area	Built	1.1	2.0	2.0	97,000	NA
8A	Jualin Avalanche Berms & Road	Partially built		0.3	0.3	23,000	NA
9/9A	Jualin Development Rock Storage	Mostly Built	4.3	2.5	2.5	121,000	1.7
10	Jualin Storm Water Treatment Pond	Built	0	0.1	0.1	1,500	NA
11	Jualin Process Area Snow/Topsoil Stockpile	Built	0	0.2	0.2	3,000	0.6
12	Jualin Pumphouse	Built	0.1	0.1	0.1	1,500	NA
13	Jualin Access Road	Existing / Built	8.2	7.7	7.7	37,000	0.6
14	Jualin Laydown #1	Built	0.4	0	0	0	NA
15	Jualin Laydown #2	Built	3.5	0	0	0	NA
16	Jualin Laydown #3	Built	0.8	0	0	0	NA
17	Jualin Admin. Area	Built	2.5	0.1	0.1	1,500	2.5
18	Jualin Borrow Source #1	Built	0	0	0		0.2
19	Jualin Borrow Source #2	Built	0.1	1.1	1.1	10,500	
20	Jualin Borrow Source #3	Built	2.4	1.2	1.2	11,500	6.0
21	Jualin Borrow Source #4	Not built	0.7	0	0	0	NA

Area	Description	Status 2018	Permitted Acres of Fill in Waters of the U.S. per 2005 Permit Table 1	Actual Waters of U.S. Acres Filled as of December 2018	Requested Acres of Total Fill in Waters of the U.S. 2009 update	Fill Volume (Cubic Yards)	Acres to be Reclaimed as Wetlands or Waters
22	LSL Tailings Pipeline & Access Road (Upper)	Built	4.7	4.3	4.3	41,500	4.3
23	LSL Tailings Facility Access Road (Lower)	Built	0.3	1.4	1.4	13,500	2.8
24	LSL Tailings Lake (tailings as fill)	Occupied	23.5	23.5	23.5	3,920,000	(23.5)
25	LSL Tailings Lake Margin Working Area	Partially occupied	8.5	10.9	10.9	500	8.7 (38.5)
26	LSL Tailings Dam Borrow Source	Partially built	0.3	0.3	0.3	3,000	0
27	LSL Tailings Pipeline Road (Mill to Snowslide Gulch)	Partially built	3.0	0.4	0.4	3,500	2.2
28	LSL Tailings Dam & Plunge Pool Area	Built	5.9	6.1	6.1	236,000	2.4
29	Slate Creek Cove Marine Terminal	Built	1.9	0.5	0.5	12,000	3.2
30	Slate Creek Cove Snow/Stockpile Area	Built	0.2	0	0	0	0.5
31	Jualin Topsoil Stockpile	Built	0	6.8	6.8	300,000	6.8
32	Jualin Borrow Source #6	Partially built	0	0.1	0.1	1,500	0
33	Jualin Borrow Source #7	Not Built	0	0	0	0	NA
34	Jualin Reclamation Material Area	Built	0	0	0	0	0
36	LSL Tailings Area Topsoil Stockpile	Not built	0	0.6	0.6	14,500	0.6
	TOTALS		**83.4**	**77.6**	**80.3**	**5,168,500**	**110.0**

TABLE 4: ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ANNUAL SPILL LOG

FACILITY NAME, ADDRESS & Phone #: **REPORT MONTH/YR:** **2018 Summary**

Coeur Alaska - Kensington Gold Mine, (907) 523-3337

Date of Spill	Time of Spill	Product Spilled	Quantity Spilled	Location of Spill	Cause of Spill or additional information	Area(s) Affected	Clean Up (Y/N)	Reported to State
1/11/2018	12:40 AM	Hydrauli Oil	2.5 gallons	Tailings Treatment Facility Lay-down yard	Hydraulic line broke on Pacific Waste Pumper Truck.	TTF lay-down yard.	Cleaned up with Adsorbent pads. Spill occurred on frozen ground. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report
1/19/2018	6:00 PM	Diesel	25 gallons	Mill Bench - adjacent to the 30,000 gallon tank	While filling the three temporary iso-containers while the existing 30,000 gallon fuel tank was being relocated oil leaked out of the 2 inch return line as a result of the failure of the integral air vent on tank 3. Each tank has an air vent with a float valve that closes once the fluid reaches a certain level. Tank 1 and 2 float valves closed and tank 3 did not. This caused an uneven pressure distribution which resulted in the fluid following the path of least resistance and overfilling tank 3 when there was still approximately 2 feet of available capacity in tanks 1 and 2.	Mill Bench fueling area	Cleaned up with Adsorbent pads. Spill occurred on frozen ground. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported to SPAR on 1/20/17 @ 11:45 AM
2/12/2018	7:00 AM	Hydraulic Oi	25 gallons	Portal Bench - Ore Pad	Blown hydraulic line on Haul Truck UH03	Portal Bench - Ore Pad	Cleaned up with Adsorbent pads. Spill occurred on frozen ground. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported to SPAR on 2/13/18 @ 11:55 AM
2/24/2018	6:30 AM	Wastewater Sewage	5 gallons	Sewage Treatment Plant	The wastewater discharge hose to the vacuum tank was not emptied or capped. This allowed for residual domestic wastewater to drain onto the ground adjacent to the wastewater plant.	Sewage Treatment Plant	The area was immediately flagged-off to prevent access to the area. The spilled material was vacuumed up utilizing the vacuum truck. The spill area was disinfected with a 5% hypochlorite solution. All residual hypochlorite solution was then vacuumed up from the affected area.	Yes, Reported to ADEC Compliance and Enforcement Hotline on 2/24/2018 at 2:30 PM.
3/22/2018	11:00 AM	Hydraulic Oi	1 gallon	Tailings Treatment Facility North Lay-down yard	Cracked hydraulic hose on D-8 dozer operated by AAP	Tailings Treatment Facility North Lay-down yard	Cleaned up with Adsorbent pads and 5 gallons of contaminated soil/ice was excavated. Spill occurred on frozen ground and ice. Spent adsorbent pads and contaminated soil is planned to be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report

Date of Spill	Time of Spill	Product Spilled	Quantity Spilled	Location of Spill	Cause of Spill or additional information	Area(s) Affected	Clean Up (Y/N)	Reported to State
3/29/2018	7:15 AM	Hydraulic Oi	1.5 gallons	Tailings Treatment Facility RB road	Blown hydraulic hose on a grader operated by AAP	Tailings Treatment Facility RB road	Cleaned up with Adsorbent pads and approximately 0.25 cubic yards of soil was excavated from the road surface. Spent adsorbent pads and contaminated soil is planned to be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report
4/10/2018	4:03 PM	Hydraulic Oi	3 gallons	Comet Waste Rock Portal	Blown hydraulic hose on a underground haul truck	Comet Waste Rock Portal	Cleaned up with Adsorbent pads and 5 gallons of soil was excavated from the road surface. Spent adsorbent pads and contaminated soil is planned to be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report
4/29/2018	4:30 PM	Hydraulic Oi	1.5 gallons	Kensington Ore Pad	Blown hydraulic hose on an excavator	Kensington Ore Pad	Cleaned up with Adsorbent pads and 5 gallons of soil was excavated from the ore pad surface. Spent adsorbent pads and contaminated soil is planned to be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report
5/11/2018	11:00 AM	Transmissio n Fluid	2.0 gallons	Haul Road from Portal to Mill Bench	Light vehicle driving on haul road from the portal to the mill bench when a rock flipped up and hit the transmission pan which put a small hole in the pan. Only a small portion of the fluid hit the ground before the operator placed pads under the small leak. The operator did not have a bucket to capture the leaking the fluid, so it continued to slowly leak onto the adsorbent pads.	Haul Road from Portal to Mill Bench	Cleaned up with Adsorbent pads. Less than one quart actually contacted the ground, the remaining 1.75 gallons leaked onto the adsorbent pads. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report
6/12/2018	2:00 PM	Ethylene Glycol (Anti-freeze)	15 gallons	Portal Pad Metal Dumster	A crushed 55 gallon drum of ethylene glycol was placed into the metal dumpster at the portal pad and leaked residual glycol into the dumpster and on the ground outside the dumpster.	Portal Pad Metal Dumster	Cleaned up with Adsorbent pads and 0.5 cubic yards of soil was excavated and placed into 55-gallon drums. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal. The contaminated soil is planned to be sent to Clean Harbors.	Yes, Reported to SPAR on 6/14/2018 at 2:10 PM.
7/6/2018	2:30 PM	Hydraulic Oil	15 gallons	Pit -4	Over-filled drum while transferring the oil from a tote	Pit -4 shop area	Cleaned up with adsorbent pads and 100 gallons of contaminated soil was excavated. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal. The contaminated soil is planned to be sent to Clean Harbors.	Yes, Reported to SPAR on 7/10/18 @ 1:45 PM
7/11/2018	1:00 AM	Transmissio n Oil	4 gallons	1065 Passing Bay - Underground Mine	Transmission hose on underground haul truck broke causing a spill of transmission oil	1065 Passing Bay - Underground Mine	Cleaned up with adsorbent pads and 5 gallons of contaminated soil was excavated. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal. The contaminated soil is planned to be sent to Clean Harbors.	Yes, Reported in Site Monthly Report

Date of Spill	Time of Spill	Product Spilled	Quantity Spilled	Location of Spill	Cause of Spill or additional information	Area(s) Affected	Clean Up (Y/N)	Reported to State
8/4/2018	5:00 AM	Diesel Fuel	1 gallon	Upper Camp Bus Parking Area	Diesel water separator valve on the crew bus was not completely closed which allowed approximately 1 gallon of diesel fuel to leak onto the ground while the bus was parked in the parking area	Upper Camp Bus Parking Area	Cleaned up with adsorbent pads and 1.5 cubic yards of contaminated soil was excavated. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal. The contaminated soil is planned to be sent to Clean Harbors.	Yes, Reported in Site Monthly Report
8/25/2018	4:00 AM	Hydraulic Oil	60 gallons	Jualin 290 Vent/Escape Drift	An allen plug backed out of the manifold for the pressure washer on UB05 bolter causing hydraulic oil to be spilled onto the floor of the underground workings	Jualin 290 Vent/Escape Drift	Cleaned up with adsorbent pads. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported to ADEC - SPAR on 8-25-18 at 10:40 AM.
9/14/2018	7:00 AM	Hydraulic Oil	20 gallons	Pit-7	A hydraulic hose broke on a John Deere haul truck. The spill occurred on top of a compacted soil pad thus the majority of the hydraulic oil pooled on the surface.	Pit-7	Cleaned up with adsorbent pads and approximately 25 gallons of contaminated soil was excavated. Spent adsorbent pads and contaminated soil is planned to be sent to Clean Harbors for disposal.	Yes, Reported to ADEC - SPAR on 9-17-18 at 9:16 AM.
10/2/2018	11:00 AM	Hydraulic Oil	2 gallons	Underground in Kensington Mine_990-236 level	Hydraulic line burst on the jumbo drill	Underground in Kensington Mine_990-236 level	Cleaned up with adsorbent pads. The spill occurred in the underground mine on rock. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported to ADEC - SPAR in site monthly report.
10/3/2018	11:00 AM	Anti-freeze	2 gallons	Underground in Jualin Mine	A coolant leak developed from the radiator of the pumper truck while servicing the blue rooms in the Jualin underground mine.	Underground in Jualin Mine	Cleaned up with adsorbent pads. The spill occurred in the underground mine on rock. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported to ADEC - SPAR in site monthly report.
10/31/2018	10:30 PM	Hydraulic Oil	15 gallons	Waste Rock Stockpile	A hydraulic hose to the boom cylinder broke at the fitting on an excavator. The spill occurred on top of a compacted soil pad thus the majority of the hydraulic oil pooled on the surface.	Waste Rock Stockpile	Cleaned up with adsorbent pads and approximately 5 cubic yards of contaminated soil was excavated. Spent adsorbent pads and contaminated soil is planned to be sent to Clean Harbors for disposal.	Yes, Reported to ADEC - SPAR on 11-02-18 at 4:00 PM.
11/5/2018	12:00 PM	Engine Oil	250 gallons	Inside Power-House Building	A engine hose broke on an EMD generator. The spill was contained inside the powerhouse building which has as cement floor.	Inside Power-House Building	Cleaned up with adsorbent pads. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported to ADEC - SPAR on 11-06-18 at 9:40 AM.

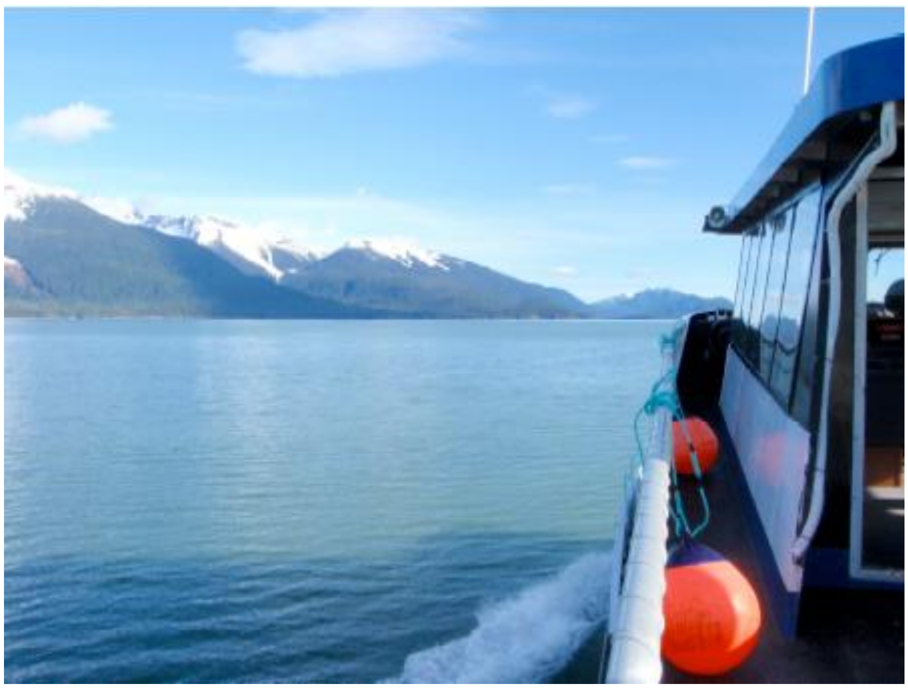
Attachment 1

Marine Mammal Monitoring Report - 2018

2018 Transportation Action Strategy

Marine Mammal
Survey Report

Coeur Alaska
Kensington Mine



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May 2018

Introduction

Coeur Alaska's Berners Bay/Lynn Canal Transportation Plan (September 2004) includes the adoption of standard operating guidelines to ensure minimal disruption of marine mammals in the area from marine traffic. Some guidelines are designed to minimize impacts throughout the year, while others are specific to the spring eulachon and herring spawning runs when marine mammals congregate in large groups within Berners Bay. This report describes monitoring activities conducted during the April/May 2018 eulachon spawning season. The Coeur Alaska crew transportation vessel during this period was the M/V Majestic Fjord, a 65ft catamaran with four inboard diesel jet engines and crew of three people that transited between Yankee Cove and Slate Cove daily (Figure 1). A one-way trip from Yankee Cove to Slate Cove takes approximately 40 minutes and consumes around 55-60 gallons of fuel (personal comm. Clint Songer, F/V Majestic Fjord captain).

Methods

Designation of the eulachon spawning season requires some information to be gathered regarding marine mammal activity within Berners Bay as this is a good indicator that eulachon migration is underway. One source of this information is the ADFG herring spawning aerial survey data for Lynn Canal posted on the internet. These updates usually include a brief summary of the location of marine mammal concentrations. Coeur also conducts marine based surveys to monitor marine mammal numbers within Berners Bay. These surveys are undertaken by Coeur environmental personnel or contractors with marine mammal observation experience. Survey results were emailed to the NMFS Office of Protected Resources within 48 hours. When Coeur's marine mammal surveys and ADFG herring surveys show a substantial increase in marine mammals within Berners Bay the eulachon spawning season is declared to have commenced.

During the eulachon spawning run a marine mammal observer accompanies the Coeur transportation vessel on all crew transfers to help adjust the daily routing into Slate Cove to avoid congregations of fish and marine mammals. The marine observer keeps watch from the bridge of the vessel and uses binoculars as needed to identify marine mammals.

Vessel trips are also kept to no more than three per day (except for emergency environmental or safety situations), and the vessel is required to maintain a maximum speed of 13 knots within the bay (with Berners Bay designated as the area inside of Point St. Mary and Point Bridget, see Figure 1). Fuel and, if possible, concentrate shipments by barge are also restricted during the eulachon spawning period. The spawning period typically occurs approximately April 15 to May 15, typically about 2-3 weeks. Marine mammal observations are categorized into two zones: Berners Bay and outside Berners Bay. All observations, including date, time, observer, weather, visibility, wave height/conditions, and counts of marine mammals, are recorded on a data sheet (see Figure 2). Each one-way trip is recorded on its own sheet.

Results

Between April 17 and May 14, one hundred and thirty nine marine mammal observation surveys were completed aboard the M/V Majestic Fjord (see Table 2). The official eulachon run transportation regulations as determined by Coeur Alaska and NMFS were put into effect on April 24, 2018. Special measures taken during the eulachon run included: having a marine observer on the vessel during all trips and maintaining a maximum speed of 13 knots within Berners Bay. Regular transit speed is approximately 21-25 knots. Transportation vessel trips during the eulachon run were limited to 3 trips daily (see Table 1). No more than 3 trips per day were conducted during the 2018 eulachon spawning window.

The majority of pinniped activity was observed inside Berners Bay (see Table 3). A total of 2439 Steller sea lions were counted during the observation period; 2179 of these sightings (89.3%) occurred within Berners Bay. The vast majority; (98.1%) of the 381 harbor seal sightings occurred within Berners Bay. Most of these sightings were at pinniped haulout areas, such as the entrance to Slate Cove and Point Saint Mary. Gatherings of over 30 harbor seals on haulouts were observed. Pinniped activity was highest on May 1 through May 5.

Aside from humpback whales, the majority of cetaceans were observed outside of Berners Bay with 184 humpback whale, 37 Dall’s porpoise, and 9 killer whale sightings (42.5%, 90.2% and 90% of the total sightings respectively). Humpback sightings were fairly consistent through the observation period, with at least one humpback being spotted most days. Killer whales were first seen on April 24 and were most commonly seen moving alone or in small groups of 2-5.

Porpoise sightings were inconsistent and sporadic, ranging in group size from 2-6 for most of the season. No recordable encounters with marine mammals occurred during the 2018 eulachon spawning season.

Discussion

Historic records showed eulachon arriving in the Berners Bay area usually in late April and early May (Harris et al 2005).

The three week restrictions were placed at the right time in 2018 to cover the greatest marine mammal activity surrounding the herring run. Careful observation of marine mammals and birds from the end of March is necessary in order to prepare for the official three-week period of transportation restrictions and ensure the goal of minimizing marine mammal encounters is achieved. The speed restriction is based on NMFS recommendations for Coeur Alaska vessels and may minimize potential impacts to marine mammals. The population of humpback whales in the North Pacific increased at around 7% per year since commercial whaling ceased in 1966 (Calambokidis et al 2008), but they are still considered endangered species owing to a worldwide population estimate being at only 8% of the historical population size (NMFS 1991). The Steller sea lion population east of Cape Suckling is not considered endangered, but vessel operations must still comply with the Marine Mammal Protection Act of 1972. The measures taken under Coeur's Transportation Action Strategy are designed to ensure compliance with this Federal law.

References

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Harris, P.M., S.W. Johnson, L.G. Holland, A.D. Neff, J.F. Thedinga, S.D. Rice. 2005. Hydrocarbons and fisheries habitat in Berners Bay, Alaska: Baseline Monitoring Associated with the Kensington Mine. AFSC Processed Report 2005-06. Juneau, AK.

NMFS. 1991. Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 105 p. Website: www.fakr.noaa.gov/protectedresources/whales/default/htm

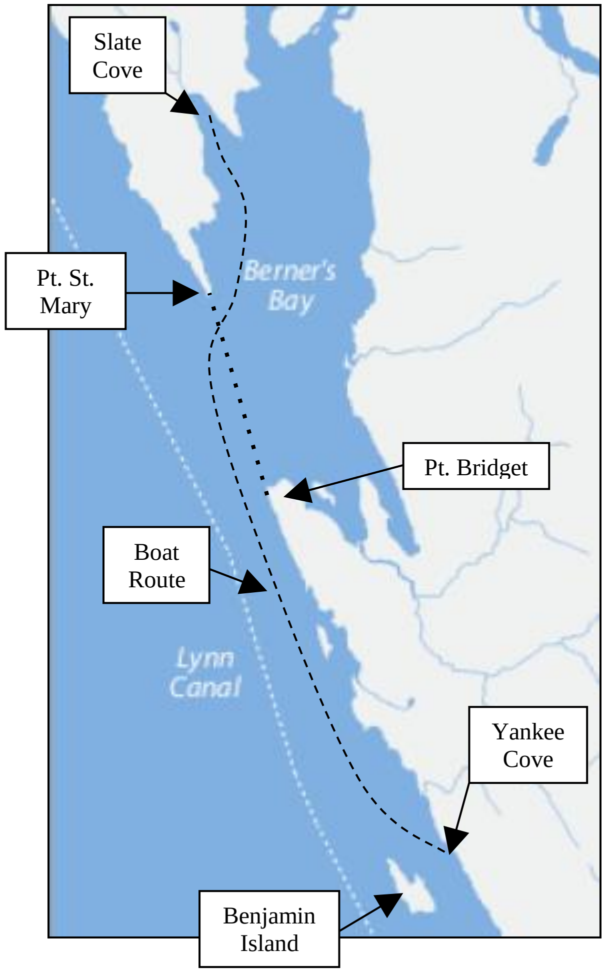

Figure 1: Boat route to Slate Cove from Yankee Cove. Line between Pt Bridget and Pt St Mary defines the area inside which the 13 knot speed limit applies.

Table 1: M/V Majestic Fjord Schedule, Spring/Summer 2018

Day	Morning Boat Departure	Evening Boat Departure 1st Run	Evening Boat Departure 2nd Run	Departure	Total trips
Monday	05:35	16:05	17:45	Yankee Cove	3
Tuesday	05:35	16:05	17:45	Yankee Cove	3
Wednesday	05:35	16:05	17:45	Yankee Cove	3
Thursday	05:35	16:05	17:45	Yankee Cove	3
Friday	05:35	16:05	17:45	Yankee Cove	3
Saturday	05:35	16:05	17:45	Yankee Cove	3
Sunday	05:35	16:05	17:45	Yankee Cove	3

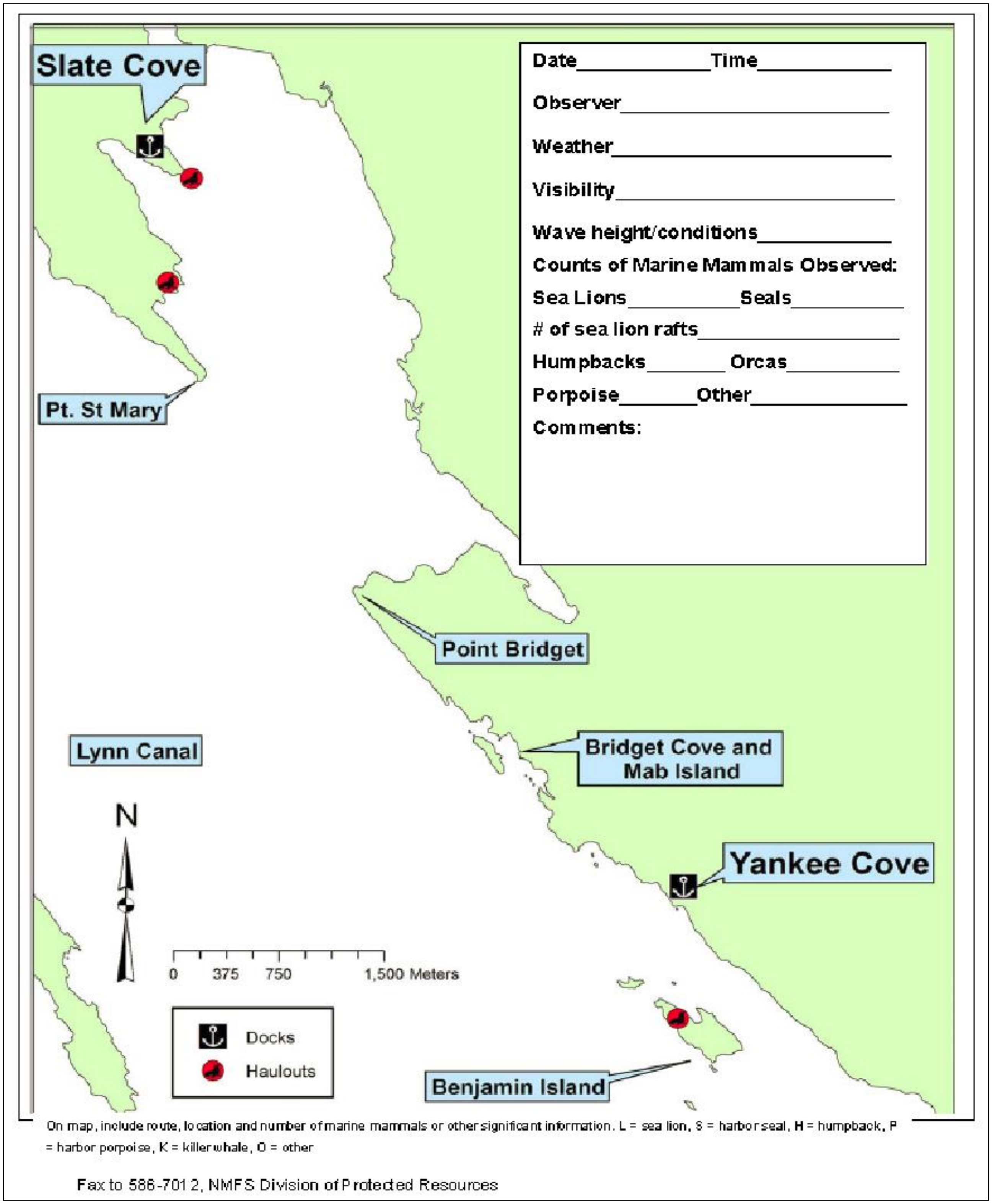

Figure 2: Data sheet

No.	Date	Time	Observer	Vessel	Route	Weather	Visibility (mi)	Wave Ht (ft.)
1	4/17/2018	16:02	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	clear	10+	0
2	4/17/2018	17:00	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	Clear	10+	0
3	4/17/2018	17:15	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	Clear	10+	0
4	4/17/2018	18:31	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	high broken	10+	0
5	4/22/2018	16:18	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	3	0
6	4/22/2018	17:04	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	5	0
7	4/22/2018	17:40	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	5	0
8	4/22/2018	18:15	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	6	0
9	4/23/2018	16:21	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	2	1
10	4/23/2018	17:00	Phil Moser	Majestic Fjord	slate Cove to Yankee Cove	rain	3.5	0
11	4/23/2018	17:42	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	5	1
12	4/23/2018	18:18	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	5	0
13	4/24/2018	5:40	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	0
14	4/24/2018	6:28	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	10	0
15	4/24/2018	16:05	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	5	0
16	4/24/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	5	1
17	4/24/2018	17:55	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	5	3
18	4/24/2018	18:38	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	5	4
19	4/25/2018	5:39	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	5	1
20	4/25/2018	6:25	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	5	2
21	4/25/2018	16:08	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	1
22	4/25/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	3
23	4/25/2018	17:53	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	5	1
24	4/25/208	18:38	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	1
25	4/26/2018	5:35	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	5	0
26	4/26/2018	6:23	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	3	0
27	4/26/2018	16:00	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	5	0
28	4/26/2018	17:01	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	5	0
29	4/26/2018	17:51	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	0
30	4/26/2018	18:40	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	10	0
31	4/27/2018	5:36	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	clear	10	0
32	4/27/2018	6:20	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	clear	10	0
33	4/27/2018	16:05	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	broken clouds	10	0
34	4/27/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	broken clouds	10	0
35	4/27/2018	17:47	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	clear	10	0
36	4/27/2018	18:26	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	clear	10	2
37	4/28/2018	5:38	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	broken clouds	10	1
38	4/28/2018	6:10	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	broken clouds	10	1
39	4/28/2018	16:05	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	clear	10	1
40	4/28/2018	17:00	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	clear	10	1
41	4/28/2018	17:43	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	clear	10	1
42	4/28/2018	18:23	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	clear	10	1
43	4/29/2018	5:38	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	
44	4/29/2018	6:20	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	1
45	4/29/2018	16:17	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	1
46	4/29/2018	17:06	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	1
47	4/29/2018	17:50:00	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	1
48	4/29/2018	18:30	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	1
49	4/30/2018	5:38	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	5	1
50	4/30/2018	6:25	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	5	3
51	4/30/2018	16:06	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	1
52	4/30/2018	17:06	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	2
53	4/30/2018	17:55	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	5	1
54	4/30/2018	18:38	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	5	1
55	5/1/2018	5:40	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	3	1
56	5/1/2018	6:26	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	3	1
57	5/1/2018	16:26	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	1	2
58	5/1/2018	17:10	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	2.5	3
59	5/1/2018	18:00	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	2	2
60	5/1/2018	18:40	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	2	3
61	5/2/2018	5:40	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	5	1
62	5/2/2018	6:22	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	5	2
63	5/2/2018	16:08	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	10	1
64	5/2/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	broken clouds	10	1
65	5/2/2018	17:50	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	broken clouds	10	1
66	5/2/2018	18:35	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	broken clouds	10	1
67	5/3/2018	5:40	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	0
68	5/3/2018	6:24	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	0
69	5/3/2018	15:58	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	2	0
70	5/3/2018	17:00	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	2	0
71	5/3/2018	17:51	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	4	1
72	5/3/2018	18:40	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	3	0
73	5/4/2018	5:37	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	2.5	0
74	5/4/2018	6:35	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	2.5	1
75	5/4/2018	16:07	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	5	1
76	5/4/2018	17:08	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	2	2
77	5/4/2018	17:56	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	5	1

78	5/4/2018	18:40	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	rain	5	2
79	5/5/2018	5:38	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	2	1
80	5/5/2018	6:19	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	rain	2	2
81	5/5/2018	16:08	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	10	1
82	5/5/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	rain	10	1
83	5/5/2018	17:50	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	2	1
84	5/5/5018	18:37	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	8	1
85	5/6/2018	5:37	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	1
86	5/6/2018	6:20	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	1
87	5/6/2018	16:05	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	broken clouds	10	0
88	5/6/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	broken clouds	10	0
89	5/6/2018	17:47	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	broken clouds	10	0
90	5/6/2018	18:39	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	mostly clear	10	0
91	5/7/2018	5:36	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	mostly clear	10	0
92	5/7/2018	6:20	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	mostly clear	10	0
93	5/7/2018	16:05	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	sunny	10	0
94	5/7/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	sunny	10	0
95	5/7/2018	17:50	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	sunny	10	0
96	5/7/2018	18:35	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	sunny	10	0
97	5/8/2018	5:37	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	sunny	10	0
98	5/8/2018	6:22	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	sunny	10	0
99	5/8/2018	16:13	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	sunny	10	0
100	5/8/2018	17:00	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	sunny	10	0
101	5/8/2018	17:50	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	sunny	10	0
102	5//8/2018	18:35	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	sunny	10	0
103	5/9/2018	5:35	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	clear	10	0
104	5/9/2018	6:20	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	clear	10	0
105	5/9/2018	16:05	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	0
106	5/9/2018	7:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	sunny	10	0
107	5/9/2018	17:47	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	sunny	10	0
108	5/9/2018	18:30	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	1
109	5/10/2018	5:38	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	lte rain	6	1
111	5/10/2018	6:25	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	lte rain	6	1
112	5/10/2018	16:05	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	sunny	10	0
113	5/10/2018	17:00	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	broken clouds	10	0
114	5/10/2018	17:45	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	8	1
115	5/10/2018	18:30	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	rain	10	1
116	5/11/20180	5:35	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	3	2
117	5/11/2018	6:18	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	rain	4	3
118	5/11/2018	16:12	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	2	1
119	5/11/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	8	2
120	5/11/2018	17:51	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	2	1
121	5/11/2018	18:35	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	1
122	5/12/2018	5:35	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	1
123	5/12/2108	6:20	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	1
124	5/12/2018	16:05	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	broken clouds	10	1
125	5/12/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	broken clouds	10	1
126	5/12/2018	17:40	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	broken clouds	10	1
127	5/12/2018	18:30	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	broken clouds	10	1
128	5/13/2018	5:35	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	2	0
129	5/13/2018	6:21	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	3	0
130	5/13/2018	16:05	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	5	0
131	5/13/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	0
132	5/13/2018	17:45	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	6	1
133	5/13/2018	18:30	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	rain	2	1
134	5/14/2018	5:37	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	rain	8	1
135	5/14/2018	6:30	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	rain	4	1
136	5/14/2018	16:13	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	1
137	5/14/2018	17:05	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	1
138	5/14/2018	17:53	Phil Moser	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	1
139	5/14/2018	18:38	Phil Moser	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	1

			Counts of MM Observed In Berners Bay								Counts of MM Observed Outside Berners Bay								Counts of MM Observed - Total								
No.	Date	Time	L	S	Rafts	H	P	D	K	O	L	S	Rafts	H	P	D	K	O	L	S	Rafts	H	P	D	K	O	Notes
1	4/17/2018	16:02	10	2	1	0	0	0	0	0	4	0	0	2	0	0	0	0	14	2	1	2	0	0	0	0	no rafts of birds; humpbacks relatively close together
2	4/17/2018	17:00	1	0	0	0	0	0	0	1	2	0	4	0	0	0	0	0	3	0	4	0	0	0	0	1	O=congregation of feeding seabirds
3	4/17/2018	17:15	0	30	0	1	0	3	0	1	4	1	0	1	3	0	0	0	4	31	0	2	3	3	0	1	O=congregation of feeding seabirds
4	4/17/2018	18:31	0	0	0	0	0	0	0	1	8			3	3				8	0	0	3	3	0	0	1	O=River otter near dock
5	4/22/2018	16:18	3			1				2					3				3	0	0	1	3	0	0	2	0=large raft of surf scoters
6	4/22/2018	17:04				1					3								3	0	0	1	0	0	0	0	
7	4/22/2018	17:40	1			1					22								23	0	0	1	0	0	0	0	
8	4/22/2018	18:15			1	1					32		1						32	0	2	1	0	0	0	0	large raft of sea lions #11
9	4/23/2018	16:21	1	1		1					1			1					2	1	0	2	0	0	0	0	
10	4/23/2018	17:00	4							1									4	0	0	0	0	0	0	1	O= River otter
11	4/23/2018	17:42	2	3		1					3								5	3	0	1	0	0	0	0	
12	4/23/2018	18:18	2			1									3				2	0	0	1	3	0	0	0	
13	4/24/2018	5:40		23		1								1			2		0	23	0	2	0	0	2	0	Start of slow boat
14	4/24/2018	6:28	11	3							3								14	3	0	0	0	0	0	0	
15	4/24/2018	16:05				1					1								1	0	0	1	0	0	0	0	
16	4/24/2018	17:05	7			1													7	0	0	1	0	0	0	0	
17	4/24/2018	17:55	5			1					2								7	0	0	1	0	0	0	0	
18	4/24/2018	18:38	6			1													6	0	0	1	0	0	0	0	
19	4/25/2018	5:39	2																2	0	0	0	0	0	0	0	
20	4/25/2018	6:25	1								2			1					3	0	0	1	0	0	0	0	
21	4/25/2018	16:08									2								2	0	0	0	0	0	0	0	
22	4/25/2018	17:05	1			1													1	0	0	1	0	0	0	0	
23	4/25/2018	17:53				1													0	0	0	1	0	0	0	0	
24	4/25/208	18:38									1			1					1	0	0	1	0	0	0	0	
25	4/26/2018	5:35		4							5	1							5	5	0	0	0	0	0	0	
26	4/26/2018	6:23		5							3					4			3	5	0	0	0	4	0	0	
27	4/26/2018	16:00	1	7											4				1	7	0	0	4	0	0	0	
28	4/26/2018	17:01	11	5											4				11	5	0	0	4	0	0	0	
29	4/26/2018	17:51	12	1		1									4				12	1	0	1	4	0	0	0	
30	4/26/2018	18:40	29			2					16								45	0	0	2	0	0	0	0	
31	4/27/2018	5:36	7	1		1					1	1		1					8	2	0	2	0	0	0	0	
32	4/27/2018	6:20	5			1													5	0	0	1	0	0	0	0	
33	4/27/2018	16:05	18	1		1					2								20	1	0	1	0	0	0	0	
34	4/27/2018	17:05	2			2								1					2	0	0	3	0	0	0	0	
35	4/27/2018	17:47	5								1			2					6	0	0	2	0	0	0	0	
36	4/27/2018	18:26	17											1					17	0	0	1	0	0	0	0	
37	4/28/2018	5:38	7			2					2			1					9	0	0	3	0	0	0	0	
38	4/28/2018	6:10	2			3					1								3	0	0	3	0	0	0	0	
39	4/28/2018	16:05	2			1					15			9					17	0	0	10	0	0	0	0	
40	4/28/2018	17:00	21			3								3					21	0	0	6	0	0	0	0	
41	4/28/2018	17:43	19			1					4			5					23	0	0	6	0	0	0	0	
42	4/28/2018	18:23	7			2					1			6					8	0	0	8	0	0	0	0	
43	4/29/2018	5:38	4	1		2					3			4		7			7	1	0	6	0	7	0	0	Some GPS points invalid
44	4/29/2018	6:20				1					2			3					2	0	0	4	0	0	0	0	GPS points invalid
45	4/29/2018	16:17	11	34							3			7					14	34	0	7	0	0	0	0	
46	4/29/2018	17:06	5	29		2					10			4					15	29		6					
47	4/29/2018	17:50	19	1		4								5					19	1	0	9	0	0	0	0	
48	4/29/2018	18:30	10			2					1			9					11	0	0	11	0	0	0	0	
49	4/30/2018	5:38	12			2					1			2					13	0	0	4	0	0	0	0	
50	4/30/2018	6:25	11	3		1					6								17	3	0	1	0	0	0	0	
51	4/30/2018	16:06	11	10							3			3					14	10	0	3	0	0	0	0	
52	4/30/2018	17:06	24	9		2								3					24	9	0	5	0	0	0	0	
53	4/30/2018	17:55	38	14		1					3			2					41	14	0	3	0	0	0	0	
54	4/30/2018	18:38	25	1		2								3					25	1	0	5	0	0	0	0	
55	5/1/2018	5:40	15			1					1			2					16	0	0	3	0	0	0	0	dead eagle in water
56	5/1/2018	6:26	5			1					4			1					9	0	0	2	0	0	0	0	
57	5/1/2018	16:26	4	1										1					4	1	0	1	0	0	0	0	
58	5/1/2018	17:10	7											1					7	0	0	1	0	0	0	0	
59	5/1/2018	18:00	9			1					5								14	0	0	1	0	0	0	0	Black bear on shore in slate cove
60	5/1/2018	18:40	6											1					6	0	0	1	0	0	0	0	
61	5/2/2018	5:40	11			3								1					11	0	0	4	0	0	0	0	
62	5/2/2018	6:22	11			2								1	2				11	0	0	3	2	0	0	0	
63	5/2/2018	16:08	20	2		2													20	2	0	2	0	0	0	0	
64	5/2/2018	17:05	22			2													22	0	0	2	0	0	0	0	
65	5/2/2018	17:50	33			3													33	0	0	3	0	0	0	0	
66	5/2/2018	18:35	31	18												7			31	18	0	0	0	7	0	0	
67	5/3/2018	5:40	59	29		4													59	29	0	4	0	0	0	0	
68	5/3/2018	6:24	59	31		4													59	31	0	4	0	0	0	0	
69	5/3/2018	15:58	71	1		5					1								72	1	0	5	0	0	0	0	
70	5/3/2018	17:00	70			3													70	0	0	3	0	0	0	0	
71	5/3/2018	17:51	75	4		5													75	4	0	5	0	0	0	0	
72	5/3/2018	18:40	74	4		1					2			1					76	4	0	2	0	0	0	0	
73	5/4/2018	5:37	81	15		1								1					81	15	0	2	0	0	0	0	
74	5/4/2018	6:35	78	13		4													78	13	0	4	0	0	0	0	
75	5/4/2018	16:07	70			6					1								71	0	0	6	0	0	0	0	
76	5/4/2018	17:08	70			6													70	0	0	6	0	0	0	0	
77	5/4/2018	17:56	65	3		6													65	3	0	6	0	0	0	0	
78	5/4/2018	18:40	65	3		3													65	3	0	3	0	0	0	0	
79	5/5/2018	5:38	49			4					1								50	0	0	4	0	0	0	0	
80	5/5/2018	6:19	50			3													50	0	0	3	0	0	0	0	
81	5/5/2018	16:08	23			4					1								24	0	0	4	0	0	0	0	
82	5/5/2018	17:05	25			4					2								27	0	0	4	0	0	0	0	
83	5/5/2018	17:50	25			5													25	0	0	5	0	0	0	0	
84	5/5/5018	18:37	27			5					2								29	0	0	5	0	0	0	0	
85	5/6/2018	5:37	46	6		6													46	6	0	6	0	0	0	0	
86	5/6/2018	6:20	45	4		4										2			45	4	0	4	0	2	0	0	
87	5/6/2018	16:05	55			6					4								59	0	0	6	0	0	0	0	
88	5/6/2018	17:05	41			2					2			1					43	0	0	3	0	0	0	0	
89	5/6/2018	17:47	37			4					1			1					38	0	0	5	0	0	0	0	
90	5/6/2018	18:39	29			4						2							29	2	0	4	0	0	0	0	
91	5/7/2018	5:36	26	20		1					4			6		6			30	20	0	7	0	6	0	0	
92	5/7/2018	6:20	15	6		1					6			6					21	6	0	7	0	0	0	0	
93	5/7/2018	16:05	29			5													29	0	0	5	0	0	0	0	
94	5/7/2018	17:05	35			4								1					35	0	0	5	0	0	0	0	
95	5/7/2018	17:50	51			5													51	0	0	5	0	0	0	0	
96	5/7/2018	18:35	50			5					4								54	0	0	5	0	0	0	0	
97	5/8/2018	5:37	19			4			1		4			3			2		23	0	0	7	0	0	3	0	heavy bird activity in B bay
98	5/8/2018	6:22	9			4					5			5			4		14	0	0	9	0	0	4	0	
99	5/8/2018	16:13	6	1								2		5					6	3	0	5	0	0	0	0	
100	5/8/2018	17:00	6	3		3					0	0		3					6	3	0	6	0	0	0	0	
101	5/8/2018	17:50	18	2		3								5					18	2	0	8	0	0	0	0	
102	5//8/2018	18:35	17			2								3					17	0	0	5	0	0	0	0	
103	5/9/2018	5:35	2	5		4					4			3					6	5	0	7	0	0	0	0	
104	5/9/2018	6:20	3				4			1							1		3	0	0	0	4	0	1	1	
105	5/9/2018	16:05									1								1	0	0	0	0	0	0	0	

106	5/9/2018	7:05	2								1			4					3	0	0	4	0	0	0	0	
107	5/9/2018	17:47	2	2							1			6					3	2	0	6	0	0	0	0	
108	5/9/2018	18:30	1											3					1	0	0	3	0	0	0	0	
109	5/10/2018	5:38																1	0	0	0	0	0	0	0	1	maybe an otter
111	5/10/2018	6:25		2						2				2					0	2	0	2	0	0	0	2	river otter
112	5/10/2018	16:05	3			2					1								4	0	0	2	0	0	0	0	
113	5/10/2018	17:00	3	1		4	1												3	1	0	4	1	0	0	0	
114	5/10/2018	17:45				3								1					0	0	0	4	0	0	0	0	Black bear on shore in slate cove
115	5/10/2018	18:30	1			3													1	0	0	3	0	0	0	0	
116	5/11/20180	5:35	3			3					1			1					4	0	0	4	0	0	0	0	
117	5/11/2018	6:18	1			3					1								2	0	0	3	0	0	0	0	
118	5/11/2018	16:12				2				1				1					0	0	0	3	0	0	0	1	O probably an otter
119	5/11/2018	17:05		1		3				1				1					0	1	0	4	0	0	0	1	
120	5/11/2018	17:51		1		2								2					0	1	0	4	0	0	0	0	
121	5/11/2018	18:35				1								3					0	0	0	4	0	0	0	0	
122	5/12/2018	5:35		4										2					0	4	0	2	0	0	0	0	
123	5/12/2108	6:20					2			1	1			1					1	0	0	1	2	0	0	1	
124	5/12/2018	16:05		2							1			3					1	2	0	3	0	0	0	0	
125	5/12/2018	17:05				3					1								1	0	0	3	0	0	0	0	
126	5/12/2018	17:40	1			1					1			3					2	0	0	4	0	0	0	0	
127	5/12/2018	18:30				2								2					0	0	0	4	0	0	0	0	
128	5/13/2018	5:35									1			1		2			1	0	0	1	0	2	0	0	
129	5/13/2018	6:21	1								1			1		6			2	0	0	1	0	6	0	0	
130	5/13/2018	16:05	2	1		1								2		1			2	1	0	3	0	1	0	0	
131	5/13/2018	17:05				1													0	0	0	1	0	0	0	0	
132	5/13/2018	17:45				2										2			0	0	0	2	0	2	0	0	
133	5/13/2018	18:30	1			1								2					1	0	0	3	0	0	0	0	
134	5/14/2018	5:37	5			1					1			1					6	0	0	2	0	0	0	0	Gull activity. Black bear in Slate cove
135	5/14/2018	6:30	4			1		1			1			1					5	0	0	2	0	1	0	0	
136	5/14/2018	16:13		1							1								1	1	0	0	0	0	0	0	
137	5/14/2018	17:05	3											4					3	0	0	4	0	0	0	0	
138	5/14/2018	17:53	3																3	0	0	0	0	0	0	0	
139	5/14/2018	18:38	2								18			1					20	0	0	1	0	0	0	0	
			2179	374	2	248	7	4	1	12	260	7	5	184	26	37	9	1	2439	381	7	432	33	41	10	13	

Latitude and Longitude Coordinates

No.	Date	Time	L (Sea Lion)		S (Harbor seal)		Rafts		H (Humpback whale)		D (Dall's porpoise)		P (Harbor porpoise)		K (Killer whale)		O (Other)	
1	4/17/2018	16:02	11) N58.76664	W135.00817														
2	4/17/2018	17:00																
3	4/17/2018	17:15																
4	4/17/2018	18:31																
5	4/22/2018	16:18							1) N58.77435,	W135.01186			3) N 58.62798,	W134.96180			1) N58.68402	W135.004849
6	4/22/2018	17:04	3)N58.67611	W134.99472					1) N58.77799,	W135.01215								
7	4/22/2018	17:40	2)N58.66905, 20)N58.73122, 1)N58.68402,	W134.99578 W135.01671 W135.00484					1)N58.703539,	W135.01535								
8	4/22/2018	18:15	11)N58.72111 12) N58.70606 13)N58.698 15)N58.6667 16)N58.6613 17)N58.64339 18)N58.60583	W134.99980 W134.9991 W134.9987 W134.99237 W134.98679 W134.97276 W134.93927					14) N58.68695	W134.99801								
9	4/23/2018	16:21	20)N58.72666 21)N58.73819	W135.00208 W135.00424	23)N58.77973	W135.01305			19)N58.61721 22)N58.74308	W134.95275 W135.00485								
10	4/23/2018	17:00	25)N58.7797 26)N58.7798	W135.01305 W135.01307													24)N58.77976	W135.01307
11	4/23/2018	17:42	27)N58.7362 29)N58.5875 30)N58.7027	W135.00351 W134.90415 W135.00102	31)N58.7291	W135.00848			28)N58.6774	W134.99735								
12	4/23/2018	18:18	32)N58.7748 33)N58.7784	W135.01301 W135.01354	39)N58.7130	W135.01551			32)N58.7748	W135.01301	34)N58.7441	W135.00624						
13	4/24/2018	5:40							37)N58.6094 38)N58.6258	W134.94572 W134.96165					35)N58.7102 36)N58.6168	W135.00546 W135.95068		
14	4/24/2018	6:28	43)N58.76121 44)N58.75332 45)N58.74127 46)N58.73472 47)N58.72971 48)N58.68528	W135.01164 W135.01316 W135.01601 W135.01707 W135.01836 W135.00144	41)N58.7765 42)N58.7970	W135.01038 W135.01294												
15	4/24/2018	16:05	49)N58.62328	W134.95816					50)N58.60296	W134.93554								
16	4/24/2018	17:05	52)N58.78696	W134.97602					51)N58.60098	W134.94523								
17	4/24/2018	17:55	53)N58.72736 54)N58.73144 56)N58.64272	W134.95839 W135.01670 W134.96151					55)N58.60124	W134.92423								
18	4/24/2018	18:38	57)N58.74388	W134.9881					56)N58.64272	W134.96151								
19	4/25/2018	5:39	58)N58.76364 59)N58.73221	W135.01516 W135.02268														
20	4/25/2018	6:25	60)N58.73061 62)N58.77977	W135.0153 W135.01292					61)N58.73897	W135.01292								
21	4/25/2018	16:08	63)N58.63014	W134.94677														
22	4/25/2018	17:05	64)N58.58.61895	W134.94555					65)N58.72994	W135.01592								
23	4/25/2018	17:53	67)N58.73994	W135.04102					67)N58.58.73994	W135.04102								
24	4/25/208	18:38	69)N58.59891	W134.92704					68)N58.68819	W135.01828								
25	4/26/2018	5:35	71)N58.7339	W135.02825	70)N58.62025 72)N58.75083 73)N58.7769	W134.95446 W135.00791 W135.01271												
26	4/26/2018	6:23	76)N58.71936 78)N58.59104 79).N58.58771	W135.01094 W134.91328 W134.90292	74)58.77299 75)N58.73348	W135.01271 W135.01094					77)N58.58.6695	W134.99719						
27	4/26/2018	16:00	81)N58.68744	W134.97014	82)N58.72744 83)N58.757 84)N58.78715 85)N58.77792	W135.01571 W135.01611 W135.00023 W134.99179					80)N58.64299	W135.02012						
28	4/26/2018	17:01	88)N58.77351 90)N58.72837 91)N58.74378 92)N58.73421	W135.01039 W134.99751 W135.02549 W135.01054	87)N58.77594 89)N58.77187 90)N58.72837	W135.01136 W135.00977 W134.99751					93)N58.72425	W135.0143						
29	4/26/2018	17:51	95)N58.6336 96)N58.73927 97)58.73226 98)N58.73996 99)N58.74837	W135.01112 W135.02033 W135.01354 W135.01307 W135.01169					98)58.73996	W135.01307	84)N58.757	W135.00023						
30	4/26/2018	18:40	100)N58.77478 101)N58.77953 102)N58.77099 103)N58.76038 104)N58.74595 105)N58.74227 106)N58.73258 107)N58.72835	W135.01147 W135.01285 W135.0149 W135.00842 W135.00667 W135.00603 W135.00693 W135.00886					108)N58.71335	W135.01427								
31	4/27/2018	5:36	109)N58.67939 113)N58.72708 114)N58.74828 115)N58.74854	W135.0009 W135.01259 W135.00806 W135.00804	111)N58.63028	W134.96537			110)58.61913	W134.95524								
32	4/27/2018	6:20	117)N58.76628 118)N58.75597 119)N58.73634	W135.00993 W135.00967 W135.01719					116)N58.76218	W135.00952								
33	4/27/2018	16:05	120)N58.72688 122)N58.68207 123)N58.67767 124)N58.72579	W135.01977 W135.02221 W134.99499 W135.0179	123)N58.67767	W134.99499			121)N58.61816	W134.95043								
34	4/27/2018	17:05	125)N58.7337 127)58.75479	W135.01654 W135.01281					126)N58.75623 128)N58.75135 129)N58.68615	W135.01283 W135.01355 W134.98021								
35	4/27/2018	17:47	130)N58.68718 132)N58.65974	W135.00646 W134.98501					131)N58.63018	W134.98501								
36	4/27/2018	18:26	133)N58.73076 134)N58.75964 135)N58.75589	W135.0162 W135.01253 W135.01243					136)N58.72619	W135.01653								
37	4/28/2018	5:38	137)N58.68956 139)N58.67246 142)N58.7108	W135.00159 W134.99478 W135.01706					138)N58.58812 140)N58.67843 141)N58.68241	W135.00159 W134.99786 W135.00067								
38	4/28/2018	6:10	145)N58.68871 146)N58.75282 148)N58.70928	W134.99185 W135.01395 W135.01441					143)N58.75684 144)N58.68448 147)N58.74569	W135.00909 W134.94815 W135.01513								
39	4/28/2018	16:05	149)N58.59716 151)N58.74762 152)N58.7301 153)N58.73887	W134.9243 W135.09681 W135.01676 W135.01478					149)N58.59716 150)N58.66674 153)N58.73887	W134.9243 W134.98709 W135.01478								
40	4/28/2018	17:00	154)N58.76027 155)N58.7798 157)N58.7157 158)N58.76602 159)N58.76106	W135.01072 W135.01289 W135.01166 W135.0113 W135.01212					156)N58.77978 160)N58.73032 161)N58.68274	W135.01305 W135.01597 W134.99972								
41	4/28/2018	17:43	164)N58.66461 167)N58.6814 168)N58.71423 170)N58.76485	W134.98718 W134.99877 W135.01556 W135.01124					163)N58.72722 165)N58.66964 166)N58.67379	W135.05611 W134.99034 W134.99372								
42	4/28/2018	18:23	171)N58.77974 172)N58.76518 173)N58.76029 176)N58.67639	W135.01304 W135.01175 W135.01142 W134.99631					174)N58.72665 175)58.70886	W135.01711 W135.01212								
43	4/29/2018	5:38	N58.36468	W134.55552							N58.39682	W134.59272						
44	4/29/2018	6:20																
45	4/29/2018	16:17	182)N58.65589 183)N58.6626 185)N58.69454 186)N58.69454 187)N58.77126 189)N58.77717	W134.98621 W134.99113 W135.01219 W135.00673 W135.01001 W135.01309	188)N58.77694	W135.01296			181)N58.68269 180)N58.69415 179)N58.70491 178)N58.58855	W135.01385 W135.03357 W135.04998 W134.90171								
46	4/29/2018	17:06	189)N58.77717 191)N58.77909 192)N58.77474	W135.01309 W135.01336 W134.01222	190)N58.77976	W135.01342			194)N58.74063 195)N58.68263 196)N58.68697	W135.01114 W134.96222 W135.01314								

47	4/29/2018	17:50:00 AM	201)N58.66672 205)N58.72553 206)N58.75503 207)N58.75832 208)N58.76571	W135.00004 W135.0167 W135.0068 W135.00677 W135.00911	209)N58.77179	W135.0118			197)N58.67555 200)N58.63085 201)N58.66672 202)N58.67518 203)N58.68097 204)N58.69075	W135.00737 W134.96528 W135.00004 W135.00484 W135.00704 W135.01079								
48	4/29/2018	18:30	204)N58.69075 205)N58.72553 217)N58.66765	W135.01079 W135.0167 W134.99707					212)N58.76956 213)N58.73935 214)N58.70741 215)N58.69476 218)N58.66431	W135.01077 W135.01052 W135.01459 W135.01127 W134.9936								
49	4/30/2018	5:38	220)N58.64202 224)N58.67639 225)N58.72927	W134.98012 W135.00346 W135.01381					219)N58.65449 221)N58.65238 222)N58.66894 223)N58.67103	W134.9811 W134.98656 W134.99917 W135.00023								
50	4/30/2018	6:25	223)N58.67103 227)N58.77744 229)N58.73817	W135.00023 W135.01308 W135.00903	226)N58.73727	W135.01124			230)N58.73264 231)N58.70148 232)N58.67004	W135.01086 W135.01273 W134.99882								
51	4/30/2018	16:06	235)N58.63695 236)N58.64167 238)N58.66077 239)N58.72886 242)N58.75753 243)N58.76401 244)N58.7789	W134.9785 W134.9785 W134.99007 W135.01563 W135.00988 W135.0091 W135.01351	239)N58.72886	W135.01563			233)N58.64153 234)N58.63381 237)N58.65561 241)N58.75257	W134.98114 W134.97406 W134.98599 W135.01155								
52	4/30/2018	17:06	245)N58.77956 247)N58.77494 248)N58.77334	W135.01363 W135.01147 W135.01089	246)N58.77899	W135.01363			249)N58.76462 250)N58.73382 251)N58.73028 252)N58.68183 253)N58.00903	W135.00727 W135.00997 W135.0113 W135.01278 W135.00903								
53	4/30/2018	17:55	256)N5861875 257)N58.63072 258)N58.65061 259)N58.65805 260)N58.73157 261)N58.73698 262)N58.7504 265)N58.7723	W134.96406 W134.97633 W134.99353 W134.9985 W135.01414 W135.0117 W135.01023 W135.01137	264)N58.7663	W135.00927			255)N58.64766 261)N58.73698	W134.99145 W135.0117								
54	4/30/2018	18:38	266)N58.77691 267)N58.77976 268)N58.77517 269)N58.77382	W135.01274 W135.01302 W135.01223 W135.01173	271)N58.76365	W135.00681			270)N58.76596 272)N58.75487 273)N58.69927 275)N58.67229 276)N58.66747	W135.008 W135.00443 W135.01966 W135.00798 W135.00406								
55	5/1/2018	5:40	278)N58.39646 279)N58.40906 280)N58.43142 281)N58.44007 282)N58.45025	W134.59435 W135.00270 W135.01198 W135.00753 W135.00433					277)N58.39179 278)N58.39646 279)N58.40906	W134.59051 W134.59435 W135.00270								
56	5/1/2018	6:26	284)N58.45691 285)N58.44473 286)N58.43802	W135.00436 W135.00460 W135.00733					287)N58.42525 288)N58.43013	W135.01051 W135.01044								
57	5/1/2018	16:26	291)N58.76866 292)N58.77244 293)N58.77976	W135.01045 W135.01109 W135.01297	290)N58.75371	W135.01059			289)N58.68209	W134.99881								
58	5/1/2018	17:10	294)N58.77903 295)N58.7617 296)N58.68404	W135.01316 W135.01207 W135.00499					297)N58.67305	W134.99369								
59	5/1/2018	18:00	298)N58.68727 299)N58.73149 300)N58.75451 302)N58.76037 303)N58.77485 304)N58.77767 305)N58.77845	W135.0024 W135.01678 W135.01139 W135.01095 W135.0114 W135.01158 W135.01318					301)N58.75859	W135.01099								
60	5/1/2018	18:40	306)N58.775 307)N58.76526 308)N58.76022	W135.01281 W135.01126 W135.01084					309)N58.67886	W135.00018								
61	5/2/2018	5:40	314)N58.73972 315)N58.75007 316)N58.75598 317)N58.76327 318)N58.77304 319)N58.77685	W135.01172 W135.00818 W135.00768 W135.0088 W135.01232 W135.01302					312)N58.66686 313)N58.70144	W134.99694 W135.01569								
62	5/2/2018	6:22	320)N58.77313 321)N58.76635 322)N58.75762 323)N58.74913 324)N58.74329 325)N58.73476 326)N58.68847	W135.01189 W135.01082 W135.00907 W135.00951 W135.00985 W135.01007 W135.01084					327)N58.67437 328)N58.64023	W135.0043 W134.98045	329)N58.69652	W134.95849						
63	5/2/2018	16:08	331)N58.77977	W135.01373	332)N58.77953	W135.01373			330)N58.77471	W135.00892								
64	5/2/2018	17:05	333)N58.77481 334)N58.77299	W135.01246 W135.01148					336)N58.67824	W135.00253								
65	5/2/2018	17:50	339)N58.76919 340)N58.77522 341)N58.77582	W135.00976 W135.01127 W135.01246					337)N58.68485 338)N58.76227	W135.00581 W135.00629								
66	5/2/2018	18:35	342)N58.77224 344)N58.66966	W135.01128 W135.00044	343)N58.76536	W135.0098					345)N58.67913	W135.0008						
67	5/3/2018	5:40	349)N58.77396	W135.01217	348)N58.7782	W135.01255			346)N58.68889 347)N58.77335	W135.0802 W135.01216								
68	5/3/2018	6:24	351)N58.71951	W135.02065	350)N58.77262	W135.01197			351)N58.71951 352)N58.69603	W135.02065 W135.0187								
69	5/3/2018	15:58	354)N58.67737 360)N58.7798 361)N58.7798	W135.0032 W135.01288 W135.01296	359)N58.77839	W135.01367			356)N58.69645 357)N58.7761 362)N58.77955	W135.01625 W135.01207 W135.013								
70	5/3/2018	17:00	363)N58.6848	W135.00787					362)N58.77955 364)N58.68703	W135.013 W135.01041								
71	5/3/2018	17:51	369)N58.77867	W135.01356	368)N58.77937	W135.01389			365)N58.68902 366)N58.74681 367)N58.77224	W135.01132 W135.00588 W135.00911								
72	5/3/2018	18:40	371)N58.77265 375)N58.6827	W135.01081 W135.00602	372)N58.6386	W134.9711			374)N58.58784	W134.90291								
73	5/4/2018	5:37	377)N58.75803 380)N58.77975	W135.01016 W135.013	378)N58.77389 379)N58.77503	W135.0131 W135.01302			375)N58.68627 376)N58.74902	W135.00602 W135.01161								
74	5/4/2018	6:35	381)N58.7761 382)N58.74157	W135.01257 W135.01223	382)N58.74157	W135.01223			381)N58.7761 383)N58.70329 384)N58.69219 385)N58.60607	W135.01257 W135.01552 W135.00982 W134.93998								
75	5/4/2018	16:07	386)N58.68031 389)N58.77312	W135.00151 W135.01034					387)N58.75288 388)N58.77251	W135.00638 W135.00828								

76	5/4/2018	17:08	390)N58.77168	W135.00982					391)N58.67684 392)N58.69653	W134.99841 W135.00864								
77	5/4/2018	17:56	396)N58.67696	W135.00276	395)N58.77977	W135.01304			393)N58.77977 394)N58.77977	W135.01302 W135.01303								
78	5/4/2018	18:40	396)N58.67696	W135.00276	395)N58.77977	W135.01304			394)N58.77977 397)N58.67632 398)N58.68011	W135.01303 W135.00225 W134.99444								
79	5/5/2018	5:38	399)N58.6911 401)N58.7582 403)N58.77403 404)N58.77971 405)N58.77339	W135.00091 W135.01012 W135.01002 W135.01305 W135.01224					400)N58.74023 402)N58.7609	W135.01377 W135.01013								
80	5/5/2018	6:19	405)N58.77339 406)N58.769 408)N58.6827	W135.01224 W135.0113 W135.99935					407)N58.75756 409)N58.64403	W135.01144 W134.97626								
81	5/5/2018	16:08	410)N58.6855 413)N58.77506	W135.00664 W135.01106					411)N58.68607 412)N58.76836 414)N58.77897	W135.00702 W135.01034 W135.01261								
82	5/5/2018	17:05	416)N58.77337 417)N58.76484 421)N58.69347	W135.0083 W135.0019 W135.00602					415)N58.7757 419)N58.66554 420)N58.61464	W135.01033 W134.99077 W134.95833								
83	5/5/2018	17:50	426)N58.77822 427)N58.7773	W135.0126 W135.01178					422)N58.69455 423)N58.75996 424)N58.76205 425)N58.77165	W135.00688 W135.0017 W135.0026 W135.00844								
84	5/5/5018	18:37	430)N58.67661 432)N58.6896	W135.00787 W135.00572					428)N58.77713 429)N58.774 431)N58.59552	W135.01173 W135.0104 W134.91933								
85	5/6/2018	5:37	438)N58.77498 439)N58.77655 440)N58.68782	W135.01051 W135.01129 W135.00997	439)N58.77655	W135.01129			433)N58.69303 434)N58.69326 435)N58.69926 436)N58.75371 437)N58.7543	W135.00754 W135.00766 W135.01027 W135.00489 W135.00464								
86	5/6/2018	6:20	438)N58.77498 440)N58.68782	W135.01051 W135.00997	439)N58.77655	W135.01129			437)N58.7543 441)N58.68758	W135.00464 W135.00986								
87	5/6/2018	16:05	446)N58.61356 447)N58.69231 449)N58.76405 450)N58.7682 451)N58.77084	W134.94964 W135.0148 W135.0065 W135.00819 W135.0093					448)N58.71081 452)N58.7734	W135.02355 W135.01151								
88	5/6/2018	17:05	451)N58.77084 454)N58.75573 455)N58.71935 456)N58.66247	W135.0093 W135.00879 W135.01987 W134.99875					452)N58.7734 453)N58.76811 457)N58.6733	W135.01151 W135.01078 W134.99956								
89	5/6/2018	17:47	458)N58.6749 462)N58.74966 463)N58.7603 464)N58.77048 465)N58.77286 467)N58.77452	W135.00077 W135.00953 W135.0087 W135.01046 W135.0105 W135.01213					459)N58.68261 460)N58.71635 461)N58.74166 466)N58.77594	W135.00698 W135.02322 W135.01056 W135.01049								
90	5/6/2018	18:39	465)N58.77286 468)N58.76982 469)N58.7429 470)N58.72307 471)N58.69138	W135.0105 W135.01031 W135.00956 W135.01654 W135.01241	474)N58.60628	W134.94022			466)N58.77594 472)N58.67686 473)N58.6409	W135.01049 W135.00415 W134.97527								
91	5/7/2018	5:36	475)N58.612 476)N58.66164 482)N58.7291 483)N58.75661 484)N58.76112 485)N58.76509 486)N58.76782 487)N58.77067 488)N58.77594 489)N58.77793 490)N58.77971	W134.94625 W134.98998 W135.0144 W135.00518 W135.00518 W135.00589 W135.00711 W135.00868 W135.01199 W135.01328 W135.01295	483)N58.75661 489)N58.77793	W135.00518 W135.01328			476)N58.66164 481)N58.70191 487)N58.77067	W134.98998 W135.01546 W135.00868	478)N58.66968	W134.99687						
92	5/7/2018	6:20	491)N58.7778 492)N58.77389 494)N58.76894 495)N58.76715 496)N58.75849 497)N58.67241 499)N58.63127	W135.01328 W135.01199 W135.01074 W135.01021 W135.0091 W135.00187 W134.96941	492)N58.77389	W135.01199			498)N58.63825 500)N58.68666	W134.97651 W135.00976								
93	5/7/2018	16:05	502)N58.77101 503)N58.77406 504)N58.7787 506)N58.77973	W135.00661 W135.00872 W135.01337 W135.01298					501)N58.75179 505)N58.77973	W135.00471 W135.01297								
94	5/7/2018	17:05	508)N58.77911 509)N58.77575 510)N58.67957	W135.01331 W135.01055 W135.00091					507)N58.77975 511)N58.67025 512)N58.6771	W135.013 W134.99619 W135.00389								
95	5/7/2018	17:50	514)N58.77787 515)N58.77977 516)N58.77977 517)N58.77617	W135.01298 W135.01301 W135.01302 W135.01181					513)N58.74521	W135.0079								
96	5/7/2018	18:35	515)N58.77977 516)N58.77977 518)N58.75734 519)N58.6783 522)N58.59384	W135.01301 W135.01302 W135.00599 W135.00377 W134.92312					515)N58.77977 520)N58.67376 521)N58.62839	W135.01301 W135.00377 W134.9653								
97	5/8/2018	5:37	524)N58.60967 526)N58.64632 527)N58.66691 533)N58.74484 535)N58.77904	W134.94461 W134.97902 W134.99173 W135.00954 W135.01352					525)N58.62548 529)N58.68918 531)N58.69383 532)N58.74231 534)N58.75437	W134.96123 W135.00688 W135.01018 W135.01023 W135.00794					528)N58.67549 530)N58.69097	W134.99713 W135.00825		
98	5/8/2018	6:22	537)N58.75827 539)N58.71464 545)N58.59753 546)N58.65932	W135.00883 W135.02285 W134.93213 W134.98849					538)N58.75408 543)N58.67369 544)N58.62292 545)N58.59753	W135.00945 W135.01118 W134.96482 W134.93213					540)N58.71079 541)N58.70351	W135.02175 W135.01952		
99	5/8/2018	16:13	549)N58.76079 550)N58.76397 551)N58.76927 552)N58.77374 553)N58.77956	W135.00892 W135.00935 W135.01063 W135.01186 W135.01338	554)N58.77953	W135.01292			547)N58.68722 548)N58.72158	W135.01098 W135.01366								
100	5/8/2018	17:00	555)N58.77355 556)N58.77123 558)N58.73292	W135.01138 W135.01086 W135.01214	557)N58.77011 559)N58.68822	W135.01061 W135.00849			560)N58.66461 561)N58.64366 562)N58.63115	W134.99376 W134.97872 W134.96558								
101	5/8/2018	17:50	570)N58.77248 571)N58.77322	W135.01154 W135.01163	571)N58.77322	W135.01163			563)N58.64416 564)N58.65285 566)N58.66942 567)N58.68825 568)N58.76881 569)N58.76976	W134.397728 W134.98419 W134.99495 W135.00761 W135.01079 W135.01102								
102	5//8/2018	18:35	570)N58.77248	W135.01154					571)N58.77322 575)N58.64963 576)N58.59781 578)N58.59582	W135.01163 W134.98124 W134.92719 W134.92316								
103	5/9/2018	5:35	579)N58.60455 580)N58.67188 585)N58.77904 586)N58.77484	W134.93733 W135.00008 W135.01313 W135.01203	584)N58.77829	W135.01268			581)N58.6888 582)N58.7621 583)N58.77639	W135.01218 W135.01052 W135.01232								

104	5/9/2018	6:20	586)N58.77484 587)N58.72429	W135.01203 W135.01701	587)N58.72429	W135.01701									591)N58.60137	W134.93571		
105	5/9/2018	16:05	592)N58.77847	W135.01331														
106	5/9/2018	7:05	593)N58.7714 594)N58.62658 597)N58.58839	W135.01124 W134.96559 W134.90934					595)N58.61538 596)N58.60455	W134.95356 W134.94188								
107	5/9/2018	17:47	600)N58.76004 602)N58.76144 603)N58.77192	W135.01372 W135.0828 W135.01091	604)N58.77511 605)N58.76695	W135.01263 W135.00875			598)N58.6126 599)N58.66404 601)N58.7388	W134.9532 W134.9955 W135.01109								
108	5/9/2018	18:30	606)N58.64618	W134.982					608)N58.63925 609)N58.73565	W134.97991 W135.01246								
109	5/10/2018	5:38															610)N58.76797	W135.01051
111	5/10/2018	6:25			612)N58.64947	W134.98797			613)N58.58967 614)N58.63581	W134.91243 W134.97384							611)N58.75754	W135.00823
112	5/10/2018	16:05	615)N58.69166 618)N58.77997	W135.01444 W135.01324					616)N58.69798 617)N58.74219	W135.01794 W135.00945								
113	5/10/2018	17:00	620)N58.72221	W135.02098	619)N58.74693	W135.007329			621)N58.70786 622)N58.69498 624)N58.66383	W135.02211 W135.01886 W134.99487			623)N58.6797	W135.0103				
114	5/10/2018	17:45							625)N58.69486 626)N58.74462	W135.01351 W135.00582								
115	5/10/2018	18:30	627)N58.68648	W135.00878					628)N58.66792	W134.98728								
116	5/11/20180	5:35	629)N58.69378 631)N58.77601 632)N58.76084	W135.00151 W135.00989 W135.00935					629)N58.69378 630)N58.72985	W135.00151 W135.01378								
117	5/11/2018	6:18	633)N58.68661 635)N58.66285	W134.99756 W134.98956					634)N58.67607	W134.99453								
118	5/11/2018	16:12							636)N58.6864 637)N58.73487	W135.01018 W135.01173							638)N58.77929	W135.01287
119	5/11/2018	17:05			639)N58.72344	W135.02028			641)N58.67575 642)N58.66773	W135.00336 W134.99765							640)N58.6831	W135.00846
120	5/11/2018	17:51			645)N58.70597	W135.01993			643)N58.691 644)N58.74758	W135.013 W135.00945								
121	5/11/2018	18:35							646)N58.69098 647)N58.6249	W135.01266 W134.96208								
122	5/12/2018	5:35			650)N58.73485	W135.01241			648)N58.69389 649)N58.76356	W135.01166 W135.00777								
123	5/12/2108	6:20	656)N58.58777	W134.9053					651)N58.72784 653)N58.67995 654)N58.65009	W135.0164 W135.01158 W134.98844							652)N58.6864	W135.01477
124	5/12/2018	16:05	657)N58.63671	W134.97009	660)N58.68479	W135.01548			658)N58.67264 659)N58.75713	W134.99625 W135.00489								
125	5/12/2018	17:05	662)N58.58764	W134.90704					661)N58.59152	W134.91528								
126	5/12/2018	17:40	663)N58.68964 666)N58.68086	W135.01061 W135.00184					664)N58.72086 665)N58.77638	W135.01672 W135.01287								
127	5/12/2018	18:30							667)N58.67056 668)N58.63287	W134.99661 W134.9687								
128	5/13/2018	5:35	669)N58.66288	W134.9979					671)N58.73272	W135.01172	670)N58.672	W135.00621						
129	5/13/2018	6:21	672)N58.7219 677)N58.66667	W135.02565 W134.99471					674)N58.66839	W135.00454	673)N58.68511 675)N58.62686 676)N58.60747	W135.01461 W134.97003 W134.94848						
130	5/13/2018	16:05	681)N58.71839 683)N58.77186	W135.01929 W135.01125	684)N58.6677	W135.00244			679)N58.6769 680)N58.68829 682)N58.72907	W135.00172 W135.0095 W135.01436	678)N58.67102	W134.99793						
131	5/13/2018	17:05							685)N58.70003	W135.01592								
132	5/13/2018	17:45							686)N58.70247	W135.01684								
133	5/13/2018	18:30	687)N58.73521	W135.01013					688)N58.72863 690)N58.59449 691)N58.60022	W135.01366 W134.92061 W134.93289								
134	5/14/2018	5:37	692)N58.63543 694)N58.73949 696)N58.75241 697)N58.77101	W134.9724 W135.01182 W135.00752 W135.00827					693)N58.72569 695)N58.74488	W135.01712 W135.00957								
135	5/14/2018	6:30	698)N58.76428 701)N58.71618 702)N58.68585 703)N58.63714 705)N58.58778	W135.00559 W135.02089 W135.00513 W134.97162 W134.90733					700)N58.75461 704)N58.60857	W135.00533 W134.94479	698)N58.76428	W135.00559						
136	5/14/2018	16:13	706)N58.77943	W135.01363	707)N58.76254	W135.00956												
137	5/14/2018	17:05	708)N58.73587 709)N58.66259	W135.01336 W134.99444					710)N58.65982 711)N58.60625 712)N58.58989 713)N58.73775	W134.99204 W134.94154 W134.91072 W135.01163								
138	5/14/2018	17:53	714)N58.74267 715)N58.75179 716)N58.7718	W135.01003 W135.00897 W135.01104														
139	5/14/2018	18:38	717)N58.76126 718)N58.67519 719)N58.66473 720)N58.65076	W135.00814 W135.00083 W134.99379 W134.98289														

Attachment 2

Wildlife Monitoring Report – 2018

2018 TERRESTRIAL WILDLIFE MONITORING REPORT OF THE SLATE LAKES BASIN

Coeur Alaska Inc. - Kensington Mine
3031 Clinton Drive Suite 202
Juneau, AK 99801

January 2019

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1.0 Introduction

This report describes the 2018 wildlife monitoring season (April through September) in accordance with the Kensington Project Terrestrial Wildlife Monitoring Plan. Coeur Alaska and resource agencies designed this plan to monitor wildlife resources in the Slate Lakes basin. This monitoring records the effectiveness of mitigation during mine operations that encourages land use by local wildlife.

The Kensington Gold Project Final Supplemental Environmental Impact Statement (FSEIS) (USFS 2004) documented the occurrence of wildlife species in the Slate Lakes basin prior to construction activity. Coeur Alaska conducted a baseline survey in 2005 (Living System Designs 2005). Management indicator species in the Berners Bay area include black and brown bear, Sitka Black-tailed deer, Alexander Archipelago wolf, Bald Eagle, red squirrel, river otter, marten, Red-breasted sapsucker, Brown creeper, and Vancouver Canada goose.

Sightings of wildlife or their sign within the Slate Lakes basin include moose, black bear, brown bear, wolf, deer, Canada goose, red squirrels, porcupine, river otter, old beaver cuttings, Bald Eagles, Red-tailed Hawks, Pygmy Owls, Rufous Hummingbirds, Sooty Grouse, bats, wading birds, ducks, passerines, sapsuckers and various mustelid species.

Coeur Alaska monitored wildlife in 2006 and 2007 during the first phase of construction. Due to no construction activity during 2008, no wildlife monitoring was conducted during this period. Wildlife monitoring resumed in early September 2009 at the start-up of construction for the Tailings Treatment Facility (TTF) and continued through 2010 when mine tailings were first placed in the TTF. Monitoring ceased during 2011, but restarted in 2012 and has continued through 2018.

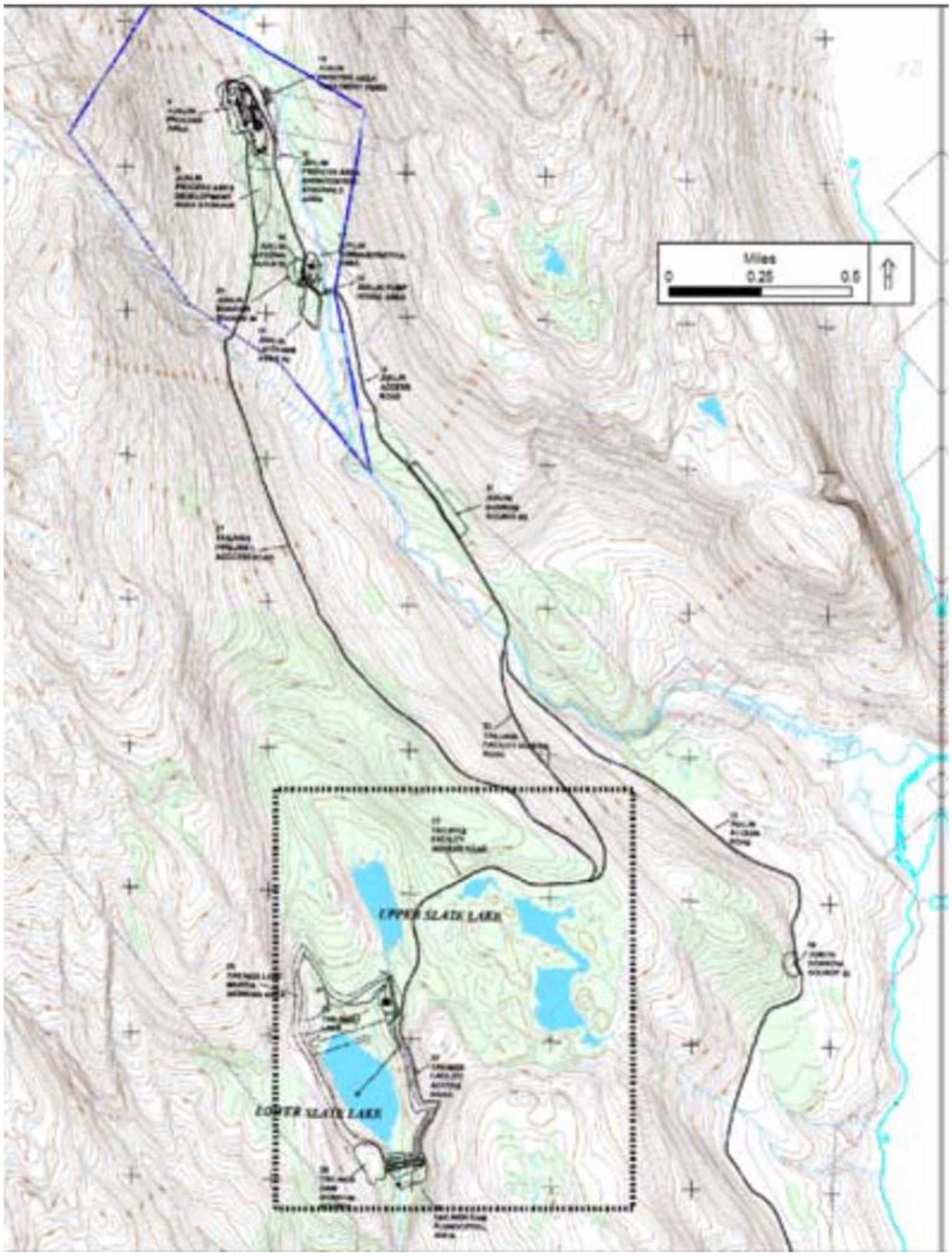

Figure 1: Slate Lakes basin in relation to access roads and the Tailings Treatment Facility (TTF). The access road to the TTF was constructed in 2006. The tailings dam was constructed between August 2009 and August 2010. Construction for the stage 3 tailings dam raise occurred February – December of 2018.

1.1 Wildlife Monitoring Objective

The objectives of the Kensington Project Wildlife Monitoring Plan are to:

- Supplement the regional resource knowledge base with site-specific data
- Gather new information on specific wildlife habitats and species that could be affected by increased activity at the project site with specific attention to sensitive species
- Identify concentrations of wildlife near specific resources (e.g., stream mouth marshes, anadromous streams, lakes, wetlands, bird nesting/feeding areas, large mammal crossing areas, etc.)
- Conduct wildlife observations along an established route surrounding the Slate Lakes basin on a frequent basis from spring through fall
- Collect data and other information that can be used to shape the subsequent year's studies and long-term monitoring

Figure 2: The Slate Lakes basin in 2005, prior to construction of the access road and the Lower Slate Lake Tailings Treatment Facility.

2.0 Survey Area

The wildlife monitoring survey area lies within the confines of the Slate Lakes basin, an area of approximately two square kilometers, ranging in elevation from 200 meters above sea level at the mouth of Lower Slate Lake, to 300 meters on the ridge to the west of Lower Slate Lake (Figure 1). Water bodies within the basin include Lower and Upper Slate Lakes to the west and the Spectacle Lakes complex to the east. Both Lower and Upper Slate Lake have steep western slopes, but much of the remaining area around Upper Slate Lake is flat with a mild slope to the east. The area around the Spectacle Lakes is also fairly flat. There is drainage from the southeast corner of Lower Spectacle Lake into Berners Bay, while Fat Rat Lake drains into Upper Slate Lake (Figure 2). Upper Slate Lake drains to Lower Slate Lake via Mid-Lake Slate Creek and Lower Slate Lake drains to East Fork Slate Creek.

Prior to construction, terrestrial vegetation types around Upper and Lower Slate Lakes were similar and included mixed spruce and hemlock forest to the west of both lakes and to the southeast of Lower Slate Lake. The north and east shores of both lakes were characterized by wetlands containing sedge meadow and scrub muskeg. The periphery timber of Lower Slate Lake was clear-cut by September 2005 and the TTF access road along the north of Spectacle Lakes was constructed by August 2006. The immediate vicinity of Upper Slate Lake has not been impacted by the project. The vegetation around the Spectacle Lake complex included sphagnum bogs and sedge fens with brushy, scrub forest in elevated areas. All of the lakes contained various species of aquatic vegetation, though not in high volume (Living System Designs 2005).

3.0 Methods

Kate Savage, who conducted wildlife monitoring in 2006, 2007, and 2010 established transects that were used in all surveys, including the 2018 season. There are 20 transects around the basin, each transect is 50 meters long and runs in a north-south direction (see Appendix A). The transects provide a systematic method for recording wildlife sign throughout the season. The north, middle, and south end of each transect were marked with stakes and survey flagging. GPS coordinates of each transect were also recorded (see list in Appendix B). Coeur Alaska environmental technicians visited each transect once per week during the 2018 season when possible. Starting at the north end of each transect (zero meters), the technicians walked the length of the transect examining the ground within one meter on both sides, ending at 50 meters. Technicians recorded the location of the sign found along transects (i.e. tracks, scat, digs) by indicating the meter number and whether they lay on the left, center, or right side of the transect. Furthermore, sign was removed from the transects by filling in tracks or brushing aside scat. In this way, fresh wildlife sign could be more easily separated from older, previously recorded sign. Three motion-sensor cameras (Browning Strike Force HD Pro, Model # BTC-5HDP) were positioned in areas of dense wildlife sign to provide information on the number of individuals using an area.

Scans with binoculars were also made from the access road and view-points between transects to detect the presence of wildlife from afar. This method was most effective for observing waterfowl on the lakes. Lower Slate Lake is easily visible from almost any aspect on the TTF road. Viewing locations were optimum in the Spectacle Lakes area from the western edge of Lower Spectacle Lake, the southern tip of Lower Spectacle Lake, which also afforded a good view of the adjacent southern slough, and the northern tip of upper Spectacle Lake.

Environmental technicians recorded data on wildlife sign along transects to ensure observations and data collection were as standardized and unbiased as possible. Other information collected included weather conditions, visibility, and the time at the start and end of each survey.

Figure 3: Spectacle Lakes basin with access road to the Tailings Treatment Facility (2010)

4.0 Survey Results

During the 2018 survey season, environmental technicians determined the presence of wildlife within the Slate Lakes basin through actual sightings, identification of wildlife sign (tracks, digs, scat, and feathers), and motion-sensor camera photography. Data collected during surveys included direct observations of wildlife species with photographs taken when possible, date and time, location, and behavior of wildlife. Specific signs such as digs, tracks, and scat were recorded on field data sheets. Other applicable data and observations were noted on the field data sheets as well. A complete photo log of all monitoring photos during the 2018 season is located in Appendix C. Table 1 through Table 4 summarize wildlife sign by the main species present in the Slate Lakes basin (All species, Bear, Moose, and Goose). Charts 1 through 7 compare data (number of signs observed) collected on these species from 2012 to 2018 by month.

4.1 Black Bears (*Ursus americanus)*

Indications of bear activity included animal sightings, tracks, scat, and digs, which were most prevalent in the month of July. The greatest amount of bear sign and sightings were noted at T13. Not all transects had sign of bear activity in 2018. Bears were frequently sighted crossing or traveling along the TTF access road and around the TTF throughout the season. Sows with cubs each were observed in the survey area this summer. No brown bears were sighted in the area in 2018. Black bears commonly triggered the trail cameras located around the survey area. One of the camera's was placed at a rubbing tree, where at least two distinct black bears were documented investigating and rubbing the tree with their backs.

4.2 Moose (*Alces alces*)

Moose sign consisted of tracks, scat, browse, and numerous photographs from the trail camers; no bedding sites were observed in 2018. The greatest concentration of moose sign was counted during the month of May and at T5 in 2018. Transect(s) of highest concentration varies from season to season. Plants such as pond weeds, grasses, and sedges that generally make up part of moose's diet are all abundant within the survey area. Moose tracks can form deep depressions in soft, wet ground that persist for months. A single moose can also leave a large number of signs by simply walking parallel to a transect. These factors were taken into consideration when making any conclusions about levels of activity over time.

4.3 Avian Species

The avian species identified through direct sightings or indirectly through songs or calls included both resident and migratory wading birds, non-passerine land birds, passerines and species of special interest, which include waterfowl and raptors. No herons were observed in the Slate Lakes basin in 2018, though numerous herons were observed at Slate Cove and Comet Beach.

As with previous survey seasons, Canada geese (Branta Canadensis) have continued to use the area as a summer refuge. Geese were seen at the tailings pond early May in 2018 and sightings continued throughout the season, peaking in August. A gaggle of nearly 40 geese were counted on Fat Rat Lake on August 3. High numbers of goose sign were concentrated at T14. This area is a large, open-flat located in close proximity to Fat Rat Lake. Goose signs observed were in the form of scat, tracks left in mud, and feathers. Numerous feathers were often found in one spot which may be an indication of summer molting. As environmental technicians conducted surveys, geese would often be observed swimming in groups on all the lakes of the survey area.

Sooty Grouse with chicks have been observed in the Slate Lakes basin in previous years. In 2018, at least 2 male Sooty Grouse mating calls could be heard throughout the Slate Lakes basin in the spring. No females were observed.

As with the 2014 through 2017 survey seasons, a pair of Yellowlegs appeared to be nesting in the survey area. No ground nest or signs of chicks were observed, however the pair behaved defensively whenever technicians attempted to survey the transects north of Upper and Lower Spectacle Lakes. Technicians were often mobbed and harassed by the pair from May to June. Ducks appear to make some use of Spectacle Lakes and Upper and Lower Slate Lake continually during summer and fall months. Goldeneyes, Mallards, Loons, Mergansers, and Greater Scaups were observed throughout the season.

Other common bird species observed in the area included Dark-Eyed Juncos, Steller’s Jays, American Robins, Varied and Hermit Thrushes, Chestnut-backed Chickadees, American Dippers, Warblers, Sapsuckers, Common Ravens, Winter Wrens, Ruby-Crowned Kinglets, Tree Swallows, Olive-sided Flycatchers and song sparrows. Rufous Hummingbirds were heard and observed flying in the survey area several times in 2018. An avian species list compiled and updated yearly since 2012 by environmental technicians is located in Appendix E.

4.4 Other Sightings

Alexander Archipelago wolf scat was recorded on one occasion in August. Porcupine and marten tracks were recorded, both in the month of July.

Both Western Toads and Wood Frogs have not been sighted since 2012. It is likely that smaller mammals are just as active (if not more so) in summer, but their sign is more evident in snow. Current surveying practices were not conducive to obtaining representative data on small mammal, weasel, and rodent populations within the Slate Lakes basin.

4.5 Human Activity

The access road to the TTF has considerable traffic use at times, and experienced an increase with heavy equipment throughout 2018 due to the construction for the stage 3 tailing’s dam raise. An increase in noise and traffic along the access road and at the dam and north laydown occurred throughout the survey season.

5.0 Discussion

The transects are all located in open bog and fen areas around the lakes, as opposed to thick brush, for ease of finding wildlife sign. Smaller, lighter mammals do not leave visible tracks in firmer ground. This led to some bias with apparent abundance of large mammals relative to smaller mammals.

Bear sign peaked in July and began steadily tapering off through fall, the same trend documented 2014 - 2017. This is most likely due to the bears' diet transitioning from the berries and roots found in the survey area in early summer, to salmon during the Pink, Chum, and Coho runs beginning early August in Slate and Johnson Creek. Most of the bear sign found was in the form of scat and digs. Bears have continued to use the TTF access road as a corridor for travel and all habitat within the survey site for food. There was less bear sign recorded in 2018 than previous years. However, bears were still regularly seen around site throughout the summer by environmental technicians and mine personnel. It seems that bears were not using the survey area the same way this summer. One can speculate the construction at the TTF played a role. It was also a notoriously bad berry year (all varieties) throughout Southeast Alaska.

The highest amount of moose sign was recorded in the month of May. The moose sign then steadily decreased through the rest of the summer and into the fall. There was minimal browse sign and little scat observed, which indicates that the moose might be traveling through the survey area, rather than using it as a food source like the bears. Summer moose activity in the survey area appear to have slightly declined since 2010 in recent years. However, moose were abundant in the winter throughout the survey area, January – March (see Appendix C: Photo Log). There were multiple cows and at least 2 of these cows were accompanied by calves.

Goose signs counted in 2018 were consistent with 2016 and 2017 data, which is higher in comparison to the 2014 and 2015 survey seasons. Both adults and gosling were witnessed this summer, confirming the survey area as optimal habitat for rearing young. Use of the Slate Lakes basin as a refuge for Canada geese has previously been documented in 2000 (ABR 2000), 2004 (USFS 2004), in 2005 (Living System Designs 2005), 2006, 2007 (Savage 2007), and 2012 through 2016 wildlife surveys. The no-fly zone over the Spectacle Lakes basin, instigated through Coastal Helicopters in 2007 to minimize disturbance to geese, continued through 2017.

6.0 Conclusions

Wildlife populations within the Slate Lakes basin generally appear healthy and abundant. Overall, signs and sightings show similar trends to previous years. A slight decrease in overall sign in 2018 could be attributed to the increased construction activity in the area for the TTF dam raise. Comparisons with baseline studies conducted in 2004 and 2005 indicate mining operations have had little impact on the abundance or habits of terrestrial wildlife in the area.

7.0 References

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SURVEY RESULTS

Table 1: Total Wildlife Sign Data

ALL	4/25	5/2	5/12	5/17	5/28	6/6	6/13	6/20	7/3	7/19	7/25	8/1	8/15	8/24	9/11	9/21	
T1	1			1					1	1			4	1			9
T2	1	1					1	2		2			1	1			9
T3			1				1			1							3
T4				1		1			1	2							5
T5	1				3	1	1		3	3	1		2	2		1	18
T6			1	2					1	1						1	6
T7		1		2				1							1		5
T8												1				1	2
T9							1		1					1			3
T10									1	4							5
T11				1						2			3	1		1	8
T12								1		1			5	1			8
T13										4	2	1		2			9
T14		1		1					1	2	3	3	3	2		1	17
T15				1						3			1				5
T16								1	1	2							4
T17							1	1	1	1			1				5
T18		1			1		1					1	4	3	1		12
T19				1		2			1			2	2				8
T20		1		1	1			2		1			1	1			8
TOTAL	**3**	**5**	**2**	**11**	**5**	**4**	**6**	**8**	**12**	**30**	**6**	**8**	**27**	**15**	**2**	**5**	**149**

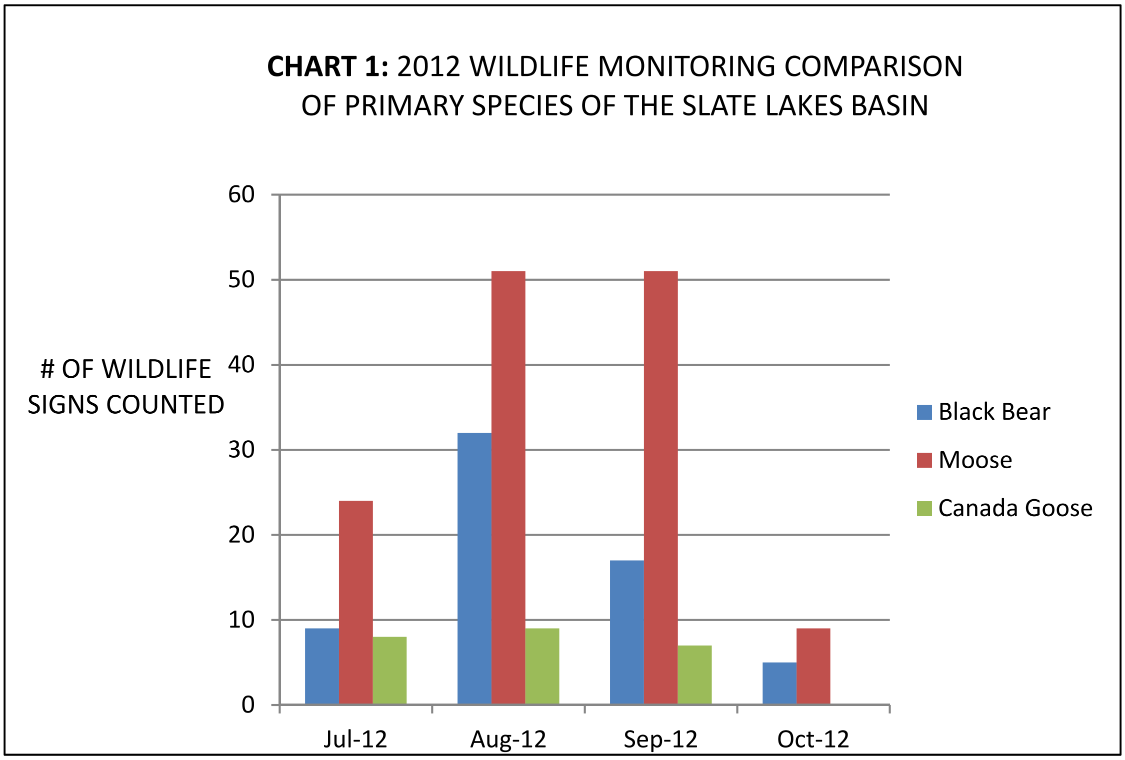
Table 2: Bear Sign Data

BEAR	4/25	5/2	5/12	5/17	5/28	6/6	6/13	6/20	7/3	7/19	7/25	8/1	8/15	8/24	9/11	9/21	
T1																	0
T2														1			1
T3										1							1
T4																	0
T5														1		1	2
T6																	0
T7															1		1
T8																	0
T9							1										1
T10									1	1							2
T11										1							1
T12														1			1
T13										4	2	1		1			8
T14													1			1	2
T15				1						2			1				4
T16								1		1							2
T17										1							1
T18																	0
T19																	0
T20																	0
TOTAL	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**1**	**11**	**2**	**1**	**2**	**4**	**1**	**2**	**27**

Table 3: Moose Sign Data																
MOOSE	4/25	5/2	5/12	5/17	5/28	6/6	6/13	6/20	7/3	7/19	7/25	8/1	8/15	8/24	9/11	9/21	
T1	1			1					1	1			2				6
T2	1	1					1	2									5
T3			1				1										2
T4				1		1											2
T5	1				3	1	1		1	2			1				10
T6			1	2													3
T7		1		2				1									4
T8																	0
T9									1								1
T10																	0
T11				1						1				1			3
T12																	0
T13																	0
T14		1		1													2
T15										1							1
T16										1							1
T17																	0
T18		1			1		1						1		1		5
T19				1		2						2					5
T20		1		1	1								1				4
TOTAL	**3**	**5**	**2**	**10**	**5**	**4**	**4**	**3**	**3**	**6**	**0**	**2**	**5**	**1**	**1**	**0**	**54**

Table 4:	Goose Sign Data															
GOOSE	4/25	5/2	5/12	5/17	5/28	6/6	6/13	6/20	7/3	7/19	7/25	8/1	8/15	8/24	9/11	9/21	
T1													1	1			2
T2										2			1				3
T3																	0
T4										2							2
T5									1	1	1			1			4
T6									1	1						1	3
T7																	0
T8												1				1	2
T9														1			1
T10										3							3
T11													3			1	4
T12										1			5				6
T13														1			1
T14									1	2	3	3	2	2			13
T15																	0
T16									1								1
T17							1		1				1				3
T18												1	3	2			6
T19									1				2				3
T20								2						1			3
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**6**	**12**	**4**	**5**	**18**	**9**	**0**	**3**	**60**

CLUSTERED COLUMN CHARTS COMPARING SPECIES 2012 - 2018



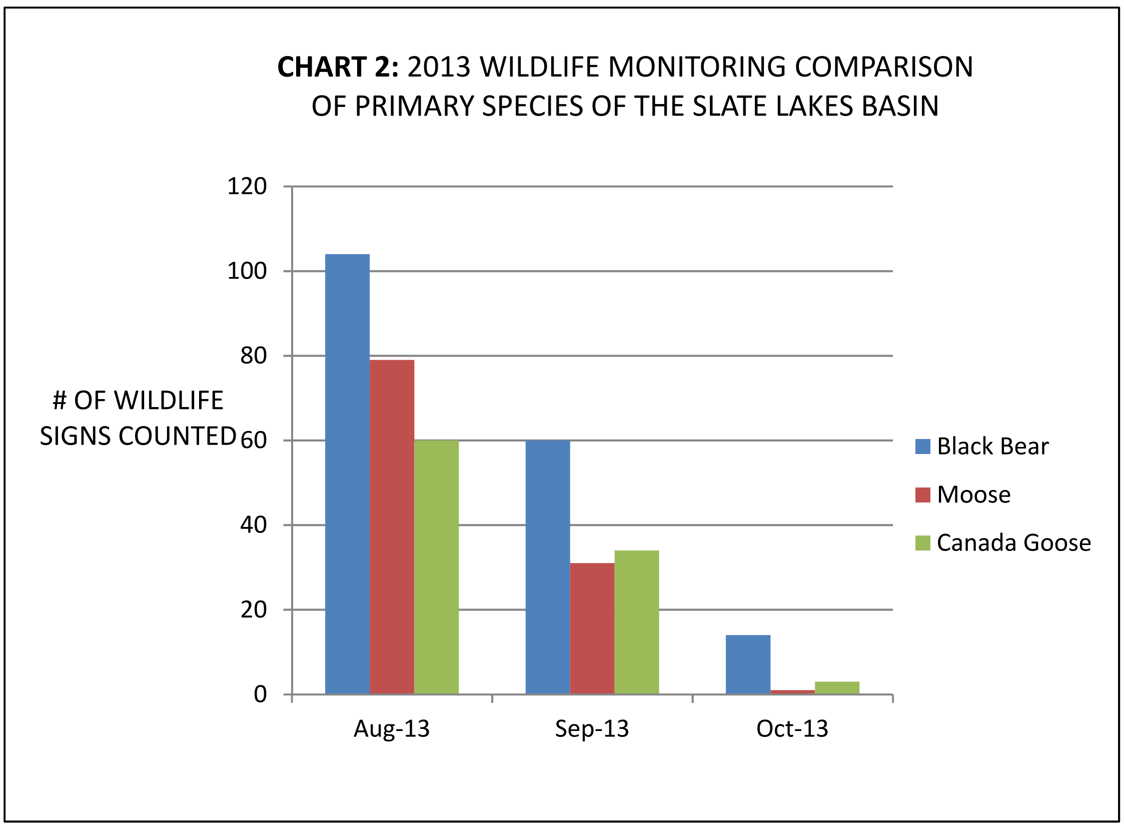


CHART 3: 2014 WILDLIFE MONITORING COMPARISON OF PRIMARY SPECIES OF THE SLATE LAKES BASIN

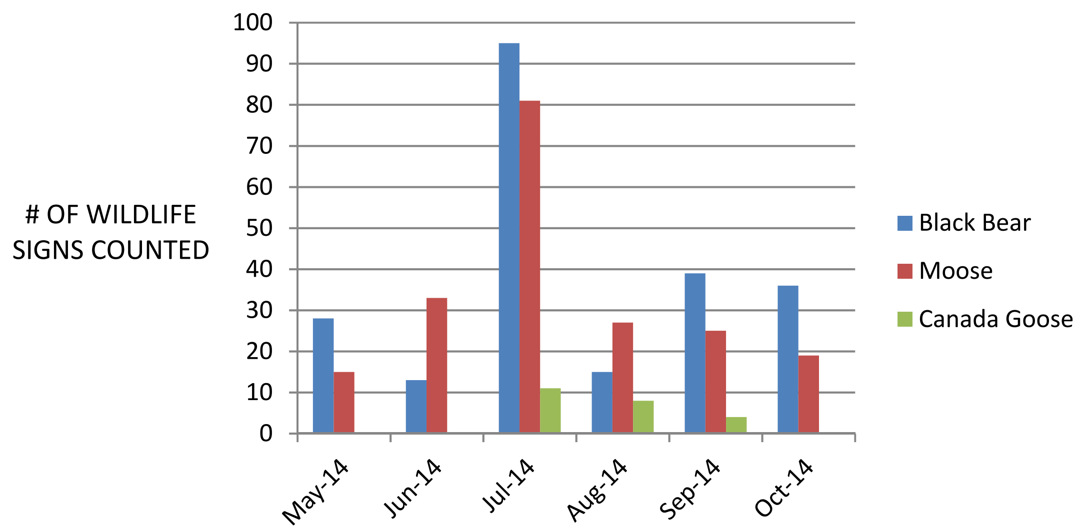
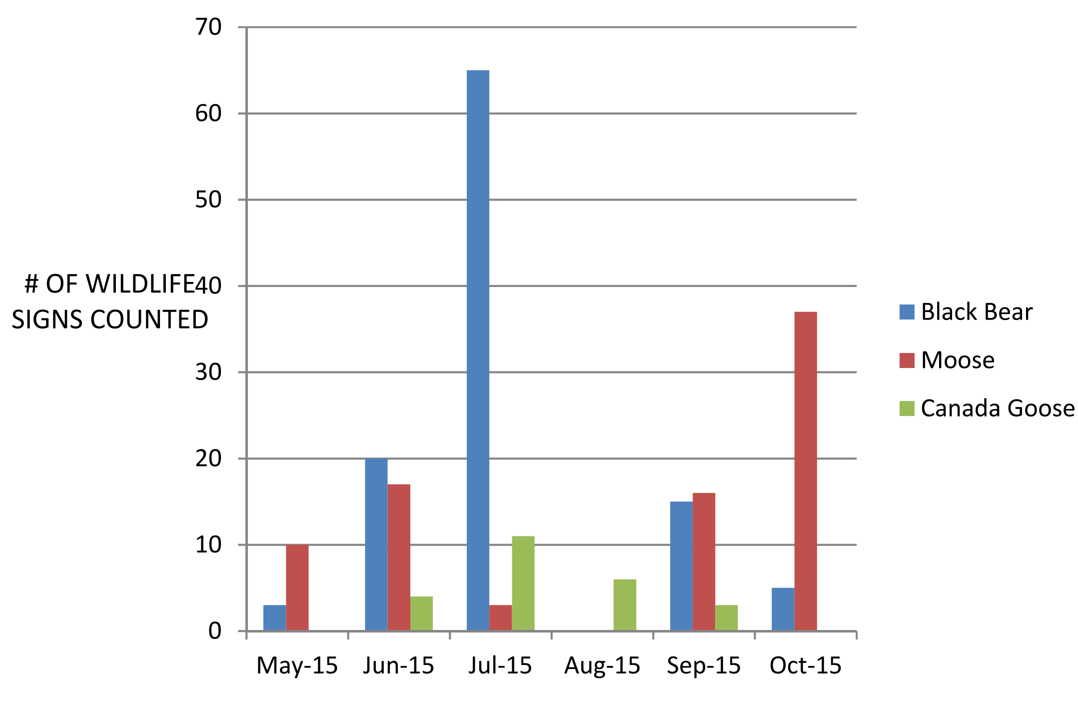


CHART 4: 2015 WILDLIFE MONITORING COMPARISON OF PRIMARY SPECIES OF THE SLATE LAKES BASIN



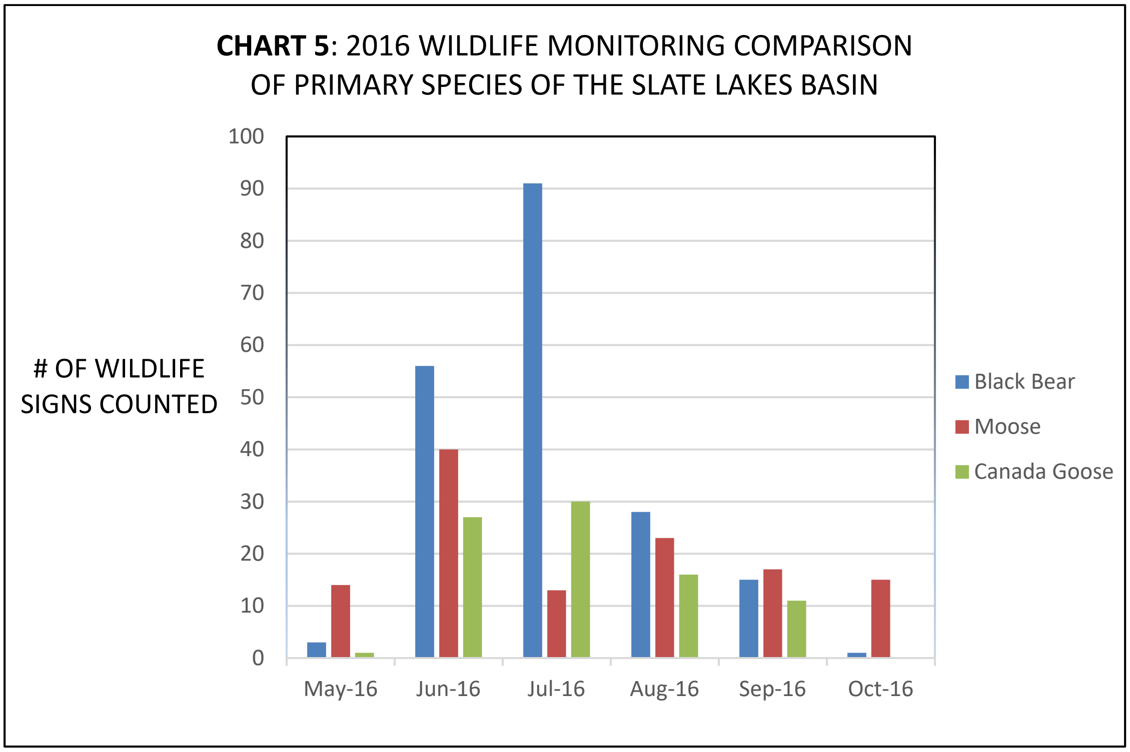


CHART 5: 2016 WILDLIFE MONITORING COMPARISON
OF PRIMARY SPECIES OF THE SLATE LAKES BASIN
OF WILDLIFE SIGNS COUNTED
100
90
80
70
60
50
40
30
20
10
0
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Black Bear
Moose
Canada Goose

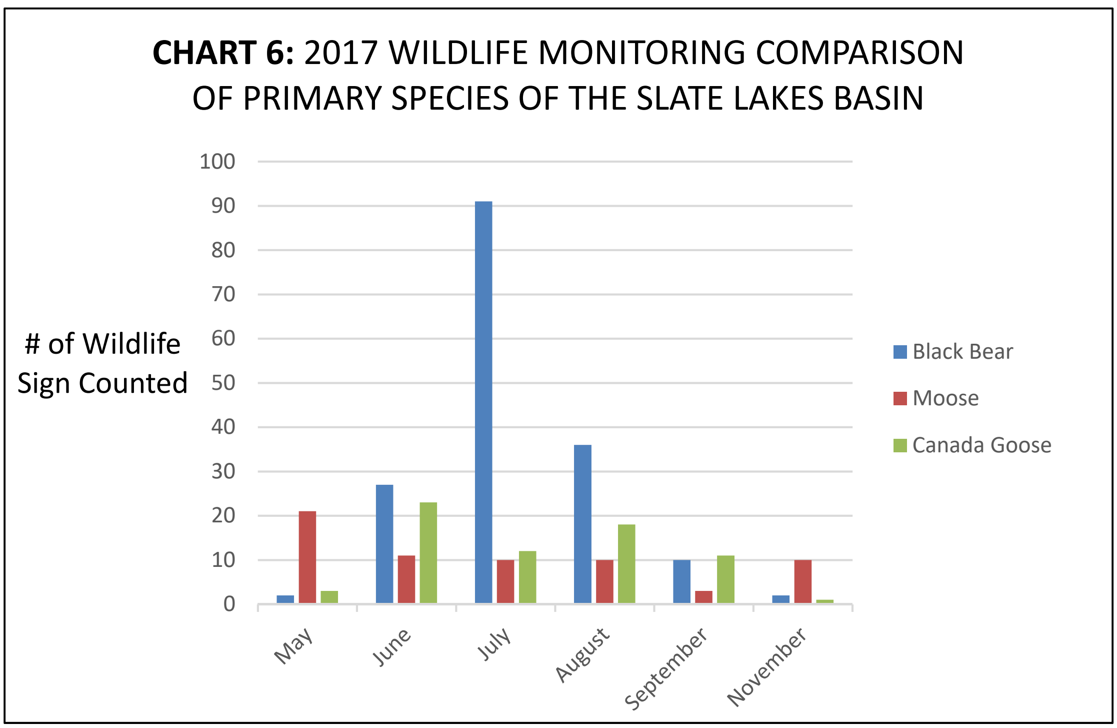


CHART 6: 2017 WILDLIFE MONITORING COMPARISON
OF PRIMARY SPECIES OF THE SLATE LAKES BASIN
# of Wildlife Sign Counted
100
90
80
70
60
50
40
30
20
10
0
May
June
July
August
September
November
Black Bear
Moose
Canada Goose

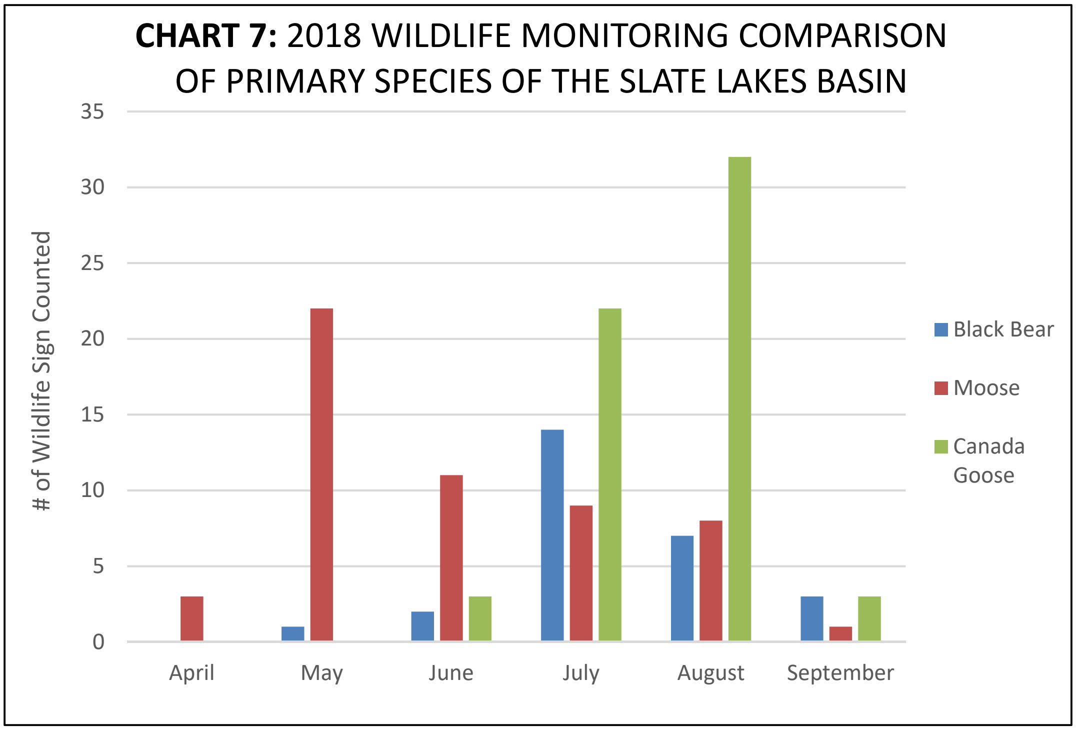
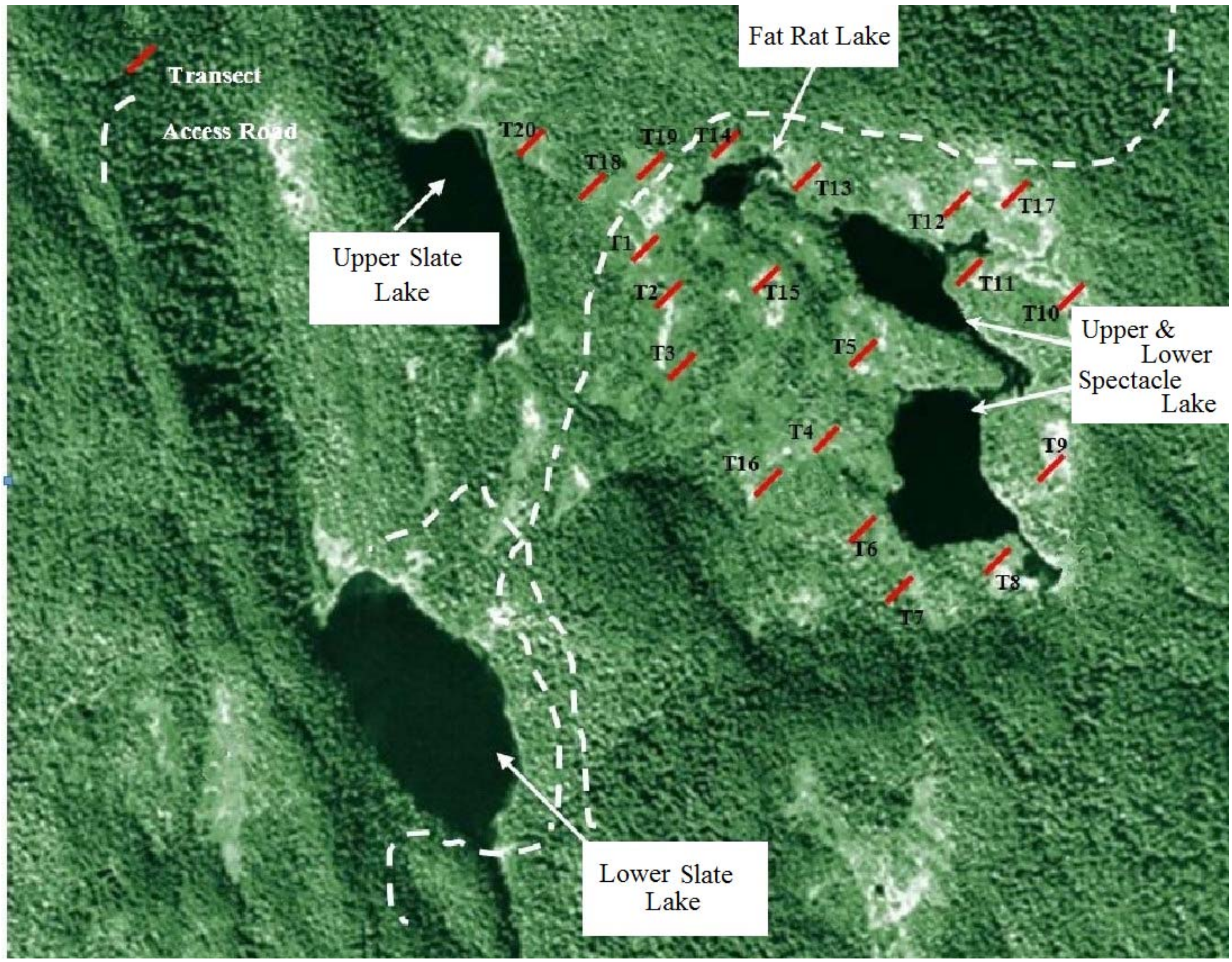


CHART 7: 2018 WILDLIFE MONITORING COMPARISON OF PRIMARY SPECIES OF THE SLATE LAKES BASIN
# of Wildlife Sign Counted
35
30
25
20
15
10
5
0
April
May
June
July
August
September
Black Bear
Moose
Canada Goose

APPENDIX A: SITE MAP WITH TRANSECTS



APPENDIX B: TRANSECT GPS COORDINATES

(All North End Coordinates)

T1 N 58.81712N/135.03537W
T2 N 58.81631N/135.03036W
T3 N 58.81509N/135.03416W
T4 N 58.81410N/135.03032W
T5 N 58.81537N/135.02911W
T6 N 58.81288N/135.02849W
T7 N 58.81182N/135.02705W
T8 N 58.81250N/135.02471W
T9 N 58.81377N/135.02370W
T10 N 58.81657N/135.02342W
T11 N 58.81678N/135.02596W
T12 N 58.81765N/135.02682W
T13 N 58.81788N/135.03061W
T14 N 58.81834N/135.03325W
T15 N 58.81660N/135.03181W
T16 N 58.81410N/135.03157W
T17 N 58.81782N/135.02492W
T18 N 58.81820N/135.03523W
T19 N 58.81812N/135.03630W
T20 N 58.81844N/135.03839W

APPENDIX C: WILDLIFE PHOTO LOG 2018

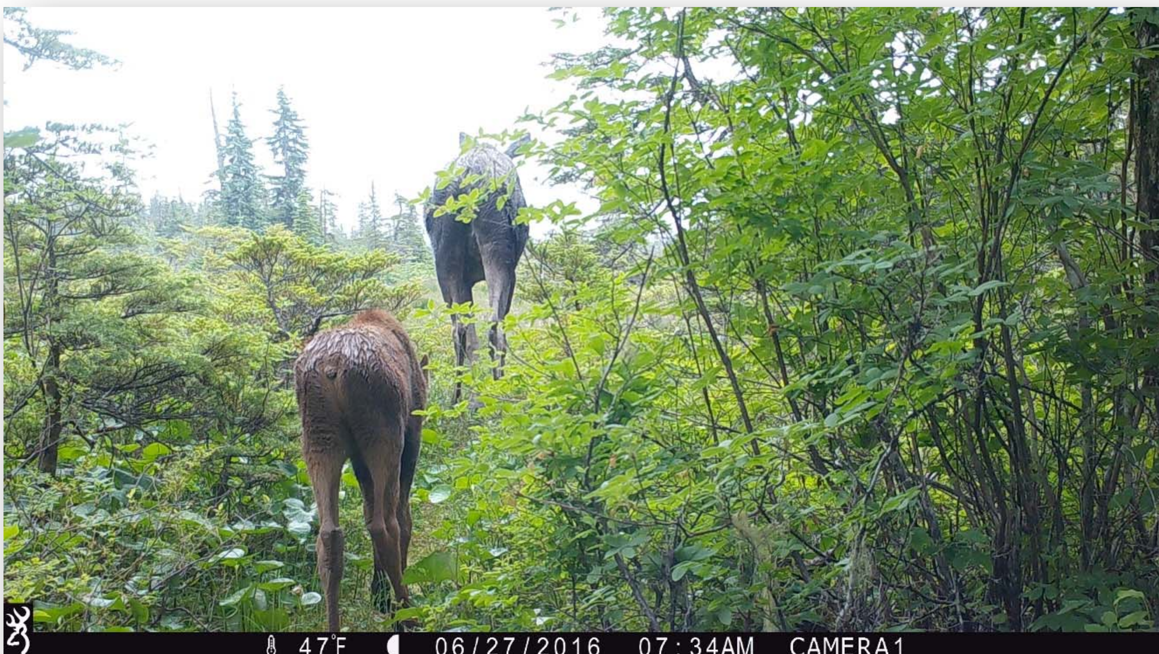
Cow moose traveling between T19 and T20 in May 2018

Red-Tailed Hawk perched in snag by TTF in April 2018

Black bear cub between T12 and T13 in June 2018 (year incorrect on camera)

Porcupine between T19 and T20 in February 2018

Black bear investigating rub tree near Upper Slate Lake in July of 2018



Cow moose with calf traveling between T12 and T13 in June 2018 (year incorrect on camera)

Black Bear traveling on water diversion pipe by TTF August 2018

Cow moose and calf foraging in survey area in February 2018 (date incorrect on camera)

APPENDIX D: 2018 DATA SHEETS

Transect Data

Transect: T1-17 Date: 4/26/18 Time: 1345 – 1630

Personnel: CWG, KS Weather: overcast +41°F

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T5	45	R	track (old)	M		dark eyed junco
T2	40	R	track (old)	M		sooty grouse hoots
T1	5	L	tracks (old)	M		lakes frozen

Transect Data

Transect: All Date: 5/2/18 Time: 1400 – 1530

Personnel: CWG, KS Weather: overcast +42°F

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T18	30	LCR	T (old)	M		sooty grouse hoots nearby (2-3)
T20	5	LCR	T (old)	M		
	8	"	"	"		lakes still partially frozen
T1	5	CL	T	M		
						geese @ TTF
T14	49	L	T	M		
T2	40	C	T	M		
T7	28	LCR	T	M		

Transect Data

Transect: A1 Date: 5/12/18 Time: 1300-1600

Personnel: ANT2 Weather: overcast + drizzle

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T18	/				nuthin
T19	/				nuthin
T20	/				upper slope still 2/3 ice covered
T14	/				Sm black white ring big head white marks on wings – fat raft ~+8 maybe on spec
T1	/				↑ Barrow's Goldeneye
T2	/				
T3 24-25	L	track	MOOSE		maybe from last week?
T15	/			Red throated-	Loons, spectacle pair
T5	/				
T6 28-35	L	track	moose		
T7	/				
T8	/				
T9	/				
T10	/				
T11	/				
T12	/				
T17	/				

Transect Data

Transect: A1 Date: Sunny + 60°F Time: 1130-1330

Personnel: RB, KS Weather: 5/17/18

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T19 46	L&R	track	M		repeat?
T20 15	L&R	track	M		
T1 28	L&R	T	M		mallards and greater scaups on farthest lake
T14 47	L&R	T	M		
T15 24	L	T	B		many barn swallows
T2 25	R	T	M		
T6 27	L	T	M		
32	R	T	M		
T7 23	L&R	T	M		
39	L&R	T	M		
T11 0	L	T	M		

Transect Data

Transect: A21 Date: 5/28/18 Time: 1400-1530

Personnel: KS Weather: P. Cloudy

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T18	35	LCR	T	M		
T20	10	LCR	T	M		
T5	45	LCR	T	M		
	44	LCR	T	M		
	35	L	T	M		

Transect Data

Transect: Date: 6-6-18 Time: 14:30

Personnel: Weather: partly Sunny

Location		L/R	Sign Type (Track, Scat, etc)	Species	Photo (Y/N)	Sample (Y/N)	Notes
T18							
T19	20	LCR	track	moose			
	32	C	"	"			
T20							
T14			—				
T1			—				
T2			—				
T3			—				
T14			—				
T5	40	C	track	moose (cow)			
T4	23	LCR	track	moose			
T16			—				
T7			—				
T8			—				
T9			—				
T16			—				
T11			—				
T17			—				
T12			—				
T13			—				

Transect Data

Transect: A11   Date: 6/13/18   Time: 1400-1540

Personnel: CMG, KS   Weather: P. Sunny

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T18 -	15	L&R	T	M		
T17	22	C	Scat	G		aggresive yellow legs
T9	3	C	T	B		
T5	49	L&R	T	M		dragonflies
	40	LCR	T	M		
T3	20	LCR	T	M		
T2	29	LCR	T	M		

Transect Data

Transect: A11   Date: 6/20/18   Time: 1345-1500

Personnel: RB, KS   Weather: Sunny + 75°F

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T12	10	L	Feather	Steller Jay		Crying loon on upper Spectacle - adult w/1chick
T11	yellow legs nest nearby, pair staked out on lath ends and diving whenever trying to approach & surveyors					
T12	40	R	Tracks	bird - in mud		lots of dragonflies
T7	26	LCR	T	M		8 geese on lower Spectacle lake
T16	46	C	Scat	B		
T2	40	R	T	M		
	29	LCR	T	M		
T20	20	L	S	G		
	28	R	S	G		

Transect Data

Transect: ________ Date: 7-3-18 Time: 14:01

Personnel: ________ Weather: SUN

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T17	17	L	Scat	Canada Goose		
T13	—					
T10	40	L	Scat	Bear		
T9	9	L	track	moose		
T8	—					
T-7	—					
T-6	22	R	scat	goose		
T-16	30	R	scat	goose		
T-4	21	Center	track	marten		
T-5	49	L	track	moose		
	42	L	scat	goose		
	24	L, C, R	track	bird		
T-15	—					
T2	—					
T1	15	R	track	moose		
T14	18	R	scat	goose		
T19	6	L	munched cabbage	goose		
T3	—					
T20	—					
T-18	—					

Transect Data

Transect: AM Date: 7/19/18 Time: 1415-1530

Personnel: RB, KS Weather: P. Cloudy + 60°F

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T1	46	LCR	T	M		
T2	5	R	S	G		
	15	C	S	G		
T3	40	C	S	B		
T14	2	R	feather	G		
	23	R	feather	G		
T15	22	C	dig	B		
		C	dig	B		
	5	LCR	T	M		
T5	36	C	S	G		
	36	LCR	T	~~B~~ M		
	46	LCR	T	M		
T4	15	L	S	G		
	20	R	S	G		
T16	12	L	T	M		
	21	C	D	B		

Transect Data

Transect: [illegible] Date: 7/26/18 Time: 1315-1600

Personnel: KS, MK Weather: Sunny + 75°F

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T14	28	L	Feather	G		dozen geese on
	30	R	S	G		upper slate -
	32	C	Feather	G		molted feathers
						on shore
T5	28	L	tracks	bird	Y	-in mud
T13	30	L	dig	B		
	15	L	dig	B		

Transect Data

Transect: A11 Date: 8/1/18 Time: 1300-

Personnel: CWG, KS Weather: Sunny + 68°F

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T18	40	C	S	G		
T19	49	L&R	T	M		cow + calf
T13	38	R	D	B		
T11				greater yellowlegs defensive of nearby nest		
T8	10	C	S	G		
T14	38	C	S	G		
	35	L	S	G		
	25	R	F	G		

Transect Data

Transect: A11
Personnel: KS, RB
Date: 8/15/18
Weather: [illegible] + 60°F
Time: 1600 – 1730

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T18 @ 12,15,24	L, R, R	Goose scat	Goose		
@ 40	R	Track	Moose		
T19 @ 10,39	L, L	S	G		
T20 @ 24	LCR	T	M		
T14 @ 2	C	S	Bear		
@ 36,45	LCR	S	G		
T-1 @ 3	C	S	G		
@ 6,23	LCR	T x2	M		
@ 18	C	S	Bear		
T-2 @ 31	C	S	G		
T-3 —					
T-15 @ 24	L	Dig	B		
T-5 @ 19	L	egg shell	Bird		
@ 48	LCR	T	M		
T-4 —					
T-16 —					
T-7 —					
T-6 —					
T-8 —					
T-9 —					
T-10 —					
T-17 @ 18	L	S	G		
T-12 @ 12	C	S	G		
@ 20	C, R	S x 4	G		Nothing on T-12
T-11 @ 8	C	S	G		
@ 9	C	Feather	G		
@ 10	C	S	G		

Transect Data

Transect: A11
Personnel: CWB, KS
Date: 8/24/18
Weather: low fog + 52°F
Time: 1330 – 1500

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T18 5	C	S	G		
8	L	S	Wolf		
10	C	F	G		
T20 49	L	S	G		
T1 15	C	S	G		
T2 30	L	S	B		
T14 13	R	S	G		
27	R	S	G		
T5 14	R	D	B		
35	C	S + F	G		
T9 27	C	F	G		
T11 47-50	LCR	browse	M		
T12 3	C	D	B		
T13 10	R	D	B		
20	R	browse	G		

Transect Data

Transect: All Date: 9/11/18 Time: 1430-

Personnel: CWG, PS, KS Weather: Sunny + 65°F

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T18	15	LCR	T	M		
T7	12	C	S	B		

Transect Data

Transect: All Date: 9/21/18 Time: 1530-1710

Personnel: KM, KS Weather: Sunny + 60°F

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T11	7	C	feather	G		
T8	5	L	feather	G		
~~T7~~	~~10~~	~~C~~	~~Scat~~	~~B~~		same from 9/11
T6	10	C	feather	G		
T5	30	L	track	B		(in mud)
T4	45	R	track	B		(in mud)

APPENDIX E: AVIAN SPECIES LIST

Common = multiple sightings throughout season

S = identified through sighting

C = identified through call or song

Waterfowl
American Wigeon *(Anas Americana)* **S**
Blue-winged Teal (*Anas discors)*
Canada Goose (*Branta canadensis*) **S, Common**
Common Goldeneye (*Bucephala clangula*) **S**
Common Merganser *(Mergus merganser)* **S, Common**
Greater/ Lesser Scaup (*Aytha marila*) **S**
Hooded Merganser (*Lophodytes cucullatus*)
Mallard (*Anas platyrhynchos*) **S, Common**
Pacific Loon (*Gavia pacifica*) **S, Common**
Ring-necked Duck (*Aythya collaris*)
White-winged Scoter (*Melanitta fusca*)

Raptors
Bald Eagle (*Haliaeetus leucocephalus*) **S, Common**
Northern Harrier *(Circus cyaneus)*
Northern Pygmy Owl (*Glaucidium gnoma*) **S**
Red-tailed Hawk (*Buteo jamaicensis*) **S, Common**
Sharp-shinned Hawk (*Accipiter striatus*)

Other
Belted Kingfisher (*Ceryle alcyon*) **S, Common**
Bohemian Waxwing (*Bombycilla garrulous*)
Cedar Waxwing (*Bombycilla cedrorum*)
Chestnut-backed Chickadee (*Poecile rufescens*) **S, Common**
Common Raven (*Corvus corax*) **S, Common**
Dark-eyed Junco (*Junco hyemalis*) **S, Common**
Great Blue Heron *(Ardea herodias)*
Hermit Thrush (*Catharus guttatus*) **S**
Least Sandpiper (*Calidris minutilla*)
Lesser Yellowlegs (*Tringa flavipes*) **S**
Northwestern Crow (*Corvus caurinus*)
Olive-sided Flycatcher (*Contopus borea*lis) **C**
Orange-crowned Warbler (*Vermivora celata*) **C**
Pine Grosbeak (*Pinicola enucleator*)
Red-breasted Sapsucker (*Sphyrapicus rubber*) **C**
Ruby-crowned Kinglet (*Regulus calendula*)
Rufous Hummingbird (*Selasphorus rufus*) **S, Common**
Savannah Sparrow (*Passerculus sandwichesis*)
Solitary Sandpiper (*Tringa solitaria*)
Song Sparrow *(Melospiza melodia*)
Sooty Grouse (Dendragapus fuliginosus) **S, Common**
Steller's Jay (*Cyanocitta stelleri*) **S, Common**
Tree Swallow (*Tachycineta bicolor*) **S, Common**
Varied Thrush (*Ixoreus naevius*) **S, Common**
White-crowned Sparrow (*Zonotrichia albicollis*)
Wilson's Warbler (*Wilsonia canadensis*)
Pacific Wren (*Troglodytes troglodytes*) **S, Common**

Attachment 3

Mountain Goat Population Monitoring near Kensington Mine, Alaska – March, 2018

Mountain goat population monitoring and movement patterns near the Kensington Mine, Alaska

Kevin S. White

March 2018

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Alaska Department of Fish & Game, P. O. Box 1100024, Juneau, AK 99811-0024, USA; Phone: 907-465-4272

Cover Photo: An adult female mountain goat (LG-194) near Mt. Sinclair, August 2017

Mountain goat population monitoring and movement patterns near the Kensington Mine, Alaska

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March 2018

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Contents

INTRODUCTION

This report was prepared to meet the annual reporting requirements for Coeur Alaska, Inc.. Funding for this project was made available in September 2005 and this report summarizes activities completed by December 30, 2017.

Background

In 2005, Coeur Alaska, Inc. re-initiated development activities at the Kensington mine site, located a short distance northwest of Berners Bay. In addition, the Alaska Department of Transportation and Public Facilities (ADOT/PF) proposed construction an all-season highway between Echo Cove and the Katzehin River. In the context of these proposed industrial development activities, mountain goats were identified as an important wildlife species likely to be affected by mine development and road construction activities.

A small-scale study of mountain goats conducted in the vicinity of the Kensington mine by Robus and Carney (1995) showed that goats moved seasonally from high alpine elevations in the summer and fall to low, timbered elevations during winter months. One of the main objectives of the Robus and Carney (1995) study was to assess the impacts of the mine development activities on habitat use, movement patterns and, ultimately, productivity of mountain goats. However, the mine never became operational, thus these objectives could not be achieved, and by 1995 goat monitoring in the area wound down and eventually ended. In 2005, when the mine development activities were re-initiated, the Alaska Department of Fish and Game (ADFG) maintained that many of the same concerns that prompted the Robus and Carney (1995) study were still valid and needed to be addressed. In addition, large-scale plans for development of the Juneau Access road raised new and potentially more substantial concerns regarding not only the enlarged "footprint" of industrial development activities in eastern Lynn Canal, but also the cumulative impacts of both development projects on wildlife resources.

The potential effects of mining and road development activities on local mountain goat populations in the vicinity of the Kensington mine and eastern Lynn Canal have potentially important ramifications for management and conservation of the species in the area. Studies indicate that mountain goats can be negatively impacted by industrial development activities. Such effects include temporary range abandonment, alteration of foraging behavior and population decline (Chadwick 1973, Foster and Rahs 1983, Joslin 1986, Cote and Festa-Bianchet 2003, Cote et al. 2013, White and Gregovich 2017). Consequently, information about the distribution of mountain goats proximate to the mine and road development corridor is critical for determining the extent to which populations may be affected by associated industrial activities. Information collected by Robus and Carney (1995), White et al. (2012) and White and Gregovich (2017), in the vicinity of Kensington mine, as well as Schoen and Kirchhoff (1982) near Echo Cove, suggest that spatial overlap between mountain goats and industrial activity are most pronounced when goats are over-wintering in low-elevation habitats.

In response to the above concerns, ADFG, with operational funding provided by ADOT/PF, Federal Highway Administration (FHWA) and Coeur Alaska, Inc., initiated monitoring and assessment activities to determine possible impacts of road construction and mine development on mountain goats and identify potential mitigation measures, to the extent needed. Assessment and monitoring work has included collection of vital rate, habitat use and movement data from a sample of radio-marked mountain goats, in addition to conducting annual aerial population abundance and productivity surveys. These efforts are aimed at providing the ADFG with information necessary to appropriately manage mountain goats in the areas of development and provide guidance relative to mitigation measures, to the extent possible.

Implementation of field objectives were initiated in 2005 and consisted of a 5-year monitoring program (2005-2011) jointly funded by ADOT/PF, FHWA, Coeur Alaska, Inc. and ADFG. Beginning in 2007, the ADFG committed additional annual funding for a complementary aerial survey technique development project within and adjacent to the project area. In 2009, the USDA-Forest Service (Tongass National Forest) also began contributing funding to further support aerial survey technique development data collection efforts. And, in 2010, Coeur Alaska, Inc. resumed funding of mountain goat monitoring near the Kensington Mine and adjacent areas (as per the Kensington Plan of Operations, USFS 2005). In 2012, the project components funded by ADOT/PF and associated with the Juneau Access project were completed (see White et al. 2012). Currently, mountain goat monitoring activities are focused on the area surrounding the Kensington mine and north to the Katzehin river, an area considerably smaller than the original Juneau Access/Kensington joint study area.

STUDY OBJECTIVES

Research efforts were designed to investigate the spatial relationships, vital rates, and abundance of mountain goats near the Kensington Mine and upper Lynn Canal. The research objectives were to:

1) determine seasonal movement patterns of mountain goats;

2) characterize mountain goat habitat selection patterns;

3) estimate reproductive success and survival of mountain goats; and

4) estimate mountain goat population abundance and composition.

STUDY AREA

Mountain goats were studied in a ca. 491 km^2 area located in a mainland coastal mountain range east of Lynn Canal, a marine fjord located between Juneau and Haines in southeastern Alaska (Figure 1 and 2). The study area was located in the Kakuhan Range and oriented along a north-south axis and bordered in the south by Berners Bay (58.76N, 135.00W) and the Katzehin River (59.27N, 135.14W) in the north. The Kensington Mine, a hard rock gold mine, is located at the southern end of the study area, immediately south of Lions Head mountain in the Johnson, Slate and Sherman creek watersheds. A majority of above ground mining activity occurs in four principal locations situated between 200–300 meters in elevation. The overall mine "footprint" comprises 56.6 km^2 of patented claims; a significant amount of activity is at low elevation (<300 m) and underground. This study has occurred during both construction and production phases of the mine and possible sources of disturbance to mountain goats in the vicinity included blasting, heavy equipment operation, helicopter operation, and vehicle traffic.

Elevation within the study area ranges from sea level to 2070 m. This area is an active glacial terrain underlain by late cretaceous-paleocene granodiorite and tonalite geologic formations (Stowell 2006). Specifically, it is a geologically young, dynamic and unstable landscape that harbors a matrix of perennial snowfields and small glaciers at high elevations (i.e. >1200 m) and rugged, broken terrain that descends to a rocky, tidewater coastline. The northern boundary of the area is defined by the Katzehin River, a moderate volume (ca. 1500 cfs; USGS, unpublished data) glacial river system (and putative barrier to mountain goat movement) that is fed by the Meade Glacier, a branch of the Juneau Icefield.

The maritime climate in this area is characterized by cool, wet summers and relatively warm snowy winters. Annual precipitation at sea-level averages 1.4 m and winter temperatures are rarely less than -15° C and average -1° C (Haines, AK; National Weather Service, Juneau, AK, unpublished data). Elevations at 790 m typically receive ca. 6.3 m of snowfall, annually (Eaglecrest Ski Area, Juneau, AK, unpublished data). Predominant vegetative communities occurring at low-moderate elevations (<460 m) include Sitka spruce (Picea sitchensis)-western hemlock (Tsuga heterophylla) coniferous forest, mixed-conifer

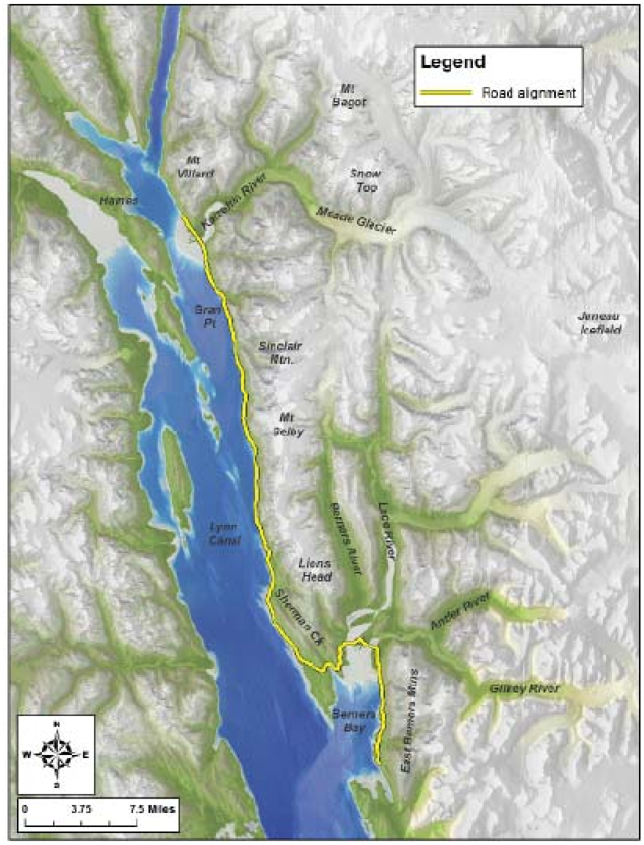

Figure 1: Map of the Lynn Canal and Berners Bay area. Local place names referenced in this report are identified. Mountain goats were studied in this area during 2005-2017.

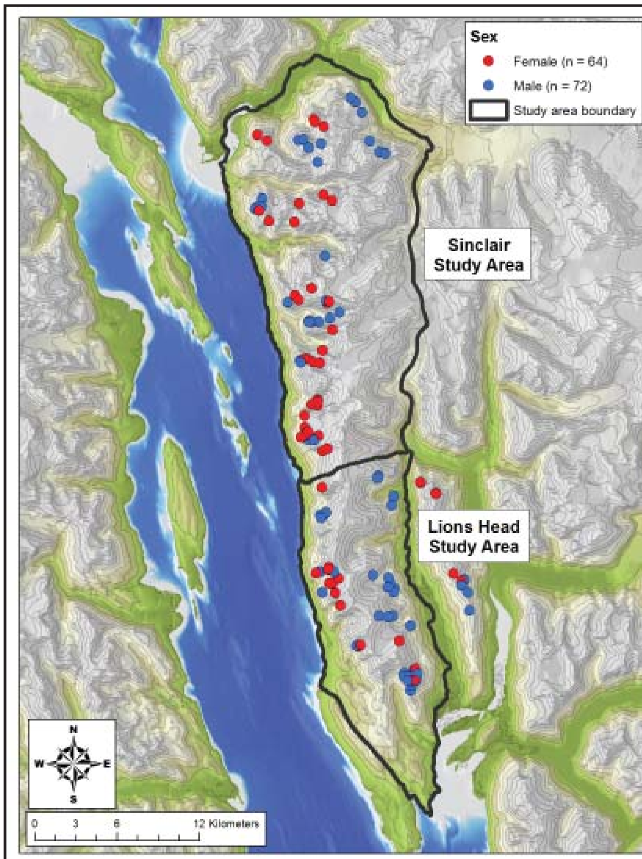

Figure 2: Locations of mountain goats captured and subsequently monitored in the Lynn Canal study area, 2005-2017.

muskeg and deciduous riparian forests. Mountain hemlock (Tsuga mertensiana) dominated 'krummholtz' forest comprises a subalpine, timberline band occupying elevations between ~460–760 meters. Alpine plant communities are composed of a mosaic of relatively dry ericaceous heathlands and moist meadows dominated by sedges, forbs and wet fens. Avalanche chutes are common in the study area and bisect all plant community types and often terminate at sea-level.

METHODS

Mountain Goat Capture

Mountain goats were captured using standard helicopter darting techniques and immobilized by injecting 3.0 - 2.4 mg of carfentanil citrate, depending on sex and time of year (Taylor 2000), via projectile syringe fired from a Palmer dart gun (Cap-Chur, Douglasville, GA). During handling, all animals were carefully examined and monitored following standard veterinary procedures (Taylor 2000) and routine biological samples and morphological data collected (Figure 3). Following handling procedures, the effects of the immobilizing agent was reversed with 100mg of naltrexone hydrochloride per 1mg of carfentanil citrate (Taylor 2000). All capture procedures were approved by the State of Alaska Animal Care and Use Committee.

Helicopter captures were attempted during periods when mountain goats were distributed at high elevations and weather conditions were favorable (i.e. high flight ceiling and moderate wind speed). Additionally, captures were scheduled to avoid periods within 8 weeks of parturition in order to avoid unnecessary disturbance of adult females and associated neonates. Captures were attempted in areas where mountain goat access to dangerously steep terrain could be reasonably contained.

GPS Location Data

Telonics TGW-3590 or TGW-4590 GPS radio-collars (Telonics, Inc., Mesa, AZ) were deployed on most animals captured. Telonics MOD-500 VHF radio-collars were been deployed on a subset (n = 23) of animals to enable longer-term monitoring opportunities. During 2009-2016, animals were simultaneously marked with GPS and lightweight (Telonics MOD-410) VHF radio-collars (370 g). Double-collaring animals was conducted to extend the period of time individual animals could be monitored (lifespan, GPS: 3 years, VHF: 6 years), thereby increasing the long-term opportunity to gather mountain goat survival and reproduction data and reducing the frequency that mountain goats must be captured. The combined weight of radio-collars attached to animals comprise 1.2% of average male body weight and 2.0% of average female body weight and

Figure 3: ADFG wildlife research technician, Yasaman Shakeri, preparing to administer the reversal to an immobilized female mountain goat (LG-191) captured in the upper Berners River, August 2017.

is well within the ethical standards for instrument deployment on free-ranging wildlife.

GPS radio-collars were programmed to collect location data at 6-hour intervals (collar lifetime: 3 years). During each location attempt, ancillary data about collar activity (i.e. percent of 1-second switch transitions calculated over a 15 minute period following each GPS fix attempt) and temperature (degrees C) were simultaneously collected. Complete data-sets for each individual were remotely downloaded (via fixed-wing aircraft) at 8-week intervals, and/or manually downloaded. Location data were post-processed and filtered for "impossible" points and 2D locations with PDOP (i.e. position dilution of precision) values greater than 10, following D'Eon et al. (2002) and D'Eon and Delparte (2005).

Resource Selection and Movement Patterns

Diet Composition.—Fresh fecal pellets were collected from live-captured animals during the summer-fall period (late-July to mid-October). Fecal pellet samples were also collected opportunistically during winter reconnaissance and snow surveys. Samples were sent to Washington State University (Wildlife Habitat Analysis Lab, Pullman, WA) for dietary analyses. Specifically, microhistological analyses of plant cell fragments in pellet samples were conducted to provide an estimate of diet composition for individual mountain goats and a composite winter sample. Results of these analyses were reported in White et al. (2012).

Activity, Movement Patterns and Resource Selection.— Analyses of mountain goat GPS location data (i.e. data collected during 2005-2011) to characterize activity, movement and resource selection patterns were summarized in White (2006), Shafer et al. (2012) and White et al. (2012). More recently, White and Gregovich (2017) assessed relationships between mountain goat resource selection and proximity to mine development. In 2017, a collaboration was initiated with BUKO (Andre Fetzer) and Trent University (Joe Northrup) to analyze existing GPS location data to estimate timing of migration. Such analyses will ultimately be useful for quantitatively determining winter and summer range residency periods; information that is useful for determining site-specific "timing windows" relevant for managing industrial activities in the vicinity of mountain goat habitat.

Snow and Winter Severity Monitoring.—
Winter distribution of mountain goats is strongly influenced by snow depth and distribution. Since patterns of snow accumulation vary at both small and large spatial scales it is often necessary to collect site-specific field data in order to accurately characterize these relationships within focal areas. Unfortunately, standardized snow depth monitoring information is extremely limited within the study area and additional information is needed in order to properly characterize spatial patterns of snow accumulation and, ultimately, mountain goat winter distribution. Consequently, in 2006 we initiated field efforts designed to create a snow depth database in order to generate spatially explicit snow depth models within the study area.

Standardized field surveys were conducted in order to estimate patterns of snow depth as it related to habitat type (i.e. forested/non-forested), altitude, and slope aspect. These efforts focused on four sites located in different mountain goat winter ranges in 2007 but consistent annual monitoring was conducted at only one site located on Echo Ridge, near Davies Creek. During surveys snow depth was measured at geo-referenced locations along an altitudinal gradient (beginning at sea level). Snow measurements were replicated at each sampling location (n = 5) and associated covariate information was collected. Sampling locations were spaced at regular (100-200 m) intervals, depending upon terrain complexity. Steep (>35 degrees), exposed slopes were, generally, not sampled due to safety considerations. In addition, daily climate information for reference weather stations was acquired from the National Weather Service (Haines COOP Weather Station).

Figure 4: Photograph of a mountain goat radiocollar (LG-173) melting out of an avalanche chute in the Yeldagalga Creek valley, July 2017. During the winter of 2016/2017, avalanches accounted for 44% of all radiocollared mountain goat mortalities.

Reproduction and Survival

Kidding rates and subsequent survival were estimated by monitoring individual study animals during monthly surveys using fixed-wing aircraft (usually a Piper PA-18 Super Cub) equipped for radio-telemetry tracking or via ground-based observations. During surveys, radio-collared adult female mountain goats were observed (typically using 14X image stabilizing binoculars) to determine whether they gave birth to kids and, if so, how long individual kids survived (Figure 4). Monitoring kid production and survival was only possible during the non-winter months when animals could be reliably observed in open habitats. We assumed that kids did not survive winter if they were not seen with their mothers the following spring. Cases in which kid status assessments were equivocal were filtered from the data set and not used for subsequent estimates of kid survival.

Mortality of individual radio-collared mountain goats was determined by detecting radio-frequency pulse rate changes during monthly monitoring surveys. In cases where mortality pulse rates were detected, efforts were made to investigate sites as soon as possible via helicopter or boat. To the extent possible, all mortalities were thoroughly investigated to ascertain the cause of death and relevant biological samples collected. We determined date of mortalities via examination of activity sensor data logged on GPS radio-collars. Annual survival of radio-collared animals was estimated using the Kaplan-Meier procedure (Pollock et al. 1989). This procedure allows for staggered entry and exit of newly captured or deceased animals, respectively.

Population Abundance and Composition

Aerial Surveys.—Population abundance and composition surveys were conducted using fixed-wing aircraft (Heliocourier and PA-18 Super Cub) and helicopter (Hughes 500) during August-October, 2005-2017. Aerial surveys were typically conducted when conditions met the following requirements: 1) flight ceiling above 5000 feet ASL, 2) wind speed less than 20 knots, 3) sea-level temperature less than 65 degrees F. Surveys were typically flown along established flight paths between 2500-3500 feet ASL and followed geographic contours. Flight speeds varied between 60-70 knots. During surveys, the pilot and experienced observers enumerated and classified all mountain goats seen as either adults (includes adults and sub-adults) or kids. In addition, each mountain group observed was checked (via 14X image stabilizing binoculars) to determine whether radio-collared animals were present.

Sightability Data Collection.—During aerial surveys, data were simultaneously collected to evaluate group-level sighting probabilities. These data were used to parameterize aerial survey "sightability" models which were subsequently used to convert minimum counts to actual population size (i.e. White et al. 2016). Specifically, we characterized behavioral, environmental and climatic conditions for each radio-collared animal seen and not seen (i.e. missed) during surveys. In cases where radio-collared animals were missed, it was necessary to back-track and use radio-telemetry techniques to locate animals and gather associated covariate information. Since observers had general knowledge of where specific individual radio-collared animals were likely to be found (i.e. ridge systems, canyon complexes, etc.), it was typically possible to locate missed animals within 5-15 minutes after an area was originally surveyed. In most cases, it was possible to completely characterize behavioral and site conditions with minimal apparent bias, however in some cases this was not possible (i.e. animals not seen in forested habitats, steep ravines, turbulent canyons) and incomplete covariate information was collected resulting in missing data.

Evaluation of Population Trends.—In order to assess how mountain goat abundance changed over space and time we delineated nine geographically distinct survey areas and summarized the maximum number of adult and kid mountain goats seen in each area, by year (Appendix 4 and 5). The number of animals seen during aerial surveys is a commonly used metric of mountain goat population abundance; termed the "minimum count". Since the quantity does not account animals "missed" during surveys, the minimum count underestimates actual population size (i.e. by 35-50%). In order to account for variation in survey conditions and mountain goat aerial survey sighting probabilities we used a "sightability" model to derive population estimates based on aerial survey observations and associated covariate values (White et al. 2016). Specifically, the model is based on aerial survey mark-resight data collated in Lynn Canal and other areas of southeastern Alaska. The model accounts for variation in sky condition, group size, terrain and habitat type and converts minimum counts to actual population size (White et al. 2016). To assess population trends, we used simple linear regression to fit equations and determine proportional change in population size and density over time, for each area. We determined the amount of summer range habitat in each area (km^2; based on RSF models in White and Gregovich 2017) in order to covert population size to density; a standardized quantity useful for geographic comparisons and inference.

RESULTS AND DISCUSSION

Mountain Goat Capture and Handling

Capture Activities.—During August 2017, 8 animals (males, n = 4; females, n = 4) were captured in the Lions Head-Mt. Sinclair areas. All animals were simultaneously marked with GPS (TGW-4590) and lightweight VHF (Telonics MOD-410) radio-collars. Since 2005, 136 mountain goats have been radio-marked in the Lions Head and Sinclair Mountain study areas; GPS location data has been compiled for 82 animals within this area. Currently (as of 3/1/2018), 22 animals are marked in these two areas; all other previously deployed collars have either remotely released or animals have died. Annual capture activities are important for maintaining adequate sample sizes and compensating for natural or scheduled collar losses.

Biological Sample Collection.—During handling procedures, standard biological specimens were collected and morphological measures recorded. Specific biological samples collected from study animals included: whole blood (4 mL), blood serum (8 mL), red blood cells (8 mL), ear tissue, hair and fecal pellets. Whole blood, serum, red blood cells and fecal pellet sub-samples were either sent to Dr. Kimberlee Beckmen (ADFG, Fairbanks, AK) for disease and trace mineral screening or archived at ADFG facilities in Douglas, AK. During 2010, nasal and pharyngeal swab samples were collected from 5 animals to index prevalence of respiratory bacteria.

Genetic Analyses.—Tissue samples from all mountain goats captured between 2005-2017 have been genotyped by Aaron Shafer (Trent University/University of Alberta). (Duplicate samples are archived at ADFG, Douglas, AK). A subset of these data were analyzed and included in continent-wide analyses of mountain goat population genetics (Shafer et al. 2010). Shafer et al. (2010) indicated that substantial genetic structuring exists among mountain goats in southeastern Alaska (and across the western North American range of the species). More recent analyses indicated that three genetically distinct mountain goat populations occur in our study area [east Berners mountains, Kakuhan range (including Lions Head and Sinclair Mountain), and Mt. Villard]; population boundaries generally coincide with our specific study area boundaries (Shafer et al. 2012). These findings indicate that gene flow between our study areas (with the exception of the Lion Head and Sinclair study areas, which are genetically indistinct) is limited. Additional analyses examined the extent to which mountain goat habitat selection characteristics and landscape configuration are linked to genetic relatedness across the study area (Shafer et al. 2012). Results from this analyses indicated that small- (i.e. distance to cliffs, heat load) and large-scale (i.e. river valleys and marine waterways) landscape features are key determinants of mountain goat gene flow across our study area (Shafer et al. 2012). In 2016, a new state-wide mountain goat population genetics project was initiated and will include more spatially extensive analyses that utilize both microsatelite and genomic techniques. This project is funded by ADFG and Trent University but will benefit our knowledge of mountain goat genetics in this study area as well.

Disease Surveillance.—In 2010, a subset of captured animals (n = 5) were tested (Washington Animal Disease Diagnostic Laboratory, Pullman, WA) for prevalence of respiratory bacteria associated with incidence of pneumonia (specifically *Pasteurella trehalosi* and *Mycoplasma ovipneumoniae*). Results of these analyses were summarized in White et al. (2012). Further surveillance testing for *Mycoplasma ovipneumoniae* was conducted in 2014, 2016 and 2017. All seven animals tested in 2014 were negative for *Mycoplasma ovipneumoniae;* laboratory results for 2016 and 2017 are not yet available.

During 2005-2015, blood serum samples collected from captured animals have been tested each year for a suite of 15 different diseases relevant to ungulates (Appendix 1). Of particular interest was contagious ecthyma (CE), a viral disease previously documented among mountain goats in Juneau, Haines and other areas of southeastern Alaska. Common symptoms of CE include presence of grotesque lesions on the face, ears, and nose which can lead to death of animals, primarily those in young or old age classes; healthy adults commonly survive the disease. Of the 65 animals successfully tested for CE in the Lions Head and Mt Sinclair areas, three animals (5%) tested positive for CE-specific antibodies; a level of prevalence comparable to other southeastern Alaska populations tested.

Trace Mineral Testing.—In 2010-2014, whole blood and

Table 1: Proportion of radio-marked adult female mountain goats observed with kids at heel during parturition in the Lynn Canal study area, 2005-2016. Data are also presented from other study areas, for comparative purposes.

Area	Year	Kids	AdF	Prop	SE
Baranof					
	2010	4	4	1.00	0.00
	2011	5	6	0.83	0.15
	2012	3	5	0.60	0.22
	2013	5	10	0.50	0.16
	2014	9	12	0.75	0.13
	2015	7	14	0.50	0.13
	2016	8	12	0.67	0.14
	2017	4	11	0.36	0.15
	Total	45	74	0.61	0.06
Haines-Skagway					
	2010	5	10	0.50	0.16
	2011	8	10	0.80	0.13
	2012	8	11	0.73	0.13
	2013	10	12	0.83	0.11
	2014	10	17	0.59	0.12
	2015	14	18	0.78	0.10
	2016	11	15	0.73	0.11
	2017	6	11	0.55	0.15
	Total	72	104	0.69	0.05
Lynn Canal					
	2005	8	12	0.67	0.14
	2006	16	25	0.64	0.10
	2007	20	32	0.63	0.09
	2008	19	33	0.58	0.09
	2009	15	25	0.60	0.10
	2010	18	26	0.69	0.09
	2011	18	27	0.67	0.09
	2012	9	15	0.60	0.13
	2013	9	13	0.69	0.13
	2014	8	14	0.57	0.13
	2015	15	17	0.88	0.08
	2016	14	17	0.82	0.09
	2017	13	17	0.76	0.10
	Total	182	273	0.67	0.03

Table 2: Estimates of mountain goat survival for different sex classes during 2005-2017, Lynn Canal, AK. Data are also presented from other study areas, for comparative purposes.

	Males				Females				Total			
	At Risk	Died	Ŝ	SE	At Risk	Died	Ŝ	SE	At Risk	Died	Ŝ	SE
Baranof Island												
2010/2011	8	1	0.88	0.11	4	0	1.00	0.00	12	1	0.92	0.08
2011/2012	12	0	1.00	0.00	6	0	1.00	0.00	18	0	1.00	0.00
2012/2013	17	3	0.82	0.09	6	0	1.00	0.00	23	3	0.87	0.07
2013/2014	17	3	0.82	0.09	10	0	1.00	0.00	27	3	0.89	0.06
2014/2015	17	3	0.82	0.09	12	1	0.92	0.08	29	4	0.86	0.06
2015/2016	14	0	1.00	0.00	13	2	0.84	0.11	27	2	0.92	0.06
2016/2017	23	3	0.85	0.08	13	2	0.82	0.12	36	5	0.84	0.06
All years	106	13	0.87	0.03	64	5	0.92	0.04	170	18	0.89	0.02
Cleveland Pen.												
2009/2010	5	0	1.00	0.00	2	0	1.00	0.00	7	0	1.00	0.00
2010/2011	6	2	0.67	0.16	6	0	1.00	0.00	12	2	0.83	0.10
2011/2012	4	2	0.50	0.18	6	0	1.00	0.00	10	2	0.80	0.11
2012/2013	2	1	0.50	0.35	6	0	1.00	0.00	8	1	0.88	0.12
2013/2014	1	0	1.00	0.00	6	2	0.67	0.19	7	2	0.71	0.17
2014/2015	--	--	--	--	--	--	--	--	--	--	--	--
2015/2016	--	--	--	--	--	--	--	--	--	--	--	--
All years	18	5	0.72	0.09	26	2	0.92	0.05	44	7	0.84	0.05
Haines-Skagway												
2010/2011	13	4	0.69	0.13	10	3	0.70	0.14	23	7	0.70	0.10
2011/2012	16	2	0.87	0.09	10	1	0.90	0.09	26	3	0.88	0.06
2012/2013	18	2	0.89	0.07	11	1	0.91	0.08	29	3	0.90	0.06
2013/2014	22	2	0.91	0.06	12	1	0.92	0.08	34	3	0.91	0.05
2014/2015	19	2	0.89	0.07	16	2	0.85	0.08	35	4	0.88	0.05
2015/2016	18	5	0.72	0.10	16	3	0.79	0.10	34	8	0.75	0.07
2016/2017	13	6	0.56	0.13	14	4	0.71	0.11	26	10	0.64	0.09
All years	116	23	0.80	0.04	85	15	0.82	0.04	201	38	0.81	0.03
Lynn Canal												
2005/2006	11	2	0.82	0.12	11	1	0.91	0.09	22	3	0.86	0.07
2006/2007	33	11	0.67	0.08	25	4	0.84	0.07	58	15	0.74	0.05
2007/2008	36	7	0.77	0.08	31	4	0.83	0.08	67	11	0.80	0.05
2008/2009	36	10	0.66	0.09	34	6	0.73	0.09	70	16	0.69	0.06
2009/2010	28	4	0.86	0.07	26	4	0.85	0.07	54	8	0.85	0.05
2010/2011	25	3	0.88	0.06	24	2	0.91	0.06	49	5	0.90	0.04
2011/2012	23	6	0.72	0.10	23	3	0.85	0.08	46	9	0.77	0.07
2012/2013	19	8	0.59	0.10	16	7	0.60	0.11	34	15	0.59	0.07
2013/2014	13	3	0.75	0.13	11	2	0.83	0.11	24	5	0.79	0.08
2014/2015	11	5	0.57	0.14	14	1	0.93	0.07	25	6	0.76	0.08
2015/2016	8	1	0.86	0.11	17	2	0.88	0.08	25	3	0.87	0.07
2016/2017	13	6	0.54	0.14	17	3	0.82	0.09	30	9	0.70	0.08
All years	232	66	0.72	0.03	217	39	0.82	0.03	448	105	0.77	0.02

At Risk = maximum number of animals monitored per month (per time period) serum samples were analyzed to determine trace mineral concentration for 31 mountain goats in order to examine whether mineral deficiencies were prevalent in our study population (Appendix 2a). While experimental data is limited to assess deficiency threshold values for Selenium, a trace mineral that can influence pregnancy, values less than 0.10 ppm are generally considered low. In the Lion Head/Sinclair study areas 32% of animals had blood Selenium values below this threshold (Appendix 2b); a high proportion of deficiencies relative to other mountain goat research study areas in southeastern Alaska. Presumably, deficiencies are related to site productivity and geologic substrate and can provide some level of insight relative to inherent productivity of mountain goat summer range in this area.

GPS Location Data

GPS System Performance.—The performance of GPS radio-collars (Telonics TGW-3590) was evaluated for 124 collars deployed since the beginning of the study (see White et al. 2012). In general, the remote GPS data collection system used in this study worked as expected. Specifically, we did not encounter any significant problems with GPS collar performance, nor did any notable problems occur with remote data download attempts.

Winter Severity and Snow Modeling

Snow Surveys.—Field-based snow surveys were conducted within 5 days of April 1 during 2007-2008, 2010-2017 on Echo Ridge. Analyses of these data quantified the degree to which snow depth differs with increasing elevation between forested and non-forested sites (White et al. 2012). Overall, these data quantify the extent to which snow depth varied relative to elevation and habitat type (i.e. open vs. forest). Specifically, snow depth was 30-40 inches deeper in open relative to forested habitats, on average. Further, snow depth increased 2.3-2.7 inches per 100 foot gain in elevation, on average (White et al. 2012). Importantly, these data provide quantitative information about winter severity in areas representative of where mountain goats in our study area are wintering. Such data will be able to be used as covariates in future analyses of survival, reproduction and resource selection.

Climate Data.—Daily climate data were archived from the National Weather Service database to characterize broader scale climate patterns. Mean daily snow depth and snowfall data were summarized from data collected at the National Weather Service station in Haines, AK (Appendix 3). Mean snowfall in Haines during the study period (2005-2016) was 117% of the long-term normal (i.e. 1950-2016). Overall, snowfall in Haines during 5 of the 7 initial winters of the study was above normal (including 5 of the 10 highest snowfall winters on record; 39 years of data). However, 3 of the last 4 winters have been below average, and included the winter of 2014/2015 which was exceptionally mild (54 inches of total snowfall, or 34% of normal).

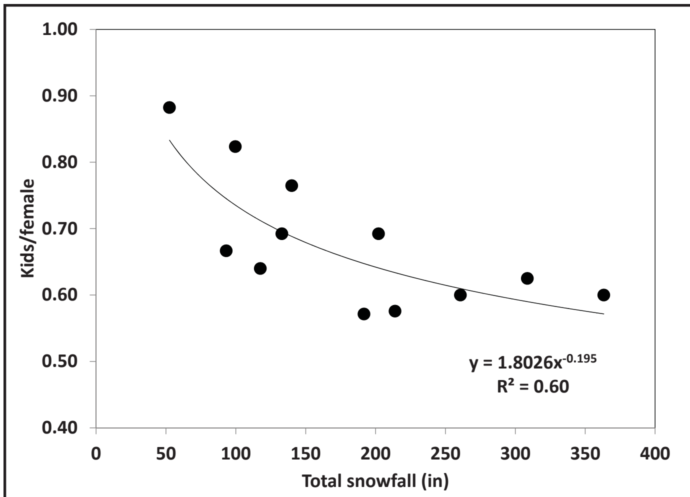

Figure 5. Relationship between total annual snowfall (Haines, AK) and the proportion of radio-marked females with kids during the parturition period during 2006-2017 in Lynn Canal, AK.

Reproduction and Survival

Kid Recruitment.—Kid recruitment of radio-marked female mountain goats was estimated by determining the percentage of radio-marked females seen with kids during May-June aerial telemetry surveys (Table 1). Since each radio-marked female was not observed daily during the kidding period, it was not possible to determine if kids were born and subsequently died prior to, or between, surveys. As such, estimates of kid production reported here are presumably lower than the actual percentage of females that gave birth. Nevertheless, our estimates of kid production were similar to estimates of kidding rates reported elsewhere (Festa-Bianchet and Cote 2007).

Annual estimates of kid production in Lynn Canal ranged from 57-88% between 2005-2016 (Table 1). During 2017, 76% of radio-marked females (n = 17) had a kid at heel; nine percent above average (Table 1). As described above, the previous three winters have been particularly mild and likely contributed to the observed increase in reproduction; preliminary analyses suggest that reproduction is negatively related to total snowfall during the preceding winter (Figure 5).

Survival.—Mountain goats were monitored monthly during fixed-wing aerial telemetry flights and/or via GPS-telemetry. During 2016/2017 biological year, 9 radio-marked animals died. Overall, 70±8% of animals survived during 2016/2017; a relatively low proportion (i.e. 7% lower than the long term average) given that winter snowfall, an important determinant of winter survival (White et al.

2011), was only 90% of average. Interestingly, avalanches were the cause of death in 4 of 9 mortality cases, and an additional animal died from a presumed fall during winter (the remaining 4 radiocollared animals died of unknown, but non-avalanche related, causes). Conditions leading to winter avalanches or falls can be somewhat independent of total winter snowfall amounts and instead more strongly linked to persistent weak layers in the snowpack. The ontogeny and stability of snowpacks can be complex and related to storm cycle sequences and, sometimes, anomalous events such as rain-on-snow and hard freezes. Overall, the higher than usual occurrence of avalanche related mortalities in the study area resulted in lower survival of mountain goats than would be expected based on total winter snowfall. Typically, we would expect relatively shallow snowpacks to improve availability of food resources, reduce costs of locomotion and depletion nutritional reserves leading to increased probabilities of survival.

Population Abundance and Composition

Aerial Surveys.—During September 2017, we conducted three aerial surveys in the Lions Head and Sinclair Mountain study areas and the Berners-Lace ridge area (Appendix 4). The Berners-Lace ridge was surveyed because seasonal movement (albeit limited) by male mountain goats has been documented from the Lions Head study area to this site in past years.

Evaluation of Population Trends.— Geographic and temporal trends were calculated for eight survey areas within the Lions Head and Sinclair study areas, and Berners-Lace ridge (Appendix 4, 5a-c). Analyses were based on population estimates derived using the White et al. (2016) aerial survey sightability model and aerial survey data collected during 2005-2016.

Population densities declined substantially in most areas since 2005/2006 (Table 3). In the Lions Head area, the strongest decline occurred in the Kensington (i.e. -14% per year) and neighboring Met (-31% per year) survey areas, while the lower density West Berners area experienced less pronounced decline (-3% per year) areas; Berners-Lace Ridge appeared stable. In the more northerly Sinclair study area, mountain goat populations exhibited even stronger declines (Table 3). The peripheral, low density populations adjacent to the icefield appeared stable (but should be interpreted cautiously due to very low total number of animals seen in each areas). Population densities also varied substantially among areas with the highest initial densities occurring on the south and west side of the Kakuhan range (i.e. Kensington, Met, Yeldagalga and S Katzehin). Areas on the east side of the Kakuhan Range, generally had lower densities (and closer proximity to icefields and glaciers).

Table 3: Estimated change in minimum count densities, based on mountain goats observed during aerial surveys during 2005-2017, Lynn Canal, Alaska.

			Density (est total/km^2)				
Area	Slope (change/yr)	r^2	Mean	Max	Min	Area (km^2)	# years
Lions Head							
W Berners	-0.03	0.03	1.3	2.3	0.6	22.0	13
Kensington	-0.14	0.23	2.4	5.9	1.2	19.9	13
Met	-0.31	0.54	5.6	8.2	3.6	15.4	12
Sinclair							
Yeldagalga	-0.21	0.22	4.5	8.2	1.8	25.1	12
S Katzehin	-0.26	0.70	2.6	5.1	1.3	41.6	12
Katzehin Lk	-0.14	0.51	1.2	2.2	0.2	21.2	11
Icefield							
S Meade	0.07	0.12	1.1	2.7	0.4	18.2	12
U Lace	<0.01	<0.01	0.7	1.3	0.2	16.9	12
BL Ridge	-0.01	0.01	1.5	2.0	1.0	30.0	10

The general decline in mountain goat populations coincided with succession of severe winters between 2006-2014; total annual snowfall in Haines was greater than average in 6 of the 8 winters during this period (Appendix 3). Winter snowfall can exert strong negative effects of mountain goat survival (White et al. 2011) by increasing energetic costs of locomotion and burial of food resources. It is not immediately clear why declines appear to be strongest in the northwestern Kakuhan Range (i.e. Yeldagalga, South Katzehin and Katzehin Lake) and Kensington survey areas. It is possible that snow depths are greater in the northwestern areas; an observation supported by anecdotal information. The northwestern survey areas also had the highest initial population densities and may have been closer to nutritional carrying capacity (and thus more vulnerable to population declines) prior to the severe winters. In the Kensington area, declines appeared stronger than in surrounding areas to the east suggesting that factors other than local variation in winter conditions were important. Recent analyses suggested that mountain goat avoidance of winter range habitats within 1.8 km of Kensington Mine developments has reduced the functional winter range carrying capacity by 42% in the local area (White and Gregovich 2017). Thus, mine related disturbance may have indirectly exacerbated the effects of severe winters in the local mountain goat population. Nonetheless, the analyses and interpretation of the causes of population declines should be considered preliminary.

Population estimates derived from aerial survey data collected in 2016 and 2017 indicated that the mountain goat sub-populations in the Yeldagalga survey area may be recovering, following the previously described multi-year decline. In other areas, populations appear to have remained stable over the last three mild (i.e. below average snowfall) winters. Under such winter conditions, population growth is expected and its currently unclear why a stronger population recovery has not occurred. Overall, results should be considered cautiously until additional data are collected in future years and confirm the apparent recovery trend.

Sightability Modeling and Population Estimates.—During all surveys, data were collected for purposes of developing group-level aerial survey sighting probability models. In addition, complementary aerial surveys were conducted in areas outside of the study area (Haines, Baranof Island) where mountain goats were marked as part of independent studies. Collection of data in other areas enabled acquisition of additional sightability data resulting in opportunity to more accurately parameterize sightability models; however, a majority of the data used to develop models was collected in the Lynn Canal/Berners Bay study areas. Details of this modeling effort are summarized in White et al. (2016).

FUTURE WORK

The mountain goat population monitoring and assessment work in the vicinity of the Kensington Mine is planned to continue during the operational phase on mining operations. The project area for ongoing mine-related monitoring work encompasses the area between Slate cove and the Katzehin River (i.e. the "Lions Head" and "Sinclair" study areas). In this area study animals (2016/17, n = 30) will continue to be monitored monthly to assess reproductive status and survival. Mortalities will be investigated during April - October, or as conditions allow. GPS location data will be downloaded from radio-collars following field recovery efforts; GPS radio collars automatically release 3 years after capture/deployment (or at the time or mortality). GPS data will be post-processed and appended to the existing GPS location database. During late-summer, 6-8 mountain goats will be captured to ensure scientifically defensible sample sizes are maintained. Three replicate aerial surveys will be conducted in early-fall 2017, weather permitting, in order to estimate mountain goat sightability, population abundance and composition. During 2017-2018, efforts will continue to develop mountain goat aerial survey sightability models and, ultimately, derive population estimates. Results of project activities will be summarized and submitted to Coeur Alaska, Inc. and associated stakeholders as an annual research project report in spring 2019.

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Appendix 1: Incidence of disease prevalence of mountain goats in the Lions Head, Sinclair, Villard and East Berners study areas, 2010-2015. Results are also provided for three other populations in southeastern Alaska in 2010-2015, for comparison. (Kakuhan includes the Lions Head and Sinclair study areas combined).

	Baranof			Cleveland			Haines			Berners			Kakuhan			Villard			Total		
Disease	n	Pos.	Prop	n	Pos.	Prop	n	Pos.	Prop	n	Pos.	Prop	n	Pos.	Prop	n	Pos.	Prop	n	Pos.	Prop
Contagious Ecthyma	40	2	0.05	10	1	0.10	44	3	0.07	20	1	0.05	65	3	0.05	24	0	0.00	203	10	0.05
Chlamydia	16	0	0.00	12	0	0.00	28	1	0.04	27	0	0.00	34	0	0.00	30	1	0.03	147	2	0.01
Q Fever	36	0	0.00	11	0	0.00	50	0	0.00	29	0	0.00	65	3	0.05	32	1	0.03	223	4	0.02
Bluetongue	17	0	0.00	10	0	0.00	20	0	0.00	20	0	0.00	17	0	0.00	18	0	0.00	102	0	0.00
Bovine respiratory synctial virus (BRSV)	17	0	0.00	10	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	16	0	0.00	101	0	0.00
Infectious bovine rhinotrachetis (IBR)	17	0	0.00	10	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	102	0	0.00
Parainfluenza-3 (PI-3)	17	0	0.00	10	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	102	0	0.00
Epizootic hemorrhagic disease (EHD)	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00
Caprinae arthritis encephalitis (CAE)	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	16	0	0.00	100	0	0.00
Malignant cataharral fever-ovine (MCF)	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	16	0	0.00	100	0	0.00
Leptospirosis cannicola	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00
Leptospirosis grippo	17	0	0.00	9	0	0.00	20	1	0.05	21	0	0.00	17	1	0.06	17	1	0.06	101	3	0.03
Leptospirosis hardjo	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00
Leptospirosis ictero	17	0	0.00	9	0	0.00	20	3	0.15	21	2	0.10	17	3	0.18	17	3	0.18	101	11	0.11
Leptospirosis pomona	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00

Positive titers: PI3>1:120, IBR> 1:64, BRSV >1:32, Leptospirosis sp.>1:100

Appendix 2a: Trace mineral concentration documented for mountain goats in the Lions Head and Sinclair study areas, 2010-2013. Results are also provided for three other populations in southeastern Alaska in 2010-2014, for comparison. (Kakuhan includes the Lions Head and Sinclair study areas combined).

	Se			Mo			Mn			Fe			Cu			Zn		
Area	mean	SE	n	mean	SE	n	mean	SE	n	mean	SE	n	mean	SE	n	mean	SE	n
Baranof	0.31	0.01	36	0.05	0.00	36	0.006	0.000	36	1.64	0.07	36	1.07	0.02	36	0.81	0.03	36
Cleveland	0.26	0.01	5	0.05	0.00	5	0.006	0.000	5	1.71	0.09	5	0.81	0.03	5	0.70	0.04	5
Kakuhan	0.17	0.02	31	0.05	0.00	31	0.006	0.000	31	1.58	0.09	31	1.01	0.05	31	0.81	0.03	31
Haines	0.24	0.02	52	0.05	0.00	51	0.006	0.000	51	1.82	0.07	51	1.06	0.03	51	0.83	0.03	51
Average	0.24	0.01	126	0.05	0.00	125	0.006	0.000	125	1.72	0.04	125	1.04	0.02	125	0.82	0.02	125

Appendix 2b: Selenium concentration for mountain goats in the Lions Head and Sinclair study areas, 2010-2013. Results are also provided for three other populations in southeastern Alaska in 2010-2014, for comparison. (Kakuhan includes the Lions Head and Sinclair study areas combined).

Selenium (ppm)

Area	mean	SE	n	Min	Max	# < 0.10	Prop < 0.10
Baranof	0.31	0.01	36	0.19	0.41	0	0.00
Cleveland	0.26	0.01	5	0.22	0.29	0	0.00
Kakuhan	0.17	0.02	31	0.05	0.37	10	0.32
Haines	0.24	0.02	52	0.03	0.73	9	0.17
Average	0.24	0.01	126	0.03	0.73	19	0.15

Appendix 3a: Monthly snowfall (in.) recorded at the NWS weather station in Haines, AK between 2005-2017.

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total	% of normal
2005/2006	0	30	9	40	22	16	0	0	118	76%
2006/2007	0	42	78	81	28	78	3	0	309	199%
2007/2008	0	6	56	78	41	31	3	0	214	138%
2008/2009	22	24	56	62	45	43	9	0	261	168%
2009/2010	0	48	19	68	8	59	0	0	202	130%
2010/2011	0	24	25	19	20	3	3	0	93	60%
2011/2012	0	126	40	121	20	56	0	0	363	234%
2012/2013	4	20	41	21	23	10	14	1	133	86%
2013/2014	0	20	92	22	23	35	1	0	192	124%
2014/2015	0	0	5	14	18	16	0	0	53	34%
2015/2016	0	21	43	18	16	2	0	0	100	64%
2016/2017	13	11	43	22	19	33	0	0	140	90%
Average, Study period	3	31	42	47	23	32	3	0	181	117%
Average, Long-term[1]	3	22	39	38	28	20	3	0	155	100%

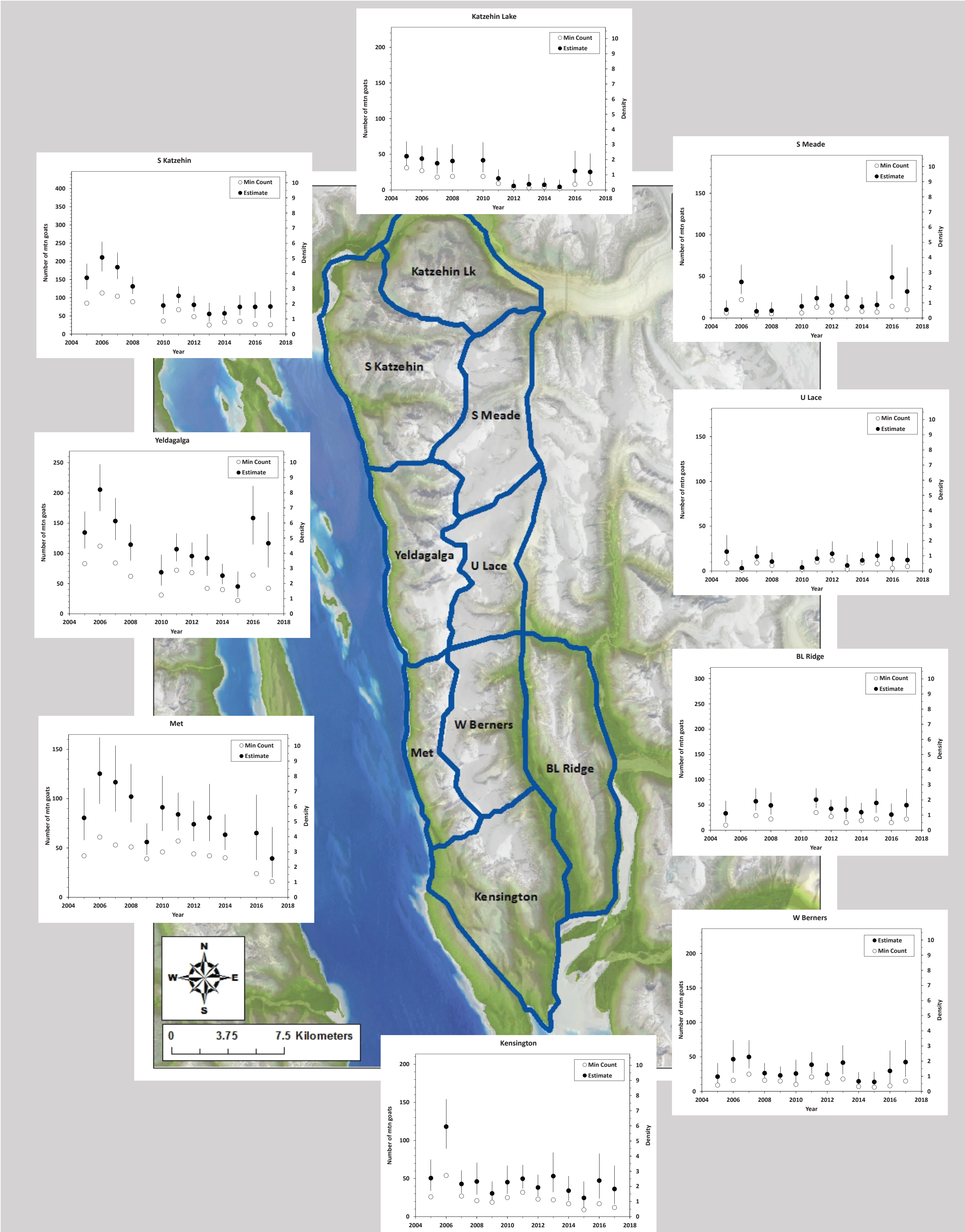
[1]Haines Airport (1950-1955, 1973-1998) and Haines COOP NWS Station (1999-2017)

Appendix 3b: Summer temperature and precipitation (in.) recorded at the NWS weather station in Haines, AK between 2005-2017.

	Temperature - July/August						Precipitation		
	Farenheit			Celcius			Inches		
Year	Mean - 0 ft.	Mean - 3000 ft.[1]	Departure	Mean - 0 ft.	Mean - 3000 ft.[1]	Departure	May/ June	July/ Aug	Annual
2005/2006	58.48	47.78	1.22	14.71	8.77	0.68	3.2	4.0	64.9
2006/2007	56.21	45.52	-1.05	13.45	7.51	-0.58	6.5	3.7	67.0
2007/2008	57.66	46.97	0.40	14.26	8.32	0.22	2.0	6.0	56.9
2008/2009	54.83	44.14	-2.43	12.69	6.74	-1.35	4.7	9.3	63.9
2009/2010	59.34	48.64	2.08	15.19	9.25	1.15	0.9	8.4	77.5
2010/2011	56.63	45.94	-0.63	13.68	7.74	-0.35	5.1	3.6	46.7
2011/2012	56.37	45.68	-0.89	13.54	7.60	-0.49	1.5	6.0	85.6
2012/2013	55.98	45.29	-1.28	13.32	7.38	-0.71	8.7	6.5	54.3
2013/2014	59.20	48.50	1.94	15.11	9.17	1.08	5.0	2.8	54.8
2014/2015	57.08	46.39	-0.18	13.93	7.99	-0.10	6.6	12.0	69.4
2015/2016	57.61	46.92	0.35	14.23	8.29	0.20	3.0	9.0	73.4
2016/2017	58.82	48.13	1.56	14.90	8.96	0.87	6.8	3.5	60.8
Average, Study period	57.26	46.57	0.00	14.03	8.09	0.00	4.5	6.2	64.6

[1]Temperature adjusted based on standard lapse rate (-5.941 C/3000 ft)

Appendix 4: Mountain goat aerial survey areas in the Kakuhan Range (Lions Head, Sinclair and Berners-Lace Ridge study areas). Each area was surveyed by fixed- and/or rotor-wing aircraft during August-October, 2005-2017. Summer range population size and density (mountain goats/km^2) estimates were derived using sightability and RSF modeling and described in associated figures.



Appendix 5a: Summary of mountain goat population composition, minimum count and population estimates based on data collected during aerial surveys on the Lions Head study area (and associated survey areas), 2005-2017. "Minimum counts" represent the number of mountain goats seen during aerial surveys and do not account for variation in sighting probabilities between surveys/years. Population estimates explicitly account for variation in group-level sighting probabilities among surveys/years.

			Minimum Count				Population Estimate					
Study Area	Survey Area	Year	Adults	Kids	Total	Prop. kids	Total	LCI	UCI	Density	# of surveys	Area (km^2)
Lions Head	W Berners	2005	9	0	9	0.00	21	11	20	1.0	2	22.0
Lions Head	W Berners	2006	16	2	16	0.13	47	20	27	2.1	4	22.0
Lions Head	W Berners	2007	18	7	25	0.28	50	17	24	2.3	4	22.0
Lions Head	W Berners	2008	15	1	16	0.06	26	9	15	1.2	2	22.0
Lions Head	W Berners	2009	12	3	15	0.20	23	8	13	1.0	1	22.0
Lions Head	W Berners	2010	9	1	10	0.10	26	13	20	1.2	2	22.0
Lions Head	W Berners	2011	17	4	21	0.19	39	13	18	1.8	1	22.0
Lions Head	W Berners	2012	11	2	13	0.15	25	10	16	1.1	1	22.0
Lions Head	W Berners	2013	16	2	18	0.11	42	17	25	1.9	1	22.0
Lions Head	W Berners	2014	6	1	7	0.14	15	8	13	0.7	1	22.0
Lions Head	W Berners	2015	5	1	6	0.17	14	8	14	0.6	1	22.0
Lions Head	W Berners	2016	7	1	8	0.13	30	18	29	1.3	1	22.0
Lions Head	W Berners	2017	14	1	15	0.07	42	21	32	1.9	1	22.0
Lions Head	Kensington	2005	21	5	26	0.19	51	17	24	2.5	2	19.9
Lions Head	Kensington	2006	48	8	54	0.15	118	29	36	5.9	4	19.9
Lions Head	Kensington	2007	24	4	27	0.15	43	12	18	2.2	4	19.9
Lions Head	Kensington	2008	17	4	21	0.19	46	17	25	2.3	2	19.9
Lions Head	Kensington	2009	15	5	19	0.26	31	10	15	1.5	2	19.9
Lions Head	Kensington	2010	18	7	25	0.28	45	15	22	2.3	2	19.9
Lions Head	Kensington	2011	25	7	32	0.22	50	13	18	2.5	1	19.9
Lions Head	Kensington	2012	20	3	23	0.13	38	11	17	1.9	1	19.9
Lions Head	Kensington	2013	17	5	22	0.23	53	21	31	2.7	1	19.9
Lions Head	Kensington	2014	16	1	17	0.06	34	13	19	1.7	1	19.9
Lions Head	Kensington	2015	7	2	9	0.22	25	14	21	1.2	1	19.9
Lions Head	Kensington	2016	13	4	17	0.24	47	23	36	2.4	1	19.9
Lions Head	Kensington	2017	10	2	12	0.17	36	19	31	1.8	1	19.9
Lions Head	Met	2005	35	7	42	0.17	80	22	31	5.2	2	15.4
Lions Head	Met	2006	47	14	61	0.23	125	30	37	8.2	5	15.4
Lions Head	Met	2007	48	5	53	0.09	117	30	37	7.6	4	15.4
Lions Head	Met	2008	39	13	51	0.25	102	26	33	6.6	2	15.4
Lions Head	Met	2009	30	9	39	0.23	56	13	19	3.6	2	15.4
Lions Head	Met	2010	32	14	46	0.30	91	24	32	5.9	2	15.4
Lions Head	Met	2011	42	15	57	0.26	84	16	22	5.5	1	15.4
Lions Head	Met	2012	37	7	44	0.16	74	17	24	4.8	1	15.4
Lions Head	Met	2013	31	11	42	0.26	81	24	34	5.3	1	15.4
Lions Head	Met	2014	30	10	40	0.25	63	15	21	4.1	1	15.4
Lions Head	Met	2015	--	--	--	--	--	--	--	--	0	15.4
Lions Head	Met	2016	17	7	24	0.29	65	27	39	4.2	1	15.4
Lions Head	Met	2017	12	4	16	0.25	39	19	32	2.6	1	15.4

Appendix 5b: Summary of mountain goat population composition, minimum count and population estimates based on data collected during aerial surveys on the Mt. Sinclair study area (and associated survey areas), 2005-2017. "Minimum counts" represent the number of mountain goats seen during aerial surveys and do not account for variation in sighting probabilities between surveys/years. Population estimates explicitly account for variation in group-level sighting probabilities among surveys/years.

			Minimum Count				Population Estimate					
Study Area	Survey Area	Year	Adults	Kids	Total	Prop. kids	Total	LCI	UCI	Density	# of surveys	Area (km^2)
Sinclair	Yeldagalga	2005	67	16	83	0.19	134	26	35	5.4	2	25.1
Sinclair	Yeldagalga	2006	95	22	112	0.20	206	36	41	8.2	6	25.1
Sinclair	Yeldagalga	2007	69	15	84	0.18	153	31	38	6.1	3	25.1
Sinclair	Yeldagalga	2008	50	12	62	0.19	114	26	34	4.6	2	25.1
Sinclair	Yeldagalga	2009	--	--	--	--	--	--	--	--	0	25.1
Sinclair	Yeldagalga	2010	25	9	31	0.29	69	22	29	2.7	2	25.1
Sinclair	Yeldagalga	2011	57	15	72	0.21	107	20	26	4.3	1	25.1
Sinclair	Yeldagalga	2012	59	9	68	0.13	95	17	23	3.8	1	25.1
Sinclair	Yeldagalga	2013	34	8	42	0.19	92	29	40	3.7	1	25.1
Sinclair	Yeldagalga	2014	31	9	40	0.23	63	14	20	2.5	1	25.1
Sinclair	Yeldagalga	2015	15	7	22	0.32	45	17	25	1.8	1	25.1
Sinclair	Yeldagalga	2016	49	15	64	0.23	158	43	54	6.3	1	25.1
Sinclair	Yeldagalga	2017	31	11	42	0.26	117	40	51	4.7	1	25.1
Sinclair	S Katzehin	2005	72	13	85	0.15	155	32	38	3.7	2	41.6
Sinclair	S Katzehin	2006	94	19	113	0.17	211	38	43	5.1	4	41.6
Sinclair	S Katzehin	2007	84	20	104	0.19	184	33	40	4.4	3	41.6
Sinclair	S Katzehin	2008	70	19	89	0.21	131	21	27	3.2	2	41.6
Sinclair	S Katzehin	2009	--	--	--	--	--	--	--	--	0	41.6
Sinclair	S Katzehin	2010	29	7	36	0.19	79	24	31	1.9	2	41.6
Sinclair	S Katzehin	2011	53	14	67	0.21	105	20	26	2.5	1	41.6
Sinclair	S Katzehin	2012	42	6	48	0.13	80	18	25	1.9	1	41.6
Sinclair	S Katzehin	2013	21	4	25	0.16	55	20	31	1.3	1	41.6
Sinclair	S Katzehin	2014	27	6	33	0.18	57	15	21	1.4	1	41.6
Sinclair	S Katzehin	2015	27	8	35	0.23	75	23	31	1.8	1	41.6
Sinclair	S Katzehin	2016	21	6	27	0.22	75	30	41	1.8	1	41.6
Sinclair	S Katzehin	2017	24	2	26	0.08	76	31	42	1.8	1	41.6
Sinclair	Katzehin Lk	2005	23	8	31	0.26	47	13	21	2.2	2	21.2
Sinclair	Katzehin Lk	2006	25	3	27	0.11	44	13	18	2.1	4	21.2
Sinclair	Katzehin Lk	2007	16	2	18	0.11	37	14	22	1.8	3	21.2
Sinclair	Katzehin Lk	2008	15	4	19	0.21	41	16	23	1.9	2	21.2
Sinclair	Katzehin Lk	2009	--	--	--	--	--	--	--	--	0	21.2
Sinclair	Katzehin Lk	2010	14	5	19	0.26	42	17	25	2.0	2	21.2
Sinclair	Katzehin Lk	2011	7	2	9	0.22	16	7	13	0.8	1	21.2
Sinclair	Katzehin Lk	2012	3	0	3	0.00	6	3	8	0.3	1	21.2
Sinclair	Katzehin Lk	2013	2	1	3	0.33	8	5	14	0.4	1	21.2
Sinclair	Katzehin Lk	2014	3	1	4	0.25	7	3	10	0.3	1	21.2
Sinclair	Katzehin Lk	2015	2	0	2	0.00	4	2	10	0.2	1	21.2
Sinclair	Katzehin Lk	2016	7	1	8	0.13	26	16	29	1.2	1	21.2
Sinclair	Katzehin Lk	2017	8	1	9	0.11	25	14	26	1.2	1	21.2

Appendix 5c: Summary of mountain goat population composition, minimum count and population estimates based on data collected during aerial surveys on the Meade Icefield and Berners-Lace Ridge study areas (and associated survey areas), 2005-2017. "Minimum counts" represent the number of mountain goats seen during aerial surveys and do not account for variation in sighting probabilities between surveys/years. Population estimates explicitly account for variation in group-level sighting probabilities among surveys/years.

			Minimum Count				Population Estimate					
Study Area	**Survey Area**	**Year**	**Adults**	**Kids**	**Total**	**Prop. kids**	**Total**	**LCI**	**UCI**	**Density**	**# of surveys**	**Area (km^2)**
Icefield	U Lace	2005	9	0	9	0.00	22	12	18	1.3	1	16.9
Icefield	U Lace	2006	1	0	1	0.00	3	2	9	0.2	1	16.9
Icefield	U Lace	2007	8	1	9	0.11	16	7	12	1.0	1	16.9
Icefield	U Lace	2008	6	1	6	0.17	10	4	11	0.6	2	16.9
Icefield	U Lace	2009	--	--	--	--	--	--	--	--	0	16.9
Icefield	U Lace	2010	2	1	2	0.50	4	2	8	0.2	2	16.9
Icefield	U Lace	2011	6	4	10	0.40	14	4	10	0.8	1	16.9
Icefield	U Lace	2012	9	3	12	0.25	19	7	14	1.1	1	16.9
Icefield	U Lace	2013	2	0	2	0.00	6	4	12	0.4	1	16.9
Icefield	U Lace	2014	6	3	9	0.33	12	3	9	0.7	1	16.9
Icefield	U Lace	2015	7	1	8	0.13	17	9	16	1.0	1	16.9
Icefield	U Lace	2016	3	0	3	0.00	13	10	22	0.8	1	16.9
Icefield	U Lace	2017	3	2	5	0.40	12	7	19	0.7	1	16.9
Icefield	S Meade	2005	6	1	6	0.17	10	4	11	0.5	2	18.2
Icefield	S Meade	2006	19	3	22	0.14	43	14	21	2.4	2	18.2
Icefield	S Meade	2007	3	1	4	0.25	8	4	10	0.4	1	18.2
Icefield	S Meade	2008	5	1	5	0.20	9	4	10	0.5	2	18.2
Icefield	S Meade	2009	--	--	--	--	--	--	--	--	0	18.2
Icefield	S Meade	2010	4	2	6	0.33	14	8	15	0.8	2	18.2
Icefield	S Meade	2011	10	3	13	0.23	24	10	15	1.3	1	18.2
Icefield	S Meade	2012	7	0	7	0.00	15	8	14	0.8	1	18.2
Icefield	S Meade	2013	10	1	11	0.09	25	12	20	1.4	1	18.2
Icefield	S Meade	2014	5	3	8	0.38	14	6	11	0.7	1	18.2
Icefield	S Meade	2015	5	2	7	0.29	16	9	16	0.9	1	18.2
Icefield	S Meade	2016	12	2	14	0.14	49	26	39	2.7	1	18.2
Icefield	S Meade	2017	9	1	10	0.10	32	18	29	1.7	1	18.2
BL Ridge	BL Ridge	2005	10	0	10	0.00	33	17	25	1.1	1	30.0
BL Ridge	BL Ridge	2006	--	--	--	--	--	--	--	--	0	30.0
BL Ridge	BL Ridge	2007	25	4	29	0.14	57	18	26	1.9	1	30.0
BL Ridge	BL Ridge	2008	19	3	22	0.14	49	18	26	1.6	1	30.0
BL Ridge	BL Ridge	2009	--	--	--	--	--	--	--	--	0	30.0
BL Ridge	BL Ridge	2010	--	--	--	--	--	--	--	--	0	30.0
BL Ridge	BL Ridge	2011	26	9	35	0.26	60	16	23	2.0	2	30.0
BL Ridge	BL Ridge	2012	24	3	27	0.11	43	12	17	1.4	1	30.0
BL Ridge	BL Ridge	2013	13	2	15	0.13	40	18	27	1.3	1	30.0
BL Ridge	BL Ridge	2014	16	3	19	0.16	36	13	18	1.2	1	30.0
BL Ridge	BL Ridge	2015	18	4	22	0.18	54	20	28	1.8	1	30.0
BL Ridge	BL Ridge	2016	13	2	15	0.13	31	14	22	1.0	1	30.0
BL Ridge	BL Ridge	2017	17	5	22	0.23	49	21	33	1.7	1	30.0

Appendix 6: Summary of mountain goats captured and monitored in the Lions Head and Mt. Sinclair study areas during 2005-2017, Lynn Canal, AK.

Mtn Goat ID	Date - Capture	Year	Sex	Est. Age	Kid	Weight (lbs.)	Fate	Date - Fate	Days Monitored
LG001	9/26/05	2005	M	9	--	308	Died	4/17/06	203
LG002	9/26/05	2005	F	11	1	140	Died	4/16/06	202
LG003	9/26/05	2005	F	7	1	180	Died	4/10/07	561
LG004	9/26/05	2005	F	7	1	196	Release	8/15/07	688
LG005	9/26/05	2005	M	9	--		Died	5/9/07	590
LG006	10/2/05	2005	M	8	--	347	Died	2/10/06	131
LG007	10/2/05	2005	M	2	--	163	Release	8/15/07	682
LG008	10/2/05	2005	F	5	0	171	Died	7/8/13	2836
LG008	8/15/10	2010	F	7	1	172	Died	7/8/13	1058
LG009	10/2/05	2005	F	10	0		Release	8/15/07	682
LG010	10/3/05	2005	F	7	?	187	Release	8/15/07	681
LG011	10/3/05	2005	M	9	--	335	Died	2/11/07	496
LG016	10/14/05	2005	M	5	--	273	Release	8/15/07	670
LG019	10/15/05	2005	M	5	--	273	Died	6/26/06	254
LG020	10/15/05	2005	M	8	--	285	Release	8/15/07	669
LG021	10/15/05	2005	F	4	0	194	Release	8/15/07	669
LG022	10/15/05	2005	F	8	?		Release	8/15/07	669
LG023	10/15/05	2005	M	9	--	221	Release	8/15/07	669
LG024	7/28/06	2006	M	3	--	134	Died	7/13/08	716
LG025	7/28/06	2006	F	6	?	130	Died	5/11/07	287
LG026	7/28/06	2006	M	6	--	251	Died	11/17/06	112
LG027	7/28/06	2006	M	10	--	274	Died	12/31/07	521
LG028	7/28/06	2006	M	8	--		Died	7/18/07	355
LG029	7/28/06	2006	F	7	?	160	Release	9/11/08	776
LG030	7/28/06	2006	F	8	?		Died	4/25/07	271
LG036	7/29/06	2006	M	6	--	308	Release	9/11/08	775
LG037	7/29/06	2006	M	4	--	216	Died	2/18/08	569
LG038	7/29/06	2006	F	4	?	141	Release	9/11/08	775
LG039	8/29/06	2006	F	10	0	165	Died	5/10/07	254
LG040	8/29/06	2006	M	8	--		Died	4/24/12	2065
LG040	9/24/08	2008	M	10	--	309	Died	4/24/12	1308
LG041	8/29/06	2006	F	5	1		Release	9/11/08	744
LG045	9/25/06	2006	F	6	0	185	Release	9/11/08	717
LG050	10/7/06	2006	M	8	--	250	Died	4/17/07	192
LG051	10/7/06	2006	F	2	0	145	Release	9/11/08	705
LG052	10/7/06	2006	F	3	0	160	Release	9/11/08	705
LG053	10/7/06	2006	M	3	--	171	Release	9/11/08	705
LG060	10/13/06	2006	M	5	--	287	Release	9/1/08	689
LG061	10/13/06	2006	M	10	--	350	Died	5/15/09	945
LG061	8/18/08	2008	M	12	--	301	Died	5/15/09	270
LG062	10/13/06	2006	M	10	--	310	Release	9/1/08	689

Appendix 6 (continued): Summary of mountain goats captured and monitored in the Lions Head and Mt. Sinclair study areas during 2005-2017, Lynn Canal, AK.

Mtn Goat ID	Date - Capture	Year	Sex	Est. Age	Kid	Weight (lbs.)	Fate	Date - Fate	Days Monitored
LG078	8/2/07	2007	F	9	1	175	Release	9/11/08	406
LG079	8/2/07	2007	M	11	--	269	Died	8/24/07	22
LG080	8/2/07	2007	M	6	--	281	Release	9/11/08	406
LG081	8/2/07	2007	M	4	--	217	Release	9/11/08	406
LG083	8/3/07	2007	M	5	--	258	Died	6/11/11	1408
LG084	8/3/07	2007	M	4	--	180	Died	4/12/11	1348
LG086	8/11/07	2007	M	4	--	223	Died	10/7/08	423
LG087	8/11/07	2007	M	5	--	233	Died	2/21/10	925
LG088	8/11/07	2007	F	8	0	160	Died	11/1/09	813
LG089	8/11/07	2007	M	4	--	240	Died	11/1/09	813
LG090	8/11/07	2007	F	3	0	157	Release	9/11/08	397
LG097	8/16/08	2008	F	5	1	151	Release	6/7/11	1025
LG098	8/16/08	2008	M	6	--	279	Died	2/15/14	2009
LG098	8/16/12	2012	M	10	--	302	Died	2/15/14	548
LG099	8/18/08	2008	M	6	--	266	Release	6/7/11	1023
LG100	8/18/08	2008	F	10	1	163	Died	10/6/08	49
LG101	8/18/08	2008	M	5	--	277	Died	10/8/09	416
LG102	8/18/08	2008	M	7	--	328	Died	4/3/13	1689
LG103	8/18/08	2008	F	7	0	185	Died	10/14/12	1518
LG103	9/10/11	2011	F	10	0		Died	10/14/12	400
LG104	8/18/08	2008	F	6	0	192	Release	6/7/11	1023
LG106	8/19/08	2008	M	5	--	242	Died	4/17/10	606
LG112	9/21/08	2008	F	11	1	199	Died	2/4/09	136
LG117	9/24/08	2008	F	3	0	170	Release	6/7/11	986
LG118	9/24/08	2008	F	3	0	166	Release	6/7/11	986
LG119	9/24/08	2008	M	4	--	237	Alive	2/20/18	3436
LG120	9/24/08	2008	F	5	1	175	Died	3/22/09	179
LG124	8/5/09	2009	M	5	--	291	Died	3/2/12	940
LG125	8/5/09	2009	F	4	0	150	Died	4/11/14	1710
LG126	8/5/09	2009	F	6	1	175	Died	10/15/12	1167
LG127	8/5/09	2009	F	11	1	182	Died	3/9/10	216
LG128	8/5/09	2009	F	6	0	170	Died	7/27/10	356
LG136	9/1/09	2009	F	2	0	131	Died	10/18/09	47
LG137	9/1/09	2009	M	9	--	342	Died	6/19/12	1022
LG141	8/15/10	2010	M	7	--	307	Died	1/15/15	1614
LG143	8/15/10	2010	F	6	1	175	Died	5/7/13	996
LG144	8/15/10	2010	F	6	1	163	Died	6/14/11	303
LG145	8/15/10	2010	F	6	1	192	Alive	2/20/18	2746
LG146	8/15/10	2010	M	2	--	134	Died	7/12/12	697
LG147	9/10/11	2011	F	3	0	145	Died	10/11/12	397
LG148	9/10/11	2011	F	6	0	182	Died	9/11/17	2193
LG149	9/10/11	2011	F	6	0	164	Died	8/28/12	353
LG150	9/10/11	2011	M	5	--	234	Died	5/19/13	617
LG151	9/10/11	2011	F	5	1	180	Died	6/24/12	288
LG152	9/10/11	2011	M	11	--	296	Died	5/21/12	254
LG153	9/10/11	2011	M	5	--	243	Died	11/8/16	1886
LG154	8/16/12	2012	F	2	0	151	Died	8/7/17	1817

Appendix 6 (continued): Summary of mountain goats captured and monitored in the Lions Head and Mt. Sinclair study areas during 2005-2017, Lynn Canal, AK.

Mtn Goat ID	Date - Capture	Year	Sex	Est. Age	Kid	Weight (lbs.)	Fate	Date - Fate	Days Monitored
LG155	8/16/12	2012	F	12	0	186	Died	5/8/13	265
LG156	8/16/12	2012	M	6	--	265	Died	1/24/14	526
LG157	8/16/12	2012	M	4	--	282	Alive	2/20/18	2014
LG158	8/16/12	2012	M	4	--	192	Died	1/5/14	507
LG159	8/16/12	2012	M	3	--		Died	10/11/14	786
LG160	10/10/12	2012	F	2	0	172	Alive	2/20/18	1959
LG161	10/10/12	2012	F	3	0	160	Alive	2/20/18	1959
LG162	8/15/13	2013	M	8	--	325	Died	1/7/17	1241
LG163	8/15/13	2013	M	3	--	170	Died	7/7/15	691
LG164	8/15/13	2013	F	7	1	180	Alive	2/20/18	1650
LG166	8/15/13	2013	M	2	--		Died	6/29/14	318
LG167	8/20/14	2014	F	11	0	208	Died	1/17/17	881
LG168	8/20/14	2014	F	5	1	193	Alive	2/20/18	1280
LG169	8/20/14	2014	F	9	0	155	Died	10/15/16	787
LG170	8/20/14	2014	M	7	--	254	Died	11/7/14	79
LG172	8/20/14	2014	M	3	--	174	Alive	2/20/18	1280
LG173	8/20/14	2014	M	6	--	268	Died	11/19/16	822
LG174	8/20/14	2014	F	10	1		Alive	2/20/18	1280
LG175	8/25/15	2015	F	4	0	202	Alive	2/20/18	910
LG176	8/25/15	2015	M	6	--		Alive	2/20/18	910
LG177	8/25/15	2015	F	11	1	211	Alive	2/20/18	910
LG178	8/25/15	2015	M	6	--	300	Alive	2/20/18	910
LG179	8/25/15	2015	F	4	1		Alive	2/20/18	910
LG180	8/25/15	2015	F	1	0		Died	4/15/16	234
LG181	9/2/16	2016	M	7	--	295	Died	12/28/16	117
LG182	9/2/16	2016	M	6	--	331	Died	4/5/17	215
LG183	9/2/16	2016	F	9	1	191	Alive	2/20/18	536
LG184	9/2/16	2016	M	5	--	321	Alive	2/20/18	536
LG185	9/2/16	2016	F	5	0	193	Alive	2/20/18	536
LG186	9/2/16	2016	F	7	1	200	Alive	2/20/18	536
LG187	9/2/16	2016	M	5	--		Died	10/23/16	51
LG188	9/2/16	2016	M	4	--		Alive	2/20/18	536
LG189	8/10/17	2017	M	4	--	321	Alive	2/20/18	194
LG190	8/10/17	2017	M	3	--		Alive	2/20/18	194
LG191	8/10/17	2017	F	6	1	170	Alive	2/20/18	194
LG192	8/10/17	2017	F	6	1	172	Alive	2/20/18	194
LG193	8/10/17	2017	M	9	--		Alive	2/20/18	194
LG194	8/10/17	2017	F	8	1	179	Alive	2/20/18	194
LG195	8/10/17	2017	F	3	0	156	Alive	2/20/18	194
LG196	8/10/17	2017	M	4	--	209	Alive	2/20/18	194

Attachment 4

2018 Re-vegetation Test Plot Monitoring Results

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: SITE 1 NORTH Date: 6/18/18

Data Collector(s): P. STRONG Slope(%)/Aspect: ____ / ____

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	5									
~~Forb~~ Moss/Lichen	10									
Shrub										
Total	15	–	–	–	–		–	–	–	–
Weed										
Cover Crop	~~75~~	–	–	–	–	–	–	–	–	–
Rock	75	–	–	–	–		–	–	–	–
Litter	5	–	–	–	–		–	–	–	–
Bare Ground	5	–	–	–	–		–	–	–	–

Other Species (Reclamation Trial)	Other Species (Reference Site)
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☐ No

Mulch
- ☑ None
- ☐ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 8/18/18 Data Collector(s) A. STROW

Site Data

Location Name: SITE I (NORTH)		Photographs taken: (circle one) (Y) N
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	YES	0	14
Surface Litter	↓	3	14
Surface Rock Fragments	↓	2	14
Pedestals	↓	0	14
Flow Patterns	↓	3	15
Rills	↓	0	14
Gullies	↓	6	15
TOTAL		8	

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 8% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: SITE 2 (MIDDLES) Date: 6/18/18

Data Collector(s): P. STTON Slope(%)/Aspect: /

Vegetation

	Reclamation Trial: Total Foliar Cover	Reclamation Trial: Species 1/ % Cover	Reclamation Trial: Species 2/ % Cover	Reclamation Trial: Species 3/ % Cover	Reclamation Trial: Species 4/ % Cover	Reference Site: Total Foliar Cover	Reference Site: Species 1/ % Cover	Reference Site: Species 2/ % Cover	Reference Site: Species 3/ % Cover	Reference Site: Species 4/ % Cover
Grass	10									
Forb (MOSS/LICHEN)	10									
Shrub	–									
Total	20	–	–	–	–		–	–	–	–
Weed	–									
Cover Crop		–	–	–	–	–	–	–	–	–
Rock	70	–	–	–	–		–	–	–	–
Litter	5	–	–	–	–		–	–	–	–
Bare Ground	5	–	–	–	–		–	–	–	–

Reclamation Trial – Other Species:	Reference Site – Other Species:
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☑ No

Mulch
- ☑ None
- ☐ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 6/18/18 Data Collector(s) D. STROW

Site Data

Location Name: SITE 2 (MIDDLE)		Photographs taken: (circle one) (Y) N
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	YES	3	14
Surface Litter	↓	3	14
Surface Rock Fragments	↓	2	14
Pedestals	↓	0	14
Flow Patterns	↓	3	15
Rills	↓	0	14
Gullies	↓	0	15
TOTAL		11	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 11% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: SITE 3 SOUTH Date: 6/18/18

Data Collector(s): D. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial: Total Foliar Cover	Reclamation Trial: Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Reference Site: Total Foliar Cover	Reference Site: Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	15									
Forb	/									
Shrub (ALDER)	45									
Total	60	–	–	–	–		–	–	–	–
Weed	/									
Cover Crop		–	–	–	–	–	–	–	–	–
Rock	20	–	–	–	–		–	–	–	–
Litter	10	–	–	–	–		–	–	–	–
Bare Ground		–	–	–	–		–	–	–	–

Reclamation Trial – Other Species:	Reference Site – Other Species:
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☑ No

Mulch
- ☐ None
- ☑ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 6/18/18 Data Collector(s) P. STRAW

Site Data

Location Name: PLOT 3 (SOUTH)		Photographs taken: (Y) N (circle one)
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	YES	3	14
Surface Litter	↓	3	14
Surface Rock Fragments	↓	6	14
Pedestals	↓	0	14
Flow Patterns	↓	3	15
Rills	↓	0	14
Gullies	↓	0	15
TOTAL		9	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 9% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

SURFACE STABILITY EVALUATION

Date 7/28/18 Data Collector(s) P. SITROW

Site Data

Location Name: PLOT 1 (NORTH)		Photographs taken: (circle one) **Y** N
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	3 ⟷	Y	14
Surface Litter	3	Y	14
Surface Rock Fragments	2	Y	14
Pedestals	0	Y	14
Flow Patterns	0	Y	15
Rills	0	Y	14
Gullies	0	Y	15
TOTAL	8		

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 8% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: SITE 1 (NORTH) Date: 7/28/18

Data Collector(s): P. STRON Slope(%)/Aspect: ____ / ____

Vegetation

	Reclamation Trial: Total Foliar Cover	Reclamation Trial: Species 1/ % Cover	Reclamation Trial: Species 2/ % Cover	Reclamation Trial: Species 3/ % Cover	Reclamation Trial: Species 4/ % Cover	Reference Site: Total Foliar Cover	Reference Site: Species 1/ % Cover	Reference Site: Species 2/ % Cover	Reference Site: Species 3/ % Cover	Reference Site: Species 4/ % Cover
Grass	5									
Forb	15									
Shrub	10									
Total	30	—	—	—	—		—	—	—	—
Weed										
Cover Crop		—	—	—	—	—	—	—	—	—
Rock	60	—	—	—	—		—	—	—	—
Litter		—	—	—	—		—	—	—	—
Bare Ground	10	—	—	—	—		—	—	—	—

MOSS
ALDER

Reclamation Trial	Reference Site
Other Species: Grass	Other Species: Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☑ No

Mulch
- ☐ None
- ☑ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: ~~S~~ SITE 2 (MIDDLE) Date: 7/28/18

Data Collector(s): R STROW Slope(%)/Aspect: ____/____

Vegetation

ALDER
1 SPRUCE

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	~~12~~	15								
Forb	7									
Shrub	5									
Total	20	—	—	—	—		—	—	—	—
Weed										
Cover Crop		—	—	—	—	—	—	—	—	—
Rock	35	—	—	—	—		—	—	—	—
Litter	10	—	—	—	—		—	—	—	—
Bare Ground	35	—	—	—	—		—	—	—	—

Other Species: (Reclamation Trial)	Other Species: (Reference Site)
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Additional Monitoring Methods

Seedling Count ☐Yes ☐No

Canopy Cover ☐Yes ☐No

Mulch
- ☐ None
- ☐ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

SURFACE STABILITY EVALUATION

Site Data

Date 7/28/18 Data Collector(s) P. STROW

Location Name: PLOT 2 (MIDDLE)	Photographs taken: (Y) N (circle one)
Aspect: / Slope (degree):	Photograph notes:
Comments:	

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	~~B~~ Y	0	14
Surface Litter	~~2 B~~ Y	3	14
Surface Rock Fragments	Y	2	14
Pedestals	Y	0	14
Flow Patterns	Y	3	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL		8	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 8% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: SITE 3 (SOUTH) Date: 7/28/18

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	5									
Forb										
Shrub (ALDER)	90									
Total	95	–	–	–	–		–	–	–	–
Weed										
Cover Crop		–	–	–	–	–	–	–	–	–
Rock	5	–	–	–	–		–	–	–	–
Litter		–	–	–	–		–	–	–	–
Bare Ground		–	–	–	–		–	–	–	–

Other Species: (Reclamation Trial)	Other Species: (Reference Site)
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☑ No

Mulch
☑ None
☐ Fiber

Grazing
☐ Wildlife
☐ Livestock
☐ Both

Severity
☐ None 0-5%
☐ Low 5-40%
☐ Moderate 40-60%
☐ Heavy 60-100%

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

- HEAVY ALDER COVER

SURFACE STABILITY EVALUATION

Date 7/28/18 Data Collector(s) P. STROW

Site Data

Location Name: PLOT 3 (SOUTH)		Photographs taken: (circle one) **Y** (circled) N
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	0 ↔	Y	14
Surface Litter	3 ↔	Y	14
Surface Rock Fragments	2 ↔	Y	14
Pedestals	0 ↔	Y	14
Flow Patterns	0 ↔	Y	15
Rills	0 ↔	Y	14
Gullies	0 ↔	Y	15
TOTAL	5		100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 5% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT 1 (NORTH) Date: 8/29/18

Data Collector(s): P. STROU Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	5									
~~Forb~~ MOSS	10									
Shrub (ALDER)	30									
Total	55	—	—	—	—		—	—	—	—
Weed										
Cover Crop	[illegible]	—	—	—	—	—	—	—	—	—
Rock	40	—	—	—	—		—	—	—	—
Litter	5	—	—	—	—		—	—	—	—
Bare Ground		—	—	—	—		—	—	—	—

Reclamation Trial Other Species:	Reference Site Other Species:
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☐ No

Mulch
- ☐ None
- ☑ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 8/29/18 Data Collector(s) P. STROW

Site Data

Location Name: PLOT 1 (NORTH)	Photographs taken: (Y) N (circle one)
Aspect: / Slope (degree):	Photograph notes:
Comments:	

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	3	14
Surface Litter	Y	3	14
Surface Rock Fragments	Y	2	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	8	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 8% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT 2 (MIDDLE) Date: 8/29/18

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial: Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Reference Site: Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	10									
~~Forb~~ MOSS	10									
Shrub (ALDER)	10									
Total	30	–	–	–	–		–	–	–	–
Weed										
Cover Crop		–	–	–	–	–	–	–	–	–
Rock	65	–	–	–	–		–	–	–	–
Litter	15	–	–	–	–		–	–	–	–
Bare Ground		–	–	–	–		–	–	–	–

Reclamation Trial – Other Species:	Reference Site – Other Species:
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☐ No

Canopy Cover ☐ Yes ☑ No

Mulch
- ☑ None
- ☐ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 8/29/18 Data Collector(s) P. STROW

Site Data

Location Name: PLOT 2 (MIDDLE)

Photographs taken: (circle one) **(Y)** N

Aspect:

Slope (degree):

Photograph notes:

Comments:

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	3	14
Surface Litter	Y	3	14
Surface Rock Fragments	Y	2	14
Pedestals	Y	0	14
Flow Patterns	Y	3	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	~~8~~ 11	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 11 ~~8~~% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL LLC

Qualitative Monitoring

Site Name: PLOT 3 (SOUTH) Date: 8/29/18

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

ALDER

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	5									
Forb										
Shrub	85									
Total	90	—	—	—	—		—	—	—	—
Weed										
Cover Crop		—	—	—	—	—	—	—	—	—
Rock	5	—	—	—	—		—	—	—	—
Litter		—	—	—	—		—	—	—	—
Bare Ground	5	—	—	—	—		—	—	—	—

Other Species:	Other Species:
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☑ Yes ☐ No

Mulch
- ☑ None
- ☐ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

SURFACE STABILITY EVALUATION

Date 8/29/18 Data Collector(s) D. STROW

Site Data

Location Name: PLOT 3 (SOUTH)

Photographs taken: (circle one) **Y** (circled) N

Aspect:

Slope (degree):

Photograph notes:

Comments:

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	3	14
Surface Litter	Y	0	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL		3	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below:

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 3% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

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Qualitative Monitoring

Site Name: PLOT 1 (NORTH) Date: 10/31/18

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	5									
Forb Moss	20									
Shrub Alder	5									
Total	30	—	—	—	—		—	—	—	—
Weed										
Cover Crop		—	—	—	—	—	—	—	—	—
Rock	45	—	—	—	—		—	—	—	—
Litter	20	—	—	—	—		—	—	—	—
Bare Ground	5	—	—	—	—		—	—	—	—

Other Species: (Reclamation Trial)	Other Species: (Reference Site)
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Additional Monitoring Methods

Seedling Count ☐ ~~Yes~~ ☑ No

Canopy Cover ☐ ~~Yes~~ ☑ No

Mulch
☐ ~~None~~
☑ Fiber

Grazing
☐ Wildlife
☐ Livestock
☐ Both

Severity
☐ None 0-5%
☐ Low 5-40%
☐ Moderate 40-60%
☐ Heavy 60-100%

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

SURFACE STABILITY EVALUATION

Date 10/31/18 Data Collector(s) P. STROW

Site Data		
Location Name: PLOT 1 (NORTH)		Photographs taken: (circle one) (Y) N
Aspect:	Slope (degree):	Photograph notes:
Comments:		

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	3	14
Surface Litter	Y	0	14
Surface Rock Fragments	Y	2	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	6	

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 6% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

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Qualitative Monitoring

Site Name: PLOT 2 (MIDDLE)   Date: 10/31/17

Data Collector(s): P. STROW   Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	~~8~~ 10									
~~Forb~~ MOSS	25									
Shrub										
Total	38	–	–	–	–		–	–	–	–
Weed										
Cover Crop		–	–	–	–	–	–	–	–	–
Rock	35	–	–	–	–		–	–	–	–
Litter	25	–	–	–	–		–	–	–	–
Bare Ground	5	–	–	–	–		–	–	–	–

Other Species: (Reclamation Trial)	Other Species: (Reference Site)
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☑ No

Mulch
- ☑ None
- ☐ Fiber

ALDER LEAF LITTER

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 10/31/18 Data Collector(s) P. STROW

Site Data

Location Name: PLOT 2 (MIDDLE)

Photographs taken: (Y) N (circle one)

Aspect: Slope (degree):

Photograph notes:

Comments:

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	3	14
Surface Litter	Y	3	14
Surface Rock Fragments	Y	2	14
Pedestals	Y	0	14
Flow Patterns	Y	3	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	11	

Procedure: (refer to Erosion Condition Classification System publication if needed)
1) Observe the total sample area and determine the average condition.
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3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 11% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

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ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: SITE 3 SOUTH Date: 10/31/18

Data Collector(s): P. STROW Slope(%)/Aspect: ______ / ______

Vegetation

	Reclamation Trial Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Reference Site Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	30									
~~Forb~~ ALDER	20									
Shrub										
Total	50	—	—	—	—		—	—	—	—
Weed										
Cover Crop		—	—	—	—	—	—	—	—	—
Rock		—	—	—	—		—	—	—	—
Litter LEAF	~~40~~ 40	—	—	—	—		—	—	—	—
Bare Ground	10	—	—	—	—		—	—	—	—

Reclamation Trial – Other Species:	Reference Site – Other Species:
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover __________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ ~~Yes~~ ☒ No

Canopy Cover ☐ Yes ☒ No

Mulch
- ☒ None
- ☐ Fiber

- LEAF LITTER FROM ALDERS

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

- ONE SPRUCE TREE 3" TALL

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 10/31/18 Data Collector(s)

Site Data

Location Name: PLOT 3 SOUTH		Photographs taken: (Y) N (circle one)
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	3	14
Surface Litter	Y	0	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL		3	

Procedure: (refer to Erosion Condition Classification System publication if needed)

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3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 3% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC