Attachment E

Dredge and Environmental Management Plan

Bonanza Channel Placer Project

Summer Case Study

DREDGING AND ENVIRONMENTAL MANAGEMENT PLAN

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File: POA-2018-00123

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ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
AMHW	above mean high water
APDES	Alaska Pollutant Discharge Elimination System
BCCS	Bonanza Channel Case Study
BCPP	Bonanza Channel Placer Project
BMLLW	below mean lower low water
BMP	Best Management Practice
CDF	confined disposal facility
CFR	Code of Federal Regulation
CWA	Clean Water Act
DEMP	Dredging and Environmental Management Plan
DMDS	Dredge Material Disposal Site(s)
EFH	Essential Fish Habitat
EM	ecological memory
EPA	US Environmental Protection Agency
H	horizontal
MHHW	mean higher high water
MLLW	mean lower low water
NMFS	National Marine Fisheries Service
NWP	Nationwide Permit
REE	routine effectiveness evaluation
SAV	submerged aquatic vegetation
SOP	standard operating procedure
SPT	standard penetration test
SWPP	storm water pollution prevention
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
V	vertical

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1 INTRODUCTION

This Dredging and Environmental Management Plan (DEMP) is an addendum to the IPOP, LLC (applicant) Individual Application for the Bonanza Channel Placer Project (BCPP) near Nome, Alaska (file number POA-2018-00123). The BCCP is comprised of two stages: Bonanza Channel Case Study (BCCS, or Stage 1) and Full-Scale Five-Year Mining Operations (Stage 2) This DEMP addresses the BCCS test dredging program within State of Alaska mining claims DKSN 35 and DKSN 36 in K001S029W, Section 19.

IPOP applied for approval from the U.S. Army Corps of Engineers (USACE) to mine their claims on April 23, 2020 (POA-2018-00123). On October 29, 2020 USACE forwarded agency comments to IPOP from US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and US Environmental Protection Agency (EPA). IPOP responded, in part, to these comments on November 10, 2020 with a proposal for the BCCS within claims DKSN 35 and DKSN 36 and submitted an amendment to the individual application for inclusion of the BCCS on February 1, 2021.

The applicant proposes to mine placer gold from their claims in the Bonanza Channel. The proposed BCPP is a simple, low-impact mining operation that will dredge for placer gold within the sediments of the Bonanza Channel.

1.1 Dredging Operation

The BCCS is intended to gather additional data and provide “proof of concept” under normal operating conditions in support of the full-scale five-year mining operation as proposed in the original application The BCCS is designed to demonstrate the long-term effectiveness of the curtain containment over a wide range of weather conditions, while minimizing the consequence of any failures.

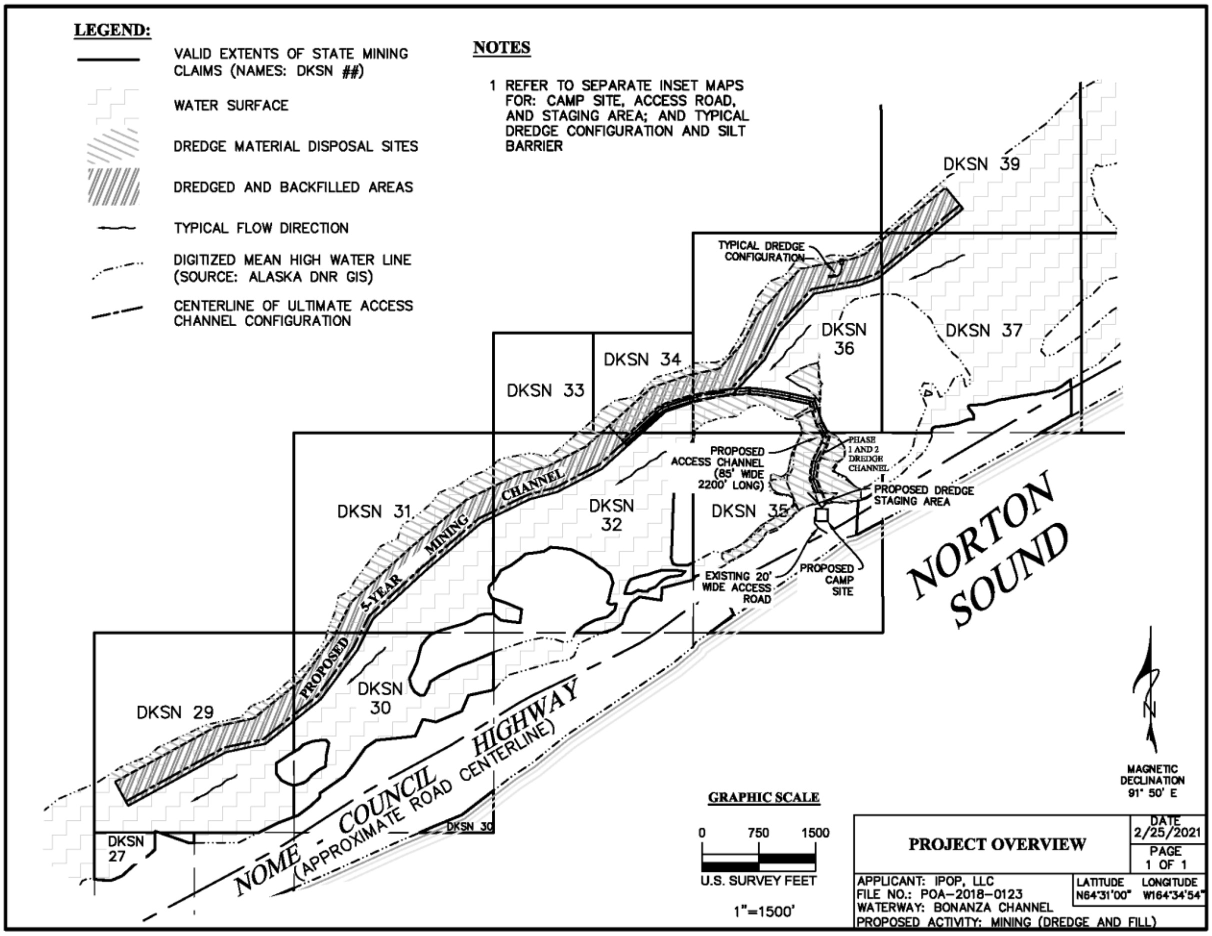
Phase 1 of the BCCS includes:

- Project operating life of one season.
- Operation within State of Alaska mining claims DKSN 35 and DKSN 36.
- Dredge and fill of approximately 158,000 cubic yards of silt, sand, and gravel from a 5.9-acre test area.
- Dredging depth of approximately 28 feet (ft).
- Reclamation would be concurrent with dredging, with temporary dredge material disposal sites reclaimed by the end of the case study.
- Area is located close to shore, near the entry point for easy access and quick response time.
- Area is outside of fish migration corridors.
- Area is planned in shallow water with submerged aquatic vegetation (SAV) mapped as sparse, patchy, and continuous offering the opportunity to demonstrate the reclamation effectiveness.
- Area is uniquely positioned between two large islands, offering isolation from the greater Bonanza Channel; especially when closed off with turbidity curtains.

Phase 2 of BCCS: If successful and time allows Phase 2 of the BCCS would be implemented and expand the test area by dredging and backfilling up to 135,000 additional cubic yards of material from a 4.6-acre test area.

Stage 2 – The full-scale mining operation (BCPP as described in the April 23, 2020 Bonanza Channel Placer Project Narrative and Plan of Operations) involves full-scale, long-term (five-year) mining. The final configuration for Stage 2 will depend upon the information gathered from Stage 1.

Figure 1-1 depicts the entire BCPP area with the BCCS area noted as “Phase 1 and Phase 2 Dredging.”



NOTE: Area labeled “Phase 1 and Phase 2 Dredge Channel” comprises the BCCS area.

Figure 1-1. BCPP Five-Year Operations Area, BCCS Phase 1 and 2 Dredging Areas, Access Channel, Camp, and Dredge Launching Site

1.2 Applicant Commitments

The applicant commitments for the BCCS that relate to the DEMP include:

- Monitoring and management of potential environmental impacts associated with the implementation of the full-scale test dredging proposal.
- Coordinate with the USFWS, NMFS, and EPA to address the objectives of maintaining ecological function of the Bonanza Channel.
- Operate within the requirements of the Clean Water Act and the project Alaska Pollutant Discharge Elimination System (APDES) permit authorization.
- Operate in accordance with agency-approved dredging schedules (activity window).
- Manage dredging operations as a treatment works inside of a full containment constructed of bottom-mounted turbidity curtains.
- Monitoring water salinities, dissolved oxygen, and turbidity levels outside of the containment.
- Continual monitoring of weather patterns and tidal fluctuations (wave climate) and shoreline processes.
- BCCS test mining area reclamation and habitat reconstruction.
- Contingency measures/plans for excess bulking of dredged sediments (over and above predicted bulking), fuel or oil spills, etc.

1.3 DEMP Structure

This DEMP is structured to meet the requirements of both the State of Alaska and federal agencies, and commitments of the applicant.

Specific objectives set forth include:

- Monitor the implementation of the proposal.
- Monitor for avoidance or minimization of potential environmental impacts associated with the proposed dredging activities.
- Meet the regulatory agency requirements to maintain the ecological function, abundance, species diversity, and geographical distribution of SAV of the Bonanza Channel area.
- Maintain relative proportions of substrates, and organic-rich soil within the active productive horizon on the bottom of the lagoon (unless BCCS restoration demonstrates that changing the relative proportions results in an “as-good-as” or “improved” productive horizon).
- Not disrupt or alter wave climate, sediment transport, or shoreline stability in the mining area.

- Maintain the quality of the broader area (Bonanza Channel, Safety Sound) in relation to recreational bird watching, boating, fishing, hunting, berry picking, egg gathering, and other coastal subsistence uses.
- Not block or negatively impact navigable waterways.

In the context of environmental management, measures will be implemented that avoid or minimize environmental effects. The DEMP is consistent with principles of ecologically, sustainable economic development and is designed to protect the natural resources and the productivity of the local environment.

2 DREDGING ENVIRONMENTAL MANAGEMENT PLAN

2.1 Configuration of Dredge Areas (BCCS Phase 1 and Phase 2))

The perimeter of the BCCS dredging and development area is shown in Figure 2-1. This area is configured to not block fish passage or navigable waterways and avoid disturbing uplands to maintain the pre-dredging viewscape. The BCCS includes areas of variable SAV densities (Eilers 2020, 2021). Dredge-and-fill BCCS operations will be conducted in two phases shown in Figure 2-2 and Figure 2-3, respectively.

The BCCS area encompasses 27 acres generally classified as E1UBL habitat. Within the BCCS area 24.6 acres will be disturbed and restored (Phases 1 and 2); the remaining area will be used for short-term turbidity containment during BCCS activity as illustrated in Figure 2-2. and Figure 2-3. Approximately 10.5 acres of the BCCS area will be dredged to a nominal 28 ft below mean lower low water (BMLLW) (as illustrated in cross-sections in Figure 2-4 and Figure 2-5 for Phases 1 and 2). Dredge channel slopes will be closely monitored and surveyed over the course of the BCCS to protect existing shorelines. As dredging occurs adjacent to the shore of the islands and as the crest of the mining channel approaches the shoreline (or mudflats), dredging depth and width will be adjusted to the stabilized slope of the mining channel. Other portions of the operational area will be used for storage of harvested soils and organic matter and temporary and long-term dredge material disposal sites (DMDS).

Active fill and reclamation will eventually restore the BCCS area mining channel to its pre-mining bathymetry (except for a 7 ft-deep access channel up to 80 ft-wide). The remaining DMDS will be stabilized and restored BMLLW (Figure 2-4 through Figure 2-6).

NOTE: Shallow water in the BCCS area is depicted in lighter shades; deeper main Bonanza Channel to the north is depicted in darker shade.

Figure 2-1. BCCS Area Perimeter, between Mile Posts 28 and 29 of the Nome-Council Highway, BCPP Camp, and Dredge Launching Site

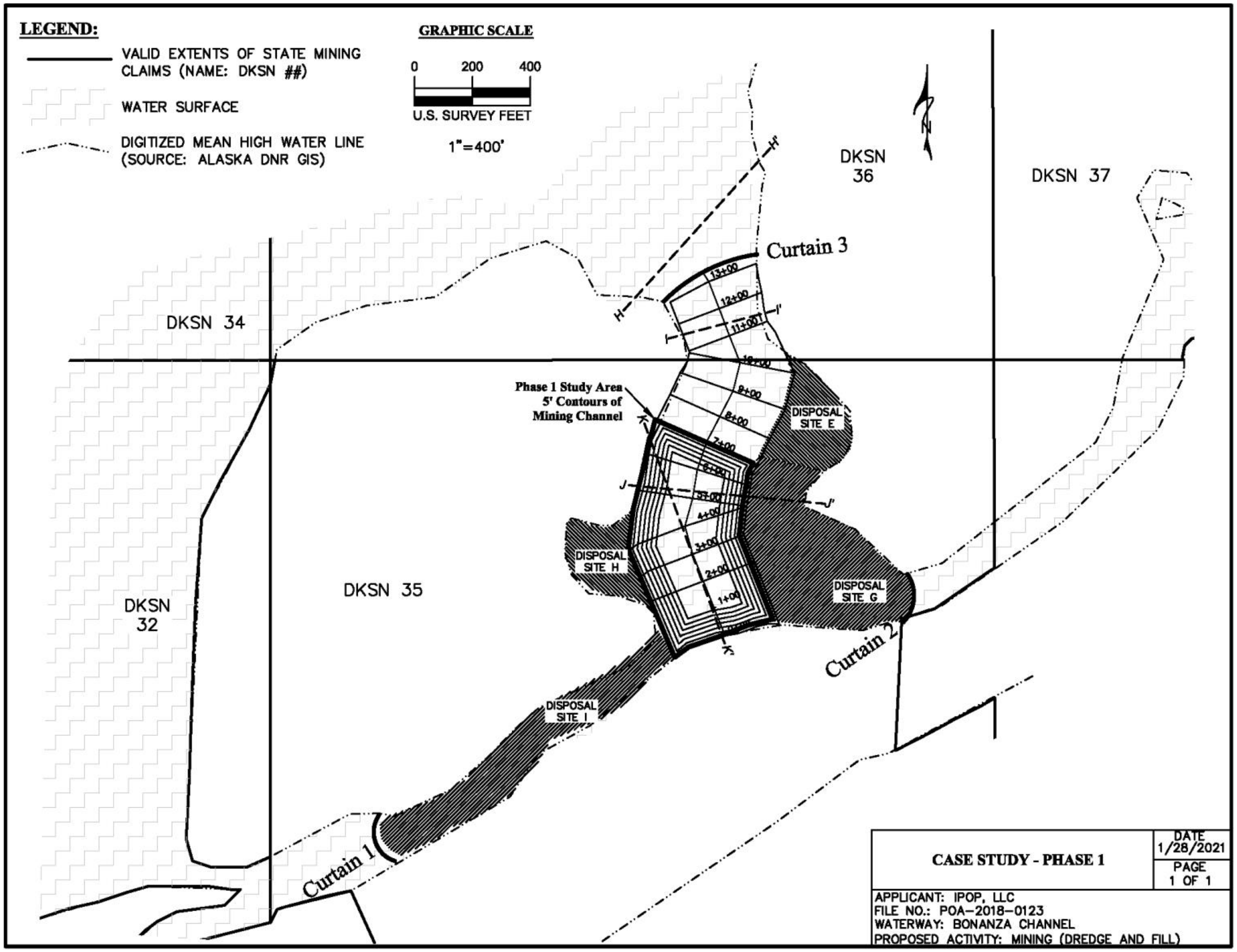


Figure 2-2. BCCS Phase 1 Area, between Mile Posts 28 and 29 of the Nome-Council Highway, BCPP Camp, and Dredge Launching Site

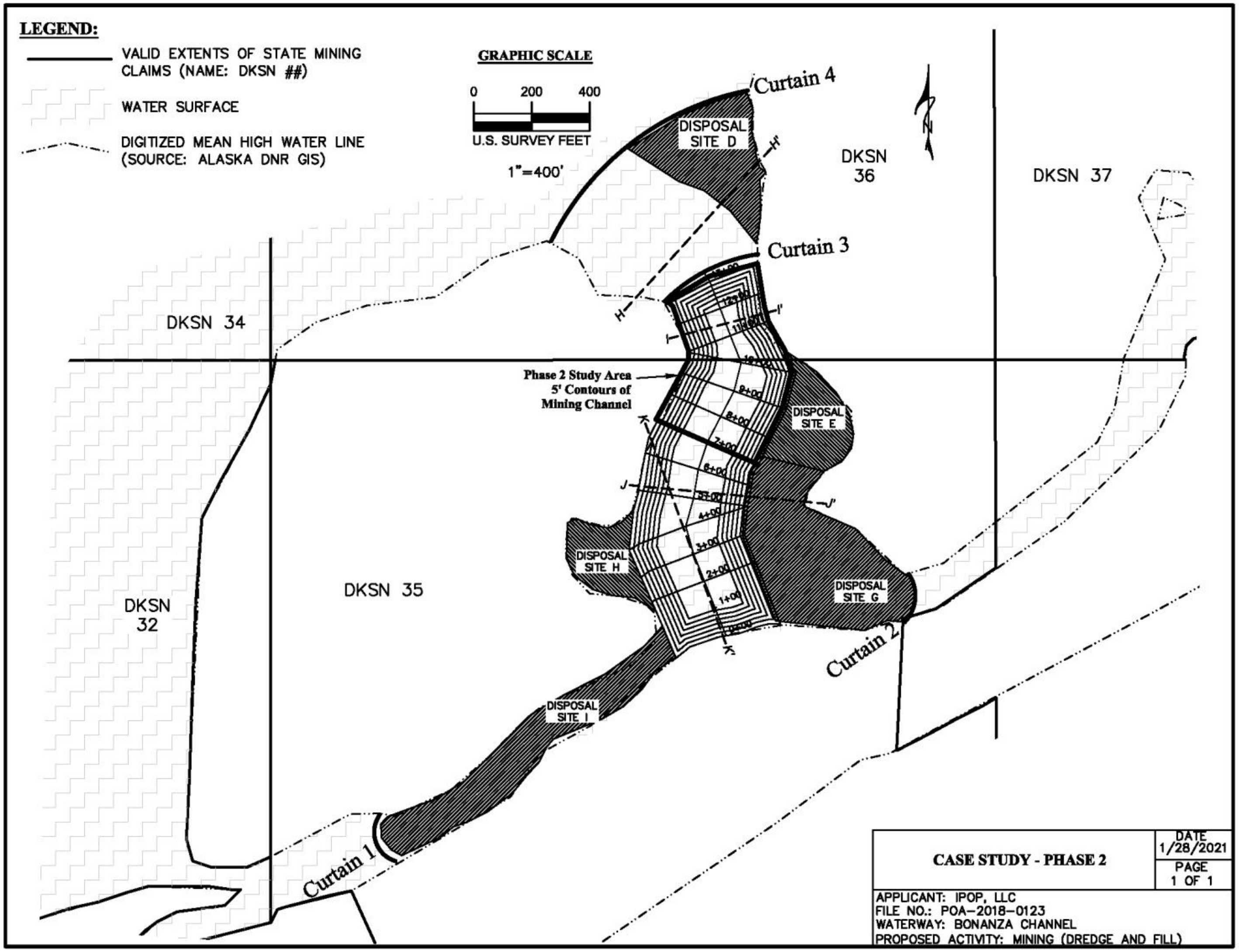
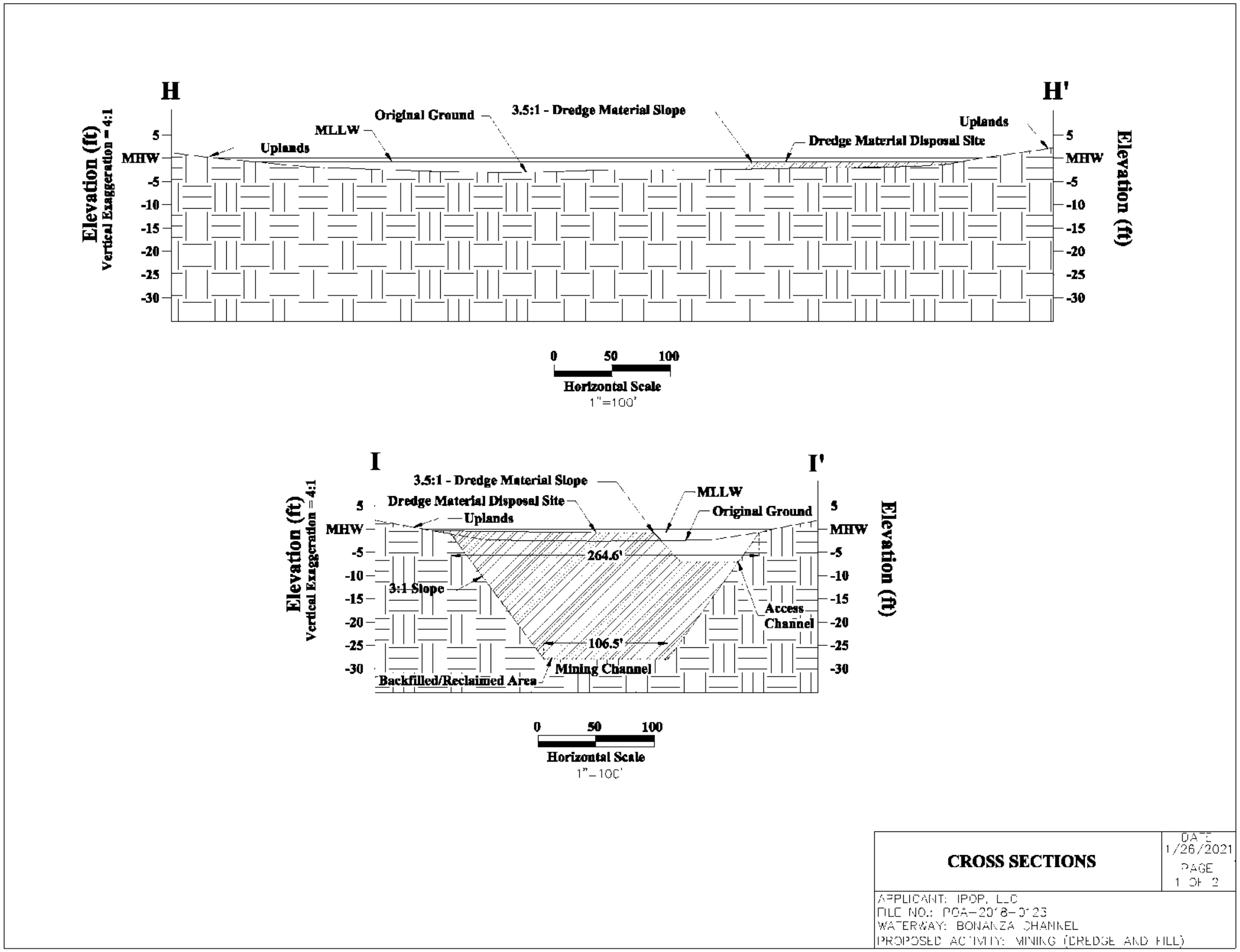
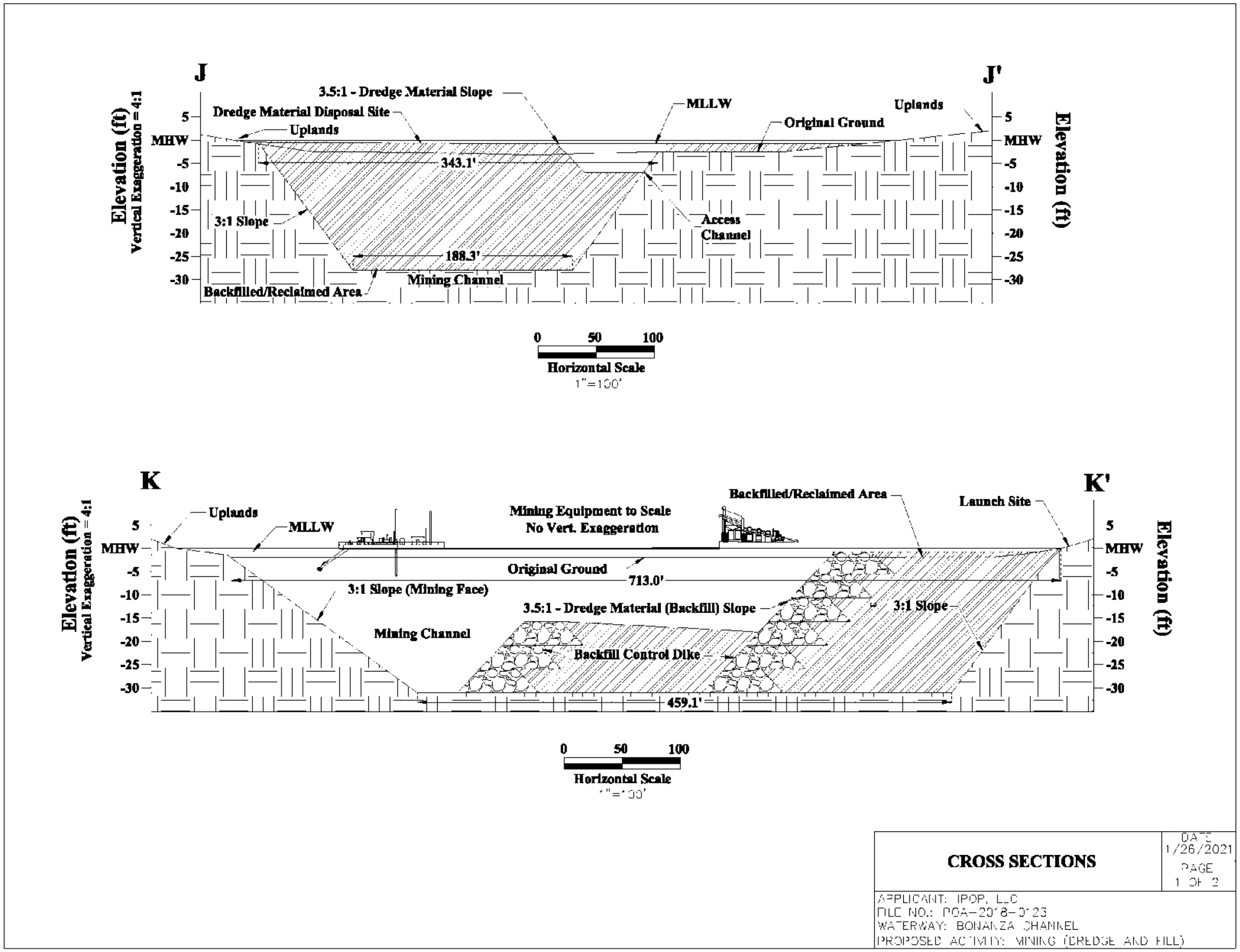


Figure 2-3. BCCS Phase 2 Area, between Mile Posts 28 and 29 of the Nome-Council Highway, BCPP Camp, and Dredge Launching Site



NOTES: 1) Locations of cross-sections are depicted in Figure 2-2 and Figure 2-3; 2) Drawing and information contained herein are for general presentation purposes and not intended, nor should be used, for engineering design purposes.

Figure 2-4. Cross-Sections of Dredged and Filled Areas Post-Mining



NOTE: 1) Locations of cross-sections are depicted in Figure 2-2 and Figure 2-3; 2) Drawing and information contained herein are for general presentation purposes and not intended, nor should be used, for engineering design purposes.

Figure 2-5. Cross-Sections of Dredged and Filled Areas During Mining (K-K') and Post-Mining (J-J')

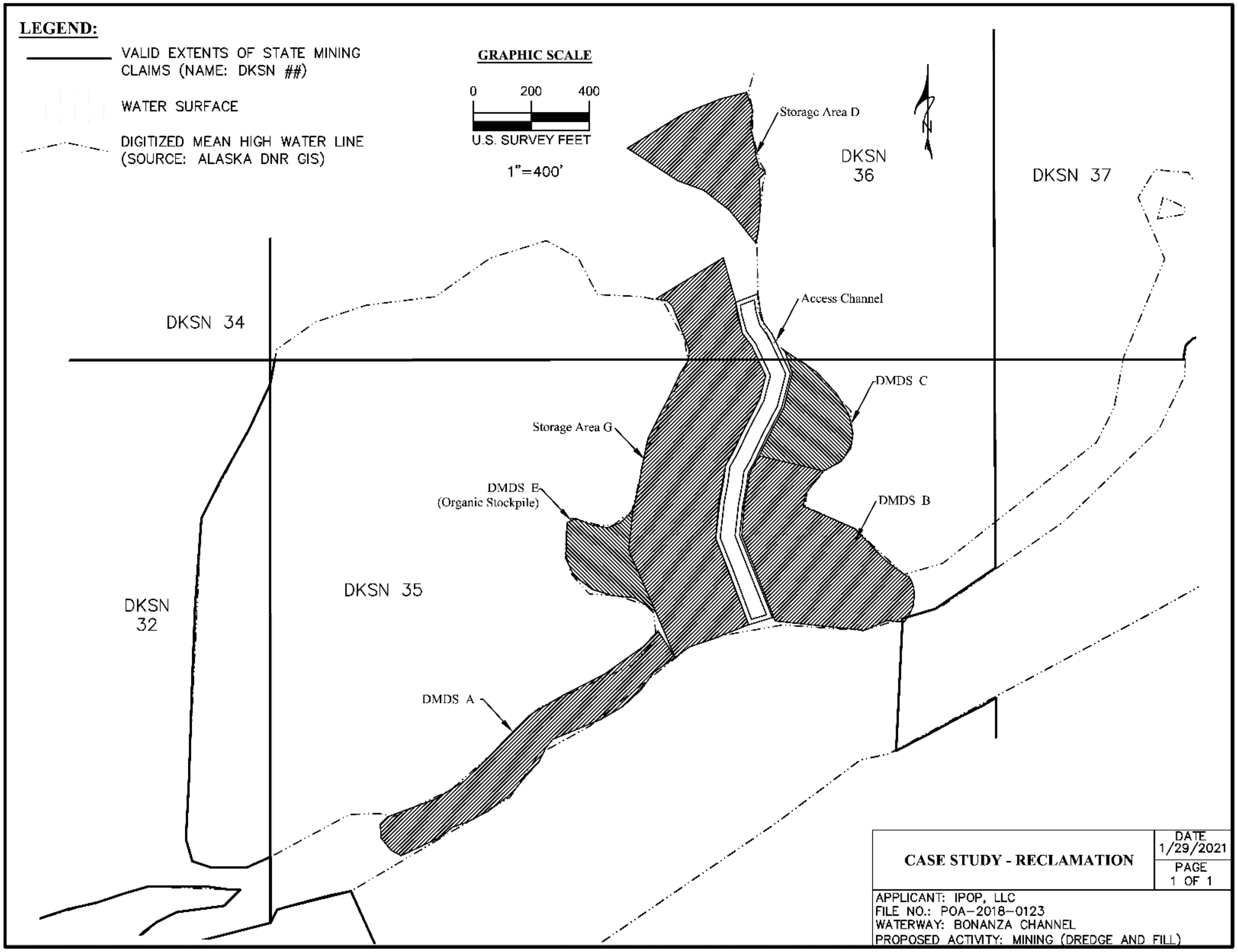


Figure 2-6. BCCS Reclamation: Filled Areas and Post-Mining Features

2.2 Dredge Scheduling

The BCPP (including the BCCS) dredging activity window would be from June 1 to November 1. The BCCS would occur during Year 1 of the project.

Dredging activity will be determined on a daily/weekly basis to meet stipulations of project permits and assessment of weather conditions to maintain stable operations. The dredging schedule for the BCCS is to maintain maximum productivity for the site conditions in small (200-ft) increments along the length of the mining channel. After each 200-ft increment, the activity will temporarily cease to allow for monitoring and surveying of slope profiles of the dredged trench and examination of the slopes of the discharged sand and gravel. The rate of production, dimensions of the channel, or turbidity curtain positions will be modified if needed to effectively maintain the containment effectiveness (turbidity curtains), spoil piles, backfilling operations, and trench wall stability.

2.2.1 Dredge Records

Dredge Log

The IPOP dredge has a state-of-the-art, computerized navigation system. The system contains information on the latest bathymetry, resource model, planned navigation/dredge channel boundaries. This system also continuously records the bathymetric profile of pre- and post-dredge and fill areas.

The location of the dredge is determined using differential GPS together with real-time water level information from instruments in the water and on the shoreline. The dredge log is digitally recorded on the vessel and transmitted in real-time to the shore-based operations office. Vessel tracklogs from the dredge are reviewed daily to verify that dredging is carried out within approved dredging areas and a summary will be provided in an annual compliance report to the USACE.

Annual Reporting

Annual reporting will include the detailed bathymetric survey of all areas impacted by the dredge and fill operations, including those areas within the containment but not dredged or filled. This information will include a comparison to pre-mining bathymetry, vegetation distribution, restoration details, volumes of materials dredged (e.g., harvested organic soil, dredged soils), estimated bulking factors, slope stability information, detailed cross sections, weather data, turbidity data (both inside and outside of the curtain containment), tide and current data, water chemistry, equipment sound monitoring data, and wildlife observation logs. The report will also include operational details such as number of man-days, hours of operations, fuel records. Although not expected to occur, the report will include incidental take and accidental releases.

2.2.2 Operations Management

The IPOP cutterhead dredge will operate on 24-hour shifts, 7 days a week, with routine maintenance occurring for 1 hr at the end of every shift and scheduled maintenance occurring once every two weeks. The operation has been planned around the production capabilities of the IPOP dredge.

Additional equipment for the fleet may include gravel pumping dredges and amphibious excavators. Both are multi-function equipment that will support the dredging operations by soil harvesting, reclamation, bottom sculpting, entry site preparation/deepening, material conveyors to dredge material disposal sites (DMDS) and shore-line habitat restoration areas, setting dredge anchors, moving pipe, management of dredge spoil piles and dike construction.

2.3 Turbidity Management

All activities of dredging, discharge, reclamation, washing and vessel movements generate some degree of turbidity. Based on available documentation of storms in the area, more turbidity is generated by natural events and for longer periods of time than the turbidity that would be associated with the dredge activities. To reduce and manage the areas affected by turbidity caused by the operation, bottom-mounted turbidity curtains will be used to establish nearly 100% containment of the operation. In summer 2020, short-term (model-scale) dredging was conducted to test the effectiveness of the turbidity curtain. Based on results of the test, the work area inside the turbidity curtain returned to background water chemistry and turbidity load within approximately 48 hours of the cessation of dredging.

Figure 2-7 depicts typical turbidity curtain installation and configuration. A contingent plan for storm surges involves placement of a secondary containment if the project conditions deem it necessary.

Real-time turbidity monitoring will be achieved by bottom-mounted and/or buoy-mounted turbidity monitoring stations situated both up- and down-current of the mining operation. These instruments will capture, record and upload real-time turbidity, conductivity, water temperature, weather, flow velocity data to the cloud accessible to the regulating agencies and operation management and send turbidity exceedance alarms to the dredge operator for quick response in the case of a failed turbidity BMP.

Turbidity from the dredging operation within the curtain containment will be characterized and summarized in a dredge plume tracking report that will be included in reporting required by the permitting authorities.

2.4 Dredge Material Management

The BCCS amendment describes the dredge material management in detail. The project anticipates some bulking of materials may occur and as such has designated DMDS areas large enough to accommodate the anticipated material bulking and initial storage of dredged material (prior to backfilling operations). Additionally, the project has designated DMDS for the storage of harvested organic-rich bottom soil for post-mining reclamation purposes.

This section addresses factors that may affect management of dredge material including physical attributes of the material, bulking factor, and stability of storage methods. In addition, long-term management is discussed and regulatory considerations for placement and storage of dredge material is described.

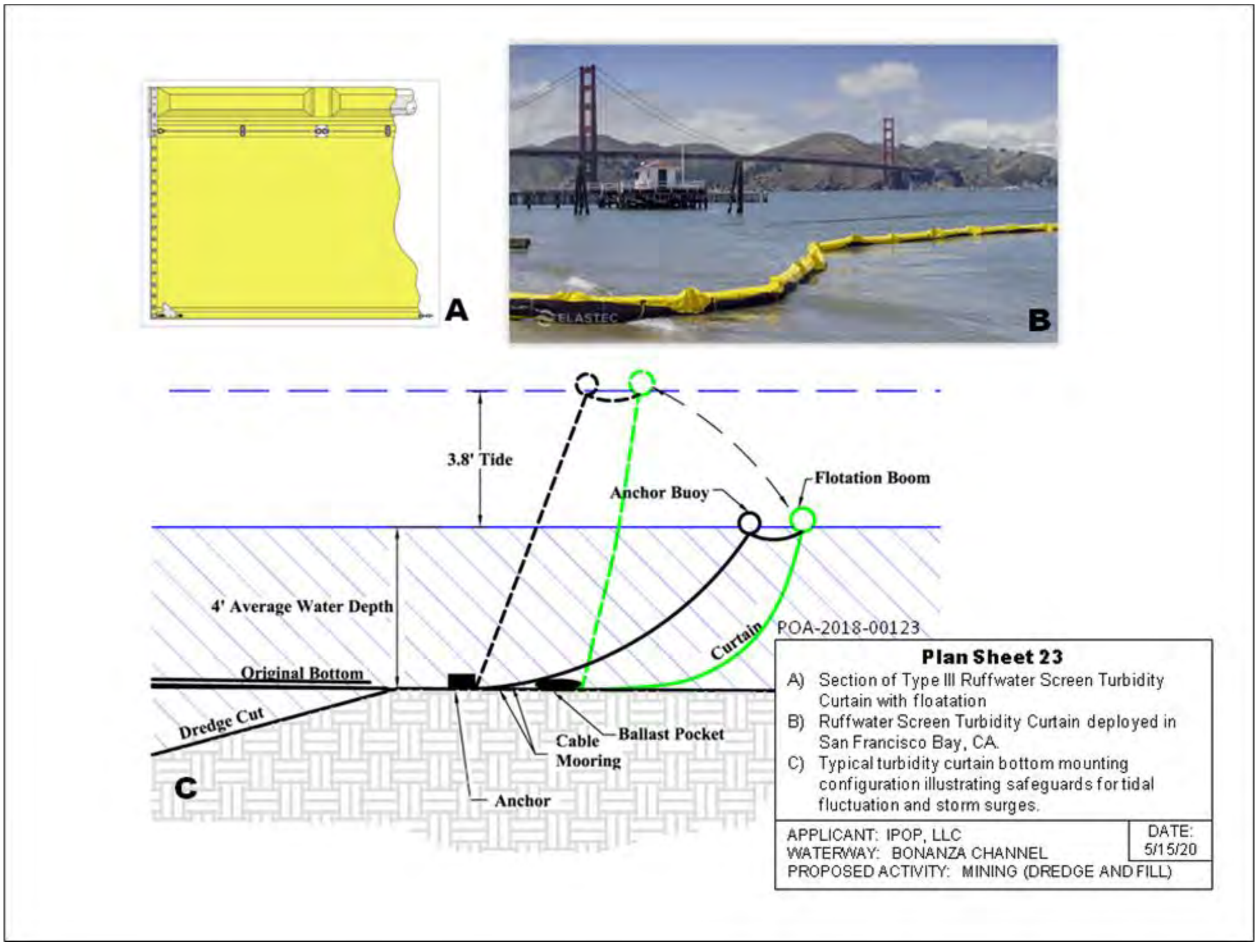


Figure 2-7. Turbidity Curtain Installation – Typical

2.4.1 Soil Size Fraction

The observations recorded during 2019 drilling indicate the presence of mostly sand with minor quartz cobbles and a recognizable clay layer that could be correlated with depth, hole-to-hole, across the area drilled. American Assay Labs returned results for sieve analysis for the representative size fraction of material from the 13 drill holes and reported the percentages for sand, silt and clay sized fractions. Though the drilling did hit a few boulders of quartz, these were not included in the size fraction analysis; material >1/4 inch is rare and represents less than 10% of the material that will be mined using the cutterhead dredge method. The size fractions of all the holes are fairly consistent. The ratio of sand to silt and sand to clay is considered within the range of variability expected for tidal sedimentary sequences in high energy locations like the Bonanza Channel. Table 2-1 details the results of sieve analysis.

Table 2-1. Results of 2019 Sieve Analysis

Hole ID	Sand %	Silt %	Clay %
BH-01	82.03	12.75	5.22
BH-02	94.58	3.05	2.37
BH-03	89.25	6.09	4.66
BH-04	77.7	16.55	5.75
BH-05	72.14	21.32	6.54
BH-06	83.75	11.42	4.82
BH-06 Dup*	85.77	9.54	4.69
BH-07	83.26	11.13	5.61
BH-08	81.37	13.66	4.97
BH-09	80.42	14.46	5.11
BH-10	77.63	18.01	4.36
BH-11	82.24	14.12	3.64
BH-12	72.33	22.06	5.6
BH-12 Dup*	74.59	17.7	7.71
BH-13	84.32	12.14	3.55
Average	*81.62*	*13.12*	*4.94*

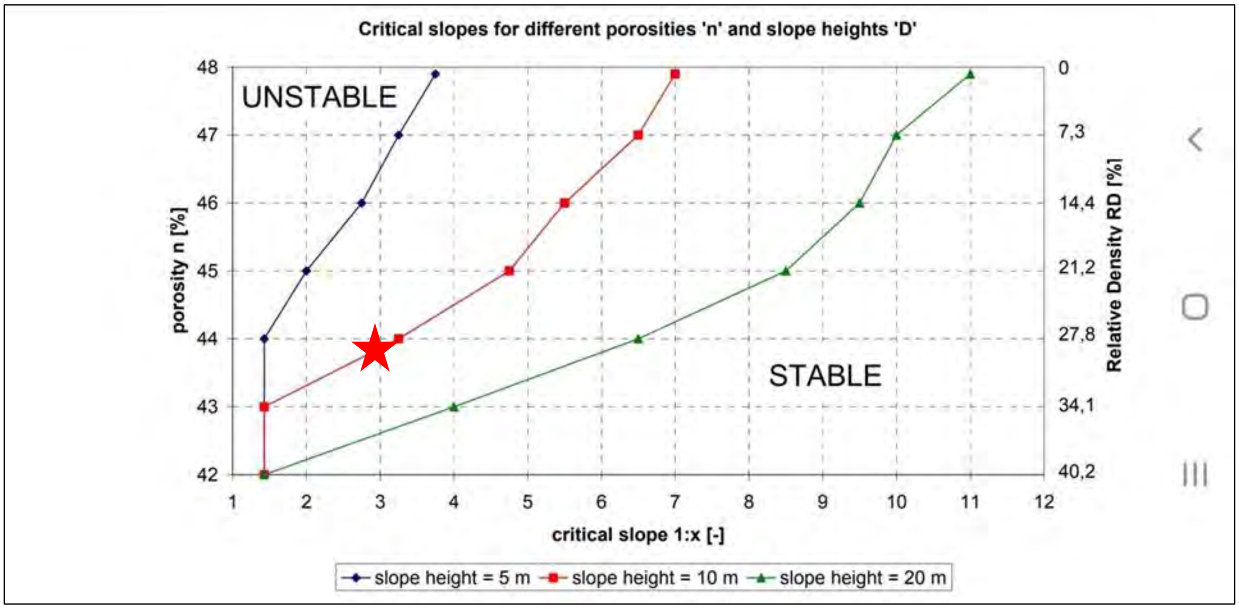
Dup = duplicate analysis

2.4.2 Soil Stability

Stability evaluation is critical for determining the angles of repose for the dredged trenches and working faces with respect to depth and for understanding the dynamics of backfill/reclamation or the slopes of the DMDS. The following factors are significant components affecting soil stability and shear stress in a dredging operation:

- Soil size fractions
- Water content
- Pore space (density)
- Depth of dredge channel
- Water depth
- In-situ stability.

Size fractions are known from the 2019 test drill hole analysis (See Section 2.4.1) and show that the material averages 81.6% percent sand, 13.1% percent silt, and 4.94% clay. Normal facies changes in a beach stratigraphic sequence results in highly variable sand, silt, and clay layers that can affect the in-situ stability of the soil. In general, sand is the most stable. In most depositional settings porosity, or conversely density, changes with respect to depth. In nearly all cases the sediment becomes denser with depth. Water content is directly proportional to porosity; the sediments will contain less water with depth in the sedimentary column. The angle of internal friction is influenced by all these as shown by the chart in Figure 2-8. Shear failure is the most common instability mechanism for slopes (Raaijmakers 2005).



NOTE: modified after Raaijmakers (2005). BCCS design slope indicated by red star.

Figure 2-8. Critical Slopes for Typical Dredge Channels Depending on Depth and Porosity

No in-situ standard penetration tests (SPT) have been conducted for the project, so the geotechnical properties of the soil have not been determined, thus the applicant has assumed well-drained soils with a relative density averaging 27.8%, based largely on the grain size analysis and stratigraphy in the 2019 drilling.

The applicant has assumed the worst-case slope stability scenario for this relative density and a maximum dredging depth of 31 ft (approximately 28 ft during the BCCS). The slopes of the cuts are assumed to be listric in section, ranging from 16 degrees near the slope toe, and steepening toward the surface to nearly 20 degrees with an overall slope of 18.4 degrees or 3H:1V.

Dredged fill stability water content will vary between in-situ sediment and dredged sediment, whereby hydraulic dredging disrupts the settled and compacted soils, mixes them with water and jettisons the slurry through the system. When these soils are discharged rocks and the coarser size fractions of sand settle to the bottom rapidly stacking up relatively steeply near the outfall. Silt is carried a bit further by the current created by the discharge and runs down the toe of the sand pile. Clay remains in suspension for a longer period of time, and flocculates depending upon various factors like water conductivity, current, and nature of the clay. As such, clay will settle over much larger areas and will not generally affect the stability of dredged fill at the immediate point of discharge. Because of these factors, the DMDS slopes are designed at a 3.5H:1V under water. Fill slopes will be monitored during the BCCS operations and designs will be adjusted if necessary.

2.4.3 Bulking Factor

During the dredging process a change in density is caused by the increase of void space that causes the dredged soil to expand. This is referred to as “bulking.” The “bulking factor” is a multiplier describing the amount the soil expands once it is dredged and discharged (as opposed to “swell factor” which is normally represented in percentage). The bulking factor for soils is primarily dependent upon the following factors:

- In-situ soil density
- Soil size fractions and percentages thereof
- Depth of discharge/fill
- Types of machinery used in the dredging operation
- Water current
- Rates of settling
- Water conductivity.

The rates of settling, or sedimentation behavior of hydraulically dredged soils can be explained by the settling characteristics typical of the depositional environment. Three types of settling can occur: 1) discrete settling, 2) flocculant settling, and 3) zone settling. The dredged material is expected to settle by a combination of all three of these types. The settling behavior of the material will affect its ultimate density (void space/porosity) as fill as does the self-weight consolidation, and subsequently the bulking factor of the soil due to hydraulic dredging. Rather than conduct in-situ SPT tests to determine the geotechnical properties of the soil (to provide a basis for more rigorous and detailed bulking factor determination), IPOP's estimates for bulking of material from dredging is based on sieve analysis of cored material to the ultimate mining depth.

The applicant has used various references and consultation with dredge soil engineering firms to determine the worst-case scenario for bulking of the dredged materials for the purposes of designing the layout of DMDS adjacent to the mining area that can accommodate the maximum bulking that could occur.

2.4.4 Dike Design

The site conditions require construction of structurally and geotechnically sound retaining dikes for effective containment of ponded water and dredged material. Best management practices (BMPs) include using dikes or berms constructed of gravel and/or geotextile sand filled tubes (to mitigate erosion from currents or wave action), and/or turbidity curtains as a temporary stabilization measure for the dredge material. Additionally, a series of 5 ft tall backfill dikes will be constructed within the mining trench to steepen up the slopes of the fill within the mining trench behind the dredging operation (Figure 2-5). These dikes will be spaced along the bottom of the mining channel as experience dictates.

2.4.5 Bank Stability Management

Prior to mining the crest line of the planned mining trench will be surveyed and marked with survey lath extending above the waterline as a visual aid to slope retreat and bank stability. Because the BCCS is a study, experience will dictate the buffer required for maintaining stability of the adjacent bank or shorelines so that they remain unaffected by the operations.

As mining progresses the slopes of the dredge channel will be routinely surveyed to generate data on the stable slope angle for the dredge channel walls. Relatively quick re-deposition of material (or fill) will eliminate or reduce the risk of longer-term sloughing and bank instability (edge effect). In subsequent years, the adjacent bank top will be monitored and summarized to evaluate the effectiveness of the plan and long-term stability of the shorelines and backfilled banks.

2.5 Long-Term Management and Storage

Dredge material disposal sites will be maintained until they are reclaimed and stabilized. Consolidation of the layers will continue for long periods following placement, causing a decrease in the volume occupied by the layers and a corresponding increase in storage capacity for future placement. If this happens, such increased storage capacity may be used for subsequent years of operation. Regardless, the DMDS and filled sites will be monitored annually and bathymetry of these areas updated and reported.

3 SUBMERGED AQUATIC VEGETATION DISTRIBUTION AND RESTORATION

Because the majority of the Bonanza Channel is covered in SAV for one-third of the year, the BCCS area was chosen to represent a variation of SAV growth profiles to gather representative data and monitor/evaluate the effects of dredge mining in this lagoon. Eilers (2020, 2021) mapped the SAV and described the SAV in the BCCS area as diverse distribution classified as patchy, sparse, and continuous growth.

The seagrass bed growth cycle in the Bonanza Channel is extremely dynamic with fall recession, winter dormancy, and dense rapid growth over the summer months. Intense seed production, wave action, storms, and active colonization result in annual changes of seagrass cover and species from year to year. During the winter, the Bonanza Channel completely freezes over, in most areas the ice reaches the bottom. Over winter months the seagrass beds are dead, with seeds and rhizomes lying dormant in the soils beneath the ice. In the springtime after the ice melts, there is a 4- to 6-week period when the water warms and the SAV begins to grow with increasing density and intense seed production in late summer/early fall, followed by completion of the annual cycle as the SAV returns to winter dormancy.

3.1 Scientific Data Collection, Bathymetry, and Habitat Restoration Plan

The applicant will conduct ongoing aerial drone photography through the ice-free months followed by ground truth surveys of benthic habitats to track losses or gains in annual seagrass cover attributed to natural causes (e.g., correlated with storm events, temperatures, amount of ice cover and subsequent timing of breakup), dredging activities, and other anthropogenic impacts. The project will implement measures to prevent or minimize environmental effects, provide mitigation where needed, and possibly enhance the natural environment. Restoration efforts will be focused on reducing net loss of biodiversity which includes loss of potential seagrass habitat and ecosystem function. The applicant recognizes that depending on bulking factors of material, some seagrass habitat may be altered and some of this area may be replaced by mudflat habitats, but no net loss of special aquatic sites is expected to occur. Over time as natural processes occur such as material compaction and desiccation of filled soils and redistribution by wind and wave processes, SAV habitat will eventually increase to its natural pre-mining state. During the BCCS, scientific studies will include documentation of fish abundance and biomass, invertebrate abundance and biomass, seagrass productivity and restoration of disturbed seagrass, nitrogen cycling rates, dissolved oxygen, water chemistry, and salinity. The study will provide data to characterize these variables into an overall expression of ecological value for the area.

Attachment E

Dredge and Environmental Management Plan

The dredging operations will result in relative changes in bathymetry; however, the project anticipates storage of bulked materials to change bathymetry in the DMDS allowing for an uplift in overall bird habitat.. The BCCS will include test plots of various restoration methods to measure the successful establishment of SAV to the dredge and fill areas. The proposed operation will leave an access channel basin floor 7 ft BMHW, or nominally 4.7 to 5 ft deeper than pre-mining basin depths. This channel will link to the adjacent shallower sand banks by relatively steep-sided dredged slopes (estimated to slump and stabilize at an overall 3V:1H slope). This dredged slope will be monitored over time, as will the SAV regrowth along the crest, slope, and basin floor of the newly developed access channel. Though stability of the side slopes of the dredged and filled slopes depends upon sediment characteristics (coarser materials will maintain steeper slopes), the relative abundance of sand makes the slopes more predictable. The prevailing hydrodynamics of the project area is affected most by wind and the effects to slope stability and SAV re-growth will be closely monitored.

3.2 Wave Climate and Shorelines

The project is designed to dredge and fill BMLLW and not affect the wave climate or shorelines of the area. Hydrodynamic or shoreline impacts caused by the operation will be monitored.

3.2.1 Wave Climate Monitoring Plan

As noted above, wind and wave climate is a key factor impacting sediment movement and shoreline stability in the project area. The objectives for the project are to:

- Maintain the stability and successful SAV restoration in dredge and fill areas.
- Maintain the integrity, function and overall environmental values of the Bonanza Channel.

As such, the project will measure and monitor the wave climate during the operation including real-time weather monitoring, and the effects of the climate on the stability and ecological function of the restored mining areas. Because of the low coastal topography, dominant prevailing wind directions, and restoration BMLLW, the project is not expected to result in major hydrodynamic changes to the wave climate; rather the wave climate is expected to help restore the disturbed areas to the pre-mining state.

3.2.2 Shoreline Monitoring Plan

The shorelines of the Bonanza Channel vary with respect to seasonal, tidal and storm cycles and are highly variable. Nevertheless, the project is planned to deposit fill BMLLW to minimize alteration of the shorelines. The success of implementation of this DEMP depends on several factors, primarily the bulking factor and the subsequent ability to dispose of dredge spoils BMLLW. The shoreline monitoring will consist of drone aerial photography, shoreline surveys, and documentation of changes in shoreline position. Coupled with shoreline monitoring, the monitoring program will identify areas that become sites of erosion or accretion of sediment caused by the dredge and fill operations.

4 FISH AND MARINE RESOURCES PROTECTION

IPOP has filed both an Essential Fish Habitat (EFH) Assessment document and a Biological Assessment (BA) document that describe fish habitat and the marine resources and the effects determination of the BCPP. This section describes the fisheries and marine life protection plan for the BCPP (including the BCCS).

The project is designed to develop the gold resource to avoid adverse impacts on fisheries or marine mammals and maintain the quality of the broader area in relation to recreation such as bird watching, boating, fishing, hunting, and subsistence.

The BCPP would protect fish and wildlife by implementing BMPs. Turbidity curtains would be used as BMP for fish exclusion barriers and 100% operational containment to protect the surrounding waters from the effects of turbidity and potential contaminants (e.g., fuel leak) from the operation.

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Application of EM material would occur in multiple locations during different phases of mining the access channel. EM material would be mechanically removed from the storage area and evenly dispersed along the side slopes of the access channel. EM material would also be applied to recontoured features outside the channel footprint to the low tide mean elevation. The applied depth of the EM material layer would be determined in the field from a mass balance calculation between the disturbed area to treat and the volume of available donor material.

4.1.2 Bird Habitat Reclamation

Review of project drone imagery from September 2018 shows large numbers of swans foraging on SAV in the project area, primarily along the north bank of the Bonanza Channel. The access channel will provide 2.4 acres of deep-water habitat preferred by larger birds (e.g., swans and loons) to mimic pond morphology.

Surveys by Eilers (2020, 2021) determined that mudflats used by shorebirds represented only 8.1 percent of the claim area. This is likely attributable to the rather steep near-shore topography, which slopes abruptly from MHHW to approximately 2.5 ft to 3.0 ft deep, creating a “bowl” shape to the existing lagoon morphology as described in the Reclamation Plan. Because tides in the claim area rarely exceed 3 ft, shorebird mudflat habitat is limited by the existing channel morphology and sediment transport regime. As shown in Figure 2-4, the DMDS areas will include final elevations within the range of tidal influences to enhance creation of mud flat habitat. Acreages and extent the mud flat habitat features will be further determined during the 2022 case study and incorporated into final reclamation design cross sections and elevations.

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This section addresses the Adaptive Management Plan for the BCPP, including the BCCS. The initial activity for the Adaptive Management Plan consists of developing models and descriptions for size and duration of suspended sediment plumes caused by dredging and how the applicant expects silt to behave after suspension in the water column (e.g., rate of settling). The results will be used as an adaptive management tool during the BCCS (Project Year 1) and to refine the standard operating procedures (SOPs) for turbidity curtain operation during the five-year operations period.

Adaptive management is a process for continually improving management practices by learning from the outcomes of operational approaches (e.g., Bunnell et al. 2009; BC MoF 2013). To be effectively implemented, adaptive management requires a prompt response to field observations of changing environmental conditions. Therefore, adaptive management is an ongoing process of monitoring, maintenance, and reassessment.

When properly implemented, adaptive management enables a cost- and time-effective hierarchical response to potential environmental issues. Best management practices, industry standard operating procedures, and a corresponding inspection, maintenance, and monitoring program constitute the basis of construction environmental management planning. If the results of monitoring indicate that management measures are not adequately meeting performance objectives, the inadequacies should be identified and addressed promptly. The adaptive management approach promotes proactive measures, with the caveat that contingency plans and materials should be in place prior to the initiation of work so that additional measures can be quickly implemented if needed.

6 COMPLIANCE AND ROUTINE EFFECTIVENESS MONITORING

Monitoring is generally recommended to:

- Measure the response of a system from combined process interactions due to imposed change.
- Document or observer the response of a specific process and compare to predicted response for a prescribed treatment.
- Define short-term versus long-term changes.
- Document spatial variability of process and system response.
- Provide confidence in specific management practice modifications or mitigation recommendations to offset adverse water resource impacts.
- Evaluate effectiveness of stabilization or restoration approaches.
- Reduce risk once predictions and (or) practices are assessed.
- Build a database to extrapolate for similar applications.
- Determine specific maintenance requirements.

Post-construction compliance and routine effectiveness evaluation (REE) monitoring would be conducted at the reclaimed/restored habitat features and will focus on the integrity of the features, compliance with conceptual design, and meeting biological objectives. Compliance and REE monitoring may include measurements and surveys, observation, and use of existing design documents (Pearson et al. 2005).

An as-built topographical survey or high-resolution aerial image will be completed in 2022 following construction of the geomorphic (e.g., width/depth ratio, pool depth, mudflat slopes) and habitat features during the BCCS noting the general location of all structure types while allowing time for construction materials to settle and allow reclassification. A checklist for presence and integrity of important project elements will be developed and used to facilitate comparisons (BCMWLAP 2001). Photographic monitoring of important project features (e.g., mudflats or SAV) will be taken at pre-identified photo points.

Productivity monitoring will be the primary tool for measuring the success of the reclaimed habitat features. The key variables will address the following questions:

- Area: Does the total area of habitat created or restored match that of the specifications of the conceptual design?
- Configuration: Does the spatial arrangement of habitat types correspond to the conceptual design?
- Materials: Are the materials used of the type and size specified in the approved design?
- Structural integrity: Are all structures in place and functioning as designed? Is there significant structural instability (e.g., erosion) on the site?

7 EROSION CONTROL PLAN

An erosion control plan and stormwater pollution prevention (SWPP) plan are needed if erosion is expected from the dredging operation. However in the case of the BCCS, there will be no permanent placement of dredge and fill above mean high water (AMHW), therefore there will be no erosion of spoils piles. Additionally, because dredging is entirely within the open water and procedures are in place to avoid shore instability and undercutting, there will be no erosion related to dredging.

The only areas where potential erosion may occur are the launch area and the existing access road into camp. In these areas, overall disturbance (1.2 acres) will be less than 5 acres, so no SWPP will be required. However, measures will be taken to stabilize the active areas and prevent erosion including placement of a geotextile mat on roads, walkways, and within the launch area. Appropriate placement of silt curtains will be placed at appropriate locations down-slope of active areas that may be prone to erosion and at outfalls into waters of the United States.

8 SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

To minimize risks of petroleum spills, the project will prepare site-specific Spill Prevention, Control, and Countermeasure (SPCC) Plan to describe fuel storage, handling, and transfer protocols as per Alaska regulatory requirements (e.g., Title 18 Alaska Administrative Code [AAC] 75.425, Oil Discharge and Prevention and Contingency Plan Contents).

In addition, the EPA SPCC rule requires facilities to develop, maintain, and implement an SPCC plan. Implementation of the SPCC plan helps facilities prevent oil spill, as well as control a spill should one occur. The proposed BCPP will be covered by the SPCC rule as it has an aggregate aboveground oil storage capacity greater than 1,320 U.S. gallons.

The applicant has prepared a Tier 1 SPCC plan and shall submit the EPA Template plan once the specific personnel required to manage and oversee the implementation of the plan are chosen. The personnel cannot be assigned until a permit is issued and personnel schedules are firmed, but in no case will the project commence prior to the submittal of the SPCC plan.

Project-specific spill prevention and mitigation measures will include:

- Double-walled fuel storage tanks with internal 110% secondary containment.

- Fuel dispensing equipment housed in internal secondary containment.
- High-level alarms and overfill protection.
- All fuel burning equipment will be housed in secondary containment enclosures.
- Drip pans, sorbents, and absorbent boom will be deployed during fueling operations.
- Turbidity curtain will provide 100% containment for dredging operations.
- Additional oil spill response equipment is staged in Nome at the Chadux facility at the Crowley Marine Services fuel terminal.

9 REFERENCES

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The dredging operations will result in relative changes in bathymetry; however, the project anticipates storage of bulked materials to change bathymetry in the DMDS allowing for an uplift in overall bird habitat.. The BCCS will include test plots of various restoration methods to measure the successful establishment of SAV to the dredge and fill areas. The proposed operation will leave an access channel basin floor 7 ft BMHW, or nominally 4.7 to 5 ft deeper than pre-mining basin depths. This channel will link to the adjacent shallower sand banks by relatively steep-sided dredged slopes (estimated to slump and stabilize at an overall 3V:1H slope). This dredged slope will be monitored over time, as will the SAV regrowth along the crest, slope, and basin floor of the newly developed access channel. Though stability of the side slopes of the dredged and filled slopes depends upon sediment characteristics (coarser materials will maintain steeper slopes), the relative abundance of sand makes the slopes more predictable. The prevailing hydrodynamics of the project area is affected most by wind and the effects to slope stability and SAV re-growth will be closely monitored.

3.2 Wave Climate and Shorelines

The project is designed to dredge and fill BMLLW and not affect the wave climate or shorelines of the area. Hydrodynamic or shoreline impacts caused by the operation will be monitored.

3.2.1 Wave Climate Monitoring Plan

As noted above, wind and wave climate is a key factor impacting sediment movement and shoreline stability in the project area. The objectives for the project are to:

- Maintain the stability and successful SAV restoration in dredge and fill areas.
- Maintain the integrity, function and overall environmental values of the Bonanza Channel.

As such, the project will measure and monitor the wave climate during the operation including real-time weather monitoring, and the effects of the climate on the stability and ecological function of the restored mining areas. Because of the low coastal topography, dominant prevailing wind directions, and restoration BMLLW, the project is not expected to result in major hydrodynamic changes to the wave climate; rather the wave climate is expected to help restore the disturbed areas to the pre-mining state.

3.2.2 Shoreline Monitoring Plan

The shorelines of the Bonanza Channel vary with respect to seasonal, tidal and storm cycles and are highly variable. Nevertheless, the project is planned to deposit fill BMLLW to minimize alteration of the shorelines. The success of implementation of this DEMP depends on several factors, primarily the bulking factor and the subsequent ability to dispose of dredge spoils BMLLW. The shoreline monitoring will consist of drone aerial photography, shoreline surveys, and documentation of changes in shoreline position. Coupled with shoreline monitoring, the monitoring program will identify areas that become sites of erosion or accretion of sediment caused by the dredge and fill operations.

4 FISH AND MARINE RESOURCES PROTECTION

IPOP has filed both an Essential Fish Habitat (EFH) Assessment document and a Biological Assessment (BA) document that describe fish habitat and the marine resources and the effects determination of the BCPP. This section describes the fisheries and marine life protection plan for the BCPP (including the BCCS).

The project is designed to develop the gold resource to avoid adverse impacts on fisheries or marine mammals and maintain the quality of the broader area in relation to recreation such as bird watching, boating, fishing, hunting, and subsistence.

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