PLACER MINING
RESOURCE NETWORK

Alaska Placer Mining 101 Guidebook

March 2026

The Alaska Placer Mining 101 Guidebook is brought to you by the Placer Mining Resource Network (PMRN). The PMRN is an informal cooperation of state and federal agencies that was formed to help address challenges Alaska placer miners face related to permitting and compliance. The goals of the PMRN are to:

- Improve permitting and compliance processes.
- Improve technical assistance to placer miners related to permitting and compliance.
- Develop and maintain relationships built on trust and mutual understanding among agencies and between agencies and placer miners.

This Guidebook is intended to assist placer miners with planning, designing, and permitting successful placer mining operations, recognizing there is no one-size-fits-all approach. At the end of the Guidebook, there are appendices with additional resources, including agency contact information and links to helpful tools.

This Guidebook is intended solely to assist operators in understanding existing regulatory requirements and does not create or impose new permit conditions.

PMRN COOPERATING AGENCIES

Photo 1 (front cover). Hammond River near Wiseman, Alaska (Ralph Hamm).

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List of Acronyms

ADF&G	Alaska Department of Fish & Game
ANCSA	Alaska Native Claims Settlement Act
APDES	Alaska Pollutant Discharge Elimination System
APMA	Application for Permits to Mine in Alaska
BCY	Bank Cubic Yards
BLM	U.S. Bureau of Land Management
CapEX	Capital expenditures
CWA	Clean Water Act
DEC	Alaska Department of Environmental Conservation
DGGS	Alaska Division of Geological & Geophysical Surveys
DNR	Alaska Department of Natural Resources
DOR	Alaska Department of Revenue
DOT	Alaska Department of Transportation and Public Facilities
EPA	Environmental Protection Agency
LCY	Loose Cubic Yards
LOP	Letter of Permission
MSHA	U.S. Department of Labor, Mine Safety and Health Administration
MAPTS	Mining and Petroleum Training Services, University of Alaska Fairbanks
NPS	National Park Service
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NWOTUS	Navigable Waters of the United States
NWP	Nationwide Permits
OpEx	Operating expenditures
PMRN	Placer Mining Resource Network
RGP	Regional General Permit
RS 2477	Revised Statute 2477
SDMS	Spatial Data Management System
SPCC	Spill Prevention, Control, and Countermeasure
TLO	Trust Land Office
USACE	U.S. Army Corps of Engineers
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WOTUS	Waters of the United States

Introduction

Welcome to the Placer Mining 101 Guidebook

This ***Guidebook*** offers some basic information that will help set you on the path to planning, designing, and permitting a successful operation that carries forward Alaska's long history as a placer mining state.

Over the past 150 years, placer mining has played a pivotal role in shaping Alaska as an American territory and then a state. Today's highway system largely retraces the steps of Gold Rush pioneers. Many of the towns across Alaska were established to support placer miners as they made discoveries spanning from the streams in the Fortymile Mining District on Alaska's eastern border with Canada to the beaches of Nome on the state's far west coast.

Photo 2. Mining Co. Miners at work in open pit mine Southeast Alaska 1896-1913, Alaska State Library, Sheldon Museum Collection, ASL-P93-52.

Today's placer miners reflect the pioneering spirit of the Gold Rush prospectors who once mined Alaska's streams, beaches, and other deposits. However, both the mining techniques and the regulatory framework guiding the responsible recovery of placer mineral deposits have evolved significantly since gold was first discovered in the gravels of the Kenai River in 1849.

> *Your financial, environmental, and regulatory success can help establish Alaska as a glimmering example of placer mining done right!*

Planning was not a high priority for the Gold Rush pioneers who uncovered gold in streams across Alaska at the close of the 19th century, nor for the large-scale dredging and mechanized placer operations that followed throughout much of the 20th century. Gold was abundant in waterways across the state, and there were few, if any, government regulations addressing environmental impacts during mining or requiring restoration of the land once the gold was extracted.

During the 1970s and '80s, however, Alaska's placer mining landscape began to change. The reason for this has three parts:

1. An increased understanding of the need to protect the natural beauty, fish, and wildlife for which Alaska is famous.
2. The establishment of state and federal environmental laws.
3. An increase in gold prices resulting in more exploration and development of placer resources in areas that were easier to access and less expensive to develop.

From the thousands of acres of tailings piles left in the wake of the large bucket dredging operations in mining districts across Alaska, to the abandoned mining camps found alongside placer mined creeks across the state, the aftermath of unplanned and unregulated mining is still evident today.

Photo 3. Large bucket dredging of Ester Creek near Fairbanks, Alaska, July 1938 (USFWS) – mosaic of original aerial photos from Quantum Spatial, Anchorage.

Unfortunately, society often judges modern miners (both placer and hardrock) by the mining practices of a bygone era before the environmental awareness and stringent regulations that guide modern mining. Your financial, environmental, and regulatory success can establish Alaska as a glimmering example of placer mining done right! By doing so, you are staking claim to your own legacy and setting the stage for future generations of placer miners across America's Last Frontier.

However, navigating the complexities of today's permitting system and establishing a financially and environmentally successful mine requires careful planning and execution at the lower-grade deposits that are often harder to access from the road system pioneered by the placer miners of a bygone age (see **Historic Roads of Alaska** for more details).

Photo 4. Leland Dredge on Solomon River Nome Alaska 1896-1913, Alaska State Archives, O.D. Goetze Collection, Goetze, AMRC b01-41-395.

Except for recreational mining and prospecting using a pick, shovel, and gold pan, almost every placer mining operation requires some level of permitting or authorization from at least one agency. More than a dozen local, state, and federal agencies may be involved depending on the location and scope of the mine. For a family-run placer mine with a small crew more accustomed to digging dirt than digging through mountains of placer mining regulations, the permitting system can be daunting.

To assist in navigating this complex permitting process, the Alaska Department of Natural Resources (DNR) designed the Application for Permits to Mine in Alaska (APMA). This application serves as a centralized tool to initiate the permitting process and compile the information required by multiple agencies for review. **While the APMA itself is not a permit, completing it helps guide your mine planning and ensures you have the necessary documentation when submitting permit applications for your operation.**

Further details on the APMA can be found in *Chapter 8 – Permitting & Compliance* of this guide or by visiting **DNR's APMA webpage** for more information and a downloadable form that can be used for mine planning and/or permitting.

HOW AGENCIES ARE HELPING

To address the challenges Alaska placer miners face when it comes to mine permitting and compliance, several state and federal and other agencies came together in November of 2021 to form the PMRN. The PMRN's Interagency Group includes the Alaska Department of Environmental Conservation (DEC), Alaska Department of Fish and Game (ADF&G), Alaska Department of Natural Resources (DNR), National Park Service (NPS), Salcha-Delta Soil & Water Conservation District (SDSWCD), U.S. Army Corps of Engineers (USACE), U.S. Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), and U.S. Forest Service (USFS).

To improve permitting and compliance services for the placer mining industry in Alaska, the PMRN asked placer miners (via interviews and a survey) about the challenges they face and asked for suggestions on how agencies can improve services.

Based on input from placer miners and interagency coordination, the PMRN has committed to sharing information and developing products and services, including the publication of this Placer Mining 101 Guidebook, to address the challenges and needs shared by Alaska's placer mining community.

Note: *This guide assumes you have already staked, leased, or purchased eligible mining properties in Alaska; you have Subsurface rights. If you are looking to acquire Subsurface rights (stake a claim) in Alaska, the "**Investigating Claims Before You Buy**" fact sheet published by DNR is a great place to start.*

Photo 5 (a), (b), and (c). The PMRN Interagency Group meetings (5a). and (5b). and PMRN Compliance Inspector Training in Spring 2025 (5c). (USFWS).

Early Planning & Site Assessment

Having a solid mine plan before starting the permitting process is critical to the financial, regulatory, and environmental success of any placer mining operation.

Collecting the information needed to build a financially and environmentally sound mine begins from the earliest days of assessing a project, and continues through exploration, evaluation, and into permitting.

The amount of information available to begin building a plan can vary widely from project to project. A newly staked claim may have very little information to go on, whereas a purchased claim may have a defined resource calculation, detailed information on the amount of overburden that needs to be stripped from the paydirt, and other information to assist in developing an early mine plan.

Whether you begin with plenty of information to build a mine plan or are starting off with a few flecks of color from prospecting a new discovery, doing your own background research and site assessments will help confirm and build upon the information already available.

There are three primary ways to gain a better understanding of placer mining claims:

- Researching the public record for past information on the property and adjacent claims.
- Talking with other miners and community members familiar with the property and surrounding area.
- Carrying out your own on-site assessment of the property.

UNDERSTANDING PLACER DEPOSITS

Placer deposits fall into four categories: valley bottom, bench, inland ancient beach, and offshore marine deposits. This Guidebook covers the planning and regulatory framework for freshwater suction dredging and traditional mechanized surface mining of valley, bench, and ancient beach deposits. This Guidebook does not address placer drift (underground) mining or offshore marine-deposit mining.

> *Having a solid mine plan before starting the permitting process is critical to the financial, regulatory, and environmental success of any placer mining operation.*

Note: *If you are planning to carry out marine suction dredging offshore of Nome, please contact the DNR Mining Section and visit the* ***Nome Offshore Mining page*** *on their website for assistance and information. Likewise, please visit the* ***USACE Placer Mining webpage*** *and refer to the Regional General Permit (RGP) 04 – Suction Dredging in Tidal Waters section to see if your planned Nome Offshore activity is covered by this permit.*

DEPOSIT TYPES

The three inland placer deposit types covered in this guide – valley, bench, and ancient beach – are categorized based on the location of the mineralized gravels in relation to the current valley floor.

Valley Deposits

Valley Deposits are traditionally the most common type of placer deposit. As their name suggests, they are found in the gravel that lies below and next to the creeks and rivers at the bottom of a valley. These deposits can vary widely, from broad river valleys with relatively consistent gold grades across the valley floor to narrow ones that sometimes host high-grade ancient channels winding back and forth through the landscape.

Photo 6. Valley deposit mine, Yentna Mining District, Alaska 2018 (DNR).

Bench Deposits

Bench Deposits are the remnants of ancient streams found above the current valley floor. These deposits were formed when the valley bottom was at a higher elevation than it is today. As erosion over thousands or millions of years deepened the valley, ancient river gravel (sometimes gold-bearing) was left on what are now benches on the slopes above the modern valley floor. These deposits often provide water management and material handling advantages because they are located away from streams and rivers.

Photo 7. Placer mining of bench deposit, Juneau Mining District Alaska 2018 (DNR).

Ancient Beach Deposits

Ancient Beach Deposits are marine placer deposits found inland from Alaska's current coastline. Gold-bearing ancient beach deposits in Alaska occur primarily on the Seward Peninsula near Nome but can also be found in other coastal areas of the state, such as along the Gulf of Alaska near Yakutat. These deposits offer location advantages similar to bench deposits.

Photo 8. Placer mining ancient beach deposits near Nome, Alaska (J.O. Keener, Alaska Miners Association 2013 Placer Mining 101 Short Course).

Understanding the type(s) of placer deposits you are working with and where exactly they are located will determine the best approach for exploration, mine planning, permitting, and operations.

COLLECTING PUBLIC INFORMATION

You have completed your research and purchased, leased, or staked a property covering a potential or proven placer deposit in Alaska and are eager to go mining! Now, it is time to collect the detailed information needed for planning and permitting a successful operation.

Whether staking, purchasing, or leasing your claim, publicly available information is the best place to begin investigating the viability of a prospective placer-gold mining property in Alaska.

The Alaska Division of Geological & Geophysical Surveys (DGGS) and **U.S. Geological Survey** both have digital libraries with current and historical information on placer mining across Alaska.

Given that every modern commercial placer mining operation in Alaska requires an **APMA** (see *APMA* in *Chapter 8*), these comprehensive mine permit application

forms, filed through Alaska DNR, are also valuable sources of information on past work that was carried out on your mining claim(s) and adjacent properties.

For purchased or leased properties, the seller/lessor likely has additional information that could include:

- Previous gold production on the property.
- Results from exploration that characterize the overburden and define the size and depth of the deposit.
- Make, model, and condition of any equipment that comes with acquisition or lease.
- Characteristics and condition of camp and other infrastructure.
- Typical mining season, based on weather conditions and access.
- Any permits and other authorizations that are already in place.

When investigating claims with previous mining activity, you should also look for signs of previous spills of fuel or hazardous materials since you may become liable for the cleanup of the contamination.

Local and regional placer mining groups (e.g., the Alaska Miners Association) and community members can provide further insights into the characteristics of the gold and other mineralization, weather events, and other useful information that may not be available in the public record.

BOOTS ON THE GROUND

Having collected available information from previous mining at and around your placer mining claim(s), it's time to get your boots on the ground.

Whether you are investigating claims with previous mining activity or a previously undeveloped property, state and federal regulators urge using tools and equipment with the lowest environmental impact when carrying out initial on-site assessments. These may include:

- Accessing the property by ATVs, four-wheel-drive pickups or similar vehicles, aircraft, or by walking, instead of accessing the property by heavy equipment such as dozers. If access to your site may require heavy equipment, contact the surface managing agency to determine if a permit or other authorizations may be required.
- Using hand tools, such as picks, shovels, and gold pans, or small-scale equipment, such as highbankers and suction dredges, is preferred for carrying out initial sampling during this earlies evaluation stage.

Equipment to document existing conditions on a newly staked or acquired property is also important for future mine planning. This equipment should include:

- A camera to capture points of interest.
- A satellite GPS to locate claim markers, sample sites, and other locations of interest.
- A notebook (a "Rite in the Rain" type of waterproof paper is a good idea) or a rugged electronic device to record sampling data and other notes.

> ***Just because you have not seen fish in the stream does not mean they are not there.***

Understanding what fish and wildlife are found in and around the claims you plan to mine is also important.

Photo 9. When mining is completed, your site should provide suitable fish and wildlife habitat. Reclamation will speed-up this habitat recovery (Bob Henszey).

Wildlife Tip!

Like fish, many birds nesting in the area are difficult to find because their nests are so well camouflaged. Planning initial clearing activities before or after the breeding season (which varies throughout the state) is a best practice to avoid disturbing bird nests when the eggs and chicks are most vulnerable to injury or mortality.

By appropriately timing your clearing activities, you can make your site unsuitable for nesting, reducing the likelihood that birds will attempt to nest there. This proactive approach allows mining to proceed during the breeding season without impacting active nests.

The breeding season for Interior Alaska is generally May 1 to July 15, and additional information for other areas of the state can be found in "**Planning Ahead to Protect Nesting Birds**."

Mining in or near fish-bearing water bodies typically requires a Fish Habitat Permit from *ADF&G*. Activities such as placing culverts in stream crossings during the early evaluation and exploration stages may also require a permit from *ADF&G* and *USACE*.

Just because you have not seen fish in the stream does not mean they are not there. The best way to find out if the streams associated with your proposed placer mine are fish-bearing is to contact your local ADF&G office. See *Agency Contacts – Appendix 3*.

Taking notes about fish and wildlife on your property can provide information on the best way to shape the landscape during reclamation. Any eagle nests on or near your claims are also important to note. Depending on the location of the nest(s) and your mining claim(s), a permit under the **Bald and Golden Eagle Protection Act** may be needed.

To find out if protected species may be in the vicinity of or on your claim(s), go to the **USFWS's Information for Planning and Consultation website**. Click on 'Get Started' and sketch your project area on the map.

> ***All information collected during your initial assessments will be extremely valuable during the planning, exploration, evaluation, permitting, and development of your future gold mine.***

This website will give a list of species and other natural resources that may be found on your site. Please contact the *USFWS Field Office* for further assistance.

Note: *You do not have to create an account or provide personal information to use this planning tool.*

In addition to fish and wildlife, documenting the existing conditions of your mining property as much as possible at the time of your acquisition is vital.

Here are some items you should document before beginning work on your site:

- Existing vegetation.
- Previous disturbances.
- Old structures or refuse, such as oil barrels, equipment, etc.
- Areas of erosion or thawing permafrost.
- Condition of the stream.

All information collected during your initial assessments will be extremely valuable during the planning, exploration, evaluation, permitting, and development of your future gold mine. Careful and accurate documentation of the information you collected during the early assessment and exploration stages can help streamline permitting, potential environmental reviews, and increase the value of your claims if you ever decide to lease or sell them in the future.

Exploration & Evaluation

You have completed an initial assessment of an Alaska property that you hope will be home to your placer mine. Now, it is time to carry out the detailed exploration and evaluation needed for planning, permitting, and operating a successful mining operation.

Any exploration or property evaluation on state or federal lands involving more than hand tools and a pan will require permits.

If you have purchased or leased properties with solid, verifiable exploration information showing enough mineral resources for at least two or more years of operation, you can move directly to designing a mine plan for the deposit, which is covered in more detail in *Chapter 5 – Designing Your Mine*.

For most, however, there is more exploration that needs to be done before detailed planning and mine permitting begin.

Establishing an economically viable gold mine begins with carrying out enough exploration to determine where the gold is (and where it is not) and the gold grades within the deposit.

Once enough exploration is carried out, a "resource" can be calculated for a deposit. This resource is an estimate of the total volume of material within a deposit, along with the average gold grade, and the total amount of gold within your deposit.

Resources (potential deposits of economic value) can be reclassified as reserves (proven portions that can be mined profitably) if a mine plan shows that, after considering all relevant mining, recovery, economic, marketing, legal, environmental, social, and governmental factors, it is "reasonable to assume" the deposit can be mined economically.

Further details on completing the analysis required to evaluate resources to reserves can be found in *Chapter 4 – Economic Evaluation*.

> ***Any exploration or property evaluation on state or federal lands involving more than hand tools and a pan will require permits.***

The exploration phase, however, is about more than establishing resources and reserves. Understanding the overburden volume and composition lying on top of your deposit(s), how much water is flowing through it, and where the gold isn't are all equally important to successfully designing, permitting, and operating a mine that efficiently recovers the gold you have outlined.

EXPLORATION METHODS

There are three primary exploration methods used to establish a resource within placer deposits – drilling, test pits, and trenching.

Photo 10. Winter placer drilling exploration in the Fortymile Mining District (DNR).

If carried out correctly, any of these techniques will provide valuable information on the lateral and vertical extent of a deposit; gold grades within that deposit; and how much overburden must be removed to reach the pay.

Accurately assessing the extent, depth, and grade of a deposit requires a pattern of regularly spaced drill holes, test pits, and/or trenches across the width and length of the area in the proposed mine plan.

Typically, "fences" – rows of drill holes or test pits laid out perpendicular to the deposit trend (e.g. valley, bench, or beach) – are used to map a deposit planned to be mined. The spacing between holes, pits, or fences will vary depending on the characteristics and grade variances of the deposit. Deposits with narrow, meandering paystreaks or highly variable gold grades will require closer spacing than those with wider and more uniform gold grades. Due to the differences in material volume, tighter spacing is required for drill holes versus test pits.

The material extracted from a drill hole or test pit will need to be sampled to accurately detail the size and grade of a deposit.

Photo 11. Placer trench exploration in the Rampart Mining District (DNR).

SAMPLING

You have the option of carrying out sampling yourself or hiring an independent company that conducts placer deposit exploration and evaluation.

Sampling at regular intervals from the surface to bedrock will provide gold grade information to determine which material is (paydirt) and which is not (overburden) worth feeding through your recovery plant.

Resource/reserve estimates for most placer deposits in the U.S. are evaluated based on grams of gold per bank cubic yard (BCY), which represents a cubic yard of material in the ground. However, material "swells" when dug out of the ground, as it is naturally less compacted once excavated.

While this swelling can vary by material, the average swelling for gravel is typically around 14%. The excavated material, which is representative of what you will be sampling and processing through your recovery plant, is measured in loose cubic yards (LCY).

Determining the grade of your deposit involves collecting measured samples; processing the samples with a pan, highbanker, or other recovery method; and weighing the quantity of gold recovered from the samples. See *Resource Estimation* in *Chapter 4 – Economic Evaluation* for how the purity of your gold affects the quantity of payable gold.

To compare gold grades between samples of different sizes, you need to calculate how much gold is present per LCY.

> For example, if you collect a 1 LCY sample and recover 0.4 grams of gold, the grade is simply 0.4 grams per LCY.
>
> But if your sample is smaller—say, 0.5 LCY—and you recover 0.2 grams of gold, you need to scale it up to estimate what a full LCY would contain. Since 0.5 LCY is half of 1 LCY, you multiply the gold by 2:
>
> 0.2 grams × 2 = 0.4 grams per LCY.

This lets you compare all your samples on the same scale, no matter their size. Larger and/or more closely spaced samples will provide more accurate information on the deposit's gold grade.

Note: *While the grams of gold per LCY will be representative of the material run through your deposit, this will be a larger quantity than the BCY in your deposit. For example, a deposit that is 200 yards long and 100 yards wide and 5 yards deep would be 100,000 BCY (200 × 100 × 5). At a 14% swell factor, this would become 114,000 LCY (100,000 × 1.14), which is the volume that you would actually run through your plant. The multiplier 1.14 reflects the original volume (100%) plus the increase (14%) from swelling.*

Keeping detailed and accurate records while collecting and processing samples is important. Careful record keeping, along with photos, video, and other forms of documentation, will assist your future mine planning and permitting. A well-documented gold deposit could also add value to your property if you decide to lease or sell it in the future.

Records for each sample should include:

- Sampling method (e.g., drilling, test pit, trench).
- Location of sample site.
- Depth of sample from surface.
- Characteristics of sample (e.g., gravel, clay, large rocks, organic overburden).
- Groundwater observations (e.g., wet, dry, live water).
- Depth and characteristics of bedrock.
- Notes of other observations during sampling.
- Date and time the sample was collected.
- Person(s) who collected the sample.
- Date and time sample was processed.
- Measured volume of sample.
- Weight of gold recovered from sample.
- Notes of other observations during sample processing.
- Person(s) who processed the sample.

If a sample site returns less gold than is economically feasible to mine, it is prudent to take other nearby samples to ensure you are beyond the edges of your deposit. If multiple samples confirm the area is outside of the deposit, stepping back toward the last sample site with economic gold quantities and collecting additional samples can help to more precisely define the edge of the deposit for mine planning purposes.

The methodology for sampling test pits or trenches is similar to sampling drill holes, but the spacing can typically be wider because the larger volume of collected material is generally more representative of the resource.

Photo 12 (a), (b) and (c). Photo 12 (a). Preparing to dig out a measured and marked test pit/trench. Photo 12 (b). Removing a grab sample from a potential pay layer in a hillside. Photo 12 (c). Panning a gravel sample in pay layer at the bottom of a test pit (BLM).

Much like at the completion of mining, reclamation of drill holes and test pits is required once the exploration is complete. Test pits and trenches are essentially mini mines and should be reclaimed in a similar manner (see *Chapter 7 - Reclamation*). When excavating a test pit or trench, set aside the topsoil (organic overburden). Once the sample is collected, refill the pit or trench with gravel, then cover it with the stockpiled topsoil and other organic material.

Drill holes should be backfilled or plugged in a manner that prevents people or wildlife from stepping into the hole and being injured or trapping small animals.

Note: *See Additional Resources in Appendix 2 for links to sites with further details on placer deposit exploration techniques.*

BULK SAMPLING

For many, drilling and/or pit sampling will provide enough information to begin designing a mine in preparation for permitting. Some, however, may require a larger sampling program to provide themselves and potential investors with greater confidence in the economic viability of establishing a full-scale placer mine.

Bulk sampling typically uses a gold recovery plant fed with material dug from a test pit within the deposit.

This larger sampling method can provide further details on gold recoveries, as well as the technical and economic viability of mining prior to investing in equipment for a full-scale operation.

The information gained from bulk sampling can also help you determine which mining and processing equipment is best suited for your property, as discussed in further detail in *Chapter 5 – Designing Your Mine*. Water management and other factors vital to permitting and regulatory compliance are covered in *Chapter 8 – Permitting & Compliance*.

Be sure to confirm with your land manager what constitutes a bulk sample; this will help ensure compliance with applicable law or regulation.

OVERBURDEN & WATER

As potentially economic gold deposits begin to take shape on your property, it is time to begin evaluating other aspects of your future mine that will be essential to successful planning, permitting, and operations.

In addition to characterizing the size, shape, depth, and grade of the deposit, it is important to record the depth and characteristics of the overburden at each drill hole or test pit location. Understanding the volume of organic material and non-mineable gravel (overburden) above the deposit will assist in planning for overburden storage during mining and for reclamation after mining.

Evaluating the water situation at your future mine site during the exploration stage is also vital. Water is required for most placer processing; however, too much site water can make mining and permit compliance difficult. In some situations, you may have to make the difficult decision of abandoning the deposit altogether if a viable water management plan cannot be established.

Photo 13. Turbid (muddy) discharge from improper water management at a mine site 2014 (DEC).

Gaining an early understanding of where the water is (and isn't) on your property will assist the planning and permitting of your water management project with a gold byproduct.

Further details on the importance of understanding and characterizing the overburden and water on your property can be found in *Chapter 5 – Designing Your Mine*.

ONGOING EXPLORATION

Eureka! Your exploration has turned up an economically viable deposit of gold to start your mining venture, but you need to start making money before you can afford to explore the entire property. Mining and mineral exploration is expensive—federal and state regulators get it! You need to wash rocks (and recover gold) before you can afford to explore your entire property.

Photo 14. Eureka! Your exploration is economically viable (BLM).

The long-term success of your mining operation, however, does not end with building a solid mine plan around your first gold strike and then simply shooting from the hip. While it's important to lay out the first couple years of development and start opening the ground, exploration should never stop!!

Gold channels change, and you need the information to change with them, so continue to drill or dig test pits/trenches in future mining areas and update your mine plan two or more years ahead of schedule as new information becomes available.

> *The long-term success of your mining operation, however, does not end with building a solid mine plan around your first gold strike and then simply shooting from the hip.*

Great times to carry out exploration are before operations begin in the spring and once it is too cold to operate the recovery plant in the fall. Snow cover and frozen ground during the spring can help minimize surface disturbances while mobilizing and operating the drill, reducing the amount of reclamation needed.

After temperatures drop too low to operate your recovery plant in the fall, you have equipment and operators available to dig the trenches or pits. Fall testing provides you with the option to process the samples onsite or transport them to an offsite location for processing during the winter.

No matter what season you choose, having a good understanding of where your deposits are and the gold grades in them will help you develop a plan for successful permitting, profitable operations, and efficient reclamation during future seasons at your placer mine.

Mine plans are always evolving so it is best to be proactive with your planning!

Economic Evaluation

Once you have outlined a placer deposit and designed a mine around that deposit, it is time to evaluate whether the economics of your planned placer mining operation pans out.

The economic evaluation of your deposit involves three steps:

- **Resource estimation:** Utilizing information collected during the exploration to determine the gold grades within your deposit.
- **Cost estimation:** A calculation of the total costs to permit, construct, operate, and reclaim your mine.
- **Profit or loss evaluation:** A study that weighs your costs against the revenues generated from the gold recovered.

> *Designing your mine on paper prior to permitting is much easier and far more efficient than trying to reconfigure and re-permit your operation later on after you have already invested significant time and money.*

RESOURCE ESTIMATION

The first step in evaluating the economics of your future placer mine is to estimate how much gold is contained in the deposit(s) that you plan to mine. An honest and accurate resource estimate will provide valuable information on how much gold you can expect to recover. A good resource estimation will include how much gold per unit of pay material (grade) and the total ounces contained within the deposit(s).

Photo 15. Gold flakes caught in sluice box, Central Mining District Alaska 2023 (DNR).

In the United States, pay material is typically measured in BCY, which represents a cubic yard of material in the ground. Material in the ground is typically compacted and expands when dug up. Excavated and expanded material is calculated as LCY. For more on BCY and LCY, see *Sampling* in *Chapter 3*.

The volume of material contained within a deposit, or a portion of it, is calculated by multiplying length times width times depth in yards. For example, if the deposit area you are calculating a resource for is 200 yards long and 100 yards wide and 5 yards deep, the total volume of the portion of the deposit calculated would be 100,000 BCY (200 yds × 100 yds × 5 yds = 100,000).

The grade of placer gold deposits in the U.S. is typically expressed in grams of gold per BCY, which can then be translated into dollars per BCY. Based on your exploration work, you should have information on the grams of gold per BCY in each sample. The gold grade of a deposit, or a portion of it, can be determined by calculating the average grams per BCY of the samples collected from within that area.

As discussed in the *Sampling* section of *Chapter 3*, it is important to keep detailed and accurate records while collecting and processing samples, as this information forms the basis of your resource estimate. The grams of gold per BCY can then be used to calculate the total ounces of gold within the deposit area.

> For example, if a deposit contains 100,000 BCY of pay material with an average grade of 0.4 grams of gold per BCY, the total gold content would be 40,000 grams (100,000 × 0.4 = 40,000 grams).
>
> Since there are 31.1 grams in one troy ounce, you can convert grams to ounces by dividing the total grams by 31.1. In this case, 40,000 grams ÷ 31.1 equals approximately 1,286.2 troy ounces of placer gold.

Placer gold, however, is never pure – it typically contains silver and other impurities. The purity of placer gold is referred to as its fineness, which varies by creek or even by sections of the same creek, depending on the gold's source. In Alaska, most placer gold ranges from 800 to 900 fine (80–90% pure), though values as low as 567 fine (56.7% gold) and as high as 995 fine (99.5% gold) have been recorded.

To accurately estimate how much gold you will be paid for by a refiner, you must determine the fineness of the placer gold in your deposit. If the gold in your deposit is 892-fine, which is roughly the average fineness of gold in Alaska, you would multiply the total placer gold by 0.892 to calculate the amount of payable gold.

Using the scenario above, the 1,286.2 troy ounces of placer gold contained in the deposit area would contain 1,147.3 troy ounces (1,286.2 troy ounces × 0.892 fineness = 1,147.3).

The gold grades and quantity of payable gold within your deposit(s) will be critical information when completing a profit or loss evaluation for your proposed gold mine. Other placer deposit types, such as platinum, will require similar calculations as outlined above but using the characteristics unique to that metal.

COST ESTIMATION

Other important information for calculating whether or not the gold mining operation you design is going to turn a profit is the costs to build and operate the proposed mine. Much of this information will not be known until after you have designed your mine. For more information, see *Chapter 5 – Designing Your Mine*.

Costs can be broken down into three primary categories—Capital Expenditures (CapEx), Operating Expenditures (OpEx), and Closure and Reclamation expenditures:

- **CapEx** includes all the costs associated with getting your mine to the point that it is producing gold at a steady rate.
- **OpEx** includes similar expenditures as CapEx but occur after commercial operations begin and should be paid for by revenues generated from the gold recovered.
- **Closure and reclamation expenditures** include all costs associated with closing your mining operation and finishing reclamation. This step must also include costs for monitoring and maintaining the site until final reclamation approval.

Note: *Some operations may be required to post an individual financial guarantee for reclamation. This cost should be planned for the overall initial mine expenditure. For more on financial guarantees, see Reclamation Bonding Requirements in Chapter 7.*

While each operation has its own unique set of circumstances and costs, here is a list of many expenditures associated with a typical placer mining operation:

- **Property (CapEx, OpEx, and Closure)** – The costs associated with purchasing, staking, or leasing your property and keeping it in good standing until operations begin.
- **Exploration & Evaluation (CapEx and OpEx)** – All costs associated with exploration, resource/reserve delineation, and evaluation before and during operations.

- **Permitting (CapEx, OpEx, and Closure)** – Costs associated with filling out and filing complete permit applications, including all fees pertaining to permitting and other legal requirements, including reclamation and post mining monitoring and maintenance.
- **Equipment (CapEx, OpEx, and Closure)** – The costs associated with purchasing and/or leasing, operations and maintenance, and mobilizing all equipment needed for exploration, mine development, operations, and reclamation.
- **Supplies (CapEx, OpEx, and Closure)** – Costs for fuel, parts, food, and other supplies needed to sustain your operations from acquisition to closure.
- **Camp (CapEx, OpEx, and Closure)** – Costs to establish and maintain a camp to support from acquisition to closure.
- **Transportation (CapEx, OpEx, and Closure)** – Costs to deliver equipment, supplies, workforce, camp, and other items needed for exploration, mine development, operations, and reclamation.
- **Labor (CapEx, OpEx, and Closure)** – U.S. Department of Labor, Mine Safety and Health Administration (MSHA) certifications, training, wages, and other costs for the employees that will be needed from acquisition to closure.

PROFIT OR LOSS EVALUATION

After determining how much gold the placer mine you have designed is expected to produce, and estimating the CapEx, OpEx, Closure and reclamation costs, a profit or loss evaluation can be calculated by yourself or a hired consultant to determine whether your proposed operation can be expected to pay all the costs and provide you with a return on your investment.

In brief, the gold recovered from your mining operation should be adequate to:

- Cover all OpEx;
- Pay back all CapEx;
- Provide adequate profits to fund reclamation; and
- Supply you with a reasonable profit after all the above are paid.

When completing your profit or loss evaluation, it is important to factor in changing gold prices, inflation, and a backup plan for unexpected costs prior to operations.

Your profit or loss evaluation should factor in that gold prices fluctuate and may not be the same during operations as when the profit and loss analysis is conducted. A good practice for determining the maximum gold price to use for your profit or loss evaluation is to use the lesser of the "three-year trailing average," which is the average gold price over the previous three years, or use the current gold price.

Inflation, or the annual change in the price of products and services from one year to the next, is another factor that should be considered in your profit or loss evaluation. The price of fuel, supplies, parts, equipment, and labor also tend to trend upwards. Factoring in cost increases over the life of your operation will help provide a clearer picture of whether the operation will be profitable.

Your profit or loss evaluation should also include a backup plan to cover costs that cannot be predicted prior to operations. Equipment failures, medical emergencies, weather events, fuel spill or hazardous materials cleanups, and expenses that may have been missed or could not be predicted during the economic evaluation are examples of what this plan should address. In addition, it is a good idea to set aside extra funds, typically 10% to 25% of your estimated OpEx and CapEx, to cover any unexpected costs. The exact amount depends on factors like the details of your mine plan, project location, age of equipment you plan to use, level of experience you and your crew have with placer mining, and other factors.

Just like using overly optimistic gold prices or underestimating your costs can make your mine look more profitable than it really is, going too far in the other direction—by only using worst-case numbers for gold prices, expenses (CapEx and OpEx), inflation, and unexpected costs—can make a good mine plan seem riskier than it actually is. It is important to find a balanced approach so you don't unnecessarily dismiss a placer mine plan that might actually be profitable.

It's common for mine operators or consultants to run profit and loss evaluations for several different scenarios. These usually range from a Worst Case (lowest expected gold price and highest operating costs) to a Best Case (highest expected gold price and lowest costs). A Base Case falls somewhere in the middle and is often used to judge whether the mine is likely to be profitable under

typical conditions. The Worst Case helps you understand potential financial risks, while the Best Case shows the possible upside if everything goes well.

A profit and loss evaluation is only as accurate as the gold prices and costs used for the analysis. Accurate deposit evaluation – carefully planning to ensure that all CapEx, OpEx, and Closure and reclamation costs have been considered – and a thorough analysis of the realistically expected ranges in gold prices, inflation, and unexpected costs are critical!

An initial economic evaluation that does not show enough earnings to cover the costs of permitting, building, operating, reclaiming, and closing the mine – while also leaving enough gold for your financial success – is not necessarily the end of the road. Redesigning your mine to increase earnings and reduce costs may help you find the right balance for a financially and environmentally successful placer mining operation.

Note: *If you are required to post an individual financial guarantee for reclamation, a properly implemented reclamation plan – one that leads to the successful release of reclamation liability – will result in a 100% refund of the original guaranteed amount (corpus).*

Designing your mine on paper prior to permitting is much easier and far more efficient than trying to reconfigure and re-permit an operation later after you have already invested significant time and money.

Designing Your Mine

Your exploration has outlined a large enough gold deposit for at least a couple of years of mining. After drilling and/or test pit digging, you know a lot more about the overburden and water situation and have likely identified potential trouble spots that need to be accounted for when developing a mine plan.

With this information in hand, it is time to decide what mining method will work best for your deposit and begin designing your mine. This is a critical point to engage with the land manager (DNR, BLM, USFS) on pre-design and plan coordination.

Early agency coordination at this step will help you design your mine with an eye toward streamlined permitting, mine authorization, and eventual reclamation and close-out. For operations on BLM-managed lands, placer miners are encouraged to contact the BLM long before any paperwork for mining is submitted to ensure an open line of communication and coordination.

In addition to understanding the location, size, and grade of your gold deposit, by this point, you should also have a solid understanding of how water, tailings, organics, wetlands, fish, and wildlife may be affected by your mining activities – and how those same factors could impact your mining operation. This knowledge is essential for designing a placer mine that is both economically viable and compliant with state and federal regulations.

More information on collecting this information can be found in *Chapter 3 – Exploration & Evaluation*; and why this information is important to your overall mine plan submitted for permitting can be found in *Chapter 7 – Reclamation* and *Chapter 8 – Permitting & Compliance*.

At the same time, you should plan for the camp, roads, fuel storage, and other temporary infrastructure needed to support your operation. When you fill out an APMA to permit your mine, you will be asked for details about the size and scope of your mining operation; how you plan to manage water, overburden, and tailings; and the camp and other temporary support facilities you intend to build.

TYPES OF OPERATIONS

Mechanical placer mining operations can take many forms, but they all rely on three essential components: equipment to move material, a system to classify that material by size, and a gold recovery plant to extract the gold. The specific setup and sequence of these components can vary significantly depending on the scale of the operation, the nature of the deposit, and the equipment available.

Traditional stationary recovery plants are typically set up to process an entire mining cut – a defined portion of the deposit – from a single location. In these operations, a dozer is usually used to push pay material toward the plant, and an excavator or loader feeds the material into the recovery system.

Some miners process just one cut per season, while others may complete multiple cuts, relocating the plant each time. Smaller cuts can reduce the distance that material must be moved, which can improve efficiency, but they also require more frequent plant moves. This results in increased downtime for breakdown, relocation, and setup. See also *Rolling Footprint* in *Chapter 7*.

> ***Early agency coordination at this step will help you design your mine with an eye towards streamlined permitting, mine authorization, and eventual reclamation and close-out.***

Some operations use mobile recovery plants, which are designed to be moved frequently and easily. In these setups, an excavator digs directly into the pay material – after the overburden has been removed – and feeds it straight into the plant. Tailings are typically deposited directly into the previously mined area, which helps reduce material handling costs during both operations and reclamation.

Once all the pay material within reach has been processed, the entire plant, which is usually mounted on skids or wheels, is moved to the next location, leveled, and reset for continued operations.

In addition to mechanical mining, suction dredges are another option for commercial-scale placer mining. These systems use a pump and hose to suction pay material from a submerged deposit and deliver it to a sluice box or other gold recovery system. Suction dredges can be especially effective for narrow, high-grade deposits where space is limited, and mechanical equipment may not be practical (see *Chapter 6 – Fresh Water Suction Dredging and High Banking*).

Ultimately, a good understanding of your deposit and the equipment and resources you already have will help determine the best combination of material handling, classification, and gold recovery systems for your operation.

MATERIAL HANDLING EQUIPMENT

Equipment to move materials typically includes some combination of dozers, excavators, loaders, haul trucks, and conveyors. The characteristics of the deposit and the quantity of overburden, paydirt, and tailings being moved will determine which combination of earthmoving equipment is right for your operation.

"Right sizing" your equipment fleet to the scale of your operation is important. While having equipment large enough and of the quantity required to carry out the tasks and to move the material is necessary to keep pace with your operation, oversized equipment will increase your environmental footprint and operating costs. Additionally, transporting equipment to and from your mine site must be an important consideration.

For example, the cost to move a piece of equipment so large it must be carried in more than one load adds cost and complexity; however, those challenges may be outweighed by the productivity of that larger piece of equipment on site. Mobilization during seasonal transportation limitations can have significant impact on cost and timelines. For example, the Alaska Department of Transportation (DOT) often reduces truck axle load allowances during the spring to protect roads.

In addition to servicing your equipment before moving it to your mine site, it is a good idea to clean it thoroughly – not just for maintenance, but to remove any dirt or plant material from the last job site, which can carry seeds from invasive plants. Once introduced, these plants can spread quickly, even far beyond your work area, outcompete local, native vegetation and destroy habitat for our fish and wildlife.

For more information, you can take a free self-paced training on invasive species control at **http://weedcontrol.open.uaf.edu/**. The UAF Cooperative Extension Service also offers helpful resources – just search for "invasive" at **http://cespubs.uaf.edu/publications**.

Dozers

Dozers are a mainstay at Alaska placer mining operations. These earthmoving machines are used to strip and stockpile organic and non-paying gravel overburden; push paydirt up in stockpiles to be fed into the gold recovery plant; push tailings away from the plant; road building and maintenance; and helping to reshape the land during reclamation.

Photo 16. Dozer, Hot Springs Mining District Alaska 2021 (DNR).

The quantities and characteristics of the overburden, paydirt, and tailings that need to be moved will determine the size and features of the dozer(s) used at your operation.

> *Thawed permafrost turns to mud that can trap equipment and delay work. Plan ahead and work frozen ground when possible to reduce impacts and keep operations moving.*

One important consideration when selecting a dozer is that many gold deposits in Alaska are covered with permafrost, which is often easier to move while still frozen. Once thawed, this material, which is made up of silt and water, can become soup-like and extremely difficult to handle with earthmoving equipment, often trapping machinery and delaying work. Planning ahead and working frozen ground when possible can help reduce impacts on the land and keep operations moving efficiently.

A ripper mounted on the back of a dozer is especially effective for breaking up frozen ground so it can be pushed into stockpiles for later use during reclamation. The land managers for the state or federal claims you are working on are a great resource for best practices when it comes to removing and handling the permafrost that covers many placer deposits in Alaska.

Excavators

Excavators are another valuable piece of equipment for placer mining operations. These digging machines are used to feed paydirt into the recovery plant; dig ditches to help drain water from the deposit; dig test pits; handle and set parts and equipment during the setup and moving of operations; and set rocks and trees in place, as well as other tasks during reclamation.

In Alaska, excavators are often preferred over loaders for feeding placer recovery plants. One of the primary reasons for this is control of feed. Where loaders dump several yards of material into the hopper at a time and need to travel to get the next load, excavators have better control of the rate of feed.

Photo 17. An excavator with a "thumb" is especially useful to pick up and place boulders and logs that are difficult to move with the bucket alone (source unknown).

Excavator operators also have the advantage of being able to see into the bucket and can avoid dumping large boulders into the plant that could cause damage and downtime (it is easy for a loader to scoop up a three-foot boulder without the operator even knowing it). Operators of plant-feeding excavators also typically have a good view of the gold recovery and classification equipment and can quickly spot when the plant is not running optimally, helping to prevent lost gold or downtime.

Loaders

Loaders are another common piece of equipment at placer mines. They are used to feed paydirt into the recovery plant, move tailings away from the plant, and load trucks hauling either paydirt or tailings. Loaders may also be used to move equipment, build and maintain roads, and handle various tasks around the operation and camp. In some cases, they are used to place live transplants of willows and sedges along streambanks and floodplains during reclamation. See *Chapter 7 – Reclamation* for more information.

Photo 18. Loader, Central Mining District Alaska 2022 (DNR).

For economic reasons and ease of operations, most placer mining operations try to minimize the distance material is moved by stockpiling overburden next to the deposit and, over the course of operations, move the gold recovery plant closer to the material being processed.

Loaders, in combination with conveyors, are used to stockpile tailings within or as close to previously mined areas as possible to minimize material handling and reclamation costs.

Haul Trucks

Sometimes, however, the lay of the land, amount of available space, and ground conditions require moving overburden and/or paydirt longer distances than is feasible with a dozer or loader. In these cases, haul trucks are used to transport the materials. Articulated dump trucks with a pivot joint are commonly used for this purpose because the truck can turn more sharply and stay more stable on rough terrain than a rigid dump truck.

Conveyors

Conveyors are the most efficient way to move materials over short distances and are used to connect the various parts of the gold recovery plant, as well as to stockpile oversized tailings.

Radial stackers, which rotate in an arc, are used to stack large quantities of material in wide piles and are often used to create larger stockpiles of oversized tailings. The use of conveyors to stockpile oversized tailings as close as possible to where they will be needed for future reclamation can help lower material handling costs.

The number, type, and size of conveyors required for your operation will vary depending on the quantity of materials being moved and the types of recovery and classification equipment being used.

Photo 19. Stacker conveyor, 2013 (DEC).

CLASSIFICATION EQUIPMENT

When it comes to placer mining, classification refers to removing large boulders and oversized rocks from the material you plan to run through your gold recovery plant. Remember to save these materials for reclamation!

Most gold recovery equipment works better, and lasts longer, when large rocks are removed before processing. This is where classification equipment comes in. Shaker screens and trommels are the two primary types of equipment used for material classification at placer mines, each with its own advantages and disadvantages. Grizzlies and derockers are also sometimes used, either alongside or in place of shaker screens and trommels.

A good understanding of the characteristics of your pay material, as well as the size and nature of the gold in your deposit, will help you choose the right type or combination of classification equipment for your operation.

> *Remember to save materials like large boulders, oversized rocks, and trees for reclamation!*

Shaker Screens

Equipped with one or more screen decks, shaker screens use vibration and water delivered via spray bars to screen off large rocks, which are directed to an oversized tailings pile. The smaller material that passes through the screen(s), along with the water, is directed to the gold recovery plant. Screen decks can generally process larger quantities of material than trommels.

Photo 20. Shaker wash plant, Hope Mining District 2012 (DEC).

Trommels

Trommels are large rotating drums lined with screens that separate the oversized tailings from the material sent through the gold recovery plant. While trommels tend to classify smaller quantities of material in relation to their size, they are excellent at breaking up clays and compacted or cemented gravels.

Photo 21. Trommel feeding refined material into sluice box, Valdez Creek Mining District (DNR).

Clay balls can pick up gold and carry it out at the end of your recovery plant, so the gold-bearing compacted gravels that are not broken up could end up in your oversized tailings pile. For deposits with really large boulders, additional or alternative classification may be needed.

Grizzlies

A grizzly is the least complex and most affordable way to ensure large boulders do not wipe out your spray bars, get jammed in your feed hopper, or damage your conveyor—all of which can bring your operations to a costly halt during a short summer mining season.

A grizzly is simply rows of steeply sloped heavy iron bars or pipes mounted over the feed hopper. The bars or pipes are spaced far enough apart to allow most of the material to fall into the hopper but are close enough together (one or two feet apart depending on the size of the plant) to prevent the large boulders from dropping into the hopper. While grizzlies are both simple and inexpensive, the large boulders that roll off of them build up next to the feed hopper and must be removed regularly.

Photo 22. Shaker wash plant with grizzly bars on top, Circle Mining District 2011 (DEC).

Derockers

Derockers can be used in place of grizzlies, shaker screens, and trommels to classify material mined from deposits with many large boulders. Designed to deal with such deposits in the Yukon, derockers consist of a flexible deck made of long, flat slabs with spaces between them.

A carriage frame with truck tires beneath the deck moves back and forth as high-pressure spray bars wash the material from above. The movement of the undercarriage rolls the oversized rocks down the deck as the water washes the smaller material through the deck slats. The downside to derockers is they do not classify material as well as shaker screens or trommels (long, flat rocks can fall through the slats), and they have more moving parts that could require maintenance and repair.

Photo 23. A derocker in combination with a trommel used to classify mined material (J.O. Keener, Alaska Miners Association 2013 Placer Mining 101 Short Course).

The intended size of your operation, the characteristics of the material within the deposit, and the type of gold recovery system used are all factors to consider when determining which classification equipment to use.

GOLD RECOVERY PLANTS

Once the classification equipment has removed the boulders and oversized rocks, the remaining paydirt is run through a recovery plant to capture the gold! There are several types of gold recovery circuits used in placer mining operations, but they all use gravity to capture the gold, which is heavier than most of the other material being processed.

Photo 24. Gold recovery plant, Valdez Creek Mining District Alaska 2023 (DNR).

Sluice boxes, which have been used by placer miners in Alaska since the Gold Rush era, continue to be by far the most commonly used gold recovery equipment in the state. Generally, sluice boxes consist of one or more channels equipped with mats, riffles, and/or expanded metal that capture the heavy gold, while the lighter materials get washed out by the water. Without any moving parts, sluice boxes are highly efficient, relatively inexpensive, and low maintenance.

Sluice boxes come in various designs and sizes. Length, width, and number of chutes are the primary variations for sluice boxes. The simplest sluice box consists of a single chute equipped with riffles and matting to capture the heavy gold as the lighter material washes out the end

of the box. Other sluice boxes have multiple chutes, where finer material that falls through a punch plate (steel plate with holes) is diverted to side boxes equipped with riffles and/or expanded metal and mats. The material that does not fall through the punch plate travels down the center chute, which is typically equipped with larger riffles and mats.

Photo 25. Water flowing through sluice boxes, Valdez Creek Mining District Alaska 2022 (DNR).

The characteristics of the materials and gold within a deposit, along with the type of classification equipment and screen sizes being used, will help determine which type of sluice box is the best fit for your operation.

Centrifuge bowls, spiral separators and jigs are other gold recovery equipment sometimes used at placer mines. These, however, tend to require more maintenance, tighter controls on feed size, and process much less material in comparison with sluices. Operations with ultrafine gold, which is hard to capture, sometimes use centrifuge bowls or jigs as a secondary recovery system behind a sluice box.

Sand Screws and Centrifuges

Sand screws, used in combination with hydrocyclones or centrifuges, are emerging as an efficient way to improve the treatment of water discharged from placer mining operations.

Photo 26. A gold wheel (a type of spiral separator) for separating gold from black sand, Valdez Creek Mining District Alaska 2023 (DNR).

The tailings coming out of a placer recovery plant are a thick slurry with fine silt particles suspended in a lot of water that is hard to handle. Sand screws and hydrocyclones (or centrifuges) help by separating water from the tailings and removing fine silt from the water. This makes tailings management and water recycling easier and more efficient.

Sand screws, also known as fine material washers, utilize a rotating screw shaft to convey tailings up a slope. This process both dewaters the slurry-like tailings coming out of the recovery plant and removes fine particles (silt) from the discharge water.

Hydrocyclones and centrifuges are devices that create a strong vortex to separate sand, gravel, and silt from water. The primary difference between hydrocyclones and centrifuges is hydrocyclones are passive separators that use their conical shape to create the vortex; and centrifuges are dynamic separators that spin to create stronger centrifugal force.

Tailings with increased fines material, when dewatered using sand screws and hydrocyclones, have been found to make an excellent aggregate product for building pads and roads at placer mining operations.

The combined use of sand screws and hydrocyclones (or centrifuges) can improve the effectiveness of your water recycling system, increase gold recoveries by recycling cleaner water back to your plant, make the handling of recovery plant tailings easier, and make reclamation more efficient.

BRINGING THE PROCESSING PLANT TOGETHER

Now that you know what pieces of equipment you will use to classify material and to recover gold, you will need to plan for the best setup and layout to keep the new processing plant running efficiently. Different parts of the processing plant will require their own power source, either dedicated engine or electrical motor, and may require specific water supplies at various pressures and flow rates. Water use volumes (gallons per minute) are a key factor in determining process water criteria, which is covered in more detail later in this chapter.

The final setup of the processing plant is important as it can greatly influence mine layout, pond placement, and the need for additional support equipment like conveyors. Every gold recovery plant has its unique setup needs. It is important to fine tune your recovery plant to operate within the conditions of your sites, addressing things like feed material type, gold characteristics, and water availability. Setting up the correctly sized sluice boxes with the correct angle and water flow rates is critical.

Randy Clarkson, Mine Engineer and Author, completed rigorous research on setting up sluice boxes and adjusting water flow to get the best gold recovery Please find Randy Clarkson's detailed research papers by searching online. For your convenience, some of the most commonly used sources are listed in *Appendix 2 - Additional Resources*.

MINE LAYOUT

Once you have outlined a potentially economic placer deposit(s) and determined the equipment and recovery plant best suited for your envisioned operation, it is time to design the layout of your mine, including the pit and how you will manage water, overburden, and tailings.

The layout of your mine centers on the deposit(s) you plan to process through the recovery plant during operation. For most operations, overburden will need to be removed and stockpiled for use during reclamation, and water will need to be drained from and/or diverted around the area being mined.

PIT DESIGN

Your mine pit will need to be large enough to extract all the pay material you plan to process while creating a pit wall with slopes that are safe and stable from the surface to the bottom of the deposit. This means the area you strip off to extract the pay within your deposit will need to be large enough to safely reach the bottom edges of your deposit plus room for the pit wall slope. This distance will vary depending on the depth of your deposit.

For example, if the bottom of your deposit is 12 feet below the surface and you are designing a 2-to-1 pit wall slope (sometimes referred to as 2H:1V for horizontal and vertical distances), the edge of your pit would need to extend 24 feet beyond your deposit (12 × 2 = 24 ft).

Determining how large your pit needs to be will help you determine how much overburden you will need to strip off, the best locations to stockpile that overburden, where to locate your recovery plant and settling ponds, how to manage groundwater and storm water, and whether a stream diversion is necessary.

WATER MANAGEMENT

Miners have a love/hate relationship with water – it always seems to be feast or famine. Too much water can create management and discharge permit challenges, and too little water can limit the scale of operations.

Photo 27. Mining pit, Valdez Creek Mining District 2022 (DNR).

Above all, proper management of water flowing into, out of, and around your placer mining operation is a major key to staying in compliance with state and federal regulations. Excess water must be bypassed (routed) around the operation. Water that cannot be bypassed must be either contained onsite or treated to meet permit limits prior to discharge.

Photo 28. Water pump, Bonnifield Mining District Alaska 2024 (DNR).

Failing to control erosion and sediment through proper storm water management at your mine site can result in:

- The need to divert your mining crew and equipment to handle storm water issues.
- Loss of production time during the short placer mining season in Alaska.
- Legal costs and financial penalties for out-of-compliance water discharges.
- Impacts to the downstream environment.

Water Balance

Most, if not all, placer recovery plants operating in Alaska require water. Careful management of the water being used by your operation and entering the site through infiltration, run-on from other areas, and precipitation is essential to both placer mine permitting and compliance. There are two major parts to the management of site water – the water coming in and the water going out. The management of water coming in is all about quantity – how much water will your operation need and where is that water going to come from? The management of water going out is all about quality – does all water leaving your operation meet state and federal discharge requirements?

Too much water can create management and discharge permit challenges, and too little water can limit the scale of operations. Above all, proper management of water flowing into, out of, and around your placer mining operation is a major key to staying in compliance with state and federal regulations. Excess water must be bypassed (routed) around the operation. Water that cannot be bypassed must be either contained onsite or treated to meet permit limits prior to discharge.

- The water **used** by your operation is regulated by the *DNR Water Resources Section*, which must review and authorize any water that will be withdrawn, stored, or diverted by your placer mining operation.
- The water **leaving** your mine site is regulated by the *DEC Division of Water*, which issues discharge permits under the **Alaska Pollutant Discharge Elimination System (APDES)** program and ensures those discharges meet the quality standards outlined by state and federal regulations. Discharged water must typically be as clean and sediment-free as the water body it is entering.

Whether your mine is on state, federal, or private lands, site water must be properly managed and meet water quality standards prior to discharge. Proper water management should consider process water, dewatering water, and storm water.

Process Water

Process water, in the simplest form, refers to water used for gold recovery, such as water pumped through the recovery plant and returned to the settling ponds. Like many of your mine-site features, where and how you construct your settling ponds will affect your reclamation options (see *Settling Pond Reclamation* in *Chapter 7*). For example, a settling pond located too close to a stream may not be a good location because the stream may move into the pond and release the accumulated sediment into the stream.

DEC discharge permits require recycling of process water and only allow discharge of excess water that cannot be used as make-up pond water for processing. Minimizing the quantity of water coming into and leaving your operation limits the amount of water requiring treatment and is key to keeping your operation in compliance with state and federal regulations.

> ***A settling pond located too close to a stream may not be a good location because the stream may move into the pond and release the accumulated sediment into the stream.***

A series of recycling ponds allowing sediment to settle out of the water prior to reuse will help lower the quantity and improve the quality of water leaving your mine site. Recycling ponds should be designed to slow the flow of water—the longer the water stays within the pond system, the more time the sediment will have to settle out. The length of the pond system determines the travel and settling time, and the pond depth determines how much sediment the pond can hold. For settling pond design considerations, see DEC's "**Placer Mining Settling Pond Design Handbook**."

Note: *Although settling ponds can clean water well enough for pay dirt processing, the ponds alone often cannot adequately treat water to meet permit limits for turbidity; more advanced treatment methods such as flocculants or filtration may be needed if discharge is going to occur. If you plan to use advanced treatment methods, it is strongly suggested you contact DEC to confirm any additional permitting requirements.*

Dewatering Water

In addition to the water being used, recycled, and discharged as part of gold recovery, placer miners must manage the water **not** being used. This includes dewatering mining areas.

Most valley placer deposits have groundwater running through them. Draining this water makes the gravel easier to handle and is essential to ensuring the gold-bearing gravel fed through your recovery plant still has all the gold. Much like gold will stay in your recovery plant while the lighter material washes away, gold will drop out of water-saturated gravel during transport to the recovery plant.

Note: *Any water entering the site is considered mine water and is subject to DEC's APDES permit requirements if discharge (i.e., pumping or draining water from the mine area) occurs. See Chapter 8 – Permitting & Compliance for further information.*

Dewatering a mining area usually involves digging ditches and constructing berms that prevent surface and groundwater from entering your mine site.

If pit water is cleaner than processing water from settling ponds, it is often better to manage the pit water through a separate system rather than adding excess water to settling ponds that are already dirty and may not meet discharge limits.

Storm Water

Storm water refers to any water running off the land's surface from precipitation (rain, snow, and melting snow). If not managed properly, storm water can create water balance issues within your mine site, cause excessive erosion, and have adverse effects on water quality.

The best storm water management systems involve the use of ditches, dikes, berms, and vegetative cover to divert as much storm water as possible away from your operation and prevent erosion that can affect the quality of the water as it flows downstream. These storm water management methods are typically easy and inexpensive to put in place and, if installed properly, need little to no maintenance to function well.

Storm water within your site must also be managed to prevent negative impacts to downstream water quality. Water management practices that prevent dirt, debris, and contaminants from being picked up by storm water within your operational area and carried downstream are essential.

In most scenarios, storm water leaving your site must meet the same water quality standards as other waters discharged under DEC's APDES permits.

In addition to diversion ditches and dikes, and maintaining vegetative cover, ponds to capture storm water may be required to settle out sediments picked up by storm water at your site. This captured storm water could be used as a source of water for your recovery plant.

Good housekeeping is a practical and cost-effective way to prevent potential pollution sources from contacting and mixing with storm water. This includes proper collection, storage, and disposal of garbage and waste materials, as well as safe storage of fuel and lubricant drums, tanks, and containers. Regular inspections for leaks and structural issues are also important to ensure these materials do not become a source of contamination.

Establishing protocols for the storage and handling of fuel, lubricants, garbage, waste products, and other potential pollutants within your mine site, and training employees on those good housekeeping techniques will help ensure that your operation stays in compliance, and the storm water at your site does not impact downstream habitat. To learn more about preventing and cleaning up spills at your mine site, see "**Small Spill Management and Best Practices When Working in Remote Alaska**."

For storm water management training, placer miners are encouraged to take an Alaska Certified Erosion and Sediment Control Lead course (**https://www.ak-cescl.com/**). Although it is not required, this course can provide valuable information and techniques for storm water management.

Stream Diversions

You may find the stream running across your claims also runs across the deposit you hope to mine, or a portion of it. In such cases, a stream diversion will likely be necessary to access your deposit.

There are two categories of stream diversions – temporary diversion, which is a short-term relocation of the stream with the intent of returning the stream to its original channel, and a permanent diversion (also known as relocation). The stream diversion information you provide in your APMA will be forwarded to DNR-Water, ADF&G, USACE, and BLM for review and issuance of any necessary permits. For more information on stream diversion designs and reclamation see *Stream Reclamation* in *Chapter 7*.

Many of the stream diversions typical to placer mining operations are covered by the RGP-08 issued by the USACE, except for operations on streams on **DEC's Impaired Waters List** and streams with anadromous fish such as salmon. The amount of annual stream diversions and other parameters of this general permit are subject to change upon its renewal. Check the **Placer Mining Permitting Process** webpage of the USACE – Alaska District website for the latest RGP-08 parameters.

Note: *Stream diversions or instream mining activity on BLM- and USFS-managed lands require a comprehensive reclamation plan that details how the reclaimed stream will provide a stable channel form with adequate vegetation to reduce erosion, dissipate stream energy, and promote the recovery of instream habitats similar to levels which were present prior to mining and consistent with applicable policy.*

Detailed maps and a written plan of the diversion will be required on your APMA. The map MUST show the entire length of the diversion (i.e., where the water is diverted from the natural stream channel to where it returns to the natural stream channel) with start and end locations clearly marked.

The detailed written plan for your stream diversion must include:

- Step-by-step procedures.
- Construction techniques.
- Reclamation techniques.
- Timelines.

Depending on the scale of the proposed diversion, land managing agencies and USACE may request additional maps, construction details, and a stream reclamation plan after its initial review.

Regardless of land ownership, any diversion of fish-bearing streams in Alaska will also require a Fish Habitat Permit from the *ADF&G*. Diversions of fish-bearing streams MUST provide a durable channel supplied with enough water to pass all species and life stages of local fish BOTH upstream and downstream of the diversion.

The new channel you build to divert the stream should mimic the shape and instream elements of the stream above and below the diversion (e.g., bends, pools, riffles, large rocks).

Note: *The USACE RGP-08 General Permit that covers stream diversions is renewed every five years, and newly issued General Permits could include changes to the parameters and/or introduce new stipulations related to stream diversions.*

OVERBURDEN MANAGEMENT

Reaching paydirt will require removing and storing some combination of soil, frozen overburden, and gravel that does not contain economically viable quantities of gold. Efficient and well-planned removal and stockpiling of this overburden is vital to the economic success and future reclamation of your gold mine.

Overburden can be roughly divided into two categories – Organic and Non-Organic – based on its composition, which in turn determines how it will be used during reclamation.

There are important considerations to keep in mind when planning for the best location to stockpile overburden:

- Organic and non-organic overburden serve different purposes during reclamation and should be stockpiled separately.
- Stockpiling close to the mining area will reduce material handling during both stripping and reclamation.
- Stockpile it far enough away from streams and other water bodies to prevent runoff from the stockpiles impacting water quality and habitat at, and downstream, from your site.

Organic Overburden

Organic overburden contains woody debris and soil, often with roots and frozen "black muck." This material is valuable for reclamation and should be stockpiled separately.

Maintaining a healthy organic stockpile will save time and money during reclamation by providing cover material that supports faster growth of native plants and trees, helping to restore the natural ecosystem and decrease environmental impacts. See *Chapter 7 – Reclamation* for more information.

You need to keep your organic overburden healthy so it can help you quickly restore vegetation at your site. To do this, stockpile it on a stable area and protect it from erosion and excessive compaction. Minimizing erosion prevents it from washing away, which helps protect water quality at your operation. At the same time, avoid unnecessary compaction to keep the organic stockpile as loose and aerated as possible to create pore space for fungi, bacteria, and small insects which are crucial for a healthy, productive material that supports revegetation during reclamation.

Non-Organic Overburden

Non-organic overburden is the upper layer of rocks and gravel that is removed to reach the pay gravels you will be feeding through your recovery plant. This non-organic overburden, along with the tailings produced during mining, will be used to refill your pit after mining.

Photo 29 (a) and (b). Spreading organic overburden on a reclaimed mine site (29a). 2011 in the Fortymile Mining District to reestablish native vegetation (29b). 2014 (DNR 2014 Annual Reclamation Award – Ted and Jeff Owen).

TAILINGS MANAGEMENT

Much like overburden, efficient and well-planned removal and stockpiling of tailings will pay dividends when it comes to reclamation after mining is complete.

Tailings at most operations fall into two categories – oversized rocks screened off during classification, and the finer material that is run through the gold recovery plant. Similar to the natural conditions found prior to mining, tailings, along with non-organic overburden, will serve as the base layer during reclamation. Covering this base layer with the stockpiled organic overburden will promote revegetation and site stabilization.

Stockpiling tailings and remixing materials as close to the mining pit as possible during operations will make reclamation of the mine much more cost effective and efficient.

SITE MANAGEMENT

Your overall mine design should also include a detailed plan for your camp, roads, fuel storage, and other infrastructure needed to support your placer mining operation. Most placer operations run in the summer months only. Planning your site for seasonal closure and startup should be taken into consideration when designing the layout of your operations.

Wildlife Tip!

If your claim is staked with uncapped vertical pipes, or if other uncapped vertical pipes are present on your claim such as fence and gate posts, you can help prevent trapping small birds and other wildlife in the pipe by capping or filling it with dirt or gravel. For more information on the hazards of open vertical pipes and simple solutions, see "Open-Topped Pipes: A Hazard to Wildlife" and "Reducing Preventable Wildlife Mortalities."

Photo 30. Any open top vertical pipe can be a death trap to birds and other wildlife (Jeff King).

Mining Camp

Most placer mining camps include worker housing, kitchen/dining space, washrooms, and/or office space. Workshops, storage areas, and cleanup rooms are other structures often built at mining camps.

When applying for permits, you will be required to provide details on all improvements you plan to make to support your operation. This will include the size and quantity of all buildings, tent platforms, trailers, outhouses, and other structures at camp.

Your plans for disposing of domestic wastewater and solid waste are another part of your overall plan that will need to be addressed on your permit application.

You will be asked to describe and provide disposal plans for gray and black water, camp garbage, scrap metal, industrial waste and other types of waste generated at the camp.

Disposal authorizations for inert waste, such as scrap metal, are not covered under the APMA and will require additional approval from the land manager and DEC. Please contact DNR (state claims) or the federal land manager (typically BLM or USFS for federal claims) and DEC for information and approvals.

Fuel Storage

Safe and secure storage and handling of fuel and lubricants is another important aspect of any environmentally sound placer mine. **All fuel should be stored in a manner to prevent leaks or accidental spills.**

Any mining site with 1,321 to 10,000 gallons of petroleum product (diesel, gasoline, lube oil, hydraulic oil, and waste oil) must store 55-gallon drums or larger in a secondary containment area(s).

Note: *For sites with less than 1,321 gallons of petroleum products, secondary containment is recommended but not required.*

Photo 31. On-site fuel storage with containment, Fortymile Mining District Alaska 2019 (DNR).

As a best management practice, fuel should be stored at least 100 feet from naturally occurring water bodies. However, on State-managed lands, DNR typically requires locating any fuel storage areas more than 55 gallons to be at least 100 feet from naturally occurring water bodies. BLM strongly recommends storing fuel outside of the 100-year floodplain on federal claims (maps and descriptions of 100-year floodplain boundaries are available from BLM upon request.)

If you will be storing between 1,321 and 10,000 gallons of petroleum products, you are required to obtain a self-certified Spill Prevention, Control, and Countermeasure (SPCC) plan. The SPCC for your mining operation should include details on the measures you will take to prevent spills, procedures to prevent spills from entering waterways, and a plan to contain and report any spill that does take place. For mining operations on BLM lands, a spill contingency plan is required for all operations storing under 1321 gallons. Storage of any volume greater than 1321 gallons on BLM lands must comply with SPCC requirements. Storage of more than 10,000 gallons requires that an SPCC plan be prepared and certified by a licensed Professional Engineer. You can find information about a SPCC plan in the APMA and at **https://dec.alaska.gov/spar/ppr/prevention-preparedness/ast-agencies/**.

DEC recently developed an outline of best practices for preventing spills and the steps to take if a spill occurs at your mine (see "**Small Spill Management and Best Practices When Working in Remote Alaska**"). More detailed information about spill prevention and response can be found at the **DEC Spill Prevention and Response website**.

Transportation of Infrastructure

When filling out an APMA for your mining operation, you will be asked to provide details of how you plan to deliver equipment, supplies, and personnel to the mine; any trail creation or improvements to be made for access to and on the site; and to list all existing all-season roads, RS 2477 easements, navigable waterways, and/or aircraft you will be using to access your claims.

Note: *RS 2477 is a statute enacted by the U.S. Congress in 1866 that grants "the right-of-way for the construction of highways across public lands not otherwise reserved for public purposes." A **fact sheet** and **map** for RS 2477 easements in Alaska can be found on DNR's website.*

If you plan to mobilize equipment or transport personnel using overland travel (not by boat or plane), you MUST include an access map with your APMA. The map should show the complete route from the main highway to your mining operation.

Access across lands in Alaska requires approval from the appropriate landowner or managing agency and it is your responsibility to obtain authorization before conducting any travel.

You are also required to describe all roads, helicopter pads, and/or airstrips to be constructed on your mining claims, including conservation (mitigation) measures to protect water, wetlands, and fish and wildlife resources.

Freshwater Suction Dredging & Highbanking

Suction dredging and highbanking are popular placer recovery methods that offer you an alternative to an open-pit mechanical mining operation on your claims. The permitting requirements for suction dredging in Alaska are dependent on the size and location of the operation.

> *The level of permitting required for your proposed suction dredging or highbanking operation will depend on several considerations.*

Suction dredging of gold-bearing streams in Alaska falls into two general categories based on the size of the intake nozzle diameter (above or below six [6] inches) and horsepower of the engine on the pump (above or below 18horsepower [HP]).

The level of permitting required for your proposed suction dredging or highbanking operation will depend on several considerations:

- What is the scale of the operation?
- Will the operation be on state or federal land?
- Will the operation be in a fish-bearing stream?
- Will the operation be in federal navigable waters?

On state lands outside of state parks on non-fish-bearing streams, small-scale suction dredging (6-inch intake nozzle diameter or smaller and 18HP or less) or highbanking is generally allowed without the need for authorization from DNR. However, there are exceptions and dredging permits are still required by other agencies, so be sure to review the rest of this chapter for more information.

Depending on where you are going to be staying, you may also need a camping permit. So, make sure to check with DNR, BLM, or USFS to ensure you have all the authorizations you need before setting out on your dredging or highbanking adventure in Alaska!

SMALL-SCALE SUCTION DREDGING

State Land

The state of Alaska defines small-scale suction dredging as the use of a suction dredge with an intake nozzle diameter of six inches or less, powered by a motor of 18HP or less (pumping no more than 30,000 gallons of water per day), and which is used without mechanized support equipment. Placer stream suction dredging that fits this definition does not require a permit from DNR Division of Mining, Land & Water when carried out on state lands. See *Chapter 8 – Permitting and Compliance* for information on how to apply for permit(s).

Note: *Small-scale* ***suction dredging in Alaska always requires a discharge permit from DEC*** *and often requires authorization from the ADF&G, Habitat Section (ADF&G-Habitat).*

Buildings or other structures, even if they are built on skids or some other non-permanent foundation, cannot be used to support small-scale suction dredging operations in Alaska. Temporary tent camps may be utilized for no more than 14 days at one site.

There are two exceptions to the general allowance of recreational suction dredging on state lands. No dredging

is allowed in state parks, and a DNR permit is required for suction dredging within the Nome Recreational Area.

Federal Land

You are required to contact a BLM Field Office before using a suction dredge of any size on BLM-managed federal land in Alaska. Likewise, you are required to contact a Ranger District office before using a suction dredge of any size on National Forest Service lands. Staff at the BLM or USFS office will help determine if suction dredging can be authorized for the federal property you plan to operate on, and, if so, will provide guidance on applying for authorization.

Navigable Waters of the U.S.

Navigable Waters of the United States (NWOTUS) are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce. Activities in these waters may be regulated by the USACE. This definition does not apply to the scope of WOTUS under the Clean Water Act.

Suction dredging occurring in NWOTUS is regulated under Section 10 of the Rivers and Harbors Act of 1899. Further details can be found on the **USACE Placer Mining in Alaska** webpage and a list of non-tidal navigable waters can be found on the **USACE Jurisdictional Determinations** webpage.

Most suction dredge operations may be authorized under USACE's RGP-04 – Suction Dredging in Tidal Waters or USACE's Letter of Permission. Contact the USACE Alaska District office to find out if your activity may be covered by this permit.

LARGER-SCALE SUCTION DREDGING

Any suction dredging operation in Alaska using a dredge larger than the small-scale parameters mentioned above and/or involving mechanized support equipment such as an excavator or dozer, is classified as either a medium- or large-scale dredging operation and is subject to additional regulatory requirements.

Photo 32. 8" medium-size suction dredge, Hope Mining District, 2012 (DEC).

Medium and large suction dredge operators are required to submit an APMA for state permits. See *APMA* in *Chapter 8* for further information.

The APMA can also serve as a federal permit application for your planned suction dredging operation on BLM-managed lands. See *Federal Agencies* in *Chapter 8* for further information.

FISH-BEARING STREAMS

No matter the scale, or whether on state or federal land, all suction dredging carried out in fish-bearing streams in Alaska requires authorization from ADF&G-Habitat Section.

In most areas of the state, salmon spawning begins in June/July and extends through the fall. The eggs deposited in the streambed do not emerge as free-swimming fish until April or May of the following year. Salmon eggs deposited in streambed gravels are extremely vulnerable to any type of disturbance.

For this reason, instream suction dredging or highbanking is generally prohibited in salmon spawning and rearing areas except for a period from **May 15 through July 15**, when salmon eggs are not likely to be present and salmon fry are least vulnerable to disturbance. These dates may vary depending upon the species of fish and the distances they must travel to reach their natural streams.

Contact your local *ADF&G-Habitat* office to find out whether the area of the stream you are planning to carry out suction dredging is classified as fish-bearing and/or salmon spawning habitat.

Permits for recreational-scale suction dredging in fish-bearing streams on state land can be obtained at *ADF&G-Habitat* offices or **Small Scale Mining Permits** and submitted to the appropriate regional office. These permits for suction dredging and high banking operations are generally issued over the counter and are free of charge.

Photo 33. Juvenile Dolly Varden, Cassiterite Creek, Seward Peninsula, Nome Mining District 2024 (ADF&G).

NOME OFFSHORE SUCTION DREDGING

If you are planning to carry out marine suction dredging offshore of Nome, please contact *DNR-Mining* and refer to the "**Nome Offshore Suction Dredging Fact Sheet**;" as well as USACE's fact sheet for **Regional General Permit (RGP)-04 - Suction Dredging** in tidal waters for assistance and information on USACE's "Types of Permits" for information on Letters of Permission.

Wildlife Tip!

Salmon eggs remain in streambed gravels from late summer through spring and are highly sensitive to disturbance. Instream dredging and high banking are generally only allowed from **May 15 to July 15** to protect eggs, fry, and spawning adults.

Reclamation

From early-stage mineral exploration to closure of your placer mining operation on state, federal, or private lands in Alaska, you are required to:

- Carry out your work in a way that minimizes the amount of land that is disturbed.
- Receive DNR approval for your plan to reclaim areas to be disturbed by your activities.
- Complete the reclamation outlined in that plan.

Under the Alaska Reclamation Act adopted in 1990, "A mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources, and the mining operation shall be reclaimed as contemporaneously [i.e., as mining progresses] as practicable with the mining operation to leave the site in a stable condition."

Under this law, you must receive approval from DNR for a reclamation plan that details how you plan to restore any impacts from your proposed operation before mining begins.

Reclamation is where your careful planning prior to permitting really comes in handy. The regulatory and financial success of your placer mine is dependent on a complete mine plan that extends until the mine site is fully reclaimed.

If you don't know how you are going to reclaim your mine site, you should not be mining it in the first place. Regulations require that a reclamation plan be approved before mining begins.

Permitting agencies can assist in developing a reclamation plan that meets state and federal regulations, and it is recommended that you reach out to your permitting agencies early in the process (see *Permitting Agencies* in *Chapter 8*).

Knowing how you plan to reclaim your site before mining begins will also help you determine the best places to stockpile your overburden and tailings, which will minimize material handling and the associated costs.

> ***If you don't know how you are going to reclaim your mine site, you should not be mining it in the first place.***

Outside of ensuring that contours are conducive to natural revegetation as required by law, the miner can go above and beyond in thinking of themselves as a painter with a blank canvas. You have the opportunity to reshape your mined area during reclamation to seamlessly blend into the surrounding landscape. This includes returning the topography to a pattern similar to what existed before mining, using the footprint of your former pit and settling pond(s) to create features, such as wetland depressions and ponds, for wildlife habitat.

Photo 34. Additional material to stockpile includes boulders, large cobble, and logs, which can be used for stream and floodplain reclamation. From BLM's "Stream Reclamation Basics."

A longtime placer miner who has been operating in Alaska for more than 40 years describes carefully planned reclamation as "a dirt smoothing operation, not a dirt moving operation."

In more practical terms, this means the overburden stripped off before mining and the tailings produced during operations are stockpiled and staged at or near where they will be needed during reclamation – making it easier and less expensive to level, shape, and contour the rock and gravel before covering with the organic material that will encourage native vegetation regrowth.

This also makes it easier to maintain a "rolling footprint," which means carrying out reclamation at the same time you are mining to minimize the amount of disturbed acreage at your operation.

ROLLING FOOTPRINT

The whole idea behind reclamation is to return previously mined areas back to as natural a state as possible. State and federal regulations also require carrying out reclamation as soon as is practicable, which is where a rolling footprint (i.e., concurrent reclamation) comes in.

The basics of good reclamation could include:

- Reshaping the mined area to create stable slopes, control erosion, and establish landforms suitable for revegetation and long term stability.
- Refilling and contouring your mining pits with tailings and non-organic overburden.
- Covering the reclaimed areas with organic material, such as with the stockpiled organic overburden, to encourage revegetation with native species.
- Reestablishing, at a minimum, a stable stream.
- Reclaiming roads and trails that were used to access the mining area.

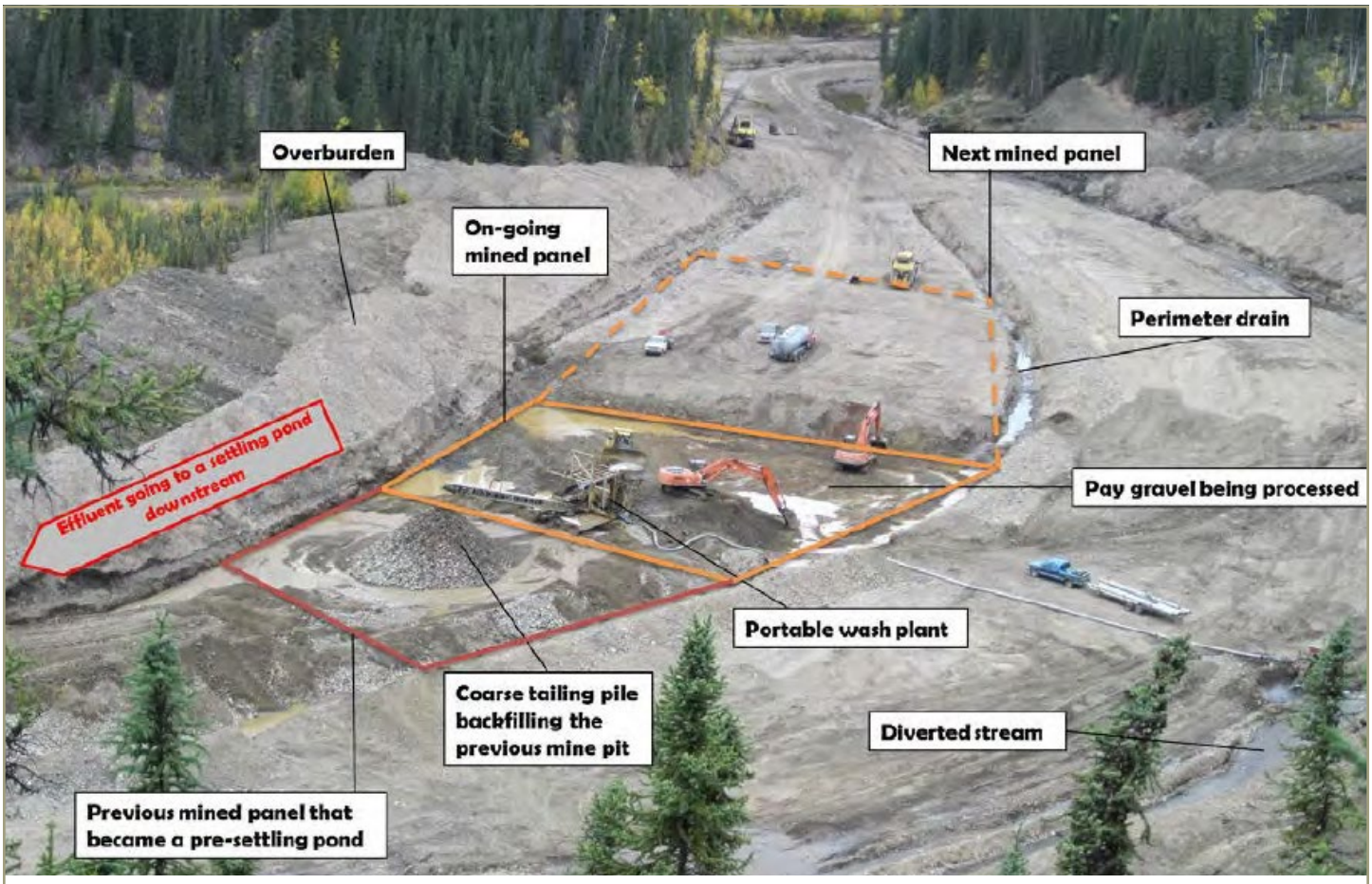

Photo 35. Example of a rolling footprint from Chevreux and Clarkson (2025). Please note: the "perimeter drain" is important to dewater the advancing mining cut. It collects ground water, meteoric water, and melt water and directs it to the bypass ditch using discharge controls (in accordance with the mine's APDES).

One of the ways to make reclamation a "dirt smoothing" instead of a "dirt moving" part of your operation is to blend your fine and oversized tailings to mimic natural conditions and place them in your previously mined pit - though you will want to save oversized tailings and large boulders to construct stream stabilization features (if needed). Since sand and gravel are the natural base layer of most stream valley's, this allows you to both store your tailings and begin reclamation at the same time.

Note: *Although this Guidebook uses the term "smoothing" as the efficient action of spreading dirt, actual site reclamation should be "rough" and include humps, depressions, and swales that mimic natural conditions. Natural areas are rarely as smooth as a golf course; they are rough, bumpy, and undulating (rolling, wavy). All this roughness helps with erosion control and provides places for seeds to settle and water to collect to help plants grow.*

If you have room to store your overburden alongside your pit, once the tailings are placed back into the pit, you can then begin covering them with the stored overburden. This typically begins by using the non-gold-bearing gravel you stripped off to finish the contouring and shaping, followed by placing the organic overburden and woody debris over the top.

Even better, with a rolling footprint, you can use your loader to scoop up intact blocks of soil and vegetation (vegetation mats) while preparing your new pit for mining and then use the intact vegetation transplants to speed recovery. During collection, the vegetation mats should be disturbed as little as possible. This includes trimming taller shrubs and trees to prevent movement that could break apart the root mass during transport, and ensuring the entire root zone (typically 12 to 18 inches) is included with the mat.

Place vegetation mats into shallow trenches on reclaimed mine sites so the surface of the mat is level with the surface of the surrounding ground. This method works much like transplanting a potted plant - you don't simply set it on top of the soil; instead, you place the mat in a shallow trench to improve its chances of survival. While this approach is commonly recommended and has been widely used in Alaska with great success, data from several mines show that placing vegetation mats directly on top of the graded surface (excluding streambanks and floodplains) can also be effective and may save operators time and money. For example, one mine in Alaska has roughly 40 acres of surface-planted vegetation mats that have shown strong survival for nearly a decade.

Photo 36. Wheel-loader moving an intact block of soil and vegetation (vegetation mat) from a source (donor) site to an area being reclaimed. This creates "instant" vegetation. From BLM's "Stream Reclamation Basics."

The end result may look ugly, but layering of tailings, non-organic overburden, organic overburden, and then woody debris and/or transplanted vegetation mats will help ensure plant regrowth after mining is complete.

SETTLING POND RECLAMATION

You will also be reclaiming your settling ponds when you are finished using them as part of your operation. When determining how best to reclaim your settling ponds, you have the option of backfilling and recontouring the ponds to match the surrounding area or leaving the ponds as safe and functional wetland habitat. Similarly, you can backfill and recontour your mining pits or use the pit as a starting point for reclaiming the pit as a functional pond. The reclamation process is similar for both starting points.

As mentioned earlier, when planning your reclamation approach, you will be starting with a blank "canvas" that you can begin preparing for post-mining land use.

Photo 37. The picture shows stable ongoing operations and successful reclamation of a previously mined area. The area to the right of the road shows ongoing reclamation, with a series of connected ponds and depressions with irregular shorelines and depths to reclaim different aquatic features. Immediately left of the road shows a previously mined area that has been reclaimed with irregular shorelines, depths, and islands to create varying habitats and has excellent revegetation rates of the mined area (USACE).

Depending on the area, size, and other site-specific factors, you may be able to include several fish and wildlife habitat features into your reclamation plan. Although your reclamation plans may vary from the basics provided in this Guidebook, attracting a variety of wildlife is a meaningful outcome of successful reclamation.

Typically, removing settling ponds involves draining any water and removing or burying silt and dirt that has settled in the pond during its use. If the surrounding reclamation site lacks good topsoil or organic material (possibly the result of historically mined sites), settling pond fines can be used to supplement soil to help promote revegetation. The fine, settled materials in these ponds can be collected and mixed with tailings during reclamation and serve as a good planting medium for capturing seeds of native species for revegetation.

Note: *Remember that any water drained or pumped into the creek during reclamation must meet the water quality requirements in your discharge permits with DEC.*

It is often possible to slowly fill the pond with coarse material, such as your oversized tailings (being careful not to cause the water to overtop the pond). This method has the advantage of not needing to discharge water.

Some reclaimed areas, while not required, can be enhanced for wildlife by creating wetland depressions or shallow swales. For example, a pit that holds water can be partially backfilled with overburden and tailings to within a few inches above or below the existing water level. Then, placing two to three inches of salvaged organic overburden on top can help promote natural revegetation.

Similarly, areas disturbed by mining can be graded down to just above or below the seasonal low water table, then covered with salvaged organic overburden to form a wetland depression. Transplanting salvaged wetland vegetation into these newly created areas can significantly accelerate revegetation – providing habitat for wildlife to enjoy sooner!

Wildlife Tip!

During high water events, fish can become trapped in poorly placed or designed settling ponds. To decrease this risk, locate settling ponds well away from natural waterbodies, and construct adequate berms to prevent an influx of water from the stream. At closure, consider adding an escapement channel that will allow fish to exit safely.

Not all settling ponds need to be filled after mining. If the settling pond will retain water after mining, the pond can be left in place and reclaimed to enhance environmental diversity and to create a home for wildlife.

Pond edges can be reshaped to create irregular and stable shorelines that increase the amount of habitat available to wildlife. Fine material may still need to be removed or stabilized to prevent the pond from releasing sediment into streams and other wetlands, and to prevent wildlife from getting trapped in the muck.

To ensure wildlife (and people!) can easily climb out of the pond, the slope from the shoreline toward the center of the pond should be less than 30% (about 3H:1V) for the first 10 to 15 feet before dropping off to deeper water. Additionally, if wanting to create connectivity with a nearby stream, contact your local ADF&G office to get assistance with prevention techniques to ensure fish will not get trapped in the pond.

Photo 38. Photo showing floodplain with varying terrain, including a small conveyance swale leading to a reclaimed pond. Seen in the picture is a micro-depression located in the swale with sediment deposition occurring during highwater events. Since this photo was taken (July 2023), additional organics were speared on site to encourage faster revegetation rates - the area is now (August 2025) mostly revegetated (USACE).

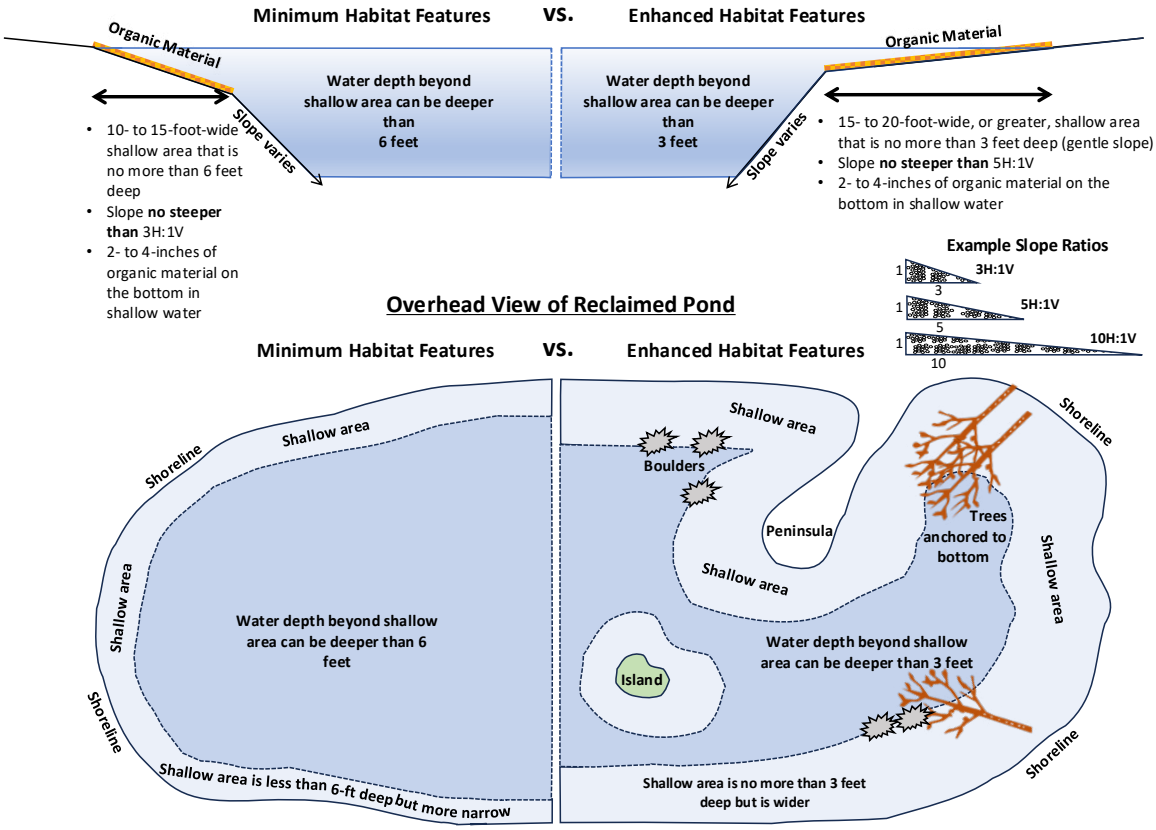

Figure 1. Reclaimed Pond Habitat Features. This figure shows basic guidelines for a reclaimed pond, with a cross-section view (top) and an overhead view (bottom). The left side shows the minimum features, and the right side shows enhanced features that help wildlife. These enhanced features can include peninsulas, islands, a few scattered boulders, and some cut trees anchored to the bottom. No matter the slope of the shallow areas (for example, 3H:1V or 5H:1V), longer shallow slopes allow for bigger changes in water levels and help aquatic plants grow. Not drawn to scale (USFWS).

To support diverse wildlife habitat in ponds larger than half an acre, USFWS recommends creating irregular shorelines with 15 to 20 feet of shallow water sloping no steeper than 5H:1V toward deeper areas. This creates warmer, shallow edges of the pond that are no deeper than 3 feet, which is ideal for rooted aquatic plants in cold Alaskan waters and provides food and cover for fish and wildlife.

These gentle slopes also help aquatic plants adapt to changing water levels during the growing season. Beyond these shallow edges, the depth of the pond can vary. To encourage natural revegetation, spread 2 to 4 inches of organic material (like salvaged overburden) along the shoreline and the shallow areas of the pond you just created.

Additionally, adding islands and peninsulas increases shoreline diversity and scattering a few large boulders and anchoring downed trees to the bottom of the pond enhances habitat complexity. For additional details and suggested wildlife enhancement features see, **Wetland Reclamation for Placer Mining**, and **Best Management Practices for Reclaiming Surface Mines**, or contact the USFWS for further recommendations.

Photo 39. Photo showing the end of a conveyance swale meeting the reclaimed pond and gravel bar. The reclaimed pond has an island in the middle and irregular shorelines with shallow depths and aquatic vegetation growing (USACE).

If multiple ponds are created, they can be connected to help with the exchange and movement of nutrients and aquatic life. Shallow ponds should be constructed in a manner that continuously holds water during the growing season of a typical year.

Regardless of the type of pond or wetland depression, the adjacent landscape should slope gently toward these features (about 1-2% slope) so runoff or seepage will collect naturally in these areas without causing erosion. If located within the floodplain, the adjacent landscape should mimic the natural floodplain, which is often broad, flat, and slightly undulating (rolling, wavy).

In summary, consider the following key points when constructing a reclaimed pond or wetland depression:

- Backfill and recontour pit and pond edges into gentle, low-relief landforms (e.g., swales, pockets, and depressions) that blend into the surrounding terrain.
- Design the reclaimed surface to mimic a natural floodplain, especially near stream channels. Broad, flat, and slightly undulating (rolling, wavy) surfaces are ideal.
- Grade surrounding disturbed ground to slope slightly toward the ponds, depressions, and swales (about 1-2% slope), so runoff or seepage would collect naturally in low areas.
- Avoid steep slopes or sharp (abrupt) berms around depressions. Keep transitions soft and natural-looking to help vegetation establish and reduce erosion.
- Place woody debris or anchor cut, whole trees in low spots to create habitat diversity, increase floodplain roughness, and retain moisture longer.
- Leave some small, excavated features partially intact if they are already holding water or staying moist. These features can develop into marshes or sedge meadows (i.e., wetlands) over time.
- Monitor water retention and vegetation. Adjust grading as needed if water is not collecting as planned or if surfaces are drying out too fast.
- Where practical, ensure pond bottoms are below the seasonal low water table.
- When able, ensure marsh areas are below the high-water table and, generally, near the low-water table.

Working with your permitting agencies is a good idea to determine whether leaving a pond and/or wetland area is the best choice for your site and operation and to ensure that any ponds or wetland areas are left stable and functional for environmental and wildlife use.

STREAM RECLAMATION

For many operations, one of the most vital aspects of your reclamation plan will be reestablishing a natural stream channel that is stable, provides functioning habitat, is connected to its floodplain, allows for the free passage of

all aquatic organisms, and is able to handle flood events without major degradation. Fortunately, in recent years, state and federal agencies have developed best practices for re-establishing stable streambeds.

While creating a streambed that mimics naturally occurring conditions of streams in the same or similar watersheds is the primary goal, creating it in such a way that the next flood does not wash away your stream reclamation efforts is vital.

Photos 40 (a) and (b). Recontoured mine site on Wade Creek prior to stream reclamation (40a). Same section of Wade Creek two seasons after stream reclamation was completed (40b). From BLM's "**Stream Reclamation Basics**."

Before mining begins, plan to stockpile large- and medium-sized rocks and identify and preserve vegetation source (donor) sites; this pre-planning will go a long way to ensure a successful stream reclamation project. To safeguard the stability and durability of your streambed, it is important to establish diversity by:

- Creating a mix of pools (for fish to rest in) and riffles (for fish to swim through). This is one area where the oversized tailings and large boulders you saved will come in handy.
- Establishing floodplain connectivity (providing ways for your stream to overflow and disperse water, energy, nutrients, and sediments onto the land next to the stream during flood events).

Photo 41. This poorly constructed stream has little to no floodplain connectivity because it likely will not overtop and spread water across it's potential floodplain on the left. From BLM's "**Stream Reclamation Basics**."

- Establishing vegetation that can tolerate wet areas (e.g., willows and sedges) along the streambank. This can be done by transplanting vegetation mats (see the *Rolling Footprint* section in this chapter) which provide immediate cover and stability, or by planting transplants that were collected in the winter or early spring when the plant is still dormant and before the leaves appear.
- Placing logs, brush piles, and boulders in the floodplain to create surface roughness and support proper floodplain function.

BLM Alaska has developed comprehensive guides for planning, designing, and carrying out successful stream reclamation that meet both state and federal guidelines.

Note: *Reclamation plans on BLM-managed lands must detail how the reclaimed stream will provide a stable channel form with adequate vegetation to reduce erosion, dissipate stream energy, and promote the recovery of instream habitats similar to levels which were present prior to mining and consistent with BLM policy.*

Photo 42. Spruce logs and vegetation transplant mats used to minimize floodplain erosion until vegetation is fully reestablished. From BLM's "Stream Reclamation Basics."

> *A stable, natural stream channel is essential. It must support habitat, connect to its floodplain, allow aquatic organism passage, and withstand floods.*

BLM's "Stream Reclamation Basics" brochure provides an overview of stream reclamation to help ensure success, and BLM's "Stream Design and Reclamation Guide for Interior Alaska" provides more detailed step-by-step instructions for stream reclamation.

While these guides are developed to meet stream reclamation criteria on federal land, they offer useful information on stream reclamation for all placer mining projects in Alaska and are useful resources as you plan and carry out stream reclamation.

Whether your mining claims are on state, federal, or private lands, consulting with the land manager is a good place to start when planning and designing stream reclamation for your placer mine.

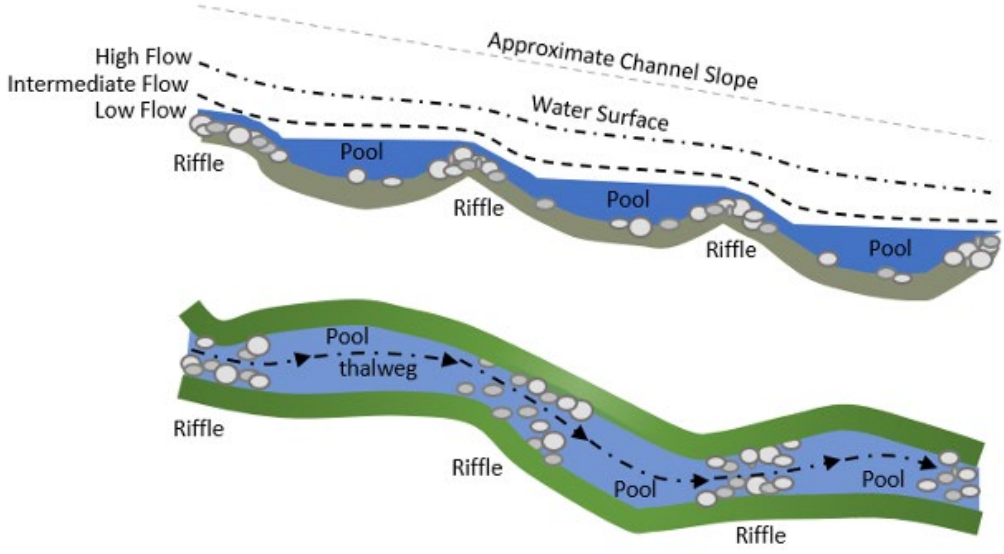

Figure 2. Side- and top-views of a series of pools and riffles. From BLM's "Stream Reclamation Basics."

RECLAMATION BONDING REQUIREMENTS

To ensure the impact from all mining carried out in Alaska is reclaimed to state and federal standards, bonding is required for all mining operations in the state with a disturbance of five acres or greater or moving more than 50,000 cy of material.

To help lower the financial burden associated with establishing individual financial assurances (i.e., bonding), the Alaska legislature established a Statewide Reclamation Bond Pool that is managed by DNR.

Photo 43. Unreclaimed abandoned mine (BLM).

Participation in the bond pool requires a cash deposit that varies depending on the size of the mining operation. Once reclamation has been completed according to your approved reclamation plan, the refundable portion of the bond pool will be released.

To encourage placer miners to keep the footprint small, Alaska does not require bonding if the disturbance of an operation on state lands is kept under five acres and less than 50,000 cubic yards of material moved.

For placer mining operations on federal lands managed by BLM, many operators choose to use the Alaska State Bond Pool managed by DNR if they qualify. Otherwise, for operations on BLM or USFS lands, reclamation bonds must be sufficient to cover the full cost of reclamation of disturbed mining areas. If mining on other federally managed lands other than BLM or USFS, contact the land managing agency responsible for bonding requirements. This cost is calculated to cover the expense of carrying out reclamation not completed by the operator.

On BLM-managed lands, a reclamation cost estimate may be required to determine the full cost of reclamation at maximum disturbance, using a third-party contractor, and labor calculated using Davis-Bacon Act. Upfront bonding costs for individual financial guarantees can be a considerable addition to your mine's economics and should be carefully considered within your overall business plan (see *Chapter 4 -Economic Evaluation*).

For individual reclamation bonds, BLM may release up to 60% of the total financial guarantee for an operational area when all contouring, water runoff, and slope stabilization requirements are complete.

The remaining 40% is released when "all structures and other facilities have been removed and the area has been revegetated to establish a diverse, effective and permanent vegetative cover, all monitoring and maintenance requirements have been met, and when discharged effluent has met, without violations and without the necessity for additional treatment, applicable effluent limitations and water quality standards for at least one full year."

The USFS has similar proportional bond release criteria; however, there are no defined percentages. Bond release/reduction is calculated on a case-by-case basis according to remaining reclamation requirements.

Further details on BLM bonding requirements in Alaska can be read in the "**BLM Alaska Mining Reclamation Bonding Guide**." Further details on USFS bonding requirements can be read in the "**Training Guide for Reclamation Bond Estimation and Administration**."

The calculation for the number of disturbed acres on federal land and state land differ. More information on bonding requirements can be found in the APMA, or by contacting DNR-Mining for questions on state land or the BLM or USFS for federal land.

Permitting & Compliance

Whether you are planning a weekend gold-hunting trip, conducting a full exploration program on your mining claims, or launching a full-scale mining operation, you will need to obtain permits or authorizations from one or more state or federal agencies. This applies to any Alaska mining activity that involves anything more than using hand tools and a gold pan, as described in the *Generally Allowed Uses on State Lands* section in this chapter.

So, what permits do you need and where do you get them? The answer to these questions begins with knowing:

- Who is the owner or manager of the land where your planned activities will take place; and
- Will you be crossing any private, state, or federal lands that require authorizations for access?

Excellent resources for information on landownership in Alaska include:

- BLM's Lands, Minerals, and Realty Interactive Map on **BLM's Spatial Data Management System (SDMS) Alaska website**.
- BLM's **Mineral & Land Records System (MLRS)** online record system.
- DNR's **Land Administration System (LAS)** online records search tool.
- DNR's **Alaska Mapper** interactive map.

Determining whether you will need permits or authorizations to access your mining claims and identifying the primary land manager are the first steps to set you on the path to securing the approvals required for your planned mining activities.

From there, the number of state, federal, and private permits you will need will be depends on the level and complexity of your planned activities – from no authorizations needed for generally allowed prospecting on state mining claims to dozens of permits and authorizations administered by various agencies for full-scale placer mining operations.

> *Determining whether you will need permits or authorizations to access your mining claims, and the primary land manager for them, will set you on the path to gaining the authorizations needed to carry out your planned activities.*

The *Permitting Agencies, Regulators and Land Managers* section of this chapter lists state, federal, and private landowners and managers involved with placer mining permitting in Alaska, as well as the permits, licenses, and/or authorizations they are responsible for.

GENERALLY ALLOWED USES ON STATE LANDS

Certain activities on state land managed by the DNR Division of Mining, Land and Water are considered Generally Allowed and do not require state permits. These activities make it easier to enjoy the great outdoors in Alaska. Generally Allowed Uses directly related to placer mining include:

- Recreational gold panning.
- Prospecting or mining using light portable field equipment, such as a hand-operated pick, shovel, pan, earth auger, or backpack power drill or auger.
- Temporary camps, clearing brush, and other activities that may be related to early assessments on state mining claims.
- Accessing mining claims with a highway vehicle (curb weight up to 10,000 lb.) or all-terrain vehicle (curb weight up to 1,500 lb.), if the use does not negatively impact water quality or cause significant ground disturbance.

- Landing an aircraft or using a watercraft without damaging the land.
- Suction dredging with an intake nozzle diameter of six inches or less, powered by an engine of 18 horsepower or less, and pumping no more than 30,000 gallons of water per day.

Note: ***All suction dredging and highbanking operations discharging to WOTUS in Alaska,*** *including recreational mining as described in Generally Allowed Uses,* ***require a discharge permit from DEC. Most placer and recreational mining operations require a fish habitat permit (FHP) from ADF&G****. FHPs are required if there are mining related activities within or adjacent to fish bearing waterbodies (e.g., water withdrawals, stream crossings, culvert installations, stream diversions). FHPs are issued in person from ADF&G Habitat Section offices, or miners can reach out to ADF&G via email or phone. See Agency Contacts-Appendix 3. ADF&G is responsible for making the final determination as to whether an activity requires an FHP.*

Note: *Generally Allowed Uses on State Lands* ***do not apply*** *to private lands, federally managed lands, state parks, or lands owned or managed by other state agencies such as the University of Alaska, Alaska Mental Health Trust, DOT, or the Alaska Railroad. In some situations, permits may be required from the USACE, DEC, ADF&G, or Environmental Protection Agency (EPA).*

Please see "**DNR's Generally Allowed Uses factsheet**" for further details and restrictions related to Generally Allowed Uses on State Lands.

APPLICATION FOR PERMITS TO MINE IN ALASKA (APMA)

To simplify the permitting process for placer mining and mineral exploration in Alaska, and to ensure that your application gets distributed to the agencies that will need to issue permits, the State of Alaska created the **APMA**.

Administered by Alaska DNR's Division of Mining, Land & Water, the APMA is a one-stop application for most of the permits needed to carry out commercial placer exploration, mining, and reclamation in Alaska.

Regardless of whether your mining operation or mineral exploration will take place on state, federal, or private land, an APMA must be completed and submitted for all your mining-related activities not covered by *Generally Allowed Uses on State Lands.*

An APMA application can be set to describe up to a 10-year mining plan, but durations of issued permits may very due to specific factors and laws of the APMA participating agencies. In addition to lessening your paperwork and providing surety of permits over an extended period, a multi-year APMA lightens the load (which helps prevent permitting backlog) for state and federal agencies.

For you, the APMA is an essential permitting tool that provides a framework for compiling all the information required when it is time to submit permit applications for your mine.

This is where the information collection and mine planning you have carried out up to this point begins to pay off! Having complete information about your property and detailed plans for the proposed mining and mineral exploration will make it much easier to fill out an APMA that will be accepted as complete by regulatory agencies, which is a key to ensuring that your application is not delayed due to the lack of information.

Details on the areas to be mined, water to be used, location and design of settling ponds, tailings disposal and overburden storage plans, permanent or temporary diversions of water, mining operation access routes, reclamation plans, and other activities related to your planned placer mine must be included for an APMA to be considered complete.

Once an application has been reviewed and deemed complete, DNR-Mining distributes your APMA to all state and federal agencies involved in the permitting process, which simplifies your paperwork and expedites the process.

Note: *State and federal regulatory agencies encourage you to include* ***ALL ACTIVITIES*** *you plan to conduct at your mining operation to ensure you have all the permits and authorizations required. Any unpermitted activities could result in fines and/or other penalties if your operation is*

found to be out of compliance during inspections carried out by regulators.

WHAT IS NOT COVERED BY THE APMA

While the APMA is designed to provide a one-stop-shop for permitting placer mining and mineral exploration in Alaska, there are certain aspects related to your operation that are not or may not be covered by the submittal of an APMA.

Here is a list of items **NOT** covered by the APMA:

- Mining license issued by the Alaska Department of Revenue (DOR) for tracking your income tax obligation.
- Information on annual rents, production royalties, and Statements of Labor required by DNR Property Management.
- Mine Identification number from MSHA.
- DEC APDES Individual Permit if your operation will discharge water and does not qualify for a General Permit.
- DEC Small Suction Dredge General Permit coverage for highbankers or suction dredges less than or equal to 6 inches and 18 hp (fresh water) or 23 hp (marine water).
- DEC permits for solid waste disposal, remote camp, and potable drinking water systems.
- A permit under the Bald and Golden Eagle Protection Act and/or an Endangered Species section 7 consultation, both issued by the USFWS where applicable.
- Permits that may need to be issued by the USACE for work in certain wetlands, including land clearing, backfilling mine cuts, constructing a stream diversion, road construction activities, and suction dredging.
- Any permits or authorizations required by private, municipal, borough, or other entities (including the Alaska Mental Health Trust Authority) to access or operate on your property.
- BLM accepts the APMA as part of the application process but the final authorization to proceed with exploration, mining, or the development of Use and Occupancy on BLM-managed lands will be issued by the appropriate BLM office.
- National Forest Service (USFS) lands do not accept the APMA as an application.

Further details on items not covered by the APMA can be found within the first 8 pages of the **APMA application**.

PERMITTING AGENCIES, REGULATORS, AND LAND MANAGERS

Every commercial placer mining operation in Alaska requires some level of permitting or authorization from up to 12 state and federal agencies, as well as potential authorizations from municipalities or private organizations for mining-related activities. The permits and authorizations required for your operation will depend on the land manager, location, and other factors.

Regardless of these factors, there are certain permits, licenses, and authorizations required for all placer mining operations in Alaska. Below is a list of permitting agencies and land managers responsible for issuing authorizations related to placer mining in Alaska.

State Agencies

Alaska Department of Environmental Conservation (DEC)

While DNR-Water is responsible for authorizing water used by your placer mining operation, DEC is responsible for issuing permits authorizing the discharge of wastewater.

All mechanical placer mining, suction dredging, and highbanking operations proposing to discharge to WOTUS, such as a creek or a river, require an APDES permit from the DEC Division of Water. Most placer mine discharges can be covered under APDES General Permits. APDES permits typically include annual fees, best practices, water quality limits and monitoring, daily recordkeeping, and annual reporting.

DEC is also charged with issuing 401 Water Quality Certifications related to Individual Permits issued by USACE. DEC 401 Certifications typically have a one-time fee upon permit issuance. (see the *U.S. Army Corps of Engineers (USACE)* section below in this chapter for further details.)

Although less common, DEC may also require permits or approvals for large camps, burial of solid waste, and installation of septic systems.

If you have any questions about DEC permits, please contact the DEC Mining Section at (907) 451-2142 or dec.placer@alaska.gov.

Alaska Department of Fish and Game - Habitat Section (ADF&G-Habitat)

Many placer mining operations are associated with fish-bearing streams. Improper stream crossings, water withdrawals, dredging, and other mining activities can have negative effects on fish and their habitat. Mining activity in or near fish-bearing water bodies typically requires a Fish Habitat Permit issued by ADF&G-Habitat.

For ADF&G-Habitat questions, contact:
Interior/Northern/Arctic/Fairbanks Office:
(907) 459-7289 or dfg.hab.infofai@alaska.gov.
Mat-Su/Palmer Office: (907) 861-3200 or
dfg.hab.infopaq@alaska.gov.
Southcentral/Southwest/Anchorage Office:
(907) 267-2342 or dfg.hab.infoanc@alaska.gov.
Kenai Peninsula/Soldotna Office: (907) 714-2475 or
dfg.hab.infosxq@alaska.gov.
Southeast/Douglas Office: (907) 465-4105 or
dfg.hab.infodou@alaska.gov.
Craig Office: (907) 826-2560 or
dfg.hab.infocga@alaska.gov.

DNR Division of Mining, Land & Water - Mining Section (DNR-Mining)

DNR-Mining is your first stop for commercial placer mining and mineral exploration permitting in Alaska. DNR-Mining is responsible for authorizing or approving:

- **Application for Permits to Mine in Alaska:** APMAs are submitted to DNR-Mining, which makes this agency your first point of contact for permitting your operation. Once your APMA has been deemed complete, DNR-Mining will distribute it to the other state and federal agencies.
- **Approved Plan of Operations:** Your APMA will automatically serve as a request for an Approved Plan of Operations, which are required for most placer mining activities to be carried out on state mining claims and leases.
- **Reclamation Plan Approvals:** Regardless of the land ownership, **ALL** placer miners are required to submit an APMA for the purpose of reclamation approval. The State of Alaska holds jurisdictional authority for reclamation related to mining activities, above generally allowed uses, on all lands of Alaska.
- **Land Use Permit for Cross Country Travel:** An authorization for the delivery and staging of mining equipment and supplies on state lands outside of your mining claims. If your proposed route for travel crosses federal or private lands, permits and/or authorizations by the landowners and/or managers will be required.
- **State of Alaska Reclamation Bond Pool:** DNR-Mining also manages the State Reclamation Bond Pool which may provide financial assurance in the event that an operator legally defaults on their reclamation obligations. By law, DNR has the discretion to determine which operations qualify for the Bond Pool participation.

On state land, a reclamation bond is required for disturbances over five acres in size or moving more than 50,000 cy of material. To satisfy this requirement, you have the option to participate in the State Reclamation Bond Pool, which requires an initial deposit of $150 per acre of disturbance. A portion of your bond deposit may be refunded upon approved reclamation.

Subject to a State/Federal Cooperative Agreement, an operator may also request that the State of Alaska Reclamation Bond Pool be used for approved operations on BLM-managed federal lands in Alaska to satisfy the required financial assurances for reclamation and occupancy of authorized mining activities.

The calculation for the number of disturbed acres on federal land and state land differs. More information on bonding requirements can be found in the APMA, by contacting DNR-Mining for questions on state bonding requirements, or by contacting BLM for federal bonding requirements.

For questions regarding the APMA, State of Alaska Reclamation Bond Pool, access to, and activities associated with mining activities on State of Alaska managed lands, please call (907) 451-2736 or email your questions to dnr.fbx.mining@alaska.gov.

DNR Division of Mining, Land & Water - Water Section (DNR-Water)

If your placer mining operation involves storage, withdrawal, or diversion of water, DNR-Water will review the water uses to determine if water use authorizations are required. Water usage (including from 100% recycle pond systems) may require a Temporary Water Use Authorization or Water Right to be issued by DNR-Water.

DNR-Water also administers the Alaska Dam Safety Program, which cooperates with individuals or organizations involved in the design, construction, or operation of dams in Alaska.

Dams that are regulated under the Alaska Dam Safety Program include any artificial barrier that:

- Impounds 50-acre-feet or more of water and is at least 10 feet high.
- Is 20 feet high or taller.
- Would threaten lives and property if it failed.

Such dams add complexity to the permitting and operations of placer mines in Alaska. And DNR encourages you to avoid including dams in your mine plan that may fall under the Alaska Dam Safety Program.

If you have any questions on water use authorizations for your operation and/or believe you may need to build an impoundment structure that falls under the Alaska Dam Safety Program, please call DNR-Water at (907) 451-2790.

Alaska Department of Revenue (DOR)

Whether your operation is located on state, federal, municipal, or private land, you are required to have a mining license issued by DOR before mining in Alaska. More information on Alaska mining licenses can be found on **DOR's website**.

Federal Agencies

Bureau of Land Management (BLM)

If your planned placer mining operation involves activities on federal lands managed by BLM that are open to the Mining Laws, your APMA can also serve as your federal permit application.

To streamline the permitting process, however, BLM asks that you meet with them first to set up a pre-planning meeting to discuss what is required for your mining plan and to ensure that your APMA is complete in accordance with the Surface Management regulations and so they can answer questions you may have about financial guarantee (bonding) and reclamation requirements, the National Environmental Policy Act (NEPA) process, and other applicable federal regulations.

This process will help ensure that your mining plan is complete in accordance with federal regulations and bonding requirements when the APMA is submitted to the agencies – preventing delays in approvals if BLM needs further information or your plan needs to be modified to meet federal requirements.

There are three generally recognized levels of mining operations on BLM-managed lands, based on scale and type of activity:

- **Casual Use** – Activities that ordinarily result in negligible disturbance, such as non-motorized prospecting with hand tools and gold pans. The public is generally allowed to prospect on unclaimed lands managed by BLM.
- **Notice** – Exploration-phase activities that result in a cumulative surface disturbance of five acres or less, removing 1,000 tons or less of presumed ore for sampling, and are located outside of special status areas. This level of activity can be performed under Notice.
- **Plan of Operations (Plan)** – Exploratory work resulting in surface disturbances of greater than five acres or production-phase operations regardless of size. This level of activity requires a Plan of Operations.

Each Notice or Plan of Operations for placer exploration or mining on BLM-managed lands must include a reclamation plan and bonding. Bonding requirements may include individual financial guarantees (for example cash or letter of credit); however, most placer operations on BLM land in Alaska use the State of Alaska Reclamation Bond Pool to provide reclamation financial assurances (see the State of Alaska Reclamation Bonding

Program discussed above in the *DNR-Mining* section of this chapter for more information). Some situations may require a combination of bonding with a mix of individual financial guarantee and State of Alaska Reclamation Bonding Program. The APMA will include an application to access the Bonding Pool for mineral exploration and mining on federal land.

Once in operation, your placer mine or exploration project will be regularly inspected for compliance with the approved Plan or Notice and BLM regulations.

For questions regarding access and mining activities on federally managed lands, please call (907) 271-5960 or email BLM_AK_AKSO_Public_Room@blm.gov.

National Park Service (NPS)

The Mining in the Parks Act of 1976 and associated regulations give NPS jurisdiction and regulatory authority over permitted mining activity in park lands. While the Act closed park lands to new mining claims by withdrawing them from the General Mining Law of 1872, the Act also provided for NPS to continue to permit valid pre-existing mining claims, requiring an approved Plan of Operations to minimize environmental damage. Valid pre-existing mining claims are located mainly in areas with historical mining significance in Denali National Park and Preserve, Wrangell-St Elias National Park and Preserve, and Yukon-Charley Rivers National Preserve. The NPS provides access to all valid current mining claims. For questions on permitted mining in National Park lands in Alaska, please reach out to the NPS Alaska Regional Director, or to your local Park Superintendent.

U.S. Forest Service (USFS)

If your planned placer mining or exploration operation involves activities on federal lands managed by the USFS that are open to mining activities, you need to notify the USFS regarding your activity.

To streamline the permitting process, the USFS recommends that you meet with them first to set up a pre-planning meeting to discuss what is required for your mining plan and to ensure that your plan is complete. Questions you may have about financial assurance (bonding) and reclamation requirements, the NEPA process, and other applicable federal regulations can be answered regarding your proposed activities in the pre-planning meetings.

There are three generally recognized levels of mining operations on USFS lands based on environmental impact:

- **Activities for which a Notice of Intent is not required** – Activities ordinarily resulting in negligible disturbance, such as non-motorized prospecting with hand tools and gold pans. The public is generally allowed to prospect USFS lands open to mineral entry.
- **Notice of Intent** – Mining-related activities that will not result in significant surface disturbance determined by the USFS District Ranger. A Notice of Intent is required for this level of disturbance.
- **Plan of Operations** – Mining-related activities likely causing significant surface disturbance. A Plan of Operations is required for this level of disturbance.

A Notice of Intent or Plan of Operations detailing your planned mining activities will be reviewed by a USFS District Ranger, who will determine whether your proposed operations may cause a significant surface disturbance. After carrying out an initial completeness review, USFS may contact you for additional information.

Each Plan of Operations for placer mining on USFS-managed lands must include a reclamation plan and bonding. Unlike BLM lands, however, USFS does not accept the State of Alaska Bond Pool as a financial assurance.

Once your Plan of Operations is approved and bonding is posted, USFS will periodically inspect your operation for compliance with the approved plan and regulations.

For questions about mining activities on USFS-managed lands, please call (907) 743-9500 or email sm.fs.chugach.minerals_geology@usda.gov.

U.S. Army Corps of Engineers (USACE)

Whether on state, federal, or private lands, placer mines in Alaska may require a permit issued by the USACE. The APMA submitted to DNR for your placer mining

exploration or placer mining operations serves as your initial application for any authorizations required by USACE.

USACE does not directly regulate mining but has jurisdiction over the discharge of fill into what are defined as WOTUS, which includes wetlands. For Alaska-specific guidelines for identifying wetlands, see "**U.S. Army Corps of Engineers Regional Supplement to Wetland Delineation Manual: Alaska Region (Version 2.0)**."

Examples of mining activities that may require authorization from USACE include:

- Exploration work involving trenching or drilling in wetlands, including the construction of temporary or permanent pads and roads.
- Excavation or mechanized land clearing where materials are pushed or placed back into wetlands.
- Certain work occurring in certain creeks, rivers, or streams including a temporary stream diversion or a stream relocation.

The following are the types of USACE permits that may be required for placer mining and exploration in Alaska. For additional information, see USACE's **Placer Mining webpage**.

- **RGP-04 – Suction Dredging in Tidal Waters** – This RGP authorizes the operation of suction dredges with intake nozzle diameters of up to 10 inches in navigable waters subject to the ebb and flow of the tides for the purpose of mining metals, strictly in accordance with the limitations, terms, and conditions of the RGP-04.
- **RGP-08 – Placer Mining** – This RGP can be used to authorize the discharge of dredged and/or fill material into WOTUS, including wetlands and streams, for the purpose of mechanical placer mining in Alaska, under the terms and conditions of the RGP. Make sure you know the requirements of the RGP! This includes, but is not limited to, submitting an annual report.
- **Nationwide Permit 6 (NWP6) – Survey Activities** – NWP6 can be used to authorize survey activities, such as core sampling, seismic exploratory operations, plugging of exploratory-type bore holes, exploratory trenching, soil surveys, sampling, wetland delineation activities, and historic resources surveys. NWP6 does not authorize permanent structures or fill placed for roads and other similar activities. Temporary structures may be authorized for up to a tenth of an acre of NWOTUS impacts.
- **Individual Permits for Placer Mining** – A Standard Individual Permit is required for activities having more than minimal impact and/or not qualifying for a RGP or NWP. Unlike NWPs or RGPs, a Standard Individual Permit is subject to the public interest review process on a project-specific basis. A public notice will be issued for a Standard Individual Permit application to allow federal, state, and local agencies, adjacent property owners, and the public an opportunity to review and comment on the plan or to request a public hearing. Applications involving public notices are typically completed within 120 days. However, some complex activities, issues or legal requirements may require additional review and take more time. Individual Permits can be modified and may allow mining operations greater flexibility to adjust to changing situations and time extensions.
- **A Letter of Permission (LOP)** is a type of Individual Permit issued through a more streamlined process, where a decision to issue is made within 90 to 120 days. In the Alaska District, LOPs are for activities subject to Section 10 of the Rivers and Harbors Act only. A LOP may be issued for Section 10 only projects where proposed work would be minor, would not have significant individual or cumulative impacts on environmental values, and isn't expected to encounter appreciable opposition. These types of projects usually include minor dredging and construction, maintenance, or replacement of piers, mooring buoys, piles, or floats. Compliance reviews under Section 7 of the Endangered Species Act and Section 106 of the National Historic Preservation Act still apply for a LOP.

RGPs and NWPs have already gone through the required public review process, which helps to shorten the time required for permit authorization. Using the information provided in your APMA, and other information sources, USACE will decide which of these permits, if any, will be required for your operation. The USACE Alaska District Regulatory Division will likely contact you for additional information to determine if you will be working in jurisdictional wetlands or stream channel(s), or to let you know that you do not need a USACE permit.

Contacting the USACE is important if you have not been notified that you do not need a USACE permit or have been contacted by their Alaska District office with additional questions regarding the APMA submitted for your operation. USACE Alaska District also encourages you to contact them with any questions you have prior to submitting your APMA at (907) 753-2712.

Other Lands in Alaska

Alaska Mental Health Trust Authority (Trust)

To provide revenues in support of the Alaska Mental Health Trust Authority's mission to ensure Alaska has a comprehensive integrated mental health program, the Trust Land Office (TLO) manages approximately one million acres of Trust land in Alaska.

Much of the lands managed by TLO were selected for their resource potential, including minerals. Prospective mineral tracts are typically offered for exploration and development through a competitive leasing process.

In addition to an APMA, the TLO requires an approved Plan of Operations for proposed mining on Trust-awarded leased lands. The leases define the fee structures and activities allowed in those lands.

Non-commercial and non-motorized day use in compliance with federal, state, and local laws is permitted on Trust Lands without a permit.

A general permit purchased from TLO is required for non-commercial, recreational activities that involve overnight use, a motorized vehicle (maximum curb weight of 1,500 lb.), firewood harvesting, subsistence activities, trapping access, or aircraft landing. A general permit may be purchased online at: **http://alaskamentalhealthtrust.org/landpermits**.

For more information about mining activities on Mental Health Trust managed lands, please call (907) 269-8658 or email mhtlo@alaska.gov.

Private Lands

Any mining operations on private land involving more than those allowed by the Generally Allowed Uses require submitting a complete APMA to DNR. This will ensure your proposed operation has all the required water use, wastewater discharge, wetlands disturbance, and reclamation plan authorizations.

Alaska Native Regional and Village Corporations

The Alaska Native Claims Settlement Act (ANCSA), signed into federal law in 1971, established 12 ANCSA regional corporations and more than 200 ANCSA village corporations, with each having its own geographical regions based largely on heritage and shared interests.

Under ANCSA, ownership of roughly 45.5 million acres of land has been transferred to regional and village corporations.

Originally, the regional corporations were granted subsurface (mineral) rights and village corporations were granted surface rights to the lands they selected under ANCSA. In some cases, the village and regional corporations have combined to consolidate ownership and governance of their lands.

Much of the land now under ANCSA corporation ownership was selected for its mineral (including placer gold) potential. Permission and stipulations related to mining on ANCSA lands are determined by the regional and/or village corporations that own the land. For more information see the **12 Alaska Native Corporations** website and the **176 Alaska Native Village Corporations** website.

For the purpose of placer mining permitting, ANCSA lands are considered private and require an APMA to be submitted.

MINE SAFETY AND HEALTH ADMINISTRATION (MSHA)

In addition to regulations related to land use and the environment, mining operations in Alaska must

comply with federal mine health and safety regulations administered by MSHA.

Established to carry out the provisions of the Federal Mine Safety and Health Act of 1977, MSHA develops and enforces safety and health rules for all U.S. mines regardless of the size or type of operation.

MSHA requires all placer mine operators to develop and submit a training plan outlining the company's procedure for training miners.

The agency has developed a **safety and health guide** for operators of small mines that details MSHA requirements.

UAF MINING AND PETROLEUM TRAINING SERVICES (MAPTS)

The University of Alaska Fairbanks Mining and Petroleum Training Services (MAPTS) provides training for miners and contract employees working at small, often remotely located mining operations.

MAPTS training courses, which include special emphasis on specific health and safety topics for Alaska mining operations, including Surface New Miner Training and Surface Annual Refresher are offered year-round. On-site training specific to your operation is also available upon request. For more program information visit their website **https://www.uaf.edu/mapts/**, call (907) 262-0231, or email uaf-mapts@alaska.edu.

Conclusion

Whether you are putting together a plan to permit and develop your first placer mine in Alaska or are one of the many longtime placer miners in the state, the PMRN Interagency Group hopes this Guidebook has provided you with helpful tools and insights that will assist the planning and permitting of a profitable and environmentally responsible mine that carries forward an industry and way of life that has been important to Alaska since the Gold Rush days began more than 125 years ago.

While mining in the 21st century is highly regulated and the permitting process can be complex, taking the time to establish a plan that ensures your Alaska mine is financially robust and the mined land is properly reclaimed will help ensure our shared success.

Conducting enough exploration to understand the location of your targeted mineral deposits and to solidly estimate the reserves they contain is essential for developing a financially (and environmentally) successful mining plan and operation.

Land managers and mining-related regulatory agencies at both the state and federal levels are available to help you navigate the complexities of placer mine permitting in Alaska. While these agencies are tasked with ensuring that regulatory requirements are met and Alaska lands are protected for future enjoyment and use, supporting the development of Alaska's rich resources is also part of their mission. Working closely with these agencies will help ensure they achieve their missions, and you achieve your goals.

The successful reclamation of your future mine rests in no small part on the financial success of your placer mining venture – recovering enough of the mineral resource you are extracting to pay for your operation, successfully completing reclamation, and returning a healthy profit are the goals.

> *Land managers and mining-related regulatory agencies at both the state and federal levels are available to help you navigate the complexities of placer mine permitting in Alaska.*

Remember, planning does not end when mining begins! Your mining and reclamation plan is a living document, keep exploring and evaluating future mining areas on your claims to update your plan and permits for ongoing success.

Please see the *Appendices* at the end of this Guide for a glossary, maps, other placer mining guides and handbooks, and additional useful information.

Thank you for reading our Placer Mining 101 Guidebook! Please do not hesitate to reach out to the agencies for support – they are there to help you along the way.

We wish you the greatest success in your future gold mining endeavors in Alaska!

Sincerely,

The PMRN's Interagency Group

PLACER MINING
RESOURCE NETWORK

Glossary

Anadromous fish – Salmon and other fish that spend most of their lives in the ocean but return to freshwater to spawn.

Bank Cubic Yards (BCY) – Refers to the volume of material in its natural, undisturbed state, which is more compact than the same material after it has been excavated and loosened. (see **Loose Cubic Yards [LCY]**)

Best practices – Best practices (sometimes called BMPs for Best Management Practices) are techniques and strategies designed to prevent or minimize pollution, protect natural resources, and promote sustainable practices.

Borrow sites – Borrow sites are areas where material is taken ("borrowed") from one area to use in another area. For construction, these materials are typically soil, sand, or gravel. For revegetation, these materials are typically blocks of intact soil and vegetation like willows taken from a "donor site" and used in the reclaimed area to speed the revegetation process.

Centrifuge bowls – Centrifuges are devices that create a strong vortex to separate sand, gravel, and silt from water. The primary difference between hydrocyclones and centrifuges is hydrocyclones are passive separators that utilize their conical shape to create the vortex, and centrifuges are dynamic separators that spin to create stronger centrifugal force. Both are sometimes used with hard to capture ultrafine gold as a secondary recovery system behind a sluice box. (see **hydrocyclones**, **jigs**, and **spiral separators**).

Corpus – The original principal amount of money that was posted as the financial guarantee for reclamation.

Davis-Bacon Act – Requires that workers on covered projects be paid at least the "prevailing wage" for their specific job classification in the local area where the work is performed. The "prevailing wage" includes a base hourly wage and fringe benefits such as paid leave, health insurance, retirement, and training/apprenticeship program contributions.

Derockers – A derocker washes and separates large boulders from gravel and sand, producing material more suitable for gold recovery equipment.

Fineness (of Gold) – Refers to the purity of gold expressed as parts per thousand of pure gold in an alloy like placer gold that may contain silver or other impurities. Fineness may also be expressed as a percentage. For example, 800-fine would be 80% pure (800 ÷ 1000 × 100 = 80%). The average fineness of placer gold in Alaska is 892-fine (89.2% pure).

Flocculants – Substances added to water to clump small, suspended particles (e.g., sediment) into larger clumps, making it easier to remove suspended sediment from the water. (see **turbidity**)

Floodplain – The lowland and relatively flat areas next to a river or stream subject to flooding. The ground is typically composed of alternating layers of sediment (e.g., gravel, sand, silt, clay) deposited over many years by flowing water.

Generally Allowed Uses on State Lands – Uses and activities on state land managed by the Alaska Division of Mining Land and Water that do not require permits.

Gram – A measure of weight (mass). One gram is equal to 0.035274 ounces or 0.0321507 troy ounces. (see **troy ounce**)

Highbanker – A piece of equipment, often on a stand, consisting of a sluice box, pump, and a hose to move water from a source to a sluice box.

Highbanking – A placer mining and prospecting method that uses a sluice box mounted on a stand and a pump to

recover gold or other metals, often with a recirculating pump for the process water. This method is ideal for use where hauling material to water is impractical or in areas with limited water availability.

Hydrocyclone – Hydrocyclones are devices that create a strong vortex to separate sand, gravel, and silt from water. The primary difference between hydrocyclones and centrifuges is hydrocyclones are passive separators that utilize their conical shape to create the vortex, and centrifuges are dynamic separators that spin to create stronger centrifugal force. Both are sometimes used with hard to capture ultrafine gold as a secondary recovery system behind a sluice box. (see **centrifuge bowls** and **jigs**)

Impaired water – A waterbody that has been identified by a State, Tribe or EPA pursuant to Section 303(d) of the Clean Water Act as not meeting applicable State or Tribal water quality standards.

Instream – Instream refers to the features within a flowing stream, often referring to the habitat for fish and other aquatic life, as well as the physical features such as the streambed characteristics (e.g., sand, gravel, boulders, slope), or the volume and timing of water flow.

Invasive plants – Invasive plants are non-native plants introduced to an area where they did not previously occur and outcompete the native species by spreading aggressively, causing harm to the environment, economy, or human health. Not all non-native plants are invasive; however, some may even be beneficial.

Jigs – A jig uses gravity and pulsating water or air to separate valuable minerals from coarse ores. (see **centrifuge bowls**, **hydrocyclone**, and **spiral separators**)

Jurisdictional Wetlands – These are wetlands considered to be "Waters of the United States" (WOTUS) subject to regulations under the Clean Water Act (CWA). Activities like filling or dredging within these wetlands are primarily regulated by the USACE. Not all wetlands are considered jurisdictional by the USACE.

Loose Cubic Yards (LCY) – Refers to the volume of material after it has been excavated and is no longer in its natural, undisturbed state. Knowing the LCY is crucial for calculating haulage volume, equipment capacity, and overall project efficiency in earthmoving and excavation tasks. (see **Bank Cubic Yards [BCY]**)

Loss – When a business's total costs exceed total revenue.

Navigable Waters – Different agencies and laws define navigable waters differently, the specific water body considered navigable can sometimes be a complex legal determination. See the USACE's **Navigable Waters of Alaska** and the State of Alaska's **Navigability Project** webpages for more details.

Navigable Waters of the U.S. (NWOTUS) – Are those waters subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. This definition does not apply to the scope of "waters of the United States" under the Clean Water Act.

Ore – Mined material with enough valuable minerals or metals to be profitably extracted. (see **reserves**)

Ounce – A measure of weight (mass) or volume, most often weight in mining. One ounce is equal to 28.3495 grams or 0.9114581 troy ounces. (see **gram** and **troy ounce**)

Overburden – Rock or soil lying on top of a mineral deposit.

Overburden (organic) – Topsoil or other materials overlying a mineral deposit that contains plant and animal matter (insects, leaves, microbes, peat, roots, etc.).

Overburden (non-organic) – Materials overlying a mineral deposit consisting primarily of rock, gravel, sand, silt, or clay with little to no organic material.

Pay, paydirt, pay streak, pay material – Refers to the sand or gravel layer containing valuable minerals such as gold.

Placer – Sand or gravel deposited in a streambed, lake, or ocean containing valuable metals or minerals.

Pools – A stream feature that is deeper than the riffle and typically with a lower slope. Pools are formed from a combination of bed scour and backwater processes. They dissipate energy and provide habitat for fish and other aquatic organisms. (see **riffles**)

Profit – The amount of money left over after subtracting total costs from total revenues.

Profit and loss statement – A financial report that summarizes a company's revenues, expenses, and profits or losses over a specific period of time.

Reclamation – The process of restoring the land to a condition that is similar to or better than its pre-disturbed state.

Resources – Concentrations of minerals or metals with sufficient grade or quantity to possibly be of economic interest for extraction. (see **reserves**)

Reserves – Reserves are the portion of resources that can be realistically and economically mined based on location, quantity, grade, and other factors. (see **ore** and **resources**)

Revenue – Total financial income received from selling goods or services.

Revised Statute 2477 (RS 2477) – A statute enacted by the U.S. Congress in 1866 that grants "the right-of-way for the construction of highways across public lands not otherwise reserved for public purposes."

Riffles – Riffles are shallow, steep-gradient stream channel segments typically located between pools. (see **pools**)

Rolling footprint – Also known as concurrent or phased reclamation, involves reclaiming parts of a mine site while mining operations are still ongoing.

Secondary containment – A structure designed as a secondary line of defense to prevent petroleum products from flowing onto the lands or into the water in the event of a failure of the primary containment such as oil barrel or fuel tank.

Settling pond – In mining, a settling pond is used to treat waste processing water allowing sediment (dirt) and other contaminants to settle to the bottom to improve the water quality before the water is reused for processing or the water leaves the mine site.

Slope – Slope is described as the percentage of vertical change in elevation (rise) over a given horizontal distance (run). For example, a 5 ft vertical rise over 100 ft can be expressed as 5% (5 divided by 100 multiplied by 100). Slope can also be expressed as a ratio of vertical change over a horizontal distance (V:H or H:V), which in this example would be 1V:20H or 20H:1V. The vertical change is always expressed as a unit value of 1, so both the vertical and horizontal values would be divided by the vertical rise (in this example 5). Since the "H" and "V" are not always specified, it's important to verify how the ratio is expressed if not indicated.

Spiral separators – A spiral separator uses gravity and water in a vertical spiral-shaped trough to separate the heavier, higher-density material from a slurry as it travels downward. At the bottom of the spiral the heavier mineral concentrate is separated from the waste material. (see **centrifuge bowls**, **hydrocyclones**, and **jigs**)

Suspended sediment – Fine-grained particles like silt and clay that do not quickly settle (silts) or settle at all (clays) to the bottom in water (i.e., suspended in the water). (see **turbidity**)

Tailings – The waste materials produced after the valuable mineral and metals have been extracted from ore.

Tailings (oversized) – Large rocks that are separated from the rest of the ore with screening or other placer mining classification methods that are too large to process with the recovery plant.

Tailings (fine) – Ore material small enough to pass through the screens or other placer mining classification medium and is processed with the recovery plant.

Three-year trailing average – The average gold price over the previous three years.

Troy ounce – A measure of weight (mass) reserved for precious metals based on a Roman measure. One troy ounce is equal to 31.10348 grams or 1.097143 ounces. (see **gram** and **ounce**)

Turbidity – Turbidity is a measure of relative water clarity. Turbid water has high concentrations of suspended solids in the water (e.g., clay, silt, very tiny inorganic and organic matter), making it difficult to see deeply into the water. (see **flocculants** and **suspended sediment**)

Waters of the U.S. (WOTUS) – The CWA defines "navigable waters" as WOTUS, but WOTUS is not further defined in the CWA. The term defines the geographic scope of federal jurisdiction over the nation's waters and has been the subject of much legal and regulatory debate. Contact the USACE for the most recent guidance on WOTUS.

Wetlands – Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Certain wetlands are a subset of the "WOTUS" and may be subject to regulation under Section 404 of the CWA. For Alaska-specific guidelines see **U.S. Army Corps of Engineers Regional Supplement to Wetland Delineation Manual: Alaska Region (Version 2.0)**.

Additional Resources

Online resources produced by state or federal agencies are listed under that agency. Other resources are provided below that list.

STATE AGENCIES

Alaska Department of Environmental Conservation

DEC Spill Reporting Placard –
https://dec.alaska.gov/media/17434/spill-reporting-placard.pdf

DEC User's Handbook – Best Management Practices for Placer Mining: Controlling Pollution to Protect Surface Water Quality –
https://dec.alaska.gov/water/wastewater/mining/

Division of Water / Mining Section –
https://dec.alaska.gov/water/wastewater/mining/

Environmental Data Management System –
https://dec.alaska.gov/water/edms

Placer Mining Settling Pond Design Handbook –
https://dnr.alaska.gov/mlw/forms/apma/2025/pdf/Placer-Handbook-Settling-Ponds.pdf

Spill Response Information -
https://dec.alaska.gov/spar/ppr/

Small Spill Management and Best Practices When Working in Remote Alaska –
https://dec.alaska.gov/media/eovff1e4/remote-camps-spill-prevention-guidance.pdf

Alaska Department of Fish and Game

Fish Habitat Permits for Mining –
https://www.adfg.alaska.gov/index.cfm?adfg=uselicense.mining

Revegetation and Protection Guide
https://www.adfg.alaska.gov/index.cfm?adfg=streambankprotection.main

Alaska Department of Natural Resources

Alaska Mapper (useful for researching mining claims and land ownership, sketching claim maps, identifying navigable waters, and more) –
https://mapper.dnr.alaska.gov/

Annual Mining Reclamation Awards –
https://dnr.alaska.gov/mlw/mining/reclamation/awards/

Application for Permits to Mine in Alaska (APMA) –
https://dnr.alaska.gov/mlw/mining/apma/

Generally Allowed Uses (factsheet) –
https://dnr.alaska.gov/mlw/cdn/pdf/factsheets/generally-allowed-uses.pdf

Information and Resources Fact Sheets –
https://dnr.alaska.gov/mlw/factsheets/

Investigating Claims Before You Buy (factsheet) –
https://dnr.alaska.gov/mlw/cdn/pdf/factsheets/investigate-claims-before-purchase.pdf

Land Administration System (LAS, Case, Land, and Water Information) –
https://dnr.alaska.gov/projects/las/

Nome Offshore Mining Page –
https://dnr.alaska.gov/mlw/mining/nome/

Nome Offshore Suction Dredging (factsheet) –
https://dnr.alaska.gov/mlw/cdn/pdf/factsheets/nome-offshore-suction-dredging-faq.pdf

RS 2477 Rights-of-Way (factsheet) –
https://dnr.alaska.gov/mlw/cdn/pdf/factsheets/rs2477-rights-of-way.pdf

RS 2477 Trails Map –
https://data-soa-dnr.opendata.arcgis.com/maps/f97ec4306fb14ed59c71b02ee8cf0f47/about

Alaska Department of Transportation and Public Facilities

Historic Roads of Alaska –
https://dot.alaska.gov/stwddes/desenviron/assets/pdf/historic/Book_Historic_Roads_2017.pdf

FEDERAL AGENCIES

Bureau of Land Management

Alaska Mining Reclamation Bonding Guide –
https://www.blm.gov/sites/default/files/documents/files/Minerals_Alaska_Reclamation_Bonding_Guide-Ver10.pdf

Mineral & Lands Records System (MLRS) –
https://mlrs.blm.gov/s/

Reducing Preventable Wildlife Mortalities –
https://www.blm.gov/policy/im-2016-023

Spatial Data Management System (SDMS) –
https://sdms.ak.blm.gov/sdms/

Stream Design and Reclamation Guide for Interior Alaska –
https://www.blm.gov/sites/default/files/docs/2023-03/BLM_AK_TR65_508.pdf

Stream Reclamation Basics –
https://www.blm.gov/sites/default/files/docs/2023-03/BLM_AK_Stream_Reclamation_Brochure_TechSeries_1_0.pdf

U.S. Army Corps of Engineers

Alaska District Jurisdictional Determinations –
https://www.poa.usace.army.mil/Missions/Regulatory/Jurisdictional-Determinations/

Alaska District Placer Mining –
https://www.poa.usace.army.mil/Missions/Regulatory/Placer-Mining/

Individual Permit for Placer Mining (Standard Permit) –
https://www.poa.usace.army.mil/Portals/34/docs/regulatory/2024/ENG434509262023.pdf?ver=F_2CfH0Y_K_-pqkiwipWhg%3d%3d

Nationwide Permit 6 (NWP6, Survey Activities) –
https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll7/id/19774

Regional General Permit 04 (Suction Dredging in Tidal Waters) –
https://www.poa.usace.army.mil/Portals/34/docs/regulatory/2024/RGP/RGP%2004%20-%20Suction%20Dredging.pdf?ver=awg3ADVgF62IgN-bvBnKNw%3d%3d

Regional General Permit 08 (Placer Mining) –
https://www.poa.usace.army.mil/Portals/34/docs/regulatory/2024/RGP/RGP%2008%20-%20Mechanical%20Placer%20Mining%20Activities.pdf?ver=L81YiONPpzeY9glmx0XYfA%3d%3d

Regional Supplement to Wetland Delineation Manual: Alaska Region (Version 2.0) –
https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/7608

U.S. Department of Labor, Mine Safety nd Health Administration

Safety and Health Guide for Operators of Small Mines –
https://arlweb.msha.gov/training/materials/small-mine-guide/Small-Mine-E-Guide-English.pdf

U.S. Fish and Wildlife Service

U.S. Fish & Wildlife Service Information for Planning and Consultation –
https://ipac.ecosphere.fws.gov/

U.S. Fish & Wildlife Service Information for Protecting Nesting Birds – https://www.fws.gov/alaska-bird-nesting-season

U.S. Forest Service

USFS Training Guide for Reclamation Bond Estimation and Administration – https://www.fs.usda.gov/geology/bond_guide_042004.pdf

U.S. Natural Resources Conservation Service

NRCS Open-Topped Pipes: A Hazard to Wildlife – https://efotg.sc.egov.usda.gov/references/public/UT/Open-Topped-Pipes_TechNote_June2014.pdf

OTHER RESOURCES

Best Management Practices for Reclaiming Surface Mines in Washington and Oregon – https://www.dnr.wa.gov/publications/ger_ofr96-2_best_management_practices.pdf

Canadian Institute of Mining, Metallurgy and Petroleum 2015 Guidance on Commodity Pricing used in Resource and Reserve Estimation – https://mrmr.cim.org/media/1032/2015-cim-guidance-on-commodity-pricing-used-in-resource-and-reserve-estimation-and-reporting.pdf

Clarkson, R. (1990). Placer Gold Recovery Research Final Summary. Whitehorse: NEW ERA Engineering Corporation. Retrieved from https://ygsftp.gov.yk.ca/ygsftp/publications/tech/placerrecovery.pdf

Clarkson, R. (1990). The Use of Radiotracers to Evaluate Gold Losses at Klondike Placer Mines. Whitehorse: Klondike Placer Miners Association. Retrieved from https://ygsftp.gov.yk.ca/ygsftp/publications/tech/the_use_radio.pdf

Clarkson, R. (2010). The Use of Nuclear Tracers to Evaluate the Gold Recovery Efficiency of Sluiceboxes. Ballarat, VIC: Gravity Gold Conference.

Cost Estimation Handbook for Small Placer Mines – https://dggs.alaska.gov/webpubs/usbm/ic/text/ic9170.pdf

Placer Sampling and Reserve Estimation – https://www.911metallurgist.com/placer-sampling-reserve-estimation/

Society for Mining, Metallurgy & Exploration (SME) Fundamental Elements of Property Value (video) – https://www.smenet.org/Professional-Development/SME-Valuation-Standards-Tutorials/SME-Valuation-Tutorials

Society for Mining, Metallurgy & Exploration (SME) Guide for Reporting Exploration Results, Mineral Resource, and Mineral Reserves – https://crirsco.com/wp-content/uploads/2024/04/usa_sme_guide_2007.pdf

APPENDIX 2: ADDITIONAL RESOURCES

Society for Mining, Metallurgy & Exploration (SME) Standards and Guidelines for Valuation of Mineral Properties – https://www.smenet.org/professional-development/sme-valuation-standards-tutorials

Summary of Gold Fineness Values from Alaska Placer Deposits – https://dggs.alaska.gov/webpubs/mirl/report_no/text/mirl_n45.pdf

Wetland Reclamation for Placer Mining: Recommendations and Guidelines – https://www.kpma.ca/wp-content/uploads/2017/07/KPMA-Wetland_reclamation-final.pdf

Agency Contacts

Agency contacts are listed in alphabetical order with their website, general email address, and phone number. Individual contacts may also be provided. If a general email address is provided, that may often be the best initial contact method since the general email inbox is always monitored so your questions will be forwarded to an available staff.

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC)

DEC – Compliance Program: https://dec.alaska.gov/water/compliance/
Compliance Inspector Supervisor: (907) 269-7440
DEC – Division of Water: https://dec.alaska.gov/water/, (907) 465-5180
DEC – Mining Section: https://dec.alaska.gov/water/wastewater/mining/
Email, the DEC Mining Section at: dec.placer@alaska.gov
Placer Mine Coordinator: (907) 451-2142
DEC – Spill Response: https://dec.alaska.gov/spar/
DEC spill line (Emergency or general assistance): (800) 478-9300
Central Region Email, dec.carspillreport@alaska.gov
Northern Region Email, decsparnregion@alaska.gov
Southeast Region Email, dec.spar.seregion.spills@alaska.gov
Western Region Email, dec.sparwregion@alaska.gov

ALASKA DEPARTMENT OF FISH & GAME (ADF&G) – HABITAT SECTION

Website: https://www.adfg.alaska.gov/index.cfm?adfg=uselicense.main
ADF&G Interior/Northern/Arctic/Fairbanks: dfg.hab.infofai@alaska.gov, (907) 459-7289
Placer activities: (907) 459-7363
Placer activities in Nome area: (907) 459-7373
Regional Supervisor: (907) 459-7282
ADF&G Mat-Su/Palmer Office: dfg.hab.infopaq@alaska.gov, (907) 861-3200
ADF&G Southcentral/Southwest/Anchorage: dfg.hab.infoanc@alaska.gov, (907) 267-2342
Anchorage Regional Supervisor: (907) 267-2342
Kenai Peninsula Regional Manager: (907) 714-2481
Mat-Su Regional Manager: (907) 861-3206
ADF&G Craig Office: dfg.hab.infocga@alaska.gov, (907) 826-2560
ADF&G Kenai Peninsula/Soldotna Office: dfg.hab.infosxq@alaska.gov, (907) 714-2475
ADF&G Southeast/Douglas: dfg.hab.infodou@alaska.gov, (907) 465-4105
Regional Supervisor: kate.kanouse@alaska.gov, (907) 465-4290

ALASKA DEPARTMENT OF NATURAL RESOURCES (DNR)

DNR – Mining Section: https://dnr.alaska.gov/mlw/mining/
Email the DNR Mining Section at: dnr.fbx.mining@alaska.gov
Mine Permitting Office: (907) 451-2736

DNR – Water Resources Section: https://dnr.alaska.gov/mlw/water/
Call: (907) 451-2790

ALASKA DEPARTMENT OF REVENUE (DOR) – TAX DIVISION

Website: https://dor.alaska.gov/
Email the Alaska DOR Tax Division at: dor.tax.mining@alaska.gov
Call: (907) 269-6948

ALASKA MENTAL HEALTH TRUST AUTHORITY (TRUST)

Website: http://alaskamentalhealthtrust.org/landpermits
Email the TLO at: mhtlo@alaska.gov
Call the TLO at: (907) 269-8658

ALASKA NATIVE REGIONAL AND VILLAGE CORPORATIONS

Website listing the 12 Alaska Native Corporations: https://ancsaregional.com/the-twelve-regions/
Website listing the 176 Alaska Native Village Corporations: https://anvca.biz/about-us#0ba280fc-6ffa-4fe3-b084-f41bbe8050e7

NATIONAL PARK SERVICE (NPS)

Alaska Region: https://www.nps.gov/state/ak
Call the Alaska Region at: (907) 644-3510

SALCHA-DELTA SOIL AND WATER CONSERVATION DISTRICT (SDSWCD)

Website: https://www.salchadeltaswcd.org/
Email: info@salchadeltaswcd.org
Call: (907) 616-9146

U.S. ARMY CORPS OF ENGINEERS (USACE) – REGULATORY

Placer Mining website: https://www.poa.usace.army.mil/Missions/Regulatory/Placer-Mining/
Email USACE – Regulatory at: regpagemaster@usace.army.mil
Call USACE – Regulatory District Office at: (907) 753-2712
APMA/Placer Team:
North Section: (907) 753-8039
North Section: (907) 753-5778
North Central Section: (907) 347-6148
North Central Section: (907) 347-1801
South Section: (907) 753-2586

U.S. BUREAU OF LAND MANAGEMENT (BLM) – ALASKA MINING AND MINERALS

Website: https://www.blm.gov/programs/energy-and-minerals/mining-and-minerals/about/alaska
BLM Alaska State Office Public Room: BLM_AK_AKSO_Public_Room@blm.gov, (907) 271-5960
Fairbanks District Office Minerals Program Lead/Geologist: (907) 474-2241
Fairbanks District Public Room: BLM_AK_FDO_PublicRoom@blm.gov, (907) 474-2200
Mining Inspection and Enforcement Coordinator: (907) 271-4227

U.S. DEPARTMENT OF LABOR, MINE SAFETY AND HEALTH ADMINISTRATION (MSHA)

Website: https://www.msha.gov/
Email the MSHA at: AskMSHA@dol.gov
Call to report an accident or a hazardous condition: (800) 746-1553.
Call for general questions: (202) 693-9400.

U.S. FISH AND WILDLIFE SERVICE (USFWS) – ECOLOGICAL SERVICES

Northern Alaska Fish and Wildlife Field Office: https://www.fws.gov/office/northern-alaska-field-office
Southern Alaska Fish and Wildlife Field Office: https://www.fws.gov/office/southern-alaska-field-office
Email either Field Office at: ak_fisheries@fws.gov

U.S. FOREST SERVICE (USFS)

Chugach National Forest:
Email the Chugach National Forest Minerals and Geology Program at:
sm.fs.chugach.minerals_geology@usda.gov
Call the Chugach National Forest Supervisors Office at: (907) 743-9500

Scan to see the DNR
Placer Mining Webpage!

Photo 44. Juneau Mining District Alaska 2020 (DNR).

PLACER MINING
RESOURCE NETWORK