Atlin Placer Mining Best Management Practices Guidebook



June 2014

FINAL

Atlin Placer Miners' Association

BRITISH COLUMBIA

TAKU RIVER TLINGIT FIRST NATION

Ministry of Forests, Lands and Natural Resource Operations
Ministry of Energy and Mines

ACRONYM LIST

APMA	Atlin Placer Mining Association
ATLUP	Atlin Taku Land Use Plan
BC	British Columbia
BMP	Best Management Practices
FCBC	Front Counter British Columbia
FLNRO	Ministry of Forests, Lands & Natural Resource Operations
G2G Agreement	Land and Resource Management and Shared Decision Making Agreement
MBCA	Migratory Bird Convention Act
MEM	Ministry of Energy & Mines
NW	North West
TRTFN	Taku river Tlingit First Nation

Preface

The intent of this guidebook is to provide guidance to the placer mining industry to ensure placer mining activities are planned, designed, implemented and maintained with due regard for environmental protection and respect of cultural values.

The guidebook provides the placer mining industry with current legislative and technical reference material regarding exploration, water management, settling ponds, stream diversions, reclamation, First Nation engagement, and fish and wildlife mitigation. This document provides guidance for the placer mining industry consistent with implementation direction set out in *Wóoshtin wudidaa:* Atlin Taku Land Use Plan. It is the expectation of BC and TRT that placer miners in the Atlin Taku region will use the BMPs that are relevant to their operations, consistent with the management direction set out in the ATLUP.

This guidebook is intended for use by placer miners in the Atlin Taku area. The best practices described in this document do not authorize anyone to conduct or participate in activities that are contrary to any statute, nor do the best practices establish any legal requirements. Placer mining is regulated by the provincial government primarily under the *Mines Act* and the *Water Act,* and miners are responsible for obtaining all necessary authorizations before commencing work.

Mining is one of British Columbia's safest heavy industries, and the Ministry of Energy and Mines is committed to ensuring that BC remains a world leader in mine health and safety practices. The *Mines Act* and accompanying Health, Safety and Reclamation Code for Mines in British Columbia outline the requirements for health and safety at mine sites. Placer miners should review the Health, Safety and Reclamation Code to promote a safe mine site.

The best practices presented here were prepared to assist placer miners in conducting responsible mining. These best practices are informed by applicable legislation and regulations, expert experience, available existing best management documents, and scientific knowledge and literature. The best management practices and strategies provided in this document represent some of the best-known current methods to avoid or mitigate impacts. However, the best practices recommended here do not represent an exhaustive list of available and appropriate best practices. Alternatives to and improvements on these best practices should not be overlooked when planning your proposed works. Best practices only serve their purpose when they are properly applied. Because of this, it is important to ensure that all people participating in your works are aware of the applicable best practices, have the necessary materials available to them, and are properly trained in implementing the chosen best practices. The guidebook will be subject to change from time to time based on the results of effectiveness monitoring, new science and trial results. The guidebook is informed by science and

experience of users; however, there are knowledge gaps and, consequently, opportunities to "learn by doing". To ensure the guidebook remains relevant and up to date, an adaptive management approach will be undertaken jointly by provincial agencies (Ministry of Energy and Mines/Forests, Lands and Natural Resource Operations) and the Taku River Tlingit First Nation.

This guidebook was compiled by members of the Atlin Placer Mining Joint Initiative Working Group, upon request from the British Columbia & Taku River Tlingit Government to Government Forum. The working group includes members from the Province of BC, Taku River Tlingit First Nation and Atlin Placer Miners' Association.

Acknowledgements

We would like to thank all those who took part in the development of the Atlin Placer Mining Best Management Practices Guidebook. A number of groups and individuals, including representatives of the Atlin Placer Miners' Association (APMA), the Taku River Tlingit First Nation (TRTFN), the Ministry of Energy and Mines (MEM), the Ministry of Forests Lands and Natural Resource Operations (FLNRO), individual placer miners and consultants, dedicated a tremendous amount of time and energy to ensure the successful delivery and development of these best management practices.

We would like to particularly thank the members of Atlin Placer Mining Joint Initiative Working Group who offered their time and expertise to review this document. Atlin Placer Mining Joint Initiative Working Group members include Karen Diemert (FLNRO); Jill Pardoe (MEM); Bobby Love (FLNRO); Mark Connor (TRTFN); Julian Griggs (TRTFN); and Randy Miller (APMA). A number of other people provided assistance to the Working Group, including Linda Dandy (APMA); Daniel Johnson (APMA); Randy Clarkson (New Era Eng. Corp.); Chris Apps (TRTFN); Nicole Gordon (TRTFN); Melvin Jack (TRTFN); Kathie Wagar (MEM); Emily Bulmer (FLNRO); and Eric Smith (FLNRO).

Table of Contents

List of Figures

List of Tables

Appendices

1 Introduction

In the Atlin Taku region, the Province of British Columbia and the Taku River Tlingit First Nation (TRTFN) jointly developed *Wóoshtin wudidaa:* Atlin Taku Land Use Plan to identify resource values and to provide strategic management direction for activities occurring on the land base. The plan calls on placer miners to "use best management practices" (Section 6.6.4), and this document was prepared to clarify this requirement.

The intent of the Atlin Placer Mining Best Management Practices Guidebook is to provide guidance to support responsible mining. The best management practices (BMPs) presented here aim to provide the placer mining industry in the Atlin Taku region with tools and knowledge for achieving regulatory efficiency, certainty and timeliness, and an understanding of social responsibility.

Through the procedures detailed in this guidebook, users can work to achieve a balance among the needs of the placer mining industry and other resource uses, First Nations and regulating government agencies. The information provided here should help users exercise their professional and technical judgement in developing site-specific management strategies and prescriptions to meet resource management objectives. The recommendations set out a range of options or outcomes that are acceptable under varying circumstances. The guidebook was prepared to assist placer miners in understanding common concerns associated with placer mining operations and in planning and selecting BMPs. A key principle in this guidebook is to plan ahead. Anticipating challenges is considerably more cost effective than trying to compensate after the fact.

Best management practices are tried and true solutions to common placer mining issues, challenges and problems. The Atlin Placer Mining Best Management Practices Guidebook is designed to be a practical, user-friendly reference and learning tool for all placer mining operators. It provides a chance for the Province of British Columbia, First Nations and placer miners to work as partners, all with an equal understanding of the steps, requirements and expectations for placer mining today in the Atlin Taku region.

The objectives of the Atlin Placer Mining Best Management Practices Guidebook are to:

- Encourage responsible mining in the Atlin Taku, so as to facilitate the longevity of the placer mining industry.
- Provide knowledge/tools to assist the placer mining industry with limiting its impacts on other land use values.
- Provide guidance to new and experienced placer miners on the best ways to conduct their mining activities.

1.1 Why Use this Guidebook

This document exists to help placer miners act as stewards of the land. The information in this document will help to ensure that placer mining activities are planned and carried out in compliance with applicable legislation, regulations, and policies that apply and in a manner consistent with *Wóoshtin wudidaa:* Atlin Taku Land Use Plan. Once informed, placer miners are expected to select the appropriate set of BMPs for their mining activities. Consistent application of the BMPs outlined in this guidebook can provide significant benefits for the placer mining industry, allowing miners to:

- Build positive relationships with local First Nations, communities and other land users.
- Build positive relationships with neighbouring placer miners.
- Reduce conflicts through planning and proper environmental protocols.
- Be efficient, effective, and consistent in working on their mine sites.

1.2 How to Use this Guidebook

Placer miners are encouraged to read and review the Atlin Placer Mining Best Management Practices Guidebook in its entirety before planning their next field season, and to assess how they can incorporate BMPs into their planning, operation and reclamation activities. The Atlin Placer Mining Best Management Practices Guidebook is a tool for mine owners, managers and all levels of workers. All workers on site should be well informed as to the expectations and legal requirements of the mining activities.

In some chapters of this guidebook, BMPs guide placer miners to obtain technical advice and assistance from qualified professionals. For example, when placer miners are thinking about applying for a stream diversion, the stream diversion chapter provides a basic summary of what the placer miner should be prepared to do themselves and what documentation should be prepared by qualified professional(s) as part of an authorization for a stream diversion. Appendix 6 lists the information the placer miner's qualified professional(s) should gather for a successful stream diversion application.

Chapters 3–8 of the Atlin Placer Mining Best Management Practices Guidebook are all organized into five sections:

- The Overview defines the subject, explains how that aspect of mining operations fits into the stages of placer mining (as described in Appendix 1), and why BMPs are important for this subject.
- The Background provides additional material and a more detailed explanation of the topic at hand.

- Context and Management clarifies the particular relevance of this topic in the Atlin Taku, its history, and management considerations.
- The Current Regulatory Requirements section provides a brief summary of provincial and/or federal regulatory obligations and links to relevant documents and references. This summary is not all encompassing, and it is the responsibility of placer miners to be well versed in their regulatory obligations.
- The Best Management Practices section comprises a table identifying the specific BMPs to undertake during placer mining relevant to the topic of the chapter. It is anticipated that placer miners will accept and use these BMPs and also improve and expand on this guide by utilizing field experience, knowledge and ingenuity.

1.3 For Further Information

The placer mining industry is managed on behalf of the Province by the Ministry of Energy and Mines and the Ministry of Forests, Lands and Natural Resource Operations. Placer miners are encouraged to consult these ministries with any questions or to determine what permits and authorizations are required for mining.

Consult FrontCounter BC for further details at:
http://www.frontcounterbc.ca/

FrontCounter BC Smithers
Phone: (250) 847-7356
Fax: (250) 847-7556
Toll free: 1-877-855-3222
E-Mail: FrontCounterBC@gov.bc.ca

1st Floor, 3726 Alfred Avenue
Smithers, BC
V0J 2N0

The Land and Resources and Fisheries departments of the Taku River Tlingit First Nation (TRTFN) manage land and resources in TRTFN territory on behalf of the First Nation. Placer miners working in the Atlin Taku region are encouraged to meet with the TRTFN to discuss any questions or concerns related to their mining activities.

Taku River Tlingit First Nation
Box 132, Atlin B.C.
V0W 1A0
(250) 651-7927

2 Permitting

2.1 Provincial Legislation and Regulations

Mines Act

British Columbia's mineral exploration and mining industry is an integral part of the provincial economy. The Ministry of Energy and Mines manages BC's substantial mineral resources on behalf of the Province. The ministry implements policies and programs that encourage the responsible development of mineral resources and ensures that all mining activities respect the health and safety of workers, the public and the environment.

The *Mines Act* and the accompanying Health, Safety and Reclamation Code for Mines in British Columbia provide the regulatory framework for mining activities in BC, although other legislation may apply to individual projects. Figure 1 outlines the permitting steps associated with placer mine exploration and development. In order to obtain a permit under the *Mines Act* for a placer mine or exploration project, proponents must submit an application to FrontCounter BC. Proponents are responsible for ensuring their applications meet the requirements of the *Mines Act*, the Health, Safety and Reclamation Code for Mines in British Columbia, and other relevant legislation.

Water Act

In British Columbia, the primary provincial statute regulating water resources is the *Water Act*. Under the *Water Act*, a "stream" "includes a natural watercourse or source of water supply, whether containing water or not, and a lake, river, creek, spring, ravine, swamp and gulch." A water licence or an approval under Section 8 of the *Water Act* may be required for placer mining processing activities. The requirement to obtain authorization to use water is dependent on the amount and type of mining or exploration.

- Placer operations processing **greater than 2,000 m^3** of pay dirt per claim (legacy or cell claim) or per lease per year and withdrawing water from a stream using a pump with an intake which measures 2 inches or greater in diamete**r** requires a *Water Act* authorization.
- Small placer operations processing **2,000 m^3 or less** of pay dirt per claim (legacy or cell claim) or per lease per year and withdrawing water from a stream using a pump with an intake which measures less than 2 inches in diameter will generally be considered to be **'prospecting'** and do not require *Water Act* authorization**.**
- Operations proposing to use multiple pumps with a combined intake capacity that is greater than 2 inches in diameter are subject to review and ***may*** require *Water Act* authorization.

- The diversion and dewatering of existing stream channels to access pay dirt requires a *Water Act* authorization.

Water Act authorizations are available through FrontCounter BC.

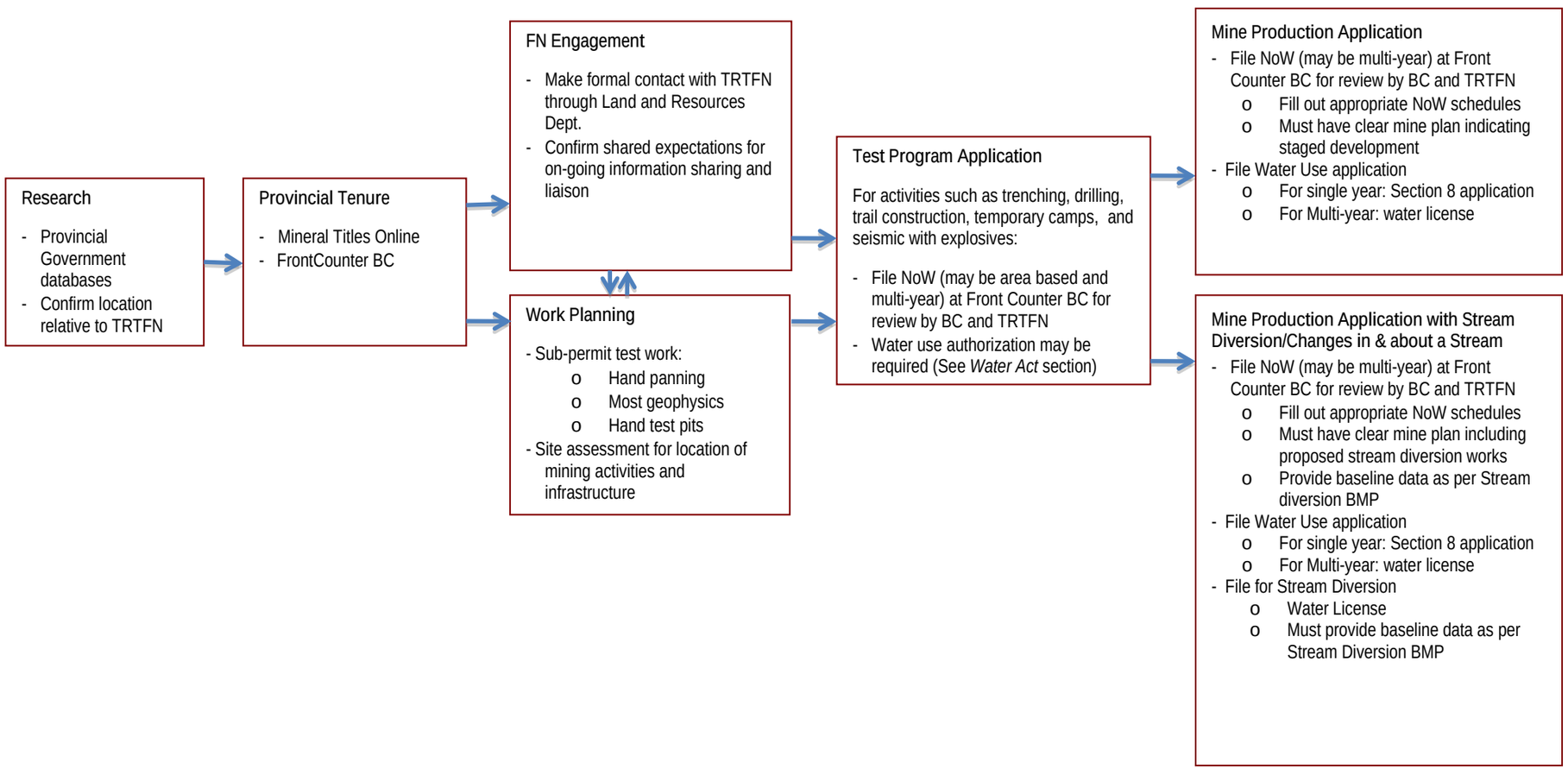
2.2 Consideration of Placer Mining Applications under G2G Engagement Model

Management of land and resources in the Atlin Taku region is undertaken jointly by the Taku River Tlingit First Nation and the Province of British Columbia, according to the government-to-government *Wóoshtin yan too.aat:* Land and Resource Management and Shared Decision Making Agreement (G2G Agreement). That G2G Agreement sets out an Engagement Model which enables both governments to review development applications and generate joint recommendations for consideration by their respective decision makers. The Engagement Model also helps BC and the TRTFN to determine the extent of engagement between them that is needed, based on the location of the proposed activity and the sensitivity of resource values or interests that may be affected.

Upon receipt of a placer application, and prior to initiating engagement with TRTFN, the Province will inform the applicant of the shared decision making approach and will encourage the applicant to contact the TRTFN, and to share application information directly with the TRTFN at a level of detail commensurate with the scale and scope of the proposed activities. Such pre-engagement is intended to allow for applicants and the TRTFN to build respectful and mutually beneficial working relationships.

The relevant TRTFN department will also inform the appropriate provincial agency of the outcomes of any pre-engagement discussions that have occurred related to a given application. It is generally expected that pre-engagement will decrease the length of time for application review.

Figure 1: The steps required for placer mining permitting.



3 First Nation Engagement

3.1 Overview

Both the provincial and Taku River Tlingit First Nation governments encourage mineral exploration and mine development proponents to engage with the TRTFN at the earliest stage and throughout the life of a project.

First Nation engagement[1] involves communication and information sharing between the proponent and the local First Nation regarding a proposed placer project. Early establishment of a mutually respectful working relationship with the First Nation(s) within whose territory mining is to take place can lead to an improved understanding of the scope of the project and phases of work, and provide opportunities to anticipate and resolve concerns that may arise. The sharing of relevant information and timely communication should be continued throughout the life of the mine.

3.2 Background

Early engagement with the First Nation and the local community is now widely accepted as part of standard operating procedures for hard rock mineral exploration and lode mining[2]. Encouraging communities, the First Nation, and placer miners to work together helps to ensure that mining provides long-term benefits to all.

As noted in 2.2 above, in July 2011, the Province of British Columbia and the Taku River Tlingit First Nation signed a G2G Agreement[3] which established a more efficient and effective engagement process, enabling provincial resource management agencies and TRTFN departments to cooperate in good faith and share information as each government reviews and makes decisions on development applications. For developers and investors, the business case for early engagement with First Nations is strong, particularly with regard to ensuring social licence, establishing certainty, and avoiding potential delays in the exchange of information and decision making.

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[1] Section 6.6.1 of the Atlin Taku Land Use Plan provides greater detail with regards to respectful engagement

[2] Several Canadian mining associations offer guidance for their members with regard to Corporate Social Responsibility, including engagement with First Nations : The Association for Mineral Exploration BC Guiding Principles: http://www.amebc.ca/policy/guiding-principles/guiding-principles-sustainable-relationships.aspx
The Prospectors and Developers Association of Canada: http://pdac.ca/e3plus/
The Mining Association of BC http://www.mining.bc.ca/first_nations.htm

[3] Wóoshtin yan too.aat: Land and Resources Management and Shared Decision Making Agreement (G2G Agreement) is available at:
http://www.ilmb.gov.bc.ca/slrp/lrmp/smithers/atlin_taku/index.html

Through the engagement process, both the Crown and the Taku River Tlingit First Nation can fulfill their respective legal duties and responsibilities with regard to consultation and accommodation. Under the G2G Agreement, BC and the TRTFN also agreed to undertake various joint initiatives, including efforts to improve regulatory certainty for placer mining in the Atlin Taku region such as compiling the BMPs presented here.

3.3 Context and Management

Benefits of Early Engagement

Establishment of a working relationship between a proponent and First Nation at the outset of a project complements and potentially streamlines the formal engagement processes between the First Nation and the Crown. Early engagement may therefore:

- Facilitate communication and foster the building of trust.
- Clarify expectations and understanding related to the location, nature and extent of a proposed project.
- Provide opportunities to identify common values, shared interests and concerns that need to be addressed in project design and planning, and to discuss proposed mitigation strategies for potential impacts.
- Allow the First Nation to indicate its support for a proposed project through a Letter of Support or a mutually acceptable agreement outlining possible concerns and mitigation resolutions.
- Identify opportunities for partnership or other benefits or strategies.

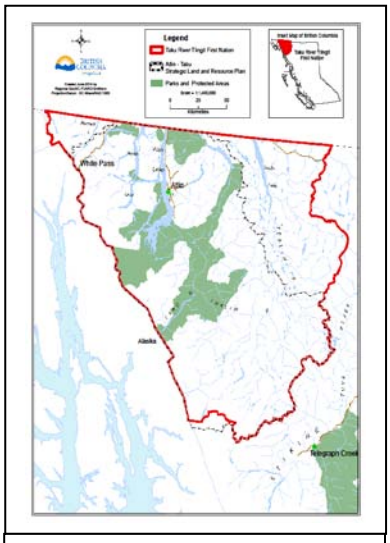

Figure 2: First Nation territory in Atlin Taku Land Use Plan Area (also Appendix 7)

Location

Figure 2 (also Appendix 7) shows territorial boundaries within the Atlin Taku Land Use Planning Area.

Taku River Tlingit First Nation Mining Policy

The Taku River Tlingit First Nation has developed a Mining Policy[4] that indicates how early engagement by proponents and the development of agreements can assist in identifying and resolving concerns, and may streamline the application process and avoid delays in securing regulatory approvals. The TRTFN has also developed a template for an agreement specifically for placer mining operations, which is available from the Land and Resources Department.

The Taku River Tlingit First Nation recommends that proponents initiate discussions with the TRTFN *prior to* submitting applications to provincial agencies for regulatory approvals.

[4] The TRTFN Mining Policy can be accessed online at: http://trtfn.yikesite.com/downloads/mining-policy-2.pdf

3.4 Current Regulatory Requirements

The shared decision making arrangements established under the G2G Agreement do not affect British Columbia's laws or regulations, and provincial agencies continue to issue provincial authorizations for placer operations under the *Mines Act* and the *Water Act* and other applicable statutes.

3.5 Best Management Practices

Management Practices	Methods and Approaches
3.1 Engage in a spirit of mutual respect with local First Nations that are affected by proposed land use activities at the earliest stage and throughout the life of a placer mining project.	A. Make formal contact with First Nations through the relevant land management department before land use activities begin and maintain open, honest and transparent communication. B. Share mining plans related to the project and work cooperatively with First Nations to identify (a) concerns related to project design, planning and implementation, and (b) mitigation measures to be used to address potential social, ecological, environmental or cultural impacts. C. Establish mutually agreeable expectations and understandings regarding proposed activities and ongoing engagement with First Nations.
3.2 Explore benefit sharing opportunities for First Nations and communities.	A. Consider partnership or joint venture opportunities with First Nations and local communities. B. Acquire goods, services and labour locally, where available. C. Create opportunities for training and capacity building for First Nations and local community members.

4 Exploration

4.1 Overview

Exploration is a vital part of any placer mine pre-development and planning process and is ongoing at most operating mines. Accurate sampling and deposit evaluation enables cost-effective mining and reclamation. More placer mine failures can be attributed to a lack of appropriate exploration and sampling than any other cause. Intentional and accidental contamination, small sample sizes, splitting samples and fire assaying are the most common causes of early placer mine failures.

4.2 Background

A variety of exploration methods are used in placer mining. In areas with placer gold potential, initial low-impact and relatively low-cost geophysical techniques, such as electrical resistivity, ground-penetrating radar and seismic refraction surveys, may provide valuable information regarding the depth of overburden and gravels as well as the location of buried channels over large areas. These methods often need to be calibrated with deep excavations, such as shafts and pits, or with drilling. Fully cased rotary drills are probably the most appropriate and successful drilling method for placer deposits in the Atlin Taku region. Other methods such as sonic drilling and reverse circulation drilling may also provide depth information and a small pay gravel sample for analysis. In most cases, geophysical and drilling data will need to be confirmed with bulk testing. All placer gravel samples should be processed in their entirety on small sampling sluices, which can be cleaned easily between samples to replicate operational scale equipment.

4.3 Context and Management

The goal of exploration is to discover and develop a mine. In addition to determining the quantity, location and value of pay gravels in a placer deposit, initial exploration can provide valuable information regarding surface drainage patterns, stream flows, and depths and types of soils. This information can be used in the evaluation of access roads, mine pits, overburden storage and settling pond locations, and can result in more cost-efficient mining.

4.4 Current Regulatory Requirements

No authorization is required for most geophysical surveys, excavation of hand-dug test pits and hand panning. Exploration must only occur on placer claims where you hold title or have written permission from the holder.

Authorization under the *Mines Act* is required for placer test activities requiring use of mechanical equipment and/or establishment of a camp. Application is made through filing of a Notice of Work. Activities requiring a Notice of Work include excavation of test pits with machinery, drilling, and construction or rehabilitation of access trails. Reclamation securities are assessed based on the amount of site disturbance associated with the proposed activities and potential impact on other land values. Prior to commencing activities, securities must be placed and a permit under the *Mines Act* issued. A *Water Act* authorization may be required if using water with mechanical equipment.

4.5 Best Management Practices

Management Practices	Methods and Approaches
4.1 Complete geological and other research prior to staking or acquiring a placer claim or lease.	A. Research the placer history and geological potential of the area from published reports (e.g., reports available on the Ministry of Energy and Mines website) and talk to local placer miners and residents in the area. B. Stake placer claims online in designated placer staking areas only. http://www.empr.gov.bc.ca/Titles/MineralTitles/mto/Pages/default.aspx C. Obtain the most recent air-photos, satellite and Google Earth images, as well the largest scale maps of the area to assist with site assessment and management planning. These data will allow you to plan your exploration program and may alert you to specific physical features that may affect exploration and mining in the area.
4.2 Minimize disturbance due to access roads and trails.	A. Consistent with Section 6.1 of the Atlin Taku Land Use Plan[5], use existing roads and trails for access where possible. If new roads are required, a permit under the *Mines Act* must -authorize them. B. Construct roads and trails consistent with the direction identified in the Guidebook for Mineral and Coal Exploration in British Columbia.[6] C. If using off-road vehicles, use low-impact vehicles and stay on existing trails, especially in

[5] Available at http://ilmbwww.gov.bc.ca/sites/default/files/resources/public/PDF/SRMP/ATLIN-TAKU-LUP.pdf

[6] Available at http://www.empr.gov.bc.ca/Mining/Exploration/Documents/MXHandbook2008-09.pdf

	environmentally sensitive areas such as wetlands, riparian and alpine areas. D. When fording creeks, do so at right angles. E. Plan exploration activities to limit the number of stream crossings. F. Avoid driving vehicles or heavy equipment down active stream beds or backchannels.
4.3 Apply low-impact exploration methods.	A. Use geophysical methods such as electrical resistivity, ground penetrating radar and seismic refraction surveys to explore large areas with relatively low costs and low environmental impacts. B. Use low-impact tracked drilling equipment (where available) to obtain samples from depths greater than 6 m and to confirm/calibrate geophysical information. C. Minimize drill pad size, and leave the topsoil as intact as possible. D. If water is used, excavate a small sump to collect and settle any drill cuttings, and backfill upon completion of drilling. E. Follow setbacks from watercourses as outlined in Table 9.1 of the Health, Safety and Reclamation Code for Mines in British Columbia.
4.4 Reduce impact of sampling pits.	A. Use hand methods or excavators that are sized to minimize ground disturbance. B. Locate sample pits in a systematic manner in a line across the expected pay gravel channel. C. Strip vegetation and soil layers and stockpile separately for use in reclamation. D. Limit sample pit depths to the length of the excavator arm, where practical. E. Reclaim test pits (as per Reclamation BMPs) as soon as possible. Pits should be reclaimed prior to leaving property for the season. F. If pits or trenches are required for the next field season, sides of the excavation must be sloped to a stable and safe angle, with a means of egress.
4.5 Protect cultural landscapes, sites and features of significance.[7]	A. Develop an awareness of cultural heritage resources[8]. B. Develop a procedure for archaeological chance finds as per *Mines Act* permit condition(s).

[7] Cultural landscapes, sites and features of significance to the TRTFN, other First Nations and non-Aboriginal community members include traditional resource harvesting and cultural use areas (and their associated camps, cabins, traditional trails, etc.); village sites, grave sites; archaeological sites; cultural landscapes and features associated with Tlingit history, stories

4.6 Reduce the impact of sample processing.	A. Use a small portable sampling sluice to process pay gravel samples. B. Use groundwater for a water source if possible, and settle and/or recycle process water from a small sump.
4.7 Use low-impact camping techniques.	A. Avoid establishing camps in environmentally sensitive areas, including riparian and alpine areas, areas prone to erosion, areas of obvious high wildlife use, etc. B. If possible, use existing cleared areas to set up camp. C. Set up tents, campers, etc. at least 30 m from any water body. D. Avoid cooking or storing food in or near sleeping tents. E. Drain all dish water into a small sump and fill in the sump when closing camp. F. Follow the Fish and Wildlife BMPs to avoid human/bear and other wildlife conflicts. G. Monitor forest fire potential and use cooking fires when it is safe to do so. H. Pack out all garbage to approved disposal or recycling facilities. I. Build a latrine and/or outhouse far from camp and at least 30 m from any water body, and bury any human waste.

and mythology; and historical feature and buildings related to non-Aboriginal settlers and prospectors (see *Wóoshtin wudidaa:* Atlin Taku Land Use Plan, page 72).

[8] Available at http://www.for.gov.bc.ca/archaeology/

5 Water Management and Settling Ponds

5.1 Overview

Settling ponds and water management are vital components of placer mining operations. Settling ponds are required in the initial mine development to control sediment-laden water due to seepage or erosion, and in placer mine production phases to treat sluice box effluents (i.e., fine tailings). The volume of water that requires settling can be reduced through establishment of ditches or berms to divert surface water flow away from mine workings, and through maintenance or re-establishment of vegetation outside of active mine areas.

Settling ponds can be constructed from old mine pits, large dug outs, or impoundments that allow sediment-laden water to slow down and particulate sediments in the water to drop out of suspension. Proper design, construction, operation and maintenance of settling ponds play a pivotal role in water management and improve discharge water quality.

5.2 Background

Settling ponds are important tools for effective water management on placer mine sites; however, there are a number of limitations that placer miners must be aware of prior to designing their water management systems:

- Settling aids such as coagulants or flocculants can be employed to increase settling efficiency; however; a specialist should be employed as improper use can result in increased toxicity.[9] Placer miners must be vigilant to not introduce pollution when using these products.
- Filter dams and discharge of large volumes of sediment-laden water into the ground have little promise as an effective primary sediment removal technique, except possibly where highly porous soils or abundant (large-scale dredge) tailings are available.
- Recycle systems reduce freshwater demands and allow mining during low flow periods or in drainages where water is scarce. However, placer miners should be aware of the following:
    - A recycle system for process water must take into account the water gain from surface and sub-surface inflows as well as the build-up of settled solids in the pond.

[9] Source: Boffa Miskell Ltd. Beca Carter Hollings and Ferner Ltd. (no date) Overview of the Effects of Residual Flocculants on Aquatic Receiving Environments.

    - More process water may be required for washing pay gravels in recycle systems due to the increased suspended solids concentration.
    - Specialized pumps may be required, and greater pump wear should be expected.
- Recycle systems can be costly due to longer piping networks, frequent pond cleaning, and potential loss of fine gold due to riffle packing.
- The main components of settling ponds are the inlet, pre-settling pond, main settling pond, polishing pond (if required) and outlet. To effectively employ settling ponds to manage water, proper planning, site selection, construction, shape, size, inspection and maintenance are required.

5.3 Context and Management

Water is an important resource. Maintaining water quality downstream of placer operations protects aquatic habitat and drinking water resources, reduces wear on downstream infrastructure, and enables a placer operation to remain compliant with provincial water quality guidelines[10]. Water management is necessary through the projected life of the mine to minimize ground disturbance, minimize runoff from disturbed sites, provide erosion control, remove sediment from flowing water, and keep the ground stable, allowing expedient reclamation.

Responsible placer mining and maintaining water quality go hand in hand.

5.4 Current Regulatory Requirements

Water withdrawals should be limited so sufficient water flows can be maintained within watercourses to protect aquatic life. In times of low stream flow, the Regional Water Manager may limit water extraction in order to protect fish and aquatic life values.

Placer miners should make every effort to limit discharging effluents from mining activities into watercourses and to minimize surface runoff from disturbed areas entering watercourses. An *Environmental Management Act* permit is required to discharge into watercourses unless the stream is listed in the *Placer Mining Waste Control Regulation*[11].

It is contrary to the *Water Act* to work below the high water mark of streams and lakes. If work within this area is required, an authorization under the *Water Act* is required. If proponents intend to build a water intake/stilling trench, construct works to transport water from the source location to a

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[10] Provincial water quality guidelines are available at http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html

[11] *Placer Mining Waste Control Regulation* http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/39_107_89

storage facility or the use site, or conduct any other work that disturbs or damages any soil, trees, stream bank or lakeshore, a water licence must be in place to include these works, and any volume of stored water associated must be identified.

Provincial policy is to maintain a 10 m riparian setback on streams identified in the *Placer Mining Waste Control Regulation*, and on streams not identified.

The federal *Fisheries Act* protects fish and their habitat. Where activities are anticipated in watercourses, placer miners should consult Fisheries and Oceans Canada. Fisheries and Ocean Canada has developed a webpage to help proponents comply with *Fisheries Act* requirements and to evaluate projects for potentially harmful impacts to fish and fish habitat. Visit Fisheries and Ocean Canada's Pacific Region Working near Water webpage for further direction: http://www.pac.dfo-mpo.gc.ca/habitat/index-eng.htm.

5.5 Best Management Practices

Management Practices	Methods and Approaches
5.1 Prevent overland transport of sediment into watercourses and surface water drainages.	A. Divert clean surface water away from disturbed areas. B. Design and construct bypass channels and/or berms to divert surface water away from mined, stripped or stockpile areas and settling ponds. C. Locate the bypass channel: i. Where the ground is stable and not on loose or fine soils. ii. Far enough away from pits and settling ponds so that sediment-laden seepage does not enter from these sources. D. Construct the bypass channel with sufficient armour, grade, and cross-section area to handle seasonal floods from the area that it drains. E. Avoid storing waste rock piles within 10 m of watercourses and surface water drainages.
5.2 Reduce water requirements.	A. Use vibrating screen decks or rotating trommel screens to increase gold recovery and dramatically decrease the amount of water required for treatment.
5.3 Clearly identify 10 m	A. Survey and stake 10 m riparian setback. B. Setback should be clearly visible from all

riparian setback.	types of equipment used on the mine site.
5.4 Install intakes for water supply pumps in a manner that is permanent, protected from erosion, and requires as little subsequent instream work as possible.	A. If an intake/stilling trench[12] is required, design and construct the trench so that: The trench is pointed in a downstream direction such that active flows from the creek do not enter the intake with erosive force (Appendix 3): i. All disturbed bank surfaces are covered in large angular rock. ii. Sediment and silts are not introduced into the stream iii. The trench is positioned in relation to the wash plant and other equipment such that multiple trenches are not created or required. B. Once the intake/stilling trench is no longer needed, reclaim it in a manner that does not introduce sediment into the stream, or cause future erosion or evulsion of the bank.
5.5 Prevent petroleum products from entering streams.	A. Prior to and during construction of settling ponds, confirm equipment and machinery is in good operating condition and free of leaks, excess oil, and grease. B. Fuel or service equipment a minimum of 30 m away from any watercourse or surface water drainage. C. Park machinery and store equipment at least 30 m from any watercourse or surface water drainage. D. Regularly inspect and maintain water pumps for oil and fuel leaks. E. Keep a spill containment kit on site and know how to use it effectively.
5.6 Plan, construct and maintain sound stream crossings to limit erosion.	A. Select the appropriate stream crossing structure for the habitat present and stream gradient.[13] B. Design, install and maintain stream crossing structures to ensure that the crossings do not restrict the cross-sectional area below the high water mark,

[12] The construction of an intake/stilling trench requires a Section 9 approval under the *Water Act* or a water licence.

[13] Direction for selecting the appropriate stream crossing structure can be found in the Fish-stream Crossing Guidebook, which is available at http://www.for.gov.bc.ca/HFP/Fish/Fish-Stream%20Crossing%20Print.pdf

	change the stream gradient, or reduce or restrict fish passage, and to ensure that the streambed characteristics are retained or replicated. C. Minimize or avoid disturbing soil and vegetation above and below the area required for actual construction of the stream crossing. D. Re-vegetate and stabilize the site to prevent post-construction erosion. *E.* Minimize sediment introduction during construction and maintenance of crossings for any stream, including those identified in the *Placer Mining Waste Control Regulation*. F. Minimize clearing width at the crossing site, and retain streamside vegetation within the stream crossing right-of-way wherever possible.
5.7 Design, construct and maintain roads and trails to limit erosion.	A. Construct trails and roads to a standard identified in the Guidebook for Mineral and Coal Exploration in British Columbia.[14]
5.8 Construct the settling pond at the location that best fits the following Best Management Practices.	A. Use previous mine pits where possible for settling ponds to reduce site disturbance and reduce reclamation costs. B. If constructing settling ponds at new mining site, the pond may be excavated in virgin ground and the pay gravels stockpiled for later processing. C. Locate settling ponds: i. In the largest flattest areas available. ii. On gently sloping ground or in a depression that is underlain by impervious consolidated material such as glacial till or bedrock. iii. Outside the streambed and flood plain to avoid wash outs during periods of high flow or floods and/or armour the settling pond bank nearest to the creek to prevent the creek from diverting into the settling pond. iv. Above the high water mark (Figure 3).

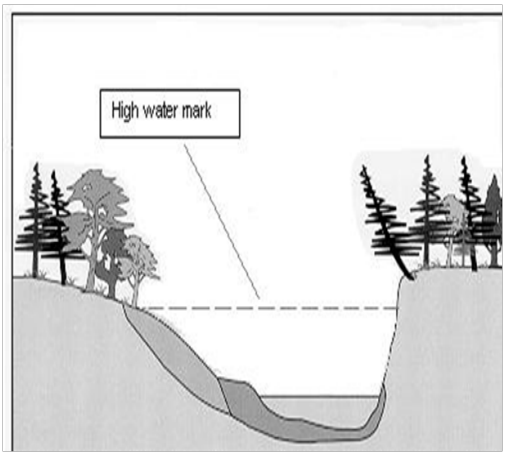

Figure 3: Depiction of high water mark **of**

[14] Available in the Exploration Access chapter at http://www.empr.gov.bc.ca/Mining/Exploration/Documents/MXHandbook2008-09.pdf

	v. A minimum of 10 m away from the high water mark of the stream. vi. Close to suitable dam construction materials and in a location appropriate for dam and dike construction. D. Ensure there are sufficient fine soils at the base of settling ponds and in any dikes to limit seepage. E. Further information on settling pond layout is available in Appendix 4.
5.9 Design and construct an adequately sized settling pond.	A. Design and construct settling ponds to: i. Have a 2:1 side slope ii. Have a minimum freeboard[15] of 0.6 m with the first settling pond having a minimum freeboard of 1.0 m. B. Design a minimum pond depth of at least 1.5 m with a minimum of 0.6 m of water over the settled solids. C. Make settling ponds as large and deep as possible given site-specific factors.[16]
5.10 Construct settling ponds to a shape and configuration for maximum settling efficiency.	A. Construct settling ponds with optimum length to width ratio in the order of 3:1 to 5:1. If the settling pond is too narrow, the higher velocity of the effluent will result in scouring and re-suspension of fine particles. B. Use an inlet structure that aids in distributing water so that it flows evenly across the width of the pond. C. Construct baffles at the pond inlet to spread out the flow of effluent across the pond. D. Where it is necessary to construct or use a square pond or a pond with a length to width ratio of less than 3:1 or 5:1, incorporate berm baffles into the design to increase the effective flow length and reduce short circuiting in the pond. Berms will however, reduce the storage volume of the pond. E. String long geotextile sheets across the

[15]" Freeboard" refers to the distance between the water or sediment surface and the top of the settling pond.

[16] See section 5.3.3 Estimating Pond Size in the Guidebook of Mitigation Measures for Placer Mining in the Yukon, available at http://www.yukonplacersecretariat.ca/pdf/Guidebook_Nov_1_2010.pdf

	settling pond and tie with ropes to anchors or trees. These types of baffles do not reduce the storage volume of the pond.
5.11 Construct pre-settling ponds to greatly extend the life of the main settling pond and improve the final effluent.	A. Construct pre-settling ponds based on the desired frequency of cleaning, approximately 1/5 to 1/10 the size of the main settling pond. B. Build pre-settling ponds to be shallow with a flat hard bottom (Appendix 4). i. Construct as a large depression in the channel between the sluice box and settling pond; or ii. Construct with a shallow berm of tailings across the channel between the sluice box discharge and the inlet to the settling pond. C. Ensure pond is in an area with adequate space to drain and store tailings. D. Frequently remove coarse sediments from pre-settling ponds; this necessary process should be accomplished without difficulty with available equipment. E. Sediment removed from the pre-settling pond should be free-draining enough to use as backfill in the active mining area.
5.12 Properly design settling ponds in narrow valleys.	A. In extremely narrow valleys, it is often better to direct effluent through a ditch to lower wider areas of the valley where an effective settling pond can be constructed. B. If there is insufficient room for a long large settling pond, use a series of smaller settling ponds. C. In small areas requiring periodic pond clean out, allow sufficient space for an excavator or dragline to dig out the sediments and to pile and drain the sediments. Haul dry sediments to a stable location or use for spreading over coarse tailings where topsoil is not available. D. Size the pond system so that sediment removal is not necessary, as sediment removal is generally difficult.
5.13 Build a safe dam/dike.	A. Follow the methods and approaches outlined below, or seek advice from a professional. B. Strip the organic overburden from the dam or dike foundation and set it aside in

	a stable stockpile for later reclamation. C. Construct the dam or dike on a thick layer of fairly impervious consolidated material. Where these materials occur at the surface, or where bedrock has already been reached by mining, special foundation measures may not be required. D. Construct a homogenous earth-fill dam using soils with a large range of particle sizes, ranging from silt to cobbles. The rock tends to hold the dam together while the finer soils help prevent seepage through the dam and generally eliminate the need for an impervious core. E. Avoid use of organic soils, black muck and frozen materials for water retention dams/dikes because these materials lose all their strength when they thaw or are saturated with water. F. Compact dam construction materials by running back and forth with a bulldozer or other heavy equipment. G. Construct the dam so its crest is twice as wide as the bulldozer (or compacting equipment) so that the centre can be compacted. If this is not feasible, drive the bulldozer back and forth over the dam at right angles to the long axis of the dam. H. Place construction materials in thin (<0.3 m) layers and thoroughly compact before the next layer is placed, until a dense firm embankment is achieved. I. Place the coarsest available materials (e.g., coarse washed tailings, broken rock, etc.) along any slopes exposed to flowing water and extend to an elevation 0.6 m higher than the annual high water mark. J. Construct dams to have a crest of at least 3 m, and upstream and downstream slopes of 2.5:1 (h: v) or flatter when constructed of granular tailing materials. Flatter slopes of 3:1 or less may be appropriate where dam heights exceed 3 m or where fine-grained materials are used in dam construction. K. Build outlets to limit the level of water to at least 0.6 m below the top of the dam. L. Construct emergency overflow spillways on the lower portion of the dam at least

	0.3 m above the normal water elevation in the pond. M. Armour the outlet of the settling pond with coarse material to prevent erosion at the toe of the dam. N. Place a minimum of 0.6 m thickness of angular rock averaging 20 cm in diameter on the downstream slope of the dam and at the toe of the spillway. O. Protect the crest of the dam spillway with a least a 0.3 m thickness of 10 cm angular rock. Filter cloth, plastic sheeting, timber cribbing or other materials may be used on the spillway to limit erosion.
5.14 Maintain your settling ponds.	A. A new settling pond should be constructed or sediments should be removed from a settling pond when sediments accumulate to 60% of the design storage volume or when sediments are less than 0.6 m from the water surface. B. If no areas are available for new settling pond construction, the existing settling pond will have to be cleaned out. C. During cleaning, the pond should be dewatered, and all sediment-laden water should be diverted to another settling pond for treatment elsewhere. D. Use an excavator or dragline to remove the sediments. E. Stack sediments removed from ponds to drain in an area that is protected from floods and surface runoff. F. Grade, smooth and then cap sediment stockpiles with a layer of tailings or granular material to prevent erosion.
5.15 Regularly monitor your settling ponds.	A. Inspect settling ponds weekly and after every major storm. B. Conduct a visual inspection of the cut slopes and dikes surrounding the pond, both upstream and downstream, for evidence of instability, overtopping, leaking, erosion or areas where water is seeping through the dam. C. Repair any damage noted as soon as possible to reduce the risk of failure. The

	erosive power of water is remarkable. D. Monitor pond effluent on a weekly basis with an Imhoff cone[17] to determine if it is becoming ineffective due to fill up or short-circuiting[18]. Monitoring with an Imhoff cone will also help protect against high pump wear and riffle packing in recycle systems. Please see Appendix 2 for more information on the use of Imhoff cones. E. If values are greater than 0.4 ml/L in the Imhoff cone, miners should act as soon as possible to prevent further degradation of the water management system.
5.16 Reclaim settling ponds once they are no longer required.	A. Breach settling ponds located higher in elevation and next to the stream channel, and divert any sediment-laden water to another settling pond for treatment. B. Alternatively, divert any sediment-laden water to another settling pond for treatment, then backfill ponds and allow them to re-vegetate. C. Leave ponds with an elevation below the channel to re-vegetate naturally. D. Place/grade coarse (erosion-resistant) tailings over the pond to stabilize the sediments in place if the ponds are located in low-lying areas near the stream channel. E. In areas where required, place riprap to prevent lateral migration of the stream into the settling pond. F. In areas with limited fine soils, spread the fine sediments from settling ponds over coarse tailings to assist in natural re-vegetation.

[17] See Appendix 3: How to use an Imhoff Cone

[18] Short-circuiting is a problematic circumstance in which water bypasses the normal flow path through the basin and reaches the outlet in less than the normal retention time.

6 Fish and Wildlife Management

6.1 Overview

The British Columbia *Wildlife Act* defines wildlife as all native and some non-native amphibians, reptiles, birds, and mammals that live in BC. The Atlin Taku area supports rich northern biodiversity, with significant landscape complexity ranging from coastally influenced to northern boreal inland systems. Impacts to fish and wildlife from placer mining can result throughout the life of a mine and until the reclaimed mine has regained its ecological productivity. Knowledge of mitigation strategies is imperative to minimizing negative impacts to fish and wildlife and their habitat.

6.2 Background

Photo: Conrad Thiessen

The Atlin Taku area supports large, intact terrestrial and freshwater ecosystems; large mammals including mountain goats, Stone's Sheep, northern mountain woodland caribou, moose and grizzly bears. The Atlin Taku area has provided for subsistence wildlife harvest for centuries, including the past century of placer mining. All human activity has the potential to impact fish and wildlife and their habitats. Placer miners should be aware of and strive to reduce human-wildlife conflicts.

While the Atlin Taku area comprises three major drainage basins, the majority of placer interests are within the Yukon River drainage. Many fish species migrate daily and/or seasonally to take advantage of different habitat requirements. In many local lakes, Arctic grayling migrate from the lake into streams to spawn in the spring. Some grayling (both adult and fry) spend the summer months in tributaries of local lakes.

If placer miners intend to work in or about a watercourse, they should determine whether or not fish are present at their proposed mine site.

6.3 Context and Management

The Atlin Taku Land Use Plan (Section 6.3) sets out management direction for wildlife to ensure:

- The health, productivity, distribution and diversity of native species and ecosystems across the Atlin Taku area are maintained.
- Wildlife populations remain healthy enough to sustain hunting and subsistence harvest in the region.
- Patterns of seasonal and regional movement of wildlife are maintained.

Human disturbance impacts wildlife populations at both the individual and regional levels. Disturbance of wildlife during key times can result in:

- Increased vigilance and flight responses (behavioural responses).
- Reduced foraging efficiency, body condition, and growth rates.
- Interference with territory defence and mate choice (specifically songbirds).
- Increased mortality from predation, injury, disease, or climate extremes.
- Physiological responses (increased heart rates, higher cortisone levels).
- Habitat shifts, including increased use of suboptimal habitat.
- Delayed newborn development and abandoned nests.
- Lower survival rates and life expectancies.
- Reduced reproductive success and population productivity (often across years).

When reclaimed, mine sites have the potential to provide functional habitat for wildlife.

Impacts to fish should be minimized by ensuring:

- Degradation of riparian areas that directly influence and provide habitat to fish is minimized.
- Aquatic habitats are not degraded including those located downstream of the mine site.

6.4 Current Regulatory Requirements

Wildlife is protected under the BC *Wildlife Act* and Federally the *Migratory Bird Convention Act* (MBCA), and under the *Migratory Birds Regulations* and the *Species at Risk Act*.

A list of species at risk in the Skeena region is available at: http://www.speciesatrisk.bc.ca/advancedsearch/?district=SKRD. If a species listed in *Species at Risk Act* has been identified at a mine site, please see http://www.sararegistry.gc.ca/.

Fish are protected under the BC *Wildlife Act*, the BC *Fish Protection Act*, and the federal *Fisheries Act*. Fisheries and Ocean Canada has developed a web page to help proponents comply with requirements of the *Fisheries Act* and evaluate projects for potentially harmful impacts to fish and fish habitat. Visit Fisheries and Ocean Canada's Pacific Region Working Near Water web page for further direction: http://www.pac.dfo-mpo.gc.ca/habitat/index-eng.htm

Provincial policy is to maintain a 10 m riparian setback on streams identified in the *Placer Mining Waste Control Regulation*, and on streams not identified.

In addition, any placer miner considering any work within a stream should consult British Columbia's Standards and Best Practices for Instream Works: http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf

6.5 Best Management Practices

Management Practices	Methods and Approaches
6.1 Assess fish values in the vicinity of the mine site prior to development, if the work will affect the watercourse.	A. Placer miners should research what aquatic values are present in the vicinity of their proposed operations before working in or about a creek. Information can be found by: i. Contacting provincial or TRTFN wildlife biologists. ii. Searching government online databases through • Fish Inventory Summary System (FISS): http://www.env.gov.bc.ca/fish/fiss/index.html (look under fish distributions). • iMap BC: http://webmaps.gov.bc.ca/imfx/imf.jsp?site=imapbc (look under all fish points). • DataBC: http://www.data.gov.bc.ca/dbc/geo/wms/index.page (look under known fish observations). B. Use appropriately qualified professional biologists to determine fish presence prior to working within a stream.
6.2 Screen all water intakes.	A. Install a fish guard or screen to exclude fish on all water intakes, ditches, channels or canals. Follow Fisheries and Oceans Canada's Freshwater Intake End-of-Pipe Fish Screen Guideline in your design and operation of fish screens[19]
6.3 Limit adverse affects to riparian and aquatic habitats.	A. Maintain a 10 m riparian buffer strip along all watercourses unless otherwise authorized. B. Prevent ground disturbance that could

[19] Available at http://www.dfo-mpo.gc.ca/library/223669.pdf

	result in a direct effect to critical aquatic habitat[20] and immediately adjacent areas. If no feasible alternative exists, conduct an assessment and fully mitigate the impacts. C. Follow BC Standards and Best Practices for Instream Works[21].
6.4 Assess wildlife values in the vicinity of the mine site prior to development.	A. Placer miners should explore their claims for wildlife values present in the vicinity of their proposed operations before construction. This should identify species utilizing the area. B. Evaluate the results of the site inspection to determine if a critical feature is present (e.g., mineral licks, denning areas, migratory bird nests) and whether your operation would cause an impact. Assistance can be provided through: i. Contacting provincial or TRTFN wildlife biologists. ii. Reviewing maps from the Atlin Taku Land Use Plan[22]. iii. Hiring a qualified professional to conduct field investigation or desktop studies.
6.5 Minimize the impacts of industrial access to ecological values.	A. Plan to use existing industrial access and minimize new road construction. B. If new industrial access is required, operations should: i. Plan and construct access routes to avoid impacts that may have been identified during the site inspection. ii. Plan access routes to avoid through roads. iii. Avoid constructing roads across active floodplain fans. iv. Avoid constructing roads in dry floodplains v. Deactivate, and where appropriate reclaim new roads, when access is no longer required to support mining or other resource development activities.

[20] Critical habitat is shown on Map 7 of the Atlin Taku Land Use Plan.
[21] Available at http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf
[22] A list of a species of conservation concern in 2010 can be found in Appendix H of the Atlin Taku Land Use Plan.

6.6 Minimize impacts to wildlife.	A. Maintain the maximum riparian buffer practical; a riparian setback of 10 m is required, unless otherwise authorized. B. Minimize the removal of vegetation from the mine area. C. Avoid infrastructure and roads within 500 m of mineral licks and trails linking high-value habitats. Do not disturb critical habitat features.[23] D. Yield to wildlife on trails and roads. E. If animals are observed in the vicinity, temporarily delay construction, blasting and other potentially disruptive activities until animals leave the area. F. Beyond the boundary of the mine site, maintain distances sufficient to prevent changes to the behaviour of wildlife (at least 500 m in open areas is the default for large mammals). G. The removal of beaver dams/houses and/or beavers requires a permit under the *Wildlife Act*. H. Follow best management practices for beaver dam removal: http://www.env.gov.bc.ca/wld/instreamworks/beaverdamremoval.htm I. Avoid the removal or disturbance of wildlife dens.
6.7 Minimize the risk of bear/human conflicts.	A. Locate camp facilities in areas that are not frequented by bears B. Reduce bear/human conflict by following the information prescribed at: i. Yukon Guidelines for Industrial Activity in Bear Country: http://www.geology.gov.yk.ca/pdf/Guidelines_for_Industrial_Activity_in_Bear_Country-web.pdf. ii. Get Bear Smart Society: http://www.bearsmart.com. iii. Yukon Environment's How you can stay safe in Bear Country: http://www.env.gov.yk.ca/publications-maps/documents/howyoucanstaysafe.pdf. iv. Proponent's Guide: Assessing and

[23] Critical habitat feature maps are available in the Atlin Taku Land Use Plan.

	Mitigating the Risk of Human-Bear Encounters developed by the Yukon government: http://www.env.gov.yk.ca/publications-maps/documents/proponents_guide_bear_risk.pdf. v. Living with Wildlife Foundation electric fencing guide: http://www.lwwf.org/index.php/resource-guides.
6.8 Wildlife Timing Windows[24] are to be utilized when removing buildings.	A. Clear old buildings in future mining areas in late summer, fall or early spring to avoid destroying barn swallows' nests or bat roosts. B. In the event that timing windows cannot be followed, placer miners should hire a qualified professional to conduct bird nest surveys. C. If the removal of active bird nests is necessary, a permit under the *Wildlife Act* is required.
6.9 Use songbird and raptor timing windows when clearing land.	A. Clear future mining areas and test pits in late summer, fall or late winter to avoid tree removal during critical timing windows for songbirds and raptors. Riparian areas often contain songbird and raptor nests. B. If active nests of birds listed under the *Migratory Bird Convention Act*[25] or *Wildlife Act* are discovered: i. Placer miners should postpone activities in the nesting area until nesting is completed (i.e., the young have left the vicinity of the nest). Miners are reminded that migratory bird species listed under the *Migratory Bird Convention Act* or *Wildlife Act* may nest on the ground, in ground cavities, in grasses, shrubs, cliffs, trees, tree cavities, etc. ii. Any nest found should be protected with a buffer zone[26] appropriate for

[24] See Appendix 5: Wildlife Timing Windows for further information.
[25] Additional information on reducing risks to and avoiding incidental take of migratory bird nests and eggs can be found at Environment Canada's updated website: http://www.ec.gc.ca/paom-itmb

	the species and the surrounding habitat until the young have left the nest.

[26] Information pertaining to appropriate buffers for raptors is available in Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia: http://www.env.gov.bc.ca/wld/documents/bmp/raptor_conservation_guidelines_2013.pdf

7 Stream Diversions

7.1 Overview

In the context of placer mining, a stream diversion is defined as the permanent or temporary relocation/realignment of a watercourse to allow for placer mining activities. Stream diversions may address safety, stability and progressive reclamation. In light of the technical challenges involved in the design and construction of a stream diversion, the application requirements for stream diversions are more detailed than most other permit applications associated with placer mining. Stream diversions must be designed by one or more qualified professionals. This chapter provides a brief overview of the topic with specific requirements for a stream diversion application included in Appendix 6.

7.2 Background

Where exploration activities identify promising deposits of pay gravels located under or adjacent to streams, placer operators may consider a channel realignment/stream diversion as part of their mine plan to facilitate the extraction of the placer minerals. Stream diversions may be required prior to mining those areas in which deep deposits are contained in narrow valleys (where a pit or its walls may intersect the stream channel or mining may result in an unstable perched natural stream channel) and to reduce sediment input into meandering streams which cross the pay gravel channel.

Classes of Stream Diversions

There are two classes of diversions: permanent and temporary diversions.

Permanent Diversions

Permanent diversions are channels that have been designed and constructed to:

- provide long-term channel stabilization and re-establishment of pre-existing riparian areas;
- prevent erosion and the transport of increased amounts of fine and coarse textured sediment downstream; and
- ensure fish access and development of fish habitat occurs within the stream corridor, where fish are present.

Permanent diversions are always located in the lowest portion of the valley floor, where the watercourse is most stable. Permanent diversions must be designed to withstand a 1:100 year flood. Permanent diversions should be of

the same length and gradient as the original stream and have sinuosity[27] unless otherwise approved by regulatory officials. It is always preferable that a natural stream channel be diverted directly into a permanent stream diversion, if circumstances allow.

Temporary Diversions

Temporary diversions provide a stable channel that typically remains in place for a maximum of three (3) years while mining of the pay gravels under and/or adjacent to the original watercourse is completed.

Temporary diversions are designed to prevent stream erosion and increases in downstream sediment transport. A temporary diversion is often located up against the sides of the valley to allow mining of the centre of the valley.

Temporary diversions have the same design criteria (1:100 year flood) as a permanent diversion and utilize flow control structures so as to ensure that stream velocity is no greater than the original stream. Where post-mining reclamation has resulted in the temporary channel being located in the lowest part of the valley or in another very stable location, authorization may be obtained to leave the stream in the "temporary" channel to avoid further unnecessary disturbances.

7.3 Context and Management

Stream diversions allow for improved access to the resource and can improve certain environmental outcomes such as reduced sediment release, increased stability, easily organized reclamation, and reduced mining footprint. However, stream diversions that are under designed/constructed have the potential for significant environmental impacts due to disturbance to flow regimes, increased risk of sedimentation, potential degradation of aquatic and riparian habitat, and greater disruption to other nearby land use activities. Prior to submitting an application, proponents are encouraged to consult with provincial and federal government agencies and the TRTFN to discuss possible issues that may affect stream diversion approval.

Applications for stream diversions in the Atlin Taku will only be considered for authorization when accompanied by documents listed in Appendix 6: Checklist for a New Stream Diversion Application.

Stream diversions potentially allow for the complete extraction of the placer gold resource in specific locations. Applicants wishing to apply for a stream

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[27] Sinuosity refers generally to the degree of meandering of a given watercourse, as is formally defined as the ratio of channel length between two points on a channel to the straight line distance between the same two points. A bedrock stream that flows directly downstream would have a sinuosity index of 1. A stream channel with sinuosity >1.5 is usually classified as 'meandering.'

diversion are encouraged to carefully plan the location of the stream diversion in order to permanently relocate a stream.

7.4 Current Regulatory Requirements

Authorizations under both the *Mines Act* and the *Water Act* are required for stream diversions.

A *Mines Act* authorization is required for placer mining activities and any proposed stream diversion and associated structures, and must be illustrated on the mine plan. Exploratory work, to outline the resource and the need for the diversion, is to be completed prior to submitting an application for construction of stream diversion works. All proposed works must lie within the placer tenure that the miner holds (or for which the miner has a written agreement with the holder) and must be approved by the inspector of mines prior to construction. Reclamation securities for proposed mine works are assessed by the inspector and are held under the *Mines Act* permit.

The diversion of a stream into a constructed stream channel requires authorization under the *Water Act*. A water licence specific to the stream diversion must be obtained prior to excavating a diversion channel and diverting water into the stream diversion channel. The water licence allows for works in and about a stream and diversion of water flow, and it provides the placer operator with the ability to construct and maintain the works authorized by the licence. Securities held under the *Water Act* may be required. A *Water Act* authorization is required prior to any stream diversion construction, even if the applicant already has a *Mines Act* permit.

A *Fisheries Act* authorization may be required, and an application for review of the project should be submitted to Fisheries and Oceans Canada. Proponents should access Fisheries and Oceans Canada's "Projects Near Water"[28] web page and follow the directions to evaluate the project for potentially harmful impacts to fish and fish habitat and to submit an application.

Placer miners considering any work within a stream should adhere to British Columbia's Standards and Best Practices for Instream Works: http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf

Appendix 6 specifically identifies what is required for a successful stream diversion application. Placer miners are encouraged to examine these documents and make sure all components are included in their application. The approval or refusal of a stream diversion application will be accompanied by a rationale.

[28] http://www.pac.dfo-mpo.gc.ca/habitat/index-eng.htm

7.5 Best Management Practices

Management Practices	Methods and Approaches
7.1 Be proactive and engage early.	A. Prior to submitting an application, proponents are encouraged to consult with government agencies and the TRTFN well in advance of information collection for their proposed activities.
7.2 Minimize site disturbance.	A. Use old stream channels where practicable. Old diversions and relic channels may make for stable diversions because they have adjusted to existing stream flows and site grades. B. Design for permanent rather than temporary channel when practicable.
7.3 Ensure that the application is complete.	A. Produce an environmental management plan consistent with the Checklist for a New Placer Mining Stream Diversion (Appendix 6).
7.4 Determine the professional services required for your project.	A. Engage qualified professional(s) with the appropriate specialization for each stage of the diversion. These professionals might include: i. Geotechnical Engineer ii. Hydrologist/Geomorphologist iii. Fisheries Biologist
7.5 Document existing mine site and existing stream channel characteristics.	A. Provide photographs taken of: i. The upstream, downstream and cross mid-channel view of the portion of stream to be diverted. ii. Areas of major barriers/obstructions. iii. Fish spawning sites and/or habitat features. iv. Bank features such as flood signs, high banks, bank failure, etc.

8 Reclamation

8.1 Overview

In the mining context, "reclamation" refers to activities that are intended to return land disturbed by exploration or mine operations to an end land use that considers previous and potential future use of the land. In the Atlin Taku area, the designated end land use for placer mine sites is a combination of functional wildlife habitat, recreation, potential future placer mining, and opportunities for the continuation of Tlingit *ḵhustìyxh* (way of life). Reclamation is a critical component for all phases of exploration and mining programs.

8.2 Background

Reclamation should be progressive and occur throughout the life of the mine. The goal of reclamation is to ensure environmental protection, site safety and land productivity. The key components of reclamation include re-establishment of natural drainage patterns, erosion control, de-compaction (where needed), re-contouring, replacement of growth medium (where available) and appropriate re-vegetation**.**

Progressive reclamation will be easier to complete and less expensive than if all reclamation is done at the end of the mining operation. For example, it is much easier and less expensive to proactively manage erosion than it is to stop gullying and stream channel erosion once these processes have begun. A well-planned work program including stripping, stockpiling, mining and water management will facilitate successful site reclamation.

8.3 Context and Management

Placer mining has taken place in the Atlin Taku area for well over a century. Over this time, society's approach to and understanding of land use has changed. Until the latter part of the 20th century, no legislation was in place to ensure that land disturbed by industrial activities was reclaimed. Since 1969 miners in BC have been legally required to reclaim disturbance caused by mining activities.

Historic mining practices have resulted in several areas where much of the finer-textured soils and growth medium have been washed away, hindering natural vegetation from re-establishing. Where environmental disturbance occurred prior to enactment of the 1969 reclamation legislation, the current

miner is not responsible for re-vegetating this portion of the mine site[29] unless further work is in that location. When a miner works an area they assume the responsibilities to reclaim it. Mine sites are required to be reclaimed to a similar capability that existed prior to the current mining activity. Proper salvage and stockpiling of surficial soils that contain organic matter and fines during the site preparation phase, and re-application of these following mining operations, are key to ensuring successful reclamation.

Historic mining has established trail access, which has facilitated use of lands within and proximal to placer areas for hunting and other recreational purposes. As these access trails often pre-date the 1969 legislation and are a valued resource for other land users, reclamation of these trails is generally not required.

8.4 Current Regulatory Requirements

The reclamation of placer mines falls under the legislative umbrella of the *Mines Act*. Mine owners are legally required to reclaim their sites in accordance with the *Mines Act*, the Health, Safety and Reclamation Code for Mines in British Columbia (the Code), and their operation's specific permit conditions. Prior to the commencement of mining activities, proponents have to post a financial security. The amount of this security is determined by the provincial inspector of mines and is based on an estimate of how much it would cost the Province if the responsibility to clean up a mine site were to revert to the Crown. Securities are not returned to proponents until they can demonstrate to inspectors of mines that their sites have been appropriately reclaimed. Reclamation includes the removal of equipment, buildings, and miscellaneous debris as well as contouring, re-establishing site drainage and stability, and re-vegetating the surface with plant species appropriate to the site. Evidence of successful vegetation recovery must be present prior to return of securities. This will generally require a full growing season to adequately demonstrate success.

The Health, Safety and Reclamation Code for Mines in British Columbia outlines the need to file a Notice of Work, including the proposed mine plan, reclamation program, and other information that the inspector may require. No mining activities which include mechanical surface disturbance may proceed without the inspector issuing a permit or authorization.

It is generally a condition of *Mines Act* permits for placer mining that an annual summary of activities be filed, which details site disturbance and reclamation.

The objectives of the portions of the Health, Safety and Reclamation Code for Mines in British Columbia that address reclamation are to:

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[29] As noted in Part 10.7.3 of the Health, Safety and Reclamation Code for Mines in British Columbia.

- Ensure long-term stability of land, watercourses and access roads.
- Reclaim each mine site to an end land use that considers previous and potential future uses.
- Within the context of the approved end land use, provide an average land capability that is equivalent to or better than that which existed prior to the mining activity.

The Health, Safety and Reclamation Code for Mines in British Columbia and the BC *Weed Control Act* describe requirements to control designated noxious plants on mine sites. Information on noxious plants can be found at http://www.agf.gov.bc.ca/cropprot/noxious.htm.

8.5 Best Management Practices

Management Practices	Methods and Approaches
8.1 Plan for progressive reclamation including ongoing monitoring.	A. Develop a reclamation plan prior to the start of development that incorporates applicable BMPs. B. Budget adequate time and resources for reclamation. C. Collect information about pre-mining site conditions, which may include soil testing and vegetation information. D. Take a phased approach to site reclamation, limiting areas of disturbance to what is actually needed for operations in any given season, and reclaiming as soon as possible when mining is completed in each area. E. Plan to minimize disturbance to instream[30] and riparian vegetation and other features, including trees, bushes, shrubs, weeds or tall grasses along any stream bank; mats of floating vegetation; overhanging vegetation; natural large woody debris; and large boulders where permitted instream work is expected.
8.2 Monitor reclamation throughout the life of the mine.	A. Monitor progressive reclamation throughout the life of the mine. If reclamation is not successful, return to the site and reclaim it using alternate methods and/or consult a professional. B. Miners are encouraged to provide geo-

[30] "Instream" refers to all areas below the high water mark of a watercourse or waterbody.

	referenced photo documentation of reclamation and re-vegetation progress.
8.3 Stockpile stripped soils and surface materials to facilitate reclamation.	A. Strip surface soils and fines to the greatest depth possible and stockpile separately from other overburden. B. Strip and set aside pods of vegetative mat where available and stockpile root side down, in a single layer if feasible, or use this material to cover stockpiled soil for later use. C. Pile small trees, shrubs and grasses with the top layer of organic soil to provide some protection of the stockpile from wind and surface water erosion, reduce root disturbance, and maintain natural seed stock. D. Stockpile large trees removed during site preparation for later placement to limit site access and provide protection for re-establishment of natural vegetation. E. Cover newly re-contoured land with available recently stripped surface soils for maximum reclamation effectiveness.
8.4 Prevent the introduction of invasive species.	A. Clean all equipment before it arrives on the mine site. Equipment cleaning helps to prevent the spread of weeds that could be lodged in equipment and will minimize the cost of invasive species control later. B. Promote natural re-vegetation in order to minimize the introduction of noxious weeds. C. If necessary to re-vegetate, use appropriate species and monitor re-vegetation success. D. Familiarize yourself with invasive species, and if you find them on your mine site, contact the mines inspector, range officer or NW Invasive Plant Council[31]. E. Remove noxious plants on the mine site consistent with the Health, Safety and Reclamation Code for Mines in British Columbia and the *Weed Control Act*.
8.5 Backfill test pits and trenches.	A. Ensure that backfilled material does not contain any materials that are deleterious to the environment (e.g., treated wood,

[31] Noxious weeds can be reported to the Northwest Invasive Plant Council at 1-866-449-3337 or at http://nwipc.org/.

	hydrocarbons, etc.). B. Apply a top layer of stockpiled soil, growth medium, and/or tailings fines where available. C. Minimize compaction of replaced growth medium. D. Replace stockpiled vegetation if available.
8.6 Remove all buildings, machinery and debris from the mine site.[32]	A. Remove and properly dispose of all buildings, machinery, equipment, cables, culverts and other debris located on the mine site. B. Remove and/or deactivate all utilities and septic systems, including drain fields and holding tanks. C. Obtain written permission from the inspector of mines to bury material onsite with suitable overburden and growth media only where removal of large machinery or foundations is not practical, and where the material will not create an environmental hazard. D. Ensure the removal and safe disposal of petroleum products and any other chemicals used in the mining operation. Disposal should utilize local recycling facilities and must comply with local landfill requirements. Where materials cannot be properly disposed of locally, alternative disposal at appropriate facilities must be arranged. E. Currently there is limited waste-oil recycling in the Atlin Taku area and the Yukon. Contact the Atlin Community Improvement District landfill[33] to determine if arrangements can be made for disposal. F. Many small community landfills, including the Atlin Community Improvement District landfill, do not accept hazardous waste. Consult the BC Hazardous Waste Legislation Guide[34] to learn how to properly dispose of this type of waste.

[32] Further information is available at the Omineca Region Environmental Protection Division Industrial Camps website at http://www.env.gov.bc.ca/epd/regions/omineca/env_mgt/ind-waste/ind-camps.htm

[33] Atlin Community Improvement District PO Box 388 Atlin BC V0W 1A0 1-250-651-7582 atlin-cid@atlin.net

[34] Available at http://www.env.gov.bc.ca/epd/hazwaste/regs/pdf/haz_waste_leg_guide.pdf

	G. Dispose of drained oil filters and used plastic oil containers at the Atlin Community Improvement District landfill. H. Take recycling and waste to the Atlin Community Improvement District facility. I. Arrange to properly recycle scrap metal. (Please note that the Atlin Community Improvement District landfill does not have the capacity to handle commercial volumes of scrap metal.)
8.7 De-activate or reclaim roads and trails where required by permit conditions.[35]	A. Scarify (roughen the surface) and rip road surfaces. B. Re-establish natural gullies and swales that occur above and below the old road so that surface drainage patterns are re-established. C. Fill road cuts that may be barriers to wildlife in a manner that permits animal movement. D. Re-contour, to blend in with natural landforms, sections of road that are unlikely to have long-term stability. E. Remove culverts and bridges.
8.8 Establish landforms and structures to reduce potential for erosion.	A. Design drainage so as to avoid water erosion and to minimize disturbance to vegetation, including re-vegetated areas. B. Design drainage channels for maximum (peak) flow events, and armour turns and drops in elevation with rock. C. Utilize earth, rocks, logs and brush to assist in stabilization of reclaimed slopes. Bioengineering practices can be beneficial both from a re-vegetation and a stabilization perspective. Professional advice is strongly recommended when dealing with steep gradients and erodible materials. D. Remove culverts and use water-diversion means, such as slope drains, to return drainage patterns to their original patterns. E. Provide coarse drain rock with appropriate filter materials in areas where

[35] For more information, see the road deactivation chapter in the Forest Road Engineering Guidebook at www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/Road/FRE.pdf

	bank seepage occurs to carry seepage safely F. Cut through roads and dikes that pose a threat to watercourses in the event of their failure, and route drainage away from the watercourses. G. Reduce the exposure of soil, silt and sediments to water by diverting surface drainage away from erodible slopes and surfaces. H. Utilize sediment control measures[36] while constructing the final drainage system to reduce the effects of erosion. Use the coarsest available materials (rock) to control the force of water. Use rock to: i. Cover slopes that are difficult to re-vegetate. ii. Line ditches that might easily erode. iii. Weigh the bottom of slopes to prevent slope failure. iv. Protect stream-crossing structures. v. Protect outlet areas such as culverts and drainage ditches from scour. vi. Protect stream banks.
8.9 Roughen slope surfaces and re-contour piles and other disturbed areas.	A. Grade steep slopes and tailings piles; surface erosion from slopes is greatest during the first year following disturbance. B. Contour side slopes and piles so that they blend with the natural topography of the surrounding area. C. Grooving, furrowing or making steps parallel to the slope is recommended on steep slopes (i.e. greater than 3:1 horizontal to vertical) (**Figure** 4). Loosening of compacted (top) soils or light tracking to encourage moisture infiltration is sufficient for less steep slopes (i.e. less than 3:1 horizontal to vertical). D. Rip terraces into soft rock slopes with a

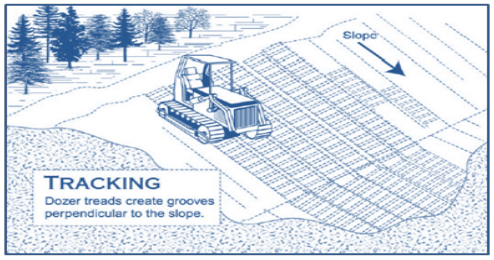


Figure 4: Tracking
(Source: Virginia Department of Forestry, 2003)

[36] Sediment control measures are techniques used to slow and minimize erosion and relate to a whole host of activities, including lining erodible areas around culverts or bridge abutments with coarse rock. Other erosion control measures include the use of mulch, rolled erosion control products, straw wattles, seeding, check dams, and polyethylene sheeting. Further information pertaining to the application of erosion and sediment prevention is available at http://www.crd.bc.ca/watersheds/lid/erosion.htm.

	dozer crawler tractor (Figure 45). Terraces should achieve an overall slope of no steeper than 1:1 (horizontal to vertical) unless soils or rock conditions will allow for a steeper stable slope. E. Tracked equipment should travel up and down the slope for safety and to ensure track cleat marks are parallel to the slope (Figure 45). F. Ensure all mine site surfaces are not compacted.
8.10 Return growth media to ground surface.	A. Replace stockpiled soil and surface materials once the placer mine site or part of the site has been re-graded. B. Use fine tailings in reclamation to assist in providing a growth media in areas where historic placer mining activities have removed much of the natural soil and fine material. C. Ensure that applied soils: i. Are rough and loose with lots of small depressions for seeds to lodge in and germinate. ii. Incorporate roots, stumps and other woody debris to reduce erosion and create greater biological diversity. D. Create islands of vegetation in large stripped areas to act as a nearby seed source and promote vegetation. E. Avoid applying soil materials during significant wind or rain events. F. Use advanced erosion protection techniques in areas of high erosion.
8.11 Re-vegetate to a self-sustaining state using appropriate plant species.	A. Maximize opportunities for re-vegetation by: i. Assessing the effectiveness of natural re-vegetation resulting from replacement of salvaged soil materials, vegetative mat and other stockpiled organic materials. ii. Transplanting willow and other shrubbery into prepared ground[37] to create islands of vegetation in large cleared areas where there is adjacent

[37] A guide to stream bank and lakeshore stabilization and soil bioengineering is available at http://www.fs.fed.us/publications/soil-bio-guide/.

	natural vegetation. iii. Consulting with the inspector of mines to determine appropriate re-vegetation measures. It is essential that in areas that are to be seeded, ecologically suitable species are used[38]. iv. Only using fertilizer under the direction of an appropriate BC government representative and in accordance with aquatic safety guidelines. B. To ensure natural re-vegetation success, miners are encouraged to seek the advice of a qualified professional. C. In areas of minimal growth medium or poor natural re-vegetation, seeding with short-lived plant species should be considered. This will help secure the growth medium until such time as natural vegetation can re-establish itself. D. To maximize success of seeding, seeding is most suitable in spring or fall.
8.12 Restore aquatic habitats and riparian areas that have been disturbed during instream work (if applicable).	A. Follow the provincial Standards and Best Practices for Instream Works[39]. B. Grade disturbed areas to a stable angle of repose or shallower after work is completed. Planting on gentle slopes can provide greater re-vegetation success. In addition, re-vegetate areas to prevent surface erosion and subsequent siltation of the watercourse. Seek a qualified professional or take an approved bioengineering course for remediation and /or bioengineering when planning significant instream work. C. Protect disturbed soil areas on the steep banks and immediately adjacent to the stream from surface erosion by: i. Hydro seeding with a heavy mulch ii. Using a tackifier, and seed mix iii. Installing erosion blankets iv. Re-vegetating

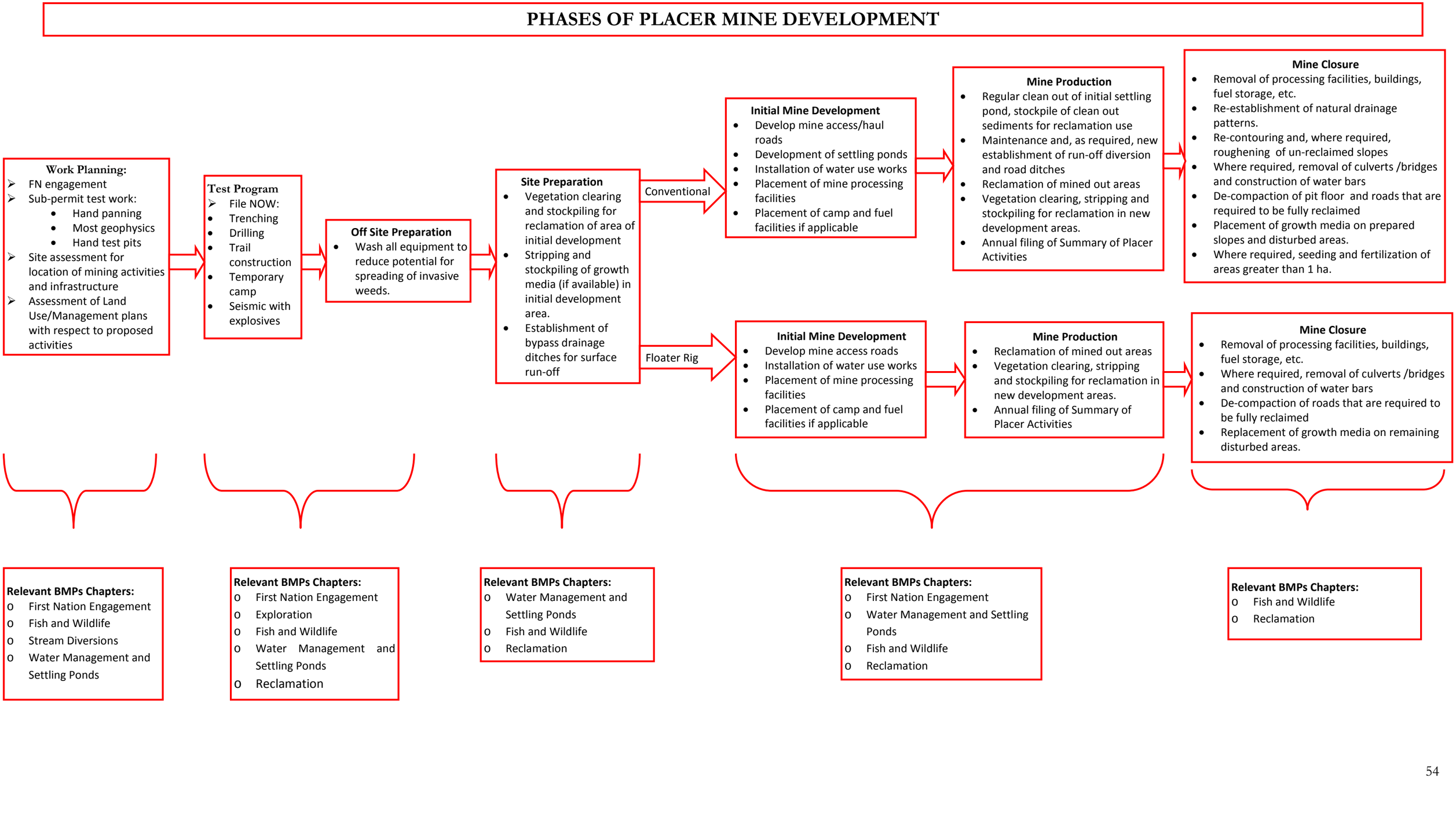
[38] All seeds are to meet or exceed Canada Common #1 specifications as defined by the *Canada Seed Act* to reduce the risk of noxious weed introductions. The "Certificate of Seed Analysis" should be reviewed to ensure that invasive plants are not accidentally introduced.
[39] Available at http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf

	D. Where instream works have been approved, install aquatic habitat features in fish-bearing streams if prescribed by a qualified professional or as part of permit conditions. E. Use rip rap to armour erosion-prone portions of the disturbed watercourse, such as the outside of stream bends.

Table 1: Recommended Slope Grades for Soil Types

Slope	Soil Characteristics	Recommended Procedure
Side Slope	Fine, poorly-drained soil	Grade slope to less than 3:1.
	Coarse, well-drained soil	Grade slope to less than 2:1. Bench or terrace if slope is over 15 m high.
Pile	Coarse, well-drained soil	Grade slope to less than 2:1. Round off the top of the pile.
	Fine, poorly-drained soil	Grade slope to less than 3:1. Round off, reshape, re-contour top of pile.

Appendix 1: Diagram Identifying the Phases of Placer Mining and the Corresponding Best Management Practice Chapters Most Relevant to Each Phase.



Appendix 2: How to Use an Imhoff Cone

Recommended sampling should be done:

- Weekly and
- After every major precipitation event
- Anytime you suspect sediment discharge has increased

Recommended sampling locations should:

- Be representative of the discharge
- Be easy and safe to access throughout the field season
- Include all outfalls of the settling ponds and above the mine site if the stream appears sediment laden

Equipment required:

- Imhoff cone and stand
- Stirring rod
- Timer
- Water Monitoring Form

To use an Imhoff cone:

1. Always collect water from the same locations.
2. Collect a grab sample from the water and pour into the Imhoff cone.
3. Shake the contents of the Imhoff cone to ensure suspension.
4. Place Imhoff cone in its rack.
5. Set a timer for 45 minutes. After 45 minutes, gently run a stirring rod along the edge of the cone to loosen any particles stuck along the edge of the sides of the cone. This is an important step in order to collect an accurate measurement.
6. Set timer for 15 Minutes and allow cone to settle.
7. After the 15 minutes, measure the volume of settleable solids by recording the height (meniscus) of the solids in the cone (the height of the dark substance on the far right cone in (Figure 5).
8. Record your data as mg/L on the attached to show your due diligence (the form is for miners' use only).

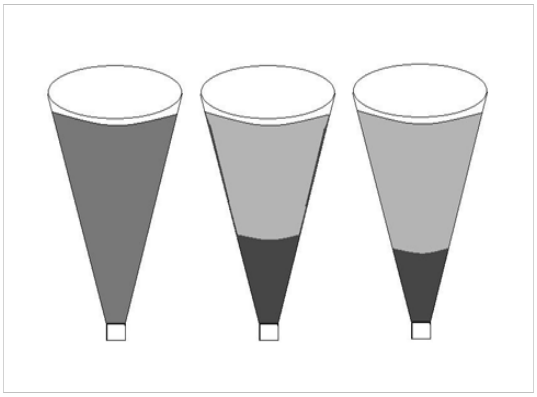


Figure 5: Imhoff Cone with sample water. From left to right: filled with sample; after 45 minutes of settling; and after one hour of settling.

WATER MONITORING FORM

Placer Mine Operation:_____

Watercourse:

_____

Location (UTMs): _____

Location of sample sites in relation to work activities and settling ponds

(Please draw a map below)

N

Measurement device: Imhoff Cone Other: _____

Date	Sample location	Time	Initial of Recorder	Date	Sample location	Time	Initial of Recorder

Appendix 3: Placer Mining Water Intake Guidelines.

Screening

Intakes must be screened according to DFO guidelines. The full document, Freshwater Intake End-of-Pipe Fish Screen Guideline can be found here: http://www.dfo-mpo.gc.ca/library/223669.pdf

Intake Structures

The preferred method of water intake pump installation is to screen the intake, and place the weighted intake directly in the stream without any disturbance or damage to soils, trees, or other riparian features. Intake structures should cause as little disturbance to the bank of the stream as possible. In some locations, an excavated intake trench is necessary in order to maintain a stable intake. A Section 9 or Water licence is required to construct any intake trenches or ponds. In these cases, disturbance must be kept to a minimum and follow the suggested guidelines below and permit conditions.

Location

- Excavated intake trenches no closer than 20 m to an existing tributary on the same side of the stream.
- NOT on an outside bend of a stream – this is an active area for erosion.
- A permanent location must be chosen if an intake trench is used. If an intake is going to be moved, a floating or weighted intake that does not require excavation on the bank is required.
- Avoid cutting or removing vegetation when at all possible.
- The trench shall point in a downstream direction so the force of the creek does not enter the intake trench.

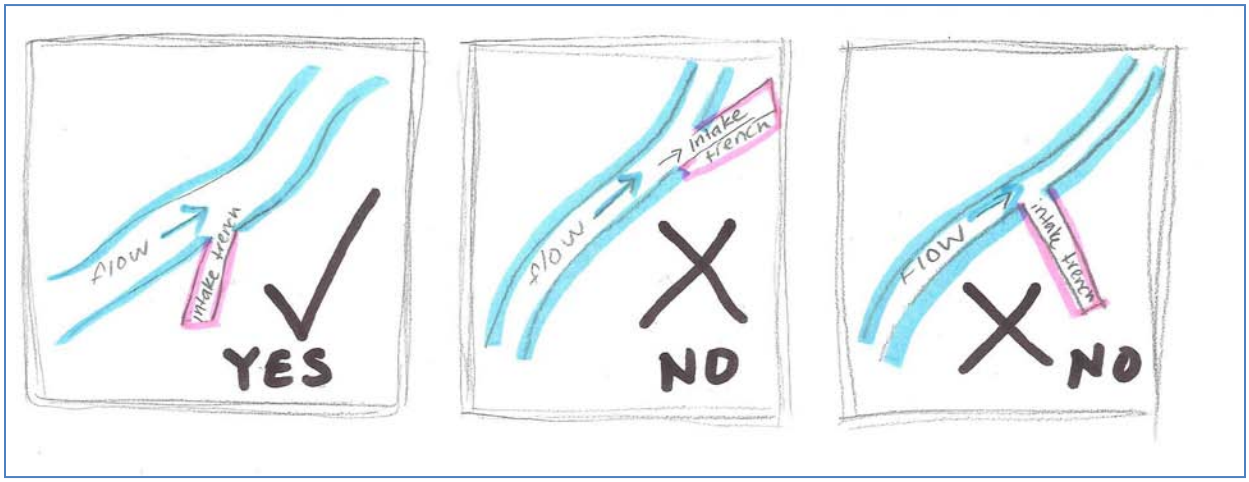


Figure 6: Schematic of water intake trench properly and incorrectly designed and constructed.

Timing

- Do not install intake trenches during high spring flows. It is best to install intakes when water has dropped and the banks can be properly protected from erosion.

Erosion Protection

- Any disturbed areas of an intake trench shall be protected from moving water by large, angular rock
- Intakes shall be inspected and fully armoured with large, angular rock at the end of each operating season to ensure adequate protection from spring freshet flows.

Regular Inspection

- Regularly inspect the intake structure at least once per week, and any time after high rainfall or snow melt. Address small erosion issues before they become large issues.

Closure Plan

- Fill intake trench and protect the bank from erosion when mining is complete
- Re-vegetate intake area

Activities NOT permitted as part of an Intake Structure under a Section 8 permit

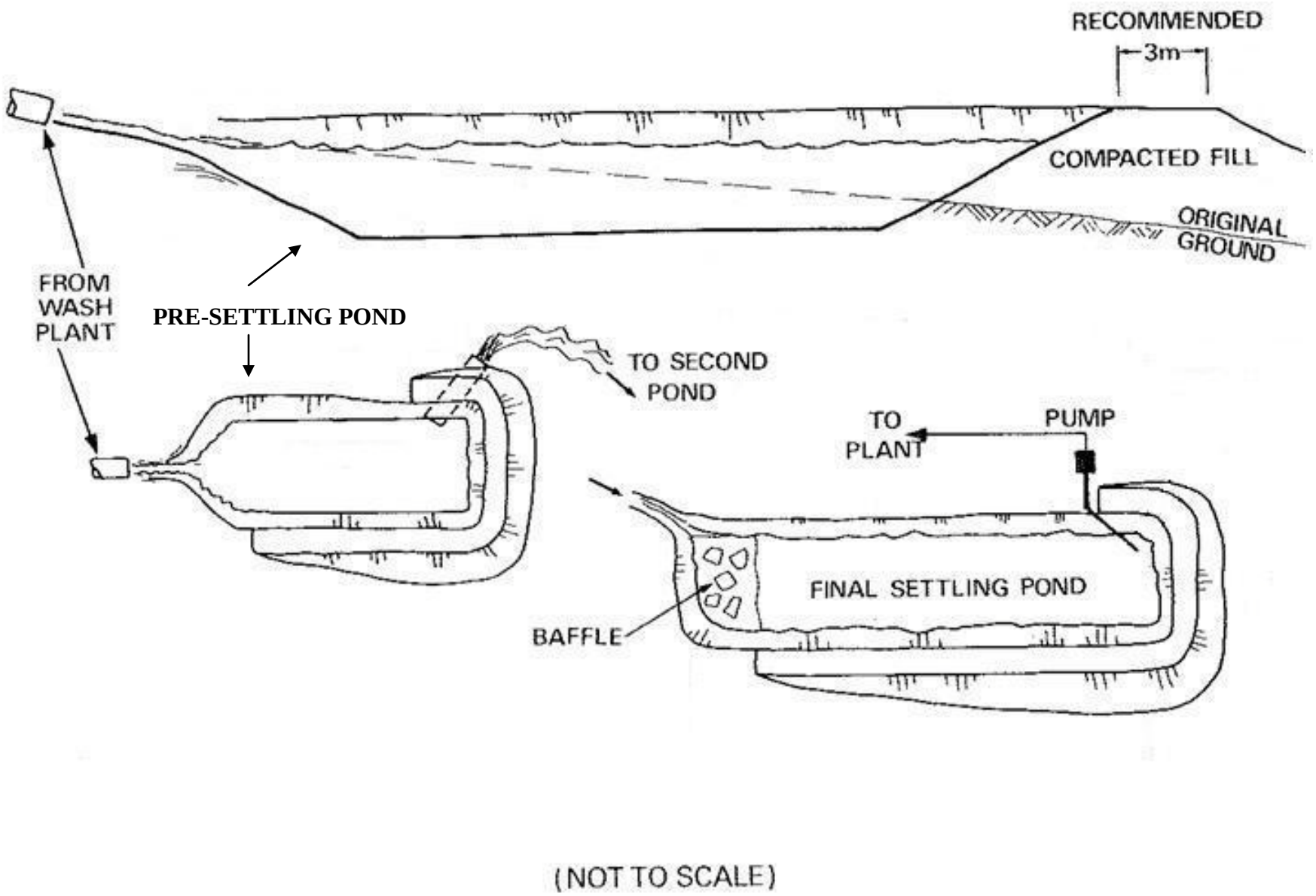
- Gravity feed trenches that connect the stream to the wash plant workings.
- Excavation within the stream channel
- Rock dams or constrictions on the creek that back up water or limit fish passage
- Bank-to-bank constrictions or dams
- Storage ponds
- Instream work for maintenance or repair of an intake trench after initial construction
- Any disturbance or damage to soil, trees, stream banks or lakeshores

Any removal of water from any beaver pond and/or damage or destruction of a beaver, muskrat or other aquatic furbearer dam, house or den

<u>May</u> be allowed if applied for under a Water Licence

- Off channel storage ponds.
- Dams.
- Regular maintenance of intakes, as per best practices.

Appendix 4: Schematic of Pre-settling Pond and Final Settling Pond Layout



Appendix 5: Wildlife Timing Windows

The Atlin Taku Land Use Plan includes management direction for particular species during sensitive periods. The table below is intended to assist miners in identifying periods when additional management considerations should be taken into account. Contact the Taku River Tlingit First Nation Land Department or provincial Skeena regional biologist for further information.

Table 1: Wildlife Timing Windows for Selected Species – Skeena Region

Wildlife	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sept*	*Oct*	*Nov*	*Dec*
Caribou												
Moose												
Thinhorn Sheep												
Mountain Goat												
Bears												
Songbirds												
Raptors & Owls												

Low Risk	Generally this is a good time to conduct planned operations.
Cautionary	Operators proceed with planned activities with possible mitigation measures applied.
Critical	Activities may require mitigation measures to avoid

Appendix 6: Checklist for a New Stream Diversion Application

Applications for stream diversions require submission of a Notice of Work under the Mines Act and Water Act Authorization application to FCBC. Application for Water Act Authorization can be made for either a Section 9 or water license. Regardless of which Water Act Authorization is being applied for, the application will not be accepted unless accompanied by a detailed Management Plan.

Application forms for both Mines Act and Water Act authorizations can be obtained from and are to be submitted to, Front Counter BC. Applications and instructions on completing applications are available at:

http://www.frontcounterbc.ca/info/

To facilitate preparation of an acceptable Management Plan, a checklist is provided to guide the applicant in preparation of this plan.

Because of the complexity of stream diversions, a proponent shall retain one or more appropriately qualified professional(s) to collect data on existing conditions and to assist with the design of the diversion including stream restoration and reclamation. The use of professionals will not only help to minimize impacts to the environment but may also avoid delays in approvals: applications that present a clear and detailed Environmental Management Plan that provide the decision maker with the required information will have fewer follow-up questions and are likely to experience fewer delays when their application is reviewed by provincial regulators.

As part of the adjudication process, the Regional Water Manager is required to provide a decision rationale. For these types of applications, the Regional Water Manager will consider the potential environmental impacts of the project with regards to stream dynamics, erosion, fish and wildlife values, riparian habitat, and other project specific factors.

Therefore, it is the responsibility of the proponent (and the proponent's consultants) to provide rationale that outlines the impacts of the project, mitigation measure options explored, and why the chosen stream diversion design is preferred. The Appendix 1: Checklist for a New Placer Mining Stream Diversion is a guide for qualified professionals to provide detailed information in the Environmental Management Plan to support the Regional Water Manager's decision related to the stream diversion.

Application Checklist

Check when complete	Requirements for submitting an application requesting a stream diversion for placer operations
☐	Completed Application Package for a Water Licence (*Water Act*) **OR** Approval Application or Notification for Changes In and About a Stream Under Section 9 of the *Water Act* and Part 7 of the *Water Regulation*. **AND** Completed *Mines Act* Permit Application Package (*Mines Act*)
	Water Authorization Environmental Management Plan The Plan should include:
☐	• Mapping o Overview Map: a spatially referenced (UTM or Lat and Long of map centre) map showing detail of immediate diversion area as well as diversion location in the context of the surrounding watershed. The map should be at a rounded scale, show a scale bar, and be size sufficient to illustrate the entire watershed, major watercourses, and roads. o Detailed Stream Channel Imagery should be spatially referenced (UTM or Lat and Long of map centre) aerial photograph, satellite, or other imagery depicting the nature of the stream. This imagery should clearly illustrate the channel pattern within each reach, the location of the existing stream channel, the location of the proposed channel, the location of the cross sectional diagrams described in the engineered drawings, and the location of the photos described in the plan. o Copy of the Mine Plan: a map depicting the existing stream, proposed stream diversion, existing mine infrastructure, and proposed mine development.
☐	• Rationale explaining why the diversion is required. (i.e. how the diversion will improve site conditions, provide improved access to the subsurface resources, be required for safety reason, to reclaim the site, etc.).
☐	➢ Fisheries and other aquatic values. Providing information on: • Fish presence / absence and species present • Fish habitat assessment • Methods used to establish fish presence and fish habitat values • Beaver dams and houses presence / absence • Other aquatic values *Please note that if the natural stream is fish-bearing then you may be required to obtain an authorization from the Department of Fisheries and Oceans.*
☐	➢ Existing channel / stream reach characteristics (*must be based on field reconnaissance by a qualified representative)* Describe the following characteristics: o Stream channel pattern

	o Stream channel type o Size and type of materials on stream channel bed and banks o Stream channel length, width and depth o Stream channel grade o Velocity and discharge o Methods used to measure existing stream characteristics o Riparian habitat
☐	➢ Stream diversion design. Provide information on the: • Type of diversion (temporary or permanent) • Detailed site description and maps / diagrams of proposed plan • A minimum of 1 engineered cross sectional diagrams within each stream reach[40]. The cross sections should depict the existing stream and proposed diversion channel from top of bank to top of bank. • Diversion length, width, depth, gradient, discharge rate • Design flood estimate and supporting hydrology information (including methods of calculation) • Drainage basin area (including method of calculation) • Length of diversion relative to original channel • Grade control structures, if required • Erosion control structures (rip rap , etc) • Fish habitat features, if required • Define distance from diversion channel bank required for safely conducting future work activities in proximity of diversion channel. • Re-vegetation of riparian habitat as per the reclamation Best Management Practice.
☐	➢ For Temporary diversion provide a detailed reclamation plan.
☐	• Schedule of proposed activities including timeframes for: o Construction of proposed stream diversion channel o Diversion of water from existing stream into new stream diversion channel including the fish salvage process

Should you have any questions about how to submit an application for a stream diversion, contact FrontCounter BC at 250-847-7260. Proponents considering the submission of these types of applications are encouraged to engage the appropriate agencies with their consultants well in advance of information collection for their proposed activities.

[40]"Reach" is defined as a channel segment with relatively repetitious and homogenous sequence of physical processes and habitat types (e.g., homogenous slope, discharge, habitat, channel type, and riparian features); lakes and wetlands are also considered reaches for the purpose of planning

Appendix 7 First Nation Territory in Atlin Taku Land Use Plan Area.