YUKON PLACER SECRETARIAT

# Fish Habitat Management System for Yukon Placer Mining

# Economic Health Monitoring Protocol

***Prepared by***

**The Yukon Placer**
**Economic Health Working Group**

**November 2008**

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## BACKGROUND

A new system for managing placer mining activity under the *Fisheries Act* is being implemented by the Yukon Placer Secretariat. Founded on principles of adaptive management and incorporating a risk-based approach to decision-making, the Fish Habitat Management System for Yukon Placer Mining is intended to balance the objectives of a sustainable Yukon placer mining industry with the conservation and protection of fish and fish habitat supporting fisheries.

As part of the new management system, a set of protocols have been designed to guide three effects-monitoring programs. These are the Aquatic Health Monitoring Protocol, the Water Quality Objectives Monitoring Protocol and the Economic Health Monitoring Protocol. The monitoring programs will assist in verifying the effectiveness of the management system in meetings its objectives and provide a rational basis for future changes, if appropriate.

The Economic Health Monitoring Protocol has been designed to measure and signal whether a viable placer industry is being maintained under the fish habitat management system.

## KEY QUESTION TO BE ADDRESSED

This economic health monitoring protocol outlines a series of indicators which will be used to measure whether or not the objective of a viable placer industry is being met. The results of the viability monitoring will be used – *in conjunction with the findings of the Aquatic Health and Water Quality Objectives monitoring protocols* – to inform decisions about how best to adapt the management framework to ensure that the Yukon's placer mining industry remains viable.

For the purposes of the economic health monitoring protocol, viability refers to the placer mining industry's ability to exist and/or grow in the new regulatory environment. As placer mining involves the extraction of a non-renewable resource, the term viability is thought to better reflect the nature of the industry rather than the term 'sustainability'.

The Yukon placer mining industry is part of a highly competitive and global market for gold production. As such, a wide variety of economic factors, some based in national markets (e.g. fuel costs) and others deriving from global markets (e.g. gold prices) all influence the viability of placer operations in the Yukon. Accordingly, a major challenge faced in the development of the economic health monitoring protocol was how to accurately identify the extent to which changes in industry viability are attributable to the new fish habitat management system.

Several agencies have decision-making responsibilities which have influence on the viability of the Yukon's placer mining industry. The agencies and their relevant decision-making responsibilities include:

Government of Canada, Fisheries and Oceans Canada – administration of the federal *Fisheries Act* which regulates the protection of fisheries resources and their supporting habitat.

Yukon Water Board – issuance of water use licenses for the use of water and/or the deposit of waste into water.

Government of Yukon, Department of Energy Mines and Resources – administration of the *Placer Mining Land Use Regulation.*

Government of Yukon, Department of Environment – administration of the *Environment Act.*

The Yukon placer mining industry is an integral part of the Yukon's economy and social fabric. While the habitat management system will most directly and materially affect placer mining businesses, other stakeholders will also potentially be affected by the implementation of the system. Those stakeholders include Yukon communities as well as the range of service and supply businesses which support the placer mining industry.

The Yukon Placer Secretariat, under the direction of the Implementation Management Group[1], was charged with developing the technical design of the economic health monitoring protocol. Non-technical issues considered in the development of the economic health monitoring protocol included overall availability and access to information, First Nation land claim-related matters as well as financial and human resource constraints.

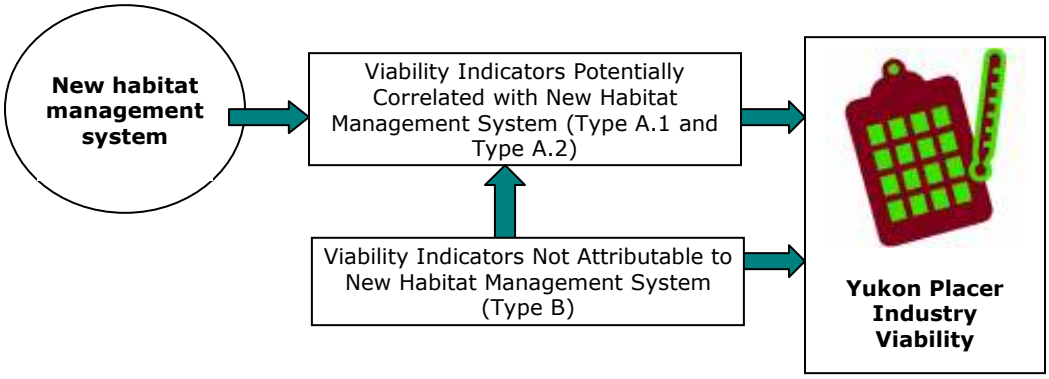
A conceptual model of the economic monitoring protocol, in the form of an impact hypothesis diagram, is presented on the following page. The diagram relates two main types of indicators to the viability of the Yukon placer industry:

*Type A: Viability Indicators Potentially Correlated with Habitat Management System*: Indicators involving factors potentially correlated with both the management system and placer industry viability. Type A.1 indicators provide an overall depiction of placer industry health. Type A.2 indicators involve the incremental costs of mine site management practices required by the habitat management system.

*Type B: Viability Indicators Not Attributable to Habitat Management System*: Indicators involving factors which, while correlated with the viability of the placer industry, are independent of the management system. For example, while the price of diesel fuel is a key determinant of industry profitability, it is determined in national and world markets where the habitat management system has no bearing. Because Type B factors influence Type A factors, the effects of Type B factors on industry health will be "mixed in" with the impacts of the management system.

[1] The Implementation Management Group was comprised of representatives from Yukon Energy, Mines and Resources, Yukon Environment, the Council for Yukon First Nations and Fisheries and Oceans Canada.

**Impact Hypothesis Diagram for Yukon Placer Industry**




## RESEARCH (SAMPLING) DESIGN AND DATA ANALYSIS

As noted earlier, the attribution of adverse changes in placer industry viability to changes in the fish habitat management system was a key challenge in the design of the economic monitoring protocol. To facilitate accurate monitoring, a two part approach to the determination of the causes of adverse changes in industry viability was developed. Part 1 involves the monitoring of placer industry viability. With Part 2, where sufficient indicators point to an adverse change in industry viability, a survey instrument is to be used to correlate adverse changes in industry viability with implementation of the management system.

## Part 1 – MONITORING OF INDUSTRY VIABILITY

The table below lists the *Viability Indicators Potentially Correlated with Habitat Management System.* The indicators are presented in order of weighting. The indicators which hold the greatest potential to monitor placer industry health appear at the top of the list.

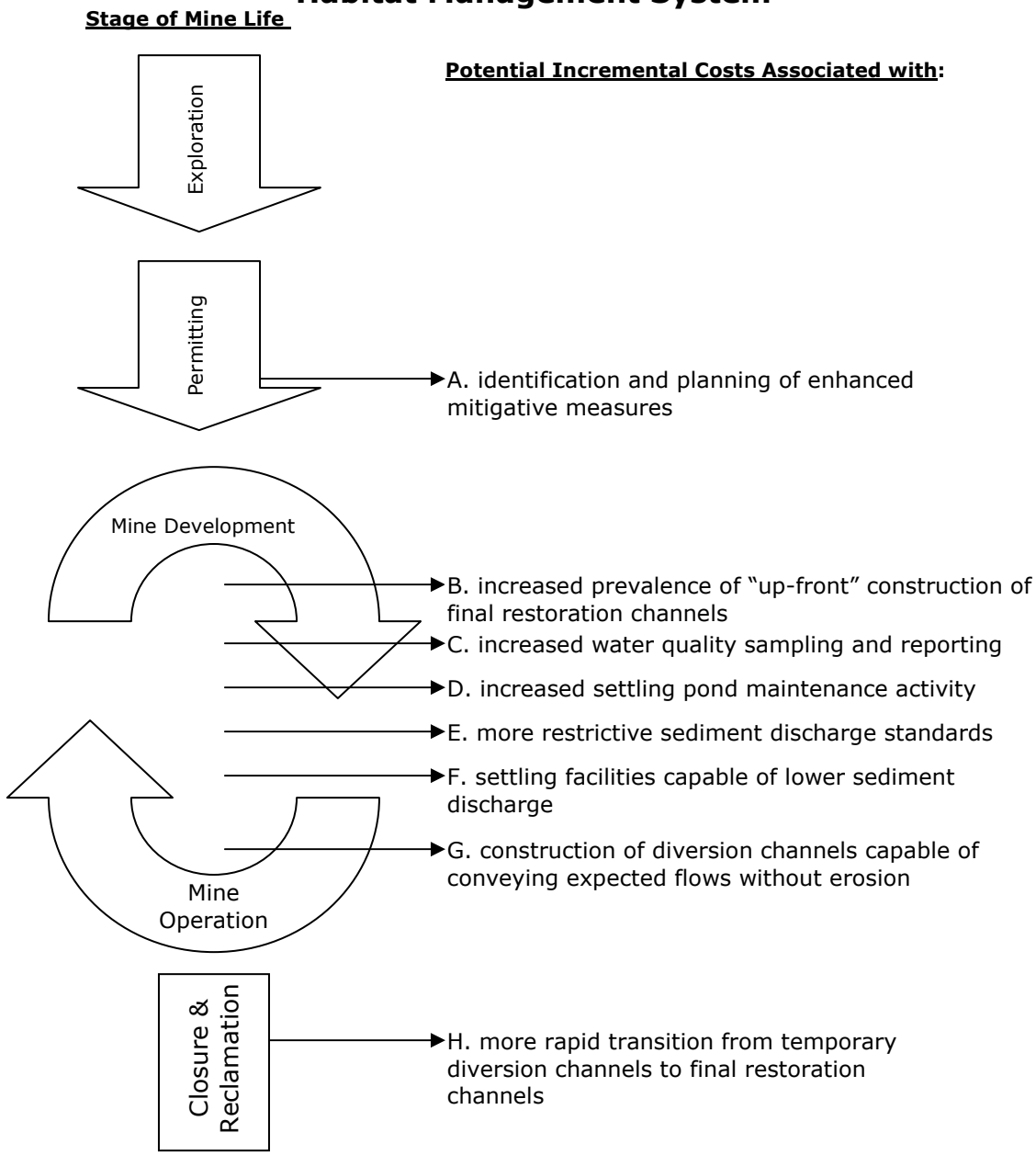
| | **Type A Indicators: Viability Indicators Potentially Correlated with Habitat Management System** | Existing data availability | Potential adverse change in viability if the indicator goes… |
|---|---|---|---|
| | **A.1 Industry-wide indicators (secondary data)** | | |
| *Top Four* | record and count of the number of placer mines in production[‡] | y | ↓ |
| | gold royalty collected | y | ↓ |
| | number of person days of employment (workers' compensation) | m* | ↓ |
| | level of non-compliance (number of "inspector's directions") | y | ↑ |
| *Bottom Four* | total claims staked in reporting period | y | ↓ |
| | total fuel consumption (fuel tax exempt permit data/fuel tank manifests) | m* | ↓ |
| | number of claims in good standing per type of stream classification | y | ↓ |
| | number of active water licenses (>50,000 cubic yards washed per year) | y | ↓ |

Notes: [‡] The record of placer mines in production will consist of a tabular listing with an entry for each placer operator outlining their a) discharge standard under the Yukon Placer Authorization, b) discharge standard under the new habitat management system, c) date of change in discharge standard requirement and d) a statement of operating status for each year hence. The number of placer mines in production will be adjusted for firm size.
* m = data exists in a form which requires modification for use as indicator.

The Type A.1 indicators were also assessed according to their potential to serve as early warning indicators of adverse changes in industry health. The top three early warning indicator candidates include: a] level of non-compliance with the requirements of the management system (relative number of "inspector's directions"), b] number of placer mines in production (adjusted for firm size), and c] gold royalty collected.

The figure below – Incremental Costs Attributable to Habitat Management System – presents a simplified model of the life cycle of a typical placer mine. The potential incremental costs associated with the various stages of the placer mine life cycle attributable to the new system are also identified.

# Incremental Costs Attributable to New Habitat Management System



The table below lists the Type A.2 indicators associated with new mine site management practices. As none of the data required to inform indicators (based on potential incremental costs attributable to the habitat management system) are available in secondary form, primary data collection will be undertaken using panel survey.[2]

| **Type A Indicators: Viability Indicators Potentially Correlated with Habitat Management System** | Existing data availability | Potential adverse change in viability if the indicator goes… |
|---|---|---|
| **A.2 Incremental costs of new mine site management practices (primary data)** | | |
| identification and planning of enhanced mitigative measures | n | ↑ |
| increased prevalence of "up-front" construction of final restoration channels | n | ↑ |
| increased water quality sampling and reporting | n | ↑ |
| increased settling pond maintenance activity | n | ↑ |
| more restrictive sediment discharge standards | n | ↑ |
| settling facilities capable of lower sediment discharge | n | ↑ |
| construction of diversion channels capable of conveying expected flows without erosion | n | ↑ |
| more rapid transition from temporary diversion channels to final restoration channels | n | ↑ |

The table below lists the *Viability Indicators Not Attributable to the Habitat Management System*.

| **Type B Indicators: Viability Indicators Not Attributable to Habitat Management System** | Existing data availability | Potential adverse change in viability if the indicator goes… |
|---|---|---|
| gold price | y | ↓ |
| cash costs (weighted index of operating costs including fuel costs, foreign exchange rate, borrowing costs, equipment costs and labour costs) | n | ↑ |
| overall regulatory requirements (e.g., YESAA, time & fees for representative permit) | n | ↑ |
| natural conditions (snow pack, water flows, forest fires) | y | ↓ |
| relative cost of mine site access | n | ↑ |
| relative favourability of deposit characteristics | n | ↑ |

[2] A panel survey is a sampling technique where the same set of individuals (or individuals who fit a similar cross-sectional profile) are asked the same questions at periodic intervals.

## Part 2 – CORRELATION WITH FISH HABITAT MANAGEMENT SYSTEM

*Following consultation on the new fish habitat management system, the Implementation Management Group decided that both Part 1 and Part 2 will be carried out in each of the first five years following implementation.*

Advancement to Part 2 of the process is triggered when an adverse change of more than 15% (in comparison to the previous period) in two or more of the "Top Four" A.1 indicators[3] is recorded or when an adverse change of more than 10% is recorded in four or more of any of the eight A.1 indicators. For example, if the number of placer mines in operation decreased from 140 to 115 (-17%) and the number of person days of employment declined from 500 to 425 (-15%), advancement to Part 2 would be triggered.

The purpose of Part 2 is to "allocate" changes in the values of Type A.1 viability indicators between a) changes that are the result of factors independent of the habitat management system and b) changes that are the result the new system. For example, if gold production drops at the same time as gold prices drop, to what extent is the drop in production the result of a) the decline in gold prices, and b) the habitat management system? The determination of the cause of adverse changes in the placer industry health will also be informed by changes in the Type A.2 indicators.

### Panel Survey Design

A highly systematic process, in the form of a panel survey, will be used to elicit the views of placer mine operators regarding the impact of the new habitat management system on the viability of their businesses. Using the Type A viability indicators as an outline, a panel survey instrument will be designed which "crosses" the Type A viability indicators specific to individual placer operations with the Type B indicators. For example, placer operators will be asked to indicate the extent to which a decrease (in the number of claims staked in the watershed where they operate) is attributable to *each* of cash costs, overall regulatory requirements, natural conditions, cost of minesite access and deposit characteristics.

Panel membership will be representative of the Yukon placer mining industry. Factors to be considered in the selection of panel members include:[4]

- size of mining operation;
- location of mining operation (a range of watersheds);
- type of stream classification (e.g., full range stream classification types); and,
- level of industry knowledge (e.g., number of years of experience).

[3] The top four A.1 indicators include: a) record and count of the number of placer mines in operation, b) gold royalty collected, c) number of person days of employment and d) level of compliance.

[4] Panel members could also possibly include individuals not actively placer mining but who are knowledgeable about the Yukon placer industry.

Other features to be determined at the time of panel survey design include:

- the minimum number of panel members required to ensure the panel is representative of the overall industry;
- survey frequency (i.e., how often the survey is run);
- survey timing (e.g., what day(s) of the year, number of days required);
- format of survey (telephone, focus group, etc); and,
- remuneration (if any) for panel members.

## SAMPLING DISTRIBUTION AND FREQUENCY

To the extent possible, monitoring of placer industry viability will be undertaken at the watershed level. Where data availability makes it unfeasible to implement a particular indicator at the watershed level, or where confidentiality considerations preclude monitoring at the watershed level, viability monitoring will be undertaken at the industry level. Survey-based monitoring efforts are to be focused on moderate/high sensitivity habitats. Given the short and intense nature of the placer mining season, it is recommended that data for all indicators be collected no more frequently than once per year and that reporting be undertaken on an annual basis.

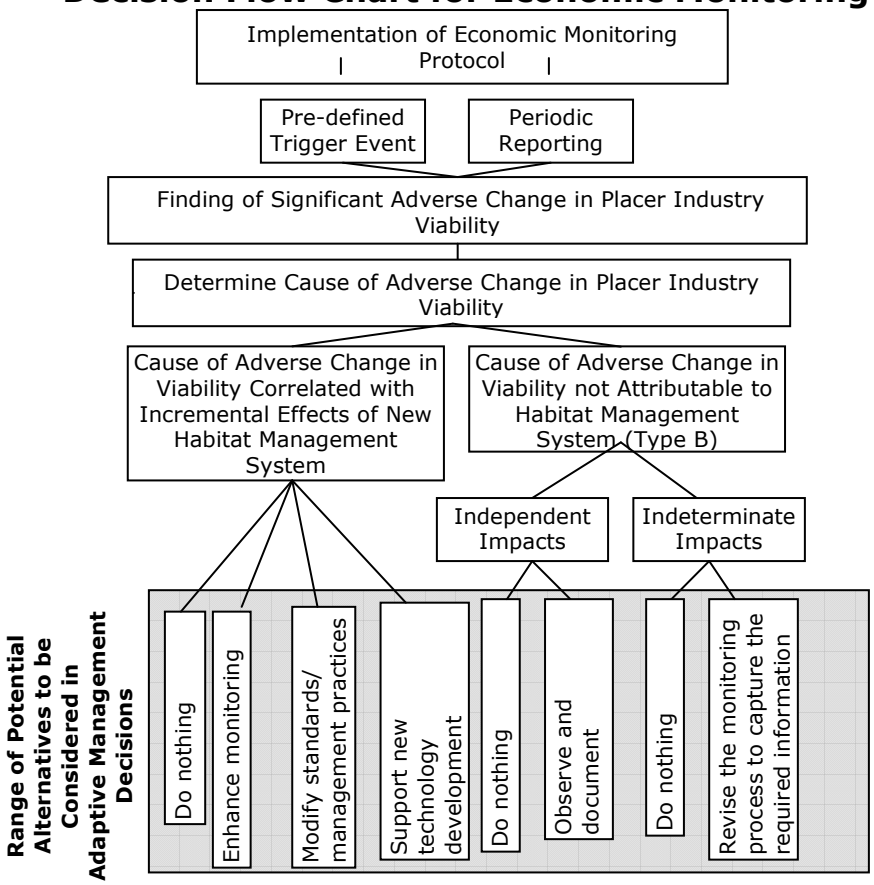
## DECISIONS TO BE UNDERTAKEN

The principal question to be addressed by the monitoring protocol is whether the habitat management system has adversely affected the viability of the Yukon's placer mining industry. Where it can be shown that an adverse change in industry viability is correlated with incremental effects of the habitat management system, one of four decisions – *decisions which will also be based on the findings of the Aquatic Health and Water Quality Objectives monitoring protocols* – may be made, including:

- do nothing;
- enhance monitoring;
- modify standards and/or management practices; or,
- support the development of new technology.

Where an adverse change in industry viability is not attributable to the habitat management system, it may be the result of a factor which is independent of the new system. In such a case, one of two decisions may be made – to do nothing or to observe and document the independent impact. Alternatively, the cause of an adverse change in viability may be indeterminate in nature, in which case a decision may be made to do nothing or to revise the monitoring protocol to capture the required information. The range of potential decisions that may be made – *in conjunction with the findings of the Aquatic Health and Water Quality Objectives monitoring protocols* – in response to a finding of an adverse change in industry viability is illustrated in the decision flow chart on the following page.

**Decision Flow Chart for Economic Monitoring**




## DESIGN OPTIMIZATION

The range of indicators will be "optimized" to ensure that some of the indicators are not redundant. Such an optimization exercise will be undertaken after the monitoring protocol has been in operation for at least two mining seasons.