

## Water Quality Zone Watercourses

## Water Quality Zone Watercourses

## Before You Begin

This workbook and associated worksheets are provided to assist with compiling information to support project proposals for submission to the Yukon Environmental and the Socio-economic Assessment Board (YESAB) and the Yukon Water Board (YWB). Once completed, the worksheets must be submitted for review as a component of both the YESAB and Yukon Water Board applications.

The guidance provided focuses on the requirements of the *Authorizations for Works or Undertakings affecting Fish Habitat for Specified Streams in the Yukon Territory* (Federal Fisheries Act) for watersheds in the Yukon (herein referred to as Watershed Authorizations). Please note that this workbook and associated worksheets may undergo revisions in the future, and users are encouraged to ensure that they use the current version.

**In order to achieve compliance with the Watershed Authorizations, the placer mining proposal must meet the requirements outlined in this workbook for the watershed type and specific habitat suitability type at the location where the activities are to occur (see Yukon Placer Fish Habitat Suitability Maps).**

In addition to this workbook and worksheets, the following documents provide the required information to support the development and submission of proposals for placer mining activities. All supporting documents are available online through the Yukon Placer Secretariat web page, [www.yukonplacersetariat.ca/howto\\_prepare\\_project\\_proposal.html](http://www.yukonplacersetariat.ca/howto_prepare_project_proposal.html) or through the web addresses given for the specific documents.

1. ***Authorization for Works or Undertakings affecting Fish Habitat for Specified Streams in the Yukon Territory***  
[www.yukonplacersetariat.ca/placer\\_authorizations.html](http://www.yukonplacersetariat.ca/placer_authorizations.html) – Provides the legal authority, with respect to placer mining, to carry on a work, undertaking or activity that results in the permanent alteration and destruction of fish habitat. Also specifies sediment discharge standards for placer mine effluent and the sensitivity category of the watershed (i.e. Category A or B). Please note that the death of fish is not authorized.
2. **Yukon Placer Fish Habitat Suitability Maps**  
[www.yukonplacersetariat.ca/maps.html](http://www.yukonplacersetariat.ca/maps.html) – Identifies the watershed sensitivity and habitat suitability of the watercourse where placer mining activities are proposed to occur.
3. **Guidebook of Mitigation Measures for Placer Mining in the Yukon**  
[www.yukonplacersetariat.ca/infocentre.html](http://www.yukonplacersetariat.ca/infocentre.html) – Provides technical information related to best management practices, mitigation measures, and design considerations to achieve compliance with the Watershed Authorizations and to assist with proposal development.

**Note: Complete and submit only the worksheets that are relevant to your operation.**

**Note: There are no Watershed Authorizations in place for the Liard and Alsek watersheds. Applications for review, forms and process to apply for a placer mine in the Liard or Alsek watershed can be obtained from the Yukon Placer Secretariat, contact information can be found online at, [www.yukonplacersetariat.ca/index.html](http://www.yukonplacersetariat.ca/index.html).**

For assistance completing the worksheets please contact the Yukon Placer Secretariat (contact information is available at, [www.yukonplacersetariat.ca/index.html](http://www.yukonplacersetariat.ca/index.html)) or the Yukon Government Client Services & Inspections office in your mining district (contact information is available at, [www.emr.gov.yk.ca/cmi/cmi\\_district\\_offices.html](http://www.emr.gov.yk.ca/cmi/cmi_district_offices.html)).

## If Your Project Does Not Comply With The Requirements

Placer mine operators are encouraged to design proposals that comply with the requirements described in this workbook. However, if the proposal is not able to achieve these requirements and the operator would like to proceed with the regulatory review process, an application for site-specific review should be submitted to Fisheries and Oceans Canada (DFO) for consideration **prior to the submission of the proposal to the YESAB and the YWB.**

When a proposal is submitted for site-specific review, DFO will review the information to determine whether a site-specific authorization is required. In some cases, DFO may recommend measures to avoid or mitigate the harm to fish and fish habitat to allow the application to proceed under the Watershed Authorization.

Applications for site-specific review, forms and process to apply can be obtained from the Yukon Placer Secretariat, contact information can be found online at, [www.yukonplacerecretariat.ca/index.html](http://www.yukonplacerecretariat.ca/index.html). Should it be determined that a site-specific authorization is required, a more detailed application, including a fish habitat offsetting plan and a letter of credit, will have to be submitted to DFO. Information on the site-specific authorization application process, offsetting plans, and letters of credit can be found on DFO's Projects Near Water website, [www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/application-eng.html](http://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/application-eng.html).

## Fish Habitat Design, Operation and Reclamation Requirements for Water Quality Zone Watercourses

Water quality zones are those areas within watercourses that are inaccessible to fish but provide water flow and contribute nutrients to downstream habitats. Water Quality zones are identified on an individual basis based on confirmed permanent barriers to fish passage. Permanent barriers include creeks that flow underground, waterfalls, and significant velocity barriers, but do not include temporary structures such as culverts, beaver dams or log jams.

Please use the following instructions and information to complete the worksheets relevant to your proposal (located in Appendix A to H). The completed worksheets will be submitted as part of your project description to the Yukon Environmental and Socio Economic Assessment Board (YESAB) and your application to the Yukon Water Board (YWB).

### SUMMARY OF GENERAL RESTRICTIONS ON WORKS OR UNDERTAKINGS IN WATER QUALITY ZONES

Activity Type / Operation	Restriction in Water Quality Zones
Riparian Zone	No Designated Riparian Zone. Berm required between active mining and watercourse.
Fords	Construction of new Fords subject to design and construction restrictions and reclamation requirements. Mitigative measures should be applied to use of existing Fords.
Diversion Channels	Construction of diversion channels subject to design restrictions and construction and reclamation requirements.
In-stream Works	Conditions apply to construction of in-stream works. Construction of in-stream settling facilities or to use a stream channel as a conduit is conditional and may not be permitted.

To determine how to proceed, please answer the following questions regarding a work, undertaking or activity in or around Water Quality Zones.

**Do you propose to undertake placer mining activities in, or within, 30 m of a watercourse? Activities may include discharging effluent, constructing stream crossings, clearing riparian vegetation, constructing channel diversions, or withdrawing water.**

**NO:** No further review pursuant to the *Fisheries Act* is required.

**YES:** Proceed to Step A, Project Information.

### A. Project Information

The first step in compiling a project proposal that involves activities proposed to occur in or around fish habitat areas is the completion of the Project Location Worksheet (Appendix A).

**Note: The Project Location Worksheet (Appendix A) is required for all applications.**

## Water Quality Zone Watercourses

- A1. On the Project Location Worksheet enter the stream name, the watershed name (as per Yukon Placer Fish Habitat Suitability Maps), identify the watershed sensitivity and habitat suitability classification for the reaches you proposed to work in, if any reaches are designated as “previous/prior development”, a short description of the location, the proposed duration of activities and a copy of a map of the specific location of the site.

Once the sections noted above are complete on the Project Location Worksheet, proceed to the next question.

**Do you propose to discharge effluent from your mine site?**

**NO:** Proceed to Step C, Riparian Zones.

**YES:** Proceed to Step B, Settling Pond Discharge.

### B. Settling Pond Discharge (effluent concentration)

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Point source sediment discharges from gold recovery processes are typically managed through the use of settling facilities. The action level approach is a key element of the risk-based approach to sediment management for Yukon placer mining. For more information on the action level approach or settling pond design, operation, recirculation systems, and settling pond reclamation refer to the Guidebook of Mitigation Measures for Placer Mining in the Yukon (herein referred to as the Guidebook).

Water quality objectives and sediment discharge standards for settling ponds in Water Quality Zones are specified in the Watershed Authorizations for the specific watershed you propose to work in. Please ensure to verify your specific discharge standard in the respective watershed you plan to work in (specifically if any exemptions exist) prior to proceeding with your application. In Water Quality Zones the discharge standard is set to maintain acceptable water quality in downstream habitats of greater sensitivity. Standards are specific to each watershed and are therefore defined in each individual authorization.

- B1. Record the Design Target, Action Level and Compliance Level on the Project Location Worksheet (Appendix A).

Once the effluent discharge standards are recorded on the Project Location Worksheet proceed to the next question.

**Do you propose to construct works other than diversion channels within the Riparian Zone (see Step C for the definition of the Riparian Zone) – this could include stripping, construction of reservoirs, construction of settling ponds, etc.**

**NO:** Proceed to Step D, Diversion Channels

**YES:** Proceed to Step C, Riparian Zone

### C. Riparian Zones

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The Riparian Zone is defined as the portion of the stream bank (either vegetated or not) immediately adjacent to the stream channel. Riparian Zones are measured from the high water mark on each bank of the watercourse and follow the pattern/morphology of the channel.

No setback is required in Water Quality Zones; however a berm that is sufficient to prevent surface runoff and associated sediment from entering the watercourse must be constructed between the mine site and the watercourse.

**Do you propose clearing of surface vegetation or subsurface works in the Riparian Zone? (this could include stripping, construction of reservoirs, construction of settling ponds, etc.)**

**NO:** Proceed to Step D, Diversion Channels.

**YES:** Proceed to next question.

**Do you propose to construct a new stream crossing (Ford)?**

**NO:** Proceed to next question.

**YES:** Review Step D, Watercourse Crossings, prior to proceeding to next question.

**Do you propose to clear surface vegetation only?**

**NO:** The proposal includes both clearing of surface vegetation and subsurface works, proceed to Step C1, Surface Vegetation Clearing, followed by C2, Bank Modification.

**YES:** Proceed to Step C1, Surface Vegetation Clearing.

### C1. Surface Vegetation Clearing

There are no restrictions on vegetation clearing in Water Quality Zones. Works or undertakings are authorized to occur up to the berm on the stream bank.

## D. Diversion Channels

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Design and construction of a diversion channel is required if the proposal includes Seasonal, Temporary or Permanent relocation of a watercourse or channel.

Provided the diversion channel design proposal meets the conditions identified in the following sections, the diversion channel may be constructed pursuant to the respective Watershed Authorization. Specific criteria related to channel design and restoration requirements are described in the following sections while general information regarding design, construction and reclamation of diversion channels is provided in the Guidebook.

### D1. Original Channel and Site Parameters Worksheet

On the Original Channel and Site Parameters Worksheet (Appendix C), record the information for the original channel (pre-diversion conditions). Refer to the Guidebook reference sections identified on the worksheet to assist you with the data collection and entry process.

**Note:** The above worksheet must be completed prior to proceeding with the following steps.

**Do you propose a Seasonal relocation of a channel? (A Seasonal Channel is in place for a period of less than one year and is replaced before winter).**

**NO:** Proceed to next question.

**YES:** Proceed to Step D2, Seasonal Diversion Channels and either Step D3, Temporary Diversion Channels or Step D4, Permanent Diversion Channels.

**Do you propose a Temporary relocation of a channel? (A Temporary Channel is in place for a period of less than five years).**

**NO:** Proceed to next question.

**YES:** Proceed to Step D3, Temporary Diversion Channels and Step D4, Permanent Diversion Channels.

## Water Quality Zone Watercourses

**Do you propose a Permanent relocation of a channel? (A Permanent Channel is in place for a period of five years or more).**

**NO:** Proceed to next question.

**YES:** Proceed to Step D4, Permanent Diversion Channels.

### D2. Seasonal Diversion Channels

Seasonal diversion channels are defined as a constructed channel that will convey stream flow for no more than one operating season. This diversion channel type may not be used to convey stream flow between late fall and the following spring of any given year. Refer to the channel design considerations in the Guidebook for more information on seasonal diversion channels. You will need to complete and submit the Channel Design Flood Estimate Worksheet (Appendix D3) and the Channel Design Method Worksheet (Appendix E) for your Seasonal Diversion Channel to the YESAB and the YWB.

**Note: Riparian Zone provisions do not apply to Seasonal Diversion Channels.**

Flood design interval for Seasonal Diversion Channels in Water Quality Zones is **1:1**.

**Note: Stream flow in Seasonal Diversion Channels must be returned to a Temporary or Permanent Restoration Channel at the end of the mining season. Your application should include worksheets for construction of a Temporary or Permanent Restoration Channel (Step D3 and D4).**

**D2a. On the Channel Design Flood Estimate Worksheet (Appendix D3), enter the flood design interval (line 1).**

Seasonal Diversion Channels must be less than 2000 metres in length.

**D2b. On the Channel Design Flood Estimate Worksheet (Appendix D3), enter the information required and complete the calculations. Refer to the Guidebook reference sections identified on the worksheet to assist with the data collection, entry and calculation process. Please ensure to include the completed Channel Design Flood Estimate Worksheet with your submission to the YESAB and the YWB.**

**Note: The Channel Design Flood Estimate Worksheet must be completed prior to proceeding with the following steps.**



### D2c. Selecting a Channel Design Method

The selection of a channel design method for channel construction is dependent upon the site geography, channel conditions and channel type. The design method selected is used to define the diversion channel dimensions and drop structure requirements.

The Channel Design Method table provides a list of recommendations to guide the selection of a suitable channel design method.

Design Method	Parameter	Condition
Channel Replication	Channel Duration	Seasonal or Temporary or Permanent
	Channel Gradient	> 2%
	Channel Material in Diversion	Similar or Coarser than Original (not in seasonal channel)
	Diversion Channel Length	Any
	Floodplain	Limited to none
	Valley Type	Incised or entrenched
	Channel Stability	Stable (if original channel is diversion it must have been in place for >10 Years)
	<b>Note: Optional when channel gradient is &lt; 2%</b>	
Floodplain Design	Channel Duration	Permanent
	Channel Gradient	< 2%
	Channel Material in Diversion	All
	Diversion Channel Length	At least 2/3 length of original channel
	Floodplain	Narrow to Wide
	Valley Type	Narrow to Wide
	Channel Stability	Any
	<b>Note: Can be used in areas with no floodplain when relocation site has space to support floodplain</b>	
Regime Channel	Channel Duration	Seasonal or Temporary or Permanent
	Channel Gradient	All
	Channel Material in Diversion	Similar or Coarser than Original (not in seasonal channel)
	Diversion Channel Length	Any
	Floodplain	Narrow to Wide
	Valley Type	Narrow to Wide
	Channel Stability	Any
	<b>Note: Use when site data is insufficient to use other methods</b>	

Select a Channel Design Method based on the criteria listed in the table above.

**Note: Each diversion channel planned requires only one channel design method.**

## Water Quality Zone Watercourses

In the following steps you will need to use a specific worksheet for the Channel Design Method you have selected: Channel Replication Worksheet (Appendix E1); Floodplain Design Worksheet (Appendix E2); or Regime Channel Worksheet (Appendix E3). Do not proceed until you have selected a Channel Design Method. Only one channel design method is required.

**Note: The Channel Design Flood Estimate Worksheet must be completed prior to proceeding with the following sections.**

**D2d.** On the Channel Design Method Worksheet you have selected, enter the information required and complete the design calculations. Refer to the Guidebook reference sections identified on the worksheets to assist with the data collection, entry and calculation process. Please ensure to include the completed Channel Design Method Worksheet with your submission to the YESAB and the YWB.

**Note: A plan for a Seasonal Diversion Channel must be accompanied by plans for a Temporary and / or Permanent Diversion Channel (See sections D3 and / or D4).**

Once the Channel Design Method Worksheet is completed, proceed to Step D3, Temporary Diversion Channels or D4, Permanent Diversion Channels.

### D3. Temporary Diversion Channels

Temporary diversion channels are defined as a constructed channel that will convey stream flow for a period of one to five years. Refer to the channel design considerations in the Guidebook for more information on temporary diversion channels. You will need to complete and submit the Channel Design Flood Estimate Worksheet (Appendix D3) and the Channel Design Method Worksheet (Appendix E) for your Temporary Diversion Channel to the YESAB and the YWB.

**Note: The Riparian Zone provisions do not apply to Temporary Diversion Channels.**

Flood design interval for Temporary Diversion Channels in Water Quality Zones is **1:2**.

**Note: Temporary Diversion Channels can only be in place for 5 years and as such, your application should include worksheets for the construction of a Permanent Restoration Channel (Step D4).**

**D3a.** On the Channel Design Flood Estimate Worksheet (Appendix D3), enter the flood design interval (line 1).

**D3b.** On the Channel Design Flood Estimate Worksheet (Appendix D3), enter the information required and complete the calculations. Refer to the Guidebook reference sections identified on the worksheet to assist with the data collection, entry and calculation process. Please ensure to include the completed Channel Design Flood Estimate Worksheet with your submission to the YESAB or the YWB.

### D3c. Selecting a Channel Design Method

The selection of a channel design method for channel construction is dependent upon the site geography, channel conditions and channel type. The design method selected is used to define the diversion channel dimensions and drop structure requirements.

The Channel Design Method table provides a list of recommendations to guide the selection of a suitable channel design method.

Design Method	Parameter	Condition
Channel Replication	Channel Duration	Seasonal or Temporary or Permanent
	Channel Gradient	> 2%
	Channel Material in Diversion	Similar or Coarser than Original (not in seasonal channel)
	Diversion Channel Length	Any
	Floodplain	Limited to none
	Valley Type	Incised or entrenched
	Channel Stability	Stable (if original channel is diversion it must have been in place for >10 Years)
	<b>Note: Optional when channel gradient is &lt; 2%</b>	
Floodplain Design	Channel Duration	Permanent
	Channel Gradient	< 2%
	Channel Material in Diversion	All
	Diversion Channel Length	At least 2/3 length of original channel
	Floodplain	Narrow to Wide
	Valley Type	Narrow to Wide
	Channel Stability	Any
	<b>Note: Can be used in areas with no floodplain when relocation site has space to support floodplain</b>	
Regime Channel	Channel Duration	Seasonal or Temporary or Permanent
	Channel Gradient	All
	Channel Material in Diversion	Similar or Coarser than Original (not in seasonal channel)
	Diversion Channel Length	Any
	Floodplain	Narrow to Wide
	Valley Type	Narrow to Wide
	Channel Stability	Any
	<b>Note: Use when site data is insufficient to use other methods</b>	

Select a Channel Design Method based on the criteria listed in the table above.

**Note: Each diversion channel planned requires only one channel design method.**

## Water Quality Zone Watercourses

In the following steps you will need to use a specific worksheet for the Channel Design Method you have selected: Channel Replication Worksheet (Appendix E1); Floodplain Design Worksheet (Appendix E2); or Regime Channel Worksheet (Appendix E3). Do not proceed until you have selected a Channel Design Method.

**Note: The Channel Design Flood Estimate Worksheet must be completed prior to proceeding with the following sections.**

**D3d. On the Channel Design Method Worksheet you have selected, enter the information required and complete the design calculations. Refer to the Guidebook reference sections identified on the worksheets to assist with the data collection, entry and calculation process. Please ensure to include the completed Channel Design Method Worksheet with your submission to the YESAB and the YWB.**

### **D4. Permanent Diversion Channels**

Permanent diversion channels are defined as a constructed channel that will convey stream flow for a period of over five years. Refer to the channel design considerations in the Guidebook for more information on permanent diversion channels. You will need to complete and submit the Channel Design Flood Estimate Worksheet (Appendix D3) and the Channel Design Method Worksheet (Appendix E) for your Permanent Diversion Channel to the YESAB and the YWB.

Flood design interval for Permanent Diversion Channels in Water Quality Zones is **1:5**.

**D4a. On the Channel Design Flood Estimate Worksheet (Appendix D3), enter the flood design interval (line 1).**

**D4b. On the Channel Design Flood Estimate Worksheet (Appendix D3), enter the information required and complete the calculations. Refer to the Guidebook reference sections identified on the worksheet to assist with the data collection, entry and calculation process. Please ensure to include the completed Channel Design Flood Estimate Worksheet with your submission to the YESAB and the YWB.**

**Note: The Channel Design Flood Estimate Worksheet must be completed prior to proceeding with the following steps.**

#### D4c. Selecting a Channel Design Method

The selection of a channel design method for channel construction is dependent upon the site geography, channel conditions and channel type. The design method selected is used to define the diversion channel dimensions and drop structure requirements.

The Channel Design Method table provides a list of recommendations to guide the selection of a suitable channel design method.

Design Method	Parameter	Condition
Channel Replication	Channel Duration	Seasonal or Temporary or Permanent
	Channel Gradient	> 2%
	Channel Material in Diversion	Similar or Coarser than Original (not in seasonal channel)
	Diversion Channel Length	Any
	Floodplain	Limited to none
	Valley Type	Incised or entrenched
	Channel Stability	Stable (if original channel is diversion it must have been in place for >10 Years)
	<b>Note: Optional when channel gradient is &lt; 2%</b>	
Floodplain Design	Channel Duration	Permanent
	Channel Gradient	< 2%
	Channel Material in Diversion	All
	Diversion Channel Length	At least 2/3 length of original channel
	Floodplain	Narrow to Wide
	Valley Type	Narrow to Wide
	Channel Stability	Any
	<b>Note: Can be used in areas with no floodplain when relocation site has space to support floodplain</b>	
Regime Channel	Channel Duration	Seasonal or Temporary or Permanent
	Channel Gradient	All
	Channel Material in Diversion	Similar or Coarser than Original (not in seasonal channel)
	Diversion Channel Length	Any
	Floodplain	Narrow to Wide
	Valley Type	Narrow to Wide
	Channel Stability	Any
	<b>Note: Use when site data is insufficient to use other methods</b>	

Select a Channel Design Method based on the criteria listed in the table above.

**Note: Each diversion channel planned requires only one channel design method.**

## Water Quality Zone Watercourses

In the following steps you will need to use a specific worksheet for the Channel Design Method you have selected: Channel Replication Worksheet (Appendix E1); Floodplain Design Worksheet (Appendix E2); or Regime Channel Worksheet (Appendix E3). Do not proceed until you have selected a Channel Design Method. Only one channel design method is required.

**Note: The Channel Design Flood Estimate Worksheet must be completed prior to proceeding with the following sections.**

D4d. On the Channel Design Method Worksheet you have selected, enter the information required and complete the design calculations. Refer to the Guidebook reference sections identified on the worksheets to assist with the data collection, entry and calculation process. Please ensure to include the completed Channel Design Method Worksheet with your submission to the YESAB and the YWB

The following tables identify design restrictions for Permanent Diversion Channels which must be incorporated to be in compliance with the respective Watershed Authorization.

Design Restrictions for Permanent Diversion Channels	
Design Component (Permanent Diversion)	Criteria
Overall Length of Diversion Channel	< 5000 metres
Conveyance (flood design) Capacity	1:5
Channel Design	As per channel design worksheets
Fish Habitat Features	None Required

**Note: In the next step you will need to refer to the Original Channel and Site Parameters Worksheet (Appendix C) in order to select the appropriate category of the original channel type (Pool-riffle, Dune-riffle, Plane-bed, Step-pool or Cascade Channel). For more information on channel types, see the Guidebook.**

### CONSTRUCTION AND RECLAMATION REQUIREMENTS FOR PERMANENT DIVERSION CHANNELS

Pool-riffle / Dune-riffle and Plane-bed Channel Type	
Reclamation Feature	Spacing Requirements (multiply the number in this column by the width of the channel in metres)
Top Soil Spreading	Continuous (both banks)
Rip-rap	Based on channel design method

## CONSTRUCTION AND RECLAMATION REQUIREMENTS FOR PERMANENT DIVERSION CHANNELS

Step-pool and Cascade Channel Type	
Reclamation Feature	Spacing Requirements (multiply the number in this column by the width of the channel in metres)
Top Soil Spreading	Continuous (both banks)
Rip-rap	Based on channel design method

Once the Channel Design Method Worksheet (Appendix E1, E2 or E3) is completed, proceed to the next question.

### Do you propose to use an Existing Ford?

**NO:** Proceed to next question.

**YES:** Proceed to Step E, Watercourse Crossings, then E1, Use of Existing Ford.

### Do you propose to construct a New Ford?

**NO:** Proceed to Step F, Water Acquisition.

**YES:** Proceed to Step E, Watercourse Crossings.

## E. Watercourse Crossings (Fords)

Fording is defined as the crossing of creeks, streams and / or rivers at locations where a bridge, causeway or elevated embankment does not exist or is not utilized by a vehicle or equipment. Fording typically involves driving directly through a watercourse, across the banks and bed. In some instances, Fording locations (Fords) have been “improved” or constructed through watercourses by way of adding materials such as rocks or gravel, the modification of approaches, or the modification of the bed of a watercourse.

### E1. Use of Existing Ford

Use of existing Fords may be used in Water Quality Zones. Refer to the Guidebook for additional information on Fords. The following measures should be adhered to when utilizing existing Fords.

**Note:** Please identify if you intend to use Existing Fords on the Project Location Worksheet (Appendix A).

Refer to the Guidebook for additional information on Fords. The following measures should be adhered to when utilizing existing Fords.

- Ensure water depth is sufficiently shallow to allow passage of vehicle / equipment.
- Plan your activities in advance to minimize the number of crossings required.
- Avoid crossing during extreme rain or flood events.
- Access approaches at 90° to the bank, when entering or exiting the Ford.
- Maintain speed at a very slow and steady pace throughout the crossing.
- Avoid rapid acceleration while on approaches or while in the water.

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### E2. Construction of New Fords

The construction of new Fords is authorized in Water Quality Zones.

The location of new Fords must be identified when proposed for original channels, Temporary Channels (with fish habitat features), and Permanent Diversion Channels. The new Ford proposed must achieve the design, construction and reclamation requirements identified in the table below to be in compliance with the respective Watershed Authorization.

#### Design and Construction Restrictions and Reclamation Requirements for New Fords

Design Component (Construction of New Ford)	Requirement
Approach Angle	90° to bank
Maximum Width of Approach Zone Clearing (surface)	No restrictions
Minimum Watercourse Distance Between Ford Sites	No restrictions
Site Selection (Watercourse)	Shallow water depth
Site Selection (Approach / Bank Composition)	Gravel / Cobble
Construction	Equipment to work from bank
Maximum Width of Bank Grading (subsurface)	No restrictions
Approach Surface Ground Coverage	Gravel / Cobble
Construction Timing	Low water period
Reclamation	Full topsoil coverage and willow staking

**Note: The above design considerations are not required for Construction of Fords in Seasonal or Temporary Diversion Channels.**

- E2a.** If the construction of a new Ford is proposed for an original channel or previously restored channel, identify the location of the new Ford(s) on the Riparian Zone / Bank Modification Worksheet (see step C, Riparian Zones and Appendix B).
- E2b.** If the construction of a new Ford is proposed for a Permanent Diversion Channel, identify the location on the Riparian Zone / Bank Modification Worksheet. Proceed to the next question.

**Do you propose to withdraw water from a Water Quality Zone?**

**NO:** Proceed to Step G, In-stream Works.

**YES:** Proceed to Step F, Water Acquisition.

## F. Water Acquisition

Acquisition of water is required for processing materials during placer mining. Effective water management is a key consideration at all placer mine sites. The following requirements must be achieved to meet compliance with the respective Watershed Authorization.



**F1. Water Intake Screens**

Intake pipes do **NOT** require screens in Water Quality Zones.

**G. In-stream Works**

In-stream works are defined as works that occur within the high water mark of a watercourse, but do not include diversion channels or Fords. Some in-stream works can lead to effects on fish and fish habitat such as erosion/scouring, sediment inputs, loss of habitat area, changes in channel morphology, blockages to passage, and reduced productivity.

**Do you propose to carry out in-stream works within a watercourse? In-stream works may include small dugouts or wing dams to facilitate water acquisition, in-stream settling facilities, in-stream reservoirs, and use of a stream channel as a conduit to transport process water to out-of-stream settling ponds.**

**NO:** Review complete – proceed with submission of all completed worksheets along with your project description to the YESAB and your application for water use license to the YWB.

**YES:** Proceed to Step G1, Severity of Effects Assessment.

**G1. Severity of Effects Assessment and Risk Management Decisions for In-stream Works****Water Quality Zones**

In-stream settling facilities and use of a stream channel as a conduit to transport process water to out-of-stream settling ponds are authorized under the auspices of a Watershed Authorization in Water Quality Zones under certain conditions. In order to determine whether your site qualifies, complete the flowchart found in Section I below and record this information on the Worksheet for In-stream Settling Ponds and Use of Stream Channels as Conduit (Appendix H).

In-stream reservoirs constructed with cross-channel dams are authorized under Watershed Authorizations in Water Quality Zones.

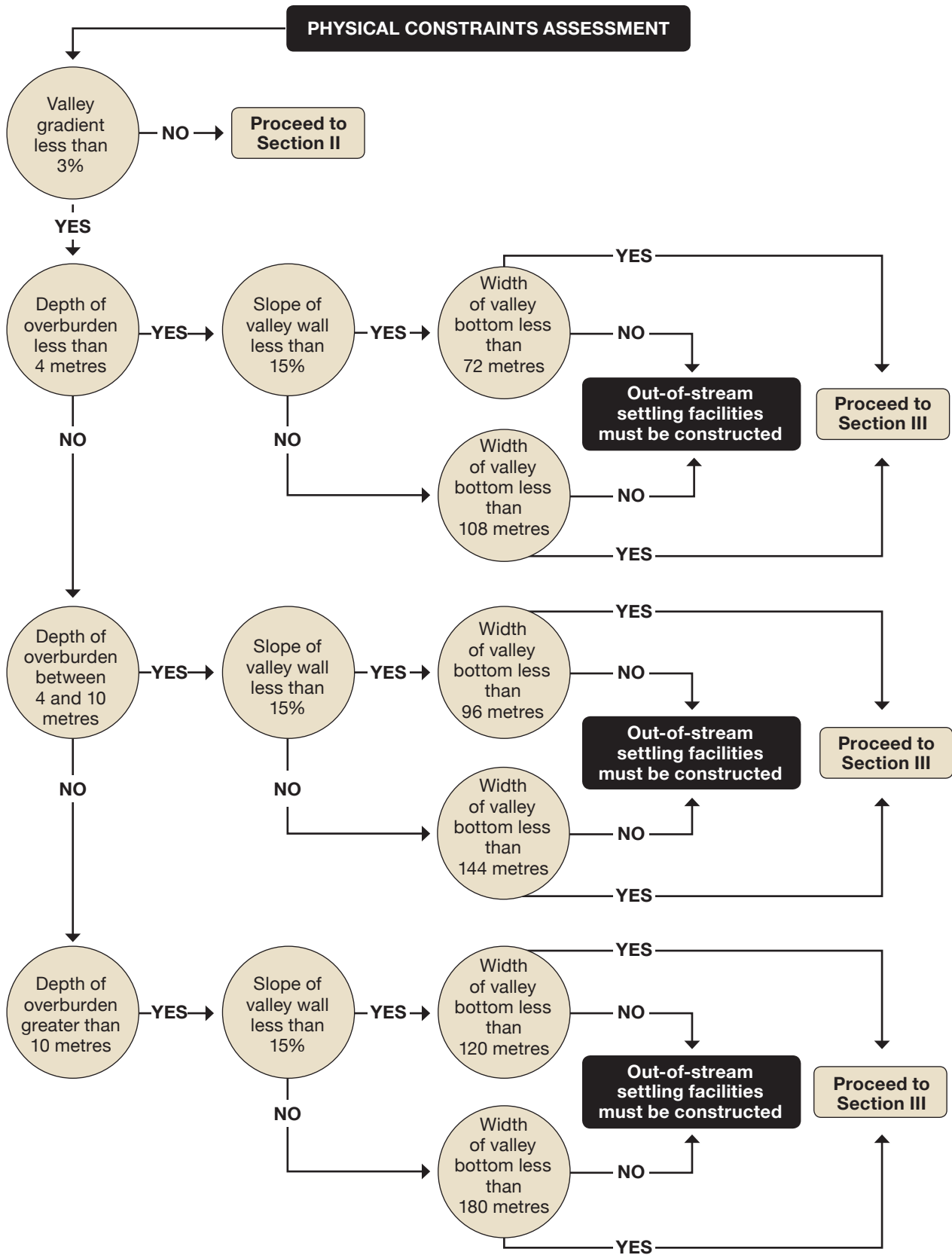
**SECTION I**

Use the following flowchart to evaluate whether your site is suitable for construction of in-stream settling facilities or the use of a stream channel as a conduit.

**Note: Authorization to construct in-stream settling facilities or to use a stream channel as a conduit is conditional and these works may not be permitted. Depending upon the scale of operation or size of earth-moving equipment out-of-stream settling facilities may be required in proximity to working areas.**

Water Quality Zone Watercourses

Flowchart for In-stream Settling Ponds and Use of Stream Channels as Conduit



## SECTION II

The valley bottom you intend to mine is not ideal for the construction of settling ponds, due to its steep gradient. Use of the stream channel as a conduit for transporting process water to the nearest suitable site for out-of-stream settling ponds may be permitted.

**Do you have the right to construct settling facilities on placer claims immediately below your working area where the valley gradient is less than or equal to 3%, and the habitat classification remains either Water Quality Zone, Low or Moderate–Low?**

- NO:** Your project may not meet the conditions of a Watershed Authorization, see “If your project does not comply with the requirements” section at the beginning of this document.
- YES:** Use the flowchart in Section I to evaluate whether the site below your working area is suitable for construction of out-of-stream settling facilities.

## SECTION III

The valley bottom you intend to mine cannot accommodate an out-of-stream settling facility, due to its narrow width. If you have the right to construct out-of stream settling facilities on placer claims immediately below your working area, and the habitat classification remains either Water Quality Zone, Low or Moderate–Low, use of the stream as a conduit for transporting process water to this downstream location may be permitted. If not, construction of in-stream settling ponds may be permitted. The following conditions apply to construction of these in-stream works:

- Construction and maintenance of a pre-settling pond is mandatory;
- If it is likely that stranding of fish will occur in a dewatered channel, the applicant should retain a qualified professional to conduct a fish salvage prior to dewatering the channel.;
- Only compactable material (fine gravel and sand) may be used as core material in dam construction, while coarse material should be used on the surfaces to prevent erosion;
- Material must be placed in shallow (< 0.3 metre) lifts and compacted when dams are constructed;
- Sluicing must be terminated if stream flows increase to bank-full width in response to rainfall events;
- Settling ponds must be mechanically cleaned and equipped with well–armoured spillways in order to maintain stability during spring freshet; or
- A stable bypass channel must be constructed to protect the settling pond cells from high flows during spring freshet; and
- Stream channel restoration must commence once these in-stream works are no longer required for current mining activities.

The following table is to be used to evaluate the risk of proposed in-stream works in Water Quality Zones. The design elements of the proposed works must achieve a risk score of no higher than the maximum risk score identified to be in compliance with the respective Watershed Authorization.

**Note: In-stream settling ponds must be constructed from compactable material that is placed and compacted in shallow lifts.**

## Water Quality Zone Watercourses

Design Component	Range	Risk Score
Channel Width Constriction	>30% channel constriction	3
	5% - 30% of the channel	2
	< 5%	1
Above and Below the Structure – Difference in Water Surface Level	>2.0 metres	3
	0.3 – 2.0 metres	2
	< 0.3 metres	1
Material Type	Fine (silt-sand)	3
	Compactable (fine gravel and sand)	2
	Metal/ riprap/ structure	1
Construction Method	Non-compaction/ dumped	3
	Moderately compacted/ placement	2
	Compacted shallow lift (or rip-rap, gabions, or boulders)	1
Amount of In-water Work	Completely in water	3
	Partially in water (more than ½)	2
	In dry	1
Structure Height	Above bank full	3
	Between bank full and channel bed	2
	Below channel bed	1
<b>MAXIMUM PERMITTED SCORE FOR IN-STREAM WORKS</b>		<b>17</b>

Calculate and record your total score and maximum permitted score on Severity of Effects Assessment for In-stream Works Worksheet (Appendix G1), and record details of proposed in-stream works on the In-stream Works Worksheet (Appendix G2). Please ensure to include the completed In-stream Works Worksheets (Appendices G1 and G2) with your submission to the YESAB and the YWB.