ANNEX 1

FISHERIES AND OCEANS (DFO) LETTER DATED SEPTEMBER 2004

The DFO letter dated September 2004 is attached.

Okanagan Lake Crossing Project
Preliminary Review and Response

Fisheries and Oceans / Pêches et Océans

FISHERIES AND OCEANS File No.: 8400-Okanagan Lake
(Okanagan Lake Floating Bridge)
Referral File No.: 04-HPAC-PA7-000-000170

September 03rd, 2004

Attention:
Mike Kent, Chief Environmental Officer
Environmental Management Section
Engineering Branch, Ministry of Transportation
PO Box 9850 Stn. Prov. Govt.
Victoria, BC V8W 9T5

DFO Fisheries Act Authorization letter

Subject: Okanagan Lake Crossing Project

As requested, Fisheries and Oceans Canada (DFO) has reviewed the Ministry of Transportation's (MoT) engineering, construction and compensation plans for the proposed Okanagan Lake Crossing Project (the 'Project') and provides the following comments for inclusion in the tender package.

It is DFO's understanding that the proposed Project will be implemented by way of a "P3" Partnership and 'Design-Build' process. DFO is aware that upon selection of a successful bidder the project design may change significantly as would the corresponding impacts to fish and fish habitat. In recognition of this, and to assist with the conclusion of the tendering process, MoT has requested that DFO conduct a preliminary review of the Project and provide comments regarding the acceptability of the proposed impacts and associated mitigation and compensation measures. This letter is intended to be included in the Project tender package to be considered by contractors in their review of the Project and preparation of their respective bids.

Please be aware that this review is based on the current Project design and associated impacts and comments are provide solely with respect to DFO's Habitat Management Policy and pursuant to the habitat sections of the federal *Fisheries Act*. This letter does not imply approval by any other federal or provincial agency nor does it imply approval for an alternate design or mitigation and compensation measures other than those currently proposed. Should the project design and/or construction change significantly, it is likely that a new project assessment will be necessary.

It is our understanding that the Project includes:

- Construction of a new floating bridge over Okanagan Lake in the immediate vicinity of the existing Okanagan Lake Floating Bridge, establishment, use and restoration of a graving dock site to pre-disturbance condition and the demolition and disposal of the existing Okanagan Lake Floating Bridge

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and that the Project

- will be undertaken by way of a P3 Partnership and that the successful bidder may propose an alternate design and/or construction methodology upon award of the contract and that such changes may alter the assessed impacts to fish and fish habitat as well as the proposed mitigation and compensation measures.

For the purpose of this review, DFO has assessed the Project design and determined the impacts to fish habitat based on the following documents:

- Ministry of Transportation, Environmental Management Section. ***Environmental Impact Assessment Synopsis Report – Okanagan Lake Bridge Report.***, December 2003.
- Coast River Environmental Services Ltd. ***Okanagan Lake Floating Bridge Project – Environmental Impact Assessment: Aquatic Resources and Associated Habitat.***, October 2001.
- Summit Environmental Consultants Ltd. ***Revised Draft Report: Harvey Avenue Realignment. Environmental Impact Assessment***. October 2003.
- Coast River Environmental Services Ltd. ***Okanagan Floating Bridge Project. Environmental Protection Plan: Aquatic Resources and Associated Habitat.*** June 2001.
- Westmar Consultants Inc. ***Okanagan Lake Bridge Project. Deliverable BD-D16: Graving Dock Assessment Report***. September 2001.

Based on the above noted reports and as a result of discussions with MoT, DFO has determined that the following impacts to fish and fish habitat are likely to result from the Project:

- *Dredging of Okanagan Lake substrate in select pockets under the corners of the end pontoons;*
- *In-filling of Okanagan Lake to facilitate the construction of the east and west approach causeways;*
- *Pile driving and pier placement at the west end of the bridge to support the piers for the west approach ramp;*
- *Installation of the new floating pontoons, including the installation and/or relocation of four new anchors;*
- *Establishment and restoration of a graving dock site for the construction of the pontoons at one of the three currently proposed sites;*
- *Vessel movement and barge operation to facilitate the above works and*
- *Deep lake disposal of six of the existing pontoons in Okanagan Lake.*

The following table provides a summary of the proposed total aerial impacts to fish and fish habitat as a result of the Project:

Proposed Impacts to Fish and Fish Habitat	Area (m^2)
West End – Causeway Fill above High Water Level over Maintained Habitat	450
West End – Causeway Fill below High Water Level over Rip Rap	1,275
West End – Causeway Fill below High Water Level over Marsh Habitat	1,400
West End – Causeway Fill below High Water Level over Pondweed Habitat	4,175
West End – Causeway Fill below High Water Level over Sandy Habitat	900

West End – Causeway Fill below High Water Level over Milfoil Habitat	3,350
Sub-total	*(11,550)*
East End – Causeway Fill above High Water Level over Maintained Habitat	825
East End – Causeway Fill below High Water Level over Sandy Habitat	1,250
East End – Causeway Fill below High Water Level over Milfoil Habitat	2,175
Sub-total	*(4,250)*
6 Pontoons Sunk in Very Deep Water (to a maximum of 4,050 sq. meters)	4,050
Graving Dock (one of three proposed sites)	Up to 2,600
TOTAL	**22,450**

** If these plans have changed since the time of submission, the advice in this letter may no longer apply and you should consult with us to determine if further review is required.*

Based on the proposed design, including mitigation measures, DFO has concluded that the Project will result in the harmful alteration, disruption or destruction (HADD) of fish habitat. As you are aware, the HADD of fish habitat is prohibited unless authorized by DFO pursuant to Subsection 35(2) of the federal *Fisheries Act*. If MoT and the successful contractor elect to proceed with the design as proposed, an Authorization pursuant to subsection 35(2) of the federal *Fisheries Act* will be required.

Please be advised that subsection 35(2) of the *Fisheries Act* is a law list trigger pursuant to the *Canadian Environmental Assessment Act* (CEAA). As a result, Fisheries and Oceans Canada is required to conduct an environmental assessment of the final project design, as prescribed by CEAA, before proceeding with the issuance of an authorization. Please be aware that your application and any and all supporting documentation would also be included in the Canadian Environmental Assessment Registry, accessible by the public.

Pursuant to DFO's No Net Loss Policy, compensation is required to offset the HADD of fish habitat. Based on the projected impacts noted herein, the MoT has proposed to undertake the following mitigation and compensation measures:

- **Reclamation of the Western and Eastern Causeways** – eastern causeway to be completely removed and reclaimed to parkscape habitat while the western causeway will be restored to produce shoal/wetland and riparian habitats. The reclamation of these historical lake infills is a critical component of the total compensation package that is necessary to offset the new lake infilling and other associated impacts resulting from the Project.
- **Salvage and relocation of existing pondweed and bulrush habitat unit.** The proposed project will impact productive bulrush and pondweed habitat that has been determined to be limiting on Okanagan Lake. The MoT has agreed to research and identify a suitable location for the salvaged plant material and re-establish this aquatic plant community elsewhere on Okanagan Lake.

The following table is a summary of the proposed compensation:

Proposed Compensation	**Area (m^2)**
West End – Causeway Restoration/Riparian Habitat Creation above HWL	5,625
West End – Causeway Restoration/Marsh Bench Habitat Creation below HWL	3,075
West End – Will Thicket Spur Bench/Riparian Habitat Creation above HWL	550
West End – Granular Beach of Willow Thicket Spurs below HWL	2,150
Marsh habitat Relocation (location to be determined)	2,525

East End – Causeway Restoration to Maintained Habitat above HWL	6,675

The above noted compensation will be built during or immediately following the construction of the new floating bridge and is designed to achieve an approximate 1:1 ratio of compensatory habitat to habitat impacted. Due to the risk of failure of all or part of the above noted compensatory habitat, time lag between habitat destruction and creation and the delay until the full productive capacity of the above noted compensation is realized, a 1:1 ratio of replacement is considered to be insufficient in achieving 'No Net Loss' of the productive capacity of fish habitat. As a result, MoT has proposed to fund the following, additional, compensation project:

- **Provision of one-time payment of $100,000 towards the restoration of Mission Creek at Cassorso Road as detailed in the Okanagan Lake Action Plan.** This contribution will be allocated towards another, high priority restoration project defined by the Ministry of Water Land and Air Protection and identified within the Okanagan Lake Action Plan in the event that the Cassorso Road restoration project does not proceed.

In summary, provided that:

- The Project is built as per the current project design,
- Impacts to fish and fish habitat do not exceed or significantly vary from those identified herein, and
- the successful contractor, on behalf of the MoT, carries out the mitigation and compensation measures as proposed in the above noted documents,

DFO is confident that the Project would result in No Net Loss of fish habitat; therefore, based on the direction provided by the Habitat Management Policy, DFO would not object to the proposed Project design and would, upon receipt of the formal proposal, undertake a review of the Project pursuant to CEAA.

However, in the event of a significant change to the current proposed bridge design, mitigation or compensation measures as detailed in the above noted documents, DFO would require a new project submission. In the event of significant variance from the Project as detailed herein, DFO does not provide any certainty as to the acceptability of a new design and associated impacts and can not guarantee issuance of an Authorization pursuant to the federal *Fisheries Act*.

If you have any questions concerning the above, please contact me directly by telephone at **(250) 851-4879**, or by fax at **(250) 851-4951**.

Yours sincerely,

Holly Smith
Habitat Biologist

c.c.: Brent Persello, MoT – Kamloops (250) 851-4197
Darryl Hussey, DFO - Kamloops

Canada

ANNEX 2

FISHERIES AND OCEANS (DFO) INITIAL AUTHORIZATION

The DFO Initial Authorization is attached.

Fisheries and Oceans / Pêches et Océans

DFO File No.: 8400-Okanagan Lake
(Okanagan Lake Floating Bridge Project)
HRTS File No.: 04-HPAC-PA7-000-000536
Previous File No.: 04-HPAC-PA7-000-000170

AUTHORIZATION FOR WORKS OR UNDERTAKINGS CAUSING THE HARMFUL ALTERATION, DISRUPTION OR DESTRUCTION OF FISH HABITAT

Authorization issued to:

Ministry of Transportation
PO Box 9850 Stn Prov. Govt
Victoria, BC
V8W 9T5

Attention:
Ron Mathieson
Fax: (250) 953-4975

Location of Project

Located on Okanagan Lake at Kelowna, BC.

Valid Authorization Period

For conducting all works or undertakings below, the mean annual high water mark of Okanagan Lake

- on the south side of the east causeway (eastern causeway removal) is from
  July 22 to Aug 24 and Oct 15 to April 1
- For all other works, no timing window has been applied.

Description of the Harmful Alteration, Disruption or Destruction of Fish Habitat Hereby Authorized

Pursuant to Section 35(2) of the federal *Fisheries Act*, the harmful alteration, disruption or destruction (HADD) of fish habitat hereby authorized by this document with respect to the Okanagan Lake Floating bridge Project is as follows:

Proposed Impacts to Fish and Fish Habitat	Area (m^2)
West End – Causeway Fill above High Water Level (HWL) over Maintained Habitat	450
West End – Causeway Fill below HWL over Rip Rap	1,275
West End – Causeway Fill below HWL over Marsh Habitat	1, 400
West End – Causeway Fill below HWL over Pondweed Habitat	4,175
West End – Causeway Fill below HWL over Sandy Habitat	900

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West End – Causeway Fill below HWL over Milfoil Habitat	3,350
Sub-total	*(11,550)*
East End – Causeway Fill above HWL over Maintained Habitat	825
East End – Causeway Fill below HWL over Sandy Habitat	1,250
East End – Causeway Fill below HWL over Milfoil Habitat	2,175
Sub-total	*(4,250)*
Pontoons Sunk in a Minimum of 150 meters Depth in Okanagan Lake (to a maximum of 4,050 sq. meters)	4,050
Graving Dock (Bear Creek South or North)	Not greater than 2,600
TOTAL	22,215

The above table was derived from the following reference documents:

- Environmental Impact Assessment Synopsis Report: Okanagan Lake Bridge Project. Ministry of Transportation, December 2003.
- Okanagan Lake Bridge Project Environmental Protection plan: Aquatic Resources and Associated Habitat. Coast River Environmental Services Ltd., March 2002.

The temporary and permanent impacts to fish and fish habitat listed here and further defined in the above noted reports represent the maximum allowable impact authorized. The final areal footprint shall be measured upon completion of each applicable stage of the project by the Environmental Monitor and the final numbers forwarded to DFO for compliance monitoring purposes. **Works that result in impacts not explicitly authorized herein, that result in greater impacts to fish or fish habitat than authorized or that occur in areas outside of that identified in the above noted table and reference documents may result in charges being laid under the federal Fisheries Act.**

Conditions of this Authorization

Conditions Relating to General Mitigation:

1. The Ministry of Transportation confirms that all plans and specifications relating to this Authorization have been duly prepared and reviewed by appropriate professionals working on behalf of the Ministry of Transportation (MoT). MoT acknowledges that the Concessionaire, as an agent of MoT, and in conformance with the Concession Agreement, is solely responsible for all design, safety, engineering and workmanship aspects of all of the works associated with this Authorization and corresponding compensatory works.
2. All additional mitigation measures pertaining to the protection of the environment as per the Okanagan Lake Bridge Project Environmental Protection Plan: Aquatic Resources and Associated Habitat, Coast River Environmental Services Ltd., March 2002 shall be implemented.

3. Any operation deemed to be detrimental to the fisheries resource shall be suspended and/or modified immediately upon the request of a Fishery Officer or Inspector.

4. The conditions of this Authorization notwithstanding, should the above works or undertaking, due to weather conditions, different soil or other natural conditions, or for any other reason, appear, in the opinion of DFO likely to cause greater impacts than the parties previously contemplated, then DFO may direct the MoT, and its agents, and contractors, to suspend or alter works and activities associated with the project to avoid or mitigate adverse impacts to fisheries resources. DFO may also direct the MoT and its agents, and contractors, to carry out at the MoT's expense any works or activities deemed necessary by DFO to avoid or mitigate further adverse impacts to fisheries resources. In circumstances where DFO is of the view that greater impacts may occur than were contemplated by the parties DFO may also modify or rescind this authorization. If the authorization is to be changed, then the MoT will be given an opportunity to discuss any proposed modifications or rescission.

5. The MoT is responsible for ensuring that any contractors working on its behalf receive a copy of this Authorization and that they have duly read and understand its contents. The MoT and the contractors are to keep a copy of this Authorization on site for the duration of the project to assist monitoring by enforcement officers and for consultation by the MoT or contract staff.

Conditions Relating to Compensatory Works:

6. Compensation for the above noted harmful alteration, disruption and destruction of fish habitat associated with the Okanagan Lake Floating Bridge Project and associated bridge approaches is as depicted in Figure 5-1: West End Causeway Existing Causeway Restoration Work* and Figure 5-3: Habitat Balance Issues Positive Impacts*, as contained in the report entitled The Okanagan Lake Floating Bridge Project Environmental Impacts Assessment: Aquatic Resources and Associated Habitat, Coast River Environmental Services Ltd., October 2001. The following table summarizes the compensation works.

Proposed Compensation	Area (m^2)
a) West End – Causeway Restoration/Riparian Habitat Creation above HWL	5,625
b) West End – Causeway Restoration/Marsh Bench Habitat Creation below HWL[1]	3,075
c) West End – Willow Thicket Spur Bench/Riparian Habitat Creation above HWL	550
d) West End – Granular Beach of Willow Thicket Spurs below HWL	2,150
e) Marsh Planting/Marsh Creation below the HWL[2] (site to be determined)	2,525
(Sub-total)	*(11,400)*
f) East End – Causeway Restoration to Maintained Habitat above HWL	6,675
(sub-total)	*(6,675)*
TOTAL	**18,075**

[1] Causeway Restoration/Marsh Bench Habitat Creation to be planted with emergent bulrush plant species at a rate that will initiate bulrush establishment of the bench area. With prior notice and detailed

planting/salvage plan, MoT may harvest donor plants from the Marsh Planting/Marsh Creation[2] area (site yet to be determined) and neighbouring bulrush communities.

Marsh Planting/Marsh Creation below the HWL[2] (site to be determined): the MoT has agreed to research and identify a suitable location for the salvaged marsh vegetation material and re-establish this aquatic plant community elsewhere on Okanagan Lake.

The above noted compensation is expected to occur during or immediately after the construction of the new floating bridge. In addition, due to the risk of failure, time lag to full productive capacity of the above noted compensation and proposed compensation ratio of only 1:1 replacement, MoT has agreed to the following monetary contribution to restoration within the Okanagan Basin to ensure that the resulting compensation achieves a No Net Loss of Productive Capacity of Fish Habitat:

7. **Provision of a one-time payment of $100,000 towards the restoration of Mission Creek at Cassorso Road as per the attached:**
   - Letter dated December 13th, 2004. Re: MoT Commitment of a payment of $100,000 to fisheries enhancement on Mission Creek. Ron Mathieson, Ministry of Transportation.
   - Letter dated December 13th, 2004. Re: Request for an Authorization - Okanagan Lake Crossing Project. Mike Kent, Ministry of Transportation.
   - **Important Note:** This contribution will be allocated towards another, high priority restoration project defined by the Ministry of Water, Land and Air Protection and identified within the Okanagan Lake Action Plan in the event that the Cassorso Road restoration project does not proceed.

Riparian Compensation

8. The total area of riparian compensation is **18,075 m²** as detailed in the table in condition (7) above.
9. Revegetation or supplementary planting must satisfy the following conditions:
   a. 90% survival of all vegetation planted or replanted must be attained for a period of five years commencing the first spring following planting. This may involve extensive care including watering, soil amendments and protection against grazing animals.
   b. Tree and shrub species selected for planting shall be native to the Okanagan Valley and shall mimic the natural density and composition of riparian vegetation along Okanagan Lake (with similar slope and planting substrate). Note: the area of 'restoration to parkland' is expected to mimic planting density of the adjacent parkland.
   c. Trees and shrubs shall be a minimum of a one gallon pot size and obtained from a reputable nursery, certified free of disease and pests.
   d. The MoT is required to submit a final revegetation plan that includes, as a minimum, the timing of revegetation activities in accordance with the

construction schedule, the final number/ratio of replacement tree species, stock size/age of species and detailed planting location. Equivalent information for any applicable transplanted stock must also be noted. The revegetation plan is required to be submitted to and approved by DFO prior to implementation of any compensatory works. (For general revegetation of large decommissioned areas, trees/square meter is appropriate).

e. In addition, the entire planted area above the high water mark should be seeded with an appropriate native grass seed mix at a rate that will ensure a quick "take".

Compensation Monitoring Program

A monitoring program, comprised of at least the following parameters, will apply to all compensatory works *with the exception of those works identified in Condition 8 above*:

10. The Monitoring Program shall be completed by a qualified biologist, or other professional who has experience in vegetative and aquatic habitat assessment, and who is deemed acceptable by DFO. The MoT will carry out a monitoring program (the "**Monitoring Program**"), which includes the following:

Vegetative Habitat Monitoring

a) As a minimum, monitoring of the riparian and marsh vegetation will be conducted in the Spring, following first flush of the vegetation, in years 1, 2, 3 and 5 commencing the first spring following re-planting. The monitoring will include visual and photographic assessment and recording of the survival rates exhibited by planted and replanted stock. All replanting is to occur prior to **June 15th** of the year of the monitoring in which it was identified for replacement and shall meet the aforementioned planting criteria.

Aquatic Habitat Monitoring

Monitoring of works undertaken below the mean annual high water mark will include monitoring of the compensatory fish habitat, as well as a pre-selected, natural sample site of <u>like</u> habitat (same features, function and affected fish species) and shall meet the following criteria:

b) Monitoring of the aquatic marsh bench habitat created below the HWL, shall occur in years 1, 2, 3 and 5 the first year following construction. Monitoring of this habitat will include a visual and photographic assessment of the stability of the physical bench habitat. Please also include the current water level, at the time of monitoring, in the monitoring data submitted.

c) Monitoring shall also include a survey of elevations to determine if the marsh benches are maintained at the elevations set forth in the compensation plan noted above in Condition 7 and whether, in the subsequent years of monitoring, the benches are actively eroding or aggrading.

d) Monitoring/assessment of both the compensatory habitat and a pre-selected natural site, comparable in intended habitat type and productive capacity, will occur during the approximate high water level of Okanagan Lake (to ensure that the area is wetted during the time of monitoring). The monitoring program shall be comprised of a quantitative and qualitative assessment of the following habitat parameters:

- Assessment of habitat type and amount of habitat, functional value (migratory, rearing, spawning), physical durability of the constructed habitat, final channel/habitat profile and where enhancement has been undertaken, a comparison of pre and post-construction site conditions.
- Assessment of total number of fish, fish species and life stage utilizing the habitat and the timing of the use.
- Qualitative assessment of the current productive capacity and recommendations on improvements if not functioning as intended.
- Assessment of basic water quality parameters (i.e. water temperature, pH and dissolved oxygen levels).

e) Provision of the annual results of the Monitoring Program in a written report to the undersigned at DFO, including an as built plan (initially), number of plants needing replacement and any other relevant documents and photographs, by **November 15th** of each year of the Monitoring Program.

11. Following the completion of the initial monitoring period, and any extensions thereof, DFO will assess the success of the compensatory habitat and determine whether or not it is functioning as intended, and choose the appropriate course of action as outlined below:

a) The vegetative compensatory habitat has consistently achieved a minimum of 90% survival for 5 consecutive years, is functioning as intended and will be self-sustaining without further major remedial work and the Monitoring Program will be terminated. OR,

b) The compensatory habitat is not functioning as intended. The Ministry of Transportation shall extend the Monitoring Program, including remedial work, for an additional two years to allow more time for the habitat to become adequately established.

12. The MoT shall ensure that the compensatory habitat is functioning as intended for the life of the project (detailed in the Project Description above). If at any time the compensatory habitat is not functioning as intended, the MoT shall carry out any works which are necessary to enable the compensatory habitat to function as intended.

Okanagan Lake Floating Bridge Project
Section 35(2) Authorization, March 16th, 2005

The holder of this authorization is hereby authorized under the authority of section 35(2) and section 32 of the Fisheries Act. R.S.C., 1985, c.F. 14, to carry out the work or undertaking described herein.

This authorization is valid only with respect to fish habitat and for no other purposes. It does not purport to release the applicant from any obligation to obtain permission from or to comply with the requirements of any other regulatory agencies.

Failure to comply with any condition of this authorization may result in charges being laid under the Fisheries Act.

This authorization form shall be held on site and work crews should be made familiar with the conditions herein.

Approved by:

Jason Hwang
Area Chief, BC Interior Area
Oceans, Habitat and Enhancement Branch
Fisheries and Oceans Canada, Pacific Region

Date of Issuance: March 21 2005

The MoT acknowledges that Fisheries and Oceans Canada has consulted with representatives of the MoT regarding the terms and conditions of this Authorization, and confirms that they have reviewed and understand the terms of this Authorization, and will comply with them.

Executed by an *authorized* signatory of the Ministry of Transportation on 17 day of March, 2005 in the presence of:

Witness (signature)

M.J. KENT P.Geo.
Name (print)

Title Chief Environmental Officer

The Ministry of Transportation (MoT)

Per:
Authorized signatory

R.W. MATHIESON R.ENG
Name (print)

PROJECT DIRECTOR
Title

Attachments:

Canada

Okanagan Lake Floating Bridge Project
Section 35(2) Authorization, March 16th, 2005

- Letter dated December 13th, 2004. Re: MoT Commitment of a payment of $100,000 to fisheries enhancement on Mission Creek. Ron Mathieson, Ministry of Transportation.
- Letter dated December 13th, 2004. Re: Request for an Authorization - Okanagan lake Crossing Project. Mike Kent, Ministry of Transportation.

Cc: Jeff Guerin, A/Senior Habitat Biologist, DFO - OHEB, BC Interior Area
Darryl Hussey, A/Section Head, DFO-OHEB, BC Interior Area
Jason Hwang, Area Chief, DFO - OHEB, BC Interior Area
Bonnie Antcliffe, Manager, Habitat Management Division, DFO - OHEB, Regional HQ

Canada

ANNEX 3

WATER ACT APPROVAL

The Water Act Approval is attached.

Land and Water
British Columbia Inc.
A corporation of the government of British Columbia

File: A3-4967

September 7, 2004

Ministry of Transportation
Engineering Branch
P.O. Box 9850, Stn. Prov. Govt.
Victoria, B.C. V8W 9T5

Attention: Mike Kent, P.Geo. - Chief Environmental Officer

Dear Mr. Kent:

Re: Stream Work Notification – Okanagan Lake - Okanagan Lake Bridge Project

Approval for the above has been granted, and the approval document verifying this is attached.

This Approval or copy of it should be kept on the work site so that it may be shown to a Ministry /Land and Water BC official upon request.

If you have any questions or concerns regarding this Approval, please contact the Regional Water Management Office. You should contact your local government (local or municipal) to determine if there are any additional requirements.

Yours truly,

Duane A. Wells, P.Ag.
Assistant Regional Water Manager
Southern Service Region – Kamloops Service Centre
Land & Water Management Division

Attachment

cc: Department of Fisheries & Oceans, Kamloops, Attn: Holly Smith
Department of Fisheries & Oceans, Kamloops, Attn: Darryl Hussey
Fish & Wildlife, Penticton, Attn: Phil Epp

145 – 3rd Ave Floor 3 Kamloops BC V2C 3M1 Phone: (250) 377-7000 Fax: (250) 377-7036
Website: www.lwbc.bc.ca

Conservation Officer Service, Kelowna, Attn: Greg Hoyer

Land and Water British Columbia Inc.
A corporation of the government of British Columbia

APPROVAL

Changes in and about a stream

WATER ACT - SECTION 9 (1)

Ministry of Transportation, Engineering Branch, P.O. Box 9850, Stn. Prov. Govt., Victoria, B.C. V8W 9T5 is hereby authorized to make changes in and about a stream as follows:

A. The stream is Okanagan Lake.

B. The changes to be made in and about the stream are construction of a five lane floating bridge across Okanagan Lake; construction of a 16200 square metre causeway; the installation of pilings and anchors, construction and dredging of a graving dock site; and removal of the existing bridge including the sinking of six pontoons into Okanagan Lake. The bridge will be constructed within Ministry of Transportation Right of Way and the graving dock site has yet to be determined. It will be the responsibility of the concessionaire to secure tenure or agreement with the property owner for the graving dock site.

C. All works shall comply to design plans submitted by the Ministry of Transportation for the application. If the Concessionaire has identified potential grave dock sites, or design the bridge outside of the details provided by the Ministry of Transportation the new designs shall be forwarded to this office for approval prior to work commencing. Changes to the proposed grave dock sites, and works outlined in the Environmental Impact Assessment Synopsis Report will be subject to the same studies that have been undertaken for the Environmental Protection Plan.

D. Any changes to the Environmental Protection Plan must be forwarded to this office for review and approval prior to the commencement of work on the project.

E. The works authorized shall be completed on or before December 31, 2008.

F. The Department of Fisheries and Oceans will outline all instream work windows.

G. No silt, or other deleterious substances, shall be allowed to enter the water outside of the worksite. This must be ensured through the use of appropriate cofferdam materials or silt fences.

145 – 3rd Ave Floor 3 Kamloops BC V2C 3M1 Phone: (250) 377-7000 Fax: (250) 377-7036
Website: www.lwbc.bc.ca

H. Dredging for the grave dock site should be kept to a minimum for the site chosen. Upon completion of the pontoon construction, the area of the grave dock site must be restored as close to its natural state as possible.

I. All work shall be conducted from the top of the bank, or the dry stream channel. No equipment shall be operated in the water.

J. The holder of this approval shall take reasonable care to avoid damaging any land, works, trees or other property, and shall make full compensation to the owners for any damage or loss resulting from the exercise of the rights granted with this approval.

K. This approval does not authorize entry onto privately held land.

L. Vegetation along Okanagan Lake shall be disturbed as little as possible.

M. All excavated material and debris shall be placed in a stable area above the high water mark and protected from erosion by planting grass and/or vegetation.

N. Any machinery operated on the site shall be in good repair and be free of hydraulic leaks and excess surface oil and grease.

O. All reasonable effort will be made to avoid any negative impacts to the stream's ecosystem.

P. Appropriate design methods and construction techniques for the site conditions shall be utilized.

Q. Upon completion of this project, the streambed shall be left in as smooth a condition as possible with no depressions that could trap fish or initiate erosion.

R. Rock used as riprap shall be clean, durable, angular in shape and suitably graded and sized to resist movement by freshet flows.

S. Where rock riprap is used to protect against erosion, it shall be placed at a slope no steeper than 2:1 (2 horizontal to 1 vertical) and have an entrenched toe/apron of rock placed on the streambed at the toe of the slope.

T. Prior to carrying out any maintenance of the works under this approval, the holder is to attain the consent of the Regional Water Manager, Southern Service Region.

Duane A. Wells, P.Ag.
Assistant Regional Water Manager
Southern Service Region

File: A3-4967

Date: September 7, 2004

ANNEX 4

NWPA APPROVALS

The NWPA Approvals are attached.

P.C. 1956-511

PRIVY COUNCIL CANADA

APR 5 1973 OFFICE OF THE MINISTER

F 0113

AT THE GOVERNMENT HOUSE AT OTTAWA

THURSDAY, the 29th day of MARCH, 1956.

PRESENT:

HIS EXCELLENCY

THE GOVERNOR GENERAL IN COUNCIL:

His Excellency the Governor General in Council, on the recommendation of the Acting Minister of Public Works and under the provisions of the Navigable Waters Protection Act, is pleased, hereby, to approve the annexed plans of a bridge and causeway and the site thereof according to the description attached proposed to be built by the Government of the Province of British Columbia across the Okanagan Lake, at Kelowna, British Columbia, from a point on the high water line on the east shore approximately 60 feet north of Mill Creek to the high water line on Siwash Point on the West shore, located in the Okanagan Indian Reserve No. 10.

His Excellency in Council, pursuant to the provisions of Section 10 of the said Act, is hereby further pleased to order as follows:

1. In this Order

   (a) "Minister" means the Minister of Public Works;

   (b) "bridge and causeway" means the bridge and causeway the plans and site of which are approved by this Order.

2. The owner or person in possession of the bridge and causeway shall

   (a) after completion of the construction of the bridge and causeway, remove all cofferdams, false works, ripraps, pile works and other temporary constructions from the bed of the channel or the site of the bridge and causeway in accordance with directions of the Minister;

   (b) deposit in accordance with instructions issued by the Minister any material excavated in the course of the construction of the bridge and causeway whether from the pier sites or otherwise;

   (c) provide and maintain at night such lights as are prescribed and required by the Minister;

....2

(d) have the bridge and causeway inspected each year by a duly registered engineer, approved by the Minister and submit a copy of his report to the Minister; and

(e) upon notice from the Minister make such repairs, alterations or improvements to the bridge and causeway as in the opinion of the Minister are required in the interest of navigation;

3. Where the Minister has required anything to be done under this order and it has not been done to his satisfaction within the time fixed by him in the notice, the Minister may cause such things to be done and the cost thereof shall be borne by the owner or person in possession of the bridge and causeway and shall be recoverable from such person as a debt due to the Crown.

4. No person shall, in constructing or maintaining the bridge and causeway or works incidental thereto, interfere with navigation in any way that, in the opinion of the Minister, is avoidable.

Certified to be a true copy.

Clerk of the Privy Council.

C A N A D A
DEPARTMENT OF TRANSPORT

NAVIGABLE WATERS PROTECTION ACT, PART I
Application Re: Section 9(2) of the Act

APPROVAL

Applicant: B.C. Ministry of Transportation and Highways, 940 Blanshard St., Victoria, B.C.

Work: Bridge and causeway.

Site - Location: Okanagan Lake at Kelowna, Province of British Columbia.

IMPORTANT NOTICE: This document is not a building permit under municipal law and does not constitute authority to occupy land.

WHEREAS by Order in Council P.C. 1956-517 of March 29, 1956 the Governor General in Council did approve the plan and site of the work hereinbefore referred to;

WHEREAS the above-named applicant has made application to the Minister of Transport under the Navigable Waters Protection Act for approval of the altering of the existing work by replacing the existing cables and anchors in accordance with the plan submitted by the applicant of the above-described lawful work at the above referred to site;

WHEREAS it is considered advisable to approve the altering and the plan of the said lawful work as interference with navigation will not be increased thereby provided the existing cables are removed from the waterway and three signs are installed and maintained on each side of the floating bridge with the warning "DANGER - ANCHOR CABLES - KEEP CLEAR".

THEREFORE, the Minister of Transport, pursuant to the provisions of the Navigable Waters Protection Act, Revised Statutes of Canada, 1970, Chapter N-19, hereby approves of the altering and the plan of the said lawful work as interference with navigation will not be increased thereby on condition that:

(1) the existing cables are removed from the waterway;

(2) three signs are installed and maintained on each side of the floating bridge with the warning "DANGER - ANCHOR CABLES - KEEP CLEAR"

Ottawa, NOV - 1 1982

J.N. Ballinger, P.Eng.,
Director, Aids & Waterways,
Coast Guard.

for Minister of Transport.

CANADA
DEPARTMENT OF FISHERIES AND OCEANS
NAVIGABLE WATERS PROTECTION ACT, PART I
Section 10(2)

FORM G-2

8200-T-9982.6

Approval

APPLICANT:	BC Ministry of Transportation and Highways 4D - 940 Blanshard Street Victoria , BC V8W 3E6
WORK:	Bridge and causeway
SITE-LOCATION:	Okanagan Lake, Okanagan Lake Bridge No. 1458, carrying Highway 97 over the Lake, at the Okanagan IR #10, from a point near Mill Creek to Siwash Point, Kelowna, British Columbia
IMPORTANT NOTICE:	This document authorizes the work in terms of its effect on marine navigation. It is the applicant's responsibility to obtain any other forms of approval, including building permits.

WHEREAS on March 29, 1956 the Governor General in Council by Order in Council P.C. 1956-517, did approve the plan(s) and site of the work hereinbefore referred to;

WHEREAS on November 1, 1982 the Minister of Transport did by *Navigable Waters Protection Act*, Section 9(2), approve the altering of the work hereinbefore referred to;

WHEREAS the above-named applicant has made application to the Minister of Fisheries and Oceans under the *Navigable Waters Protection Act* for approval of the further altering of the said lawful work by redecking the lift span in accordance with the attached plan(s); (3)

WHEREAS it is considered advisable to approve the further altering of the work and the plan(s) thereof as interference with navigation will not be increased thereby provided construction material and debris are not allowed to become waterborne; all temporary piles, false works, debris, etc., to be completely removed from the waterway; any materials or equipment used in construction shall be marked in accordance with the *Collision Regulations* of the *Canada Shipping Act* when located when in the waterway; in the event that the operation of the above works is terminated, it will be the proponents responsibility to remove the works and associated equipment in its entirety; install and maintain warning signs at appropriate locations upstream and downstream of the construction site advising of the work in progress, and upon completion install and maintain warning signs indicating the presence of the works; debris control and removal will be the responsibility of the proponent; the proponent shall provide unimpeded access to the Minister or his/her representatives for inspection and/or monitoring purposes; the *Navigable Waters Works Regulations* apply and the *Navigable Waters Bridge Regulations* apply; ensure that equipment used in construction does not interfere with navigation; all conditions contained in the attached document entitled 'Lift Span Operation and Accomodation of Marine Traffic' shall be adhered to.

.../2

THEREFORE, the Minister of Fisheries and Oceans, pursuant to the provisions of the *Navigable Waters Protection Act*, Revised Statutes of Canada, 1985, chapter N-22, hereby approves of the further altering of the work and the plan(s) thereof on condition that:

The owner(s) or person(s) in possession is required to ensure that:

Construction material and debris are not allowed to become waterborne.

All temporary piles, false works, debris, etc., to be completely removed from the waterway.

Any materials or equipment used in construction shall be marked in accordance with the *Collision Regulations* of the *Canada Shipping Act* when located when in the waterway.

In the event that the operation of the above works is terminated, it will be the proponents responsibility to remove the works and associated equipment in its entirety.

Install and maintain warning signs at appropriate locations upstream and downstream of the construction site advising of the work in progress, and upon completion install and maintain warning signs indicating the presence of the works.

Debris control and removal will be the responsibility of the proponent.

The proponent shall provide unimpeded access to the Minister or his/her representatives for inspection and/or monitoring purposes.

The *Navigable Waters Works Regulations* apply and the *Navigable Waters Bridge Regulations* apply.

Ensure that equipment used in construction does not interfere with navigation.

All conditions contained in the attached document entitled 'Lift Span Operation and Accommodation of Marine Traffic' shall be adhered to.

Vancouver, BC

AUG 15 2002

Bob Gowe
A/Superintendent
Navigable Waters Protection Division
Canadian Coast Guard - Pacific Region
for Minister of Fisheries and Oceans

73-0104

CANADA
TRANSPORT CANADA
NAVIGABLE WATERS PROTECTION ACT, PART I
Section 10(2)

FORM G-2

8200-T-9982.7

Approval

APPLICANT:	Ministry of Transportation P.O. Box 9850 Stn Prov Govt Victoria , BC V8W 9T5
WORK:	Bridge and Causeway
SITE-LOCATION:	Okanagan Lake, Okanagan Lake Bridge No. 1458, carrying Highway 97 over the Lake, at the Okanagan IR #10, from a point near Mill Creek to Siwash Point, Kelowna, British Columbia
IMPORTANT NOTICE:	This document authorizes the work in terms of its effect on marine navigation. It is the applicant's responsibility to obtain any other forms of approval, including building permits.

WHEREAS on April 3, 1956 the Governor General in Council by Order in Council P.C. 1956-517, did approve the plan(s) and site of the work hereinbefore referred to in favour of the Government of the Province of British Columbia;

WHEREAS on November 1, 1982 the Minister of Transport did by *Navigable Waters Protection Act*, Section 9(2), approve the altering of the work hereinbefore referred to in favour of BC Ministry of Transportation and Highways;

WHEREAS on August 15, 2002 the Minister of Fisheries and Oceans did by Navigable Waters Protection Act, Section 10(2), approve the alterting of the work hereinbefore referred to in favour of BC Ministry of Transportation and Highways;

WHEREAS the above-named applicant has made application to the Minister of Transport under the *Navigable Waters Protection Act* for approval of the further altering of the said lawful work by rebuilding the bridge in accordance with the attached plan(s); (12)

WHEREAS it is considered advisable to approve the altering of the work and the plan(s) thereof as interference with navigation will not be increased thereby provided all temporary piles, false works, debris, etc., to be completely removed from the waterway; any materials or equipment used in construction are to be marked in accordance to the *Collision Regulations* of the *Canada Shipping Act* when located on or in the waterway; bridge pier footings are not to protrude above natural bed of waterway; bridge piers are to be constructed parallel to the stream flow and are not to have any sharp edges, protrusions etc., into the navigational openings and are to have a streamlined upstream face; debris control and removal will be the responsibility of the proponent. The Navigable Waters Protection Division will monitor; the proponent shall provide unimpeded access to the Minister or his/her representatives for inspection and/or monitoring purposes; the *Navigable Waters Works Regulations* apply; any piles to be removed are to be cut at or below the natural bed of the waterway;

.../2

ensure that equipment used in construction does not interfere with navigation; the site/work shall be adequately marked/lit during all phases of construction to safeguard marine navigation; on completion of installation of the work / facility and establishment of new private aids to navigation, please contact the Navigation Information Officer of the Canadian Hydrographic Service at (250) 363-6354 or the Database Information Officer at (250) 363-6360. This will ensure the correction of marine charts and publications; monitor VHF channel 16 during all hours of construction; monitor and communicate VHF working channel (to be determined) during all hours of construction; have the VHF working channel, VHF channel 16 and a cell phone number posted/advertised for the purposes of public information; issue public notices, at least once a week, over the working VHF channel and by posting notices at local marinas that describe the construction schedule 2 weeks in advance during the summer boating season. In addition, a fax shall be forwarded to Transport Canada/NWPD @ 604-775-8828 and to the Kelowna Fire Department @ 250-862-3371 (the primary marine emergency resource) that describes these activities; have onsite, a 'qualified person' to address queries/questions from the boating public. The 'qualified person' shall be conversant with details of the construction activities so that public and boating safety is maintained at all times; ensure that equipment used in the construction of the bridge is marked in accordance with the *Canada Shipping Act*; advise Transport Canada / NWPD staff should equipment staging areas (barges) be located on the lake. Information regarding staging areas must include a location plan, securing arrangements and timing of placement and removal; ensure that a pre/post construction hydrology study is completed that considers the placement of the new piers and abutment fills and their effect on scour and deposition of material at the new navigation channel location and adjacent to the shoreline modification to a distance of 500 metres north and south of the reconstructed bridge. This study should forecast the effects of scour and deposition on the main navigation channel and adjacent to the shoreline modifications at five (5) year intervals; contact Transport Canada / NWPD schedule of placement of navigation lighting on the bridge is known; discuss with Transport Canada / NWPD staff the details of disposal of decommissioned floating piers when known. Should disposal of the piers be contemplated in Okanagan Lake, provisions under Part II, section (22) of the *Navigable Waters Protection Act* will apply; during the final phase of construction the reduced clearance of 4.3 metres at high water shall not occur prior to October 14 or continue beyond March 16 of the construction year.

THEREFORE, the Minister of Transport, pursuant to the provisions of the *Navigable Waters Protection Act*, Revised Statutes of Canada, 1985, chapter N-22, hereby approves of the altering of the work and the plan(s) thereof on condition that:

The owner(s) or person(s) in possession is required to ensure that:

All temporary piles, false works, debris, etc., to be completely removed from the waterway.

Any materials or equipment used in construction are to be marked in accordance to the *Collision Regulations* of the *Canada Shipping Act* when located on or in the waterway.

Bridge pier footings are not to protrude above natural bed of waterway.

.../3

Bridge piers are to be constructed parallel to the stream flow and are not to have any sharp edges, protrusions etc., into the navigational openings and are to have a streamlined upstream face.

Debris control and removal will be the responsibility of the proponent. The Navigable Waters Protection Division will monitor.

The proponent shall provide unimpeded access to the Minister or his/her representatives for inspection and/or monitoring purposes.

The *Navigable Waters Works Regulations* apply.

Any piles to be removed are to be cut at or below the natural bed of the waterway.

Ensure that equipment used in construction does not interfere with navigation.

The site/work shall be adequately marked/lit during all phases of construction to safeguard marine navigation.

On completion of installation of the work / facility and establishment of new private aids to navigation, please contact the Navigation Information Officer of the Canadian Hydrographic Service at (250) 363-6354 or the Database Information Officer at (250) 363-6360. This will ensure the correction of marine charts and publications.

Monitor VHF channel 16 during all hours of construction.

Monitor and communicate VHF working channel (to be determined) during all hours of construction.

Have the VHF working channel, VHF channel 16 and a cell phone number posted/advertised for the purposes of public information.

Issue public notices, at least once a week, over the working VHF channel and by posting notices at local marinas that describe the construction schedule 2 weeks in advance during the summer boating season. In addition, a fax shall be forwarded to Transport Canada/NWPD @ 604-775-8828 and to the Kelowna Fire Department @ 250-862-3371 (the primary marine emergency resource) that describes these activities.

Have onsite, a 'qualified person' to address queries/questions from the boating public. The 'qualified person' shall be conversant with details of the construction activities so that public and boating safety is maintained at all times.

Ensure that equipment used in the construction of the bridge is marked in accordance with the *Canada Shipping Act*.

.../4

Advise Transport Canada / NWPD staff should equipment staging areas (barges) be located on the lake. Information regarding staging areas must include a location plan, securing arrangements and timing of placement and removal.

Ensure that a pre/post construction hydrology study is completed that considers the placement of the new piers and abutment fills and their effect on scour and deposition of material at the new navigation channel location and adjacent to the shoreline modification to a distance of 500 metres north and south of the reconstructed bridge. This study should forecast the effects of scour and deposition on the main navigation channel and adjacent to the shoreline modifications at five (5) year intervals.

Contact Transport Canada / NWPD schedule of placement of navigation lighting on the bridge is known.

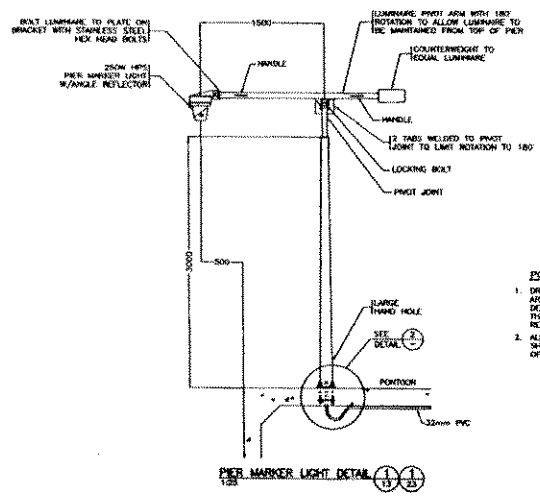
Discuss with Transport Canada / NWPD staff the details of disposal of decommissioned floating piers when known. Should disposal of the piers be contemplated in Okanagan Lake, provisions under Part II, section (22) of the *Navigable Waters Protection Act* will apply.

During the final phase of construction the reduced clearance of 4.3 metres at high water shall not occur prior to October 14 or continue beyond March 16 of the construction year.

Vancouver, BC

APR 0 8 2005

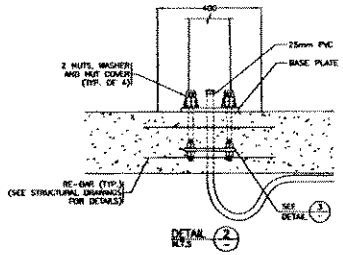
John Mackie
Area Officer
Navigable Waters Protection Division
Pacific Region
for Minister of Transport



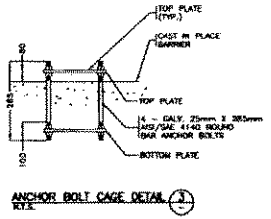
PIER MARKER LIGHT DETAIL 1/3 1/4

POLE SUPPORT NOTES:

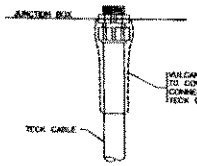
1. DRAWINGS OF POLE AND MARKER LIGHT SUPPORT BRACKET ARE FUNCTIONAL ONLY. THE CONCESSIONAIRE SHALL VERIFY/ DETERMINE DIMENSIONS AND STEEL/BOLT SIZES DURING THE PREPARATION OF SHOP DRAWINGS. REFER TO THE REFERENCE DOCUMENTS FOR FURTHER INFORMATION.
2. ALL STRUCTURAL STEEL, CONNECTING BOLTS AND GALVANIZING SHALL CONFORM TO THE REQUIREMENTS OF CHAPTER 306 OF THE MOT ELECTRICAL AND SIGNING MATERIAL STANDARDS.

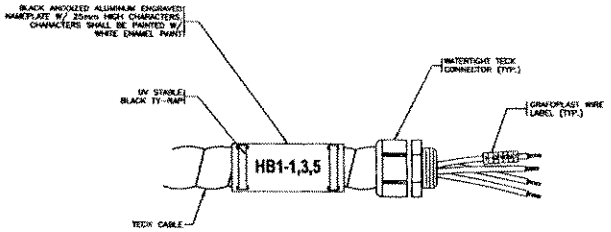


DETAIL 2 N.T.S.



ANCHOR BOLT CAGE DETAIL 3 N.T.S.





TECK CABLE OR ARMOURED COMMUNICATION TERMINATION DETAIL (TYP.)
N.T.S.

ALL EQUIPMENT IS PROPOSED UNLESS NOTED OTHERWISE

0m 0.5m 1m

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE

SEE REFERENCE DRAWINGS FOR FOR APPLICABLE STANDARD DRAWINGS

SCALE: SHOWN

No.	Date	Description	Init.	
A	CHANGES	SHEET RE-ISSUED		PBA

REVISIONS

Province of British Columbia
MINISTRY OF TRANSPORTATION
OKANAGAN LAKE BRIDGE PROJECT

OKANAGAN HIGHWAY No. 97
OKANAGAN LAKE BRIDGE No. 1458
ELECTRICAL INSTALLATION
PONTOON MARKER LIGHT
AND TECK CABLE DETAILS

Project Manager: Okanagan Lake Bridge Project Management Team, 310 - 546 Tutor Street, KELOWNA, B.C. V1Y 7N3

Bridge Consultant: PBA CONSULTING ENGINEERS

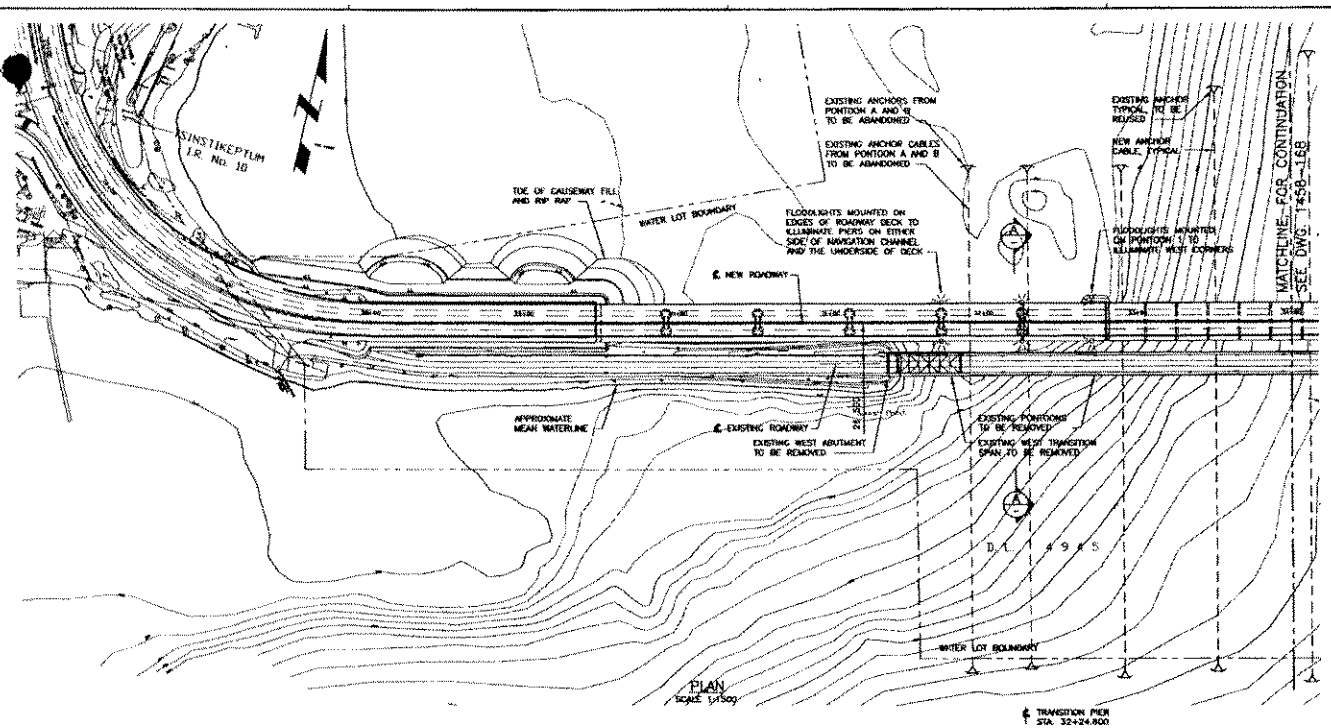
PREPARED UNDER THE DIRECTION OF

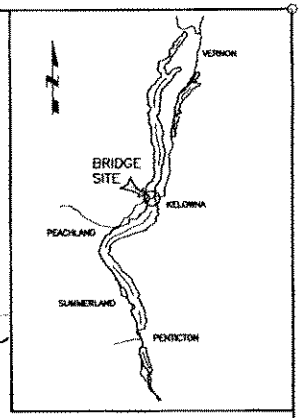
CONSULTANT

SEAL

RCE No.	Project No.	Contract No.	Version	Drawing No.
L2-97-OLB	77880		2	TE-98116-59

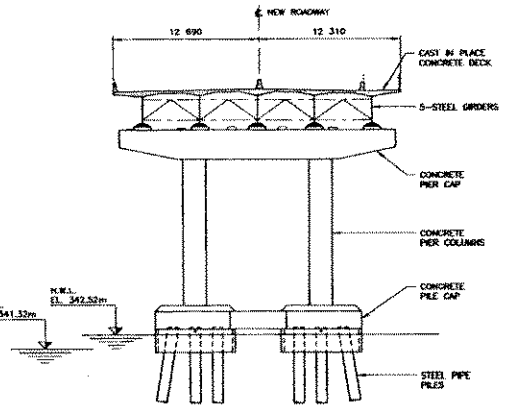
CHECK PRINTS BEARING PREVIOUS ISSUE





KEY PLAN
N.T.S.

NAVIGABLE WATERS PROTECTION ACT
APR 08 2015
8200-T-9982.7
PACIFIC REGION



SECTION (A)
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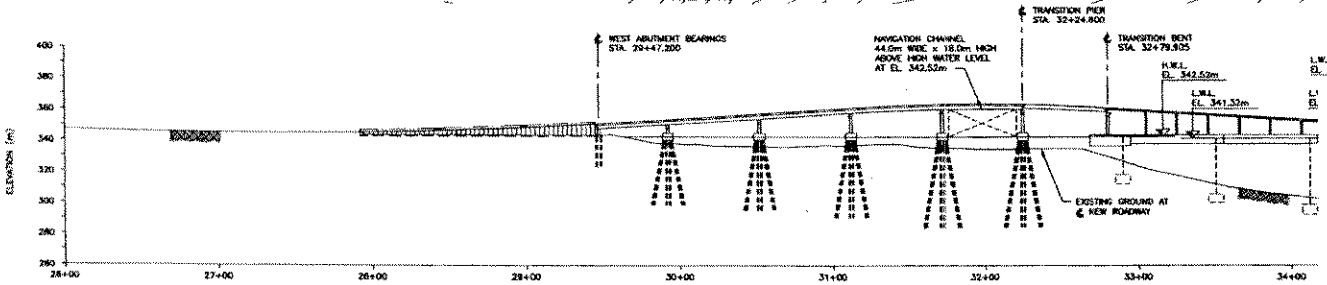


ELEVATION
SCALE 1:1500

I CERTIFY THAT A DUPLICATE OF THIS PLAN WAS DEPOSITED IN THE LAND TITLE OFFICE AT_____, PROVINCE OF BRITISH COLUMBIA, ON THE_____ DAY OF_____, 20____ UNDER THE PROVISIONS OF THE NAVIGABLE WATERS PROTECTION ACT.

_____
REGISTRAR

SCALE: SHOWN

No.	Date	Description	Init.

REVISIONS

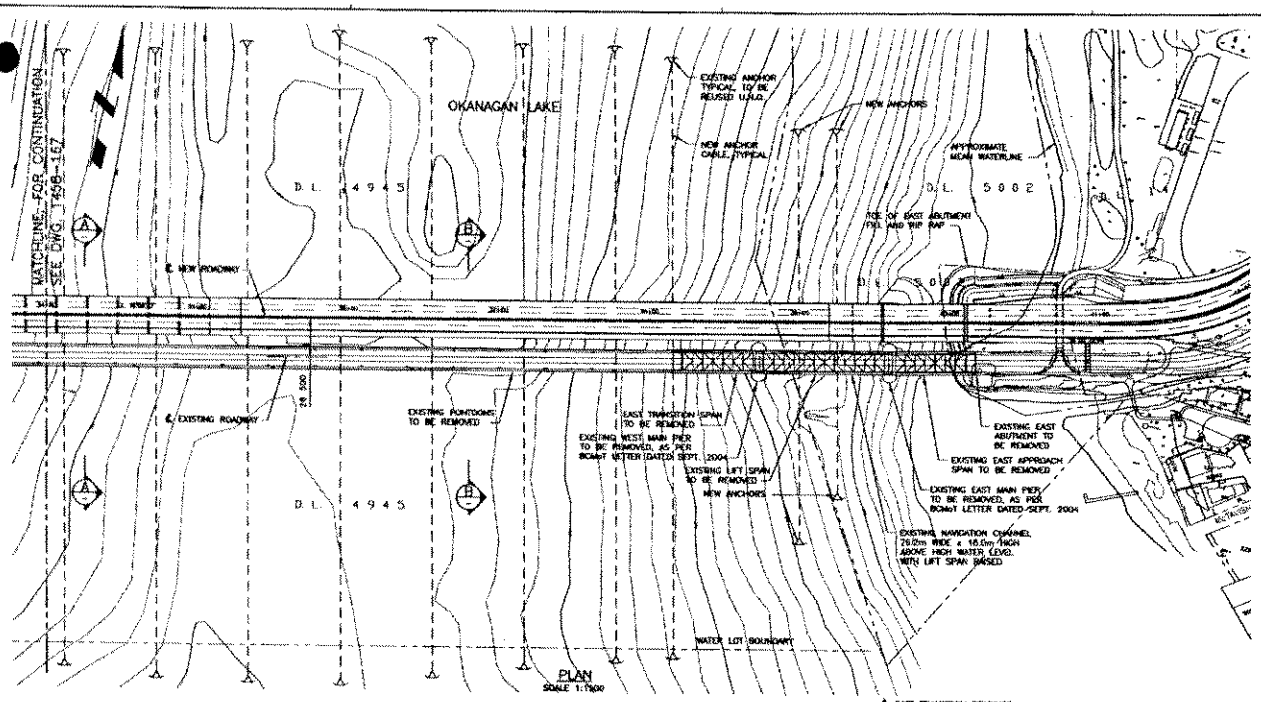
Province of British Columbia
MINISTRY OF TRANSPORTATION
OKANAGAN LAKE BRIDGE PROJECT

OKANAGAN HIGHWAY No. 97
OKANAGAN LAKE BRIDGE No. 1458
NWPA APPLICATION LAYOUT
SHEET 1

Project Management: Okanagan Lake Bridge Project Management Team, 300 – 940 Blanshard Street, VICTORIA, B.C., V8W 3E6
Design Consultant: Westmar
PREPARED UNDER THE DIRECTION OF: CARLO ELHOLM, CONSULTANT, DATE: 04 FEB 10

FILE No.	PROJECT No.	CONTRACT No.	REVISION	DRAWING No.
L2-97-OLB	77860		2	1458-167

CANCEL PRINTS BEARING PREVIOUS LETTER



PLAN
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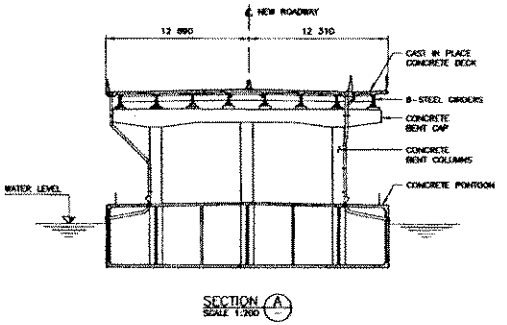

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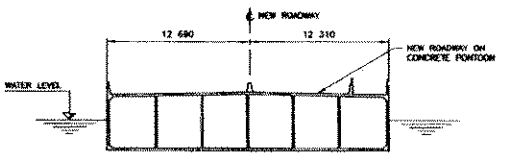

SECTION (B)
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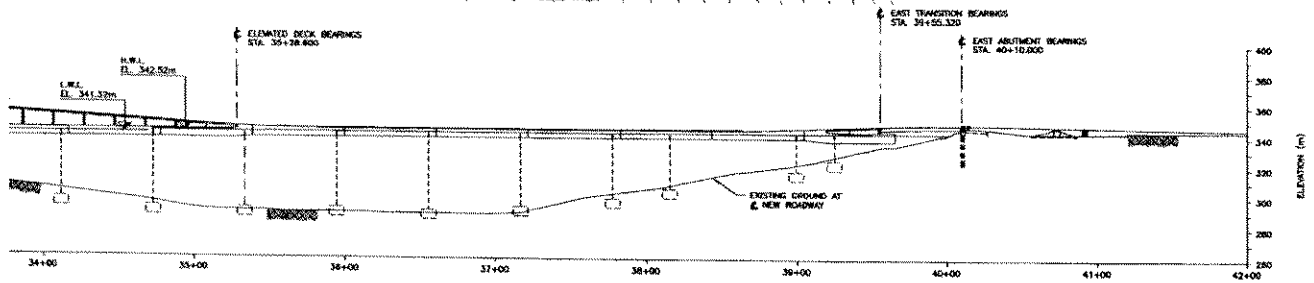


ELEVATION
SCALE 1:1500

I CERTIFY THAT A DUPLICATE OF THIS PLAN WAS DEPOSITED IN THE LAND TITLE OFFICE AT _____, PROVINCE OF BRITISH COLUMBIA, ON THE _____ DAY OF _____, 20____ UNDER THE PROVISIONS OF THE NAVIGABLE WATERS PROTECTION ACT.

_____
REGISTRAR

SCALE: SHOWN

Rev.	Date	Description	Init.

REVISIONS

Province of British Columbia
MINISTRY OF TRANSPORTATION
OKANAGAN LAKE BRIDGE PROJECT

OKANAGAN HIGHWAY No. 97
OKANAGAN LAKE BRIDGE No. 1458
NWPA APPLICATION LAYOUT
SHEET 2

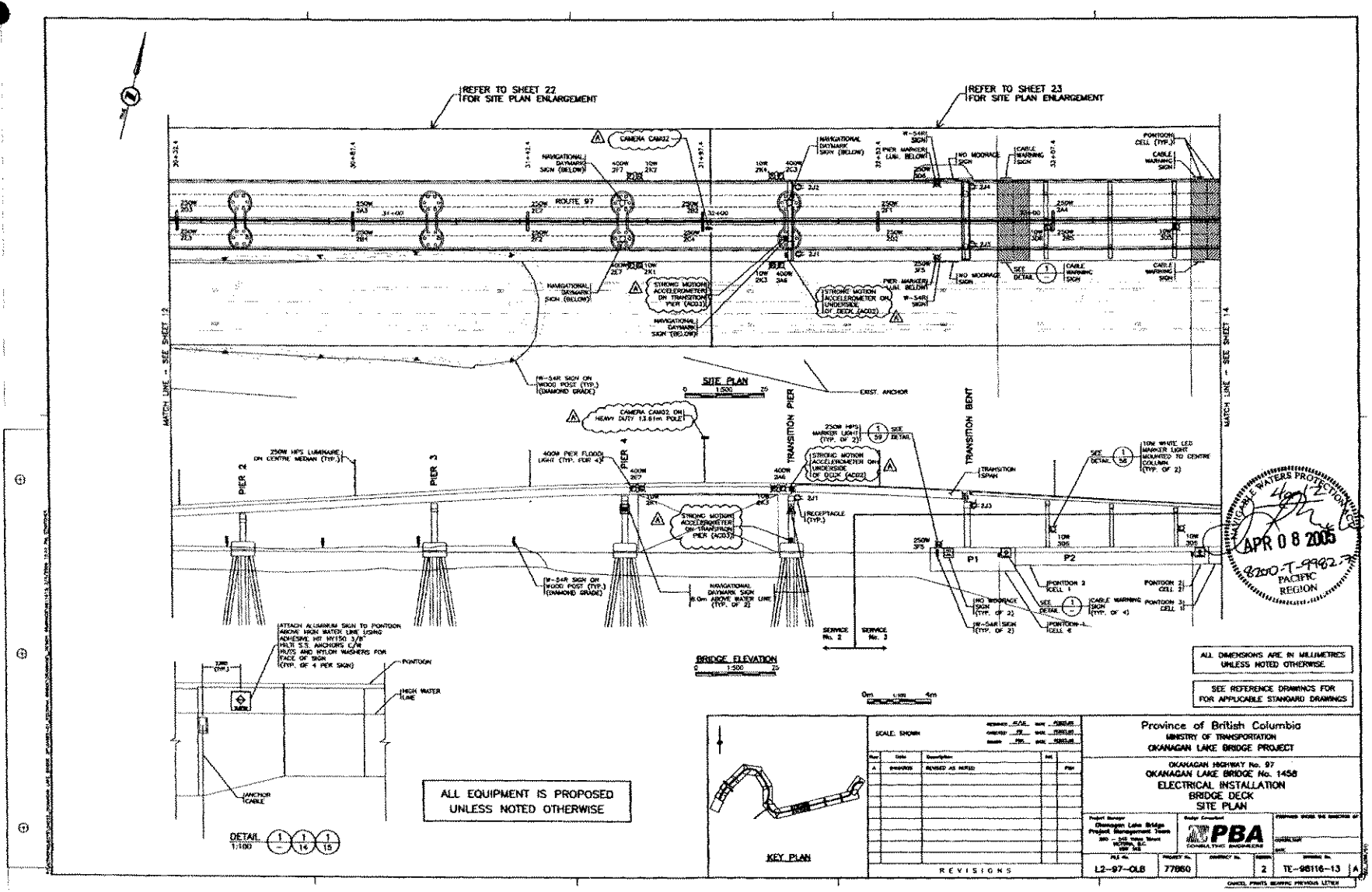
Project Manager: Okanagan Lake Bridge Project Management Team, 300 – 542 Yates Street, VICTORIA, B.C. V8W 1K8

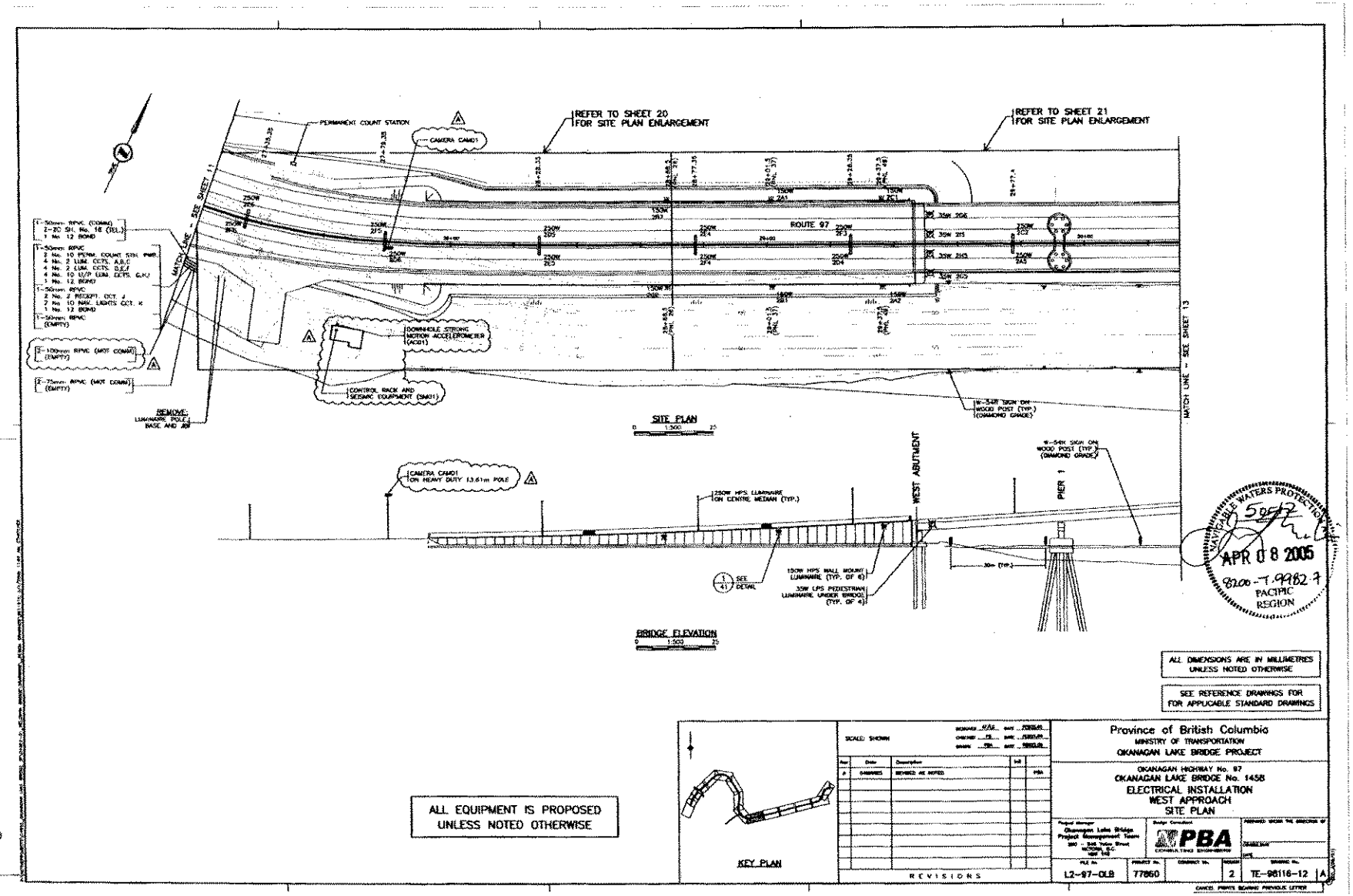
Design Consultant: Westmar

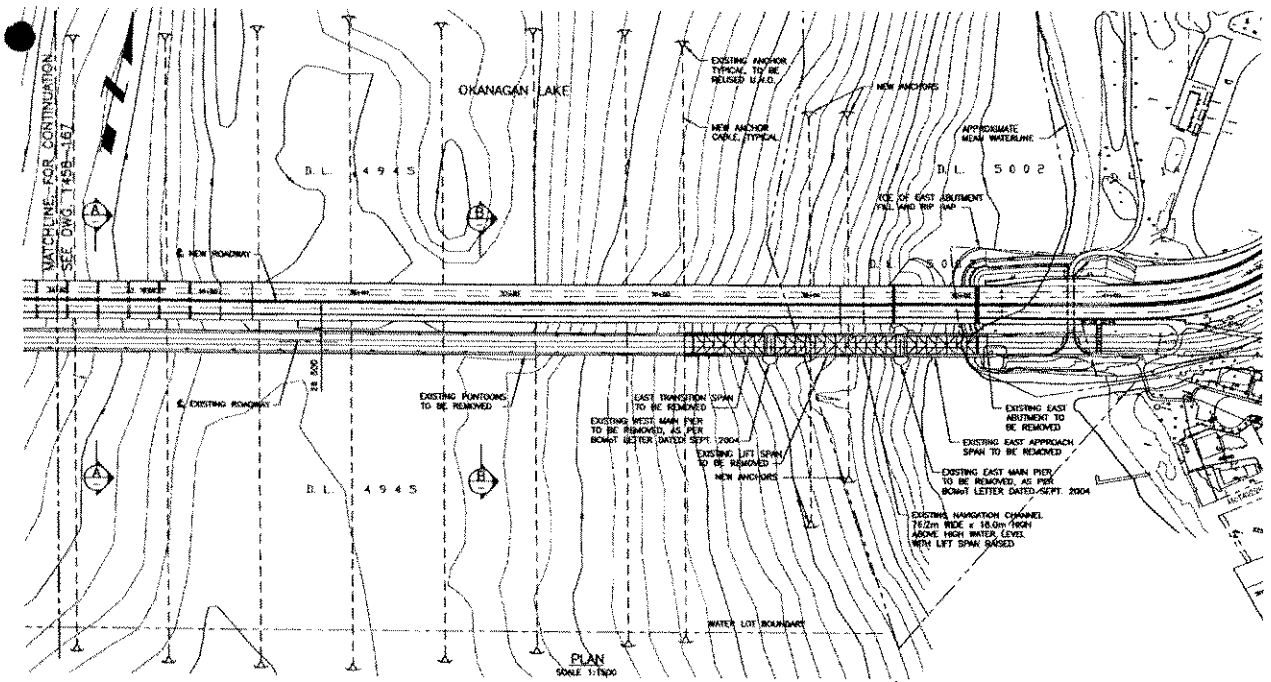
PREPARED UNDER THE DIRECTION OF: CARLO ELHOUK
DATE: 04 FEB 10

FILE No.	PROJECT No.	CONTRACT No.	REVISION	DRAWING No.
L2-97-OLB	77860		2	1458-168

CANCEL PRINTS BEARING PREVIOUS LETTER




REFER TO SHEET 20
FOR SITE PLAN ENLARGEMENT
REFER TO SHEET 21
FOR SITE PLAN ENLARGEMENT
PERMANENT COUNT STATION
CAMERA CAM01
ROUTE 97
MATCH LINE - SEE SHEET 11
MATCH LINE - SEE SHEET 13
DOWNHOLE STRONG MOTION ACCELEROMETER (ACC01)
CONTROL RACK AND SEISMIC EQUIPMENT (SMC01)
REMOVE: LUMINAIRE, POLE, BASE AND JBP
W-54R SIGN ON WOOD POST (TYP.) (DIAMOND GRADE)
SITE PLAN
CAMERA CAM01 ON HEAVY DUTY 13.61m POLE
250W HPS LUMINAIRE ON CENTRE MEDIAN (TYP.)
WEST ABUTMENT
PIER
SEE 41 DETAIL
150W HPS WALL MOUNT LUMINAIRE (TYP. OF 6)
35W LPS PEDESTRIAN LUMINAIRE UNDER BRIDGE (TYP. OF 4)
BRIDGE ELEVATION
ALL EQUIPMENT IS PROPOSED UNLESS NOTED OTHERWISE
KEY PLAN
NAVIGABLE WATERS PROTECTION
APR 08 2005
8206-T-9982.7
PACIFIC REGION
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
SEE REFERENCE DRAWINGS FOR FOR APPLICABLE STANDARD DRAWINGS
SCALE: SHOWN
REVISIONS
Province of British Columbia
MINISTRY OF TRANSPORTATION
OKANAGAN LAKE BRIDGE PROJECT
OKANAGAN HIGHWAY No. 97
OKANAGAN LAKE BRIDGE No. 1458
ELECTRICAL INSTALLATION
WEST APPROACH
SITE PLAN
PBA
FILE No. L2-97-OLB
PROJECT No. 77860
ISSUE 2
DRAWING No. TE-98116-12
A



PLAN
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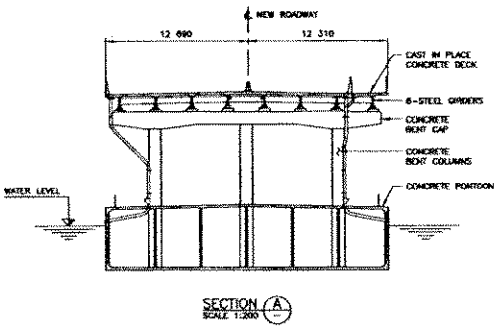
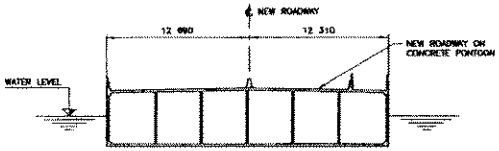
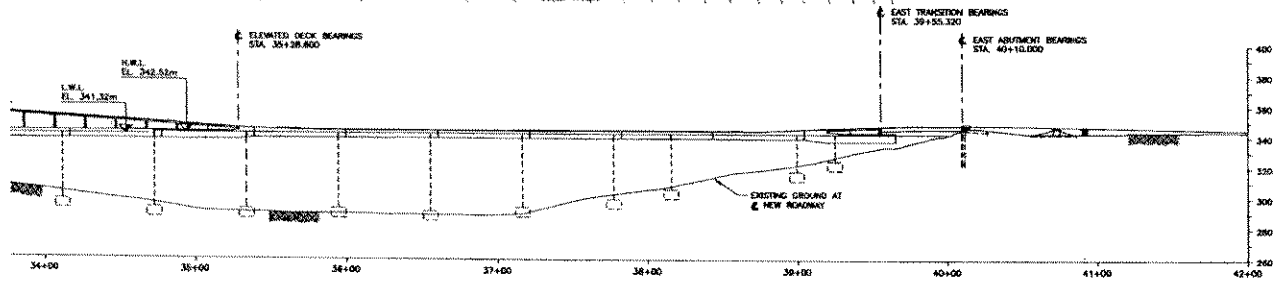


SECTION (A)
SCALE 1:200



SECTION (B)
SCALE 1:200



ELEVATION
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NAVIGABLE WATERS PROTECTION
6002
APR 08 2005
8200-T-9982.7
PACIFIC REGION

I CERTIFY THAT A DUPLICATE OF THIS PLAN WAS DEPOSITED IN THE LAND TITLE OFFICE AT_____, PROVINCE OF BRITISH COLUMBIA, ON THE_____ DAY OF_____, 20____ UNDER THE PROVISIONS OF THE NAVIGABLE WATERS PROTECTION ACT.

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Rev	Date	Description	Init

REVISIONS

Province of British Columbia
MINISTRY OF TRANSPORTATION
OKANAGAN LAKE BRIDGE PROJECT

OKANAGAN HIGHWAY No. 97
OKANAGAN LAKE BRIDGE No. 1458
NWPA APPLICATION LAYOUT
SHEET 2

Project Manager: Okanagan Lake Bridge Project Management Team, 340 - 546 Yates Street, VICTORIA, B.C. V8W 1K8
Design Consultant: Westmar
PREPARED UNDER THE DIRECTION OF: CARLO ELHOLM
DATE: 04 FEB 10

FILE No.	PROJECT No.	CONTRACT No.	SCREEN	DRAWING No.
L2-97-OLB	77860		2	1458-168

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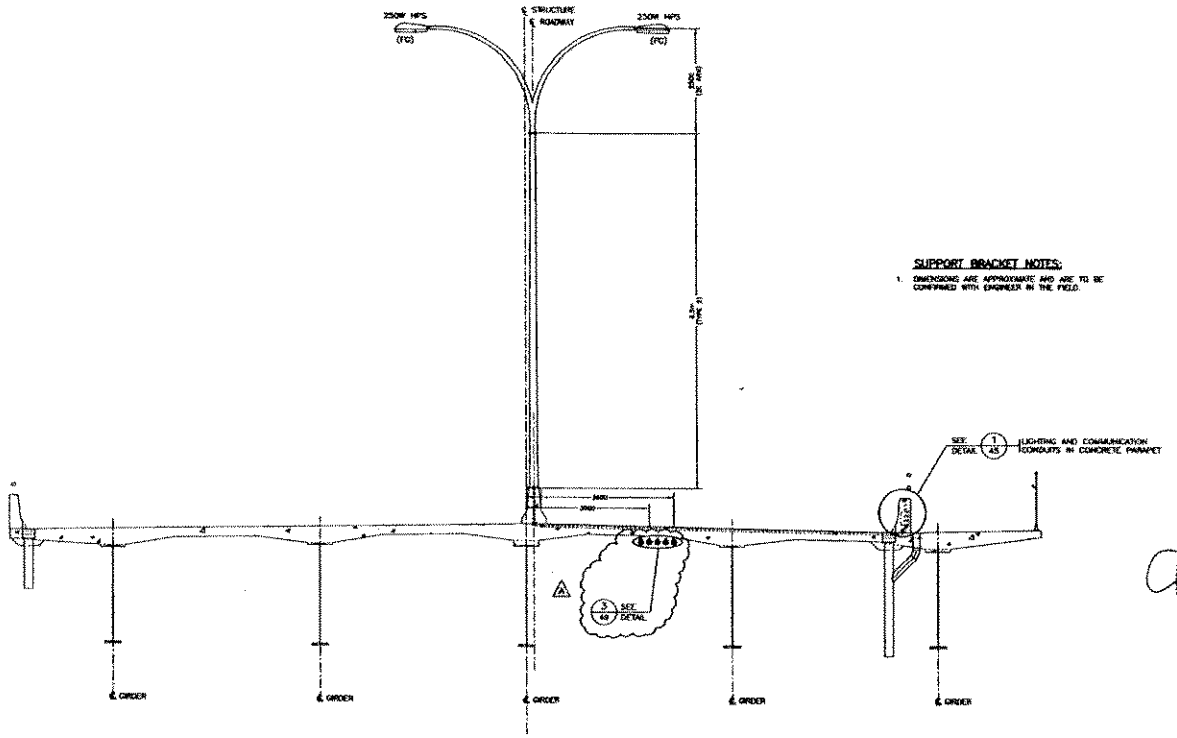

SUPPORT BRACKET NOTES:

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ALL EQUIPMENT IS PROPOSED UNLESS NOTED OTHERWISE

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE

SEE REFERENCE DRAWINGS FOR FOR APPLICABLE STANDARD DRAWINGS

APR 08 2005
8200-T-99827
PACIFIC REGION

7 OF 17

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A	04/MAR/05	REVISED AS NOTED	PBA

REVISIONS

Province of British Columbia
MINISTRY OF TRANSPORTATION
OKANAGAN LAKE BRIDGE PROJECT

OKANAGAN HIGHWAY No. 97
OKANAGAN LAKE BRIDGE No. 1458
ELECTRICAL INSTALLATION
BRIDGE THIRD PARTY CONDUIT
WEST ELEVATED DECK SUPPORT BRACKETS

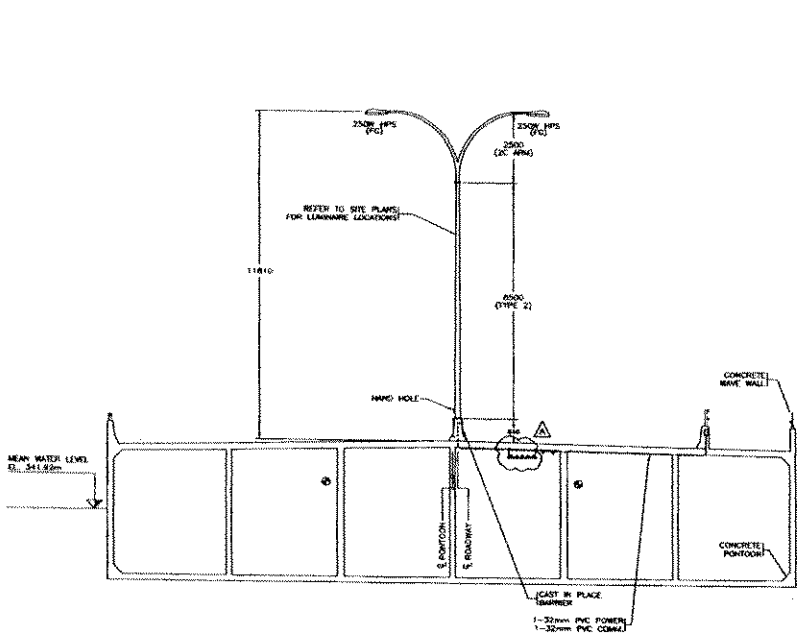
Project Manager: Okanagan Lake Bridge Project Development Team, 300 – 3rd Yates Street, Victoria, B.C. V8W 1K8

Bridge Consultant: PBA CONSULTING ENGINEERS

PREPARED UNDER THE DIRECTION OF: CONSULTANT, DATE

FILE No.	PROJECT No.	AGREEMENT No.	ISSUE	DRAWING No.
L2-97-OLB	77860		2	TE-98116-50 | A

CANCELS, PRINTS BEARING PREVIOUS LETTER



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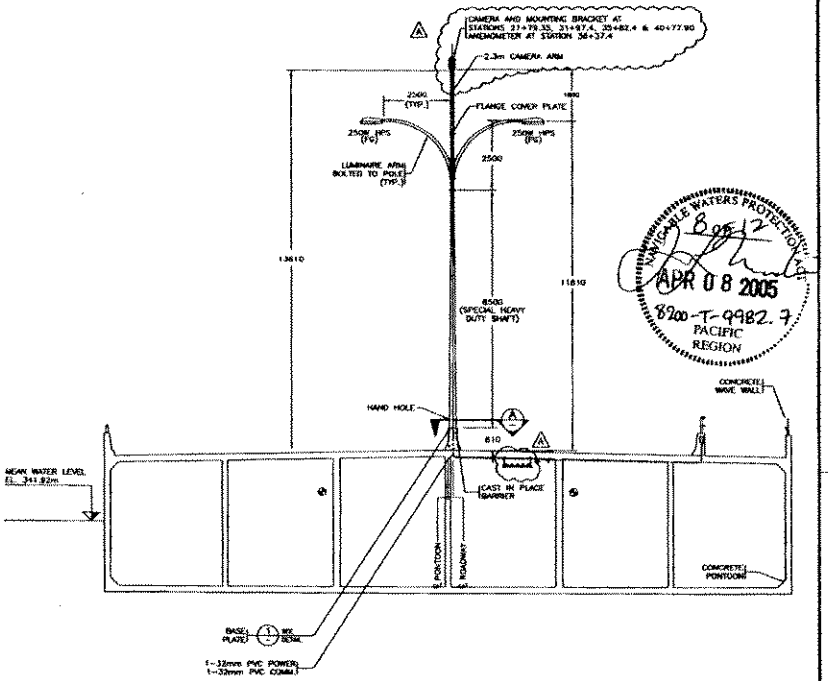

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COMBINATION LUMINAIRE/CAMERA POLE ON FLOATING SECTION (LOOKING EAST)
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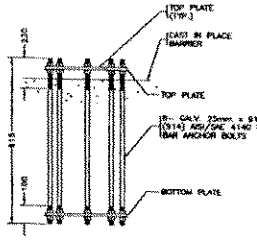

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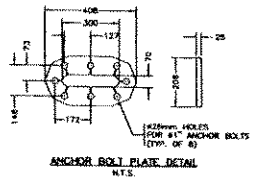

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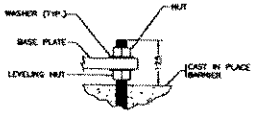

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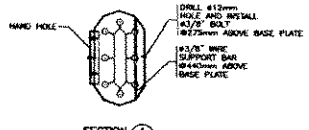

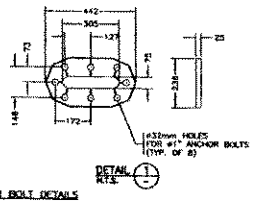

SPECIAL HEAVY DUTY ANCHOR BOLT DETAILS

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ALL EQUIPMENT IS PROPOSED UNLESS NOTED OTHERWISE

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE

SEE REFERENCE DRAWINGS FOR FOR APPLICABLE STANDARD DRAWINGS

NAVIGABLE WATERS PROTECTION ACT
APR 08 2005
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PACIFIC REGION

SCALE: SHOWN

No.	Date	Description	Init.
A	DRAWING	REVISED AS NOTED	PBA

REVISIONS

Province of British Columbia
MINISTRY OF TRANSPORTATION
OKANAGAN LAKE BRIDGE PROJECT

OKANAGAN HIGHWAY No. 97
OKANAGAN LAKE BRIDGE No. 1458
ELECTRICAL INSTALLATION
BRIDGE DECK
POLE ELEVATIONS

Project Manager: Okanagan Lake Bridge Project Management Team, 300 - 542 Yates Street, Victoria, B.C. V8W 1K8

Design Consultant: PBA Consulting Engineers

PREPARED UNDER THE DIRECTION OF: ENGINEER, DATE

PLT No. L2-97-OLB | PROJECT No. 77860 | DISTRICT No. | VERSION 2 | DRAWING No. TE-98116-40 | A

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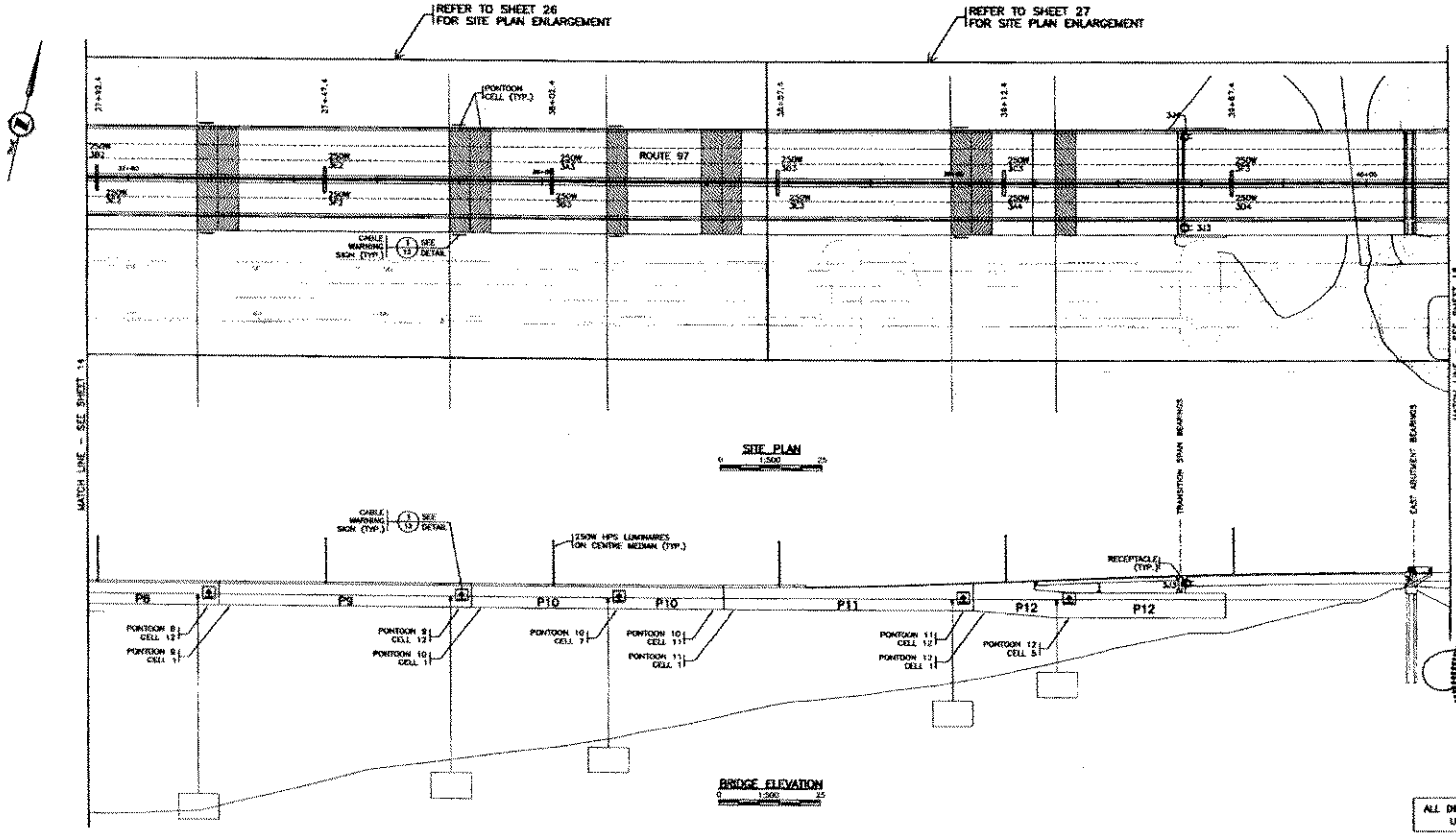

ALL DIMENSIONS ARE IN MILLIMETRES
UNLESS NOTED OTHERWISE

SEE REFERENCE DRAWINGS FOR
FOR APPLICABLE STANDARD DRAWINGS

ALL EQUIPMENT IS PROPOSED
UNLESS NOTED OTHERWISE

KEY PLAN

SCALE: SHOWN

No.	Date	Description	Init.
A	(unknown)	REVISED AS NOTED	PBA

REVISIONS

Province of British Columbia
MINISTRY OF TRANSPORTATION
OKANAGAN LAKE BRIDGE PROJECT

OKANAGAN HIGHWAY No. 97
OKANAGAN LAKE BRIDGE No. 1458
ELECTRICAL INSTALLATION
BRIDGE DECK
SITE PLAN

Project Manager: Okanagan Lake Bridge Project Management Team
Design Consultant: PBA CONSULTING ENGINEERS

FILE No.	PROJECT No.	CONTRACT No.	SHEET	DRAWING No.	
L2-97-OLB	77860		2	TE-98116-15	A

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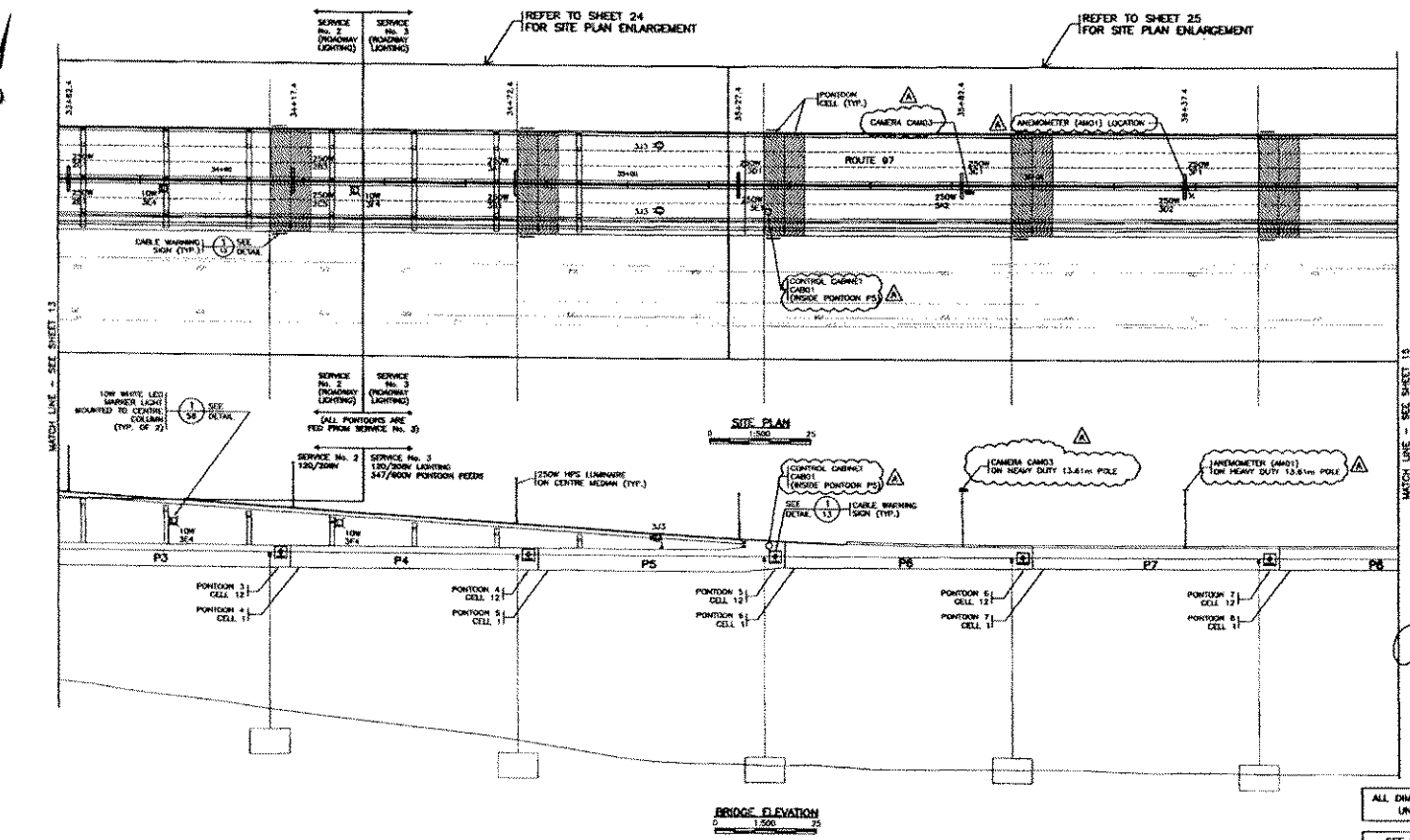


ALL EQUIPMENT IS PROPOSED UNLESS NOTED OTHERWISE

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE

SEE REFERENCE DRAWINGS FOR FOR APPLICABLE STANDARD DRAWINGS

KEY PLAN

SCALE: SHOWN

REVISIONS

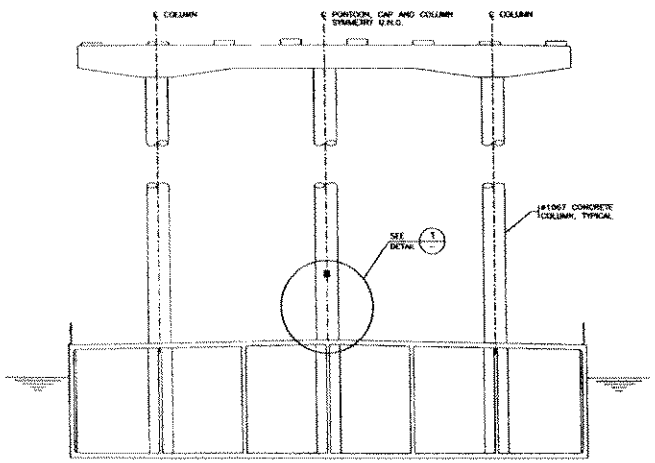
Province of British Columbia
MINISTRY OF TRANSPORTATION
OKANAGAN LAKE BRIDGE PROJECT

OKANAGAN HIGHWAY No. 97
OKANAGAN LAKE BRIDGE No. 1456
ELECTRICAL INSTALLATION
BRIDGE DECK
SITE PLAN

Okanagan Lake Bridge Project Management Team
3rd Floor, 1550 Blanshard Street
Victoria, B.C.
V8W 3X6

PBA CONSULTING ENGINEERS

FILE No. L2-97-OLB
PROJECT No. 77880
DRAWING No. TE-98116-14
SHEET 2
REVISION A



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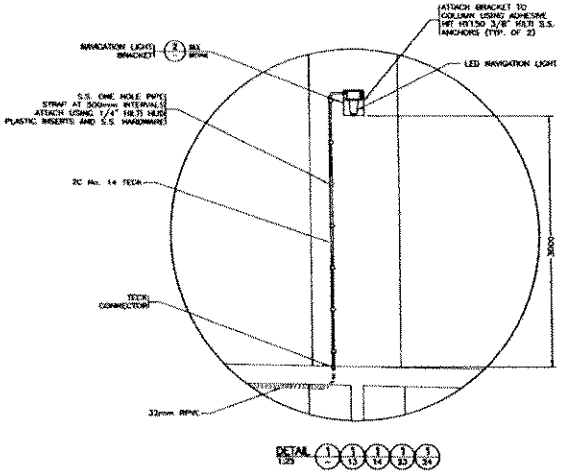
1:100



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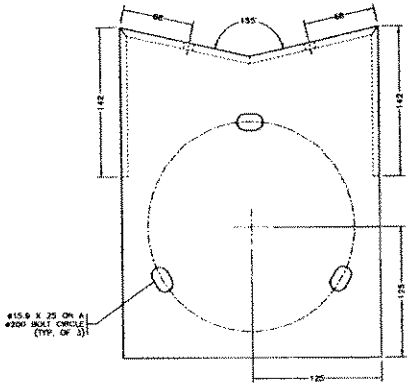

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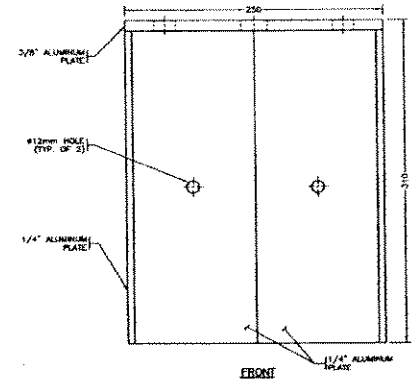

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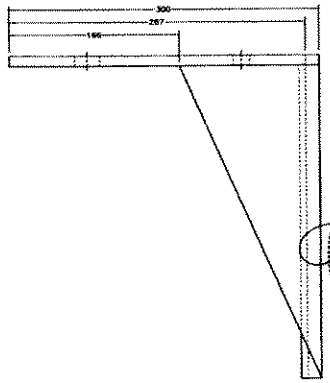

SIDE

DETAIL 2 1:2

BRACKET NOTES:

1. DRAWINGS OF BRACKETS ARE FUNCTIONAL ONLY. THE CONTRACTOR SHALL VERIFY/DETERMINE DIMENSIONS AND STEEL/BOLT SIZES DURING THE PREPARATION OF SHOP DRAWINGS. REFER TO THE SPECIAL PROVISIONS FOR FURTHER INFORMATION.
2. ALL STRUCTURAL STEEL, CONNECTING BOLTS, AND GALVANIZING, SHALL CONFORM TO THE REQ. OF CHAPTER 306 OF THE MOT ELECTRICAL AND SIGNING MATERIAL STANDARDS.
3. ALL JOINTS SHALL BE WELDED IN ACCORDANCE WITH CAN/CSA W59.
4. ALL BRACKETS SHALL BE HOT DIP GALVANIZED.

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE

SEE REFERENCE DRAWINGS FOR FOR APPLICABLE STANDARD DRAWINGS

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ALL EQUIPMENT IS PROPOSED UNLESS NOTED OTHERWISE

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No.	Date	Description	Init.	Plan
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REVISIONS

Province of British Columbia
MINISTRY OF TRANSPORTATION
OKANAGAN LAKE BRIDGE PROJECT

OKANAGAN HIGHWAY No. 97
OKANAGAN LAKE BRIDGE No. 1458
ELECTRICAL INSTALLATION

NAVIGATION LIGHT DETAILS

Project Manager: Okanagan Lake Bridge Project Management Team, 300 – 542 Yates Street, Victoria, B.C. V8W 1K8
Design Consultant: PBA CONSULTING ENGINEERS
PREPARED UNDER THE DIRECTION OF
SIGNATURE
DATE

FILE No. L2-97-QLB | PROJECT No. 77860 | CONTRACT No. | SCHEME 2 | DRAWING No. TE-98116-58 | A

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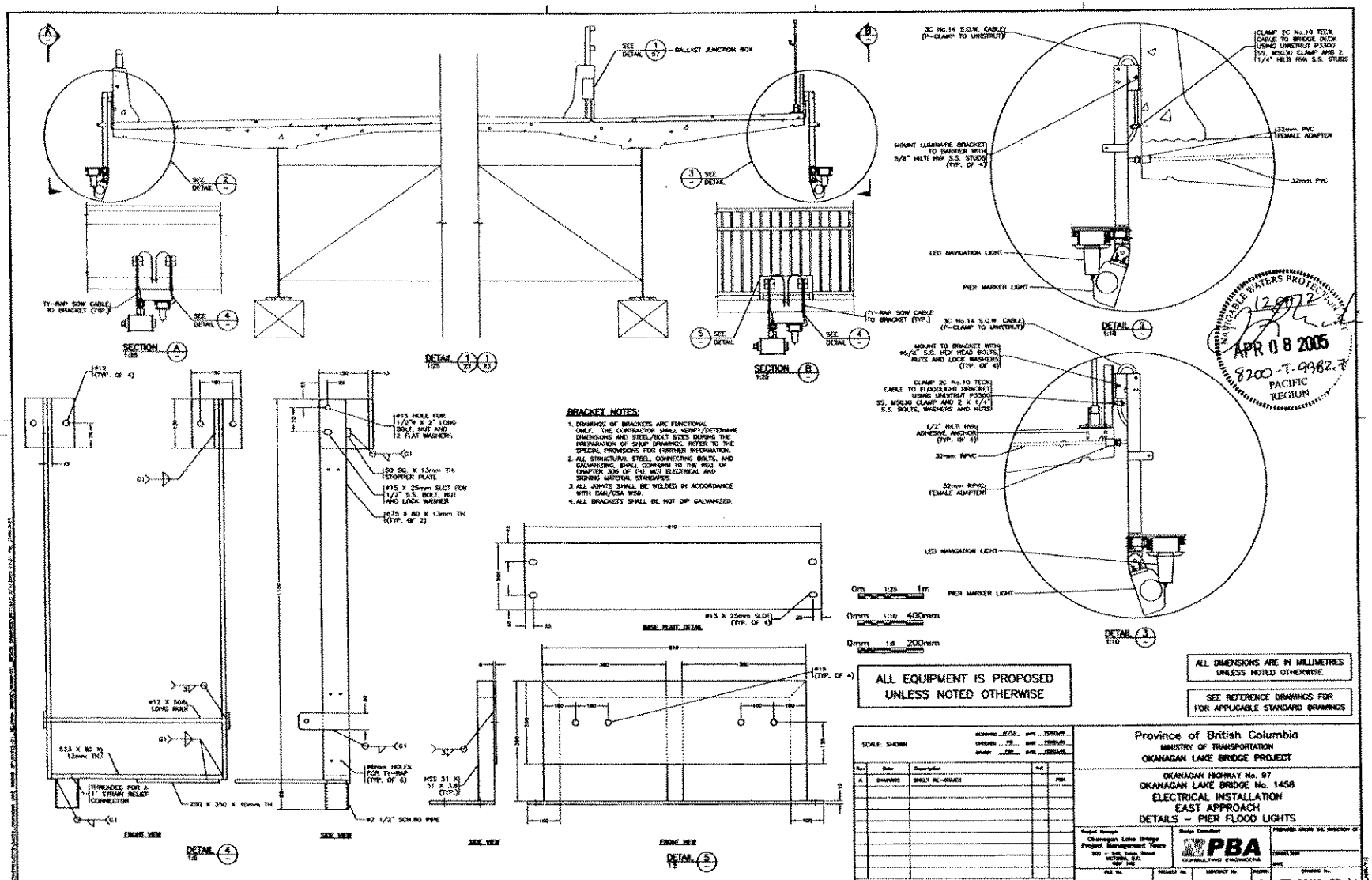


ANNEX 5

ENVIRONMENTAL PROTECTION PLAN

The Environmental Protection Plan is attached.

Okanagan Lake Bridge Project

Environmental Protection Plan:
Aquatic Resources and Associated Habitat

Prepared for:
Ministry of Transportation
Environmental Services Section
Victoria, B.C.

Prepared by:
Coast River Environmental Services Ltd.
1672 West 75th Avenue,
Vancouver, B.C. V6P 6G2

March 2002

EXECUTIVE SUMMARY

This Environmental Protection Plan (EPP) has been prepared as a guide to:

- contractors bidding on the Okanagan Lake Bridge Project;
- MoT staff involved in delivery of the project; and,
- environmental agencies reviewing the project.

As this document has been prepared without knowledge of the specific, and possibly innovative methods ultimately implemented to do the work, it is intended that the successful CONTRACTOR expand this document with additional details and plans based on his specific proposal. This expanded EPP must be submitted for review and approval by MoT and the environmental regulatory agencies prior to the start of work on the project.

The prime objectives of this EPP are the protection of fish and wildlife habitat, and the water quality of Okanagan Lake and its tributaries during construction of the project. The primary means of achieving these objectives include the following:

- All permits and approvals must be in place prior to the start of work on the project and the CONTRACTOR must comply with all conditions of approval at all times.
- The limits of clearing and disturbance must be clearly marked prior to the start of land clearing, and booms must be installed around the perimeter of marsh areas prior to the start of in-water work.
- All equipment, used in and around Okanagan Lake or any other surface water, must be clean and free of leaks.
- Sediment and erosion control plans must be developed, approved and implemented prior to the start of work on the project.
- There is a Zero Discharge Objective with regard to this project, i.e., there is to be no discharge of sediment, sanitary wastes, garbage or any other contaminants into Okanagan Lake or the surrounding watershed.

Additional and more specific requirements and restrictions are identified within the body of the EPP.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

Department of Fisheries and Oceans	DFO
Environmental Incident Report	EIR
Environmental Protection Plan	EPP
Material Data Safety Sheets	MSDS
Ministry of Environment, Lands and Parks[1]	MELP
Ministry of Transportation	MoT
Non-filterable Residue	NFR
Provincial Emergency Program	PEP
Workplace Hazardous Materials Information System	WHMIS

Notes:

1. The Ministry of Environment, Lands and Parks (MELP) no longer exists; it has been re-organized into two separate Ministries: the Ministry of Water, Land and Air Protection, and the Ministry of Sustainable Resource Management. However, at this time, there is no clear definition of which Ministry will be responsible for reviewing and approving elements of this project ; therefore, the term MELP is still used for this edition of the EPP.

1 INTRODUCTION

This Environmental Protection Plan (EPP) describes measures that are to be implemented during project development of the new five-lane floating bridge across Okanagan Lake, as well as the road improvements and dry dock site associated with this project. These measures are intended to minimize the impacts of construction on the natural resources and environment of the area.

Common sense and proactive approaches to good housekeeping on site and regularly scheduled equipment maintenance, as described in this document, will go a long way towards avoiding negative impacts to both aquatic and terrestrial environments.

In addition, Best Management Practices (BMP's) have been developed for a large number of industries and environmentally sensitive activities by both industry associations and government agencies. As these BMP's are so numerous and are being updated on a continuous basis, they have not been included in this document. It is recommended that contractors contact their suppliers and, if applicable, their associations for current BMP's for their particular field or activity. In addition, they could refer to the Internet Web Site http://nalms.org/bclss/bmphome.html which provides a number of BMP's with specific applicability to British Columbia legislation.

1.1 General Measures

The following general requirements must be adhered to:

a) During the pre-construction meeting, the environmental protection measures will be discussed with the successful CONTRACTOR. This meeting will include representatives from the Ministry of Transportation's (MoT) construction, engineering and environmental sections and the CONTRACTOR, as well as the Environmental Monitor. In addition, the environmental reviewing agencies will be invited to attend.

b) All necessary permits, licences and approvals will be obtained and copies will be on site prior to the start of construction. Unless otherwise allowed by the environmental reviewing agencies, work should not start on any component of the project, including decommissioning of the old bridge and associated structures, until all environmental permits are obtained. Permits and licences for this project include, but are not limited to approval under the Heritage Conservation Act, Section 9 of the Provincial Water Act, Authorization under Section 35(2) of the Federal Fisheries Act, and approval under the Navigable Waters Protection Act (see Appendices A and B for detailed information regarding project activities and potential regulatory authorities and

requirements). Furthermore, all work will be undertaken in a manner consistent with the conditions of all permits, licences and approvals. Changes to any proposed work must be approved by MoT, or the Owner's Representative, as well as all appropriate regulatory agencies.

c) Environmental emergency contingency plans shall be developed by the CONTRACTOR in a form, and with content, acceptable to MoT. A sediment and erosion control plan for all work areas in or about Okanagan Lake, and its tributaries, must also be developed by the CONTRACTOR. This Plan is intended to be the basis for more detailed plans developed by the CONTRACTOR as the scope of the project develops/changes.

1.2 Protection of the Environment

The following protective measures must also be adhered to:

a) Minimize Disturbance - The CONTRACTOR shall take all reasonable and necessary measures to ensure that any activities undertaken in the performance of the work are conducted in such a way as to minimize any disturbance or damage to the environment. Construction activities, storage of materials and access will be restricted to the designated right-of-way or to yards/sites developed and approved by MoT, and any extra temporary workspaces acquired during the life of the project. All temporary work spaces outside of the right-of-way must be approved by MoT prior to their use.

b) Do Not Kill Fish or Wildlife - The CONTRACTOR shall take all reasonable and necessary measures to ensure that any activities undertaken in the performance of the work do not result in the loss of fish or wildlife. These measures include, but are not limited to, the following:
   - all activities will be undertaken only during the approved work windows;
   - all water intakes will be screened in accordance with the requirements of Section 30 of the Federal Fisheries Act as described in the DFO publication *Freshwater Intake End-of-Pipe Fish Screen Guideline* (see Appendix C);
   - booms and silt curtains will be employed where necessary to prevent the potential dispersal of sediment and other contaminants, as well as prevent the incursion of fish and other aquatic animals into the work area of the lake; and
   - fish salvages will be undertaken using trained personnel and in a manner approved by the Department of Fisheries and Oceans (DFO) and the Ministry of Environment, Lands and Parks (MELP).

c) Vegetation and Water - The CONTRACTOR shall not destroy, remove or clear trees and shrubs, or disturb or destroy marsh areas or watercourses to any extent greater than is absolutely necessary in the performance of the work, or to any greater extent than has been authorized.

d) Dangerous Goods - Dangerous goods, such as welding supplies, paints, primers and preservatives, must be stored in secure sheds and handled in such a manner as to prevent their inadvertent release to the environment.
e) Material Safety Data Sheets (MSDS) - The CONTRACTOR shall submit copies of MSDS for hazardous goods that may be used on the Project to the MoT for review, and mitigative strategies will be developed and implemented for containment of accidental spills and for handling during emergencies (i.e., fire, flood, etc.). The CONTRACTOR shall maintain these information sheets for all hazardous materials onsite and follow the *Workplace Hazardous Materials Information System* (WHMIS) regulations.
f) Compliance - The CONTRACTOR shall comply with all Standard Specifications - Section 195 (see Appendix E) and Special Provisions given by MoT to protect and preserve the environment.

1.3 Monitoring and Reporting

The CONTRACTOR shall conduct all operations in a careful manner to protect natural ground surfaces, water quality, wildlife and fish, and shall use practices that will:

a) prevent and avoid all forms of pollution,
b) prevent the fouling of all waterbodies and groundwater, and
c) minimize soil erosion and preserve ground stability.

An Environmental Representative will be employed by MoT during work in and about Okanagan Lake and its tributaries to assist in the implementation of the environmental protection measures and to ensure that all specifications are followed. The Environmental Representative will be empowered to modify and/or halt any construction activity necessary to ensure compliance with Agency approval for the work. The CONTRACTOR will be required to hire an Environmental Monitor . The Environmental Monitor will be responsible for inspecting the ongoing work and reporting all potential concerns to the CONTRACTOR in a timely manner.

2 ECOLOGICAL AND ENVIRONMENTAL PROTECTION PRACTICES

The CONTRACTOR must strictly comply with the following requirements in order to avoid degrading the habitat quality of Okanagan Lake and its environs.

2.1 General

The CONTRACTOR shall:

a) dispose of sewage, refuse and chemical wastes in a manner approved by all authorities having jurisdiction;
b) conduct all operations in such a manner that there are no unauthorized discharges of any sort (liquid or solid) to Okanagan Lake and its tributaries;
c) ensure that all equipment and machinery working in or near the lake or any of its tributaries is in good working condition, power washed, and free of leaks or excess oil and grease;
d) undertake work in compliance with the plans approved by DFO and other regulatory agencies, and shall not undertake work not on the approved plans;
e) ensure that habitat areas that are not within the work site are protected from disturbance; and,
f) ensure that appropriate spill kits are available on all equipment working on or adjacent to Okanagan Lake or any of its tributaries.

2.2 Fisheries and Water Quality

In order to protect fish and fish habitat, and the quality of water used for domestic and irrigation purposes, the CONTRACTOR shall:

a) ensure that all water intakes for any pumps required for the work are screened in accordance with the requirements of the Federal Fisheries Act (see Appendix C);
b) perform the work in strict compliance with any timing restrictions imposed by MELP and DFO (see Appendix D for Fisheries work Window Guidelines, and refer to the permit/approval documents from these agencies, as they may impose special restrictions on the Project);
c) employ fish exclusion devices, such as mesh fences and silt curtains, to minimize the incursion of fish into the work zone, prevent the dispersal of sediments outside the construction zone, and protect fish from shock wave injury during drop-type pile driving activities;
d) minimize and contain suspended sediment (i.e., Non-Filterable Residue, NFR) within the immediate zone of construction;
e) undertake appropriate containment measures during concrete pours to ensure that uncured concrete or concrete leachate does not enter any watercourse or drainage; and,
f) ensure that water intakes for domestic and irrigation purposes are protected from damage at all times.

2.3 Vegetation

The CONTRACTOR shall:

a) not destroy, remove or clear trees and shrubs, or disturb or destroy marsh areas or watercourses to any extent greater than is absolutely necessary for the performance of the work, or to any greater extent than has been authorized;
b) clearly define the boundary of the work zone using flagging and snow fencing to ensure that clearance or disturbance of vegetation outside of the work area does not occur;
c) prior to the start of in-water work, install booms to protect marsh areas from direct disturbance and from wave wash;
d) ensure that machine operators take extra care when backing up or swinging around to avoid damaging overhanging limbs and nearby trees when working close to the boundary of the work zone;
e) minimize disturbance of existing beds of milfoil in order to prevent fragmentation of the plants and dispersal of the fragments to other areas of the lake;
f) inspect all equipment working in the water and clear any aquatic vegetation or vegetative fragments from the equipment prior to entry and during exit from Okanagan Lake; dispose of this material well away from the lake and other watercourses and ditches, so that no fragments may enter any aquatic environments; and,
g) dispose of all vegetation removed from equipment during dredging to a permitted landfill site and ensure that it is properly contained during transport and disposal to prevent the spread of aggressive/invasive plant species.

2.4 Soil Disturbance, Erosion Prevention and Sediment Control

It is important to note that the sediment and erosion control measures required for this Project will depend greatly upon local site conditions and weather at the time the work is undertaken (i.e., not all measures will work in every given situation and during all seasons of the year). The sediment and erosion control plan must be flexible in order to react to site and time specific requirements and conditions.

The CONTRACTOR shall:

a) develop a sediment and erosion control plan prior to the start of work on the site as part of the required enlarged and detailed EPP for the Project;
b) minimize disturbance of vegetation as a first defense in the control of erosion and sediment release;
c) minimize grading, benching and scarification in accordance with the Design Drawings;
d) use blast mats or swamp pads where necessary to minimize soil disturbance and erosion;

e) take reasonable care to avoid damage to graded and/or seeded areas;
f) employ sediment and erosion control works as required to minimize the generation of sediment-laden water within the work site and prevent the discharge of this water into Okanagan Lake and/or its tributaries (i.e., diversion ditches to intercept surface runoff entering the site, installation of rock layers and berms, installation of sediment control fencing around the perimeter of disturbed areas and stockpiles of spoil, and construction of sediment control ponds to collect and settle sediment from runoff);
g) where water is to be discharged on to land, dissipate this water over a well-vegetated area, temporary riprap or other stable surface material to ensure that there is no soil erosion;
h) stabilize and seed newly disturbed areas following completion of work in each particular location and phase of the project (i.e., rather than undertaking this work throughout the work site following completion of construction of the entire project) in order to control sediment and erosion during the life of the project;
i) when revegetating areas temporarily disturbed within the work zone, comply with the requirements of DFO and MELP (if not otherwise specified in the approval documents, replanting is to be undertaken using plant species native to the Okanagan Lake area);
j) ensure that all riprap placed in or adjacent to Okanagan Lake is free of dirt and other contaminants (the boxes of all dump trucks hauling the riprap are not to be lined with clay for protection.)
k) adhere to the *Standard Specifications for Highway Construction – Section 195* (Appendix E) that pertain to clearing and grubbing (see Appendix E);
l) designate and post the construction areas within the lake as "no-wake zones" in order to minimize unnecessary abrasion and erosion through propeller wash and wave generation, and to minimize deterioration of water quality through sediment re-suspension; and'
m) refer to the requirements identified in Section 2.2 Fisheries and Water Quality

2.5 Wildlife

For the protection of wildlife and wildlife habitat, the CONTRACTOR shall:

a) minimize disturbance to wildlife, particularly along the shoreline areas;
b) adhere to authorized work timing windows to ensure that there is no disturbance during critical periods (i.e., nesting);
c) ban all firearms from the work site;
d) fence the staging areas and construction zone to prevent the entry of larger animals, such as deer and coyotes;
e) use low toxicity antifreeze/coolants in equipment on site in order to minimize the potential for poisoning wildlife and domestic animals that stray onto the site;

f) dispose of garbage in secure bins and ensure that the construction site is clean and free of food items to deter nuisance pests; and
g) contact MELP in the event that a wild animal is found trapped in the site or has taken up residence therein. Depending on the type of animal trapped, MELP may require that a professional animal control officer or company capture the animal and release it at an appropriate location outside of the work area.

2.6 Vehicles, Vessels, and Equipment - Fuelling and Servicing

The CONTRACTOR shall service or refuel vehicles and equipment in such a way that contaminants do not enter any waterbody.

The following requirements are to be adhered to:

a) All marine-operated vessels and barges brought to Okanagan Lake for this Project shall be steam-cleaned prior to their placement in the lake.
b) All vessels will have sealed bilges for the duration of work on the Project.
c) All barges operated on Okanagan Lake will have sealed decks and sides in order to contain any spills of fluids from equipment working on the barge.
d) All machinery operating in the vicinity of Okanagan Lake or its tributaries shall be free of excess oil and grease, and shall be in good mechanical order so that no leaks occur.
e) All equipment is to be inspected daily to ensure that it is leak-free.
f) The servicing and fuelling of equipment is prohibited within 15 metres of Okanagan Lake or its tributaries. Servicing of equipment is to be done at the staging areas within bermed containment areas or at appropriate work yards operated by the CONTRACTOR or his supplier. All vehicles utilized for refueling will be equipped with automatic back-pressure shut-off valves, and nozzles should be kept locked at all times, except during refueling. Spigots should be metal to prevent them being accidentally or intentionally damaged. A crew member is to remain in attendance at all times while refueling is being carried out.
g) Fuel for cranes and other equipment operating on barges and other structures floating on Okanagan Lake must be delivered in sealed, leak-free drums and placed within temporary containment berms. Refueling rigs are to be equipped with automatic back-pressure shut-off valves. Fuel is not to be stored on the barges or floating vessels.
h) Marine-based vessels, such as tugboats and scows, will be refueled at existing approved facilities on Okanagan Lake.
i) Wherever possible, "environmentally-friendly" vegetable oil-based hydraulic fluids are to be used.
j) Use low toxicity antifreeze/coolants in equipment on site so that the potential for poisoning wildlife and domestic animals that stray onto the site will be minimized.

k) All grease and oil required for maintenance will be properly applied. Any excess shall be cleaned up and disposed of in an environmentally appropriate manner, as shall all containers, lids, and contaminated cloths and applicators.
l) Portable generators and pumps shall be located within bermed and lined containment frames to prevent inadvertent releases of fuels and oils to the environment.
m) Refueling of any machinery, including portable generators and pumps, must occur away from roadside drainage ditches.
n) Emergency response hydrocarbon spill kits, and personnel trained in their deployment and use, must be on site at all times.
o) Fire extinguishers and other emergency response equipment and supplies must be kept in known and visible locations and access to them shall not be blocked by other materials or equipment. A list of emergency contacts shall be posted at predetermined, accessible and visible locations, as well as kept with the emergency response equipment.
p) If diesel hammer pile drivers are used, oil booms shall be deployed surrounding the work site to contain the overspray of diesel splatters that result from the operation of this type of equipment. Absorbent pads must also be available to absorb any resultant oil release.
q) Wash water from concrete trucks, as well as any other effluent generated during work on the project, will be contained and disposed of in such a manner as to ensure that the effluent is not released into Okanagan Lake, any of its tributaries, any surface ditches or storm sewer system.

2.7 Prevention of Discharges into Okanagan Lake

The CONTRACTOR shall:

a) ensure that working hydrocarbon spill containment kits are available on site and that personnel are well trained in their application ;
b) not allow material, i.e., plastics, paper, construction materials, etc., to enter the lake (a "zero emissions" objective will apply to the lake environment);
c) not allow any sediment-laden water discharged onto land to flow directly back into Okanagan Lake or its tributaries; and,
d) place pumps and generators on bermed polyethylene sheeting to prevent hydraulic fluid and/or fuel leaks from entering Okanagan Lake or its tributaries.

2.8 Fugitive Dust

In order to prevent wind erosion of scarified areas resulting in fugitive dust , particularly during the dry summer months, the CONTRACTOR shall:

a) use water trucks to dampen unpaved access routes and staging areas at regular intervals;
b) not employ the use of chemical binding agents, such as calcium chloride, unless authorized by DFO and MELP; and,
c) install wind screens around, or protect the surface of, stockpiled material.

2.9 Noise

The CONTRACTOR shall comply with municipal noise by-laws and shall adhere to any specific noise level requirements. All equipment must be equipped with mufflers or other noise abatement devices, specific to this project, that are in good working order and suitable for use in the areas of the proposed Works. Hours of work must comply with the Special Provisions of the Contract.

2.10 Heritage Objects

Areas where Heritage Objects (as defined by the Heritage Conservation Act of B.C.) are identified will be monitored by MoT during construction. If any Heritage Objects are discovered during the work, the CONTRACTOR shall cease all related activity and notify MoT. All such remains shall be deemed the property of MoT and the CONTRACTOR shall protect them from vandalism and theft.

Where a previously unidentified heritage site is encountered during construction, no further work will be undertaken in the immediate vicinity of the site, until it is examined by MoT's archaeological representative and approval to continue work is provided by MoT.

3 CONSTRUCTION PROCEDURES

The CONTRACTOR shall comply with the following minimum requirements:

a) Unless otherwise stated in the approval/permit documents, construction timing within environmentally sensitive areas must adhere to fish and wildlife lake and instream work windows (see Appendix D)
b) All vessels used on Okanagan Lake shall be free of dirt, oil, grease, foliage and any other harmful contaminants to the lake's environment and shall be inspected prior to launching to ensure compliance with the foregoing. Aquatic vegetative debris will be

cleaned from all vessels and equipment when exiting the lake and disposed of at an approved site.

c) A debris containment system (i.e., fine mesh drapes and/or tarps) shall be installed to prevent, to the greatest extent possible, the release of concrete dust, paint chips and other debris to Okanagan Lake during demolition and removal of the existing bridge. Drapes over scaffolding which hang down onto a supporting barge or ground must be "toed-in" to the bottom tarpaulin to help prevent paint chips or concrete dust from escaping into the environment.

d) A containment system shall be installed to collect, to the greatest extent possible, any effluent generated during removal of the existing bridge (i.e., saw cutting waste water). Any such material collected must be disposed of in accordance with all environmental regulations.

e) Silt curtains shall be deployed as sediment and debris control measures around the east and west end approach areas during fill placement into the lake to construct the new causeways and during excavation of portions of the existing causeways during creation of compensation works.

f) Prior to opening the lock gate system of the pontoon construction facility, all debris and garbage within the graving dock area will be removed, the water level within the facility shall be equalized with that of the lake in order to prevent scour and sedimentation of the lake, and the water surface skimmed to remove any floating debris and oil.

g) Suitable measures and procedures shall be undertaken to ensure the safety of the public and boaters during all construction operations.

h) Prior to start of work, all authorities having jurisdiction in Okanagan Lake or its tributaries, shall be notified of the date of commencement of construction.

4 WASTE MANAGEMENT

The CONTRACTOR shall comply with all applicable laws, regulations, permit conditions and requirements of the Contract when disposing of any waste generated by this project, including but not limited to general garbage and trash, hazardous wastes (such as, used paint or waste batteries), waste oil, or other materials not authorized for on-site disposal. At no time shall any waste material be allowed to enter Okanagan Lake or its tributaries, with the exception of those sections of the existing floating bridge sections destined for in-lake disposal.

The CONTRACTOR shall be responsible for assuring that all reasonable efforts are implemented to eliminate or minimize waste production. In addition, only facilities approved by the authorities (having jurisdiction) and by MoT may be used for disposal or recycling of any waste (garbage, trash, hazardous material, etc.)

4.1 Garbage and General Waste

All non-hazardous and non-toxic garbage, such as paper, paper products, wood, plastic, glass, and discarded food items, shall be stored in closed, leak-proof storage bins that are secure against nuisance wildlife. Furthermore, all material which can be recycled, such as paper and cardboard products, glass bottles and plastic and metal containers must be recycled. The CONTRACTOR is responsible for the proper collection and transportation of garbage and recyclable waste to disposal facilities (e.g., sanitary landfill and appropriate recycling facilities) approved by MoT and the authorities having jurisdiction. Open burning and the use of open dumps is prohibited.

4.2 Construction-related Wastes

Construction wastes, such as spent metal, lumber, spent welding rods, etc., shall be minimized to the fullest extent possible. All construction waste shall be recycled where possible or disposed of in an environmentally acceptable manner, subject to the approval of both MoT and all authorities having jurisdiction. Construction debris and other garbage will not be deposited in the lake.

4.3 Sanitary Wastes

Sanitary facilities must be provided within the construction zone and at any staging or graving dock sites. These facilities must be serviced on a regular basis and the waste disposed of at permitted treatment facilities.

4.4 Equipment-related Wastes

The CONTRACTOR shall comply with the following minimum requirements:

a) Used oil filters must be drained into a waste oil container and drained filters placed in an appropriate trash container before disposal at a recycling facility or other approved facility.

b) Waste-oil and antifreeze must be collected and recycled/disposed of at an approved facility.

c) Used acid-lead batteries must be stored on an impervious surface, under cover, and disposed of at an approved recycling facility.

4.5 Hazardous Wastes

It is the CONTRACTOR's responsibility to determine whether any waste generated pursuant to the execution of the work has any hazardous or toxic characteristics, or is identified as a "Hazardous Waste" by MELP, Environment Canada, or any other authority having jurisdiction, and to treat this material appropriately.

a) The CONTRACTOR shall review the lists of Hazardous Wastes, as defined by MELP and Environment Canada to determine if any waste generated by the CONTRACTOR during construction operations is hazardous.
b) If the waste item does not appear in published Hazardous Waste lists, the CONTRACTOR shall determine whether the waste displays a characteristic which would make it hazardous.
c) The CONTRACTOR and its subcontractors will review and comply with the "*Standards Applicable to Transporters of Hazardous Waste*" as defined by MELP and Environment Canada.
d) All Hazardous Waste shall be treated/disposed of in authorized facilities, permitted under regulations as defined by MELP and Environment Canada. The CONTRACTOR shall identify potential facilities for waste disposal and evaluate each facility's legitimacy, compliance with regulatory requirements and capacity. The CONTRACTOR shall notify MoT in writing of approved waste disposal site(s) for their approval. After selecting a facility, the CONTRACTOR shall periodically check and verify that the facility is properly handling and disposing of the Hazardous Waste.

4.6 Graving Dock Water

The CONTRACTOR shall comply with the following minimum requirements:

a) Water to be used in filling of the graving dock to float out the constructed pontoons will only be drawn from and discharged into approved waterbodies at approved rates, as outlined in the Water Licence obtained for the project.
b) The intake pipe will be screened in accordance with DFO requirements (see Appendix C).
c) Prior to opening the lock gate system of the pontoon construction facility, all debris and garbage within the graving dock area will be removed, the water level within the facility shall be equalized with that of the lake in order to prevent scour and sedimentation of the lake, and the water surface skimmed to remove any floating debris and slicks.

d) At the end of each pontoon cycle, once the pontoons have been floated out and the graving dock gate has been closed, water in the graving dock needs to be pumped out to prepare the dock for construction of the next pontoons. If this water is to be discharged onto land, the water will be dissipated over a well-vegetated area, onto a temporary riprap pad, or onto other stable surface material to ensure that there is no soil erosion.
e) Pumps used for the graving dock operation that are within 15 m of Okanagan Lake or its tributaries will be placed on bermed polyethylene sheeting to prevent hydraulic fluid and/or fuel leaks from entering the water source.

4.7 Vessel Operations

All vessels including, but not limited to, construction vessels, support vessels, transportation vessels and boats, are prohibited from discharging any materials into Okanagan Lake or the surrounding waters and watershed. Materials that are prohibited from being discharged include, but are not limited to, all forms of trash, construction related wastes, sanitary wastes, and contaminated water. A zero discharge objective applies to vessel operations.

The CONTRACTOR shall employ the following measures to prevent discharges:

- maintain spill containment/cleanup equipment and materials;
- develop hydrocarbon release notification procedure; and,
- educate employees on the environmental requirements and responsibilities.

5 ENVIRONMENTAL SPILL PROCEDURES AND EQUIPMENT

The CONTRACTOR shall develop and implement two environmental spill procedure plans: one for land-based operations and one for marine-based operations. The purpose of these emergency response plans is to identify potential risks at or in proximity to the Okanagan Lake Bridge construction site and ancillary facilities. These plans shall contain the procedures to facilitate rapid deployment of resources in the event of a spill and to minimize the impact and risk to the environment, the public and personnel on the job site.

Fire extinguishers and other emergency response equipment and supplies must be kept in known and visible locations and access to them will not be blocked by other materials or equipment. A list of emergency contacts will be posted at pre-determined, accessible and visible locations, as well as kept with the emergency response equipment.

In the event of a spill occurring*, this incident must be immediately reported to the Provincial Emergency Program (PEP) at 1-800-663-3456 and/or Environment Canada at

the 24 hour emergency telephone number 604-666-6100. PEP will notify all concerned municipal, provincial and federal agencies. Spill response advice can be obtained from both Environment Canada and PEP, as well as from Transport Canada's Chemical Accident Emergency Advisory Service at 1-800-613-9966.

* Under Section 1 of the Spill Reporting Regulation, a "spill" means a release or discharge of a substance in an amount equal or greater than that specified in the Schedule of this Regulation. The reportable quantities vary according to class of substance, ranging from any amount to 200 kg, depending on the nature of the material that has been spilled. The CONTRACTOR must develop an environmental spill procedure applicable to the types of materials being utilized on the project and be familiar with the reportable spill quantities applicable to these materials.

6 ENVIRONMENTAL INCIDENT REPORTING

An environmental incident is one that has caused, or has the potential to cause, one or more of the following:

- environmental damage;
- an adverse effect on fish, wildlife or other environmental resources;
- heightened publicity associated with a negative effect on the environment; and,
- legal action with respect to environmental noncompliance and/or damage.

The following procedures shall be undertaken by the CONTRACTOR and shall be coordinated with MoT's response through MoT's Environmental Representative:

- take immediate action to minimize environmental consequences and manage resolution of the incident;
- gather information for the assessment of causes so that prevention of future incidents can be planned;
- prepare a written Environmental Incident Report (EIR) as soon as possible (within one working day of the occurrence) summarizing events, actions and recommendations for future avoidance;
- submit EIR to the MoT Environmental Representative; and,
- prepare updates to the EIR as necessary and submit them to MoT's Environmental Representative.

APPENDIX A: REFERRAL MATRIX - MAIN ENVIRONMENTAL CONTACTS FOR MOT ACTIVITIES

Referral Matrix: Main Environmental Contacts for MOT Activities Related to the Okanagan Lake Bridge Project (Adapted from Acres International Ltd., 1994a).

ACTIVITIES	PROVINCIAL AGENCIES						FEDERAL AGENCIES			
	Environment, Lands & Parks					CA&WS[a]	Fisheries & Oceans Canada		Environment Canada	
	Environmental Protection	Fish & Wildlife	Water Management	Lands Regional Office	Parks Regional Office	Heritage Branch	District Office	Canadian Coast Guard	Canadian Wildlife Service	Environmental Protection Service
Project Initiation										
Planning and Design[b]	√	√	√	√	√	√	√	√	√	√
Property Acquisition		√[c]		√	√		√		√	√
Access to Adjacent Properties		√		√	√	√	√		√	√
Site Preparation										
Geotechnical Testing/Drilling		√	√				√			
Clearing and Grubbing	√[b]	√	√			√	√			
Staging/Dry Dock Areas Location and Development	√	√	√	√	√	√	√	√	√	√
Borrow/Waste Site Development	√	√	√	√		√	√			√
Filling/Dredging of Lake	√	√	√				√	√	√	√
Grading Operations										
Drilling and Blasting		√	√				√			√
Ditching/Erosion and Drainage Control		√	√				√			√
Other Roadbed Creation Activities in Sensitive Areas		√	√			√	√			√
Gravel Pit Development		√	√	√		√	√			
Access Road Construction		√	√	√	√	√	√			
Watercourse Crossings										
Culverts		√	√				√	√[d]		√
Bridges		√	√				√	√[d]		√
Potential Effects on Downstream Users	√	√	√				√	√[d]		

[a] Ministry of Community, Aboriginal and Women's Services
[b] If burning permit required.
[c] Within Wildlife Management Areas.
[d] For works affecting navigable waters.

Appendix A (con't): Referral Matrix: Main Environmental Contacts for MOT Activities Related to the Okanagan Lake Bridge Project (Adapted from Acres International Ltd., 1994a).

ACTIVITIES	PROVINCIAL AGENCIES						FEDERAL AGENCIES			
	Environment, Lands & Parks					CA&WS[a]	Fisheries & Oceans Canada		Environment Canada	
	Environmental Protection	Fish & Wildlife	Water Management	Lands Regional Office	Parks Regional Office	Heritage Branch	District Office	Canadian Coast Guard	Canadian Wildlife Service	Environmental Protection Services
Site Completion and Clean-up										
Revegetation and Landscaping	√	√		√	√		√			
Paving	√	√	√				√			
Fencing		√							√	
Site Abandonment (Temporary Facilities)	√	√	√	√	√		√			
Operation and Maintenance										
Culvert Maintenance/Rehabilitation		√	√				√	√[d]		
Bridge Maintenance/Rehabilitation (Cleaning, Painting, *etc.*)	√	√	√				√	√[d]		√
Resurfacing	√	√					√			√
Navigable Channel Maintenance		√	√				√	√[d]		
Other/Additional Activities										
Handling of Hazardous Materials	√	√					√			√
Demolition of old bridge structures	√	√					√	√		√
Sinking of old bridge pontoons	√	√	√				√	√[d]		√

[a] Ministry of Community, Aboriginal and Women's Services
[b] If burning permit required.
[c] Within Wildlife Management Areas.
[d] For works affecting navigable waters.

APPENDIX B: LIST OF LEGISLATIVE AND REGULATORY REQUIREMENTS

List of Legislative and Regulatory Requirements (Adapted from Acres International Ltd., 1994b).

Federal Statute	Description	Agency
Canada Wildlife Act *Migratory Birds Convention, 1994 Act*	Protects migratory birds and wildlife of international significance; establishes National Wildlife Areas for research, conservation and interpretation with respect to migratory birds and other wildlife.	Canadian Wildlife Service, Environment Canada
Fisheries Act	Addresses protection of fish and fish habitat. Approval required for any work with the potential to affect fish-bearing waters, including construction of bridges, installation of culverts, diversion of streams, withdrawal or discharge of water, and placement of riprap, and design and construction of water intake facilities in fish-bearing waters in accordance with federal fisheries regulations.	Fisheries and Oceans Canada
Canadian Environmental Protection Act	Addresses protection of the environment and human health; focuses on the prevention of toxic problems before they occur and the control of toxic substances throughout their life cycles.	Environmental Protection, Environment Canada
Canadian Environmental Assessment Act	Describes review requirements of the potential environmental and directly related social effects of any proposal that may have an environmental effect on an area of federal responsibility; an initial assessment is undertaken by the federal department that has the decision-making authority for the project. If potential adverse environmental effects are significant or public concern warrants, the project is referred to the federal Minister of Environment for review.	Canadian Environmental Assessment Agency
Indian Act	All First Nation Reserves in B.C. are owned by the federal government for the benefit of aboriginal people, subject to the right of the province to take property within the reserve for use as roads and public utilities; under the Act, three groups share responsibility for land use controls: the band council which is the main authority, the Minister of Indian and Northern Affairs, and the Federal Cabinet.	Indian and Northern Affairs Canada
Navigable Waters Protection Act	Requires the submission of an application to obtain approval to construct any work whatsoever in, under, over or through a navigable body of salt or fresh water; "navigable waters" includes any body of water capable in its natural state of being navigated by floating vessels of any description for the purpose of transportation, recreation, or commerce; it also includes canals and any other bodies of water created or altered for public use, as well as any waterway where the public right of navigation exists by dedication of the waterway for public purposes or by the public having acquired the right to navigate through long use.	Canadian Coast Guard, Fisheries and Oceans Canada

(continued)

Appendix B (continued). List of Legislative and Regulatory Requirements (Adapted from Acres International Ltd., 1994b).

Provincial Statute	Description	Agency
Ecological Reserves Act	Establishes areas by Order-in-Council as ecological "benchmarks," gene pool reserves and/or long-term research and scientific study; consumptive uses, including road construction and vehicular traffic, are prohibited.	Parks and Ecological Reserves Management Branch, BC Ministry of Environment, Lands and Parks
Environment and Land Use Act	Allows nature conservancies to be established by Order-in-Council to preserve outstanding or representative examples of scenery and natural history; maintained as roadless tracts in which both natural and ecological communities are preserved intact and natural systems may develop without alienation	BC Parks, BC Ministry of Environment, Lands and Parks
Greenbelt Act	Governs provincial acquisition of lands suitable for preservation as greenbelts and reservation of Crown Lands for the same purpose; a right-of-way or easement may be granted in accordance with the *Land Act* on terms consistent with the continued existence, nature and use of the land as greenbelt.	BC Lands, BC Ministry of Environment, Lands and Parks
Heritage Conservation Act	Encourages and facilitates the protection and conservation of heritage property; "heritage" refers to properties of historic, architectural, archeological, paleontological, or scenic significance.	Heritage Conservation Branch, BC Ministry of Small Business, Tourism and Culture
Land Act	Describes requirements regarding disposition of Crown Land, including: sales, leases, licences of occupation, rights-of-way, easements, and leases or other dispositions of building or construction materials; permission is required to enter and construct upon Crown Land, including access roads; gravel removal orders are also required; the Lieutenant Governor in Council may establish an Order-in-Council Reserve for any purpose, including the protection of the land from alienation and for future permanent use by a Crown Ministry or agency.	Regional Operations, BC Lands, BC Ministry of Environment, Lands and Parks
Weed Control Act	Describes requirements for the control of noxious weeds; lists those weeds considered invasive and detrimental to livestock on a province wide basis and by region.	Crop Protection Branch, Agriculture Division, BC Ministry of Agriculture, Food and Fisheries
Fish Protection Act	Protects rivers and streams deemed to have sensitive fish habitat, including streamside protection; prohibits construction of dams on such watercourses and provides for minimum water flows	BC Fisheries, BC Ministry of Agriculture, Food and Fisheries
Wildlife Act and Wildlife Amendment Act	Governs licensing of hunting, trapping, fishing; protects wildlife and its habitat, including birds, nests and eggs; allows Minister to designate wildlife sanctuaries, wildlife management areas and/or critical wildlife areas, and threatened or endangered species; describes admonitions against intentional feeding of dangerous wildlife and removal of potential attractants.	Fish and Wildlife Branch, BC Ministry of Environment, Lands and Parks

(continued)

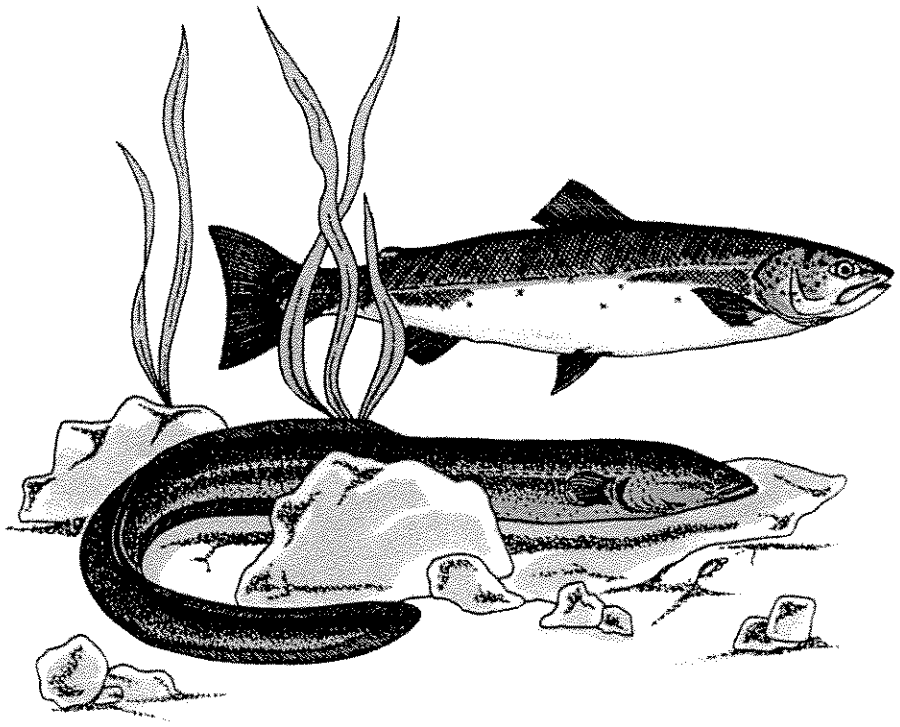
Appendix B (continued). List of Legislative and Regulatory Requirements (Adapted from Acres International Ltd., 1994b).

Provincial Statute	Description	Agency
Park Act	Controls all provincial parks and recreation areas, as well as lands designated under the *Park Act*; a licence or Park Use Permit is required to authorize occupancy, use, development, exploitation, or extraction of a natural resource on or in a park; conditions vary depending on whether the park is Class A, B, or C.	BC Parks, BC Ministry of Environment, Lands and Parks
Soil Conservation Act	Describes approval and permit requirements for the removal of soil from an ALR and provides for regulations to prevent and control soil erosion.	Agricultural Land Commission, BC Ministry of Agriculture, Fisheries and Food
Waste Management Act *Litter Act*	Describes permit or temporary approval requirements for the discharge or emission of effluent, waste material, or contaminants on land, into water or into the air; restrictions regarding the discharge or disposal of litter, sewage, or waste on land or into water.	Environmental Protection Division, BC Environment, BC Ministry of Environment, Lands and Parks
Water Act	Describes water licence or approval requirements for the use, diversion or storage of water, alteration of streams or channels, or operation of works in and about water bodies. The construction of works or diversion and use of water in a specified time and under specified conditions requires a Conditional Water Licence. A single diversion or the non-recurrent, short-term use of water requires an approval. Authority to flood or to construct, maintain, or operate works on Crown Land requires a Flooding Permit (Permit Over Crown Land). Water use may also requires a Certificate of Convenience and Necessity under the *Public Utilities Act* or *Utilities Act*.	Water Management Division, BC Environment, BC Ministry of Environment, Lands and Parks
Environmental Assessment Act	Promotes sustainability by protecting the environment and fostering a sound economy and social well-being; provides for thorough, timely and integrated assessment of the environmental, economic, social, cultural, heritage, and health effects of reviewable projects; governs issuance of a Project Approval Certificate.	Member of the Executive Council designated by the Order-in-Council of the Lieutenant Governor in Council as the BC Minister responsible for the project
Municipal Act	Provides for enactment of by-laws within municipal and regional district boundaries.	Municipal Councils; Regional District Boards
Streamside Protection Act	Provides for the protection of riparian zones along streams for 50 m from top-of-bank. May affect project works depending on initiation of the project approvals application process.	BC Ministry of Fisheries Local governments to implement over next five years

APPENDIX C: DFO FRESHWATER INTAKE END-OF-PIPE FISH SCREEN GUIDELINE

Department of Fisheries and Oceans

Freshwater Intake End-of-Pipe Fish Screen Guideline



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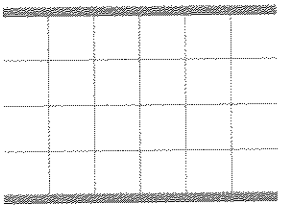

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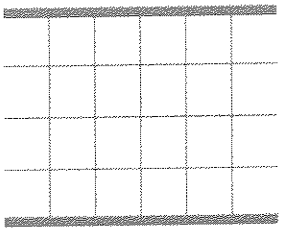


1.0 Introduction

The Department of Fisheries and Oceans (DFO) has prepared the **Freshwater Intake End-of-Pipe Fish Screen Guideline** to assist proponents in the design and installation of fish screens lfor the protection of anadromous and resident fish where freshwater is extracted from fish-bearing waters. This guideline will also assist regulatory agencies in the review of fish screen proposals.

A requirement for fish screening is stated under Section 30 of the *Fisheries Act*, where every water intake, ditch, channel, or canal in Canada constructed or adapted for conducting water from any Canadian fisheries waters must provide for a fish guard or a screen, covering, or netting over the entrance or intake so as to prevent the passage of fish into such water intake, ditch, channel or canal. Other sections of the *Fisheries Act*, or other Federal, Provincial, or Municipal Legislation and Policy may also apply to associated water extraction activities. Proponents are advised to contact the appropriate regulatory agencies regarding approvals or permits.

2.0 Guideline Objective

The objective of the guideline is to provide a National standard-of-practice and guidance for end-of-pipe fish screens at freshwater intakes to prevent potential losses of fish due to entrainment or impingement. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself. The severity of the impact on the fisheries resource and habitat depends on the abundance, distribution, size, swimming ability, and behaviour of the organisms in the vicinity of the intake, as well as, water velocity, flow and depth, intake design, screen mesh size, installation and construction procedures and other physical factors.

The **Freshwater Intake End-of-Pipe Fish Screen Guideline** deals exclusively with the sizing and design of fixed screens that are often placed at the end of a pipe used to extract water up to 0.125 m^3/s, or 125 litres per second (L/s) (i.e., 2000 US gallons per minute (US gpm)). The guideline is intended for use in addressing fish screens for small permanent and temporary withdrawals for irrigation, construction, small municipal and

private water supplies, etc. It is *not* intended for application to hydroelectric or canal screen designs; however, such proposals can be considered by regulatory agencies on a site-specific basis. The guideline focuses on the technical aspects of intake screens and the protection of fish rather than on policy, legislation, or environmental assessment processes and their application. This guideline has been developed to provide protection of freshwater fish with a minimum fork length of 25 mm (approximately 1 inch) since most eggs and fish larvae remain in bottom substrates until they reach the fry stage (i.e., 25 mm fork length). Other designs, in addition to intake screens, may be appropiate to address fish and fish habitat protection associated with water withdrawals. Such proposed designs should be addressed with the appropriate regulatory agencies on a site-specific basis.

3.0 Information Requirements for Evaluation of Intake Screens

Information that should be provided to facilitate evaluation of an end-of-pipe intake screen design intended for fish protection during a freshwater withdrawal is highlighted below. Types of information requirements that may also be applicable to the water intake project as a whole are identified in Appendix A.

- fish presence, species, and possible fish size or fish habitat conditions at the project site
- rate or ranges of rates of withdrawal from the watercourse
- screen open and effective areas
- physical screen open parameters with respect to the intake and the watercourse
- screen material, method of installation and supporting structures
- screen maintenance, cleaning, or other special requirements

4.0 Design, Installation, & Maintenance of Freshwater Intake End-of-Pipe Fish Screens

The appropriate design of a fish screen is largely dependent upon the species and the size of fish requiring protection. Appropriate installation and maintenance/cleaning of the screen are also important in keeping approach velocities low and ensuring satisfactory operation of the screen. For the purposes of this guideline, emphasis is placed on the protection of freshwater fish with a minimum fork length of 25 mm from entrainment and impingement due to water extraction activities. Depending upon site-specific circumstances, a case may be made whereby the minimum fork length size of fish to be protected is greater than 25 mm. In this instance, the fish screen criteria for open screen area (Table 2 and Figure 1) and screen mesh size (2.54 mm) presented here do not apply. Fish screen criteria and guidance for the protection of fish larger than 25 mm is provided by Katopodis (1992).

The following sections address the appropriate design of fixed freshwater intake end-of-pipe fish screens for the protection of fish with a minimum fork length of 25 mm. Guidance on

installation, cleaning, and maintenance is provided. Common types of intake screens and associated intakes are also presented. Appendix B presents a sample calculation utilizing the guideline to determine the appropriate end-of-pipe intake screen size for the protection of freshwater fish.

4.1 Fish Screen Criteria

To protect fish from impingement or entrainment, the approach velocity (i.e., the water velocity into, or perpendicular to, the face of an intake screen) should not exceed certain values based on the swimming mode (i.e., subcarangiform or anguilliform) of the fish present in the watercourse. The subcarangiform group includes fish that swim like a trout or salmon, and move through the water by undulating the posterior third to half of their bodies. The anguilliform group includes fish that swim like an eel, and move through the water by undulating most or all of their body. Table 1 presents the swimming modes of most common fish species in Canada. Contact DFO or provincial fisheries agencies regarding fish species that are not included in Table 1.

Envelope curves for approach velocities were developed for each swimming mode corresponding to a minimum fork length of 25 mm and a maximum endurance time of 10 minutes (the time the fish is in front of the face of the screen before it can elude it). To satisfy approach velocities of approximately 0.11 m/s and 0.038 m/s for the subcarangiform and anguilliform groups respectively, curves indicating the required open screen areas, based on fish swimming performance data, including fish species and size (Katopodis, 1990) and related to flows/extractions, were developed. Table 2 presents the required open screen area, in both metric and non-metric units, for end-of-pipe intake screens with a capacity up to 125 L/s (2000 US gpm). The open screen area is the area of all open spaces on the screen available for the free flow of water. The same information is presented graphically in Figure 1.

Table 1
Summary of Common Fish Species and Swimming Modes

SUBCARANGIFORM SWIMMING MODE

Common Name	Scientific Name
Alewife (Gaspereau)	*Alosa pseudoharengus*
Arctic Char	*Salvelinus alpinus*
Arctic Grayling	*Thymallus arcticus*
Atlantic Salmon	*Salmo salar*
Broad Whitefish	*Coregonus nasus*
Brook Trout	*Salvelinus fontinalis*
Brown Trout	*Salmo trutta*
Carp	*Cyprinus carpio*
Channel Catfish	*Ictalurus punctatus*
Chinook Salmon	*Oncorhynchus tshawytscha*
Chum Salmon	*Oncorhynchus keta*
Cisco	*Coregonus artedii*
Coho Salmon	*Oncorhynchus kisutch*
Cutthroat Trout	*Oncorhynchus clarki clarki*
Dolly Varden	*Salvelinus malma*
Goldeye	*Hiodon alosoides*
Green Sturgeon	*Acipenser medirostris*
Inconnu	*Stenodus leucichthys*
Kokanee	*Oncorhynchus nerka*
Lake Sturgeon	*Acipenser fulvescens*
Lake Trout	*Salvelinus namaycush*
Lake Whitefish	*Coregonus clupeaformis*
Largemouth Bass	*Micropterus salmoides*
Longnose Sucker	*Catostomus catostomus*
Mooneye	*Hiodon tergisus*
Mountain Whitefish	*Prosopium williamsoni*
Ouananiche	*Salmo salar ouananiche*
Pink Salmon	*Oncorhynchus gorbuscha*
Rainbow Smelt	*Osmerus mordax*
Rainbow Trout	*Oncorhynchus mykiss*
Sauger	*Stizostedion canadense*
Smallmouth Bass	*Micropterus dolomieui*
Sockeye Salmon	*Oncorhynchus nerka*
Walleye	*Stizostedio vitreum*
White Bass	*Morone chrysops*
White Perch	*Morone americana*
White Sturgeon	*Acipenser transmontanus*
White Sucker	*Catostomus commersoni*
Yellow Perch	*Perca flavescens*

ANGUILLIFORM SWIMMING MODE

Common Name	Scientific Name
American Eel	*Anguilla rostrata*
Burbot	*Lota lota*
Sea Lamprey	*Petromyzon marinus*

Note: The few data points available for Northern Pike *(Esox lucius)* are close to the anguilliform group.

4.2 Design of Fixed End-of-Pipe Fish Screens

Once the required open area has been found from Table 2 or Figure 1, the effective screen area must be calculated. It is the area occupied by the open spaces (i.e., open screen area) and the screen material available for the free flow of water. The effective screen area should be provided at the intake location and is determined as follows:

$$\text{Effective Screen Area } (m^2 \text{ or } ft^2) = \frac{\text{Open Screen Area (Table 2)}}{\left(\frac{\text{\% Open Area (Table 3)}}{100}\right)}$$

It should be noted that if the percent (%) open screen area is maximized, then the effective screen area required for a given flow is minimized. The narrowest dimension of any opening on the screen is referred to as the design opening, regardless of opening shape. The maximum design opening for a fish of 25 mm fork length is estimated at 2.54 mm (0.10 inches). Guidance on screen openings and materials is presented below.

- The screen openings may be round, square, rectangular, or any combination thereof, but should not have any protrusions that could injure fish.
- Screen materials may include brass, bronze, aluminum, monel metal, galvanized or stainless steel, and plastics. The screen material should be resistant to corrosion and UV light.
- Note: clogging due to corrosion is minimized with the use of stainless steel.
- Welded wedge wire screens offer reduced debris clogging and increased open area and screen stiffness, in comparison to round wire mesh and punch plate.

Table 3 presents several common types of screening material that meet the requirements of wire diameter, clear opening width and percent open area,

The dimensions of the fish screen can be calculated after the correct shape, configuration, location, and method of installation have been determined. This will usually be determined after a site investigation and a review of these guidelines. Included in Figure 2 are common screen shapes and the associated

Table 2
Open Screen Area Required for End-of-Pipe Water Intakes

Metric Units			Non-Metric Units		
Flow (L/s)	Subcarangiform (m^2)	Anguilliform (m^2)	Flow (US gpm)	Subcarangiform (ft^2)	Anguilliform (ft^2)
1	0.01	0.03	10	0.1	0.2
5	0.05	0.13	50	0.3	0.9
6	0.06	0.16	100	0.6	1.8
8	0.07	0.21	150	0.9	2.7
10	0.09	0.26	200	1.3	3.6
12	0.11	0.31	250	1.6	4.5
14	0.13	0.37	300	1.9	5.4
15	0.14	0.39	350	2.2	6.2
16	0.15	0.42	400	2.5	7.1
18	0.17	0.47	450	2.8	8.0
20	0.18	0.52	500	3.2	8.9
22	0.20	0.58	550	3.5	9.8
24	0.22	0.63	600	3.8	10.7
25	0.23	0.65	650	4.1	11.6
26	0.24	0.68	700	4.4	12.5
28	0.26	0.73	750	4.7	13.4
30	0.28	0.79	800	5.0	14.3
32	0.30	0.84	850	5.4	15.2
34	0.31	0.89	900	5.7	16.0
35	0.32	0.92	950	6.0	16.9
36	0.33	0.94	1000	6.3	17.8
38	0.35	0.99	1050	6.6	18.7
40	0.37	1.05	1100	6.9	19.6
45	0.42	1.18	1150	7.2	20.5
50	0.46	1.31	1200	7.6	21.4
55	0.51	1.44	1250	7.9	22.3
60	0.55	1.57	1300	8.2	23.2
65	0.60	1.70	1350	8.5	24.1
70	0.65	1.83	1400	8.8	25.0
75	0.69	1.96	1450	9.1	25.8
80	0.74	2.09	1500	9.4	26.7
85	0.78	2.23	1550	9.8	27.6
90	0.83	2.36	1600	10.1	28.5
95	0.88	2.49	1650	10.4	29.4
100	0.92	2.62	1700	10.7	30.3
110	1.02	2.88	1750	11.0	31.2
120	1.11	3.14	1800	11.3	32.1
125	1.16	3.30	1850	11.6	33.0
			1900	12.0	33.9
			1950	12.3	34.8
			2000	12.6	35.7

Table 3
Examples of Sereen Material

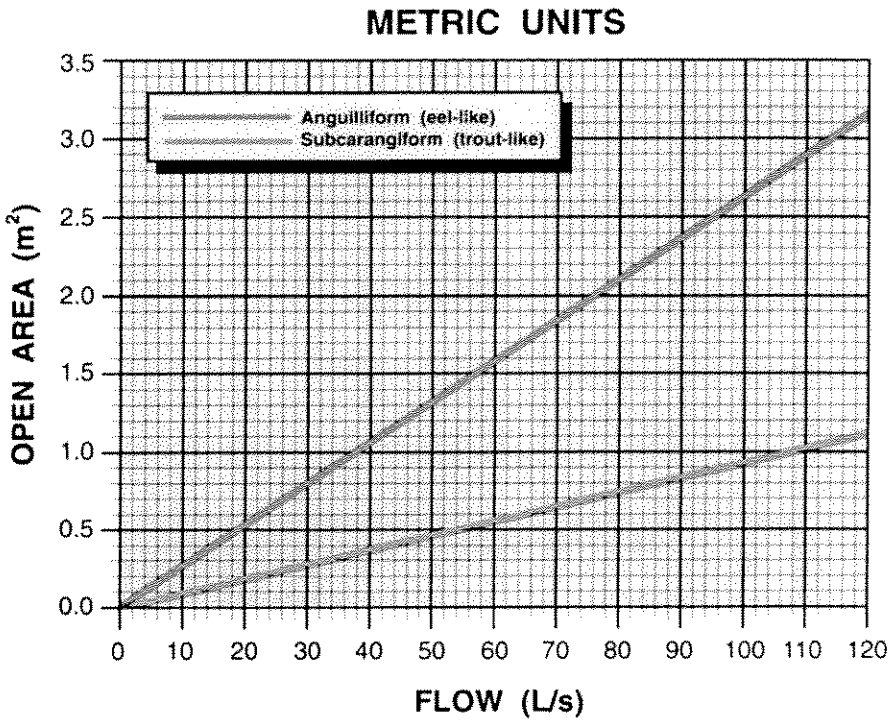
Material	Wire Thickness	Opening Width	% Open Area
8x 8 Stainless Steel Alloy Mesh	0.711 mm (0.028")	2.44 mm (0.096")	60
#7 Mesh Wire Cloth	1.025mm (0.041")	2.54 mm (0.100")	51
#8 Mesh Wire Cloth	0.875 mm (0.035")	2.25 mm (0.089")	52
#8 Mesh Wire Cloth	0.700mm (0.028")	2.54 mm (0.100")	62
#60 Wedge Wire Screen	1.50mm (0.059")	2.54 mm (0.100")	63
#45Wedge Wire Screen	1.10mm (0.080")	2.54 mm (0.100")	69

dimensions and area formulae. These are just examples of the many shapes and sizes in which fish screens can be fabricated. Screens are instream structures and, as such, should have sufficient strength and durability, and be capable of withstanding any potential large forces and impacts. Figure 3, 4, and 5 illustrate some of the various configurations, applications, and screen material types of end-of-pipe fish screens.

4.3 Installation

- Screens should be located in areas and depths of water with low concentrations of fish throughout the year.
- Screens should be located away from natural or man-made structures that may attract fish that are migrating, spawning, or in rearing habitat.
- The screen face should be oriented in the same direction as the flow.
- Ensure openings in the guides and seals are less than the opening criteria to make "fish tight".
- Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
- Structural support should be provided to the screen panels to prevent sagging and collapse of the screen.
- Large cylindrical and box-type screens should have a manifold installed in them to ensure even water velocity distribution across the screen surface. The ends of the structure should be made out of solid materials and the end of the manifold capped.
- Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where there is debris loading (woody material, leaves, algae mats, etc.). A 150 mm (6 in.) spacing between bars is typical.

Figure 1
Open Screen Area for End-of-Pipe Water Intake Flow



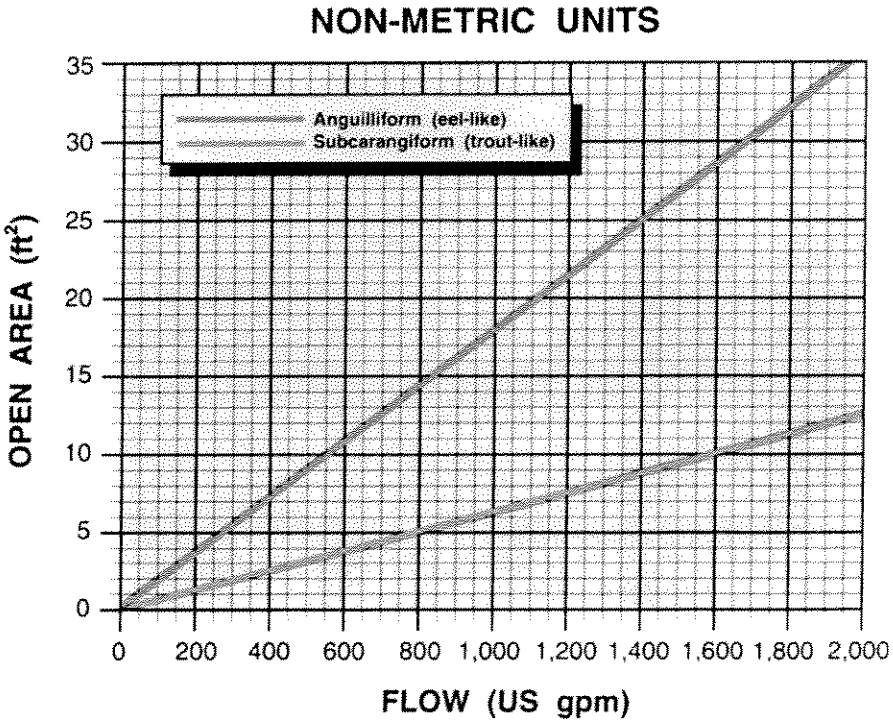
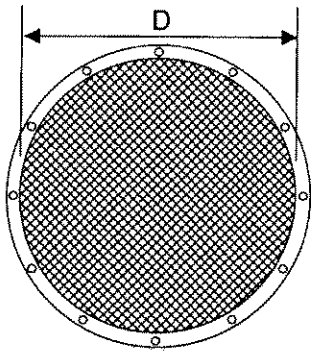


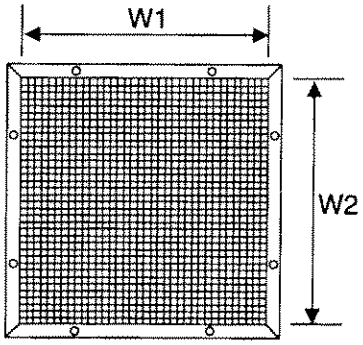
Figure 2
Common Screen Shapes and Area Formulae

CIRCULAR SCREEN



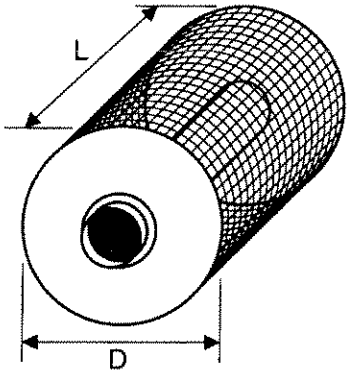
Area = $\frac{\pi}{4} D^2$

SQUARE SCREEN



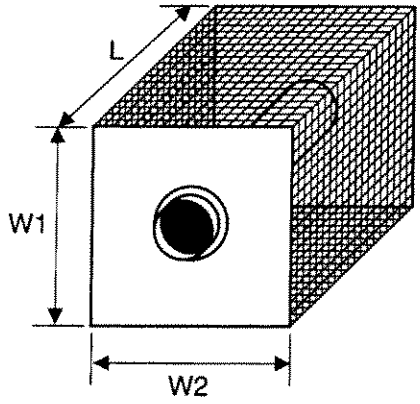
Area = W1 x W2

CYLINDRICAL SCREEN



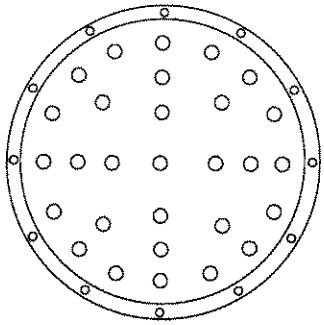
Area = πDL

BOX SCREEN

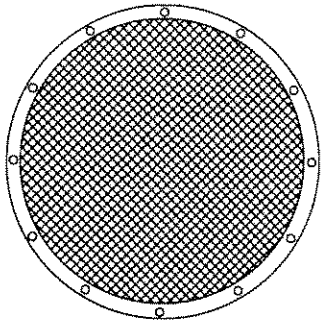


Area = 2L(W1 + W2)

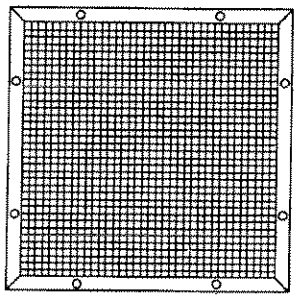
Figure 3
Typical Applications and Features of End-of-Pipe Screens



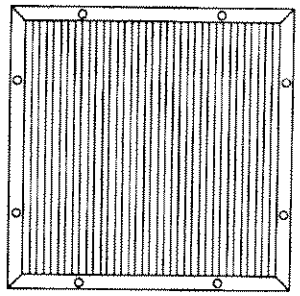
PERFORATED PLATE (PUNCHED)



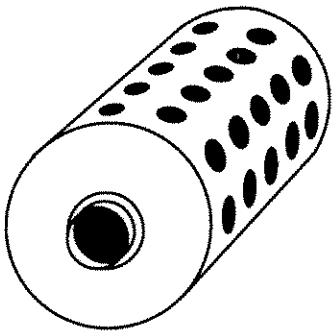
CIRCULAR MESH SCREEN



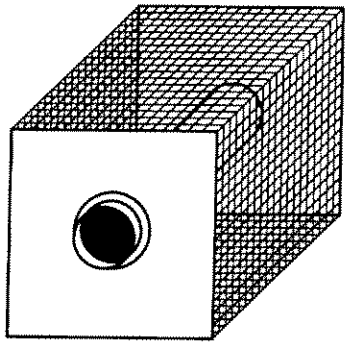
SQUARE MESH SCREEN



SQUARE WEDGE WIRE SCREEN

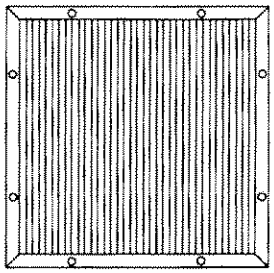


DRUM OR CYLINDER WITH PERFORATED PIPE

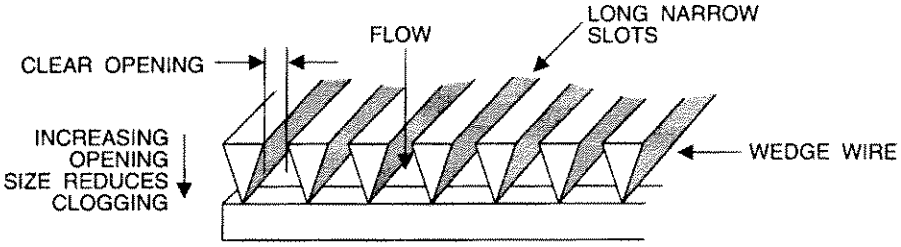


BOX-TYPE WITH MESH SCREEN

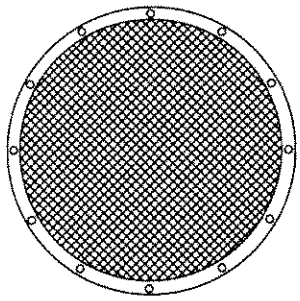
Figure 4
Examples of Typical Screen and Material Types



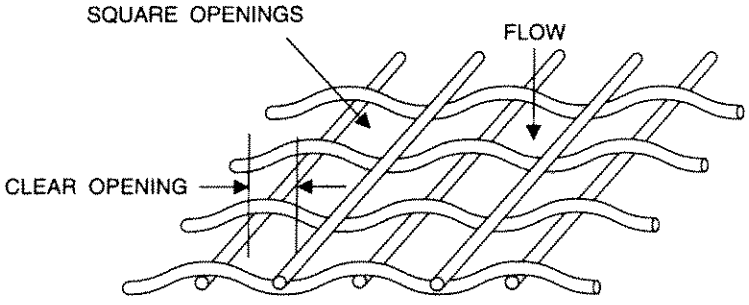
SQUARE WEDGE WIRE SCREEN



WEDGE WIRE PROFILE

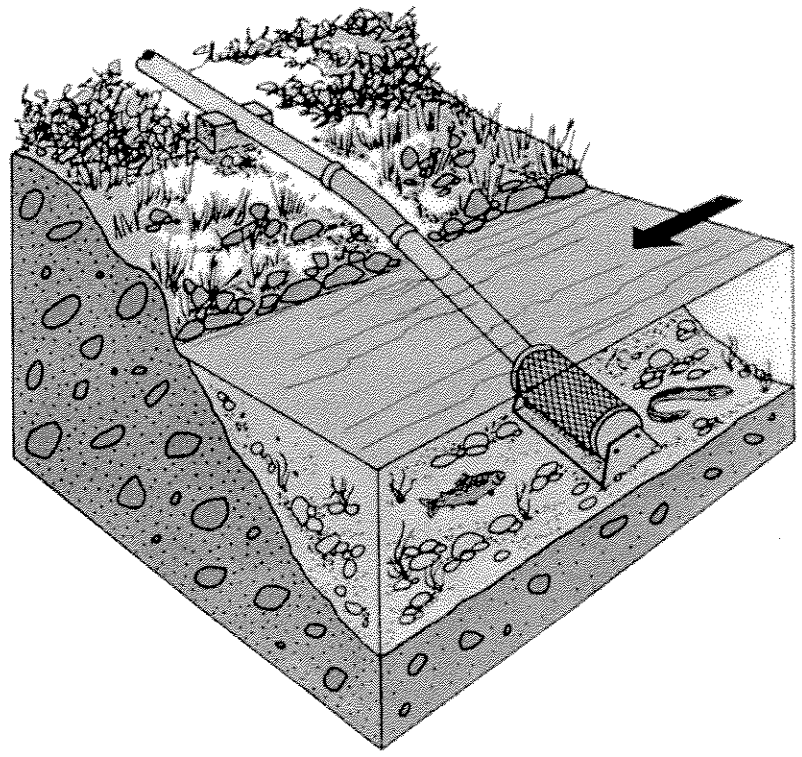


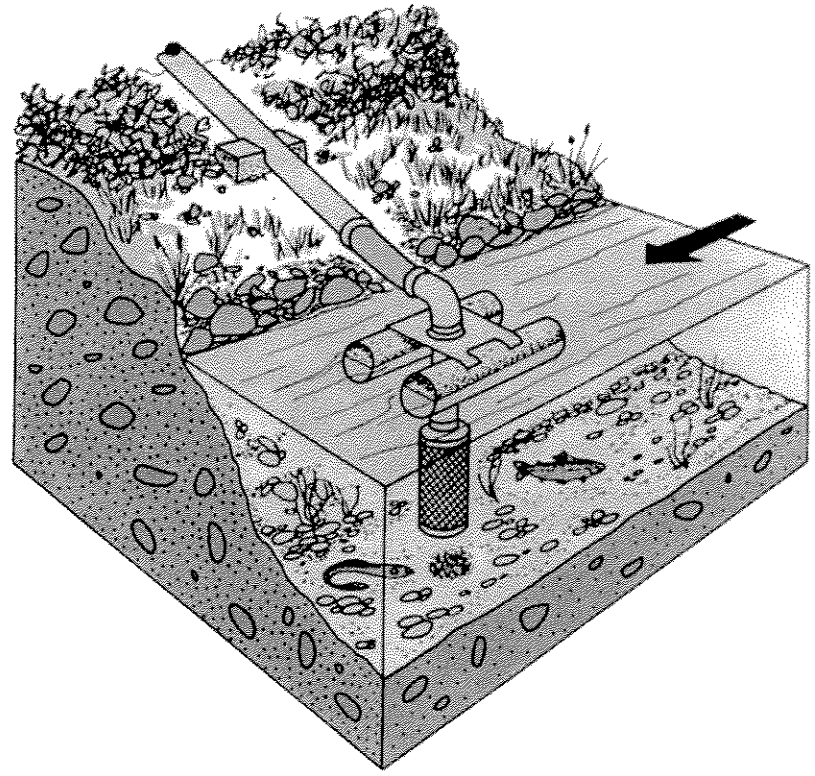
CIRCULAR MESH SCREEN

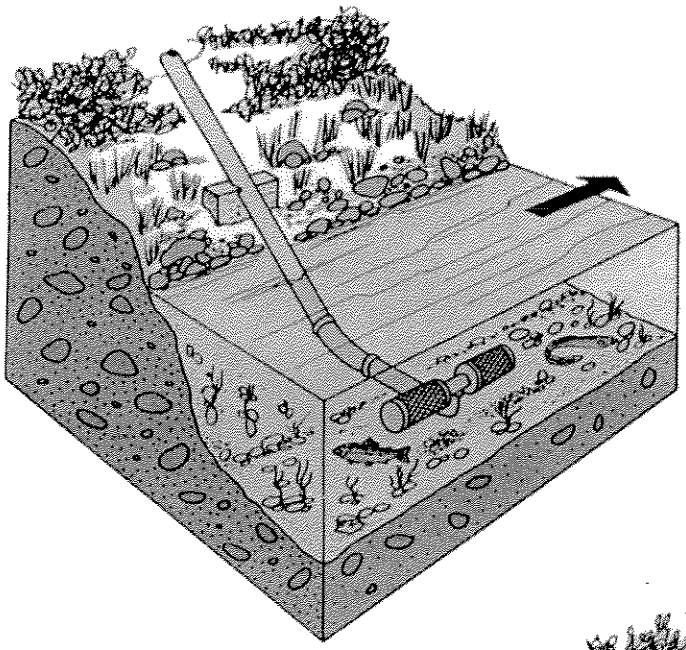


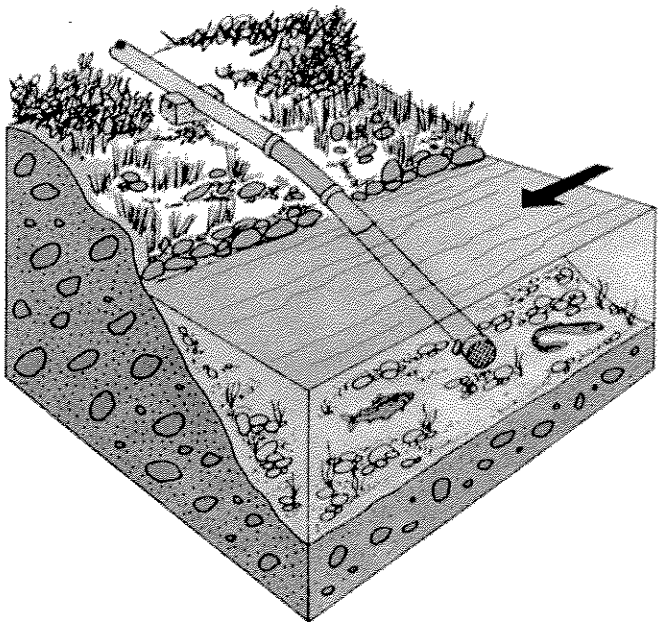
WOVEN WIRE MESH PROFILE

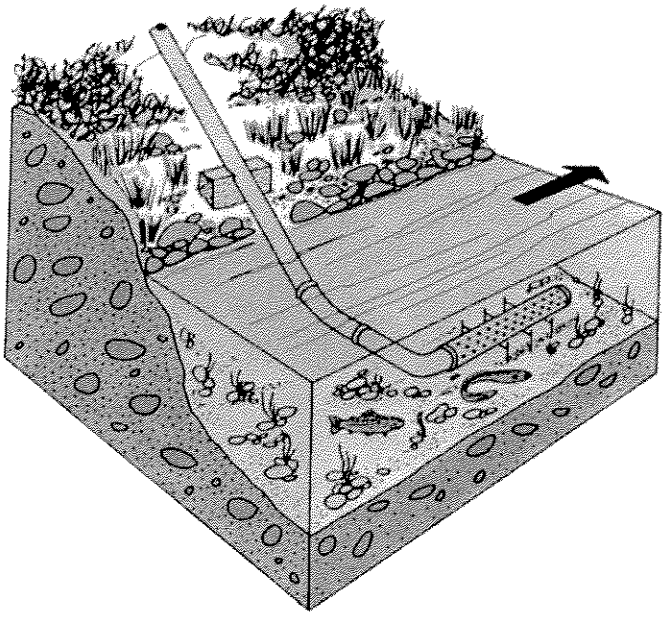
Figure 5
Examples of Typical Installations of End-of-Pipe Screen











4.4 Cleaning and Maintenance

- Provision should be made for the removal, inspection, and cleaning of screens.
- Ensure regular maintenance and repair of cleaning apparatus, seals, and screens is carried out to prevent debris-fouling and impingement of fish.
- Pumps should be shut down when fish screens are removed for inspection and cleaning.
- Screens may be cleaned by methods such as air or water, backwashing, removal and pressure washing or scrubbing.
- Under certain site-specific winter conditions, it may be appropriate to remove screens to prevent screen damage.
- Flexible suction pipe may be used instead of solid, fixed piping for ease of screen removal and cleaning.
- Pump suction pressure can be measured to assess the need for screen cleaning.

To facilitate intake screen cleaning/maintenance, design and installation features such as orientation of the screen (e.g., in a cove) or variation in mesh shape (i.e., square wire/bars versus round wire/bars), etc. may be considered for regularly cleaned screens. For screens that will not be cleaned regularly, provision of considerably more open screen area (e.g., four times more) than determined from Table 2/Figure 1 may be considered. Such design/installation features should be addressed with the appropriate regulatory agencies on a site-specific basis.

Appendix C presents a list of units of conversion.

For more information on the appropriate design of freshwater intake end-of-pipe fish screens, contact the nearest DFO office. In addition, a list of DFO Regional contacts is presented in Appendix D. Other appropriate regulatory agencies should also be contacted.

References

Fish Screening Directive. 1990. Department of Fisheries and Oceans, Ottawa, Ontario,

Katopodis, C. 1990. *Advancing the art of engineering fishways for upstream migrants.* Proceedings of International Symposium on Fishways '90, Oct. 8-10, 1990, Gifu, Japan, p. 19-28.

Katopodis, C. 1992. *Fish screening guide for water intakes.* Working Document, Freshwater Institute, Winnipeg, Manitoba.

Katopodis, C, 1994. *Analysis of ichthyomechanical data for fish passage or exclusion system design.* Proc. International Fish Physiology Symposium, July 16-21, 1994, Vancouver, B.C. American Fisheries Society and Fish Physiology Association.

Katopodis, C. and R. Gervais, 1991. *Icthyomechanics*, Working Document, Department of Fisheries and Oceans, Freshwater Institute, Winnipeg, Manitoba.

Glossary

Anadromous: Fish species that migrate from the sea to freshwater systems in order to spawn.

Anguilliform: The type of swimming mode for fish that swim like an eel, and move through the water by undulating most or all of their body.

Effective Screen Area: The area occupied by the open spaces (i.e., open screen area) and screen material available for the free flow of water.

Entrainment: Occurs when a fish is drawn into a water intake and cannot escape.

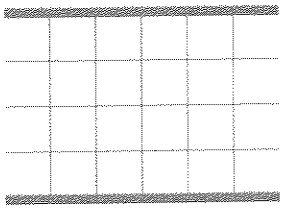
Fork Length: The straight line distance measured from the tip of the nose to the fork of the tail of a fish.

Impingement: Occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.

Open Screen Area: The area of all open spaces on the screen available for the free flow of water.

Subcarangiform: The type of swimming mode for fish that swim like trout or salmon, and move through the water by undulating the posterior third to half of their body.

Appendix A
Information
Requirements



Appendix A Information Requirements

Types of information requirements that may be applicable to a freshwater intake proposal are highlighted below. While this listing is not intended to be all inclusive, it indicates information that may be necessary to enable regulatory agencies to review a water intake and fish screen proposal. The information highlighted below considers Section 30 and other sections of the *Fisheries Act* .These information requirements may also address other Federal, Provincial, and Municipal legislation and policies.

General and Site Information

- gazette or common name of the watercourse
- location of the watercourse
- type of watercourse (e.g., pond or stream)
- type of water intake
- other activities associated with the development or construction of the intake/screen structure

Biophysical Information

- fish presence, species, and possible fish size or fish habitat conditions at the protect site
- physical description of the watercourse at the intake site, including channel width and depth, direction and velocity of water currents, variations in wafer levels, sediment transport processes, lateral or channel grade movement, debris loading, etc.
- location and position of the intake within the watercourse, including dimensions, alignment, depth in the water column, wetted area, etc.
- description of the site features and characteristics, including site access

Water Use Information

- purpose of water withdrawal

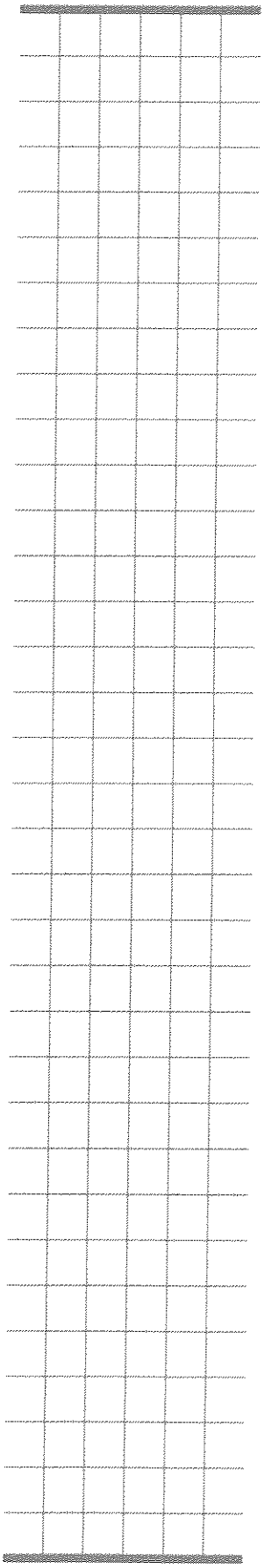
- average rate, or ranges of rates, of withdrawal from the watercourse
- duration and lime of withdrawal
- estimates of ranges of flow (i.e., daily, weekly, monthly) in the watercourse during times of withdrawal with dates and times of year (with particular consideration to periods of low flow)
- expected effects of withdrawal on existing watercourse (e.g., drawdown, downstream dewatering, etc)
- description of structures or activities associated with the development of the intake
- whether the application is for a new intake, or re-development or upgrading of an existing structure

Other Information

- site plans/sketches indicating intake site and location (detailed on 1:50,000 topographic map)
- photographs/video of the site are often useful

Fish Screen Information

- screen open and effective areas
- physical screen parameters with respect to the intake and the watercourse
- screen material, method of installation and supporting structures
- screen maintenance, cleaning or other special requirements



Appendix B
Sample Calculation

A proponent wishes to withdraw water at a rate of 0.075 m^3/s from a nearby pond. The pond supports populations of brown trout, brook trout, and American eel. The intake is proposed to be cylindrical with the ends solid and #60 wedge wire screen around the cylinder.

What size must the intake screen be to satisfy the guideline requirements?

There are 4 steps to finding the answer:

1. Determine the fish swimming mode.
2. Determine the open screen area.
3. Determine the effective screen area.
4. Determine the dimensions necessary to produce the effective screen area.

1. Fish Swimming Mode

The fish swimming mode is found from Table 1. Brook trout and brown trout are listed as subcarangiform swimmers, while the American eel is an anguilliform swimmer.

2. Open Screen Area

Table 2 lists the required open screen area for both subcarangiform and anguilliform swimmers under flows up to 125 L/s (2000 US gpm). To use the table, if is necessary first to convert the flow from cubic metres per second to litres per second.

$$0.075 \frac{m^3}{s} \times \frac{1000\ L}{1\ m^3} = 75 \frac{L}{s}$$

For a flow of 75 L/s, Table 2 indicates that the open screen area must be:

- 0.69 m^2 for subcarangiform swimmers, and
- 1.96 m^2 for anguilliform swimmers.

The higher number (1.96 m^2) is the more stringent requirement, therefore, it is used in the calculation of effective screen area,

3. Effective Screen Area

The screen material in this case is # 60 Wedge Wire. A review of Table 3 indicates that the % Open Area for this material is 63%, With this value and the previously determined area from Step 2, the following formula is used to determine the Effective Screen Area.

$$\text{Effective Screen Area} = \frac{\text{Open Screen Area}}{\left(\frac{\text{\% Open Area}}{100}\right)}$$

$$= \frac{1.96\ \text{m}^2}{\left(\frac{63}{100}\right)}$$

$$= 3.111\ \text{m}^2$$

4. Dimensions of Intake Screen

Figure 2 lists several common screen shapes and their respective area formulae. For a cylindrical screen where the ends are solid and screening is around the cylinder, the following formula applies:

$$\text{Area} = \pi DL$$

The unknown dimensions are diameter (D) and length (L). These dimensions are determined by choosing a value for one and solving the equation for the other.

If the diameter is 0.600 m, then the length follows as:

$$\text{Area} = \pi DL$$

$$3.111\ \text{m}^2 = (0.600\ \text{m})L$$

$$3.111\ \text{m}^2 = (1.885\ \text{m})L$$

$$L = \frac{3.111\ \text{m}^2}{1.885\ \text{m}}$$

$$L = 1.65\ \text{m}$$

A 0.600 m diameter, 1.65 m long cylindrical screen would meet the design requirements. It should be noted that the dimensions given are representative of the screening area only; they do not include any screen that may be blocked by framing, etc. By comparison, if the pond only supported trout (subcarangiform), a 0.600 m diameter, 0.58 m long cylindrical screen would meet the design requirements.

Appendix C
Units of Conversion

To Convert	Into	Multiply By
cubic feet per second	cubic metres per second	0.0283
cubic feet per second	litres per second	28.3
cubic feet per second	US gallons per minute	448.9
cubic metres per second	cubic feet per second	35.3
cubic metres per second	US gallons per minute	15850
litres per second	cubic feet per second	0.0353
litres per second	cubic feet per minute	2.12
litres per second	cubic metres per second	0.001
litres per second	US gallons per minute	15.85
square metre	square foot	10.76
square metre	square inch	1550
square foot	square metre	0.0929
US gallons per minute	litres per second	0.0631
US gallons per minute	cubic feet per second	0.00223
US gallons per minute	Imperial gallons per minute	0.833
Imperial gallons per minute	litres per second	0.0758

Appendix D
DFO Regional Contacts

NEWFOUNDLAND REGION	Habitat Management Division P.O. Box 5667 St. John's NF A1C 5X1 Tel: 709-772-6157 Fax: 709-772-5562
GULF REGION	Habitat Management Division P.O. Box 5030 Moncton NB E1C 9B6 Tel: 506-851-6252 Fax: 506-851-6579
SCOTIA-FUNDY REGION	Habitat Management Division P.O. Box 550 Halifax NS B3J 2S7 Tel: 902-426-6027 Fax: 902-426-1489
QUEBEC REGION	Fish Habitat Management P.O. Box 15550 Quebec QC G1K 7Y7 Tel: 418-648-4092 Fax: 418-648-7777
CENTRAL & ARCTIC REGION	Habitat Management 501 University Crescent Winnipeg MB R3T 2N6 Tel: 204-983-5181 Fax: 204-984-2404
PACIFIC REGION	Habitat Management 555 W. Hastings St. Vancouver BC V6B 5G3 Tel: 604-666-6566 Fax: 604-666-7907

Local DFO offices should be contacted. Other appropriate regulatory agencies should also be contacted.

APPENDIX D: FISHERIES WORK WINDOW GUIDELINES

OKANAGAN REGION FISHERIES WORK WINDOWS

This table is meant only as a guide and does not replace on-site inspections. Proposals within these windows may be rejected by either Fisheries or Habitat when deemed incompatible with additional site-specific fish resource data.

Note: Dates in bold vary from the regional species specific windows due to stream specific information

PLANNING UNIT	STREAM/LAKE	PROTECTED SPECIES*	WORK WINDOW	Comments
Kettle/Granby	**Christina Lk**	KO/RB/SMB/BB/ MW		
	a) Within 0.5km of spawning creek (known or potential KO/WF shore spawning area)	KO(shore and stream)/RB/MW	**Jul 15 - Aug 10**	End of RB fry out-migration to start of Ko spawning migration
	b) Within 0.5km of spawning creek and exclusively mud/silts (No known or potential KO shore spawning)	Ko(stream)/RB	**July 15 - Aug 10** And Oct 15 - Apr 1	End of RB fry out-migration to start of Ko spawning migration And End of Ko spawn to start of RB spawn
	c) Beyond a) (known or potential KO shore spawning area)	Ko(shore)/MW	June 1 - Oct 15	End of Ko fry outmigration to start of Ko spawn
	d) Beyond a) and exclusively mud/silts (no known or potential KO shore spawning)	Bass	July 1 to April 1	End of bass swim up to start of bass spawn
	Granby R and tribs extending 500 meters upstream from mouth	MW/RB	**Aug 15** - Sept 30	End of RB fry swim-up to start of RB/WF winter behavior
	Kettle R and tribs.	MW/RB/EB		

PLANNING UNIT	STREAM/LAKE	PROTECTED SPECIES*	WORK WINDOW	Comments
	extending 500 meters upstream from mouth **< 1100 meters** **> 1100 meters**		**Aug 7** - Sep 15 **Aug 15** - Sept 15	End of RB fry swim-up to start of EB spawn
	Boundary Creek **< 1100 meters** **> 1100 meters**	**RB/EB**	**July 22 - Sept 15** **Aug 7 - Sept 15**	**End of RB fry swim-up to start of EB spawn**
	McCrae Cr a) Below falls b) Above falls ***Falls located approx 1.75 km upstream of lake**	RB/KO RB	**July 15 - Aug 10** **Aug 15 - Sept 30**	End of RB fry swim-up to start of Ko spawn End of RB fry swim up to start of RB winter behavior
	Sutherland Cr a) Below falls b) Above falls ***Falls located approx 1.75 km upstream of lake**	KO/RB RB	**July 15 - Aug 10** **Aug 15 - Sept 30**	As above for McCrae Creek
	Texas Cr	RB	Aug 7 - Oct 15	End of RB fry swim-up to start of RB winter behavior
	West Kettle R and tribs extending 500 meters upstream from mouth	MW/RB	**Aug 15** - Sept 30	Same as for Granby River
Okanagan	**Kalamalka Lk**	Ko(shore and stream)/RB/MF/LW/LT		
	a) Within 0.5km of spawning creek (known or potential KO/WF shore spawning area)	KO(shore and stream)/RB/WF	Jul 22 - Sept 10	End of RB fry out-migration to start of Ko sp migration

PLANNING UNIT	STREAM/LAKE	PROTECTED SPECIES*	WORK WINDOW	Comments
	b) Within 0.5km of spawning creek and exclusively mud/silts (No known or potential KO/WF shore spawning)	Ko(stream)/RB	July 22 - Sept 10 And Oct 15 - Apr 1	End of RB fry out-migration to start of Ko sp migration And End of Ko spawn to start of RB spawn
	c) Beyond a) (known or potential KO/WF shore spawning area)	Ko(shore)/WF	June 1 - Sept 30	End of Ko fry outmigration to start of Ko spawn
	d) Beyond a) and exclusively mud/silts (no known or potential KO/WF shore spawning)	Nil	No restrictions	
	Coldstream Cr	RB/KO	Aug 7 - Sep 10	End of RB swim up to start of KO sp
→	**Okanagan Lk**	KO/RB/MF/LW		
	a) Within 0.5km of spawning creek (known or potential KO/WF shore spawning area)	KO(shore and stream)/RB/WF	Jul 22 - Aug 24	End of RB fry out-migration to start of Ko sp migration
	b) Within 0.5km of spawning creek and exclusively mud/silts (No known or potential KO/WF shore spawning)	Ko(stream)/RB	July 22 - Aug 24 And Oct 15 - Apr 1	End of RB fry out-migration to start of Ko sp migration And End of Ko spawn to start of RB spawn
	c) Beyond a) (known or potential KO/WF shore	Ko(shore)/WF	June 1 - Sept 30	End of Ko fry outmigration to

PLANNING UNIT	STREAM/LAKE	PROTECTED SPECIES*	WORK WINDOW	Comments
	spawning area) d) Beyond a) and exclusively mud/silts (no known or potential KO/WF shore spawning)	Nil	No restrictions	start of Ko spawn
	Bellevue Cr	RB/KO	July 22 - Aug 24	End of Rb swim-up to start of Ko spawn
	Eneas Cr	RB/EB/KO	July 22 - Aug 24	As above
→	**Kelowna Cr** (aka Mill Cr)	KO/RB	July 22 - Aug 31	As above
→	**Lambly Cr**	KO/RB	July 22 - Aug 31	As above
	Lower Vernon	KO/RB	July 22 - Aug 31	As above
	McDougall Cr	RB	July 22 - Oct 31	End of RB swim-up to start of RB winter behavior
	Mission Cr a) downstream of Gallagher falls b) upstream of Gallagher Falls (no downstream KO impacts)	 KO/RB RB	 July 22 - Aug 24 Aug 7 - Oct 15	 End of RB swim-up to start of KO spawn End of RB swim up to start of RB winter behavior
	Naramata Cr a) Mouth to Naramata Rd b) Above Naramata Rd (no downstream KO	 KO/RB RB	 July 22 - Aug 24 Aug 7 - Oct 15	 End of RB swim-up to start of KO spawn End of RB swim up to start of RB winter

PLANNING UNIT	STREAM/LAKE	PROTECTED SPECIES*	WORK WINDOW	Comments
	impacts)			behavior
	Peachland Cr a) Below Dam	KO/RB	July 22 – **Aug 24**	End of RB swim-up to start of KO spawn
	b) Above Dam (no downstream KO impacts)	RB	Aug 7 – Oct 15	End of RB swim up to start of RB winter behavior
	Penticton Cr a) Below Dam	KO/RB	July 22 – Aug 24	End of RB swim-up to start of KO spawn
	b) Above Dam (no downstream KO impacts)	RB	Aug 07 – Oct 15	End of RB swim up to start of RB winter behavior
	Powers Cr a) Below Falls	KO/RB	July 22 – Aug 24	End of RB swim-up to start of KO spawn
	b) Above Falls (no downstream KO impacts)	RB	Aug 7 – Oct 15	End of RB swim up to start of RB winter behavior
	Shorts Cr a) Below falls	KO/RB	July 22 – Aug 31	End of RB swim-up to start of KO spawn
	b) Above Falls (no downstream KO impacts)	RB	Aug 7 – Oct 15	End of RB swim up to start of RB winter behavior
	Thompson Brook	KO/RB	July 22 – Aug 24	End of RB swim-up to start of KO spawn
	Trepanier Cr			

PLANNING UNIT	STREAM/LAKE	PROTECTED SPECIES*	WORK WINDOW	Comments
	a) Below falls	KO/RB	July 22 - Aug 24	End of RB swim-up to start of KO spawn
	b) Above Falls (no downstream KO impacts)	RB	Aug 7 - Oct 15	End of RB swim up to start of RB winter behavior
	Trout Cr a) Below falls	RB/KO	July 22 - Aug 24	End of RB swim-up to start of KO spawn
	b)Above Falls (no downstream KO impacts)	RB/EB	July 22 -Sept 15	End of RB swim up to start of EB spawn
	Okanagan R a) Okanagan Lk to Ellis Cr	KO/RB	July 22 - Aug 31	End of RB swim up to start of KO spawn
	b) Shingle Cr	RB/KO	July 22 - Aug 31	A/A
	c) Ellis Cr	KO/RB	July 22 - Aug 31	A/A
	d) Below Ellis Cr to Skaha Lk	KO/RB	Nov 15 - Apr 01 AND July 22 - Aug 31	End of KO sp migration to start of RB sp migration AND End of RB out migration to start of KO sp
	e) Skaha Lk to McIntyre Dam	RB/SK	July 22 - Aug 31	End of RB fry out migration to start of SK spawning migration
	f) McIntyre Dam to Osoyoos L	KO/RB/SK	Jul 22 - Aug 31	End of RB swim up to start of SK/KO spawn

PLANNING UNIT	STREAM/LAKE	PROTECTED SPECIES*	WORK WINDOW	Comments
	Osoyoos Lk a) Within .5 km of Ok River or Inkaneep Creek	KO/SK/RB	Jul 22 - Aug 31	End RB swim up to start of KO/SK sp migration
	b) Beyond a)	LMB/SMB	Jul 01 - Apr 01	End of Bass swim up to start of Bass spawn

	Skaha Lk a) Within .5 km of Ok River	KO/RB	Jul 22 - Aug 31	End RB swim up to start of KO migration
	b) Beyond a)	SMB	Jul 01 - Apr 01	End of Bass swim up to start of Bass sp
	Swan Lk a) within .5 km of spawning creek	RB/EB	Jul 22 - Sept 15 AND Nov 1 - Apr 1	End of RB outmigration to start of EB sp migration AND End of EB sp migration to start of RB sp migration
	b) Beyond a)	Nil	No restrictions	
	BX Cr a) above Swan Lk	RB	July 22 - Oct 31	End of RB swim up to start of RB winter behavior
	b) below Swan Lk	RB/KO	July 22 - Aug 31	End of RB swim up to start of KO sp
	Vaseux Cr a) Below falls when access for SK/KO	RB/SK/KO	July 22 - Aug 31	End of RB swim up to start of SK/KO sp
	b) Below falls when no access for SK/KO	RB	July 22 - Oct 31	End of RB swim up to start of RB winter behavior
	c) Above falls	RB	Aug 7 - Oct 15	End of RB swim up to start of RB winter

				behavior
	Vaseux Lk	LMB/SMB/YP/ KO/RB	Jul 22 - Aug 31 AND Nov 1 - Apr 01	End of RB fry out migration to start of SK spawning migration AND End of SK migration to start of RB migration/SK fry out migration
	Wood Lk	KO/RB/WF		
	a) Within 0.5km of spawning creek (known or potential KO/WF shore spawning area)	KO(shore and stream)/RB/MF/ LW	Jul 22 - Sept 10	End of RB fry out-migration to start of Ko sp migration
	b) Within 0.5km of spawning creek and exclusively mud/silts (No known or potential KO/WF shore spawning)	Ko(stream)/RB	July 22 - Sept 10 And Oct 30 - Apr 1	End of RB fry out-migration to start of Ko stream sp migration And End of Ko spawn to start of RB spawn
	c) Beyond a) (known or potential KO/WF shore spawning area)	Ko(shore)/MF/ LW	June 1 - Sept 30	End of Ko fry outmigration to start of Ko spawn
	d) Beyond a) and exclusively mud/silts (no known or potential KO/WF shore spawning)	Nil	No restrictions	
	Mid Vernon Cr	KO/RB	July 22 - Sep 10	End of RB swim up to start of KO spawn
	Winfield Cr	KO/RB	July 22 - Sep 10	End of RB swim up

				to start of KO spawn
Shuswap/Mabel	**Bessette Cr**	KO/RB/CN/CO	Aug 7 - Aug 31	End of RB swim up to start of salmon sp
	Blurton Cr	RB/CN/CO	Aug 7 - Aug 31	End of RB swim up to start of salmon sp
	Cherry Cr	RB/CN/BT	Aug 7 - Aug 15	End of RB swim up to start of BT sp
	Creighton Cr	CN/CO/RB	Aug 7 - Aug 31	End of RB swim up to start of salmon sp
	Duteau Cr	RB/CN/CO	Aug 7 - Aug 31	End of RB swim up to start of salmon sp
	Ferry Creek	RB/CN/BT	Aug 7 - Aug 15	End of RB swim up to start of BT sp
	Fortune Cr	RB/KO/CO/CN	Aug 7 - Aug 31	End of RB swim up to start of Ko sp
	Harris Cr	RB/CN/CO	Aug 7 - Aug 31	End of RB swim up to start of salmon sp
	Ireland Cr	RB/BT	Aug 7 - Aug 15	End of RB swim up to start of BT sp
	Johnson Cr	RB/CN/CO	Aug 7 - Aug 31	End of RB swim up to start of salmon sp
	Kingfisher	RB/CO/BT	Aug 7 - Aug 15	End of RB swim up to start of BT sp
	Mabel Lk a) Within .5 km of spawning creek	BT/SK/RB/KO (Note: No shore spawning)	Aug 7 - **Sep 15** AND Nov 1 - Apr 1	End of RB swim up to start of KO sp migration AND End of KO sp migration to start of RB sp migration
	b) Beyond a)	Nil	No restrictions	
	Mara Lk	BT/SK/RB	See Shuswap Lake	See Shuswap Lake

		BT/KO		
	Noisy Cr	RB/CO/BT	Aug 7 - Aug 15	End of RB swim up to start of BT sp
	Shuswap R	KO/RB/CN/CO/SK		
	a) Mara Lk to Enderby Br (migration only)	CN/CO/SK/RB	Aug 7 - Aug 31 AND Dec 01 - Apr 01	End of RB out migration to salmon sp. AND **Consult with DFO**
	b) Enderby to Mabel Lk	CN/CO/SK/RB	Aug 7 - Aug 31	End of RB out migration to start of salmon sp.
	c) Mabel Lk to Falls	KO/CN/CO/RB/ MF	Aug 7 - Aug 15	End of RB swim up to start of **CN** sp
	d) Falls to Sugar Lk	RB/MF/BT	Aug 7 - Aug 15	End of RB swim up to start of BT sp
	e) Above Sugar	RB/KO/MF/BT	Aug 7 - Aug 15	End of RB swim up to start of BT sp
	Sugar Lk a) Within .5 km of spawning creek b) Beyond a)	BT/RB/KO (Note: No shore spawning) Nil	Aug 7 - Sep 15 AND Nov 1 - Apr 1 No restrictions	End of RB swim up to start of KO sp migration AND End of KO sp migration to start of RB sp. migration
	Trinity Cr	RB/CO	Aug 7 - Aug 31	End of RB swim up to start of CO sp
	Tsuisus Cr	RB/CO/BT	Aug 7 - Aug 15	End of RB swim up to start of BT sp
	Torrent Cr	RB	Aug 7 - Oct 15	End of RB swim up to start of RB winter behavior
	Wap Cr/Tribs	RB/CO/BT	Aug 7 - Aug 15	End of RB swim up to

				start of BT sp
Similkameen	**Allison Cr**	RB/EB	Aug 7 - Sept 15	End of RB swim up to start of EB spawn
	Hayes Cr	RB	Aug 7 - Oct 15	End of RB swim up to start of RB winter behavior
	Similkameen R	MW/RB	Aug 7 - Sept 30	End of RB swim up to start of WF spawn
	Summers Cr	RB/EB	Aug 7 - Sep 15	End of RB swim up to start of EB spawn
	Ashnola R	RB	Aug 7 - Oct 15	End of RB swim up to start of RB winter behavior
	Tulameen R	MW/RB	Aug 7 - Oct 15	End of RB swim up to start of WF spawn

***SPECIES CODES:**

BB	= Burbot (Ling)	LMB	= Largemouth Bass
BCB	= Black Crappie	RB	= Rainbow Trout
BT	= Bull Trout	SK	= Sockeye Salmon
CN	= Chinook Salmon	SMB	= Smallmouth Bass
CO	= Coho Salmon	WF	= Whitefish (all spp)
EB	= Brook Trout	WP	= Walleye
KO	= Kokanee Salmon	YP	= Yellow Perch

YY/MM/DD OF LAST UPDATE	UPDATED BY	DETAILS/RATIONALE FOR UPDATE
95/07/31	Shepherd	General update--draft for review
95/08/30	Shepherd	Revisions requested by reviewers
95/09/12	Shepherd	Various additions
95/10/05	Shepherd	Notes re KO shorespawners @ crks
96/02/16	Shepherd	Harmonize with Region 3 windows
97/02/14	Smith	Mission Ck re upstream of kokanee impacts
01/05/16	Matthews	Standardize with new SIR Species Specific Instream Work Windows (Jan 25/01) and integrate up to date stream specific information

Southern Interior Species Specific Instream Work Windows

January 25, 2001

Species	Open	Close
KO (stream spawners)	June 1	Aug. 31
KO (shore spawners)	June 1	Sep. 30
RB/ ST/ CT(early spawners)	July 22	Oct. 31
RB/ ST/ CT (late spawners)	Aug. 7	Oct. 15
EB	June 1	Sep. 15
BT	June 1	Aug. 15
LT	July 15	Sep. 30
BB (shallow)	July 1	Oct. 31
BB (deep)	June 1	Dec. 31
LW	June 1	Oct. 31
MW	May 1	Sep. 30
Salmon	July 15	Aug. 15

KO - Kokanee Salmon
RB - Rainbow Trout
ST – Steelhead Trout
CT – Cutthroat Trout
EB – Eastern Brook Trout
BT - Bull Trout
BB - Burbot
MW - Mountain Whitefish
LW - Lake Whitefish

APPENDIX E: MOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION 2000 – SECTIONS 195, 751, 754, 757,AND 769

SECTION 165

PROTECTION OF THE ENVIRONMENT

165.01 General - This Section covers the general and specific provisions for the protection of the environment under the direction of the Ministry Representative, in cooperation with any Federal and/or Provincial Environment officers or an Environmental Monitor, as designated in the Special Provisions.

165.01.01 Intent of Specifications - These Specifications give the Ministry or its Agent the right to exercise control over environmental aspects of the work. The Contractor shall adhere to specific instructions if the work may result in an adverse impact on the environment.

The Ministry will determine the significance of environmental impacts in consultation with Environmental Agencies. The Ministry reserves the right of approval over the general methods employed by the Contractor in the performance of the work, but only insofar as they may affect relations with Environmental Agencies and the protection of aquatic and terrestrial resources, the health and safety of public, and protection of socio-community resources and features.

These specifications are for the protection of the environment, and shall be given such interpretation as will secure this intent.

165.01.02 Definitions - For the purposes of this Section, the following general terms are defined as follows:

"Compensation" refers to monetary payment or replacement in kind for environmental losses resulting from a development project, as well as the construction activities for the re-creation of lost or damaged habitat.

"Deleterious Substance or Material" is defined as a substance harmful to fish or fish habitat (Canada Fisheries Act, Section 34.1).

"Designated" shall mean designated in the Special Provisions or by the Ministry Representative.

"Environment" refers to the physical, biological, social, spiritual and cultural components that are interrelated and affect the growth and development of living organisms. The term "environment" in these specifications shall include socio-community issues and resources.

"Environmental Agencies" shall mean the appropriate regulating branches of the Federal and Provincial agencies responsible for the management and protection of the Environment and human resources. A partial listing of these agencies and their areas of concern is given in the joint publication "Land Development Guidelines for the Protection of Aquatic Habitat", Fisheries and Oceans Canada and Ministry of Environment, Lands and Parks (1992), hereafter referred to as the "Land Development Guidelines".

The "Environmental Monitor" shall mean an agent hired by the Ministry to monitor the Contractor's compliance with the environmental protection aspects of Standard Specifications, Special Provisions, permits and approvals, and to advise the Contractor and Ministry Representative on environmental problems. An Environmental Monitor will be used when and where required, and will report to the Ministry Representative.

"Environmental Approval" is defined as the written authority issued to a person or company by a government agency that allows the person or company to do something that otherwise may not be permitted by law or which is not defined in law. An environmental approval is a broad, generic term referring to informal or formal authorization for actions that may have an adverse effect on the environment, such as (i) undertaking an activity (e.g., authorization from fishery agencies to proceed with work within the wetted perimeter of a fish-bearing stream); or (ii) discharging some form of material (e.g., approval under the British Columbia Waste Management Act to introduce waste into the environment or the storage of special waste for a period of 12 months or less). The term "approval" can include related forms of authorization such as permits and licenses.

"Environmentally Sensitive Areas" shall mean areas requiring special management and attention to protect resources, habitat or species (which includes and is not limited to water quality, identified sensitive areas, fish and fish habitat, vegetation, rare and endangered flora/fauna, landscaping and visual aesthetics, soil conservation (including dust control), air quality and archaeological, heritage and cultural resources).

"Environmental Timing Window" shall mean any period suitable for environmentally sensitive construction work as designated by an Environmental Agency or other federal, provincial, municipal or local agency. This window represents the period that the natural or human environment is likely less susceptible to adverse impacts. A common example of an Environmental Timing Window on highway construction projects is a Fishery Timing Window. Timing windows may also be imposed for the protection of breeding birds, retention of significant recreational activities, maintenance of critical traffic patterns, etc.

"Fishery Timing Window" refers to the time period(s) of reduced risk for important commercial, sport, and resident

fish species, based on their life histories. The Fishery Timing Window is the time of year during which there are no fish eggs or alevins present in the substrates of local watercourses, and the period when fish migration (juvenile out-migration and adult spawning in-migration) is not occurring. This is generally the preferred period for (i) instream work or (ii) work adjacent to or over top of fish-bearing streams with the potential to create adverse impacts on fish or fish habitat.

"Habitats" are defined as those parts of the environment on which terrestrial and/or aquatic species depend, directly or indirectly, in order to carry out their life processes.

"Fisheries Sensitive Zone" is defined as the instream aquatic habitats, as well as out-of-stream supporting habitat features such as side channels, wetlands, and vegetated riparian areas adjacent to these features.

"Impact" is defined as an alteration, either positive or negative, to the environment brought about as a direct or indirect result of a highway project, including construction, operation and maintenance work (e.g., the consequence of a highway-related activity interacting with its surroundings).

"Mitigation" refers to a procedure or an action designed to avoid, reduce or control the severity, magnitude, duration and/or frequency of environmental impacts of a project through design alternatives, scheduling or other means.

"Permit" refers to a formal authorization, typically granted to proponents by an Environmental Agency, for discharging agreed upon quantities and types of regulated substances such as pollutants or waste. For example, under Section 8 of the British Columbia Waste Management Act, a permit may be issued to introduce waste into the environment or to store special waste subject to environmental protection requirements which are deemed advisable. The permit can specify the procedures or requirements respecting the handling, treatment, transportation, discharge or storage of waste that the holder of the permit must fulfill. The term "permit" can be defined by applicable legislation. The term "permit" is synonymous with the term "license", and the two terms are often used interchangeably.

"Riparian Area" is defined as the land adjacent to the normal high water level in a stream, river, lake or pond and extending to the portion of land that is directly influenced by the presence of adjacent ponded or channeled water, or a groundwater zone fed by surface water bodies (e.g., zone in which rooted vegetation is influenced). Riparian areas typically contain important vegetation resources which provide several critical functions for the survival of fish (e.g., protection from predators, shade for temperature regulation of the watercourse, and sources of food).

"Sedimentation" is defined as the deposition of material carried in water, usually as a result of a reduction in water velocity below the point at which material can be transported.

"Watercourses" shall apply to all bodies of water including streams, rivers, canals, ditches, lakes, ponds, and wetlands.

"Wetted Perimeter" is defined by Station number and/or as highlighted on the plan drawings.

165.01.03 General Restraints for Watercourses and Groundwater - The following general restraints in regard to the protection of any watercourse shall apply:

a) The Contractor shall place and/or dispose of all organic material, refuse, ash, petroleum products and other deleterious materials so as not to directly or indirectly pollute any watercourse or groundwater. The placement and disposal of all such products and materials shall be done in an environmentally acceptable manner.

b) Except as required by the Contract Documents, all inorganic material shall be placed and/or disposed of in a manner that does not obstruct or unduly disturb any permanent or seasonal watercourse. Any such obstruction or disturbance shall be restored to the original drainage pattern as reasonably required by the Ministry Representative. Any removal of inorganic material from a watercourse shall be done in a manner that minimizes adverse impacts and shall be carried out as directed by the Ministry Representative.

c) All activities within the wetted perimeter of any watercourse shall be kept to an absolute minimum. Machinery and equipment shall not be operated within the wetted perimeter of any watercourse other than under the authority of the Ministry Representative. An Environmental Monitor shall be present at the direction of the Ministry Representative during any work within the wetted perimeter of any watercourse on the Project.

The preceding requirements, **a)** through **c)**, are considered incidental to the price bid for work under Contract and no other compensation will be made.

165.01.04 Designated Streams and Designated Environmentally Sensitive Areas - Any watercourse or environmentally sensitive area designated in the Special Provisions or by the Ministry Representative is subject to all of the restraints of this Section.

165.02 Planning and Scheduling - The Contractor shall carefully plan and schedule construction activities in a

manner that ensures the avoidance or absolute minimization of environmental damage. The Contractor shall be familiar with and be able to identify those areas and times which present environmental problems and shall prepare schedules and work methods accordingly. The Contractor shall forward a copy of each of the schedules to the Ministry Representative at least one week in advance of commencement of each of these operations, unless otherwise specified in the contract.

The Contractor, as directed by the Ministry Representative, shall provide an **Environmental Management Plan** (EMP) which describes in detail the approach to be taken in addressing environmental issues associated with the Project and the correlation of the EMP to the project schedule. The EMP will be structured according to the following format and will include, but not be limited to, the following:

- demonstrate understanding of the specific environmental issues involved with the Project,
- indicate an understanding of Ministry/Contractor responsibilities,
- include a sediment and drainage management plan,
- identify all the tasks required and clearly identify the duration and sequence of each task leading to the receipt of agency approvals, and
- indicate its linkage to the project schedule.

The EMP will clearly indicate how the Project will be undertaken to avoid negative impacts pertaining to, but not limited to, the following resources:

- water quality (including all surface and sub-surface sources),
- identified sensitive areas,
- fish and fish habitat,
- wildlife,
- vegetation (including riparian plant communities),
- rare and endangered flora/fauna,
- landscaping and visual aesthetics,
- soil conservation (including site stability, dust control),
- air quality, and
- archaeological, heritage, and cultural resources.

The Contractor, in consultation with the Ministry Representative, Environmental Monitor and the Environmental Agencies, shall be responsible for determining the conditions under which the work must be carried out in Environmentally Sensitive Areas, and for making all required on-site examinations and examinations of documents supplied and referenced by the Ministry in order to fully comprehend the environmental aspects of the work required.

165.02.01 Environmental Legislation and Regulatory Requirements - The Contractor shall observe and comply with all federal, provincial, municipal and local laws and regulations which seek to ensure that construction work does not adversely affect the environment or social-community resources.

In the event of conflict between the requirements set out in these Specifications and quality control laws, statutes, regulations and ordinances of federal, provincial, municipal or local agencies, the more restrictive requirements or regulations shall apply. A violation of the environmental laws and regulations reported to the Ministry by the responsible agencies may result in the issuance of a non-conformance report. Should the situation warrant more stringent measures, it may also result in the issuance of an order to suspend work (e.g., a stop-work order) until the violation is corrected. The Contractor shall have no recourse for reimbursement due to delays or alterations to construction activities arising from such violations or the correction of such violations.

165.02.02 Environmental Procedures - The Ministry may require one or more detailed sets of environmental procedures for any work in and around Environmentally Sensitive Areas, such as critical fish habitat. When a set of environmental procedures is required, the Contractor shall prepare and submit the procedures for approval by the Ministry Representative and the Environmental Agencies prior to undertaking work in these areas. These detailed procedures shall supplement the EMP. The Contractor shall forward a copy of the approved set of procedures to the Ministry, prior to undertaking the work. The environmental procedures shall contain the following items:

a) Existing environmental conditions. Identification of the environmental resources (e.g. fish species and habitat) in the area of the proposed work.

b) Description of work proposed in the Environmentally Sensitive Area. Summary of the proposed work, equipment to be used, schedule of activities, and location.

c) Environmental protection measures. Statement concerning the protective measures that will be used to protect environmental resources (e.g., species and habitat) from each anticipated adverse impact.

d) Contingency plan. Description of alternative or backup plan in the event of an environmental emergency or failure of any of the protective measures.

e) Environmental monitoring requirements. Indication of any specific or unique environmental monitoring requirements to ensure compliance with environmental

specifications and proper implementation of the environmental procedures.

The Contractor shall contact the Environmental Monitor and, if necessary, Fisheries and Oceans Canada (F&OC) and the Ministry of Water, Land and Air Protection for specific recommendations about the preparation of the environmental procedures. The environmental procedures must be approved by the Ministry Representative and the Environmental Agencies prior to commencement of work in Environmentally Sensitive Areas.

165.02.03 Project Orientation - The Contractor shall arrange regular meetings with the Ministry Representative, and, if employed, the Environmental Monitor. Other interested parties may be asked to attend (e.g., Agency Representatives), whose representation is necessary because of the specific type or location of work being undertaken. The purpose of such regular meetings will be to outline the schedule of upcoming construction and proposed activities, and to review the activities of the previous week. Such regular meetings do not relieve the Contractor from attending or arranging other types of meetings as required due to the nature or extent of the work being done.

The Contractor shall arrange and conduct such regular meetings during construction, subject to the following conditions:

a) Meetings shall be held on a weekly basis when construction activities are to proceed during an Environmental Timing Window, during a period when work is to proceed in an Environmentally Sensitive Area, or during a period when the proposed construction activity elsewhere on a project is to proceed for a duration greater than two weeks and has the potential to cause adverse environmental impacts.

b) During periods other than that specified above, regular environmental meetings shall be held every two weeks, or as otherwise agreed to by the Ministry Representative.

c) In the event that the Environmental Monitor or the Ministry deem the Contractor's compliance regarding environmental requirements to be inadequate at any time during the Project, the frequency of the weekly or biweekly regular meetings shall be increased accordingly until the Environmental Monitor and the Ministry are satisfied with the Contractor's compliance rate.

d) The Contractor's Environmental Representative will record highlights from the meetings (e.g., summary of major discussion items and key action items) and forward a copy to the Contractor, as well as include this material in the Project Environmental Progress Reports.

e) During the maintenance phase of the Project, the Contractor shall conduct regular environmental meetings with the Environmental Monitor on a quarterly basis, unless operations are to be conducted within Environmentally Sensitive Areas that pose potential environmental concerns. In the event that operations are to be conducted within such areas, the Contractor and Environmental Monitor shall conduct weekly environmental meetings for the duration of the maintenance work in such areas.

The Contractor is responsible for ensuring that the foreman, operators, and work crews (including any subcontractors) understand the specific environmental issues on the work site and their responsibilities under this Section. The Contractor's Environmental Representative will give all construction personnel a brief environmental orientation prior to such personnel commencing work in any Environmentally Sensitive Area on the Project. The Contractor's Environmental Representative will ensure that construction personnel are familiar with the environmental requirements and acceptable construction practices on the Project. The Contractor shall support the Contractor's Environmental Representative's role in this regard.

165.02.04 Activity Within Designated Watercourses and Environmentally Sensitive Areas - All activities that are conducted within the wetted perimeter of any designated watercourse or within other designated Environmentally Sensitive Areas must conform to the timing restrictions stated in the Special Provisions, and to the Environmental Timing Windows given in the approvals of the Environmental Agencies. Construction work must be scheduled so that all operations affecting the Fisheries Sensitive Zone or other designated Environmentally Sensitive Areas can be completed within these time periods. Prior to the commencement of any construction activities, all work in these areas must be approved by the Environmental Agencies and the Ministry Representative.

The Contractor must give at least 48 hours notice to the Ministry Representative in advance of any construction-related activity in designated areas. Construction activities within designated watercourses or other Environmentally Sensitive Areas shall not commence without the approval of the Environmental Monitor.

165.02.05 Inclement Weather - The Contractor shall cease operations, modify construction methods, or relocate to an alternative site within the project area during periods of inclement weather to avoid siltation of designated watercourses. If the Ministry Representative judges that the Contractor is not complying with the intent of this Section, the Ministry Representative may direct the Contractor as to

measures required without additional compensation for delays or alterations in the Contractor's work.

165.02.06 Work Stoppage - Prior to initiating work stoppages, the Contractor shall initiate and complete any mitigative and environmental protection measures required to safeguard the environment and the Project during work stoppages.

The Contractor shall give the Ministry Representative sufficient notice of impending shutdowns to enable the Ministry Representative, Contractor, and, if employed, the Environmental Monitor to examine the project. This notice shall be sufficient to permit the Contractor adequate time to install all necessary additional environmental mitigation measures as may be directed by the Ministry Representative.

The Contractor shall ensure the Environmental Monitor and construction personnel inspect Environmentally Sensitive Areas on the Project on a regular basis during any extended work stoppages (e.g., weekends, statutory holidays, Christmas vacation periods) to prevent environmental problems. If potential adverse environmental impacts are observed during work stoppage periods, the Contractor shall initiate and undertake any required environmental measures to avoid or minimize impacts.

165.03 Compliance, Enforcement and Payment

165.03.01 Temporary Pollution Control - The Contractor shall be responsible for implementation of any temporary environmental protection measures, such as pollution control measures. If the Contractor fails to respond to this requirement or to the instructions in this regard from the Ministry Representative or the Environmental Monitor within directed time span, the Ministry Representative may take whatever action is necessary to provide the proper corrective measures. In the event the Contractor fails to take reasonable action to implement temporary environmental control measures, the Ministry's Representative shall determine the need for additional corrective action. The Ministry's Representative may deduct incurred costs from any money due or to become due to the Contractor for any corrective action taken in this regard.

165.03.02 Responsibility for Damage to Environment - The Contractor shall bear sole responsibility for any direct or indirect damage to the environment which occurs as a result of failure to comply with these Specifications, the directions of the Ministry Representative or recommendations of the Environmental Monitor.

165.03.03 Stop Work Orders - In the event that the Ministry Representative determines that some aspect of the construction is creating or will result in a substantial adverse effect on environmental values or resources on or adjacent to the project site, the Ministry Representative may issue a "stop work order" (either an "Order to Suspend Work - form H8" or formal "Stop Work Order") on behalf of the Ministry. The Contractor shall subsequently be responsible for advising the Ministry Representative of the intended remedial action. The Ministry Representative may direct the Contractor to cease construction work on an unaffected portion of the site so that any necessary equipment can be immediately diverted to address the environmental emergency. In such an event the Contractor will not be entitled to any claim for compensation from the Ministry.

In the event that an Environmental Monitor is employed, and the Ministry Representative cannot be contacted, the Environmental Monitor will assume the Ministry Representative's role regarding Stop Work Orders, as detailed above, until such time as the Ministry Representative can be contacted. The Environmental Monitor will fully document all such instances. In such an event, the Contractor will not be entitled to any legal recourse or claim for compensation from the Ministry.

The Contractor shall be required to modify or halt any aspect of construction or maintenance that the Environmental Agencies determine poses or will pose an environmental concern. The Environmental Agencies may verbally direct the Contractor to modify or halt any such activity or submit formal written instructions to that effect. In either case, the Contractor's immediate compliance with their instructions will be mandatory. The Contractor shall document any such requests by the Environmental Agencies and forward a copy of this documentation to the Ministry within five working days of the initial notification by the Agencies.

165.03.04 Compliance with Specifications - The Contractor is responsible for ensuring that all subcontractors and employees are in compliance with these Specifications and all applicable environmental legislation and regulatory requirements at all times, and shall take immediate action to rectify problems in this regard. The Contractor shall initiate action to rectify environmental problems within the time period as specified by the Ministry Representative. The Contractor shall have available such additional safeguards, safety devices and protective equipment as are necessary to protect the environment. The Contractor shall be responsible for ensuring sufficient safety devices and protective equipment (e.g., pumps, silt fence, armoring, tarps, fuel spill cleanup kits, etc.) are readily available at all times during construction of the Project. The location and inventory of safety devices and protective equipment shall be documented and placed in a prominent location in the Contractor's field office. A copy of this information shall be updated as necessary and provided to the Ministry

Representative.

The Ministry Representative, and/or Environmental Monitor when employed, will inspect and monitor conditions at, and in the vicinity of, the project to ensure acceptable levels of pollution and disturbance are not exceeded, and to ensure compliance with the environmental specifications contained herein and in the Special Provisions.

The frequency of such inspection and monitoring efforts shall correspond to the sensitivity and location of construction activities, as well as to the environmental conditions (e.g., increased monitoring and inspection will be conducted during periods of inclement weather). In the event that the Ministry Representative is not satisfied with the frequency and duration of such inspection and monitoring, the Contractor and/or the Environmental Monitor will be required to increase their efforts in this regard to a level satisfactory to the Ministry.

165.03.05 Payment - All the requirements for compliance with these environmental specifications shall be considered incidental to the price bid for the Project under contract and no other compensation shall be made to the Contractor. However, the Contractor may be eligible for reimbursement for the installation of any additional environmental works (e.g., enhancement measures) where directed and approved in writing by the Ministry Representative and not covered in this Section or elsewhere in the Special Provisions or Schedule of Quantities and Unit Prices. Any eligible reimbursement will be paid for by an Order for Extra Work. The Ministry Representative, in consultation with the Ministry's Environmental Quality staff and the Environmental Agencies, will be responsible for determining the Contractor's eligibility in this regard and for identifying what environmental work is beyond the scope of the Contract and these specifications.

165.04 Erosion, Sediment, and Drainage Control - All works shall be undertaken in a manner that avoids or absolutely minimizes erosion problems and the discharge of siltation or other deleterious substances into any watercourse. The Contractor shall not disturb designated watercourses, unless the express written consent of the Environmental Agencies is obtained prior to initiating construction activities in such areas. No obstruction or debris shall be placed in any watercourse during any operations, unless specified in the Special Provisions or by the Ministry Representative, or for designated watercourses approved by the Environmental Agencies. Should any material be inadvertently placed within the normal high water wetted perimeter of a watercourse, the Ministry Representative shall be notified immediately and the Contractor shall remove the material immediately, using environmentally acceptable construction procedures and under the direction of the Environmental Monitor.

165.04.01 Sediment and Erosion Control - The Contractor shall incorporate all permanent soil erosion control features into the project at the earliest practicable time, as outlined in the accepted work schedule, and shall be responsible for temporary erosion and sediment control measures, including daily inspection of the integrity of such measures during adverse weather conditions or when construction operations are proceeding in Environmentally Sensitive Areas. Control measures shall be capable of continuous operation during working and non-working hours, and are subject to approval by the Ministry Representative. Any deficiencies which are observed in erosion control measures shall be immediately corrected.

The Ministry Representative has the authority to define environmentally sensitive areas or conditions, such as areas of erodible soil, and to direct the Contractor to provide temporary erosion and sediment control measures. These measures may include, but may not be limited to:

- interceptor ditches or berms to direct runoff away from erodible areas;
- slope protection measures such as mulches, hydroseeding, erosion mats, geotextiles, filter fabric, polyethylene covers, or riprap;
- silt fences;
- ditch blocks to reduce flow velocities, and;
- sediment control measures, such as settling ponds.

The Contractor shall have sufficient materials, such as clean rock, granular material, and filter fabric available on-site for emergency protection measures when required.

The Contractor shall regularly maintain sediment and drainage control measures, such that they function as designed. Immediate action shall be taken by the Contractor to correct any deficiency observed in the operation of sediment and erosion control measures. In the event that a deficiency in any sediment or drainage control measures is directly or indirectly creating an adverse environmental impact, the Contractor shall initiate the necessary action to correct the problem within one hour of observing or being informed of the situation. In the event that a deficiency in any sediment or drainage control measures poses the potential to create an adverse environmental impact, the Contractor shall take action within two days of observing or being informed of the situation. In the event that environmental conditions or the status of the situation change in regards to a potential deficiency, the Contractor shall accelerate any proposed correction measure(s) by taking immediate action (i.e., within one hour). The judgment of the need and timing for corrective action in regard to sediment or drainage control measures shall be at the discretion of the Ministry Representative, Environmental

Monitor, and the Environmental Agencies.

Sediment and debris accumulations which compromise the functioning of the erosion and sediment control measures shall be removed by the Contractor and disposed of in an environmentally acceptable location and manner. At a minimum, silt fence structures shall be cleaned when sediment accumulation heights exceed 30 cm along any portion of the structure.

In the absence of site-specific requirements from the Fisheries and Oceans Canada or the British Columbia Ministry of Water, Land and Air Protection , the Contractor shall comply with criteria for suspended solids in runoff water from the site as agreed upon prior to construction by the Ministry Representative and Environmental Agencies.

Sediment and drainage control methods are detailed in the "Land Development Guidelines" and the MoT publication "Control of Erosion and Shallow Slope Movement". Compliance with the spirit and intent of these guidelines is mandatory. The determination of the Contractor's compliance with these guidelines shall be at the discretion of the Ministry Representative, Environmental Monitor and Environmental Agencies.

165.04.02 Sediment and Drainage Management Plans - The Contractor, as directed by the Ministry Representative and in consultation with the Contractor's Environmental Representative, shall be responsible for the preparation and implementation of any Sediment and Drainage Management Plan(s) required for the Project. Such plans will form an essential component of the Contractor's environmental protection program, in terms of identifying environmentally acceptable construction practices for sediment and erosion controls at specific sites. The Sediment and Drainage Management Plan(s) will be subject to, but not limited to the following requirements:

- Prior to commencement of construction activities on the Project and thereafter when deemed necessary, the Contractor and the Environmental Monitor will identify areas and major construction activities for which the Contractor will be required to prepare one or more Sediment and Drainage Management Plans. Designation of these areas and activities will be done in consultation with the Environmental Agencies and the Ministry's Environmental Quality staff.
- In addition to activities within the Project area, a Sediment and Drainage Management Plan shall be submitted for activities related to the Contractor's work in areas away from the project that have the potential to create adverse environmental impacts, which will be determined by the Contractor in consultation with the Environmental Monitor, the Environmental Agencies and the Ministry. These activities are not confined to the areas immediately adjacent to the right-of-way, but also in other locations in which the work or associated activities will be conducted, including but not limited to haul or access roads, temporary structures, borrow and granular excavations, staging/laydown areas, material storage sites and disposal sites.
- The Contractor shall not commence work in any area so identified until a Sediment and Drainage Management Plan has been submitted and accepted by the Ministry and involved Environmental Agencies.
- The acceptance and approval of the Contractor's Sediment and Drainage Management Plan or updated Plan shall be valid only so long as the conditions and anticipated conditions upon which the Plan and its acceptance were based continue to be applicable.
- The Contractor shall at all times be responsible for ensuring that work is carried out in accordance with a Sediment and Drainage Management Plan or updated Plan, which has been accepted by the Ministry and Environmental Agencies.
- The Ministry or the Environmental Agencies may request the Contractor to update and resubmit its plan(s) at any time, and may require the Contractor to cease work until the update(s) has been submitted and accepted. Whether or not the Ministry or the Environmental Agencies so request, the responsibility for carrying out the work in accordance with a validly accepted Plan lies entirely with the Contractor.
- The Ministry or the Environmental Agencies may order the Contractor to stop work or to take other precautionary or remedial measures whenever the Contractor is carrying out any work that is not in accordance with a Sediment and Drainage Management Plan or updated Plan which has been accepted by the Ministry or the Environmental Agencies, and for which that acceptance is still valid. All costs of any resulting delay shall be borne entirely by the Contractor.

At a minimum, a Sediment and Drainage Management Plan will include the following information and will be prepared in a format satisfactory to the Ministry Representative and the Ministry:

a) A schedule for the proposed activities, as they pertain to the Sediment and Drainage Management Plan and construction staging, including anticipated duration of construction.

b) A description of the construction procedures that will be used to limit the potential for erosion and sediment production, including estimates of work areas where applicable (e.g., volume of material in a proposed stockpile site), description of construction equipment to

be used, and staging of operations.

c) A detailed description of the site-specific measures for runoff and drainage management.

d) A detailed description of the site-specific mitigation measures and design information for erosion prevention and control (e.g., sizing of culverts, ditches or sediment/detention ponds, silt fence specifications, and description of ditching and berming).

e) A schedule that identifies the various sloped areas by station and the dates in which they will be protected using temporary and permanent revegetation measures, such as hydroseeding.

f) A detailed description of mitigative measures for ensuring acceptable water quality and quantity at points of discharge to watercourses, including sizes and specifications for any proposed water treatment facilities.

g) A key plan and drawings, in suitable scale and detail, of the site and proposed mitigative measures and applicable construction procedures.

h) A written commitment of on-site equipment (e.g., water pumps) and materials (e.g., silt fence, hay bales, rock armoring, and ditch breakers) for erosion, sediment and drainage control to deal with emergency situations that may arise.

i) A written commitment of on-site equipment and staff to handle any fish salvage and transfer operations, if required.

j) Contact names, positions and telephone numbers.

A description of the specific monitoring procedures prior to, during and after completion of construction activities at this site.

165.04.03 Sediment Control Ponds - The Contractor shall construct sediment control ponds where necessary to prevent the release of unavoidably entrained sediments in runoff from the construction site, and shall construct stormwater detention ponds for the temporary and/or permanent control and discharge of stormwater runoff. The Contractor shall provide designs for and construct sediment control ponds, as well as stormwater detention ponds, on a site-specific basis in a manner that conforms to the "Land Development Guidelines", other than for the following exception(s):

- Sediment control ponds and dry or wet stormwater detention ponds shall be designed and constructed to accommodate the 10-year return period storm under developed conditions with a minimum 0.60 metre freeboard to the top of the berm.

The Contractor is referred to Section 3 of the "Land Development Guidelines" for other pond design criteria and Section 8 of that publication, for sample calculations for water flows and pond sizes.

If during construction the settlement pond is filled to capacity and is still required for sediment control, accumulated settled sediments shall be removed from sediment control ponds and stormwater detention ponds. Such sediments shall be disposed of in an environmentally acceptable location and manner.

165.04.04 Maintenance of Drainage Patterns - Except where interceptor ditches or berms are required to divert sediment laden runoff from the site to a sediment control pond, original drainage patterns shall be maintained throughout construction operations. Interceptor ditches or berms shall be constructed to divert water entering the site away from erosion prone areas. The Contractor will not rely on drainage courses or conduits being shown on the Plans, and will make whatever investigation is necessary. Where a natural watercourse traversing the construction site crosses this interceptor ditch or berm, an armoured or lined ditch or a culvert shall be installed in order to pass accumulated flows through or around the construction site in a manner that maintains the natural runoff pattern, unless otherwise directed by the Ministry Representative.

All ditches constructed for interception of clean water outside the work site(s) to divert it around the work site(s) and for collection of treated water from the work site(s) shall be designed and constructed to accommodate the 10-year return period storm with a 0.3 m freeboard under developed conditions. Temporary and/or permanent drainage ditches, including those constructed for sediment and erosion control, shall be designed to prevent high water velocities and erosion by including measures such as check dams, drop structures or erosion-resistant liners or armoring.

165.04.05 Storm Drainage Systems - In order to minimize siltation, the Contractor may be required to block storm drain inlets, or to activate inlets by means of sandbags, berms or swales, as circumstances require, or at the direction of the Ministry Representative. Berms shall be constructed of clean, non-erodible granular material. The Contractor shall maintain, on a regular basis, any inlets activated during the course of construction. Any deficiencies noted in these works shall be corrected immediately in the event that the inlet is plugged, and within the same day if the site is relatively dry.

The Contractor shall ensure adequate inspection and correction of any storm drainage system deficiencies for

sites within the influence of the Project. During periods of inclement weather, the Contractor shall ensure project staff inspect storm drainage systems throughout the day, and if necessary, make arrangements for inspection and maintenance during regular work stoppage periods, such as evenings or weekends. At a minimum, such inspections shall be carried out at the start of the regular workday, at mid-day in the workday, and one hour prior to end of the regular workday. Furthermore, in the event of flooding problems, the Contractor shall be responsible for any damages or compensation resulting from impacts on residences or businesses caused by a failure or deficiency in the Contractor's design and maintenance of the storm drainage system.

During concrete curb and gutter construction, road surface runoff shall be directed by berms or swales away from concrete which has been poured within the previous 48 hours.

165.05 Clearing and Grubbing

165.05.01 Limits for Clearing and Grubbing - Clearing and/or grubbing shall extend only to the designated limits, as defined in the Contract Drawings and marked on site. Prior to clearing or grubbing, marked limits will be inspected by the Ministry Representative, who may amend them. The Contractor may be required to use close-cut, no grub practices (i.e., cutting trees at ground level and not removing root system) or undertake hand clearing at environmentally sensitive sites, as designated in the Special Provisions or by the Ministry Representative.

The Contractor shall prepare a detailed clearing and grubbing plan in consultation with the Environmental Monitor and the Ministry Representative. The Contractor will obtain approval for this plan from the Ministry Representative and any necessary tree removal permits from the Ministry of Forests and/or municipal agencies prior to initiating any clearing and grubbing operations within 50 m of any designated watercourse or Environmentally Sensitive Area.

The Contractor shall minimize ground disturbance in the vicinity of any watercourse or Environmentally Sensitive Area, and shall not proceed with clearing and grubbing closer than 50 m from a designated watercourse or Environmentally Sensitive Area prior to marking the limits of the Fisheries Sensitive Zone or Environmentally Sensitive Area. The width of these zones, if not specified in the Special Provisions, will be determined by the Ministry Representative in consultation with the Environmental Agencies. The Contractor shall mark the limits of any Fisheries Sensitive Zone or Environmentally Sensitive Area, such as orange flagging tape or orange snow fence, at a minimum height of 1.5 m.

All clearing and grubbing activities in this zone must be granted prior approval by the Environmental Agencies. The Contractor shall not conduct approved grubbing operations within this zone until ready to proceed with earthwork and stabilization.

In areas near designated watercourses or other Environmentally Sensitive Areas determined by the Ministry Representative to be of high erosion or siltation potential, the surface area of erodible soil exposed at one time may be limited by the Ministry Representative. This will supersede Subsection 200.03 and 200.04. The Ministry Representative may confine grubbing to an area where excavation and earthwork is to be actively conducted within approximately 30 days following the completion of grubbing operations. In the event that a highway project consists only of clearing and grubbing operations, the cleared ground shall be protected and able to withstand specified periods of inclement weather.

165.05.02 Protection of Vegetation - The Contractor shall protect all vegetation growing outside of the designated and marked areas for clearing and grubbing, as specified in Section 769 "Protection and Retention of Vegetation", with the exception of danger trees, which must be hand-felled and removed with minimum disturbance to retained vegetation.

165.05.03 Clearing Activities - Falling of timber into a watercourse is prohibited except in situations in which safety considerations dictate otherwise or unless approved by the Environmental Monitor. Any trees or large pieces of woody debris that accidentally fall into a watercourse and require removal, shall be removed in a manner that minimizes the disturbance of the watercourse and adjacent banks, and is approved by the Ministry Representative. Skidding of logs across watercourses will not be permitted. The Environmental Monitor must be present during removal of any large woody debris or trees from watercourses.

165.05.04 Disposal of Combustible Materials - The Contractor shall comply with the Forest Act and the Open Burning Smoke Control Regulation under the British Columbia Waste Management Act. For additional information regarding the regulation, the Contractor should contact regional Environmental Protection staff in the British Columbia Ministry of Water, Land and Air Protection office and the Fire Control staff in the British Columbia Ministry of Forests.

The Contractor shall prevent heat or smoke damage to all vegetation that has been designated for preservation. The use of waste oil and/or tires as fire accelerators shall not be permitted. The Contractor may be required to use a forced

air method of burning. Burning piles shall not be located within 50 m of any watercourse, wetland or other Environmentally Sensitive Area, or in areas where ditches are to be constructed without written approval of the Ministry Representative.

In situations in which the material generated as a result of clearing and/or grubbing may not be burned on site, the Contractor shall dispose of it in a manner approved by the Ministry Representative who may require approval of the British Columbia Ministry of Water, Land and Air Protection.

165.06 Stripping Operations

165.06.01 Exposure of Erodible Earth - In areas where erosion or siltation is anticipated, the duration of exposure of erodible earth material shall be minimized. In such cases the surface area of erodible earth material exposed at one time shall be determined and approved in writing by the Ministry Representative. (See Subsection 165.05.01 Limits for Clearing and Grubbing)

165.06.02 Placement of Stripped Material - The Contractor shall avoid placement of stripped materials in areas adjacent to watercourses or other Environmentally Sensitive Areas. Sediment and erosion control measures must be taken prior to and after placement of stockpiles of stripped material in areas where natural drainage or storm water could erode the stockpile and thereby transport pollutants to surface waters. The location of stockpiles and erosion control measures must be approved by the Ministry Representative prior to placement of stripped materials and may be specified in the Special Provisions. The Contractor shall ensure that all stockpiles are stable.

Polyethylene sheeting or other suitable tarp material shall be used to cover temporarily exposed steep surfaces or stockpiles of erodible materials, such as topsoil, sand, gravel or roadbase fill. The Contractor shall ensure such erodible materials are properly covered with sheeting or suitable tarp materials immediately after creation of any temporary stockpiles. Such sheeting or tarp materials shall be examined and maintained on a regular basis. The sheeting or tarp materials shall be sufficiently anchored to prevent displacement by winds.

165.06.03 Slope Protection - The Contractor shall employ suitable techniques to prevent the initiation of surface soil erosion and movement of sediments from slopes, particularly those exposed as a result of clearing, grubbing and stripping operations. Acceptable techniques and conditions of implementation of erosion and sediment control measures for slopes are outlined in Section 3 (i.e., entitled "Slope Protection and Surface Protection") of the "Land Development Guidelines" and the MoT publication "Manual of Control of Erosion and Shallow Slope Movement". Compliance with the requirements specified in this Section, as well as any Authority/MoT manual(s) developed specifically for the Project, will be mandatory.

165.07 Earthwork Operations (Subgrade Construction)

165.07.01 Excavation and Disposal of Waste or Surplus Material - The creation and use of any site on Crown or private lands for the placement and disposal of waste or surplus material requires prior approval from the Ministry Representative and may require the approval of representatives of British Columbia Forests and the Environmental Agencies. Unless another time period is specified in the Special Provisions or by the Ministry Representative, not less than fifteen days prior to disposing of any waste or surplus material, the Contractor shall submit to the Ministry Representative for approval, a proposal delineating the locations and extent of the areas in which the Contractor intends to dispose of such material. The proposal shall describe the nature of the material and the methods to be employed in material placement, stabilizing and site revegetation. If a disposal site is required off the right-of-way, the proposal shall also indicate the procedures for any required land clearing activity. The proposal will be reviewed by the Ministry Representative who may consult with the Environmental Monitor, if employed, and the Environmental Agencies. No waste or surplus material shall be disposed of until the proposal has been approved. All work shall be done in accordance with the approved proposal.

All waste disposal sites shall be selected such that spoil is prevented from entering any watercourse. The excavated material shall be properly drained, spread and trimmed to a stable slope not exceeding 1.5 to 1, in a manner which minimizes disturbance of watercourses and vegetated areas. All waste sites shall be revegetated immediately after creation of the waste disposal site, or else suitable temporary erosion control measures, such as tarps, shall be used until revegetation is undertaken. The Contractor is responsible for ensuring that revegetation is successfully accomplished unless otherwise specified in the Special Provisions.

165.07.02 Work in Areas of High Water Table - Work in areas of high water table shall be scheduled to proceed during dry weather periods unless otherwise specified in the Special Provisions. The Contractor shall adopt all necessary mitigation measures to avoid or minimize adverse impacts in such areas.

165.07.03 Drilling and Blasting - Blasting operations shall be conducted in a manner that minimizes the disturbance of residences, businesses and public infrastructure (e.g.,

schools and churches) and to aquatic and terrestrial habitats and organisms due to shock waves, noise and vibration.

The Contractor shall not conduct blasting within 400 m of fish habitat without the approval of the blasting plan by the Fisheries and Oceans Canada; British Columbia Ministry of Water, Land and Air Protection, Fish and Wildlife offices and the Ministry Representative. The Ministry Representative may require the Contractor to undertake mitigative measures such as scheduling of works in Timing Windows given by the Environmental Agencies, smaller staggered blasts or use of blasting mats to minimize impacts. Vibrations and shock waves in fisheries habitat resulting from blasts shall comply with the Fisheries and Oceans Canada "Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters".

Blasting operations shall be controlled to minimize the entry of fly rock into watercourses or adjacent to the right-of-way, particularly in an urban setting. If required by the Environmental Agencies, the Contractor shall comply with the Agencies' directions in removal of fly rock from watercourses and Environmentally Sensitive Areas at no cost to the Ministry.

When blasting is to be conducted adjacent to or in a designated environmentally sensitive area, the Contractor shall provide at least 24 hours notice of each blast to the Ministry Representative. The Contractor shall provide at least 24 hours written notice to those individuals or groups potentially affected by shock waves, noise and vibration from blasting operations.

165.08 Borrow and Sand / Gravel Pits - All Borrow and Sand/Gravel pit locations, operations, reclamation and revegetation shall comply with the Ministry of Energy and Mines / MoT / Natural Resources Canada joint publication "Reclamation and Environmental Protection Guidelines for Sand, Gravel and Quarry Operations in British Columbia".

165.08.01 Control of Drainage - Prior to borrow excavations, or quarry, sand or gravel pit development, all surface water entering the site shall be controlled so that its entrance into the operating area is prevented. Drainage shall be controlled throughout borrow operations in order to prevent natural drainage and surface runoff from carrying sediment into adjacent watercourses. The Contractor shall prepare a Sediment and Drainage Management Plan (see Subsection 165.04.02) prior to the creation and/or operation of any borrow excavations or quarry, sand or gravel pit development sites. The Contractor shall also prepare a Reclamation Plan.

165.08.02 Location and Development of Borrow and Sand/Gravel Pits - Clearing for borrow and sand/gravel pits shall comply with Subsection 165.05 - Clearing and Grubbing. All topsoil shall be stockpiled for future reclamation.

Borrow excavations shall not be located in the wetted perimeter of a watercourse or on a stream floodplain at a location likely to create a new channel to the stream at a time of flooding, without the approval of the Environmental Agencies. Borrow sources located within 100 metres of the wetted perimeter of a watercourse or at distances less than 100 m from any water-impounding dyke or dam embankment will require the design of a Professional Engineer or Professional Geologist. Final floor elevations shall be sufficiently high that they will not be subject to fluctuations in the groundwater table.

In erosion-prone areas, overburden removal shall be restricted to an area that will be excavated within one year. The open face(s) of the borrow pit should be no larger than necessary for efficient pit operation. Material should be exhausted at one location in a pit prior to the opening of a new face to remove a similar type and grade of material.

The Contractor shall be responsible for maintaining the functionality of erosion, sediment and drainage control measures within and around borrow and sand/gravel pits throughout all phases of overburden and material removal, as well as during periods of work stoppages. Borrow and/or sand/gravel pits shall be rehabilitated and decommissioned in an environmentally acceptable manner and to the satisfaction of the Ministry and the Environmental Agencies.

To minimize the spread of noxious weed seeds between construction sites and gravel pits/quarries, all crushing equipment and mining vehicles must be cleaned with a power/high pressure washer (manually cleaned in freezing temperatures), before entering any MoT pit or quarry. If the pit contains noxious weeds the crushing equipment and mining vehicles must also be cleaned with a power/high pressure washer (manually cleaned in freezing temperatures) before leaving the pit/quarry. Prior to the production of aggregates the pit floor, crusher/plant location, equipment-parking area, stockpile site(s), pit face(s) and area to be mined will be inspected by the contractor for the presence of noxious weeds. If noxious weeds are present they must be removed mechanically by the contractor. Noxious weeds are defined as non-native plants species designated on the provincial or regional district lists as defined by the Weed Control Act.

165.08.03 Washing Operations - In locations where siltation of a fish-bearing watercourse may occur, approval shall be obtained from the Environmental Agencies prior to the establishment of aggregate washing operations, and all wash water shall be subject to Subsection 165.04. Where

possible the Contractor may be directed by the Ministry Representative to use water from pit dewatering or clarified water from the sediment pond(s) in the wash plant.

Waste or surplus material shall be disposed of at a waste disposal site approved by the Ministry Representative. The Contractor shall create and designate, with appropriate signing, suitable sites and facilities for disposal of waste or surplus material. In particular, the disposal of deleterious materials, such as surplus concrete or concrete wash water in sites other than those approved by the Environmental Monitor and the Environmental Agencies will be prohibited. The Contractor and the Contractor's Environmental Representative shall be responsible for ensuring all construction personnel, including subcontractors, are made aware of this requirement. In the event that it is not feasible to install a suitable concrete waste disposal site immediately adjacent to the work site, such as during a concrete pour on a long bridge deck, then the Contractor shall take the necessary precautions to isolate the work site from any watercourse or other environmentally sensitive area and to temporarily collect the concrete waste or wash water and transport it to a nearby suitable disposal facility. The Contractor shall notify and seek approval from the Ministry and the Environmental Agencies for any changes in the location of waste disposal sites during construction operations.

165.09 Detour, Access and Haul Roads

165.09.01 Design, Construction and Operation of Access Roads - Any temporary access, detour and/or haul roads associated with the project shall be constructed to accommodate all required uses and maintained throughout the course of construction operations in a safe, environmentally sound manner.

The location, alignment, design and construction of all detour, access and haul roads shall be subject to the approval of the Ministry Representative, who may have to obtain the approval of the appropriate Environmental Agencies. Clearing shall extend no further than safe operation requires, or to the edge of cut or toe of fill. Root systems of cleared vegetation shall not be removed except in the area of cuts or actual road surface.

The Contractor shall employ suitable measures to maintain air quality, visibility, and safe conditions in the use of access, detour and/or haul roads associated with the Project.

165.09.02 Drainage and Erosion Control - Drainage structures shall be incorporated into and maintained for the duration of the project along all detour, access and haul roads to minimize erosion and maintain drainage patterns.

165.09.03 Abandonment - The Contractor shall winterize haul and access roads at the end of the construction season and shall ensure proper drainage control measures are in place. Culvert inlets and outlets shall be flagged. During periods of work stoppages, the Contractor shall ensure sufficient inspection and maintenance of the access, detour and/or haul roads such that adverse environmental impacts are avoided or minimized. In the event that potential or existing environmental problems are identified by the Contractor, its staff, the Ministry, the Environmental Agencies or the public, the Contractor will take immediate steps to rectify the problem and ensure corrective action is taken to prevent future recurrence of similar problems.

When no longer required by the Contractor or the Ministry, construction roads shall be properly decommissioned, including measures such as blocking such roads off from vehicular traffic, scarifying the compacted surfaces and generally revegetating the area. All drainage and crossing structures shall be removed, and sufficient cross ditches and ditch blocks constructed and stabilized to restore the original drainage patterns and prevent erosion. The Ministry Representative may require that windrows along the side of the road be removed, and the road surface sloped to drain in the direction of the surrounding contours. Fill may be required to be pulled back onto the road if it is judged to be unstable. Remaining cut slopes shall not exceed the natural angle of repose. Reclamation works required by the Ministry Representative may include, but may not be limited to decompaction of the road surface, revegetation of exposed soil surfaces, and reforestation.

165.10 Instream Works - In general the Contractor shall comply with the requirements specified in Section 5, "Guidelines for Construction Practices within the Fisheries Sensitive Zone", of the "Land Development Guidelines", as well as those requirements noted below. The Contractor, in consultation with the Environmental Monitor, shall prepare a detailed set of environmental procedures for any work within a Fisheries Sensitive Zone, within the wetted perimeter of any fish-bearing watercourse (or any watercourse that flows directly into a fish-bearing stream), or for any work with the potential to cause major adverse impacts on a fish-bearing watercourse (e.g., concrete pour for a bridge deck over a fish-bearing watercourse, hydroblasting of bridge substructures over a fish-bearing watercourse, etc.).

No clearing or equipment operation shall take place in a Fisheries Sensitive Zone prior to Ministry and environmental agency approvals. Waste material generated during instream works shall not be stored or dumped within the floodplain unless otherwise approved by the Ministry Representative.

Drainage of waterbodies, such as wetlands, swamps or beaver ponds, shall be subject to the approval of the Ministry Representative who will consult the Environmental Agencies, unless drainage of these areas is specifically required as part of the Contract and has been approved by Fisheries and Oceans Canada and British Columbia Water Management office.

165.10.01 Provision of Fish Passage - Unless the Contractor has written approval from the Ministry Representative and the Environmental Agencies, any instream works in fish bearing streams shall provide for fish passage. It is the Contractor's responsibility to contact the Environmental Agencies to determine fish passage requirements for the specific location.

The Contractor is required to give two week's notice to the Ministry Representative of any activities, which may result in stranding of fish, to allow for scheduling of fish retrieval and/or transfer operations.

165.10.02 Management of Water Discharges - During preparation of stream diversions, culvert installations and other operations involving dewatering where drainage could readily reach a designated watercourse, all effluent and silt-laden water shall be discharged to a sediment control pond or a vegetated area acceptable to the Ministry Representative and the Environmental Monitor for removal of silt prior to its release into that watercourse. This requirement also applies to the control of discharge resulting from curing areas of recent concrete pours for bridges or drainage structure headwalls. The direct discharge or discharge via seepage of untreated, silt-laden water or other deleterious substance into any watercourse is prohibited.

165.10.03 Encroachment of Fill into Watercourses - Embankments which encroach on fish-bearing watercourses shall either be isolated and dewatered, by means of a cofferdam, until surfaced with riprap, or constructed of clean granular material and riprap or shot rock which is free of fine-grained material or other potential contaminants. Riprap composition and placement may be further detailed in the Special Provisions. The method of placement of this material shall be such that disturbance and/or alteration of aquatic habitats is absolutely minimized. Fill material must be entirely contained within the proposed fill cross section.

165.10.04 Temporary Stream Crossings - Prior to construction, the Contractor shall provide the Ministry Representative with a plan for approval, describing the proposed locations and types of stream crossings, complete with construction procedures and timing of construction. The Contractor shall forward a copy of the approved plan to the Ministry. Temporary stream crossings shall be subject to the same environmental constraints as permanent crossings, and shall be built to pass, at least, the 10 year return period flood for the time of year during which the structure will be in place. Wherever possible, vegetative cover shall be maintained in order to minimize erosion.

Temporary stream crossings that have been constructed during periods of low precipitation (i.e. summer and late winter) shall be completely removed prior to periods of increased precipitation (i.e. fall and spring freshet), unless otherwise approved by the Ministry Representative.

165.10.05 Instream Equipment Operation or Crossings - The entering or crossing of any designated watercourse by construction equipment, when not specified in the Special Provisions, shall require and comply with the written approval of the Ministry Representative who will consult the Environmental Agencies. The Contractor shall notify the Ministry Representative 48 hours prior to allowing equipment to cross or enter designated streams. The Environmental Monitor shall be present while equipment enters into and exits from any designated watercourse.

Upon completion, the banks shall be restored, stabilized and revegetated to prevent erosion. This work shall be completed to the satisfaction of the Ministry Representative.

165.10.06 Culvert Installations - Unless otherwise approved by the Ministry Representative, culvert installation in designated watercourses shall involve an appropriate method of isolating the work site from the stream, such as the diversion of the stream around the culvert site, and the placement of the culvert in the "dry".

Installation of riprap and other protective works shall be carried out at the earliest possible time following culvert installation in order to prevent erosion and siltation.

165.10.07 Culvert Obstructions - Unless the watercourse is dry, an obstructed culvert shall be cleared by mechanical means. Any variance to using mechanical means to clear wet obstructed culverts must have the prior approval of the Workers' Compensation Board.

165.10.08 Channel Diversions - Channel diversions shall be performed in accordance with the Special Provisions. If not specified in the Special Provisions, methods shall be approved by the Ministry Representative, and shall comply with the "Land Development Guidelines".

165.10.09 Bridge Construction - Bridge Endfills shall be constructed implementing fully the applicable subsections of Section 165, and Section 769, Protection and Retention of Vegetation. The Fisheries Sensitive Zone shall not be disturbed until construction of the endfill or crossing structure is ready to proceed. The Contractor may be

required to hand fall trees and leave the root systems in place.

165.10.10 Watercourse Clean-up - Final watercourse clean-up shall consist of, but not be restricted to, the removal of temporary haul roads and temporary crossings, the reshaping of the stream to its original configuration, width and depth, the protection of stream banks, revegetation, and the removal of all construction related material and debris, including any material and debris deposited upstream or downstream of the site as a result of operations, under the direction of the Ministry Representative. All abandoned temporary diversions shall be plugged and stabilized. In the event that erosion has occurred during the course of construction, the Contractor will be required to recontour, stabilize and revegetate the affected area.

165.11 Ditch Maintenance - To reduce the risk of damage to aquatic habitat and sensitive life stages of fish and other aquatic organisms, the Contractor shall ensure that the excavation and maintenance of ditches is conducted in an environmentally sound manner.

Excavation for ditch cleaning of any ditch that contains or directly drains into fish-bearing waters shall be performed only within Timing Windows as detailed in the "Guidelines for Land Development, Appendix III" or as specified in the Special Provisions.

The Contractor shall consult local Environmental Agencies for the locations of sensitive areas and local Timing Windows prior to commencement of ditch maintenance. Areas identified as Fisheries Sensitive Zones shall be revegetated by the Contractor prior to the close of the timing window.

165.12 Bridge Maintenance - In performing any bridge rehabilitation or maintenance, the Contractor shall follow the procedures specified in the document "Federal Fisheries Guidelines for the Protection of Fish and Fish Habitat During Bridge Maintenance Operations in British Columbia"

The Contractor shall take measures to ensure absolute minimal loss of paint and abrasive material into watercourses during bridge cleaning. Mitigation measures may include placement of ground covers, lined nets or tarpaulins to capture falling debris, blast enclosures to encase the section of the bridge to be abrasively blasted, use of vacuum-shrouded power tools, and use of floating booms and barges to trap floating debris. Similar measures shall also be employed to assist in mitigating paint spray drift.

165.13 Servicing and Operation of Equipment

165.13.01 Transport of Materials - The Contractor shall use equipment and containers that are capable of safely transporting petroleum products and/or hazardous materials in compliance with Section 7.33.1 of the Federal "Transport of Dangerous Goods Regulations" for bulk containers, and Sections 7.21 and 7.23 of the same regulations for materials in packages or small containers. These regulations shall apply to both on-road and on-site transport. In addition to compliance with the Federal Transport of Dangerous Goods Regulations, the transportation of fuel trailers, fuel tanks on skids, and non-commercial fuel trucks shall comply with all the requirements of the Motor Vehicle Act and the British Columbia Fire Code.

The Contractor shall take the necessary precautions to prevent the loss of materials during transport on public highways, roads, access roads, and haul routes. Trucks carrying loose materials shall be covered and restraints shall be used to prevent materials from blowing or falling from vehicles. The Contractor shall be responsible for collection and removal of any and all litter deposited by vehicles or equipment along access routes during construction-related activities, including removal of dirt and mud deposited from truck tires on municipal roadways.

165.13.02 Location and Installation of Fuel Storage Facilities - The siting and installation of all fuel storage facilities shall be the responsibility of the Contractor. Fuel storage shall not be located within 30 m of a watercourse, within a watercourses flood plain, or where there is a potential for any spilled fuel to enter a watercourse or groundwater. Fuel storage facilities shall be located on flat or gently sloping ground and shall be dyked to contain at least 125% of the total capacity of the storage containers. Dykes shall be constructed of impermeable material or lined to ensure that petroleum products cannot escape.

All large fuel storage tanks must be locked and secured when not in use. Automatic shut-off nozzles shall be installed on all dispensing units over 250 ℓ capacity. Fuel storage tanks must be drained within one week of completion of construction or within one month of a prolonged shutdown period.

All small fuel storage containers, such as 45 gallon (200 litre) drums, used as a fuel cache shall be installed on a stable storage rack, within an impermeable containment device capable of capturing at least 125% of the total capacity of the storage container(s). A cover, such as a tarp, must be placed over the top of the fuel cache to prevent accumulation of precipitation in the containment device. The small fuel storage container(s) shall contain a metal spigot with a padlock placed on the container when not in use.

In the transport, storage and/or dispensing of fuel and other petroleum-based products, the Contractor shall comply with the requirements outlined in the Ministry of Environment, Lands and Parks/Ministry of Forests publication: "Environmental Standards & Guidelines for Fuel Handling, Transportation and Storage" (December, 1995).

The Contractor shall be responsible for all costs associated with clean-up and disposal of any escaped toxic and hazardous substances.

165.13.03 Servicing of Equipment - The fueling, servicing or washing of machines or equipment within the wetted perimeter or riparian zone of watercourses is prohibited. On-site fueling and lubrication of equipment shall also be conducted as far as possible from detention and sediment control facilities. The Ministry Representative may require that servicing be conducted at designated sites that are properly protected and approved by Fisheries and Oceans Canada and British Columbia Ministry of Water, Land and Air Protection.

Refuse generated during the servicing of equipment (e.g., air and oil filters, hydraulic fluids, petroleum products) shall be collected and disposed of in an environmentally acceptable location and manner. Where possible, the Contractor is encouraged to recycle lubricants and other waste materials generated during the servicing of equipment and machinery, or alternatively dispose of such materials and refuse at nearby recycling depots. The dumping of oil or other deleterious materials on the ground or in any watercourse is strictly prohibited. The Contractor shall provide a means of catching and retaining drained oil or other deleterious materials and shall properly dispose of these materials in a location approved by the Ministry Representative.

165.13.04 Equipment Operation in Environmentally Sensitive Areas - Construction equipment shall be operated only within the designated construction site and access roads. Equipment operators shall not be allowed to damage or destroy vegetation or streambanks outside of this area.

The operation of equipment and machinery in a Fisheries Sensitive Zone must be:

a) authorized by the Ministry Representative

b) kept to an absolute minimum, and

c) undertaken only during the period(s) specified in the Special Provisions.

When working in any designated watercourse, equipment shall use biodegradable hydraulic fluid and shall be steam cleaned of oil, grease and other contaminants deleterious to aquatic species, prior to commencing work. When working in or near any watercourse, the Contractor shall ensure that all hydraulic systems, fuel systems and lubricating systems are in good repair. Equipment with fuel or fluid leaks shall not be permitted to enter the wetted perimeter of any watercourse. Equipment developing such leaks shall be removed immediately and repaired.

165.14 Waste Disposal and Toxic/Hazardous Materials

165.14.01 General - All non-toxic or non-hazardous wastes which are not designated as combustible waste to be burned on-site shall be either recycled or disposed of in an approved sanitary landfill or other specialized area as indicated in the Special Provisions or as directed by the Ministry Representative. Any waste material that is inadvertently dumped in or adjacent to watercourses or other designated environmentally sensitive areas shall be removed by the Contractor and disposed of in an approved manner at the Contractor's expense.

The Contractor shall be responsible for the regular collection and disposal of all waste material generated by employees and sub-contractors. The Contractor shall take the necessary precautions to prevent loss of these materials during transport on public highways and roads, and shall be responsible for cleanup of all of these materials and all litter deposited by employees and subcontractors along access routes during construction-related activities, at no expense to the Ministry. Construction debris shall not be allowed to accumulate on the construction site but shall be collected promptly and regularly removed from the site. The Contractor shall ensure that waste materials are placed and stored in suitable containers. Waste material shall be disposed of at an approved waste disposal site. The Contractor shall be responsible for providing and regularly servicing animal-proof refuse containers and for ensuring that all employees and subcontractors dispose of wastes to keep the Project clear of waste and garbage.

165.14.02 Spill Clean-up Plans for Toxic/Hazardous Materials - Contingency plans for the clean-up of toxic or hazardous spills shall be prepared prior to construction and submitted, together with a list of spill abatement equipment to be stored on the job site, to the Ministry Representative for review. The Ministry Representative may require the Contractor to have on site any additional equipment or materials deemed necessary to deal with a potential spill. For operations adjacent to a watercourse, the Ministry Representative may require a Ministry-approved spill kit to be present. The Contractor shall promptly replace any used spill abatement and clean-up materials and maintain a sufficient inventory of materials throughout construction operations. For operations being conducted adjacent to or within the wetted perimeter of a watercourse or other

Environmentally Sensitive Area, the Contractor shall have an approved spill kit ready for use nearby.

The Contractor shall immediately report any spill of any toxic or hazardous material verbally to the Ministry Representative and the Provincial Emergency Program (24 hour phone line: 1-800-663-3456). Written notification of the spill must follow within two weeks of this verbal report. The Contractor shall immediately take the necessary steps to abate the discharge and provide the necessary labour, equipment, materials and absorbents to contain and remove the spill, clean up the affected area, dispose of waste materials at an approved disposal site, and restore the area to the satisfaction of the Environmental Regulatory Agencies, at the Contractor's expense. Any soil contaminated by spills shall be removed and replaced by comparable substitutes at the expense of the Contractor. Contaminated soil and vegetation removed shall be disposed of in an approved waste disposal site. If the Contractor fails to respond to the Ministry Representative's requirements for cleanup, the Ministry reserves the right to take whatever action is necessary to clean up the spill and deduct incurred costs from any money due or to become due to the Contractor.

The Environmental Monitor and/or the Contractor's Environmental Representative shall document any spills observed in the vicinity of the Project that are not the result of Project-related activities, and notify the Environmental Agencies of such incidents.

165.14.03 Contaminated Sites - If an area within or adjacent to the project site has been identified as a possible source of contaminated or hazardous material and the defined contaminated or hazardous material has not been removed prior to the start of the project, the Contractor shall notify the Ministry Representative at least two weeks prior to the time work is scheduled in or adjacent to that area.

In the event that the Contractor locates material on the project site believed to be contaminated or hazardous, and which has not been previously identified, the Contractor shall immediately cease work in that area and notify the Ministry Representative. The Ministry Representative will seek investigation and disposal recommendations from regional staff of the British Columbia Ministry of Water, Land and Air Protection, Environmental Protection office. No work shall proceed in the identified or suspected area until such time as these materials have been removed to the satisfaction of the Ministry Representative, representatives of the British Columbia Ministry of Water, Land and Air Protection Environmental Protection office, and the British Columbia Workers' Compensation Board. Unless it is specified in the Special Provisions, or agreement is made with the Ministry Representative to carry out such work, the Contractor is not responsible for the removal of contaminated or hazardous materials, which are not the result of the Contractor's actions.

165.14.04 Concrete Wastes - The Contractor shall isolate fresh concrete or cement from any designated watercourse for 48 hours after placement. Containers or trucks carrying cement or fresh concrete shall be washed at a site approved by the Ministry Representative. Concrete wastes, including wastewater from batching or cleaning, shall only be disposed of at approved and designated disposal sites (i.e., location designated with proper signing). All cement-contaminated wastewater from cleaning or mixing is to be considered toxic, and must be prevented from entering any designated watercourse for at least 48 hours to allow the water to reach neutral pH. Any cement or concrete-contaminated wastewater shall be tested prior to release into a designated watercourse. In the event that such wastewater pH levels are unacceptable in terms of water quality for fish and other aquatic species, the Contractor shall take the necessary measures to contain and treat such wastewater until acceptable pH levels are achieved (i.e., pH levels are the same as the receiving waters).

The Contractor shall securely store on-site and use suitable equipment and materials for the mitigation of concrete spills into or in areas adjacent to watercourses. For example, cylinders of gaseous carbon dioxide shall be kept on the Project site, which shall be used in the event of concrete or concrete leachate discharges into any watercourse. During any concrete pour within 15 m of, or in work areas above the wetted perimeter of any designated watercourse, the Contractor shall ensure that carbon dioxide cylinders and suitable application devices (e.g., weighted soaker hoses) are available on-site and ready for use in the carbonation of water columns to neutralize any concrete leachate that is inadvertently discharged into the watercourse. Where concrete leachate is allowed to enter settling ponds, such that pH levels become very high, bubbling with carbon dioxide may not be an effective buffering agent. In such cases, it may be necessary to use other methods, such as acid buffers. The Ministry Representative shall be responsible for assisting the Contractor in identifying appropriate mitigation options and monitoring effectiveness of procedures to mitigate unacceptable pH levels.

Aged, broken concrete shall only be used as riprap with the approval of the Ministry Representative and the Environmental Agencies. The Contractor shall remove broken concrete or concrete wastes that have been inadvertently placed in non-approved sites on the Project and dispose of them at an approved waste disposal site.

165.14.05 Petroleum Wastes - Refuse generated during the servicing of equipment shall be removed from the site and disposed of in a location and manner that has been approved

by the Ministry Representative. The dumping of oil or other deleterious materials (such as diesel used to wash out dump boxes) on the ground is prohibited. Where facilities are located within a reasonable distance, the Contractor shall dispose of wastes at recycling depots.

Solids, sludges and other pollutants generated as a result of construction or removed during the course of treatment or control of wastewaters shall be disposed of in a manner that prevents their direct or indirect discharge to any watercourse or groundwaters. Effluent generated by the water scrubber of an asphalt mixing plant must be given retention time in suitably sized, impermeable settling ponds prior to release into an adjacent watercourse. The required retention time will be determined by the Ministry Representative in consultation with representatives from British Columbia Water, Land and Air Protection.

Asphalt pavement shall be stockpiled for recycling in a specified location, or disposed of in a location approved by the British Columbia Environmental Protection branch, as directed by the Ministry Representative

165.15 Pesticides - The use of all pesticides is subject to pre-approval by the Ministry Representative. The use of herbicides for vegetation control, other than noxious weeds, is not permitted. The Contractor shall comply with all Federal, Provincial and local regulations relative to the storage, use, and proper disposal of pesticides. Relevant legislation includes the Federal Pest Control Products Act and the British Columbia Pesticide Control Act. All pesticide wastes, washwaters, solvents, and containers shall be disposed of in compliance with the British Columbia Waste Management Act, Special Waste Regulation.

165.16 Air and Noise Pollution

165.16.01 Noise and Emissions - All activities, equipment, processes and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with Federal, Provincial and local regulations governing noise levels and air emission standards. The Ministry Representative may require the Contractor to have maintenance performed on equipment or alter practices which are judged to produce excessive noise or emissions.

165.16.02 Dust Control - Application and handling of the any dust palliative, with the exception of water, shall be in compliance with the Ministry standards as given in "Maintenance Guidelines for Dust Palliatives and Gravel Road Stabilization".

Dust control techniques may also be required by the Ministry Representative during other construction operations, including but not limited to demolition, drilling, sand blasting and concrete cutting.

165.17 Use of Water

165.17.01 Authorization for Use - For any source of water not specified in the Special Provisions, the Contractor is required to contact British Columbia Ministry of Sustainable Resource Management / Ministry of Water, Land and Air Protection Water Management office before any water is diverted, impounded, pumped or used for any purpose, including dust control, compaction, or operation of a work camp. Authorization in the form of an approval for short term use of water may be required from that agency. The Contractor should be aware that, if required, a water application approval may take at least six weeks to process.

Downstream water flow must be maintained at all times during water takings in fish-bearing waters.

Prior to commencing any work which may affect potable water supplies downstream of the construction area, the Contractor shall ensure that all owners of licensed water intakes have been notified.

Water sources must be approved by the Ministry Representative. In order to reduce the impact on local water supplies and watercourses, the Contractor may be required to use uncontaminated wastewater, such as that pumped from the surface of sedimentation basins.

165.17.02 Screened Intake Requirements - The intakes of all pumps or diversions used to withdraw water from fish-bearing watercourses shall be screened in accordance with the Fisheries and Oceans Canada "Freshwater Intake End-of-Pipe Fish Screen Guideline".

The Contractor shall provide and maintain stable access routes to all water withdrawal sites. The location of all such routes shall be subject to the approval of the Ministry Representative and the Environmental Agencies.

165.18 Support Facilities

165.18.01 Location and Operation of Support Facilities - The preservation of trees, shrubs, ground cover, fish and wildlife must be considered in site selection and construction of all temporary support facilities. During site preparation, vegetation shall be removed using selective hand clearing in preference to blanket clearing with heavy machinery, retaining vegetative cover wherever possible. The Contractor shall locate temporary field offices, storage, plant and other facilities on pre-existing cleared portions of the job-site or on areas to be cleared during the course of routine construction unless otherwise authorized by the Ministry Representative.

Where possible, for aesthetic purposes, work camps and parking areas shall be located behind a vegetative screen buffer. The Ministry Representative may require that work vehicles and heavy equipment shall be parked in designated locations only.

The Contractor shall abide by all pollution control practices, laws, ordinances and regulations applicable to the construction of work camps and support facilities. The Contractor shall obtain the approval of the British Columbia Ministry of Health, the British Columbia Water, Land and Air ProtectionEnvironmental Protection and Water Management offices, and any applicable local authority prior to the installation and/or operation of sewage disposal and potable water distribution systems.

Work camps, field office facilities and work sites shall be kept clear of litter and garbage. The Contractor shall be responsible for providing and regularly servicing animal-proof refuse containers and for instructing all employees to dispose of food wastes accordingly. Sanitary landfill operations shall be located well away from the main camp in order to minimize conflicts with wildlife.

Combustible solid wastes shall be incinerated on a regular basis, subject to all applicable emission guidelines. Solid waste containers shall be large enough to contain all of the wastes generated between collection periods. The containers shall be constructed such that spilled liquids are contained and access by insects and wildlife is prevented. Storage areas and containers shall be maintained in a sanitary condition and shall be covered to prevent spreading of wastes by water, wind or animals. Transportation of solid waste shall be performed in a manner which prevents littering during transit to the disposal site.

Sanitary landfill sites shall be located a minimum of 450 m from watercourses or campsites, and shall be situated such that contamination of any stream, lake or groundwater system is avoided. The location of all sanitary landfill sites must be approved by British Columbia Ministry of Water, Land and Air Protection, Municipal or local officials and the Ministry Representative. The bottom of the landfill site shall be located at least 2 m above the water table. Trees and other vegetation shall be removed progressively as the size of the landfill increases in order to minimize erosion by wind and water.

Sanitary wastes shall not be discharged into watercourses or on the soil surface. All temporary toilets shall be equipped with approved septic tanks having safe drainage or with closed holding tanks which are emptied only into approved treatment plants or sewage tanker trucks. All temporary toilets used on -site shall be placed in environmentally acceptable areas, and shall be secured to avoid or minimize damage from vandalism.

165.18.02 Abandonment of Sites - Upon completion of construction, all temporary support facilities and camp infrastructure, including buildings, equipment, lumber, refuse, surplus materials, fencing and other such items shall be removed. The original drainage pattern shall be re-established, and all disturbed areas shall be revegetated.

The Contractor shall ensure that all project-related sites are left in an environmentally acceptable manner, subject to the approval of the Ministry Representative, the Ministry and the Environmental Agencies. Decommissioned construction areas, material sources and access roads shall be reclaimed by the Contractor such that as much of the original forest, wildlife, agricultural productivity, recreational use, etc. as possible is restored or enhanced.

165.19 Protection of Livestock and Wildlife

165.19.01 Protection of Livestock and Wildlife - Harassment of livestock or wildlife in and adjacent to the project site is prohibited. The presence of livestock or wildlife in or adjacent to the project site, field office trailers or construction camp shall not be encouraged by feeding. The Contractor is required to inform work crews of the location of wildlife and livestock crossing sites situated within the boundaries of the construction area.

If it is necessary to arrange the removal or transfer of beavers, bears or other wildlife from the work-site or camp the Contractor shall contact a British Columbia Ministry of Water, Land and Air Protection Fish and Wildlife representative prior to taking action, and follow the course of action recommended.

165.19.02 Disturbance of Fish and Wildlife - Rules regarding hunting, fishing and the discharge of firearms by the Contractor, employees and sub-contractors, within the project area during the period of construction, shall be made in consultation with the Ministry Representative and the local British Columbia Ministry of Water, Land and Air Protection Fish and Wildlife office. The Contractor shall be responsible for ensuring compliance with these rules.

165.20 Archaeological and Paleontological Discoveries - In the event that any item of particular archaeological, heritage, historical, cultural or scientific interest is found on the project site, such item(s) shall remain the property of the Province and the Contractor shall, on making or being advised of such a find, immediately cease operations in the affected area, minimize activities which create ground disturbance in and adjacent to the affected area, and notify the Ministry Representative of the discovery. The Ministry Representative will notify the Archaeology Branch of the

British Columbia Ministry of Sustainable Resource Management. Work shall not resume within 30 m of the discovery site until an appropriate directive has been received from that agency.

To protect archaeological and paleontological sites that are situated within or adjacent to a project site, the Contractor may be required to use a variety of mitigative measures, including but not limited to drainage or erosion control, slope stabilization measures, or erecting fences or other suitable barriers to protect archaeological or paleontological sites that are situated within or adjacent to a project site. These measures, with any negotiated extensions of time for completion of the contract they require, will be determined and adopted at the discretion of the Ministry Representative. The costs associated with such mitigative measures will be borne by the Ministry, unless otherwise specified in the Special Provisions.

A buffer zone, in which no land alteration or other activity is permitted, may be required to ensure adequate site protection. The width of this buffer zone shall be determined by the Ministry Representative in consultation with a representative of the Archaeology Branch of the British Columbia Ministry of Sustainable Resource Management.

The Contractor shall be responsible for the actions of employees and sub-contractors with respect to site vandalism and the unlicensed collection of artifacts from designated archaeological sites in and around the construction area.

165.21 Resolution of Disputes - In the event that a dispute arises between the Contractor and the Ministry, or the Environmental Monitor and the Ministry regarding environmental matters related to the project, the Ministry, or where appropriate, the Environmental Agencies, will have the final decision.

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SECTION 751

TOPSOIL AND LANDSCAPE GRADING

DESCRIPTION

751.01 Scope - This Section refers to those portions of work that are unique to the supply and placement of topsoil and subsequent finish grading. In this Section, the term "topsoil" is used to identify either:

a) On-site topsoil: material stockpiled for use, or

b) Imported topsoil, or

c) Manufactured topsoil (Growing Medium).

751.02 Related Work - Section 754, Planting of Trees, Shrubs and Ground Covers; Section 757, Revegetation Seeding.

751.03 References - Canadian System of Soil Classification, Canada Fertilizer Act, Canadian National Master Specification.

751.04 Topsoil Supplied by the Contractor - The Contractor shall advise the Ministry Representative of the sources of topsoil not less than seven days before any is used in the work.

The Contractor shall, at the Contractor's expense, acquire a soil analysis from an accredited soil testing laboratory, to verify that supplied material is within the requirements indicated. Results of the soil test are to be submitted to the Ministry Representative prior to installation.

The Ministry Representative will approve all topsoil once it has met the standard required at the source.

MATERIALS

751.11 General - In this Section, a range of measurable physical and chemical properties are set out as being acceptable in a topsoil. Compliance with this Section shall be determined by testing for those properties. When imported or on-site topsoil is used, it shall be tested and modified as necessary by a mixture of other components to bring its properties to within the range set in Subsection 751.16, or as stated in the Special Provisions. Topsoil shall not be prepared or handled in an excessively wet or frozen condition, or in any manner in which structure is adversely affected.

751.12 Topsoil Types - Three topsoil types are described in Subsections 751.13 through 751.15. Regardless of origin, all types shall conform to Subsection 751.16.

751.13 On-Site Topsoil - On-site topsoil may be used, as specified in the Special Provisions, provided that it meets the standard set for imported topsoil and can be modified to meet the requirements set out for the specified topsoil. On-site topsoil shall be defined as the existing "A" horizon containing accumulated organic matter. On-site topsoil shall be tested prior to stockpiling. Upon approval by the Ministry Representative of the suitability of the on-site topsoil for topsoil, a sufficient quantity of stripped on-site topsoil shall be stockpiled where shown on the Plans or in areas designated for stockpiling.

751.14 Imported Topsoil - Imported topsoil shall be of a sandy loam or loamy sand texture (no less than 50% sand by weight) containing between 4% and 15% organic matter (dry weight basis).

Imported topsoil shall be free of propagules of plant species designated as noxious weeds under the BC Weed Control Act and Regulation and other perennial, weedy plants such as couch-grass, horsetail, broom, Japanese Knotweed and blackberry species.

At least 80% of imported topsoil shall pass a Tyler #10 sieve after appropriate crushing of structural units using accepted laboratory test methods.

751.15 Manufactured Topsoil - Manufactured topsoil is any soil or growing medium mixture whose chemical and physical properties fall within ranges required by this Section for a particular application.

Manufactured topsoil shall conform to Subsection 751.16 or as specified in the Special Provisions.

751.16 Requirements For Topsoil - Commercial processing and mixing of topsoil components shall be done thoroughly by a mechanized screening process. No hand mixing shall occur. The resulting product shall be a homogenous mixture having the required properties throughout.

The general amendment of both natural topsoils and manufactured topsoils by mixing in situ with rototill cultivation equipment after placement, will be acceptable if carried out to the satisfaction of the Ministry Representative. Fertilizers typically used at time of seeding or planting will be surface applied and incorporated as described in Subsection 751.33, Applying Fertilizers.

The Contractor shall also require the laboratory to include recommendations for incorporating fertilizers and other amendments into the topsoil as needed for plant

establishment and maintenance, and as they specifically relate to:

- grassed areas
- ground covers, shrubs and trees
- container or planter box installations, and to site conditions and season of planting.

Refer to Table 751-A for required properties of growing medium for different applications.

Other specific requirements are as follows:

Fertility :

- Nitrogen - total nitrogen shall be 0.2% to 0.6% by weight.
- Phosphorus - available phosphorus shall be 20 to 100 ppm.
- Potassium - available potassium shall be 50 to 250 ppm.
- Boron - concentration in saturation extract shall not exceed 1 ppm

General:

- Acidity - in accordance with Table 751-A. Maximum of 0.5 kg/m2 of dolomite lime to achieve the required pH level.
- Salinity - saturation extract conductivity shall not exceed 3.0 mmho/cm at 25 degrees C. Sodium absorption ration (SAR) as calculated from analysis of saturated extract shall not exceed 8.0.
- C/N ratio - carbon to nitrogen ration shall not exceed 40:1.
- Texture - in accordance with Table 751-A.
- Organic content - in accordance with Table 751-A
- Cedar or redwood sawdust shall not be present in the topsoil.
- Soil shall be virtually free from subsoil, wood including woody plant parts, weeds, toxic materials, stones over 30 mm, and foreign objects.
- Drainage - in accordance with Table 751-A. Drainage of growing medium can be measured only after growing medium is in place. Mixing and handling of growing medium shall be done in such a manner that the minimum saturated hydraulic conductivity indicated is achieved.

751.17 Soil Amendments - The following amendments shall be added to the topsoil as required.

751.17.01 Peat Moss - Peat moss shall be Horticultural grade, partially decomposed fibrous or cellular stems and leaves of sphagnum mosses with a texture varying from porous to spongy fibrous, fairly elastic and substantially homogeneous with pH value not less than 3.5 and not greater than 6.5, medium to coarse shredded, suitable for horticultural purposes.

751.17.02 Sand - Sand shall be clean river pump sand or alternative source approved by the Ministry Representative, free of impurities, chemical or organic matter.

Particle size in sand shall be as follows:

- 95 - 100% passing a 4.75 mm sieve;
- 0 - 40% passing a 0.600 mm sieve;
- 0 - 5% passing a 0.075 mm sieve.

751.17.03 Manure and Compost - Manure shall be well-rotted farm animal manure or mushroom manure, rotted to the extent that the material is crumbly. Manure shall be free from weed seeds, rocks, sticks, rubble and shall contain not more than 40% composted sawdust, straw or shavings. Manure shall be free of propagules of plant species designated as noxious weeds under the BC Weed Control Act & Regulation and other perennial, weedy plants such as couch-grass and horsetail.

TABLE 751-A PROPERTIES OF TOPSOIL FOR DIFFERENT APPLICATIONS

PROPERTIES	Low Traffic Lawn Areas Trees and Large Shrubs	Planting Areas, Planters, Shrub and Groundcover Areas
TEXTURE: Particle size classes by the Canadian system of soil Classification	Percent of Dry Weight Mineral Fraction (%)	
Gravel greater than 2 mm, less than 30 mm	0 - 10	0
Sand greater than .05 mm, less than 2 mm	50 - 70	50 - 70
Silt & Clay combined	Maximum 25%	Maximum 25%
ACIDITY (pH)	6.0 - 7.0	4.5 - 6.5
DRAINAGE: Minimum saturated hydraulic conductivity (cm/hr) in place	2.0	2.0
ORGANIC CONTENT: Percent of Dry Weight (%)	5 - 10	14 - 20

Commercial compost shall be free from all weed seeds, coliform, pathogens and chemical or toxic contaminants. Physical contaminants such as rocks, plastic, metal or glass shall be less than 0.5%. Compost shall not be derived from or contain processed municipal sewage sludge, unless such product is authorized for use by the Ministry of Water, Land and Air Protection, and meets all local regulations and approvals.

751.17.04 Wood Residuals - Raw sawdust and woodwaste are not acceptable components of topsoil. Wood residuals used as a component of topsoil, compost, farm animal manure or mushroom manure are acceptable provided they are rotted and the total Carbon to total Nitrogen ratio for the topsoil is a maximum of 40:1.

751.18 Fertilizers - Fertilizers shall be standard commercial brands, meeting the requirements of the Canada Fertilizer Act.

All fertilizers shall be in granular, pelleted or prill form, and shall be dry, free-flowing and free from lumps.

Fertilizers shall be packed in standard waterproof containers, clearly marked with the name of the manufacturer, weight and guaranteed analysis.

All fertilizer shall be stored in a weatherproof storage place and in such a manner that it will stay dry and its effectiveness will not be impaired.

The types, formulations, and rates of application for fertilizers and liming agents to topsoil supplied by the Contractor shall be as recommended by a laboratory soil specialist on the basis of tests of the topsoil, and as approved by the Ministry Representative.

Substitutions or variations in fertilizers and methods shall be made only upon pre-approval by the Ministry Representative.

751.19 Fill Material - Fill Material shall not be toxic to plant and animal life in part or in concentration.

CONSTRUCTION

751.31 Area Preparation

751.31.01 Stripping of Topsoil - Existing top soil material, where specified or required by the Ministry Representative, shall be stripped and removed to stockpile(s) within the project area, kept properly drained, and maintained in a neat and presentable condition free of spoil and subsoil material for subsequent spreading on prepared rough graded areas.

The storage of topsoil shall not interfere with the effective utilization of a granular source or borrow pits.

751.31.02 Preparation of Landscape Area Subgrade - This Section applies only to grading of landscaped areas outside the roadway prism.

Rough grading shall be carried out by necessary cutting and filling work to produce the lines and grades shown on the Plans and as directed by the Ministry Representative, allowing for the stipulated new topsoil thickness.

Surplus excavated material shall be removed from the site and disposed of at the Contractor's expense unless the Ministry Representative authorizes its use as fill elsewhere on the project.

The landscape area subgrade shall be prepared to a consistent 80 - 85% Proctor density.

Soft and unstable areas below the landscape area subgrade that cannot be compacted to this standard shall be excavated and filled with suitable fill material, except in locations where special environmental conditions have been identified. In such cases, appropriate alternative solutions shall be approved by the Ministry Representative and environmental agencies as required, and carried out.

Debris, roots, branches, stones, building material, contaminated subsoil, visible weeds and anything else that may interfere with the proper growth and development of the planned finished landscaping shall be removed.

Fill materials shall be placed so as to achieve stability. This may necessitate placing in lifts of 225 mm and compacting each layer to 80 - 85% standard proctor density.

Grade transitions of landscape area subgrade should be smooth and even and shall be such that ponding cannot occur on the landscape area subgrade surface.

Existing land forms shall be warped and blended into the landscaped areas with a minimum of visual disharmony.

751.31.03 Fine Grading - Areas requiring topsoil shall be fine graded by raking out spoil material and debris such as rocks, asphalt and concrete over 50 mm in diameter.

Naturalized areas not requiring topsoil shall be similarly cleaned, raked and manicured.

751.31.04 Scarifying - All landscape area subgrade shall be scarified to a minimum depth of 150 mm immediately before placing topsoil.

751.31.05 Cleanup - All unsuitable material and inorganic debris shall be removed from the project area by the Contractor unless the Ministry Representative authorizes its use in fill areas on the project.

All surplus or unsuitable organic waste and debris shall be removed from the site unless its complete burning is approved by the Ministry Representative in compliance with the B.C. open burning regulation.

751.32 Placing Topsoil - The landscape area subgrade shall be inspected and approved by the Ministry Representative, before topsoil is placed.

The topsoil shall be:

- placed over the prepared landscape area subgrade and shall be allowed to settle or be compacted by light rolling such that it is firm against deep footprints and shall not be compacted more than necessary to meet this requirement;
- moist (25% to 75% of field capacity) but not wet when placed, and shall not be handled if frozen or wet such that its structure will be altered;
- manually spread around trees, shrubs and obstacles;
- evenly spread to a depth which after settlement or light compaction will be that shown in the plans or as directed by the Ministry Representative.

During hauling and spreading, the paved roadway and other finished surfaces including subgrade under future base courses shall be kept clean and free of all topsoil.

751.33 Applying Fertilizers - Fertilizers shall be added to bring topsoil fertility within the ranges set out in this Section or as specified in the Special Provisions.

Manufactured topsoils and processed imported topsoils will typically have fertilizers and amendments incorporated at the time of mixing and screening, while other topsoils will receive in situ amendment.

Fertilizers normally applied at the time of seeding and planting are specified under the appropriate sections. These fertilizers are generally supplemental to the base fertility requirements outlined for topsoil and are applied after topsoil is in place.

Surface applied fertilizers shall be evenly spread over the topsoil with a suitable mechanical spreader and fully incorporated to a minimum depth of 50 mm.

Lime used for top dressing shall be thoroughly cultivated into the top 100 mm of topsoil.

751.34 Finish Grading - After placing the topsoil to the finish elevations and contours required, the grade shall be finished to a high standard, to the grades shown on the plans with a smooth and even surface. Rough spots and low areas shall be eliminated to ensure positive surface drainage, and the surface shall be left smooth, uniform, free of debris and firm enough to resist deep footprinting.

Topsoil placed in traffic islands and medians shall be crowned for drainage, as shown on Drawing SP751-01.

MEASUREMENT

751.81 General - Measurement for the supply of topsoil by the Contractor will be by the CUBIC METRE in the truck at the point of delivery. Topsoil removed from stockpiles will be measured in place in the stockpile.

The placing of topsoil will be measured by the SQUARE METRE for the stipulated topsoil thickness, unless stated otherwise in the Special Provisions.

PAYMENT

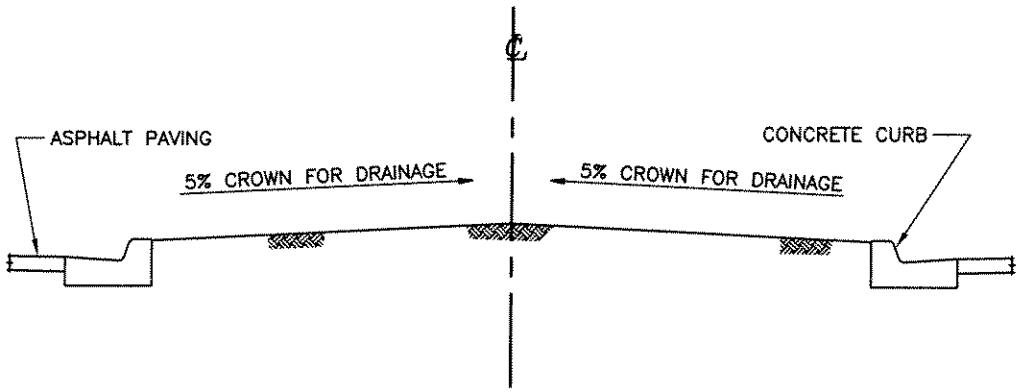
751.91 General - Payment for TOPSOIL supplied by the Contractor will be at the contract unit price bid per cubic metre. The unit price bid for topsoil supplied by the Contractor shall be accepted as full compensation for all handling, any necessary screening and testing of topsoil, and for delivery and off-loading on the area to be topsoiled.

Payment for TOPSOIL SPREADING will be at the contract unit price bid per square metre. The unit price bid for topsoil spreading shall be full compensation for all labour and equipment required for the specified preparation, spreading, and finish grading of the topsoil, and for all incidental work not required to be separately paid for.

Separate prices may be included in the Contract to cover the area preparation work such as:

- clearing and grubbing,
- stripping existing topsoil and removal to stockpile,
- rough grading and fill,
- naturalizing with fine grading,
- rotovating and soil conditioning, and
- trenching for irrigation and sub-soil drainage systems.

CROWNING DETAIL FOR ISLANDS & MEDIANS	SP751-01



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SECTION 754

PLANTING OF TREES, SHRUBS, AND GROUND COVERS

DESCRIPTION

754.01 Scope - This Section refers to those portions of the work that are unique to the supply and planting of trees, shrubs and ground covers, including seeded and sodded areas that are not designated for treatment under Section 757 "Revegetation Seeding". This Section must be referenced and interpreted simultaneously with all other Sections pertinent to the works described herein.

754.02 Related Work - Section 751, Topsoil and Landscape Grading; Section 757, Revegetation Seeding; .

754.03 References - Canadian Standards For Nursery Stock (Canadian Nursery Trades Association), BC Weed Control Act & Regulations, Canada Seed Act, British Columbia Standard for Turfgrass Sod.

754.04 Guarantee/Maintenance

754.04.01 The Contractor shall guarantee and maintain all materials and quality of work for a period of one full year. The guarantee and maintenance period will commence when the following conditions have been met:

- the supply and installation of all plant materials have been completed as per Subsection 754.43,
- all seeding/sodding has been completed (but is not necessarily yet established) , and
- installation and hydrostatic testing of the irrigation system have been completed as per Subsection 766.42, and the system is fully operational.

754.04.02 The guarantee includes replacing all plants as determined by the Ministry Representative which are found dead or failing during the entire maintenance and guarantee period. Replacements shall be made immediately unless otherwise directed by the Ministry Representative, and conditions of the guarantee shall apply to all replacement seeding for one full growing season.

Approval of plant material at the source does not preclude rejection of non-conforming stock on the site prior to, or after planting.

The guarantee shall not apply to plants and planted areas damaged after Acceptance by causes beyond the Contractor's control, such as vandalism, "acts of God", "excessive wear and tear", or abuse.

MATERIALS

754.11 Source Quality Control - The Contractor shall notify the Ministry Representative of the sources of plant materials to be supplied at least two weeks prior to commencing the landscape work. All non-seed plant materials shall be made available for inspection at the nursery by the Ministry Representative upon at least three days notice. Field grown material is not to be dug prior to inspection.

Approval of plant material at the source does not preclude rejection of non-conforming stock on the site prior to, or after planting.

Imported plant material shall be accompanied by all necessary permits and import licences, and shall conform to federal and provincial regulations.

It shall be the Contractor's responsibility to ensure that all regulations pertaining to the import of plant materials or their movement to or from a particular region of the province are adhered to, and all inspection certificates required by the Ministry of Agriculture are completed to the satisfaction of that Ministry.

754.12 Transporting Plants to Site

754.12.01 Dormant Period

Deciduous: Bare Root Stock (only in dormant period): Adequate protection shall be given in order to preserve moisture around the root system. For short transit period, four hours or less, maximum temperature in the truck shall not be above 20°C. In all cases, at all times, roots should be protected from frost, wind and sun (e.g., a closed van with wet straw or other suitable packing material protecting the roots). The temperature shall be maintained as uniformly as possible by mechanical means, or in any event to prevent frost damage to roots. The appropriate temperature range shall be between 1°C and 10°C.

Evergreens: It is recommended that root balls not be subjected to freezing temperatures below -5°C for a period longer than four hours. Plants shall be protected to prevent desiccation by wind and sun.

754.12.02 Non-Dormant period - Deciduous and Evergreen plant material shall be transported in a closed van or well-covered truck with a tarp or similar material in order to protect the leaves or needles from windburn. When in transit, with protection of a tarp cover only, it is recommended that foliage be sprayed with an antidesiccant. For the above material in transit for more than three days, it shall be unloaded and then stored away from direct sun for 24 hours to avoid leaf burning.

Sod shall be protected during transportation to prevent drying out and shall arrive at the site in a fresh and healthy condition.

754.13 Unloading and Handling Procedures - Plants shall be carefully handled to minimize disturbance to root systems and damage to stems and branches. Plants shall not be dropped to the ground when unloading. Plant material that is mishandled and showing evidence of damage to root balls, or undue damage and breakage to top growth will be rejected.

Plants are to be kept in a moist condition at all times. All plants shall be well protected against physical damage and desiccation until they are planted on the site.

B.R. (Bare Roots) Stock: Roots shall be covered and protected immediately from frost, sun and wind.

Stock in Pots/Containers: Shall be handled as much as possible by pots only in order to reduce breakage of branches/leaves.

Balled & Burlapped (B & B) Material: Plants shall be handled by holding the root ball and supporting the stem to minimize disturbance to the root ball and damage to stems and branches.

Material in Wire Basket: Specimen trees shall be lifted and supported by the wire basket and not by the trunk.

All plants shall be promptly unloaded and their condition checked immediately upon arrival. Watering shall be provided as required and necessary pruning of minor breakage on branches performed.

Protection Against Stem and Branch Damage - During loading, transportation, off-loading and planting, all trees shall be protected against damage to stems and branches. This applies particularly to larger wire-basketed trees.

Bark shall be protected against chafing and cuts by providing a wrapping of cardboard, sackcloth or other material as appropriate and when required.

754.14 Storage

754.14.01 Storage During Growing Season - All plants in containers, balled and burlapped, or in wire basket, if not planted within three days, shall be stored in an upright position in an area providing even light and offering protection from wind and sun scald. Enough space shall be provided between plants so that light reaches all around to the bottom of the plant in order to avoid leaf burning when planted out.

Sod: Sod shall be installed as soon as possible after delivery. If there is a delay of more than 24 hours, the sod shall be properly stored and kept moist and cool until it is placed. Sod shall not be stacked more than three levels high while being stored.

Balled and Burlapped Material: Special attention shall be given to the root ball, and unless weather is rainy or cool, root balls shall be protected by covering with material suitable to protect them from drying out (e.g. sawdust, peat moss, topsoil). Plants intended to be planted in the open shall not be kept stored in a building or any area of low light intensity for a period exceeding seven days. All plants shall be kept well watered and protected from heat and frost.

Containerized Plants: In extreme weather, freezing or high dry heat, the containers shall be buried in a protective medium. Plants intended to be planted in the open shall not be kept stored in a building, truck or any area of low light intensity for a period exceeding seven days during the growing season.

754.14.02 Storage During Dormant Period - Plants shall be cared for according to each plant's requirement for winter protection, and according to geographical location.

754.15 Plant Material

754.15.01 Species - Selection of species shall be as specified. Every effort shall be made by the Contractor to obtain the plant material specified. Where evidence is submitted that a specified plant cannot be obtained, substitutions in kind, size and grade shall be made upon written approval by the Ministry Representative.

754.15.02 Origin and Requirements - All plant material shall be nursery grown stock or approved collected native plants unless specified otherwise. Plant material will be inspected by the Ministry Representative upon delivery to the site.

All nursery grown plants shall, as a minimum, comply with the Canadian Nursery Trades Association Specification "Canadian Standards for Nursery Stock" with respect to sizing, grading and quality.

Plants shall be true to name, type and form and shall be representative of their species and variety.

All plants shall be sturdy stock, with tree and shrub heights proportional to trunk caliper, overall plant width and size of root ball, as determined by the Ministry Representative. Plants that are weak and thin, and those showing effects of being grown too closely together or poorly maintained, will not be accepted.

Plants shall be vigorous and healthy with normal, well developed branches and good fibrous root systems and be free from decay, physical injury, disease and insect damage and infestation.

In particular, conifers shall have a healthy, single leader with well shaped whorls of vigorous, newly growing branches and shall exhibit natural growth habit characteristic of the species and variety. Trees sheared as Christmas trees are not acceptable.

The root balls of dug material and the soil of containerized plants shall be free from pernicious perennial weeds. All balled and burlapped plant stock shall be supplied in biodegradable root ball sacking.

The search area for plants shall include, but not necessarily be limited to, the provinces of British Columbia, Alberta and the states of Washington, Oregon, California (northern portion), Idaho and Montana. All plant material being sourced from milder areas shall be properly "hardened off" prior to shipping and planting.

754.15.03 Nursery Grown Stock - All plants specified "Container" shall be grown for the length of time necessary to permit the roots to fill and hold the soil within the container, as required by the Canadian Standards for Nursery Stock.

Similarly, all field dug material will show evidence of having been root pruned to encourage fibrous root system development and resulting in root balls that retain their integrity during handling.

Forestry seedlings shall be supplied and handled in accordance with the requirements of the Silvicultural Manual, Ministry of Forests, Province of B.C., 1993. This manual can be found on the Internet at: http://www.for.gov.bc.ca/hfp/pubs/silvman/index.htm.

All plant material shall be appropriately identified and individually labelled with weatherproof tags. In the case of small containerized plants such as ground covers and bundled bare root seedlings, which are supplied in large numbers, labelling shall be limited to identification of group lots as permitted by the Ministry Representative.

754.15.04 Collected Plant Stock - The Contractor shall provide either permits or verification that permission was obtained for collecting native and/or introduced plant materials. Information shall be supplied on where, when and how collection was made.

All collected plant material shall have been grown and maintained in a nursery environment for a minimum of one growing season, unless, at the sole discretion of the Ministry Representative, certain species are approved for a lesser period of time. As for nursery grown stock, collected plants shall be held long enough prior to planting to allow roots to fill the container or the dug root ball and to retain the soil within.

Collected plant stock shall be appropriately labeled with weather proof tags for easy identification at the job site.

754.15.05 Seed - Seed quality and type shall conform to that specified in the Special Provisions.

All other requirements are per Section 757 Revegetation Seeding.

754.15.06 Sod - Sod shall be nursery grown, true to type and conform to the British Columbia Standard for Turfgrass Sod, and the general requirements of the Canadian Standards For Nursery Stock.

Sod grade shall be as specified in the Special Provisions.

754.16 Water - Water shall be clean and potable and shall be supplied by the Contractor.

754.17 Fertilizer - Fertilizer shall comply with the provisions of the Canada Fertilizers Act and Fertilizer Regulations. Fertilizer shall be supplied to the specifications in the Special Provisions.

754.18 Bark Mulch - Bark mulch shall be sized 25 mm and minus, Douglas Fir or Hemlock bark chips and fines, or a combination of both types and of the quality used for decorative landscape mulching purposes. It should be free of chunks and sticks, dark brown in colour and free of all soil, stones, roots or other extraneous matter.

754.19 Backfill Topsoil - Backfill topsoil for planting operations shall conform to the requirements of Section 751 - Topsoil and Landscape Grading.

754.20 Other Materials - When required, various other materials such as soil amendments, erosion control products, hydraulic mulches, etc. shall be supplied to the specifications in the Special Provisions.

CONSTRUCTION

754.31 Scheduling - Work shall be scheduled to meet the milestone dates provided in the Special Provisions, and to ensure its execution meets the requirements of living plant material.

The work shall be co-ordinated with the schedule of other

trades, and be well integrated with other specific requirements such as Sediment and Drainage Management Plans, which may be provided for any given project.

754.32 Preplanting Operations - The plant material shall be approved by the Ministry Representative prior to installation. The Contractor shall ensure that all requirements of Sections 754.11 through 754.15 have been met and that any minor damage to plant stock is taken care of through appropriate pruning or other measure. When directed by the Ministry Representative, the Contractor shall apply anti-desiccant to large conifers and deciduous trees that are in leaf. Application will be in accordance with the manufacturer's instructions for the particular product.

754.33 Location of Planting - Locations, quantities and spacing of trees, shrubs, vines and groundcovers as shown on the Plans shall be considered approximate and may be adjusted by the Ministry Representative to meet field conditions. Tree numbers, spacings and locations will vary according to the site conditions and amenities. The Contractor may adjust plantings to meet field conditions, with the concurrence of the Ministry Representative. Locations shall be staked as shown on the Plans and verified on site with the Ministry Representative prior to planting. If underground obstructions are uncovered they shall be reported to Ministry Representative for resolution.

754.34 Area Preparation

754.34.01 Finish Grade Preparation - The Contractor shall verify that grades are correct. If discrepancies occur, the Ministry Representative shall be notified and work shall be halted until otherwise instructed by the Ministry Representative.

754.34.02 Planting Beds and Grass Areas - Prepare planting beds and grass areas in accordance with Section 751 - Topsoil and Landscape Grading.

754.34.03 Planting Holes - Planting holes shall be dug in accordance with the specific requirements described below. The bottom of planting holes shall be scarified and loosened to a depth of 100 mm prior to placement of plants and backfill soil.

Subsoil, rocks, roots and extraneous material shall be removed from excavated material that will be used as planting backfill soil. Unsuitable or excess material shall be disposed of.

Holes dug by a mechanical tree spade shall have their sides scarified to loosen any compaction glazing caused by the blades. Planting holes shall be tested by filling with water. Inadequate drainage conditions permitting the retention of water in planting pits for more than 12 hours shall be reported to the Ministry Representative before proceeding with the work.

i) Free Draining Sub-Grade: Where the subgrade and existing native surface soils are of good drainage and of a non-compacted nature, planting holes shall be excavated and prepared to allow the following depth of topsoil backfill underneath and around the root ball:

- For plants up to and including 27 cm (#5) pot size - not less than 150 mm .
- For plants larger than 27 cm (#5) pot- size not less than 300 mm

ii) Poor Draining Sub Grade: Where the subgrade and existing native surface soils are of poor texture and conditions are generally compacted, planting holes shall be excavated and prepared to allow the following depth of topsoil backfill underneath and around the root ball:

- For plants up to and including 27 cm (#5) pot size not less than 300 mm
- For plants up to 45 cm pot size - not less than 450 mm
- For tree root balls larger than 45 cm - not less than 600mm

If severely compacted conditions are encountered, and surface or ground water entering the excavations does not drain, the Contractor shall correct the problem by;

- providing a means of sub-surface drainage
- utilizing elevated planting techniques where some of the planting soil will be placed into a partial excavation and the remainder on the surface to meet the depth requirement for growing medium, or
- considering alternate planting sites.

These alternatives shall receive prior approval by the Ministry Representative, as applicable to the site.

754.35 Time of Planting - All planting operations shall be performed during the normal planting season for each type of material, and within the milestone dates provided in the Special Provisions, unless otherwise authorized in writing. During the specified timeframe, plant operations shall, as far as practicable, take advantage of soil and weather conditions favourable to the work.

Planting into frozen ground is not acceptable.

754.36 Planting Procedures - Trees and Shrubs

General Procedure - Plants shall be installed so that after settlement they will be at the same planting depth they were at in the field or in containers. The soil mark on the stem is

an indication of this, and it shall be flush with the finished level allowing for settling of the topsoil after planting and settlement. The entire root ball shall be covered with growing medium.

Once the bottom of the planting hole is scarified and the initial lift of backfill topsoil is placed, the holes shall be pre-watered and allowed to drain prior to installation of plant material.

Plants shall be set plumb in the planting beds or in the centre of the pits except where the plant's character requires variation from this.

The growing medium shall be placed in layers around the roots or ball, preferably by hand. Each layer shall be firmed to eliminate air void and ensure good soil contact with the roots. The process shall be carried out carefully to avoid injuring the roots or ball, or disturbing the position of the plant.

Trees requiring staking shall have support stakes placed carefully between the roots before backfilling. Specifications for tree supports are described in Section 754.

After the planting hole is filled with soil to ground level, the plant shall receive a thorough watering. A final backfill layer shall be applied to form a saucer-like berm around the circumference of the planting hole in order to catch and hold rainwater. This rain basin shall be maintained until final acceptance of the work.

Once planting and mulching is complete, the site shall be cleaned of all excess soil, rock and debris.

Specific Planting Requirements:

Bare Root Stock - The roots of bare root plant material shall be soaked in water prior to planting. During installation, the plant roots shall be evenly spread out over a cone of soil in the bottom of the hole, and the plant supported to the correct depth as backfilling takes place. The plant shall be gently shaken in a vertical motion to ensure that soil particles sift into the root system and establish close contact with the roots

Container Stock - Non-perishable, impervious containers such as plastic pots and tubs shall be removed from plants before planting. Once plants are removed from these containers, root systems shall not be disturbed with the exception of unraveling any roots starting to spiral around the root ball.

Bio-degradable containers such as peat or paper fibre pots shall not be removed before planting, but shall be thoroughly soaked with water prior to placement in the holes. This will ensure that containers absorb subsequent watering and not repel it due to the presence of a dry barrier. The rim of such containers shall be not be exposed to the air, and when necessary, shall be removed after planting.

Balled and Burlapped Stock - When backfill soil is placed to approximately two-thirds of the root ball height, the ties on the sacking shall be cut and the top portion of the burlap folded back carefully to avoid disturbing the integrity of the root ball. The sacking shall not be removed. The remainder of the hole will then be backfilled and firmed.

Where wire baskets are used to encase and support the root ball of supplied plant material, these shall not be removed. The top of the wire basket shall be cut away or completely folded back and buried without disturbing the integrity of the root ball.

Forestry Seedlings - Planting of forestry seedlings shall be in accordance with the Silvicultural Policy and Procedures Manual, Volume 3, of the British Columbia Ministry of Forests and Lands.

Tree Support - All trees of a size requiring staking or guy wiring shall be supported in accordance with the details and instructions provided on Drawings SP754-04 through SP754-07 of these Standard Specifications. All hardware required shall be installed without damage to plants.

Trees that are dislodged during the contract period shall be uprighted and re-secured as required. Trees that are damaged shall be replaced by the Contractor at the Contractor's expense.

754.37 Seeding - Application of seed, fertilizer, and other materials shall be at the rates specified in the Special Provisions.

The requirements for construction shall be in accordance with Section 757 Revegetation Seeding.

754.38 Sodding - The required fertilizer shall be applied at the rates specified in the Special Provisions, and worked well into the topsoil prior to laying the sod.

Sod shall be laid within 24 hours after delivery unless proper storage arrangements can be made.

The sections of sod shall be laid close together with joints staggered. No open joints are to be visible, and no pieces are to overlap.

Sod shall be laid smooth and flush with the adjoining grass areas, adjacent hard surfacing, and the tops of curbs and

planting bed liners, unless otherwise shown on the Plans. All necessary cutting shall be done using sharp implements.

On Slopes of approximately 2.5 to 1 and steeper, the sod shall be laid lengthwise across the slope, and the material secured with wooden stakes driven flush with the sod at intervals not exceeding 0.5 metres. There shall be at least three stakes per individual sod piece. On slopes of gradients between 2.5 and 1.5 to 1, the bottom three rows of sod and every third subsequent row shall be secured with stakes. For slopes steeper than 1.5 to 1, every sod course shall be staked.

Sodded areas shall be rolled or suitably tamped to ensure a good bond with the topsoil, and then subsequently protected from heavy foot traffic or equipment travel.

Unless otherwise indicated, sodded areas shall be evenly watered within 12 hours of installation, and with sufficient quantity to saturate the grass and the upper portion of the topsoil.

754.39 Watering - All trees, shrubs, groundcovers, vines, and designated grass areas, shall be watered immediately after planting, and regular watering shall continue as required for plant health until final acceptance of the work.

754.40 Pruning - Pruning shall be limited to the minimum necessary to remove dead or injured tissue and branches interfering with desirable growth habit and overall health of the plant.

Pruning shall be done in accordance with proper horticultural practice, using clean, sharp tools appropriate to the task and in a manner that preserves the natural character of the plant.

754.41 Mulching - When specified in the Plans and Special Provisions, individual tree pits and planting beds shall be mulched.

Mulching of tree pits and planting beds shall be carried out after watering, to an even depth of 50 mm after settlement, unless otherwise specified on the Plans and in the Special Provisions.

754.42 Clean-up - All plant containers and waste materials resulting from landscaping and planting operations shall be removed from the site and appropriately disposed of.

754.43 Conditions for Acceptance - The Contractor shall ensure that the following conditions are met for all planted and grassed areas:

a) Topsoil quality, fertility levels, depths and surface conditions are as set out in the Plans and Specifications;

b) All plants are of the species and varieties specified and planted in the locations shown on Plans;

c) All plants are healthy and growing vigorously. Seeded grass areas are sufficiently established into the underlying growing medium, are free of thin and bare patches, and are relatively free of weeds: not more than 5% in lawn areas, and not more than 15% in rough grass areas;

d) The water content in the topsoil, i.e. – when irrigation is provided, is to the satisfaction of the Ministry Representative;

e) Trees are supported, as specified;

f) Pruning is complete, in accordance with proper horticultural practice and to the satisfaction of the Ministry Representative;

g) All planting beds and tree pits are free of weeds;

h) Mulch is in place, as required and;

i) Unmulched areas are cultivated to leave a loose, friable, water-permeable surface;

j) Maintenance procedures set out in Subsection 754.71 have been carried out.

MAINTENANCE

754.71 Maintenance - The following maintenance operations shall be performed from the time of landscape installation, until the expiry of the landscape maintenance period as defined in the contract documents:

a) When specified, water shall be applied in sufficient quantity and by appropriate method to maintain optimum soil moisture conditions for healthy plant establishment, without causing surface soil erosion.

b) Weed control will be carried out, as required to prevent competition with establishing planted material and to maintain the aesthetic appearance of landscaped areas. The presence of weeds in plantation beds, individual planting pits, and designated lawn areas, is limited to a maximum of 5% of the surface area at any given time, unless otherwise stated in the Special Provisions. The use of herbicides for the control of weed growth is not permitted.

c) Mowing shall be carried out at regular intervals, as

required, to maintain grass in the areas designated, and at the height(s) specified in the Special Provisions. Edges of areas designated "Lawn" shall be neatly trimmed. Excess clippings shall be removed immediately after mowing and trimming.

d) Fertility levels in planted and grassed areas shall be maintained in accordance with the requirements of the plant material.

e) Bark Mulch shall be maintained to the specified depth.

f) For non-mulched areas, the soil surface shall be cultivated, as required, to keep it loose and friable.

g) Insect and disease control shall be carried out as required by the Contractor with approval of the Ministry Representative. The Contractor shall secure all necessary Pesticide Use Permits in accordance with Ministry of Water, Land and Air Protection (MoWLAP) regulations, and possess a valid Pesticide Service License. When required, the Contractor shall provide a Pesticide Management Plan to MoWLAP.

h) Establishment pruning to encourage proper shape and health of plants by removing dead, or broken and interfering branches and diseased or damaged tissue.

i) Maintenance of tree stakes, guy wires and tree ties to prevent plant dislodgement and damage to trunk and branches.

j) All plant material shall be alive and maintained in a healthy growing condition during the entire establishment period. Plant material which has died or is not healthy, and in the opinion of the Ministry Representative, does not perform its function, will be removed and replaced by the Contractor at the earliest opportunity, weather and season permitting. Grassed areas that show deterioration or bare spots shall be repaired immediately. Unless otherwise directed by the Ministry Representative, all repair and/or replacement shall be in accordance with the original specifications and requirements.

The landscape maintenance period may run concurrently, in whole or in part, with the contract warranty period.

MEASUREMENT

754.81 Planting - The unit of measurement for plants will generally be PER PLANT, unless otherwise specified in the Special Provisions.

754.82 Seeding and Sodding - The unit of measurement for seeded and sodded areas will generally be by the SQUARE METRE, unless otherwise specified in the Special Provisions.

754.83 Mulch - The unit of measurement for supply and installation of bark mulch will generally be by the SQUARE METRE for the stipulated mulch thickness, unless otherwise specified in the Special Provisions.

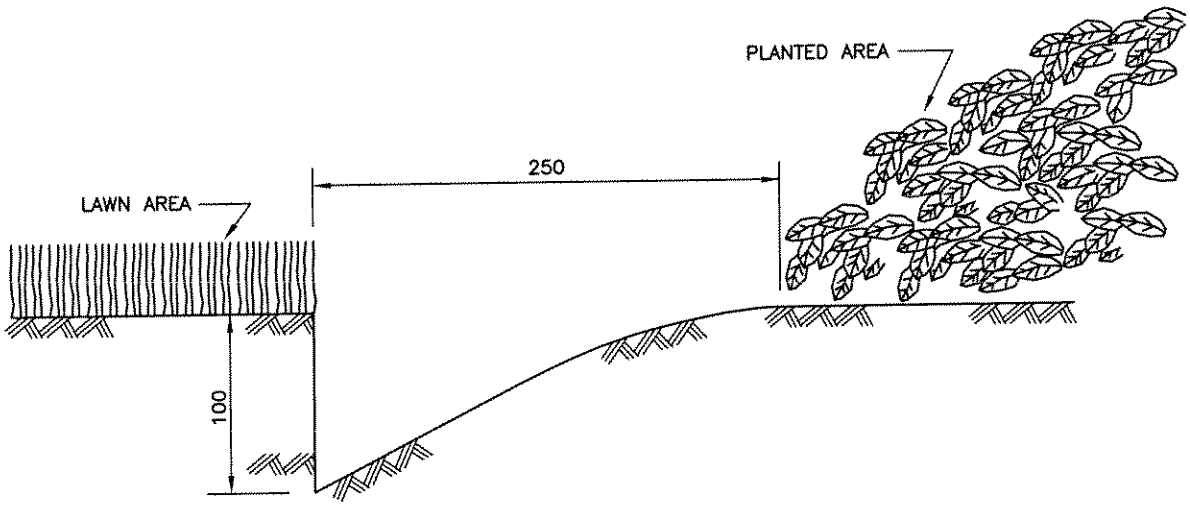
PAYMENT

754.91 General - Payment for plants will be at the contract unit prices bid for PLANTING of the types, species and sizes called for, and shall constitute full compensation for supplying and delivering plants; for supplying and delivering topsoil for plant backfill, fertilizer and all incidental materials; for digging holes for plants; for planting, pruning, staking and guying, mulching, rain basinformation, clean up after planting and maintenance of plants; and for all labour, equipment and tools and incidentals necessary to complete the work prescribed in this Section.

Payment for SEEDING and SODDING will be at the contract unit price bid per square metre. The unit price shall be full compensation for work described and all work subsidiary and incidental thereto for which separate payment is not elsewhere provided.

Payment for MULCHING will be at the contract unit price bid per square metre. The unit price bid for mulching shall be full compensation for all labour and equipment required for supplying and spreading of the mulch and for all incidental work not required to be separately paid for.

PLANTATION EDGING DETAIL	SP754–01

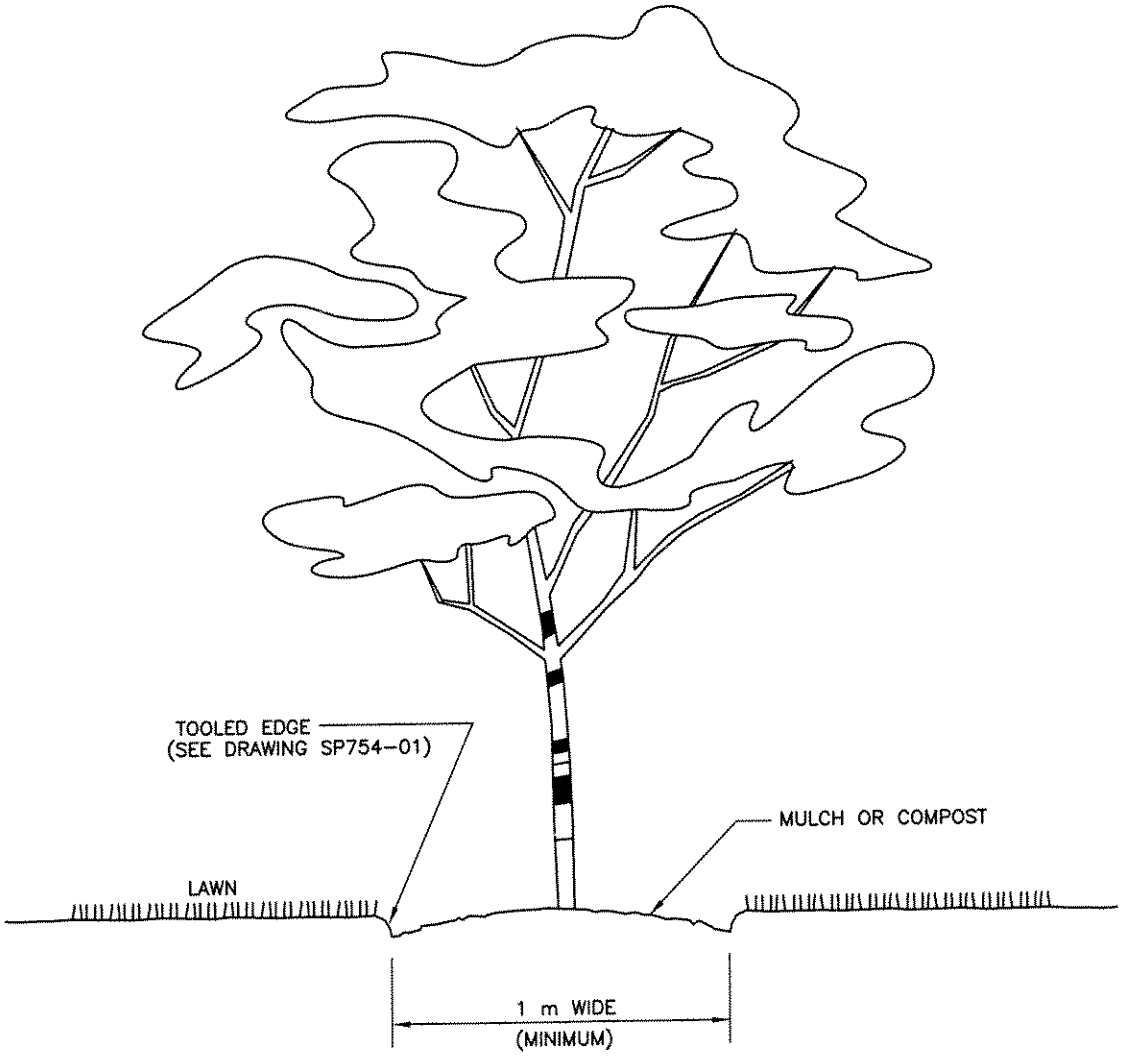


NOT TO SCALE

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

TREES WITHIN LAWN AREAS

SP754-02



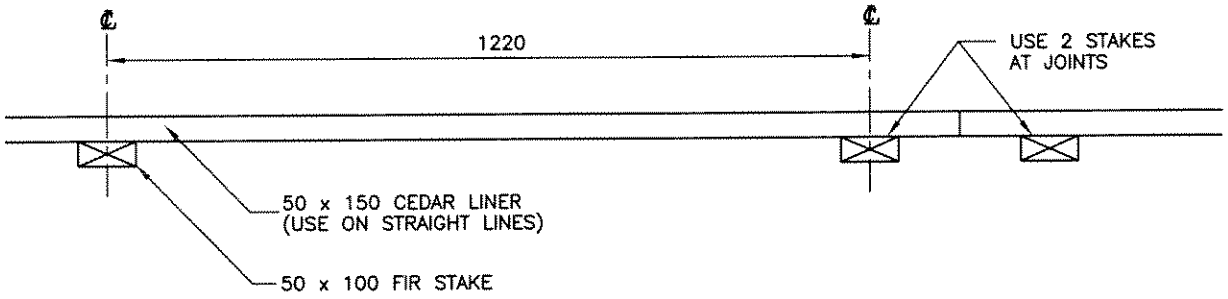
NOTE:
MAINTAIN VEGETATION FREE BASE

NOT TO SCALE

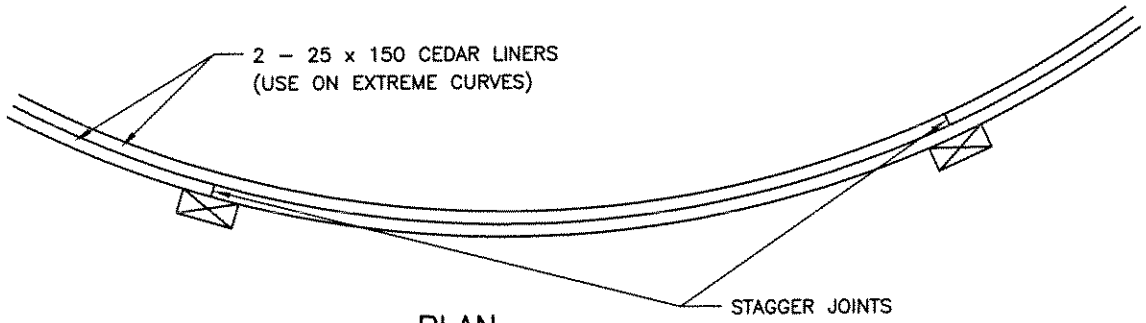
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

CEDAR LINER DETAILS

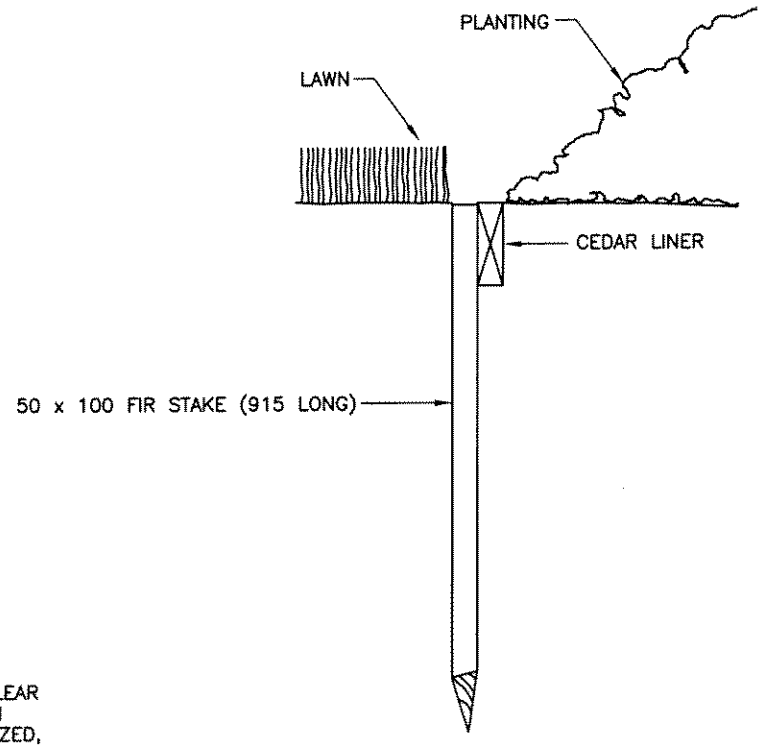
SP754-03



PLAN



PLAN



SECTION

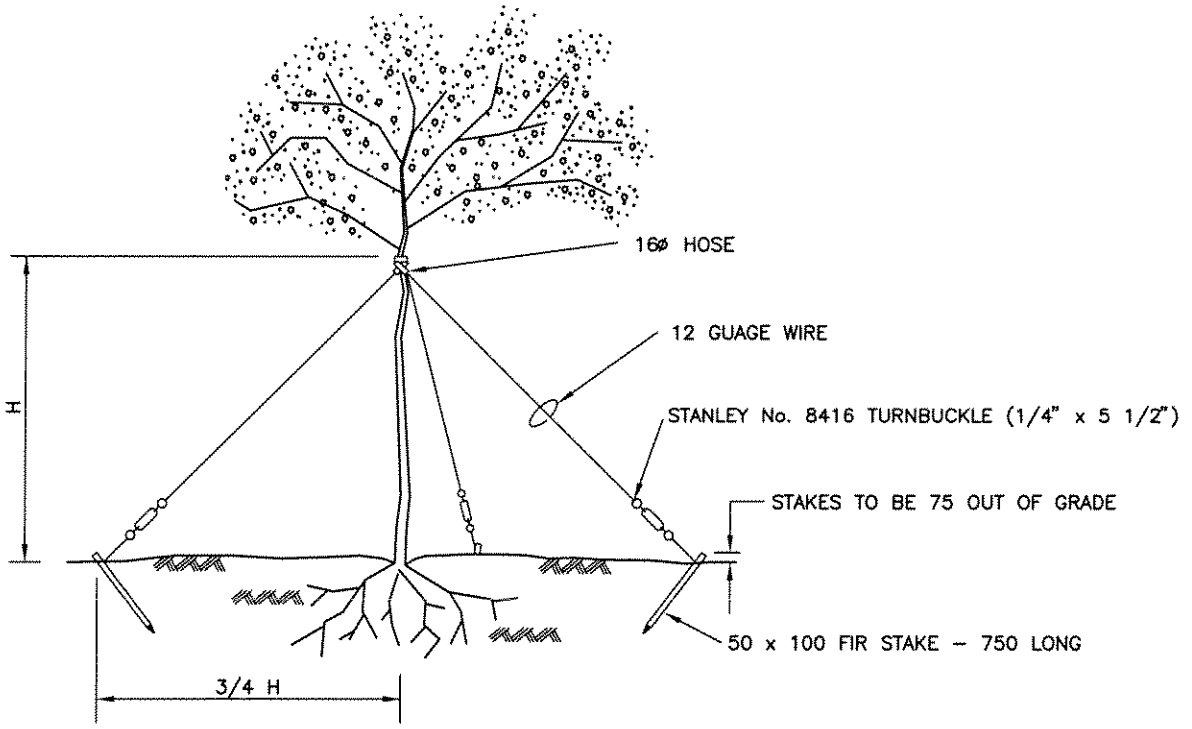
NOTES:
1. ALL WOOD TO RECEIVE 2 COATS CLEAR CREOSOTE PRIOR TO CONSTRUCTION
2. ALL NAILS TO BE HOT-DIP GALVANIZED, 75 mm LONG

NOT TO SCALE

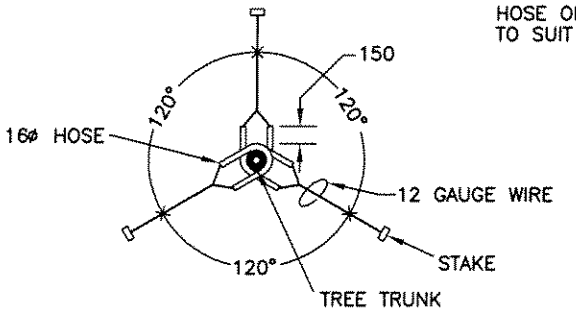
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

TRIPOD BRACING DETAIL

SP754-04

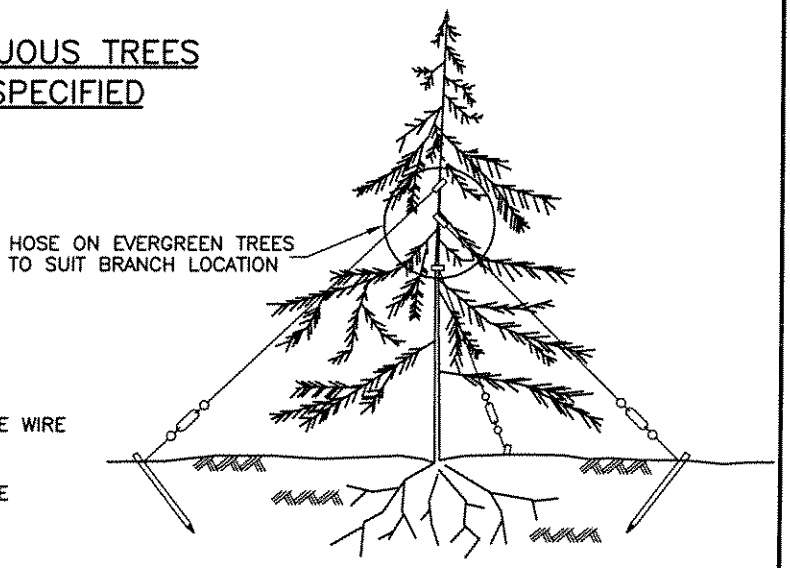


FOR DECIDUOUS TREES
WHEN SPECIFIED



PLAN VIEW

TURNBUCKLES NOT SHOWN FOR CLARITY



FOR CONIFEROUS TREES
WHEN SPECIFIED

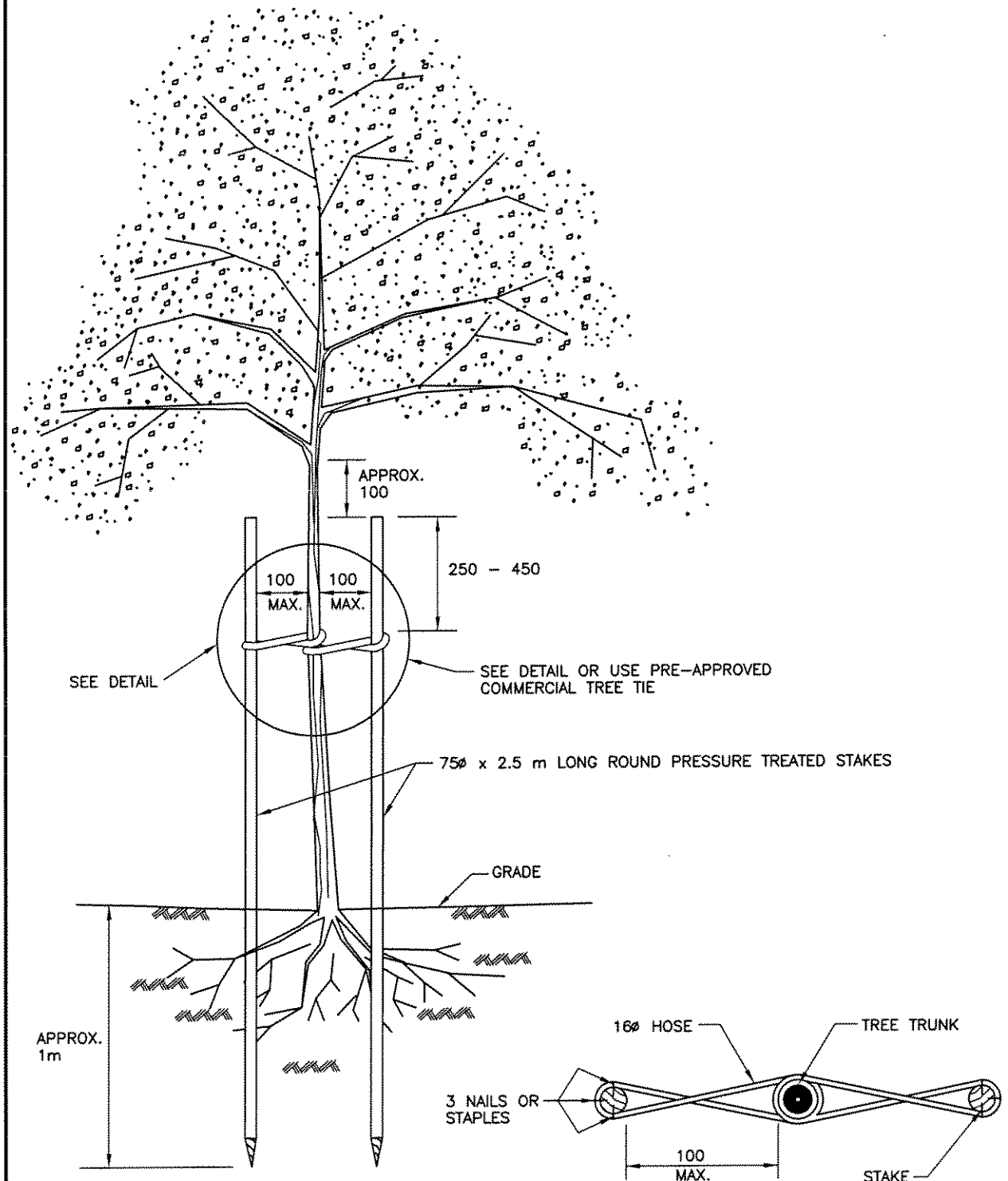
NOTE:
TIGHTEN WIRE BY ADJUSTING TURNBUCKLES

NOT TO SCALE

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

DOUBLE TREE STAKES FOR TREES OVER 3 m HIGH

SP754–05



ELEVATION

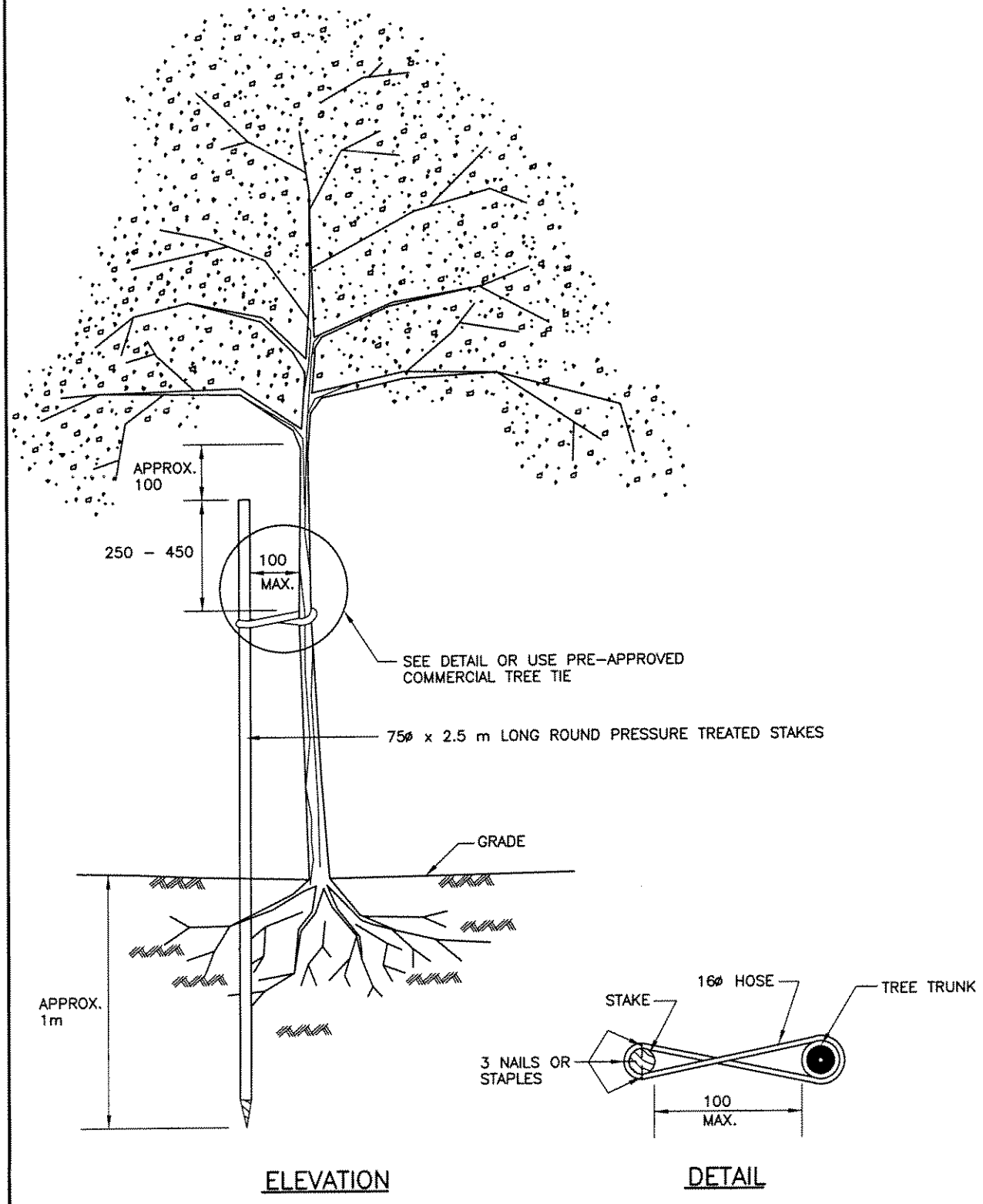
DETAIL

NOT TO SCALE

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

SINGLE TREE STAKE FOR TREES 1.5 m TO 3 m HIGH

SP754-06



ELEVATION

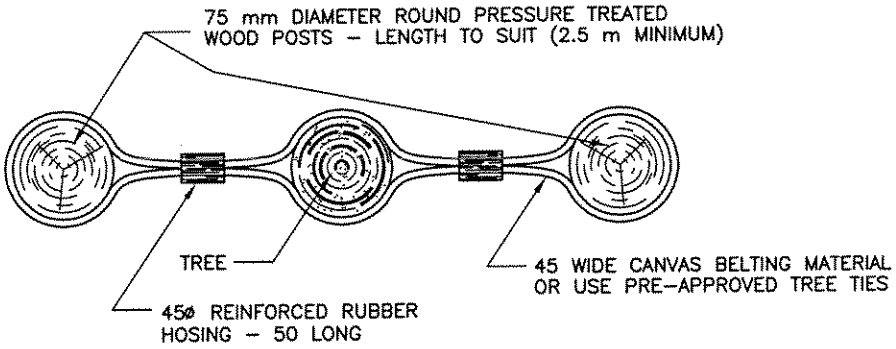
DETAIL

NOT TO SCALE

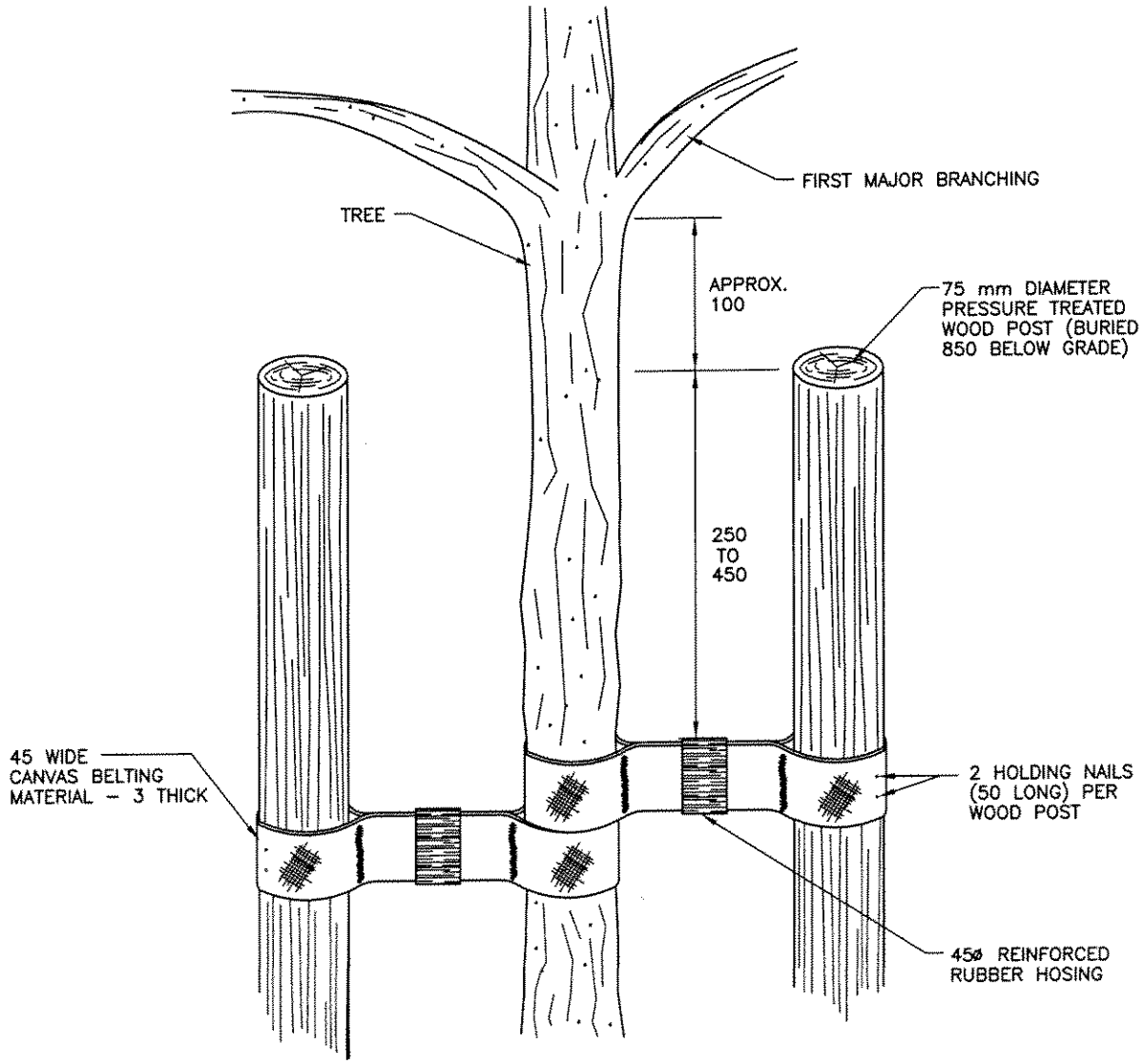
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

DOUBLE TREE STAKES FOR BOULEVARD PLANTING AREAS

SP754-07



CROSS SECTION



NOT TO SCALE

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

SECTION 757

REVEGETATION SEEDING

DESCRIPTION

757.01 Scope - This Section refers to those portions of the work that are unique to the supply and application of seed, fertilizer, mulch, tackifier, and other materials used for revegetating disturbed areas, and that are not designated for treatment under Section 754, Planting of Trees, Shrubs, and Ground Covers. This Section must be referenced and interpreted simultaneously with all other Sections pertinent to the works described herein.

757.02 References - Guidelines for Hydroseeding in Proximity to Hydro Lines, Canada Seed Act, and BC Weed Control Act & Regulation.

MATERIALS

757.11 Handling and Storage - All seed, mulch, fertilizers and other dry materials shall be stored in a dry, weather proof storage place and shall be protected from damage by heat, moisture, rodents or other causes until the time of seeding. Supplier labels or other identification are not to be removed or defaced.

757.12 Seed

757.12.01 Supply of Seed - All seed specified shall be supplied by the Contractor and obtained from a recognized source.

757.12.02 Seed Type and Grade - All seed supplied either as individual species, or as a seed mix, shall comply with the requirements of the Canada Seed Act and Regulations, and the grade standards for that particular crop kind. Grass and legume seed shall meet or exceed Common No.1 grade prior to mixing with other species. Seed shall be free of propagules of plant species designated as noxious weeds under the BC Weed Control Act & Regulations.

All legume seed shall be inoculated with an adapted bacterial culture to ensure nitrogen fixation.

Seed mixes used for general roadside revegetation, and for the general conditions and areas indicated, shall be as shown on the table "Standard Grass Seed Mixes For Revegetation of British Columbia Highway Roadsides", unless otherwise specified in the Special Provisions.

When specified, wildflower and shrub seed shall be supplied to the requirements of the Special Provisions.

757.12.03 Seed Analysis Report - Upon request by the Ministry Representative, the Contractor shall provide valid Certificates of Analysis for each species and seed lot used in a mix. These shall set out details of the seed as specified in the "Canadian Methods and Procedures for Testing Seed".

757.12.04 Packaging and Labelling - Seed shall be supplied in the original sealed packages, with legible labels securely attached, and providing the following information:

- Supplier's name and address
- Analysis of seed mixture – the grade, and the name and percentage by weight of individual seed species
- Percentage of Pure Live Seed (PLS) for each species
- Lot number and crop year for each species in the mix
- Net weight (mass)
- Date and location of packaging

757.13 Fertilizer - Fertilizer shall comply with the provisions of the Canada Fertilizers Act and Fertilizer Regulations. Fertilizer shall be supplied as noted on the table "Standard Grass Seed Mixes For Revegetation of British Columbia Highway Roadsides" unless otherwise specified in the Special Provisions.

757.14 Hydraulic Mulch - Hydraulic mulch shall be a wood fibre type, specifically designed for hydraulic seeding, and having demonstrated satisfactory past performance for this purpose. The product shall be dyed green for appearance and ease of monitoring application.

Mulch shall be supplied in packages bearing the manufacturer's label, clearly indicating the weight and product name.

Mulch may contain a tackifier, which shall adhere to mulch to prevent separation during shipment and to avoid chemical agglomeration during mixing in hydraulic mulching equipment.

757.15 Water - Water used for hydraulic seeding operations shall be free of impurities that would inhibit germination and growth or may be harmful to the environment. Unless otherwise noted in the Special Provisions, the Contractor shall be responsible for securing a water source for hydraulic application of materials, including obtaining use permits under the Water Act if water is to be drawn from waterbodies, and for all cost to supply.

757.16 Other Materials - Tackifiers, Bonded Fiber Matrix coverings, erosion control blankets, soil amendments and other materials shall be supplied to the specifications in the Special Provisions.

EQUIPMENT

757.21 General - Equipment used shall be capable of applying the materials listed in the Special Provisions uniformly over the designated areas.

Equipment shall not cause soil rutting or other site damage.

757.22 Hydraulic Seeding/Mulching Equipment - Equipment shall have the tank volume identified by an identification plate or sticker, which shall be affixed in plain view.

The hydraulic seeder/mulcher shall be capable of sufficient agitation to mix the materials into a homogenous slurry, and to maintain the slurry in a homogeneous state until application.

Equipment shall be adequately sized to the task, to complete work efficiently within the time frame specified, and to permit application of materials without excess water being applied, or undue time lapse between operations. Hydraulic mulchers should be capable of producing slurry viscosities containing approximately 18 to 30kg of mulch per 500 litres of water.

Extension hoses or pipes shall be provided to reach areas not accessible from the hydraulic seeder.

CONSTRUCTION

757.31 Scheduling - Work shall be scheduled to ensure a minimum duration of on-site storage of materials, minimum compaction of topsoil, and prompt mulching operations.

The work shall be co-ordinated with the schedule of other trades, and be well integrated with specific requirements such as Sediment and Drainage Management Plans, which may be provided for any given project.

757.32 Protection - Existing site equipment, roadways, landscaping, reference points, monuments, markers, utilities and structures shall be protected from damage.

757.33 Timing of Material Application - Material application shall be carried out in accordance with the milestone dates provided in the Special Provisions, and after fine grading has been completed and the prepared areas approved by the Ministry Representative.

757.34 Methods - The methods chosen for material application shall be at the Contractor's discretion, unless otherwise specified in the Special Provisions.

757.35 Rates of Application - Application of fertilizers, seed mixtures, mulch and other materials shall be at the rates specified in the Special Provisions.

757.36 Record of Application - The Contractor shall maintain a record of all pertinent application information on the form supplied by the Ministry for this purpose, or similarly provided by the Contractor. Refer to Sample Form "Daily Seeding/Application Record".

757.37 Application Method for Mechanical Drop or Broadcast Dry Seeding - Seed shall be applied in two intersecting directions, except where conditions dictate seeding in one direction only.

Seeding shall overlap adjoining ground cover by 300mm.

Refer to the Special Provisions for specific instructions for installation of wildflower, shrub and other seed as may be applicable.

757.38 Hydraulic Application of Materials

757.38.01 General - The hydraulic seeder/mulcher shall be operated in compliance with Ministry safety standards including those detailed in the publication "Guidelines for Hydroseeding in Proximity to Hydro Lines."

Materials shall not be sprayed on objects not expected to support plant growth.

The Contractor shall be responsible for any overspray or damages incurred during hydroseeding. Any overspray or damage shall be made good at no cost, to the satisfaction of the Ministry Representative.

757.38.02 Mixing - The required quantities of seed, fertilizer, mulch, tackifier and other material shall be charged into the tank accurately by weight or by an acceptable system of mass calibrated volume measurement. The materials shall be thoroughly mixed into a homogeneous water slurry prior to application.

All seed shall be added last when mixing. Pellet inoculated seed shall be applied immediately after placement into tank, and if this is not possible, dry application methods must be used. Other seed shall not be left in the tank for unreasonable lengths of time prior to application, i.e. – exceeding one or two hours, particularly when in contact with fertilizer solution.

The Ministry Representative will determine if Seed that remains in the tank for periods longer than specified can be used. Rejected seed shall be replenished with fresh stock.

757.38.03 Application - The mulch and tackifier

components of hydraulically applied mixtures will generally be applied in stages. The initial pass of the hydraulic seeder will distribute the correct amount of seed and fertilizer for the area being done, as well as up to one third of the required mulch/tackifier. The subsequent pass(es) will complete the mulching/tacking process to the required rate.

Mulch shall be applied to form an even, uniform mat blended 150 mm into adjacent vegetated areas or previous mulch applications.

757.39 Related Work - Additional related work such as the application of erosion control blanket or other coverings, and harrowing or discing of soil following material application, shall be as specified in the Special Provisions.

757.40 Clean-up - All surplus and waste materials resulting from seeding operations shall be removed from the job site after empty product containers have been inspected by the Ministry Representative.

Hydraulic seeding and/or mulching overspray that may cause problems on areas or objects not designated for re-vegetation, shall be removed in an appropriate manner.

757.41 Conditions for Acceptance -Treated areas will be accepted by the Ministry when the following conditions have been met:

a) Treated areas are not thin with bare patches, or uneven in distribution.

b) Empty containers of materials used during the work are stored neatly on site for inspection by the Ministry Representative.

757.42 Repairs - Seeded areas that show thin application or bare spots shall be re-treated with the specified materials at the Contractor's expense and at the earliest opportunity, weather and season permitting.

MEASUREMENT

757.81 General - Revegetation Seeding will be measured by the HECTARE treated. The treated areas will be measured to the nearest tenth of a hectare [0.1 ha].

PAYMENT

757.91 General - Payment for REVEGETATION SEEDING will be at the Contract Unit Price per hectare. The Contract Unit Price shall be accepted as full compensation for the work described and all work subsidiary and incidental thereto for which separate payment is not elsewhere provided.

SHEET #_____

MINISTRY OF TRANSPORTATION AND HIGHWAYS

PROJECT #_____

DAILY SEEDING/APPLICATION RECORD

DATE	LOAD #	AREA COVERED IN HECTARES				SEED APPLIED* (IN KG.)			OTHER MATERIALS* (IN KG.)				REMARKS
		GRASS	MULCH	REFERT		GRASS	RYE	OTHER	FERT	MULCH	TACK	MISC.	
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	8												
	9												
	10												
	11												
	12												
	13												
	14												
	15												
	16												
	17												
	18												
	19												
	20												
Total of Sheet													

Provide details of seed mixes and other materials, as required, in this space:

THIS SHEET CERTIFIED CORRECT:

FOR MINISTRY _____

FOR CONTRACTOR _____

DATE :

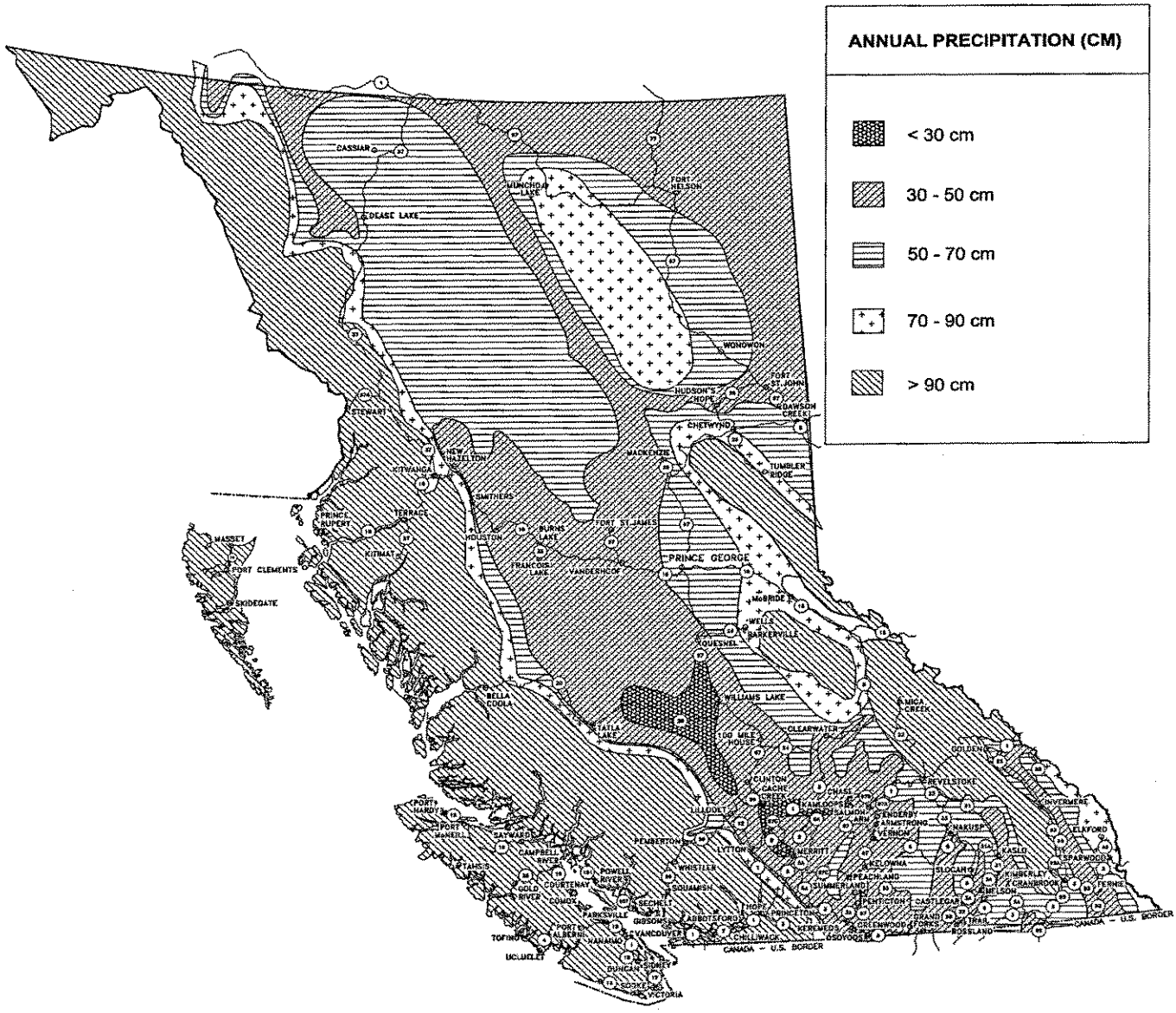
STANDARD GRASS SEED MIXES FOR REVEGETATION OF BRITISH COLUMBIA HIGHWAY ROADSIDES (BY WEIGHT)

CLIMATIC AREA	STANDARD MIXES (by weight)	APPLICATION
South Coast	**Vancouver Island / Coast Mix** Perennial Ryegrass 26% Creeping Red Fescue 24% Alsike Clover 14% Hard Fescue 13% White Clover 9% Timothy 8% Canada Bluegrass 4% Redtop 2%	General seeding coastal locations where mean annual precipitation is > 90 cm. Fertilizer: 16-32-6
	Interior Forestland Mix Intermediate Wheatgrass 32% Alfalfa ("Rambler") 20% Perennial Ryegrass 15% Annual Ryegrass 15% Hard Fescue 10% White Dutch Clover 5% Canada Bluegrass 2% Redtop 1%	General seeding inland where mean annual precipitation is >50 cm. Fertilizer: 16-32-6
	Interior Dryland Mix Crested Wheatgrass 40% Tall Wheatgrass 25% Slender Wheatgrass 20% Hard Fescue 15%	General seeding inland where mean annual precipitation is < 30 cm. Fertilizer: 16-32-6
Thompson – Okanagan	**Interior Forestland Mix** Intermediate Wheatgrass 32% Alfalfa ("Rambler") 20% Perennial Ryegrass 15% Annual Ryegrass 15% Hard Fescue 10% White Dutch Clover 5% Canada Bluegrass 2% Redtop 1%	General seeding inland where mean annual precipitation is >50 cm. Fertilizer: 22-11-11
	Interior Dryland Mix Crested Wheatgrass 40% Tall Wheatgrass 25% Slender Wheatgrass 20% Hard Fescue 15%	General seeding inland where mean annual precipitation is < 30 cm. Fertilizer: 22-11-11
	Alkaline Tolerant Blend Crested Wheatgrass 35% Sherman Big Bluegrass 20% Hard Fescue 20% Canada Bluegrass 15%	General seeding in alkaline soils. Fertilizer: 22-11-11

CLIMATIC AREA	STANDARD MIXES (by weight)	APPLICATION
Kootenays	**Interior Forestland Mix** Intermediate Wheatgrass 32% Alfalfa ("Rambler") 20% Perennial Ryegrass 15% Annual Ryegrass 15% Hard Fescue 10% White Dutch Clover 5% Canada Bluegrass 2% Redtop 1%	General seeding inland where mean annual precipitation is >50 cm. Fertilizer: 22-11-11
	Kootenay Dryland Tall Wheatgrass 45% Crested Wheatgrass 20% Alfalfa ("Rambler") 15% Hard Fescue 7% Sheep Fescue 5% Alsike Clover 5% Canada Bluegrass 2% Redtop 1%	General seeding inland where mean annual precipitation is < 50 cm. Fertilizer: 22-11-11
Northern **(Prince George Area)**	**North East General Mix** Smooth Bromegrass 40% Creeping Red Fescue 20% Timothy 15% Alfalfa 15% Alsike Clover 10%	General seeding inland where mean annual precipitation is > 50 cm. Fertilizer: 26-16-8
	North East Dryland Mix Crested Wheatgrass 35% Intermediate Wheatgrass 25% Alfalfa 15% Smooth Bromegrass 10% Creeping Red Fescue 10% Alsike Clover 5%	General seeding inland where mean annual precipitation is < 50 cm. Fertilizer: 26-16-8
Northern **(Terrace Area)**	**North West General Mix** Smooth Bromegrass 70.6% Alfalfa 18.0% Creeping Red Fescue 3.9% Alsike Clover 3.4% Timothy 2.9% Kentucky Bluegrass 1.1%	General seeding inland where mean annual precipitation is > 50 cm. For use in CWH and ICH biogeoclimatic zone. Fertilizer: 22-11-11
	North West Dryland Mix Intermediate Wheatgrass 47.7% Alfalfa 19.1% Crested Wheatgrass 17.9% Orchardgrass 9.1% Hard Fescue 3.0% White Clover 2.1% Kentucky Bluegrass 1.1%	General seeding inland where mean annual precipitation is < 50 cm. For use in SBS biogeoclimatic zone (East of Moricetown to West of Endako) Fertilizer: 22-11-11

CLIMATIC AREA	STANDARD MIXES (by weight)	APPLICATION
	Northern Coastal Mix: Alfalfa 46.6% Intermediate Wheatgrass 14.0% Smooth Bromegrass 10.3% Kentucky Bluegrass 9.0% Sheep Fescue 8.2% Birdsfoot Trefoil 6.2% Timothy 5.7%	General seeding coastal locations where mean annual precipitation is > 90 cm. For use in CWH biogeoclimatic zone (QCI, Prince Rupert to Pacific) Fertilizer: 22-11-11
	Northern Mix: Hairy Vetch 57.3% Crested Wheatgrass 16.4% Alfalfa 13.1% Creeping Red Fescue 5.3% Orchardgrass 3.8% Birdsfoot Trefoil 3.1% Kentucky Bluegrass 1.1%	General seeding coastal locations where mean annual precipitation is > 90 cm. For use in ICH and BWBS biogeoclimatic zones. (ICH – Pacific to Moricetown, Kitwanga to Thomas Creek 220 km N) (BWBS – Thomas Creek to Yukon border) Fertilizer: 22-11-11
	Ditch Vegetation Seed Mixture Crested Wheatgrass 38.7% Alfalfa 30.9% Creeping Meadow Foxtail 15.8% Birdsfoot Trefoil 6.9% Reed Canarygrass 4.8% White Clover 1.6% Kentucky Bluegrass 1.2%	For use in revegetating roadside ditches following ditch maintenance operations. Fertilizer: 22-11-11
Vancouver Island	**Vancouver Island / Coast Mix** Perennial Ryegrass 26% Creeping Red Fescue 24% Alsike Clover 14% Hard Fescue 13% White Clover 9% Timothy 8% Canada Bluegrass 4% Redtop 2%	General seeding coastal locations where mean annual precipitation is > 90 cm. Fertilizer: 18-18-18

MEAN ANNUAL PRECIPITATION



SECTION 769

PROTECTION AND RETENTION OF VEGETATION

DESCRIPTION

769.01 Scope - This Section refers to the protective measures required to safeguard vegetation from construction operations, equipment and vehicles, where vegetation is not designated for removal under the Contract, and covers the installation of barriers.

769.02 Related Work - Section 165, Protection of the Environment; Section 200, Clearing and Grubbing; Section 201, Roadway and Drainage Excavation; Section 751, Topsoil and Landscape Grading.

769.03 Definitions

Specimen Trees - means trees so designated in the Contract Documents.

Native Vegetation - means areas of existing and/or indigenous shrubs, trees and groundcover.

Dripline - means the location on the ground surface directly beneath a theoretical line described by the tips of the outermost branches of trees.

Barrier - means fence consisting of approved material, supported by steel posts and being a minimum of 2.0 m high, without breaks or unsupported sections.

MATERIALS

769.11 Water - Water shall be free of impurities that would inhibit germination and growth or may be harmful to the environment.

The Contractor shall supply the water.

769.12 Fertilizer - Fertilizer shall be supplied to the specifications of the Special Provisions and to Subsection 751.18.

CONSTRUCTION

769.31 Operational Constraints - The Contractor's operations shall not damage vegetation designated for retention.

Existing vegetation shown on the Plans or designated by the Ministry Representative to be retained shall be marked by the Contractor and inspected by the Ministry Representative, who may adjust the limits. A minimum of 48 hours notice shall be given to the Ministry Representative for this purpose.

Areas shown on the plans adjacent to streams or as designated by the Ministry Representative as "Vegetation to remain" areas are not to be disturbed, cleared or logged.

The Contractor's operations shall not cause flooding, sediment deposits or deposition of debris in "Vegetation to Remain" areas.

Where construction procedures substantially alter natural drainage patterns, interim drainage or irrigation shall be provided as necessary to compensate for construction interference.

Construction procedures, stockpiling of materials or debris burning or disposal shall not be undertaken adjacent to designated trees and/or native vegetation retained.

Unless the Contract requires work within the dripline of trees designated to remain, equipment shall not be operated within that dripline. When the Contract requires work within the dripline of trees designated to remain, operation of equipment within that dripline area shall be kept to the minimum necessary to perform the work required, as required by the Ministry Representative. Tree roots shall be protected from compaction by temporary placement of hogfuel or other lightweight insulative material, as required by the Ministry Representative.

Equipment or vehicles shall not be parked, repaired or refuelled, construction materials shall not be stored and earth materials shall not be stockpiled within the dripline area of any tree designated to remain.

769.32 Clearing and Grubbing - No clearing and grubbing shall be conducted for a radius of 3 m from the trunks which lie on the edge of clearing and grubbing zones, or as directed by the Ministry Representative.

Trees to be removed shall be felled toward the centre of an area, away from selectively cleared or retained vegetation.

769.33 Barriers for Existing Vegetation Protection - Barriers for vegetation protection shall be erected prior to commencement of construction operations, at locations specified in the Plans, to provide a continuous barricade between vegetation and the area of work. The barriers shall be maintained erect and in good repair throughout the duration of construction operations, and shall be

removed upon completion of the work, and disposed of outside the project by the Contractor.

The barrier shall be placed at the dripline of trees or forest edges unless this is inadequate space to provide a 1.5 m buffer zone between the barrier and the limit of grading. The barrier shall be placed within the dripline if necessary to provide a buffer zone of up to 1.5 m. Under no circumstance shall it be placed less than 0.75 m from the circumference of the trunk. When the trunks of trees are less than 4.5 m apart, the trees shall be considered a group, and the barrier shall be placed to form a continuous barricade as specified in the Plans.

A barrier is not required where an existing fence will serve the same purpose. At such locations, the barrier shall terminate at the existing fence so that a continuous barricade is provided between the trees and the area of work.

769.34 Pruning and Repair of Specimen Trees - Specimen trees and trees safeguarded by barriers shall be repaired in accordance with this Subsection.

One third of the tree branches shall be selectively removed to reduce transpiration and compensate for dieback of roots in fill conditions and damage to the root system in cut conditions.

Within five calendar days of damage, branches 25 mm or greater in diameter that are broken as a result of the Contractor's operations shall be cut back cleanly at the break, or to within 10 mm of their base, if a substantial portion of the branch is damaged.

Roots 25 mm or larger in diameter that are exposed by the Contractor's operations, shall be cut back cleanly to the soil surface within five calendar days of exposure.

Bark that is damaged by the Contractor's operations shall be neatly trimmed back to uninjured bark, without causing further injury, within five calendar days of damage.

MAINTENANCE

769.71 Watering - The retained specimen trees shall be watered three times during the summer or as stated in the Special Provisions or as directed by the Ministry Representative. The area immediately below the tree crown shall be soaked sufficiently to reach the feeder roots.

769.72 Fertilizing - Where specified or directed by the Ministry Representative, fertilizer shall be applied at a rate of 50 g/mm of caliper to existing specimen trees to be retained. The caliper measurement shall be taken 0.3 m above the grade. The fertilizer shall be applied once early in the growing season unless specified otherwise.

MEASUREMENT

769.81 General - Measurement for barriers will be made in metres according to the length of barrier installed to protect vegetation.

PAYMENT

769.91 General - Payment at the unit price bid for barriers shall be full compensation for work described and all work subsidiary and incidental thereto for which separate payment is not elsewhere provided. Compensation for all costs other than installation of barriers associated with the work of protecting vegetation to be retained shall be deemed to be included in the contract prices for the various tender items of the contract.