# FORESHORE INVENTORY AND MAPPING

## *Standard Methods for Completion of Foreshore Inventory And Mapping Projects*

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With proper management, we may begin to find a balance within our ecosystems.  Without the ongoing support for inventory and mapping initiatives, the objective of sustainable development and balance will not be achieved.

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## 1.0    INTRODUCTION

Foreshore Inventory and Mapping is a methodology currently being employed to map the larger lakes of British Columbia experiencing land use and recreational pressures.  The protocol for Foreshore Inventory and Mapping (FIM) was first developed by the Regional District of Central Okanagan (RDCO), in conjunction with the Department of Fisheries and Oceans (DFO), Ministry of Environment (MOE), City of Kelowna, District of Lake Country, BC Conservation Foundation, and the Real Estate Foundation of British Columbia (Magnan and Cashin, 2004).  The intent of the project was to characterize shoreline areas around the central regions of Okanagan Lake so that sensitive ecosystems could be better managed.

Since 2005, numerous other lakes have been mapped using this methodology.  During 2008, the MOE, DFO (Community Mapping Network) and other stakeholders worked to update information collected during FIM to better reflect how this information is being used.  With the numerous ongoing works on FIM projects, it was in the best interest of land use managers to ensure a standardization of the FIM methodology.

## 2.0    FORESHORE INVENTORY AND MAPPING OVERVIEW

Foreshore Inventory and Mapping (FIM) is a GPS/GIS assessment of lake shorelines.  The methodology closely resembles that of Sensitive Habitat Inventory and Mapping (SHIM) (Mason and Knight, 2001), a GPS/GIS methodology developed for mapping streams and watercourses.  The concepts are similar to other land based spatial mapping initiatives (e.g., Terrestrial Ecosystem Mapping (TEM), Sensitive Ecosystem Inventories (SEI)).  However, for lake shorelines, the primary feature under review is the shore zone area.  For the purposes of this methodology, the shore zone is the area from the pelagic regions of the lake (deepwater) to 30 to 50 m past the high water level in the upland/riparian zone.  In FIM, spatial data describing the shore zone area is attributed to shoreline using a line feature.

The methodology developed incorporates standard practices developed by the Resource Inventory Committee for mapping of fish and fish habitat features.  It also adapts standards developed for stream SHIM mapping (Mason and Knight, 2001).  The methodology is typically completed in a three step process as follows:

1.  Video Documentation of the Lake Shoreline;
2.  Data Collection of biophysical and habitat attributes along the lake shoreline;
3.  Reporting and Data Analysis;

The intent of FIM projects is to catalogue and describe land uses (e.g., Residential Development), shoreline modifications (e.g., docks), and biophysical attributes (e.g., substrates) along lake shoreline.  Information collected allows resource managers at all levels of government to incorporate the information into a variety of land use planning documents including but not limited to:

1. Official Community Plans;
2. Shoreline Management Plans;
3. Land and Resource Management Plans;

For a complete review of background information or for use of a GPS/GIS software/hardware, readers should refer to the SHIM (Mason and Knight, 2001) and the Technical Addendum in Part 3 of the Central Okanagan FIM (Magnan and Cashin, 2004). These documents provide in depth documentation of background information for use of GPS/GIS technologies for mapping habitat features and watercourses. A brief summary of some GIS techniques is found in Appendix D.

### 2.1     Development of the Foreshore Inventory and Mapping Protocol

The following provides a summary of projects that have currently been completed using this methodology in British Columbia:

Table 1:  Foreshore Inventory and Mapping of Lakes Completed to Date

| Lake | Region | Year Completed |
|---|---|---|
| Okanagan Lake (Central portions) | Okanagan | 2004 |
| Osoyoos Lake | Okanagan | 2002 |
| Winderemere |  | 2006 |
| Skaha Lake | Okanagan | 2008 |
| Shuswap | Thompson | 2008 |
| Nicola Lake (Video) | Thompson | 2006 |
| Mara Lake | Thompson | 2008 |
| Moyie Lake | Kootenay | 2008 |
| Monroe Lake | Kootenay | 2008 |
| Rosen | Kootenay | 2008 |
| Tie | Kootenay | 2008 |
| Columbia | Kootenay | 2007 |
| Wasa | Kootenay | 2008 |
| Windemere | Kootenay | 2008 |
| Charlie | Peace | 2008 |
| Swan | Peace | 2008 |
| Dragon | Cariboo | 2008 |
| Sheridan | Cariboo | 2008 |
| Williams | Cariboo | 2008 |
| Bigelow | Skeena | 2008 |
| Call | Skeena | 2008 |
| Kathlyn | Skeena | 2008 |
| Lakelse | Skeena | 2008 |
| Round | Skeena | 2008 |
| Seymore | Skeena | 2008 |
| Tyhee | Skeena | 2008 |
| Gun | Thompson | 2008 |
| Montana | Thompson | 2008 |
| Pinantan | Thompson | 2008 |
| Sakinaw | Lower Mainland | 2008 |
| Ruby | Lower Mainland | 2008 |
| Sproat | Vancouver Island | 2008 |
| Horne | Vancouver Island | 2008 |
| Kemp | Vancouver Island | 2008 |
| Langford | Vancouver Island | 2008 |
| Prospect | Vancouver Island | 2008 |
| Cowichan Lake  (Video) | Vancouver Island | 2006 |

Since 2004, when the methodology was first developed for Okanagan Lake, land resource managers at local, provincial, and federal levels have begun to utilize data collected during FIM. Data collected during these inventories has been incorporated into Official Community Plans, has been used to prepare Aquatic or Ecological Habitat Indices (e.g., Schleppe and Arsenault, 2006; McPherson and Hlushak, 2008), and has been used to facilitate making informed land use decisions. The baseline inventory information collected can also be used for monitoring purposes, to develop land management objectives for a shoreline, and to develop shoreline management plans and policies.

Development of the data dictionary, or database, for FIM has undergone several different iterations over the past few years. Contributors to the ongoing FIM projects, the database and methodology are summarized in the acknowledgements section of this document. All funding partners who have provided to the development of the FIM protocol should be given recognition for the investments towards improved lake management.

During the summer of 2008, meetings were coordinated with the RDCO, Regional District of Okanagan Similkameen, City of Kelowna, MOE, and DFO to update the data dictionary to reflect current usage of the database and to ensure data collected is most appropriate to guide shoreline management. As part of these meetings, it was determined that there was a need to standardize the methodology for FIM, as recommended in the FIM report prepared for the central regions of Okanagan Lake (Magnan and Cashin, 2004). The following document is intended to provide this standardization by:

1. Providing an overview of field assessment techniques and methodologies;
2. Providing a detailed summary of the most recent FIM Data Dictionary (SHIM LAKE v. 2.6) (full dictionary is in Appendix C);
3. Reconciling previous versions of the database with the most current version so end users understand how the different fields have been adapted over time (see Appendix B for tabular summary);

## 3.0    FOREHORE INVENTORY AND MAPPING OVERVIEW

Foreshore Inventory and Mapping is generally a three step process, as follows:

1. Shoreline Video Documentation;
2. Shoreline Data Collection;
3. Data Analysis and Reporting.

During the Video Documentation (Step 1), a video is collected for the entire shoreline of a lake. The video is stamped with GPS coordinates that can be used to help with determination of where you are along the shoreline. The video documentation is typically referred to as Pass 1. During this pass, assessors should make note of significant features and begin to asses where shore segment breaks will be made.

Shoreline Data Collection (Step 2) is where most of the field data for the assessment is collected. This is often referred to as Pass 2. During this stage, data is entered into the

GPS data dictionary for all applicable fields.  Other information that may be collected includes shoreline habitat mapping (e.g., delineating the extent of shore marshes on air photos), mapping significant changes in substrates within a segment, etc.

During the Data Analysis and Reporting stage, data is transferred to a computer and then is processed.  During this step, data is reviewed and corrections are made as necessary.  It is preferred if data collectors also process data, as they have had first hand experience with field collection.  This review and correction of the data acts as a quality assurance process and is one of the most important steps in the process.  Finally, data is transferred to the shoreline, and segment breaks are adjusted so that they occur where intended during the field assessment.

Once these steps have been completed, this work is often times followed by more detailed data collection such as shoreline wildlife habitat mapping, shore marsh habitat mapping, shore spawning mapping, etc.  Other data bases have also been developed that are currently being used to assess compliance with best management practices and permitting.  With the accumulation of multiple data sets, end users then may also pursue Aquatic Habitat Index (AHI) development (e.g., Schleppe and Arsenault, 2006; McPherson and Hlushak, 2008).  The focus of this document is to detail data collection for items 1 through 3 above.  However, recommendations are presented to help facilitate future data management and integration (see Section 7.0).

## 4.0    FIELD ASSESSMENT

The field assessment, as discussed above, typically occurs during two steps.  The following sections will provide methodology for pre field requirements, shoreline video documentation, and shoreline data field collection.

### 4.1    Pre-Field Overview

During the pre field overview, assessors should gather as much background information as possible.  The pre field overview will help guide the field assessment to ensure that all information is collected.

During the pre field overview, the following information should be gathered, if possible:

1. The most recent digital (GIS) air photographs of the entire shoreline.  Air photos are valuable to help determine segment breaks, assess land uses, and to help assess important features such as the location of stream mouths.  Air photos are available for most areas of the province and have been flown at varying times. Preferably, air photos will be included in budgets for these projects to ensure the most recent information is available.

2. Any topography information for the shoreline.  Topographic information is available for almost all areas of the province from the TRIM mapsheets and can be

obtained digitally (GIS files).  This information can help assessors determine reach breaks and assess slope.

3. Local cadastre information for private holdings that occur along the shoreline.  This information is typically available digitally (GIS or AutoCAD files) from the local government, first nations offices, or regional districts.

4. Jurisdiction and Zoning information from local government, first nations, and regional districts.  This information can help assessors determine land uses and segment breaks.  In some instances, this information is available digitally (GIS files), but may also be available as map sheets from the local jurisdiction.

5. Any provincial parks boundaries, conservations areas, or other known features that occur along the shoreline.  Much of this information is available from the Land and Data Warehouse, provided by the Integrated Land Management Bureau.

Once the above information has been collected, assessors should prepare field maps that can be used to document information during their survey.  Field maps should show all available information possible in a concise manor.  Field maps are not required to complete the assessment, but are extremely valuable as they provide a method to record field observations that can be digitized in GIS later. Field maps are especially valuable to help with defining the locations of important shore marsh habitats and stream mouths, because often times the location of these features is not spatially accurate.  Matching field map grid sheets to the local government sheets can be helpful.

If field maps are generated, assessors can provide a pre field assessment of the shoreline.  During this assessment, possible segment breaks and other information can be set up to assist with the field inventory.

## 4.2    Shoreline Video

The purpose of recording lake shoreline video is to assist in classifying lake shore substrates, land use and land cover.  Detecting change over time as a result of development or natural disturbance can then be examined. The video can also be used to classify or validate the classification of shoreline segments and to assist in quantifying structures such as boat ramps and retaining walls.  Depending on the lake, it may be appropriate to capture video at a particular elevation such as high or low water.  For example, if video is captured during high water, the number of retaining walls that become submerged or partially submerged can be enumerated.

The selection of a boat is critical.  If possible, choose a boat that is stable under windy conditions and that has a small draft to avoid grounding when navigating near the shore.  An appropriate power supply such as a car or RV battery should be used with a power inverter to ensure there is adequate power for all of the recording equipment.

The following is a guide for recording georeferenced lake shoreline video. Video equipment is constantly being improved as well as recording methods. However, the tools are only as good as the operator so nothing replaces training, personal experience and practice. There are several models and several setup options for recording shoreline video so the following is to be used only as a guide.

Almost any digital video camera can be used successfully; however, users must become familiar with the video camera controls prior to going into the field. The video should be recorded no more than 50 m from shore if possible. One to two homes should be in the view of the video at one time. Do not use the digital zoom and try not to use the optical zoom if possible, otherwise the video will become blurry especially in rough conditions. The video should be recorded on dry, calm days if possible. A general rule is that the larger the waves, the poorer the quality of the resulting video. Other considerations include:

- good image stabilization
- analog output (mandatory)
- durability for use in the field conditions
- easy to use and reach buttons
- a lens shroud to protect from direct sunlight
- a polarized lens
- an excellent tripod with easy to use controls
- tape or harddrive storage media

Geo-referencing the video output by tagging each frame with a latitude and longitude is recommended. In addition, a GPS track line should be recorded at the same time using one second intervals. This will allow synchronization of the video with the GPS trackline for each shoreline segment.

Analog output from a digital video camera connects to a GPS stamper unit such as Horita or SeaTrak (figure 1). GPS output also connects to the GPS stamper unit. Output from the GPS stamper unit is recorded onto a digital video recorder or a personal computer. In the case of a digital video recorder, the use of a digital video player is useful in order to ensure the video output is correct.

Video files should be edited to remove any unwanted frames. A digital video recorder is very efficient for doing this task. Alternatively, video can be edited using video editing software such as Pinacle or Adobe on a PC.
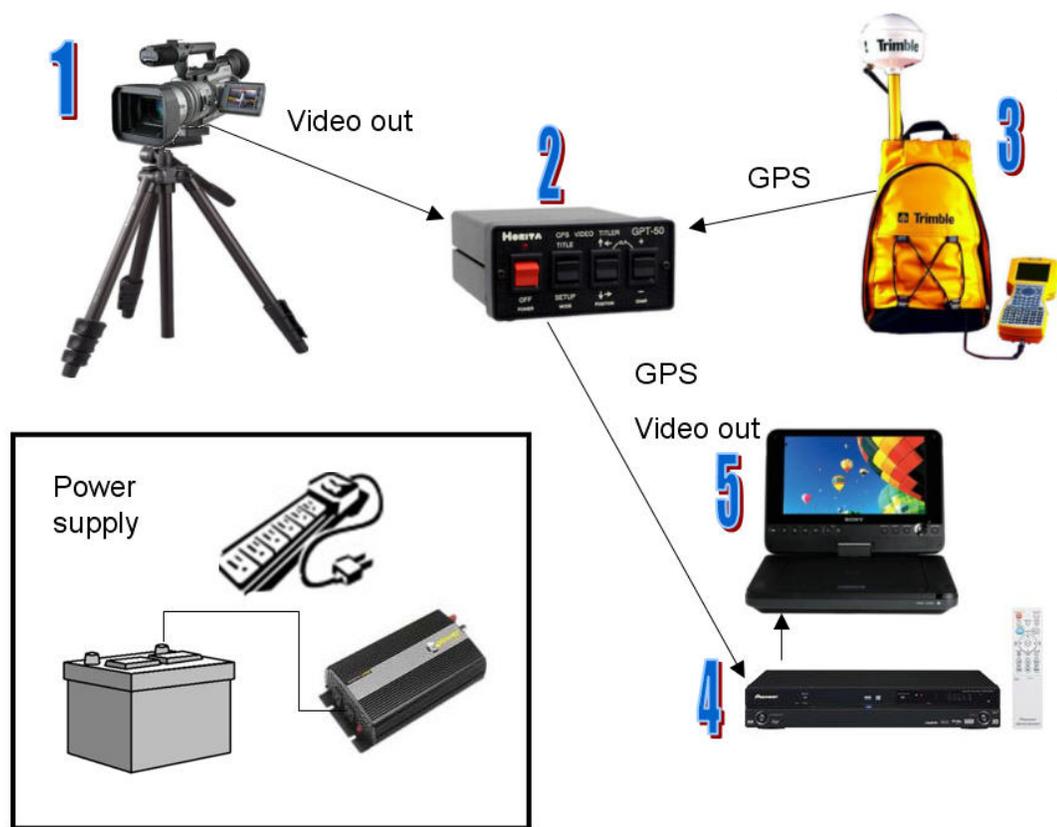
Figure 1: Shoreline video setup. 1) Digital video camera, 2) GPS stamper unit, 3) GPS data logger and receiver, 4) Digital video recorder, 5) Digital video player

### 4.3 Shoreline Data Field Collection

The shoreline field data collection involves the following different categories of information:

1. *Lake Reference* – This section of the data dictionary includes summary information for the lake being assessed and the crew assessing the information.
2. *Segment Class* – This section of the data dictionary includes a summary of the dominant features of the shore segment, such as land use, shore type, slope, etc.
3. *Shore Type* – This section includes specific information regarding the different shore types that occur along the shore segment.
4. *Land Use* – This section includes specific information regarding the different land uses that occur along the shore segment.
5. *Substrates* – This section includes specific information regarding substrates that occur along the shore segment.
6. *Vegetation Band 1* – This section includes specific information regarding the first distinctive band of vegetation. This section was previously called Riparian (See Appendix A).

7. *Vegetation Band 2* – This section includes specific information regarding the second distinctive band of vegetation.  This section was previously called Upland (See Appendix A).
8. *Littoral Zone* – This section contains specific information regarding littoral zone features of the shore segment.
9. *Modifications* – This section contains specific information regarding shoreline modifications, such as retaining walls and docks that exist along the shoreline.
10. *Flora and Fauna* – This section contains specific information regarding flora and fauna information, such as veterans and snags that exist along the shoreline segment.

Within each of the different sections above, data fields allow assessors to enter specific information into the GPS unit.  A field crew of three to four people (plus a boat skipper) is optimal for these assessments.  As there are many items that need to be counted and there is some interpretation required, at least one crew member should be very familiar with the database and have a good understanding of the methodology to guide other members of the crew.  During the assessment, crew members will assume different roles, such as counting docks, paying attention to substrates, etc. and it is preferred if crew members focus on their particular tasks rather than trading off part way through the assessment.  If assessors intend on trading of tasks part way through, they should thoroughly discuss their criteria and ensure that the other is familiar with their task.  A paper photo log should also be completed.  Assessors should take as many representative photos as possible of the shoreline to aid with data management and quality assurance review.

The following is a list of some of the field equipment that should be taken on the field assessment vessel:

1. Four to Eight Thumb Counters;
2. Field Maps for the entire shoreline (if available);
3. At least one GPS Unit with the data dictionary loaded (with a back up if available);
4. Digital Camera, or preferably a Digital Camera with GPS stamp;
5. Water proof field paper for field notes and data sheets (in case GPS unit fails);
6. Binoculars for viewing shore substrates and other features;
7. Required Safety Equipment such as life vests, rain gear, etc.

The following sections will provide specific information for interpreting and entering data into the data fields of the GPS unit.  Appendix A provides a summary of the following sections in tabular format.

### 4.3.1   Lake Reference

The Lake Reference section is intended to provide background information regarding the lake that is being assessed, field conditions during the assessment, and the crew completing the assessment.  The following is a summary of data fields and methods for this section of the dictionary (summarize in Appendix A).

1. *Lake Name* – This field is for the local lake name (gazetted or common name).

2. *Lake Level* – This field is for the level or elevation of gauges lakes on the date of the assessment.  On gauged lakes, lake level is typically the geodetic level (i.e., above sea level) of the lake the day the assessment was completed.  However, each gauging station will be benchmarked to a certain level and this standard should be used.  This will help people utilizing data understand at what water level the data was collected.  This field should be left blank if the lake level is unknown or if the lake is not gauged.  Some lake levels are available online at http://scitech.pyr.ec.gc.ca/waterweb/formnav.asp

3. *Secchi Depth* – This field is for entering the Secchi depth. Secchi depth is a measure of the point where a 20 cm weighted white line disappears from view when lowered from the shaded side of a vessel and that point where it reappears upon raising it.  This measurement should be made at mid-day as the results are more variable at dawn and dusk. Secchi depths vary depending upon the time of year measured and productivity of a lake, particularly in lakes with increased particulate matter (e.g., algae).  This measurement is not required, but can be included if assessors have the necessary equipment to complete it.

4. *Organization* – This field is to enter the organization that is completing the work.  Organizations include government, non-profit organization, or companies who are responsible for collection of the field data.

5. *Date and Time* – This field is for the date and time.  These fields allow assessors to enter the date and time of the assessment.  Some GPS units may enter this information automatically.

6. *Crew* – This field is for the crew completing the field assessment.  Assessors should enter the initials of all crew members on the vessel who are completing the assessment.

7. *Weather* - The weather is a categorical field.  Available options include Light Rain, Heavy Rain, Snow/Sleet, Over Cast, Clear, Partly Cloudy, and other.  This field should be filled in with the most appropriate weather observed throughout the day.  If the Other category is chosen, field assessors should identify the weather in the comments field.

8. *Air and Water Temperature* – The air and water temperature fields allows assessors to enter in the temperature during the assessment.

9. *Jurisdiction* – The jurisdiction field is to identify the governmental entity that has predominant governance over the shore segment being assessed. Typically, this would be a local government, regional district or First Nations band. In some cases, the shoreline may occur along crown land or within a provincial park.  If possible, field assessors should break segments at all major changes in jurisdiction to allow

for better management of shore line segments. If a segment break is not included at a change in jurisdiction, the jurisdiction with the predominant length of shoreline should be listed here and the secondary jurisdiction should be noted in the comments field.

10. *Comments* – The comments field is for assessors to enter any relevant information regarding the lake information.

### 4.3.2  Segment Class

The Segment Class section is intended to provide a summary of the dominant land uses, shore types, and other characteristics of the entire shore segment. The following is a summary of data fields and methods for this section of the dictionary (summarize in Appendix A).

1. *Segment Number* – The shoreline segment number is a field that identifies the shore segment. The shore segment if the fundamental unit of FIM and each shore segment is characterized by attributes (e.g., land use, shore type, vegetation) that are similar. Typically, shore segments begin at 1 and continue until the entire shoreline has been mapped. However, in some instances, shore segments may begin at another number, particularly in cases where only portions of a lake are mapped at various different time periods. Shore segments should generally have a similar land use, shore type, vegetation, and substrates. The minimum length of shoreline for a shore segment is 50 m and there is no maximum to the length of a shore segment. Generally, assessors will create more segments in densely developed areas due to changes in vegetation cover and land use than they will under more natural conditions, when shorelines tend to be more similar for longer stretches.

   **Determining Shore Segment Breaks**

   Shore segments should consider the following different criteria:

   a. Shore Type is a primary characteristic (defined below) that should be used to assess shore breaks;
   b. Land Use is another primary characteristic (discussed below) that should be used to assess shore segments. Changes from residential development to single family development, for instance, could warrant a segment break.
   c. Vegetation is another characteristic that can be used to determine segment breaks. Significant differences in vegetation coverage are typically associated with changes in land use also, but sometimes can be due to differences in property management.
   d. Stream Mouths are extremely important shore types and should be given their own segments for important fish habitat streams.

2. *Shore Type*– Shore type is a categorical field that describes the predominant shore type that occurs along the length of the shore segment (i.e., the highest percentage

of the linear shoreline length).    Shore types include Cliff/Bluff, Rocky Shore, Gravel, Sand, Stream Mouth, Wetland, and Other.   If other is selected, comments should be included to describe the shore type observed.  Definitions for each of the above shore types are found in the Shore Type Section discussed below.

3. *Shore Type Modifier* – The shore type modifier field is used to describe significant shoreline activities that influence the shoreline.  The field is categorical and choices include Log Yard, Small Marina (6-20 slips), Large Marina (greater than 20 slips), Railway, Roadway, None, and Other.   If Other is selected, the comments field should be used to identify the modifier.   If the field is left blank, users should assume that there is no shoreline modifier.

   a. *Log Yard* – A log yard is an area where logs are temporarily stored until they are moved to a lumber mill.   Log yards typically have large log breakwaters, log booms, and associated loading / unloading facilities.
   b. *Large and Small Marina* – A marina is any type of location where boats are moored.  A boat slip is where each boat is moored and each finger of a dock may be used to moor two boats (i.e., one on each side).  Marinas can either be on pile supported or floating structures.  Marinas may have associated breakwaters, fueling stations, boat launches, etc. Also, marinas can be associated with commercial or multi family dwellings.
   c. *Railway* – Railways constructed within 5 to 10 m or below the high water level are another shore type modifier.  Railways should only be considered a modifier if they are within 0 to 15 m of the shoreline and there is no private holdings between the railway and the shoreline.  Decommissioned railways can be considered a railway modifier.
   d. *Roadway* – The roadway modifier identifies shore segments where a roadway occurs directly adjacent to the shoreline.  Roadway should only be considered a modifier when they are within 10 to 15 m of the shoreline and there are no private holdings between the roadway and the shoreline.  Boat launch access roads are not considered a roadway modifier.

4. *Slope* – Slope is a categorical determination of the slope or gradient of the shoreline. Categories include Low (less than 5%), Moderate (5-20%), Steep (20-60%), Very Steep (>60%), and Bench. A Bench is a shoreline that rises, typically steep or very steep, has a flat area typically greater than 15 horizontal meters, and then becomes steep or very steep again.  On bluff shore types, where the shoreline rises sharply and then flattens, the categorical statement should describe the steep portion of the shoreline (i.e., do not use bench).

5. *Land Use* – Land use is a categorical field that is used to describe the predominant land use observed along the segment.  Categories include Agriculture, Commercial, Conservation, Forestry, Industrial, Institution, Multi-Family, Natural Area, Park, Recreation, Single Family, Rural, and Urban Park.  Land use can be determined based upon a combination of field observation, review of zoning and bylaw maps,

and air photo interpretation.  Please refer to detailed definitions of the different land use types to better understand the different categories below.

6. *Level of Impact* - Level of Impact is a categorical field that is used to describe the general disturbance that is observed along the shoreline.   Disturbances are considered any anthropogenic influence that has altered the shoreline including foreshore substrates, vegetation, or the shoreline itself (e.g., retaining walls).  Level of impact is considered both looking at the length of the shoreline (i.e., along the segment) and the depth of the shore zone area to between 15 to 50 m back.  In more rural settings, typically the assessment area is greater (i.e., 50 m) and in more developed shorelines, typically the assessment area is less (i.e., 15 to 30 m).  In cases of roadways or railways, one should generally consider the location of the rail or roadway along the segment (i.e., how far back is it set, is the lake infill, etc.).  To facilitate interpretation of this category, air photo interpretation is recommended to better estimate disturbance. Disturbance categories include High (>40%), Medium (10-40%), Low (<10%), or None.  Consistency of determination is very important and assessors should use the same criteria to determine the level of impact.  The RDCO Foreshore Inventory and Mapping report defines the *Level of Impact* as follows (Magnan and Cashin, 2004):
    a. *Low* - Segments that show little or limited signs of foreshore disturbance and impacts. These segments exhibit healthy, functioning riparian vegetation. They have substrates that are largely undisturbed, limited beach grooming activities, and no to few modifications.
    b. *Moderate* - Segments that show moderate signs of foreshore disturbance and impacts. These segments exhibit isolated, intact, functioning riparian areas (often between residences). Substrates (where disturbed) exhibit signs of isolated beach grooming activities. Retaining walls (where present) are generally discontinuous. General modifications are well spaced and do not impact the majority of the foreshore segment.
    c. *High* - Segments that show extensive signs of disturbance and impacts. These segments exhibit heavily disturbed riparian vegetation, often completely removed or replaced with non-native species. Modifications to the foreshore are extensive and likely continuous or include a large number of docks. Generally, residential development is high intensity. Modifications often impact a majority of the foreshore.

7. *Livestock Access* - Livestock access is a categorical field that is used to determine whether livestock, such as cattle, have access to the foreshore.  Choices include Yes, No or blank.  If the field is left blank, one should assume that cattle do not have access.

8. *Disturbed* – The disturbed field allows assessors to enter the percentage of the shoreline that is disturbed by anthropogenic influence.  This is a measurement of the approximate length and depth of the shore zone that has been disturbed. Assessors should use a combination of field observations and air photo interpretation to determine the percentage disturbed.  Generally, the percentage

disturbed should correspond to the level of impact (i.e., a high percentage of disturbance should translate into a High level of impact). The summation of the Percentage Disturbed and the Percentage Natural should equal 100%. If air photo field maps are available, use of a scale ruler can help assessors determine the percentage that has been disturbed. Although this field is somewhat qualitative, assessors should do their best to be consistent and to be as quantitative as possible.

9. *Natural* – The natural field is the percentage of the shoreline that is natural. This is a measurement of the approximate length and depth of the shore zone that remains in a natural condition. Assessors should use a combination of field observations and air photo interpretation to determine the percentage disturbed. Generally, the Percentage Natural should correspond to the level of impact. The summation of the Percentage Disturbed and the Percentage Natural should equal 100%. If air photo field maps are available, use of a scale ruler can help assessors determine the percentage that has been disturbed. Although this field is somewhat qualitative, assessors should do their best to be consistent and to be as quantitative as possible.

The remaining fields that are included in the data dictionary are described in Appendix A. These fields do not have any specific methodology and are for information purposes.

### 4.3.3   Shore Type

The Shore Type section is intended to provide a summary of the different shore types that may occur over the entire shore segment. In many cases, one shore type will be predominant in a segment, with other shore types occurring to a smaller extent. Examples of this include rocky shorelines, with intermittent gravel beach areas in depositional areas. The shore type section allows assessors to enter in the approximate percentage of the shore segment that is occupied by the different shore types.

When determining the percentage of a segment that a shore type occupies, assessors should utilize whatever data is available to them. During the field assessments, scaled air photos can be used to determine the approximate percentage. If field maps are not available, assessors should use best judgment to estimate the percentages. As segment lengths become longer, it becomes more difficult to estimate the percentage of a segment a particular shore type occupies. Given this, an assessor should be cognizant of the distance traveled, boat speed, and other factors when judging the percentage of the segment.

Initial shore type fields were developed by the Resources Inventory Committee (RIC, 2001) and were subsequently refined and adapted for the FIM of Okanagan Lake (Magnan and Cashin, 2004). The shore types below were again refined during the summer of 2008 in discussions with the MOE, DFO, and local government stakeholders and consultants. The most significant change in SHIM Lake v.2.6 is the removal of the Vegetated Shore Type. This shore type was removed because all shore types describe physical aspects of the shoreline whereas the vegetated shore type described vegetation characteristics. The following is a summary of data fields and methods for this section of the dictionary (summarize in Appendix A).

1.  *Cliff / Bluff Shoreline*– The Cliff / Bluff field allows assessors to enter the percentage of the segment, based upon the shore segment length, that is a cliff or bluff shore type. A cliff shore type is typically very steep with substantial vertical elements that are greater than 70º or 275%. A bluff shore type is typically steep or very steep, and then flat for a substantial distance, typically formed by the fast recession of water levels during glacial periods. Bluff substrates tend to consist mostly of silts and clays.



The above photos are examples of a cliff shoreline (left) and a bluff shoreline (right).

2. *Rocky Shoreline* – The Rocky Shoreline field allows assessors to enter the percentage of the segment, based upon the shore segment length, which is rocky. Rocky shores consist mostly of boulders and bedrock, with components of large cobble and some gravels.  These shores tend to occur on steeper shorelines. Previous versions of the data dictionary called these shorelines low rocky shorelines or possibly (but less so) vegetated shorelines.



The photo above is an example of a typical rocky shoreline. Sometimes, a rocky shoreline may contain less bedrock and larger boulders.  Substrates on these shoreline should consist predominantly of larger cobbles, boulders, and bedrock.

3.  *Gravel Shoreline* – The Gravel shoreline field contains the percentage of the segment, based upon the shore segment length, that is a gravel beach.  Gravel beach shorelines tend to occur on Low or Moderate slopes, and substrates are predominantly gravels and cobbles.  These shore types may also contain small percentages of boulders and / or bedrock.  Often times, gravels beaches and rocky shores occur along one segment, with gravel shore types occurring in depositional areas (i.e., in bays) and rocky shores (i.e., at points) occurring in erosion areas.  Previous data base versions may have also referred to these shorelines as vegetated shores.



The photo above shows a typical gravel beach.  Notice that substrates consist mostly of gravels and cobbles.  Gravel shorelines may also have boulders and periodic patches of bedrock in some instances.  In previous database versions, a shoreline such as this may also have been referred to as a vegetated shore.

4. *Sand Shoreline* – The Sand Shoreline type contains the percentage of the shoreline, based upon the shore segment length, which is a sand beach. Sand beach shorelines tend to occur within low gradient areas and consist predominated of sands and small gravels. These shore types may also contain some gravel shoreline areas in places that are more exposed to wind and wave action (e.g., points).



The photo above shows a typical sandy shoreline.

5.  *Stream Mouth* – The Stream Mouth field contains the percentage of the shoreline, based upon the shore segment length, which is a stream confluence.  A stream mouth is defined as the space where there is a confluence between a lake and a stream or a river and the stream has direct influence on sediment movements and deposition or is part of the active floodplain.  Typically, the stream mouth segment is larger for rivers and smaller for creeks.  A separate segment should be created for significant fisheries streams, such as those known to contain spawning populations of anadramous salmon.



The photo above is the Adams River on Shuswap Lake.
This is a good example of a stream mouth segment.

6.  *Wetland* – The Wetland shore type field contains the percentage of the shoreline, based upon the shore segment length, which is a shore marsh wetland.  A wetland segment typically occurs on low gradient sites, the littoral zones is wide and shallow, substrates are predominantly silts, organics, or clays, and there is emergent vegetation present.  The Wetlands of British Columbia defines a shore marsh as a seasonally or permanently flooded non tidal mineral wetland that is dominated by emergent grass like vegetation.  The BC Wetland book contains descriptions of some of the wetland shore types that may be observed along lake shorelines

The photo above shows an example of a wetland shore type. Notice the significant amounts of emergent vegetation. The Wetlands of British Columbia A Guide to Identification (MacKenzie and Moran, 2004) book provides specific classifications for the different types of marshes that occur.

The remaining fields that are included in the data dictionary are described in Appendix A. These fields do not have any specific methodology and are for information purposes.

### 4.3.4  Land Use

The Land Use section allows assessors to provide more detail regarding existing land uses. Land use categories have been created to generally correspond with a broad range of local government zoning bylaws. Other categories have been created to correspond with provincial, non-profit, and federal government land use types (e.g., natural areas parks, conservations areas, etc.). In many cases, shore segments will have only one land use type. However, in some instances, land uses may slightly vary along a segment and the differences do not warrant creation of a new shore segment. These fields allows users to enter the percentage of the shoreline, based upon the shore segment length, which the different land uses occupy.

When determining the percentage of a segment that a shore type occupies, assessors should utilize whatever data is available to them. During the field assessments, scaled air photos can be used to determine the approximate percentage. If field maps are not available, assessors should use best judgment to estimate the percentages. As segment lengths become longer, it becomes more difficult to estimate the percentage of a segment a

particular shore type occupies. Given this, an assessor should be cognizant of the distance traveled, boat speed, and other factors when judging the percentage of the segment.

1. *Agriculture* – The agriculture land use field is the percentage of the shoreline, based upon the shore segment length, which is predominantly used for crop based agricultural or as active livestock range lands (i.e., extensive holding areas, large numbers of cattle etc.). Livestock pastures that are not active rangelands (i.e., a few cows or horses) are typically considered a rural land use and not an agriculture land use (see rural). These lands are typically part of the Agriculture Land Reserve or aprovincial range tenure.

2. *Commercial* - The Commercial land use field is the percentage of the shoreline, based upon the shore segment length, which is predominantly used for commercial purposes. Commercial purposes include retail, hotels, food establishments, marinas with fuel, stores, etc. Commercial areas tend to occur along highly impacted shorelines. Where feasibly, significant commercial areas should be part of one segment because the land use on these shore types has a different assortment of potential impacts. Commercially zoned, but yet to be constructed areas, may also warrant there own segment.

3. *Conservation* - The Conservation land use field is the percentage of the shoreline, based upon the shore segment length, which is predominantly used for conservation of critical or important habitats. Examples of conservation shorelines include lands held by the Land Conservancy, biological reserves, etc. Conservation lands cannot occur on privately held shorelines, unless conservation covenants or other agreements are in place to protect areas in perpetuity.

4. *Forestry* - The Forestry Land use field is the percentage of the shoreline, based upon the shore segment length, which is predominantly used for forestry. These areas are typically crown lands that are part of active cut blocks or forestry operations. Log Yards are considered an industrial land use and are not considered a Forestry Land because they tend to have associated industrial infrastructure.

5. *Industrial* - The Industrial land use field is the percentage of the shoreline, based upon the shore segment length, which is predominantly used for industrial purposes. Examples of industrial purposes include log yards, processing facilities, lumber mills, etc. These shorelines are typically heavily impacted by infrastructure, impervious surfaces, buildings, etc.

6. *Institutional* - The Institutional land use field is the percentage of the shoreline, based upon the shore segment length, which is predominantly used for institutional purposes. Examples of institutional land uses include schools, public libraries, etc.

7. *Multi-Family Residential* - The Multi-Family land use field is the percentage of the shoreline, based upon the shore segment length that is predominantly used for

multi-family residences.  Multi-family developments are typically condominiums, apartments, or town homes.

8.  *Natural Areas* - The Natural Areas land use field is the percentage of the shoreline, based upon the shore segment length, which are predominantly undisturbed crown lands.  These areas do not occur in provincial or federal parklands and cannot be privately held.

9.  *Park* - The Park land use field is the percentage of the shoreline, based upon the shore segment length, which are predominantly natural areas parklands.  These parks areas can be provincial, federal, or local government parks.  These parks tend to be relatively undisturbed and natural.  They differ from urban parks (discussed below), which are used intensively for recreational purposes (e.g., public beaches).

10. *Recreation* - The Recreation land use field is the percentage of the shoreline, based upon the shore segment length, which is predominantly used for recreational purposes. Examples include public or private campgrounds, areas of known cabin rentals, etc.  In some cases recreational shoreline may also be referred to as a single family land use, depending upon how much information is known about them.  Generally, if a shoreline contains privately held cabins that are rented out occasionally, these should be referred to as single family land uses rather than recreational.

11. *Rural* - The Rural land use field is the percentage of the shoreline, based upon the shore segment length, which is predominantly used for rural purposes.  These shorelines are typically large lots, private estates, or hobby farms.  Differentiation between rural and single family land use can be difficult when lots are narrow but deep (i.e., buildings appear dense on the shoreline but extend quite far back).  When doubt exists between a rural designation and a single family land use, assessors should be consistent in their judgments and refer back to local government zoning or bylaws to help decide on the appropriate land use type.

12. *Single Family Residential* - The Single Family Residential land use field is the percentage of the shoreline, based upon the shore segments length, which is predominantly used for single family residential purposes.  Typically, single family residential occurs in more densely developed areas.  However, seasonal use cottages or cabins can often be considered single family residential areas if the dwellings have associated outbuildings, docks, and other features consistent with more densely developed areas.  In areas where the there are numerous seasonal use cabins and cottages, assessors should consider this single family residential if lots have smaller lake frontages and land uses and buildings are consistent with single family types of development.  If lake frontages for seasonal use cabins and cottages are quite large, the land use would be considered rural.  The differentiation between rural and single family in these cases can be difficult and assessors should be consistent in their determination.

13. *Urban Parklands* - The Urban Park land use field is the percentage of the shoreline, based upon the shore segments length, which is predominantly used as an urban park. Examples of this land use include public beaches, picnic areas, etc. Shorelines dominated by this land use tend to have limited riparian vegetation and contain extensive areas of turf in the understory.

The remaining fields that are included in the data dictionary are described in Appendix A. These fields do not have any specific methodology and are for information purposes.

## 4.3.5 Substrates

The substrate section of the data dictionary allows assessors to enter in detailed information regarding foreshore substrates. Shore substrates are important for a variety of reasons and can influence primary productivity. When describing shore substrates, assessors should describe a *representative distribution* of substrates along the shoreline. It is acknowledge that shore substrates are variable along shore segments; with many areas have concentrations of coarse or fine materials. Thus, this section provides a description of the distribution of substrates and may not be representative of particular micro-sites that occur along the segment.

When assessing substrates, the entire shore segment should be considered. In many cases, small amounts of a particular substrate type may be observed (e.g., one small bedrock outcrop along a gravel shoreline). In these cases, a value of 1% should be used to acknowledge the presence of this substrate type along the shore segment.

Shore substrates are best viewed at low water levels because more of the foreshore is visible. However, often assessments do not coincide with these periods. Thus, binoculars are extremely helpful to help determine substrates along a shoreline. They allow assessors to better assess particle size to appropriately fill in data fields. Assessors may also wish to exit the vessel and visually inspect the shoreline substrates. The data fields in the data dictionary allow assessors to enter in detailed information for highly visible shorelines and summary information for less visible shorelines (e.g., Gravels can be entered as total gravels or sub described as fine and coarse gravels). As segment lengths become longer, it becomes more difficult to estimate the percentage of a segment a particular shore type occupies. Given this, an assessor should be cognizant of the distance traveled, boat speed, and other factors when judging the percentage of the segment.

The following are descriptions of the different substrate type fields that occur within the data dictionary. Substrate definitions below are derived from the SHIM manual (Mason and Knight, 2001) and Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures (2001)

1. *Marl* - The Marl substrate field allows assessors to enter the relative percentage of marl occurring along the shoreline. Marl is a substrate that is typically white in color, associated with clear lakes and consists of loose clay, precipitated calcium

carbonate, mollusk/invertebrate shells, and other impurities.  Marl substrates would often be associated with fines, mud, or organics depending upon the lake.

2.  *Mud* - The Mud substrate field allows assessors to enter the relative percentage of mud occurring along the segment.  Mud is a substrate that is typically dark in color and consists of a mixture of silts, clays, and finely decayed organic material that is not typically discernable.

3.  *Organics* - The Organic substrate field allows assessors to enter the relative percentage of organic materials that occur along the shoreline.  Organic substrates are typically associated with wetland sites and consist of detritus material that is identifiable to some extent (e.g., sticks, leaves, etc.).  Organics generally do not form a large proportion of the substrates unless the shore segment is an extremely productive wetland.

4.  *Fine Substrates* - The Fine Substrate field allows assessors to enter the relative percentage of fines that occur along the shoreline.  Fines consist of silts and clays and these substrates are typically less than 0.06 mm in size.  Fines are differentiated from mud because there is little to no organic content.

5.  *Sand Substrates* - The Sand substrates field allows assessors to enter the relative percentage of sands that occur along the shoreline.  Sands are any particle that contains granular particles visible to the naked eye.  These particles are typically .06 to 2 mm in size.

6.  *Gravel Substrates* - The Grave substrates field allows assessors to enter the relative percentage of gravels that occur along the shoreline.  Gravels are particles that range from 2 mm to approximately 64 mm.  Thus, they are the size of a lady bug to the size of a tennis ball or orange.  This field should only be used when substrates are difficult to identify and assessors cannot determine whether fine or coarse gravels (see below).

7.  *Fine Gravel Substrates* - The Fine Gravel substrates field allows assessors to enter the relative percentage of fine gravels that occur along the shoreline.  Fine gravels are particles that are 2 mm to approximately 16 mm or the size of a ladybug to the size of a grape.  This field should only be used when assessors have good visibility and can confidently identify fine gravels.  If this field is used, the general gravel category should *not* be used.

8.  *Coarse Gravel Substrates* - The Coarse Gravel substrates field allows assessors to enter the relative percentage of coarse gravels that occur along the shoreline.  Coarse gravels are particles that are 16 mm to approximately 64 mm or the size of a grape to the size of a tennis ball or orange.  This field should only be used when assessors have good visibility and can confidently identify coarse gravels.  If this field is used, the generally gravel category should *not* be used.

9. *Cobble Substrates* - The Cobble substrates field allows assessors to enter the relative percentage of cobbles that occur along the shoreline. Cobbles are particles that are 64 to 256 mm in size (tennis ball to basketball).

10. *Fine Cobble Substrates* - The Fine Cobble substrates field allows assessors to enter the relative percentage of fine cobbles that occur along the shoreline. Fine cobbles are particles that are 64 to 128 mm in size (tennis ball to coconut). This field should only be used when assessors have good visibility and can confidently identify fine cobbles. If this field is used, the general cobble category should *not* be used.

11. *Coarse Cobble Substrates* - The Coarse Cobble substrates field allows assessors to enter the relative percentage of course cobbles that occur along the shoreline. Coarse cobbles are particles that are 128 to 256 mm in size (coconut to basketball). This field should only be used when assessors have good visibility and can confidently identify coarse cobbles. If this field is used, the general cobble category should *not* be used.

12. *Boulder Substrates* - The Boulder substrates field allows assessors to enter the relative percentage of boulders that occur along the shoreline. Boulders are particles that are greater than 256 mm in size (bigger than a basketball). These substrates can not typically be lifted by one person as they are too heavy.

13. *Bedrock Substrates* - The Bedrock substrates field allows assessors to enter the relative percentage of bedrock that occurs along the shoreline. Bedrock is consider any rock where blocks are larger than 4 m or is solid, un-weathered underlying rock.

14. *Embeddedness of Substrates* - Embeddedness is a categorical field that allows assessors to enter the approximate embeddedness of substrates. Embeddedness is a measure of the degree to which boulders, cobbles and other large materials are covered by fine sediments. Categories for embeddedness include None (0%), Low (0 to 25%), Medium (25-75%), High (>75%), or Unknown. When assessors are unclear of the embeddedness they should either complete measurements of foreshore substrates or leave the field as unknown.

15. *Substrate Shape* - Shape is a categorical field that allows assessors to identify the shape of larger particles such as cobble or boulders. Angular shapes refer to naturally occurring angular rock material that has not been substantially weathered. Blast rock refers to angular blast rock materials, such as rip rap. Smooth materials are rocks that are generally rounded. This field should be used to describe the predominant substrates that occur along the shoreline (e.g., if 85 % of the substrates are round and smooth, and 10% are blast rock, the field should be used to describe the 85%).

The remaining fields that are included in the data dictionary are described in Appendix A. These fields do not have any specific methodology and are for information purposes.

### 4.3.6 *Vegetation Bands (Vegetation Band 1 & 2)*

The Vegetation Bands sections of the data dictionary are intended to allow assessors to describe lake side vegetation that occurs. The data dictionary includes two sections, Vegetation Band 1 and Vegetation Band 2, which are almost identical. The addition of a second Vegetation Band occurred during the summer of 2008 because in many cases there are two distinctive vegetation zones that exist adjacent to lakes. Other dictionaries have called these two sections Riparian and Upland. The riparian zone, tends to occur in moist areas, and often transitions to drier upland areas. Also, in many wetlands, there is a wide band of emergent shrubs and willows, and then a riparian zone beyond the wetland features. When assessing Vegetation Bands, assessors should consider everything within 50 m of the shoreline and possible the band of emergent riparian vegetation associated with wetland features. The approximate length of the bands considered is the sum of Vegetation Band 1 and 2 Bandwidths.

Vegetation bands can be extremely variable along a segment. Assessors should focus on the primary or dominant vegetation observed along the segment and people utilizing the data must understand that this overview inventory cannot describe every micro-site that may exist. When assessing the different bands, assessors should consider both the linear length and depth of the bands. The intent is to describe a representative section of the shore segment.

In highly urbanized or impacted areas, it is often difficult to define a clear band. In these cases, it is generally preferred to limit the assessment to the first row of development, which often times results in describing only one vegetation band. In other cases, shorelines may not contain two distinctive bands of vegetation. In these circumstances, assessors should only describe the shoreline with one vegetation band, leaving the second band blank. The comments field is a useful section that allows assessors to describe exactly what is being described. Also, the bandwidth fields (discussed below) are helpful because they give an indication of the width of the band.

The following sections describe all fields that occur in Vegetation Band 1 and 2. Fields are duplicated in Vegetation Band 2 and are therefore only described once here. Please refer to Appendix A for a tabular description of information below.

1. *Vegetation Class* - The Vegetation Band 1 Land Cover Class is a description of the predominant vegetation class present. Categories are largely derived from the SHIM Module 4 (Mason and Knight, 2001).

     a. The Coniferous Class occurs where tree cover is at least 20% of the shore zone area and at least 80% of the trees are coniferous.

b.  The Broadleaf Class occurs where the tree cover is at least 20% and at least 65% of the trees are broadleaf or deciduous.
c.  The Mixed Forest Class occurs where tree cover is at least 20% and there are no more than 80% coniferous trees and no more than 65% broadleaf trees.
d.  The Shrubs Class occurs where tree coverage is less than 10% and there shrubs cover at least of 20%.  Shrubs are defined as multi-stemmed woody perennial plants.
e.  The Herbs / Grasses Class occur where there is less than 10% tree coverage and less than 20% of shrubs.
f.  The Exposes Soil Class occurs where recent disturbance, either anthropogenic or natural, has occurred and mineral soils are exposed.
g.  The Landscape Class refers to urbanized areas where most natural vegetation has been replaced by at least 30% coverage of ornamental trees, shrubs, and other vegetation.
h.  The Lawn Class occurs in urbanized areas where turf grasses cover at least 30% of the shore zone area and landscaping with ornamental shrubs or trees is less than 30% coverage.
i.  The Natural Wetland Class occurs where shore marshes dominate the shore zone area and they have not been significantly influenced by human disturbance.
j.  The Disturbed Wetland Class occurs where shore marshes predominate the shore zone area and they have experience significant disturbance (i.e., greater than 30%).
k.  The Row Crops Class occurs in agricultural areas where crops are growing. If sites are agricultural, but are not used for row crops (e.g., pasture lands), they should be described as Herbs/Grasses and comments should be used to indicate the agricultural nature of the shore segment.
l.  Un-vegetated Sites occur where there is less than 5% vegetation cover and at least 50% of the vegetation cover is mosses or lichens.  Un-vegetated sites tend to occur on rocky, exposed shorelines.

2.  *Vegetation Stage* - The Vegetation Band 1 Stage is a description of the structural stage of the dominant vegetation.  Categories are largely derived from the SHIM Module 3 and the Field Manual for Describing Terrestrial Ecosystems (MOE, 1998).  On highly developed shorelines, assessors should attempt to describe the structural of the dominant vegetation type observed.

a.  The Sparse Stage describes sites that are in the primary or secondary stages of succession, with vegetation consisting mostly of lichens and mosses, and the total shrub coverage is less than 20% and tree coverage is less than 10%.
b.  The Grass / Herb Stage describes sites where shore zones are dominated by grasses and herbs, as a result of persistent disturbance of natural conditions (e.g., grasslands).
c.  The Low Shrubs stage describes sites that are dominated by shrubby vegetation less than 2 m in height.

d. The Tall Shrubs Stage is dominated by vegetation that is 2 to 10 m in height and seedlings and advance regeneration may be present.

e. The Pole / Sapling Stage describes sites that contain trees greater than 10 m in height, typically densely stocked, and there is little evidence of self thinning or vertical structure.

f. The Young Forest Stage describes sites that are typically less than 40 years old (but could be as great as 50 to 80 years depending upon the forest community), self thinning is evident, and the forest canopy has begun to differentiate into distinct layers.

g. The Mature Forest Stage describes sites that are typically 40 to 80 years old (but could be as high as 140 years), and the understory is well developed with a second cycle of shade trees.

h. The Old Forest Stage describes sites that are typically greater than 80 years old and the stands are structurally complex. Old Forests contain abundant coarse woody debris at varying stages of decay. Old Forests are at least 80 years in age, but may be as old as 250 years and should be considered relative to the forest community assessors are in.

3. *Shrub Cover* - The Shrub Coverage categorically describes shrub coverage within the shore zone. Shrubs are defined as multi-stemmed woody perennial plants. Sparse sites have less than 10% shrub coverage. Moderate shrub coverage occurs on sites that have between 10 to 50% coverage. Abundant shrub coverage occurs on sites that have greater than 50% shrub coverage.

4. *Tree Cover* - The Tree Cover categorically describes tree coverage within the shore zone. Sparse sites have less than 10% tree coverage. Moderate tree coverage occurs on sites that have between 10 to 50% coverage. Abundant tree coverage occurs on sites that have greater than 50% tree coverage.

5. *Distribution* - The Distribution field is used to describe whether the vegetation band described is continuous along the entire shore segment. Categories include Continuous and Patchy (for sites where the dominant vegetation band occurs in patches along the segment). An example of a patchy distribution is a shore segment where most areas are extensively landscaped, with the exception of a few shore lots which remain relatively natural. In this case, the dominant landscaped area would be described and comments would be used to identify residual natural areas.

6. *Bandwidth* - The Vegetation Band 1 Bandwidth field is used to provide an estimate of the approximate width of the band being described. In cases where bandwidth varies along the segment, a representative width should be used to describe the shore segment. The intent of this field is to provide a general description of the width of the vegetation band that is being described and users of the database need to consider this when assessing data within the database.

7. *Overhanging Vegetation* - The Overhanging Vegetation field is used to describe the percentage of the shore segment length that contains significant overhanging

vegetation. Overhanging vegetation should be considered as if the lake was at full pool or the mean annual high water level.

8. *Aquatic Vegetation* - The Aquatic Vegetation field is used to describe the percentage of the shoreline that contains emergent, submergent, and floating aquatic vegetation. This field is the combined length of aquatic vegetation along the segment, not considering overlapping areas.

9. *Submergent Vegetation* - The Submergent Vegetation field is used to describe the percentage of the shoreline segment that contains submergent vegetation. Submergent vegetation includes species such as milfoil, *Potamogeton* spp., etc.

10. *Submergent Vegetation Presence* - The Submergent Vegetation Presence field is used to indicate whether submergent vegetation is present along the segment. In cases where assessors cannot determine the percentage of the segment but are aware it is present, this field should be used.

11. *Emergent Vegetation* - The Emergent Vegetation field is used to describe the percentage of the shoreline segment that contains emergent vegetation. Emergent vegetation includes species such as cattails, bulrushes, varies sedges, willow and cottonwood on floodplains, grasses, etc.

12. *Emergent Vegetation Presence* - The Emergent Vegetation Presence field is used to indicate whether emergent vegetation is present along the segment. In cases where assessors cannot determine the percentage of the segment but are aware it is present, this field should be used.

13. *Floating Vegetation* - The Floating Vegetation field is used to describe the percentage of the shoreline segment that contains floating vegetation. Floating vegetation includes species such as pond lilies, etc.

14. *Floating Vegetation Presence* - The Floating Vegetation Presence field is used to indicate whether floating vegetation is present along the segment. In cases where assessors cannot determine the percentage of the segment but are aware it is present, this field should be used.

The remaining fields that are included in the data dictionary are described in Appendix A. These fields do not have any specific methodology and are for information purposes.

### 4.3.7 Littoral Zone

The Littoral Zone section of the data dictionary includes biophysical information about the littoral zone within the segment. Air photos are extremely helpful for determining the width of this zone, but are not necessary. The data fields in this section are quite easy to fill out and interpretation is not that difficult.

1. *Littoral Zone* - The Littoral Zone Width Category provides a general classification of the littoral zone. Wide littoral zones are greater than 50 m. Moderate littoral zones are 10 to 50 m in width, and narrow littoral zones are less than 10 m wide.

2. *Large Woody Debris* - The Large Woody Debris (LWD) presence field allows assessors to indicate whether LWD is present along the segment. Categories include less than 5 Pieces, 5 to 25 Pieces, and greater than 25 Pieces.

3. *Large Woody Debris Number* - The LWD count field allows assessors to enter the total number of LWD pieces counted along the shore segment. Only significant pieces of LWD, which are contributing to fish habitat, should be counted.

4. *Littoral Zone Width* - The Littoral Zone Width field allows assessors to enter the average littoral width of the segment. This field can be determined using air photo interpretation or field measurements. Typically, the field is rounded to the nearest 5 m as the number is intended to be representative of the segment.

The remaining fields that are included in the data dictionary are described in Appendix A. These fields do not have any specific methodology and are for information purposes.

### 4.3.8 Modifications

The Modifications section allows assessors to enter a summary of all of the different types of shoreline modifications that may occur along the shore segment. Most of the categories described in this section are features or structures that are counted. However, some of the fields require assessors to pay attention to the percentage of the segment that modifications are observed along. As mentioned above, assessors need to be cognizant of boat speed, distance traveled, and this relationship to the feature in question. Again, use of air photos to estimate and scale shoreline length to determine the percentage is extremely beneficial and improves the accuracy of measurements.

1. *Retaining Walls* - The Retaining Wall count field is the total number of retaining walls occurring along the segment. Retaining walls should only be counted if they are within 5 to 10 m of the high water level. Retaining walls must have a vertical element that is greater than 30 cm and must be retaining earth to some degree. On steep sloping sites, more than one retaining wall may be present (i.e., the property is tiered). In these cases each retaining wall is counted.

2. *Percent Retaining Walls* - The Percent Retaining Wall field indicates that approximate percentage of the shore segment length where retaining walls occur.

3. *Docks* - The Docks Count field is the total number of pile supported or floating docks or swimming platforms that occur along the segment. Properties may have more than one dock present and each different structure is considered a separate dock. For instance, a property could have one swimming float and one dock.

4. *Docks per Kilometer* - The Docks per Kilometer field is determined during post processing. This field is calculated by dividing the total number of docks observed by the total length of the shore segment.

5. *Boat House* - The Boat House count field is used to count boat houses that occur along the segment. Boat Houses are structures that are specifically designed to house boats or watercraft. Boat Houses can either be located on land or as structures over the water. If only structures over the water are counted, assessors should be consistent and make note of this so end users are aware of what definition was used for a boat house. If structures on land are considered as boat houses, a rail or boat launch should be present that land owners use to launch the boat to the lake. Garages that house boats should not be counted as boat houses because there is not an associated launch structure.

6. *Groynes* - The Groyne count field is used to count any structure that is perpendicular to the shoreline that is impacting regular sediment drift along the shoreline. Groynes can be constructed out of concrete, rock, piles, wood, or other materials. Docks or other structures that are acting as groynes, and affecting sediment movement should be included in the groyne count. Rock lines that are too small to significantly impact sediment movement should not be counted as a groyne.

7. *Groynes per Kilometer* - The Groynes per Kilometer field is determined during post processing of data. This field is calculated by dividing the total number of groynes observed by the total length of the shore segment.

8. *Boat Launch* - The Boat Launch count field is the total number of boat launches that were observed along the shoreline. Generally, only permanent boat launches are counted (e.g., made of concrete). However, on small systems assessors may choose to count gravel boat launches as these may be the only type present. Assessors should document criteria used to determine what constitutes a boat launch during the assessment.

9. *Percent Rail Modifier* - The Percent Rail Modifier field is used to describe the percentage of the linear shore segment length that contains railways in close proximity to the shoreline.

10. *Percent Road Modifier* - The Percent Road Modifier field is used to describe the percentage of the linear shore segment length that contains a roadway in close proximity to the shoreline.

11. *Marine Railways* - The Marine Rail count field is the total number of marine rails that occur along a shore segment. Marine Rails are a track system that is used to remove boats from a lake during the winter months.

12. *Marinas* - The Marinas Field is the total number of large and small marinas that were documented along the shoreline. A marina is considered to be any pile supported or floating structure that has slips for 6 or more boats.

13. *Substrate Modification Presence* - The Substrate Modification Presence field is used to document whether substrate modification is occurring along the shore segment. Substrate modification includes any type of importation of sands, significant movement of natural substrates (e.g., to construct groynes), or earthworks.

14. *Percent Substrate Modification* - The Percent Substrate Modification field is the estimated percentage of the shore segment where substrate modification has occurred.

The remaining fields that are included in the data dictionary are described in Appendix A. These fields do not have any specific methodology and are for information purposes.

### 4.3.9   Flora and Fauna

The Flora and Fauna sections contain specific information for flora and fauna observations and data along the shore segment. The fields in this section are quite self explanatory and are either count or comments fields.

1. *Veterans* - The Veterans field is a categorical field to describe the number of veteran trees that occur along the shore segment. Veteran trees are defined as a tree that is significantly older than the dominant forest cover and provides increased structural diversity. Categories include no, less than 5 trees, 5 to 25 trees, and greater than 25 trees.

2. *Snags* - The Snags field is a categorical field to describe the number of dead standing snags that occur along the shore segment. Snags are defined as dead standing trees that provide increased structural diversity. Categories include no, less than 5 trees, 5 to 25 trees, and greater than 25 trees.

3. *Flora and Fauna Comments* – These fields are important to note observations made. Examples of important observations are known spawning areas, osprey or other birds of prey nesting locations, etc. Significant features should be individually mapped if possible, especially sensitive nesting areas, etc.

## 5.0   DATA PROCESSING AND QUALITY ASSURANCE

The data processing and quality assurance portions of these projects are extremely important. It is preferred if assessors carry out these steps because they have firsthand knowledge of the shoreline and its condition. Although data entry into the GPS unit results in minimal errors (i.e., forgotten fields, etc.), there is often times small items that are

missed or accidentally overlooked.  It is during the data processing stages that data gets reviewed and finalized.

## 5.1     Data Processing

Data processing for FIM projects is slightly different than SHIM (Mason and Knight, 2001).  Module 5 of the SHIM manual provides very detailed information regarding accuracy requirements for stream mapping.  This manual should be referred to as it contains useful information regarding standard GPS receivers, data logging, and other requirements that field assessors need to know and be able to do.  The methodology below is intended to provide assessors with a summary of the post processing steps that occur as part of a FIM project and does not contain a summary of methods for use of the GPS or GIS software.

### *5.1.1     Accuracy and Determining the Shoreline Location*

Typically accuracy targets for stream mapping are 5 m (Mason and Knight, 2001).  These targets are realistic for stream mapping, but are not possible while carrying out boat surveys of a shoreline.  Generally, boat surveys are done 20 to 30 m from the actual shoreline being measured.  Thus, there is an immediate accuracy issue, as the line feature being collected with the GPS unit is already inaccurate because it is 20 to 30 m from the shoreline.  Thus, precision mapping with the GPS is not required for FIM projects (i.e., PDOP values) because of the inherent data inaccuracies.

Accuracy of shore segment information ultimately relates to the accuracy of the shoreline.  Mapped shorelines and the spatial data associated with them should be attached the approximate high water level of the shoreline.  The above highlights how accuracy is not feasible with a FIM boat survey.  Thus, shoreline accuracy with these surveys is typically obtained using air photo interpretation, detailed topographic modeling, or by using existing lake shoreline information.  Each of the above provides a different level of accuracy, and typically a combination approach is preferred.  Accuracy of the shoreline segment features can affect the following:

1.  The length of the shoreline segment;
2.  The location of segment breaks;
3.  Calculation in the data base such as docks per kilometer.

The first step in post processing is to accurately identify the location of the approximate high water level of the lake being assessed.  This can be accomplished, as mentioned above, by using one or a combination of the following:

1.  Creation of the shoreline by air photo interpretation using changes in vegetation, retaining walls, and other visible features;
2.  Using a topographical model and spatial analyst software to calculate an elevation, which can be used for a shoreline (e.g., 343 m asl is often used for Okanagan Lake); and,

3.  Using existing TRIM shoreline;

There are distinct advantages and disadvantages to each of the above. Advantages of air photo interpretation are that it tends to be quite accurate with good air photos. However, it also tends to be quite time consuming to complete. Use of spatial analyst software is possible, but often the data available to create the model is not very accurate and the software is extremely costly. Use of the TRIM shorelines is very cost efficient, but this line work can often be quite inaccurate (i.e., up to 20 linear m in some instances). Given the above, assessors must consider the accuracy requirements of their assessments to ensure that the desired accuracy is achieved. Assessors should attempt to achieve the 5 m accuracy recommendations of SHIM and utilize whatever means necessary within allowable budgets to achieve these results. GIS software allows data to be updated as increased accuracy becomes possible.

### 5.1.2   Segment Breaks

Segment breaks are often determined in field assessments by marking field air photos that were produced for the survey because it is more efficient than manually marking the point using the GPS. These visual markers allow segment breaks to be easily added to the shoreline once it has been determined (above) and allows field crews to be very specific about where the break is being made from the boat. If air photo field maps are not possible, assessors are strongly encouraged to manually mark the segment break using a point feature on the GPS unit. Using offset features, it is possible to mark this from the vessel. This is recommended because it is the most accurate ways to ensure the segment break occurs where desired on lakes without high resolution air photos.

Once the shoreline has been mapped, and segment breaks have been determined, the database should be "transferred" to the shoreline. This process involves moving the spatial line features to the shoreline with the appropriate breaks. Some databases include the transferred GPS settings (e.g., PDOP data). This data can be retained, but is somewhat unnecessary because it is associated with line features collected in the boat survey and not associated with the manually determined shoreline features discussed above.

### 5.2   Data Management and Quality Assurance

Data management is extremely important. One of the typical GPS settings used is a copy feature that allows assessors to quickly begin a segment. However, use of this feature can result in data field carry over (i.e., substrate data from Segment 25 is carried over to Segment 26. The assessor forgets to zero a substrate percentage and the number carries over. The substrates total now exceeds 100%). Therefore, once data has been collected, it must be proofed. This process involves review of photos, data fields, etc. The following are specific items that should be reviewed:

1.  Lake Reference – Errors in data collection are not common in this section. Clean up of spelling and comments is most common.

2. Segment Class – In this section, the shore type and shore modifier fields are most important and percentages in other sections should be consulted to confirm. Review percentages and ensure that photo numbers are correct. Video time can be entered if available.

3. Shore Type – Field pictures and air photos should be reviewed in conjunction with field data entered. Typically, only minor adjustments are required to ensure data adds to 100%.

4. Land Use – Land use is often more difficult to determine in rural areas. Often times, digital data is lacking and land use is assessed by field interpretation. Review of local government zoning is helpful as it provides a basis for interpretation. Assessors should do their best to document land uses as observed, and adjustments should be made as necessary.

5. Substrates – Field photos can be reviewed, to assist in final determination of substrates. Generally, these fields just need to be reviewed to determine that they add to 100%. Substrates are intended to provide a broad overview of the distribution of segment.

6. Vegetation Bands – Review of field photos is extremely helpful to review these fields. Having a large number of photos can help assessors in ensuring these sections are accurate. Adjustments should be made as necessary.

7. Littoral Zone – These fields are usually quite accurate. A review of air photos to look at the littoral zone widths will help improve accuracy.

8. Modifications – In these fields, the docks per kilometer and groynes per kilometer need to be calculated. These field as calculated as follows:
   a. Dock (or groynes) per Kilometer = # of Docks / Shore Segment Length
   Other items to pay attention to are modifiers. Airphotos and photos should be carefully reviewed to confirm these fields.

9. Flora and Fauna – These fields usually just need to be briefly reviewed and added as necessary.

Review and finalization of the spatial location of the shoreline, segment breaks, and associated data is very important and assessors should do their best to review data sets.

## 6.0   REPORTING

Reporting for FIM is a budget dependant item. Reporting is not as important as field data collection, review, and verification. Thus, a variety of different reporting can be completed and the reporting completed varies with budgets and time allotted for the project. Reporting should focus on identification of key concerns observed along the shoreline and data analysis should be used to corroborate findings.

### 6.1   Data Analysis

Data analysis can be completed in numerous different ways using FIM databases. Most reports prepared to date have followed the templates developed by the RDCO for the central regions of Okanagan Lake. There reports contain numerous different graphs, figures, and correlations prepared using the dataset, and all help with understanding and

interpreting data. Important correlations can lead to a better understanding of modified shorelines.

Integration of biophysical data with spatial data and analysis is also important. These types of analyses often follow and examples include the various different aquatic habitat indices that have been developed. Ultimately, the shore segments described above provide a basis for long term monitoring and data analysis for lake shorelines because new spatial and biophysical data may be appended to the database from future assessments.

## 7.0　RECOMMENDATIONS FOR ONGOING DATA MANAGEMENT

The following are recommendations for management of these data sets:

- One location should be determined to hold the master database for the different lake systems being assessed. Spatial data management is a big responsibility and one authority should be determined to hold master data sets. However, municipalities, consultants, non-profit organizations, and the public should all have access to data. Local governments are also good at holding and managing data sets because often times they routinely utilize data on a day to day basis. Regardless, one government body should maintain responsibility for data sets.

- As new data is gathered (e.g., AHI), it should be appended to the FIM database. Sub databases should be considered (e.g., detailed substrate mapping, more detailed modifications inventories, etc.) as they are developed. Any sub data bases should be referenced in the FIM Database as a field or column of data. The **Shore Segment Number** should be used as the unique identifier for all sub data sets created. Examples of this include geo hazard assessments, shore spawning assessments, substrate mapping, etc.

- Funding should be allocated at all levels to facilitate ongoing data management and collection. These inventories form the basis for all future land management and land use decisions for large lakes. They will help managers at all levels of government work within a unified framework for understanding environmental data and managing the complex aquatic systems associated with our large interior lakes.

- The most recent data base version is SHIM LAKE v. 2.6. This report has attempted to identify and consolidate versions of the dictionary. Future revisions of the methodology should provide a reference guide for changes / additions.

## 8.0   REFERENCES

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**Appendix A – Foreshore Inventory and Mapping Field Code Definitions**

| Dictionary Section | Abbreviated Database Column Heading | Un-Abbreviated Column Heading | Previous Database Column Headings (if different) | Type | Definition | Unit of Measurement |
|---|---|---|---|---|---|---|
| Lake Reference | LAKE_NAME | Lake Name | | Alphanumeric | Local lake name | |
| | LAKE_LEVEL | Lake Level | | Numeric | On gauged lakes, lake level is the geodetic level (i.e., above sea level) of the lake the day the assessment was completed. This will help people utilizing data understand at what water level the data was collected. This field should be left blank if the lake level is unknown or if the lake is not gauged. | |
| | SECHI_DEPT | Secchi Depth | | Numeric | Secchi depth is a measure of the point where a 20 cm weighted white line disappears from view when lowered from the shaded side of a vessel and that point where it reappears upon raising it. This measurement should be made at mid-day as it results are more variable at dawn and dusk. Secchi depths vary depending upon the time of year measured and productivity of a lake, and in lakes with increased particulate matter (e.g., algae). | Meter |
| | ORGANIZATI | Organization | | Alphanumeric | Organization is the government, non-profit organization, or companies who are responsible for collection of the field data. | |
| | DATE_ | Date | | Alphanumeric | Date field data was collected. | |
| | TIME_ | Time | | Time | Time field data was collected. | |
| | CREW | Crew | | Alphanumeric | The initials of all field crew, including boat skippers, should be included. | |
| | WEATHER | Weather | | Categorical | The weather is a categorical field. Available options include Light Rain, Heavy Rain, Snow/Sleet, Over Cast, Clear, Partly Cloudy, and other. This field should be filled in with the most appropriate weather observed throughout the day. If the Other category is chosen, field assessors should identify the weather in the comments field. | |
| | AIR_TEMP_ | Air temperature | | Numeric | Air temperature is the temperature observed during the assessment. | Celsius |
| | WATER_TEMP | Water Temperature | | Numeric | Water temperature is the water temperature observed during the assessment. This field is not mandatory. | Celsius |
| | JURISDICTI | Jurisdiction | | Alphanumeric | Jurisdiction is the governmental entity that has predominant governance over the shoreline being assessed. Typically, this would be a local government, regional district or native band. In some cases, the shoreline may occur along crown land or within a provincial park. If possible, field assessors should break segments at all major changes in jurisdiction to allow for better management of shore line segments. If a segment break is not included at a change in jurisdiction, the jurisdiction with the predominant length of shoreline should be listed here and the secondary jurisdiction should be noted in the comments field. | |
| | COMMENTS | Comments | | Alphanumeric | The comments field allows assessors to enter applicable information that is not included in the data field above. | |
| Segment Class | SEGMNT_NUM | Shoreline Segment Number | | Numeric | The shoreline segment number is a field that identifies the shore segment. Typically, shore segments begin a 1 and continue until the entire shoreline has been mapped. A shore segment is an area of with similar land use, shore type, vegetation, and substrates. | |
| | SHORE_TYPE | Shore Type | | Categorical | Shore type is a categorical field that describes the predominant shore type that occurs along the length of the shore segment (i.e., the highest percentage of the linear shoreline length). Shore types include Cliff/Bluff, Rocky Shore, Gravel, Sand, Stream Mouth, Wetland, and Other. If other is selected, comments should be included to describe the shore type observed. | |
| | SHORE_MODI | Shore Type Modifier | | Categorical | The shore type modifier field is used to describe significant shoreline activities that influence the shoreline. The field is categorical and choices include Log Yard, Small Marina (6-20 slips), Large Marina (greater than 20 slips), Railway, Roadway, None, and Other. If other is selected, the comments field should be used to identify the modifier. If the field is left blank, users should assume that there is no shoreline modifier. | |
| | SLOPE | Slope | | Categorical | Slope is a categorical determination of the slope or gradient of the shoreline. Categories include Low (less than 5%), Moderate (5-20%), Steep (20-60%), Very Steep (>60%), and Bench. A bench is a shoreline that rises, typically steep or very steep, has a flat area typically greater than 15 horizontal meters, and then becomes steep or very steep again. On bluff shore types, where the shoreline rises sharply and then flattens, the categorical statement should describe the steep portion of the shoreline (i.e., do not use bench). | |

| Dictionary Section | Abbreviated Database Column Heading | Un-Abbreviated Column Heading | Previous Database Column Headings (if different) | Type | Definition | Unit of Measurement |
|---|---|---|---|---|---|---|
| Segment Class | LAND_USE | Land Use | | Categorical | Land use is a categorical field that is used to describe the dominant land use observed along the segment. Categories include Agriculture, Commercial, Conservation, Forestry, Industrial, Institution, Multi-Family, Natural Area, Park, Recreation, Single Family, Rural, and Urban Park. Land use can be determined based upon a combination of field observation, review of zoning and bylaw maps, and air photo interpretation. Please refer to detailed definitions of the different land use types to better understand the different categories. | |
| | LEV_OF_IMP | Level of Impact | | Categorical | Level of impact is a categorical field that is used to describe the general disturbances that are observed along the shoreline. Disturbances are considered any anthropogenic influence that has altered shoreline including foreshore substrates, vegetation, or the shoreline (e.g., retaining walls). Level of impact is considered both looking at the length of the shore line (i.e., along the segment) and the depth of the shore zone area to between 15 to 50 m back. In more rural settings, typically the assessment area is greater (i.e., 50 m) and in more developed shorelines, typically the assessment area is less (i.e., 15 m). In cases of roadways or railways, one should generally assess the location of the rail or roadway along the segment. To facilitate interpretation of this category, air photo interpretation is recommended to better estimate disturbance. Disturbance categories include High (>40%), Medium (10-40%), Low (<10%), or None. Consistency of determination is very important and assessors should consistently use the same criteria to determine the level of impact. | |
| | LIVEST_ACC | Livestock Access | | Categorical | Livestock access is a categorical field that is used to determine whether livestock, such as cattle, have access to the foreshore. Choices include Yes or No or blank. If the field is left blank, one should assume that cattle do not have access. | |
| | DISTURBED | Percentage of the Shoreline that is Disturbed | | Numeric | Percentage of the shoreline that is disturbed is a measurement of the approximate length and depth of the shore zone that has been disturbed. Assessors should use a combination of field observations and air photo interpretation to determine the percentage disturbed. Generally, the percentage disturbed should correspond to the level of impact (i.e., a high percentage of disturbance should translate into a High level of impact). The summation of the Percentage Disturbed and the Percentage Natural should equal 100%. | % |
| | NATURAL_ | Percentage of the Shoreline that is Natural | | Numeric | Percentage of the shoreline that is natural is a measurement of the approximate length and depth of the shore zone that remains in a natural condition. Assessors should use a combination of field observations and air photo interpretation to determine the percentage disturbed. Generally, the percentage natural should correspond to the level of impact. The summation of the Percentage Disturbed and the Percentage Natural should equal 100%. | % |
| | PHOTONUM | Photo Number | | Alphanumeric | Photo number is a field that is used to enter in digital or still photos taken during the assessment. | |
| | TAPE_NUMB | Tape Number | | Alphanumeric | Original Video tape number | |
| | VIDEO_TIME | Video Time | | Alphanumeric | Delineates that start and stop time of the video segments. Assessors may also just enter in the start time of the segment, as it is generally inferred that the start time of one segment corresponds with the stop time of a previous segment. | |
| | CMMNT_CLAS | Class Comments | | Alphanumeric | The comments field allows assessors to enter applicable information that is not included in the class data fields above. | |
| Shore Type | CLIFF_BLUF | Cliff and/or Bluff Shore Type | | Numeric | The Cliff / Bluff field contains the percentage of the segment, based upon the shore segment length that is a cliff or bluff shore type. A cliff shore type is typically very steep with substantial vertical elements. A bluff shore type is typically steep or very steep, and then flat for a substantial distance, typically formed by the fast recession of water levels during glacial periods. | % |
| | ROCKY | Rocky Shore Type | Low Rocky Shoreline and/or Vegetated Shoreline | Numeric | The Rocky Shoreline field contains the percentage of the segment, based upon the shore segment length that is rocky. Rocky shores consist mostly or boulders and bedrock, with components of large cobble and some gravels. These shores tend to occur on steeper shorelines. Previous versions of the data dictionary called these shorelines low rocky shorelines or possible (but less so) vegetated shorelines. | % |

| Dictionary Section | Abbreviated Database Column Heading | Un-Abbreviated Column Heading | Previous Database Column Headings (if different) | Type | Definition | Unit of Measurement |
|---|---|---|---|---|---|---|
| Shore Type | GRAVEL2 | Gravel Shore Type | Gravel Beach Shore Type | Numeric | The Gravel shore type field contains the percentage of the segment, based upon the shore segment length that is a gravel beach. Gravel beach shorelines tend to occur on Low or Moderate slopes, and substrates are predominantly gravels and cobbles. These shore types may also contain small percentages of gravels and or bedrock. Often times, gravels beaches and rocky shores occur along one segment, with gravel shore types occurring in depositional areas (i.e., in bays) and rocky shores (i.e., at points) occurring in erosion areas. | % |
| | SAND2 | Sand Shore Type | Sand Beach Shore Type | Numeric | The Sand shore type field contains the percentage of the shoreline, based upon the shore segment length that is a sand beach. Sand beach shorelines tend to occur in low gradient shorelines and are predominated by sands and small gravels. These shore types may also contain some gravel shoreline areas in places that are more exposed to wind and wave action (e.g., points). | % |
| | STREAM_MOU | Stream Mouth Shore Type | Alluv_Fan or Alluvial Fan | Numeric | The Stream Mouth shore type field contains the percentage of the shoreline, based upon the shore segment length that is a stream mouth. A stream mouth is defined as the space where there is a confluence between a lake and a stream or a river and the stream has direct influence on sediment movements and deposition or is part of the active floodplain. Typically, the stream mouth segment is larger for rivers and smaller for creeks. A separate segment should be created for significant fisheries streams, such as those known to contain spawning populations of anadramous salmon. | % |
| | WETLAND | Wetland Shore Type | | Numeric | The Wetland shore type field contains the percentage of the shoreline, based upon the shore segment length that is a shore marsh wetland. A wetland segment typically occurs on low gradient sites, the littoral zones is wide and shallow, substrates are predominantly silts, organics, or clays, and there is emergent vegetation present. The Wetlands of British Columbia defines a shore marsh as a seasonally or permanently flooded non tidal mineral wetland that is dominated by emergent grass like vegetation. The BC Wetland book contains descriptions of some of the wetland shore types that may be observed along lake shorelines | % |
| | OTHER | Other Shore Type | | Numeric | The Other shore type field allows assessors to enter in shore types that do not fit into one of the general categories above. If the other shore type field is used, assessors should add comments to describe the shore type and provide justification for use of the other field. Examples of other shore types may include constructed boat access canals. | % |
| | STYPE_COMM | Shore Type Comments | | Alphanumeric | The comments field allows assessors to enter applicable information that is not included in the shore type data fields above. | |
| Land Use | AGRICULTUR | Agriculture Land Use | | Numeric | The agriculture land use field is the percentage of the shoreline, based upon the shore segment length that is predominantly used for crop based agricultural or as active livestock range lands (i.e., extensive holding areas, large numbers of cattle). Livestock pastures that are not active rangelands (i.e., a few cows or horses) are not considered an agriculture land use (see rural). | % |
| | COMMERCIAL | Commercial Land Use | | Numeric | The Commercial Land use field is the percentage of the shoreline, based upon the shore segment length that is predominantly used for commercial purposes. Commercial purposes include retail, hotels, food establishments, marinas with fuel, stores, etc. Commercial areas tend to occur along highly impacted shorelines. | % |
| | CONSERVATION | Conservation Land Use | | Numeric | The Conservation Land use field is the percentage of the shoreline, based upon the shore segment length that is predominantly used for conservation of critical or important habitats. Examples of conservation shorelines include lands held by the Land Conservancy, biological reserves, etc. Conservation lands cannot occur on privately held shorelines, unless conservation covenants or other agreements are in place to protect areas in perpetuity. | % |
| | FORESTRY | Forestry Land Use | | Numeric | The Forestry Land use field is the percentage of the shoreline, based upon the shore segment length that is predominantly used for forestry. These areas are typically Crown Lands that are part of active cut blocks. Log Yards are not considered a Forestry Land use as they are Industrial. | % |
| | INDUSTRIAL | Industrial Land Use | | Numeric | The Industrial Land use field is the percentage of the shoreline, based upon the shore segment length that is predominantly used for industrial purposes. Examples of industrial purposes include log yards, processing facilities, lumber mills, etc. These shorelines are typically heavily impacted. | % |

| Dictionary Section | Abbreviated Database Column Heading | Un-Abbreviated Column Heading | Previous Database Column Headings (if different) | Type | Definition | Unit of Measurement |
|---|---|---|---|---|---|---|
| Land Use | INSTITUTIO | Institutional Land Use | | Numeric | The Institutional Land Use field is the percentage of the shoreline, based upon the shore segment length that is predominantly used for institutional purposes. Examples of institutional land uses include schools, public libraries, etc. | % |
| | MULTI_FAMI | Multi-Family Land Use | LU_URB_RES or Urban Residential Land Use | Numeric | The Multi-Family Land Use field is the percentage of the shoreline, based upon the shore segment length that is predominantly used for multi-family residences. Multi-family developments are typically condominiums or town homes. | % |
| | NATURAL_AR | Natural Areas | | Numeric | The Natural Areas Land use field is the percentage of the shoreline, based upon the shore segment length that is predominantly natural crown lands. These areas do not occur in provincial parklands and cannot be privately held. | % |
| | PARK | LU_PARK or Park | | | The Park Land Use field is the percentage of the shoreline, based upon the shore segment length that is predominantly natural areas parklands. These parks areas can be provincial, federal, or municipal parks. These parks tend to be predominantly natural and are different from urban parks, which are used intensively for recreational purposes (e.g., public beaches). | % |
| | RECREATION | Recreation Land Use | | Numeric | The Recreation Land Use field is the percentage of the shoreline, based upon the shore segment length that is predominantly used for recreational purposes. Examples include public or private campgrounds, areas of known cabin rentals, etc. In some cases recreational shoreline may also be referred to as single family land uses, depending upon how much are known about them. Generally, if a shoreline contains privately held cabins that are rented out occasionally, these should be referred to as single family land uses rather than recreational. | % |
| | RURAL | Rural Land Use | | Numeric | The Rural Land Use field is the percentage of the shoreline, based upon the shore segment length that is predominantly used for rural purposes. These shorelines are typically large lots, private estates, or hobby farms. Differentiation between rural and single family land use can be difficult when lots are narrow but deep (i.e., appear dense on the shoreline but extend quite far back). When doubt exists between a rural designation and a single family land use, assessors should be consistent in their judgments and refer back to local government zoning or bylaws to help decide on the appropriate land use type. | % |
| | SINGLE_FAM | Single Family Residential | LU_URB_RES or Urban Residential Land Use | Numeric | The Single Family Residential Land Use is the percentage of the shoreline, based upon the shore segments length that is predominantly used for single family residential purposes. Typically, single family residential occurs in more densely developed areas. However, seasonal use cottages or cabins can often be considered single family residential areas if the dwellings have associated outbuildings, docks, and other features consistent with more densely developed areas. | % |
| | URBAN_PARK | LU_PARK or Park | | | The Urban Park Land Use is the percentage of the shoreline, based upon the shore segments length that is predominantly used as an urban park. Examples of this land use include public beaches, picnic areas, etc. Shorelines dominated by this land use tend to have limited riparian vegetation and contain extensive areas of turf in the under story. | % |
| | LANDU_COMM | Land Use Comments | | Alphanumeric | The comments field allows assessors to enter applicable information that is not included in the shore type data fields above. | % |
| Substrates | MARL | Marl Substrate | SUB_FINES or Fine Substrates | Numeric | The Marl substrate field allows assessors to enter the relative percentage of marl occurring along the shoreline. Marl is a substrate that is typically white in color associated with clear lakes and consists of loose clay, precipitated calcium carbonate, mollusk/invertebrate shells, and other impurities. | % |
| | MUD | Mud Substrates | SUB_FINES or Fine Substrates | Numeric | The Mud substrate field allows assessors to enter the relative percentage of mud occurring along the segment. Mud is a substrate that is typically dark in color and consists of a mixture of silts, clays, and finely decayed organic material that is not typically discernable. | % |
| | ORGANIC | Organic Substrates | SUB_FINES or Fine Substrates | Numeric | The Organic substrate field allows assessors to enter the relative percentage of organic materials that occur along the shoreline. Organic substrates are typically associated with wetland sites and consist of detritus material that is identifiable to some extent (e.g., sticks, leaves, etc.). | % |
| | FINES | Fine Substrates | SUB_FINES or Fine Substrates | Numeric | The Fines substrate field allows assessors to enter the relative percentage of fines that occur along the shoreline. Fines consist of silts and clays and these substrates are typically less than 1 mm in size. Fines are differentiated from mud because there is little to no organic content. | % |

| Dictionary Section | Abbreviated Database Column Heading | Un-Abbreviated Column Heading | Previous Database Column Headings (if different) | Type | Definition | Unit of Measurement |
|---|---|---|---|---|---|---|
| Substrates | SAND | Sand Substrates | SUB_FINES or Fine Substrates | Numeric | The Sand substrates field allows assessors to enter the relative percentage of sands that occur along the shoreline. Sands are any particle that contains granular particles visible to the naked eye. These particles are typically .06 to 2 mm in size. | % |
| | GRAVEL | Gravel Substrates | SUB_GRAVEL or Gravel Substrates | Numeric | The Grave substrates field allows assessors to enter the relative percentage of gravels that occur along the shoreline. Gravels are particles that range from 2 mm to approximately 64 mm. Thus, they are the size of a lady bug to the size of a tennis ball or orange. This field should only be used when substrates are difficult to identify and assessors cannot determine whether fine and course gravels. | % |
| | GRAVEL_FIN | Fine Gravel Substrates | SUB_GRAVEL or Gravel Substrates | Numeric | The Fine Gravel substrates field allows assessors to enter the relative percentage of fine gravels that occur along the shoreline. Fine gravels are particles that are 2 mm to approximately 16 mm or the size of a ladybug to the size of a grape. This field should only be used when assessors have good visibility and can confidently identify fine gravels. If this field is used, the generally gravel category should *not* be used. | % |
| | GRAVEL_COA | Coarse Gravel Substrates | SUB_GRAVEL or Gravel Substrates | Numeric | The Coarse Gravel substrates field allows assessors to enter the relative percentage of course gravels that occur along the shoreline. Coarse gravels are particles that are 16 mm to approximately 64 mm or the size of a grape to the size of a tennis ball or orange. This field should only be used when assessors have good visibility and can confidently identify coarse gravels. If this field is used, the generally gravel category should *not* be used. | % |
| | COBBLE | Cobble Substrates | SUB_COBBLE or Cobble Substrates | Numeric | The Cobble substrates field allows assessors to enter the relative percentage of cobbles that occur along the shoreline. Cobbles are particles that are 64 to 256 mm in size (Tennis ball to basketball). | % |
| | COBBLE_FIN | Fine Cobble Substrates | SUB_COBBLE or Cobble Substrates | Numeric | The Fine Cobble substrates field allows assessors to enter the relative percentage of fine cobbles that occur along the shoreline. Fine cobbles are particles that are 64 to 128 mm in size (tennis ball to coconut). This field should only be used when assessors have good visibility and can confidently identify fine cobbles. If this field is used, the general cobble category should *not* be used. | % |
| | COBBLE_COA | Coarse Cobble Substrates | SUB_COBBLE or Cobble Substrates | Numeric | The Coarse Cobble substrates field allows assessors to enter the relative percentage of course cobbles that occur along the shoreline. Coarse cobbles are particles that are 128 to 256 mm in size (coconut to basketball). This field should only be used when assessors have good visibility and can confidently identify coarse cobbles. If this field is used, the general cobble category should *not* be used. | % |
| | BOULDER | Boulder Substrates | SUB_BOULDE or Boulder Substrates | Numeric | The Boulder substrates field allows assessors to enter the relative percentage of boulders that occur along the shoreline. Boulders are particles that are greater than 256 mm in size (bigger than a basketball). These substrates can not typically be lifted by one person as they are too heavy. | % |
| | BEDROCK | Bedrock Substrates | SUB_BEDROC or Bedrock Substrates | Numeric | The Bedrock substrates field allows assessors to enter the relative percentage of bedrock that occurs along the shoreline. Bedrock is consider any rock where blocks are larger than 4 m or is solid, un-weathered underlying rock. | % |
| | EMBEDDEDNE | Embeddedness | COMPACTION or Compaction | Categorical | Embeddedness is a categorical field that allows assessors to enter the approximate embeddedness of substrates. Embeddedness is a measure of the degree to which boulders, cobbles and other large materials are covered by fine sediments. Categories for embeddedness include None (0%), Low (0 to 25%), Medium (25-75%), High (>75%), or Unknown. When assessors are unclear of the embeddedness they should either complete measurements of foreshore substrates or leave the field as unknown. | |
| | SHAPE_1 | Shape of Substrates | | Categorical | Shape is a categorical field that allows assessors to identify the shape of larger particles such as cobble or boulders. Angular shapes refer to naturally occurring angular rock material that has not been substantially weathered. Blast rock refers to angular blast rock materials, such as rip rap. Smooth materials are rocks that are generally rounded. This field should be used to describe the predominant substrates that occur along the shoreline (e.g., if 85 % of the substrates are round and smooth, and 10% are blast rock, the field should be used to describe the 85%). | |
| | COMMNT_SUB | Substrate Comments | | Categorical | The comments field allows assessors to enter applicable information that is not included in the data field above. | |

| Dictionary Section | Abbreviated Database Column Heading | Un-Abbreviated Column Heading | Previous Database Column Headings (if different) | Type | Definition | Unit of Measurement |
|---|---|---|---|---|---|---|
| Vegetation Band 1 | B1_CLASS | Vegetation Band 1 Land Cover Class | RIP_CLASS of Riparian Class | Categorical | The Vegetation Band 1 Land Cover Class is a description of the predominant vegetation class present.  Categories are largely derived from the Sensitive Habitat Inventory and Mapping Module 4. The Coniferous Class occurs where tree cover is at least 20% of the shore zone area and at least 80% of the trees are coniferous.  The Broadleaf Class occurs where the tree cover is at least 20% and at least 65% of the trees are broadleaf or deciduous.  The Mixed Forest Class occurs where tree cover is at least 20% and there are no more than 80% coniferous trees and no more than 65% broadleaf trees.  The Shrubs Class occurs where tree coverage is less than 10% and there shrubs cover at least of 20%.  Shrubs are defined as multi-stemmed woody perennial plants.  The Herbs / Grasses Class occur where there is at less than 10% tree coverage and less than 20% of shrubs.  The Exposes Soil Class occurs where recent disturbance, either anthropogenic or natural, has occurred and mineral soils are exposes.  The Landscape Class refers to urbanized areas where most natural vegetation has been replaced by at least 30% coverage of ornamental trees, shrubs, and other vegetation.  The Lawn Class occurs in urbanized areas where turf grasses cover at least 30% of the shore zone area and landscaping with ornamental shrubs or trees is less than 30% coverage.  The Natural Wetland Class occurs where shore marshes dominate the shore zone area and they have not been significantly influenced by human disturbance.  The Disturbed Wetland Class occurs where shore marshes predominate the shore zone area and they have experience significant disturbance (i.e., greater than 30%).  The Row Crops Class occurs in agricultural areas where crops are growing.  If sites are agricultural, but are not used for row crops (e.g., pasture lands), they should be described as Herbs/Grasses and comments should be used to indicate the agricultural nature of the shore segment.  Un-vegetated Sites occur where there is less than 5% vegetation cover and at least 50% of the vegetation cover is mosses or lichens.  Un-vegetated sites tend to occur on rocky, exposed shorelines. | |
| | B1_STAGE | Vegetation Band 1 Stage | RIP_STAGE or Riparian Stage | Categorical | The Vegetation Band 1 Stage is a description of the structural stage of the dominant vegetation.  Categories are largely derived from the Sensitive Habitat Inventory and Mapping Module 3 and the Field Manual for Describing Terrestrial Ecosystems.  The Sparse Stage describes sites that are in the primary or secondary stages of succession, with vegetation consisting mostly of lichens and mosses, and the total shrub coverage is less than 20% and tree coverage is less than 10%.  The Grass Herb Stage describes sites where shore zones are dominated by grasses and herbs, as a result of persistent disturbance of natural conditions (e.g., grasslands).  The Low Shrubs stage describes sites that are dominated by shrubby vegetation less than 2 m in height.  The Tall Shrubs Stage is dominated by vegetation that is 2 to 10 m in height and seedlings and advance regeneration may be present.  The Pole / Sapling Stage describes sites that contain trees greater than 10 m in height, typically densely stocked, and there is little evidence of self thinning or vertical structure.  The Young Forest Stage describes sites that are typically less than 40 years old (but could be as great as 50 to 80 years depending upon the forest community), self thinning is evident, and the forest canopy has begun to differentiate into distinct layers.   The Mature Forest Stage describes sites that are typically 40 to 80 years old (but could be as high as 140 years), and the under story is well developed with a second cycle of shade trees. The Old Forest Stage describes sites that are typically greater than 80 years old and the stands are structurally complex. Old Forests contain abundant coarse woody debris at varying stages of decay.   Old Forests are at least 80 years in age, but may be as old as 250 years and should be considered relative to the forest community assessors are in. | |
| | B1SHRUB_CO | Vegetation Band 1 Shrub Coverage | SHOR_COVER or Shore Cover | Categorical | The Shrub Coverage categorically describes shrub coverage within the shore zone.  Sparse sites have less than 10% shrub coverage.  Moderate shrub coverage occurs on sites that have between 10 to 50% coverage.  Abundant shrub coverage occurs on sites that have greater than 50% shrub coverage. | |
| | B1TREE_COV | Vegetation Band 1 Tree Coverage | SHOR_COVER or Shore Cover | Categorical | The Tree Coverage categorically describes Tree coverage within the shore zone.  Sparse sites have less than 10% Tree coverage.  Moderate Tree coverage occurs on sites that have between 10 to 50% coverage.  Abundant Tree coverage occurs on sites that have greater than 50% Tree coverage. | |

| Dictionary Section | Abbreviated Database Column Heading | Un-Abbreviated Column Heading | Previous Database Column Headings (if different) | Type | Definition | Unit of Measurement |
|---|---|---|---|---|---|---|
| Vegetation Band 1 | B1_DISTRIB | Vegetation Band 1 Distribution | | Categorical | The Distribution field is used to describe whether the vegetation band described is continuous along the entire shore segment. Categories include Continuous and Patchy (for sites where the dominant vegetation band occurs in patches along the segment). An example of a patchy distribution is a shore segment where most areas are extensively landscape, with the exception of a few shore lots which remain relatively natural. In this case, the dominant landscaped area would be described and comments would be used to identify residual natural areas. | |
| | B1_BANDWI | Vegetation Band 1 Bandwidth | | Numeric | The Vegetation Band 1 Bandwidth field is used to provide an estimate of the approximate width of the band being described. In cases where bandwidth varies along the segment, a representative width should be used to describe the shore segment. The intent of this field is to provide a general description of the width of the vegetation band that is being described and users of the database need to consider this when assessing data within the database. | |
| | B1_OVERHAN | Overhanging Vegetation | | Numeric | The Overhanging Vegetation field is used to describe the percentage of the shore segment length that contains significant overhanging vegetation. Overhanging vegetation should be considered as if the lake was at full pool or the mean annual high water level. | |
| | AQUATIC_VE | Aquatic Vegetation | | Numeric | The Aquatic Vegetation field is used to describe the percentage of the shoreline that contains emergent, submergent, and floating aquatic vegetation. | |
| | SUBMERGENT | Submergent Vegetation Quantity | | Numeric | The Submergent Vegetation field is used to describe the percentage of the shoreline segment that contains submergent vegetation. Submergent vegetation includes species such as milfoil, *Potamogeton* spp., etc. | |
| | SUBMERG_VE | Submergent Vegetation Presence | | Categorical | The Submergent Vegetation Presence field is used to indicate whether submergent vegetation is present along the segment. In cases where assessors cannot determine the percentage of the segment but are aware it is present, this field should be used. | |
| | EMERGENT_V | Emergent Vegetation Quantity | | Numeric | The Emergent Vegetation field is used to describe the percentage of the shoreline segment that contains emergent vegetation. Emergent vegetation includes species such as cattails, bulrushes, varies sedges, etc. | |
| | EMERGED_VE | Emergent Vegetation Presence | | Categorical | The Emergent Vegetation Presence field is used to indicate whether emergent vegetation is present along the segment. In cases where assessors cannot determine the percentage of the segment but are aware it is present, this field should be used. | |
| | FLOATING_V | Floating Vegetation Quantity | | Numeric | The Floating Vegetation field is used to describe the percentage of the shoreline segment that contains floating vegetation. Floating vegetation includes species such as pond lilies, etc. | |
| | FLOATING_1 | Floating Vegetation Presence | | Categorical | The Floating Vegetation Presence field is used to indicate whether floating vegetation is present along the segment. In cases where assessors cannot determine the percentage of the segment but are aware it is present, this field should be used. | |
| | AVEG_CMT | Aquatic Vegetation Comments | | Alphanumeric | The comments field allows assessors to enter applicable information that is not included in the data field above. | |
| | B1_COMMNT | Vegetation Band 1 Comments | | Alphanumeric | The comments field allows assessors to enter applicable information that is not included in the data field above. | |
| Vegetation Band 2 | B2_CLASS | Vegetation Band 2 Class | UP_CLASS or Upland Class | Categorical | See Vegetation Band 1 Class for a description. | |
| | B2_STAGE | Vegetation Band 2 Stage | UP_STAGE or Upland Stage | Categorical | See Vegetation Band 1 Stage for a description. | |
| | B2SHRUB_CO | Vegetation Band 2 Shrub Cover | UP_SHORE_COVER or Upland Shore Cover | Categorical | See Vegetation Band 1 Shrub Cover for a description. | |
| | B2TREE_COV | Vegetation Band 2 Tree Cover | UP_SHORE_COVER or Upland Shore Cover | Categorical | See Vegetation Band 1 Tree Cover for a description. | |

| Dictionary Section | Abbreviated Database Column Heading | Un-Abbreviated Column Heading | Previous Database Column Headings (if different) | Type | Definition | Unit of Measurement |
|---|---|---|---|---|---|---|
| Vegetation Band 2 | B2_DISTRIB | Vegetation Band 2 Distribution | UP_BANDWI or Upland Bandwidth | Categorical | See Vegetation Band 1 Distribution for a description. | |
| | B2_BANDWID | Vegetation Band 2 Width | | Categorical | See Vegetation Band 2 Width for a description. | |
| | B2_COMMNT | Vegetation Band 2 Comments | | Alphanumeric | The comments field allows assessors to enter applicable information that is not included in the data field above. | |
| Littoral Zone | LITTORAL_Z | Littoral Zone Width Categories | | Categorical | The Littoral Zone Width Category provides a general classification of the littoral zone. Wide littoral zones are greater than 50 m. Moderate littoral zones are 10 to 50 m in width, and Narrow littoral zones are less than 10 m wide. | |
| | LWD | Large Woody Debris Presence | | Categorical | The Large Woody debris presence field allows assessors to indicate whether LWD is present along the segment. Categories include Less than 5 Pieces, 5 to 25 Pieces, and Greater than 25 Pieces. | |
| | LWD_NUMBER | Large Woody Debris Count | | Numeric | The Large Woody debris count field allows assessors to enter the total number of large woody debris pieces counted along the shore segment. Only significant pieces of large woody debris, which are contributing to fish habitat, should be counted. | |
| | WIDTH_LITT | Littoral Width | LITTORAL_W or Littoral Width | Numeric | The Littoral Width field allows assessors to enter the average littoral width of the segment. This field can be determined using air photo interpretation or field measurements. Typically, the field is rounded to the nearest 5 m as the number is intended to be representative of the segment. | |
| | COMMNT_LIT | Littoral Zone Comments | | Alphanumeric | The comments field allows assessors to enter applicable information that is not included in the data field above. | |
| Modifications | RETAIN_WAL | Retaining Wall Count | | Numeric | The Retaining Wall Count field is the total number of retaining walls occurring along the segment. Retaining walls should only be counted if they are within 5 to 10 m of the high water level. Retaining walls must have a vertical element that is greater than 30 cm and must be retaining earth to some degree. On steep sloping sites, more than one retaining wall may be present (i.e., the property is tiered). In these cases each retaining wall is counted. | # |
| | PERRETAIN_ | Percent Retaining Wall | RET_WAL_TY | Numeric | The Percent Retaining Wall field indicates that approximate percentage of the shore segment length where retaining walls occur. | % |
| | DOCKS | Docks Count | | Numeric | The Docks Count field is the total number of pile supported or floating docks or swimming platforms that occur along the segment. Properties may have more than one dock present and each different structure is considered a separate dock. For instance, a property could have one swimming float and one dock. | # |
| | DOCKS_KM | Docks Per Kilometer | | Numeric | The Docks per Kilometer field is determined during post processing. This field is calculated by dividing the total number of docks observed by the total length of the shore segment. | # |
| | BOAT_HOUSE | Boat House Count | | Numeric | The Boat House Count field is used to count boat houses that occur along the segment. Boat Houses are structures that are specifically designed to house boats or watercraft. Boat Houses can either be located on land or as structures over the water. If only structures over the water are counted, assessors should be consistent and make note of this so end users are aware of what definition was used for a boat house. If structures on land are considered as boat houses, a rail or boat launch should be present that land owners use to launch the boat to the lake. Garages that house boats should not be counted as boat houses because there is not an associated launch structure. | # |
| | GROYNES | Groyne Count | | Numeric | The Groyne Count field is used to count any structure that is perpendicular to the shoreline that is impacting regular sediment drift along the shoreline. Groynes can be constructed out of concrete, rock, piles, wood, or other materials. Docks or other structures that are acting as groynes, and affecting sediment movement should be included in the groyne count. Rock lines that are too small to significantly impact sediment movement should not be counted as a groyne. | # |
| | GROYNES_KM | Groynes per Kilometer | | Numeric | The Groynes per Kilometer field is determined during post processing of data. This field is calculated by dividing the total number of groynes observed by the total length of the shore segment. | # |

| Dictionary Section | Abbreviated Database Column Heading | Un-Abbreviated Column Heading | Previous Database Column Headings (if different) | Type | Definition | Unit of Measurement |
|---|---|---|---|---|---|---|
| Modifications | BOAT_LAUNC | Boat Launch Count | | Numeric | The Boat Launch Count field is the total number of boat launches that were observed along the shoreline.  Generally, only permanent boat launches are counted (e.g., made of concrete).  However, on small systems assessors may choose to count gravel boat launches as these may be the only type present.  Assessors should document criteria used to determine what constitutes a boat launch during the assessment. | # |
| | PERRAIL_MO | Percent Rail Modifier | | Numeric | The Percent Rail Modifier field is used to describe the percentage of the linear shore segment length that contains railways in close proximity to the shoreline. | % |
| | PERROAD_MO | Percent Road Modifier | | Numeric | The Percent Road Modifier field is used to describe the percentage of the linear shore segment length that contains a roadway in close proximity to the shoreline. | % |
| | MARIN_RAIL | Marine Rail Count | | Numeric | The Marine Rail Count field is the total number of marine rails that occur along a shore segment.  Marine Rails are a track system that is used to remove boats from a lake during the winter months. | # |
| | MARINAS | Marina Count | | Numeric | The Marinas Field is the total number of large and small marinas that were documented along the shoreline.  A marina is considered to be any pile supported or floating structure that has slips for 6 or more boats. | # |
| | SUB_MODIFI | Substrate Modification Presence | BEACH_GROO or Beach Grooming | Categorical | The Substrate Modification Presence field is used to document whether substrate modification is occurring along the shore segment.  Substrate modification includes any type of importation of sands, significant movement of natural substrates (e.g., to construct groynes), or earthworks. | |
| | PERSUB_MOD | Percent Substrate Modification | | Numeric | The Percent Substrate Modification field is the estimated percentage of the shore segment where substrate modification has occurred. | % |
| | COMMNT_MOD | Modifications Comments | | Alphanumeric | The comments field allows assessors to enter applicable information that is not included in the data field above. | |
| Flora and Fauna | VETERANS | Veteran Trees | | Categorical | The Veteran Tree field is a categorical field to describe the number of veteran trees that occur along the shore segment. Veteran trees are defined as a tree that is significantly older than the dominant forest cover and provides increased structural diversity. Categories include No, Less than 5 Trees, 5 to 25 Trees, and Greater than 25 trees. | |
| | SNAGS | Snags | | Categorical | The Snags field is a categorical field to describe the number of dead standing snags that occur along the shore segment. Snags are defined as dead standing trees that provide increased structural diversity. Categories include No, Less than 5 Trees, 5 to 25 Trees, and Greater than 25 trees. | |
| | CMMNT_FLRA | Flora Comments | | Alphanumeric | The flora comments field allows users to enter in comments regarding flora observed within the shore segment. | |
| | CMMNT_FAUN | Fauna Comments | | | The fauna comments field allows users to enter in comments regarding fauna observed within the shore segment. | |

Appendix B – Data Base and Field Code Version Consolidation

| Dictionary Section | Abbreviated Database Column Heading | Un-Abbreviated Column Heading | Type | Definition | Rationale for Removal |
|---|---|---|---|---|---|
| Segment Class and Shore Type | VEG_SHORE | Vegetated Shore | Numeric or Category | A vegetated shore is a shoreline that is well vegetated, to the high water level. | Vegetated shore was removed because it differs from the other shore types, which tend to be more description of physical properties of the shoreline. Because a vegetated shore typically occurs on a rocky shore or gravel shore, it is better to describe lake side vegetation elsewhere in the database and leave the shore type to describe more physical attributes of the shoreline. |
| Riparian or Upland Vegetation | RIP_QUALIF or UP_QUALIF | Riparian or Upland Qualifier | Category | The Riparian Qualifier field was used to qualify the Riparian Class and Stage. Categories included Agriculture, Natural, Urban/Residential, Recreation, Disturbed, Unknown. Refer to Module 4 of the Sensitive Habitat Inventory and Mapping for definitions. | This field was removed from the dictionary because additional categories were added to the Vegetation Class and Stage for Bands 1 and 2. This was done to reduce redundancy in the dictionary and improve clarity. |
| Littoral Zone | ALLUV_FAN | Alluvial Fan | Category | The Alluvial Fan field was used to describe whether the segment contained an alluvial fan. | The Stream Mouth shore type was added to the dictionary to replace the Alluvial Fan field. Due to the importance of stream mouths as rearing and staging areas for salmonids, the shore type was used because these extremely sensitive features can be better identified. |
| Modifications | BEACH_GROO | Beach Grooming | Category | The Beach Grooming field identifies whether substrate modification has occurred to enhance beach conditions. | This field was removed from the dictionary and replaced with the SUB_MODI or Substrate Modification Field because it better describes the actual acitivity. Also, a PERSUB_MODI or Percent Substrate Modification field was added to help quantify substrate modification that is occuring. |
| Riparian or Upland Vegetation | RIP_BANKSL or l | Upland or Riparian Bank Slope | Numeric | The Ripariand or Upland Bankslope field was use to identify the slope of the riparian (now Vegetation Band 1) or upland areas (Vegetation Band 2) described (as a percentage). | This field was added with categories to the Segment Class as SLOPE. Categories was used rather than a slope percentage because assessors do not typicallly exit the boat to measure the slope. Because the idea is to gain a broad understanding of the slope for a segment, it was determined that slope categories were more appropriate for the level of detail of the assessment. |
| Riparian or Upland Vegetation | RIP_VET or UP_VET | Riparian or Upland Veterans | Category | The Veteran Tree field is a categorical field to describe the number of veteran trees that occur along the shore segment. | This field was added to the Flora and Fauna section and is intended to describe both the Riparian and Upland Sections. This was done to reduce redundancy in the datebase and make interpretation easier. |
| Substrates | COMPACTION | Compaction of Substrates | Category | Compaction is a measure of the degree of compaction or relative looseness of bed material. See the Sensitive Habitat Inventory and Mapping Module 3 for a better description of Compaction. | In lake systems, compaction is better discussed in terms of substrate embeddedness. Generally, the two measures are correlated so some extent (i.e., a high compaction is equivalent ot a high level of embeddedness). As embeddedness of substrates is a better description and easier to measure using binoculars from a boat, the field was changed to this. |

**Appendix  C – SHIM Lake v. 2.6 Data Dictionary**

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Shim Lake 2008
June 23, 2008


Lake_Shoreline          Line Feature, Label 1 = Segmnt_Num, Label 2 = Aquatic_Veg
                        Lake shore
    _____        Separator
    LAKE REFERENCE      Separator
    Lake_Name           Text, Maximum Length = 100
                        Normal, Normal
    Lake_level          Numeric, Decimal Places = 2
                        Minimum = 0, Maximum = 3000, Default Value = 0
                        Normal, Normal
    Sechi_depth         Numeric, Decimal Places = 1
                        Minimum = 0, Maximum = 50, Default Value = 0
                        Normal, Normal
    Organization        Text, Maximum Length = 50
                        Normal, Normal
    Date                Date, Auto generate Create, Year-Month-Day Format
                        Normal, Normal
    Time                Time, Auto generate Create, 24 Hour Format
                        Normal, Normal
    Crew                Text, Maximum Length = 50
                        Normal, Normal
    Weather             Menu, Normal, Normal
        Light Rain [L]
        Heavy Rain [H]
        Snow/Sleet [N]
        Over cast [OV]
        Clear [S]
        Partly Cloudy [PC]
        Other [O]
    Air_Temp            Numeric, Decimal Places = 1, degrees centigrade
                        Minimum = -25, Maximum = 45, Default Value = 0
                        Normal, Normal
    Water_Temp          Numeric, Decimal Places = 1, degrees celsius
                        Minimum = -2, Maximum = 29, Default Value = 0
                        Normal, Normal
    Jurisdiction        Text, Maximum Length = 100, Jurisdiction
                        Normal, Normal
    Comments            Text, Maximum Length = 100
                        Normal, Normal
    _____        Separator
    SEGMENT CLASS       Separator
    Segmnt_Num          Numeric, Decimal Places = 1, Unique Identification number for segment
                        Minimum = 0, Maximum = 99999, Default Value = 0
                        Required, Required
    Shore_Type          Menu, Required, Normal
        Cliff/Bluff
        Rocky Shore
        Gravel
        Sand
        Stream Mouth
        Wetland
        Other
    Shore_Modifier      Menu, Normal, Normal
        Log Yard
        Marina_small (6-20)
        Marina_large (20+)
        Railway
        Road
        None    Default
        Other
    Slope               Menu, Normal, Normal, general slope of shore landward
        Bench
        Low (0-5)
        Moderate (5-20)
        Steep (20-60)
        Very Steep (60+)
    Land_Use            Menu, Normal, Normal, observed
        Agriculture
        Commercial
        Conservation
        Forestry
        Industrial
        Institution
        Multi Family
        Natural Area
        Park
        Recreation
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      Rural
      Single Family
      Urban Park
Lev_of_Imp          Menu, Normal, Normal, Level of Impact
   None    Default
   Low (<10%)
   Medium (10-40%)
   High (>40%)
Livest_Acc          Menu, Normal, Normal, Stream segmnet accessible to live-stock
   Yes
   No    Default
Disturbed           Numeric, Decimal Places = 0, Percent of segment disturbed
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Natural             Numeric, Decimal Places = 0, Percent of segment natural
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
PhotoNum            Text, Maximum Length = 100, Roll and print number of photograph
                    Normal, Normal
Tape_Numb           Text, Maximum Length = 100, Original Video Tape Number
                    Normal, Normal
Video_Time          Text, Maximum Length = 100, Time stamp on original video tape
                    Normal, Normal
Cmmnt_Clas          Text, Maximum Length = 100, Comments for Segment
                    Normal, Normal
_____          Separator
SHORE TYPE          Separator
Cliff/Bluff         Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Rocky               Numeric, Decimal Places = 0, Rocky Shore
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Gravel              Numeric, Decimal Places = 0, Gravel Shore
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Sand                Numeric, Decimal Places = 0, Sand Beach
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Stream_mouth        Numeric, Decimal Places = 0, Stream mouth
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Wetland             Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Other               Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Stype_comm          Text, Maximum Length = 100, Comments for Segment
                    Normal, Normal
_____          Separator
LAND USE            Separator
Agriculture         Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Commercial          Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Conservation        Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Forestry            Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Industrial          Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Institution         Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Multi Family        Numeric, Decimal Places = 0, Percent mult family residential (condo)
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Natural Area        Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Park                Numeric, Decimal Places = 0, Percent
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
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Recreation           Numeric, Decimal Places = 0, Percent
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Rural                Numeric, Decimal Places = 0, Percent
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Single Family        Numeric, Decimal Places = 0, Percent single family residential
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Urban Park           Numeric, Decimal Places = 0, Percent
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Landu_Commnt         Text, Maximum Length = 100, Comment Land use
                     Normal, Normal
_____             Separator
SUBSTRATE            Separator
Marl                 Numeric, Decimal Places = 0, Clay limestone
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Mud                  Numeric, Decimal Places = 0, Percent Mud
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Organic              Numeric, Decimal Places = 0, Percent Organic
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Fines                Numeric, Decimal Places = 0, Percent Fines
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Sand                 Numeric, Decimal Places = 0, Percent Sand
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Gravel               Numeric, Decimal Places = 0, Percent Gravel
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Gravel_Fine          Numeric, Decimal Places = 0, Percent Fine Gravel
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Gravel_Coarse        Numeric, Decimal Places = 0, Percent Coarse Gravel
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Cobble               Numeric, Decimal Places = 0, Percent Cobble
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Cobble_Fine          Numeric, Decimal Places = 0, Percent Fine Cobble
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Cobble_Coarse        Numeric, Decimal Places = 0, Percent Coarse Cobble
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Boulder              Numeric, Decimal Places = 0, Percent Boulder
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Bedrock              Numeric, Decimal Places = 0, Percent Bedrock
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Embeddedness         Menu, Normal, Normal, Level of substrate embeddedness
   None
   Low (0-25%) [L]
   Medium (25-75%) [M]
   High (75%+) [H]
   Unknown    Default
Shape                Menu, Normal, Normal, man made refers to angularity
   angular
   blast rock
   smooth
Commnt_Sub           Text, Maximum Length = 100, Comment for Substrates
                     Normal, Normal
_____             Separator
VEGETATION BAND1     Separator
B1_Class             Menu, Normal, Normal, Riparian Class
   Coniferous forest [VNF]
   Broadleaf forest [VBF]
   Mixed forest [VMF]
   Shrubs [VSH]
   Herbs/grasses [VHB]
   Exposed soil [NEL]
   Landscaped [LS]
   Lawn [L]
   Natural wetland [WN]
```

```
   Disturbed wetland [DWN]
   Row Crops [NAG]
   Unvegetated
B1_Stage            Menu, Normal, Normal, Structural Stage
   Sparse [1]
   Grass/Herb [2]
   low shrubs <2m [3a]
   tall shrubs 2-10m [3b]
   sapling >10m [4]
   young forest [5]
   mature forest [6]
   old forest [7]
   Mixed age
B1Shrub_Cover       Menu, Normal, Normal, Shrub Cover
   None [ ]
   Sparse (<10%) [ ]
   Moderate (10-50%) [ ]
   Abundant (>50%) [ ]
B1Tree_Cover        Menu, Normal, Normal, Tree Cover
   None [ ]
   Sparse (<10%) [ ]
   Moderate (10-50%) [ ]
   Abundant (>50%) [ ]
B1_Distribution     Menu, Normal, Normal, Riparian Distribution
   Patchy [ ]
   Continuous [ ]
B1_Bandwi           Numeric, Decimal Places = 0, Band 1width
                    Minimum = 0, Maximum = 9999, Default Value = 0
                    Normal, Normal
B1_Overhang         Numeric, Decimal Places = 0, %  Overhang for segment
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Aquatic_Veg         Numeric, Decimal Places = 0, Length of aquatic vegetation in segment
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Submergent veg      Numeric, Decimal Places = 0, % submergent vegetation in segment
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Submerg_Veg         Menu, Normal, Normal, Submerged Aquatic Vegetation
   Yes
   No   Default
Emergent vegetation      Numeric, Decimal Places = 0, % emergent vegetation
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Emerged_Veg         Menu, Normal, Normal, Emergent Aquatic Vegetation
   Yes
   No   Default
Floating vegetatio  Numeric, Decimal Places = 0, % floating vegetation
                    Minimum = 0, Maximum = 100, Default Value = 0
                    Normal, Normal
Floating_Veg        Menu, Normal, Normal, Floating  Vegetation presence
   Yes
   No   Default
AVeg_Cmt            Text, Maximum Length = 100, Aquatic Vegetation Comment
                    Normal, Normal
B1_Commnt           Text, Maximum Length = 100, Comment Band 1 vegetation
                    Normal, Normal
_____           Separator
VEGETATION BAND2    Separator
B2_Class            Menu, Normal, Normal, Vegetation Class
   Coniferous forest [VNF]
   Broadleaf forest [VBF]
   Mixed forest [VMF]
   Shrubs [VSH]
   Herbs/grasses [VHB]
   Exposed soil [NEL]
   Landscaped [LS]
   Lawn [L]
   Natural wetland [WN]
   Disturbed wetland [DWN]
   Row Crops [NAG]
   Rock [NNB]
B2_Stage            Menu, Normal, Normal, Structural Stage
   Sparse [1]
   Grass/Herb [2]
   low shrubs <2m [3a]
   tall shrubs 2-10m [3b]
   sapling >10m [4]
   young forest [5]
```

```
   mature forest [6]
   old forest [7]
   Mixed age
B2Shrub_Cover        Menu, Normal, Normal, Shrub Cover
   None [ ]
   Sparse (<10%) [ ]
   Moderate (10-50%) [ ]
   Abundant (>50%) [ ]
B2Tree_Cover         Menu, Normal, Normal, Tree Cover
   None [ ]
   Sparse (<10%) [ ]
   Moderate (10-50%) [ ]
   Abundant (>50%) [ ]
B2_Distribution      Menu, Normal, Normal, B2 Vegetation Distribution
   Patchy [ ]
   Continuous [ ]
B2_Bandwidth         Numeric, Decimal Places = 0, B2 vegetation Bandwidth
                     Minimum = 0, Maximum = 9999, Default Value = 0
                     Normal, Normal
B2_Commnt            Text, Maximum Length = 100, B2 vegetation Comment
                     Normal, Normal
_____            Separator
LITTORAL ZONE        Separator
Littoral_Z           Menu, Normal, Normal, Littoral Zone
   Narrow (<10m)
   Moderate (10-50m)
   Wide (>50m)
LWD                  Menu, Normal, Normal, Count of Large Woody Debris
   No    Default
   <5
   5-25
   >25
LWD_Number           Numeric, Decimal Places = 0, Number of LWD units
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Width_Littoral       Numeric, Decimal Places = 0, Width of Littoral area
                     Minimum = 0, Maximum = 1000, Default Value = 0
                     Normal, Normal
Commnt_Lit           Text, Maximum Length = 100, Comment for Littoral zone
                     Normal, Normal
_____            Separator
MODIFICATIONS        Separator
Retain_Wal           Numeric, Decimal Places = 0, Retaining walls per segment
                     Minimum = 0, Maximum = 99999999, Default Value = 0
                     Normal, Normal
PerRetain_Wall       Numeric, Decimal Places = 0, Percent retaining wall on segment
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
Retain_Mat           Menu, Normal, Normal
   Bio_Eng
   Concrete
   Mixed
   Stonework
   Wood
   Metal
   Tires
   Rock
   Other
Docks                Numeric, Decimal Places = 0, Docks per segment
                     Minimum = 0, Maximum = 99999999, Default Value = 0
                     Normal, Normal
Docks_km             Numeric, Decimal Places = 0, Docks per km
                     Minimum = 0, Maximum = 1000, Default Value = 0
                     Normal, Normal
Boat_House           Numeric, Decimal Places = 0, Docks per segment
                     Minimum = 0, Maximum = 99999999, Default Value = 0
                     Normal, Normal
Groynes              Numeric, Decimal Places = 0, Groynes per segment
                     Minimum = 0, Maximum = 99999999, Default Value = 0
                     Normal, Normal
Groynes_km           Numeric, Decimal Places = 0, Groynes per km
                     Minimum = 0, Maximum = 1000, Default Value = 0
                     Normal, Normal
Boat_Launch          Numeric, Decimal Places = 0, Number of Boat launches
                     Minimum = 0, Maximum = 1000, Default Value = 0
                     Normal, Normal
PerRail_mod          Numeric, Decimal Places = 0, % of segment with a railway
                     Minimum = 0, Maximum = 100, Default Value = 0
                     Normal, Normal
```

```
    PerRoad_mod          Numeric, Decimal Places = 0, % of segment with a road
                         Minimum = 0, Maximum = 100, Default Value = 0
                         Normal, Normal
    Marin_Rail           Numeric, Decimal Places = 0, Marine Railways per segment
                         Minimum = 0, Maximum = 99999999, Default Value = 0
                         Normal, Normal
    Marinas              Numeric, Decimal Places = 0, Marinas per segment
                         Minimum = 0, Maximum = 99999999, Default Value = 0
                         Normal, Normal
    Sub_modification     Menu, Normal, Normal, Substrate modification / grooming
       Yes
       No
    PerSub_mod           Numeric, Decimal Places = 0, % of segment with substrate alteration
                         Minimum = 0, Maximum = 100, Default Value = 0
                         Normal, Normal
    Commnt_Mod           Text, Maximum Length = 100, Comments on modification
                         Normal, Normal
_____          Separator
    FLORA & FAUNA        Separator
    Veterans             Menu, Normal, Normal, Number of Veterans
       No    Default
       <5
       5-25
       >25
    Snags                Menu, Normal, Normal, Presence of Snags
       No    Default
       <5
       5-25
       >25
    Cmmnt_Flra           Text, Maximum Length = 100, Flora Comment
                         Normal, Normal
    Cmmnt_Faun           Text, Maximum Length = 100, Fauna Comment
                         Normal, Normal

Site                     Point Feature, Label 1 = HWM, Label 2 = Land_Use
                         Site Description
    Lake_Name            Text, Maximum Length = 100
                         Normal, Normal
    Crew                 Text, Maximum Length = 50
                         Normal, Normal
    Date                 Date, Auto generate Create, Year-Month-Day Format
                         Normal, Normal
    Weather              Menu, Normal, Normal
       Light Rain [L]
       Heavy Rain [H]
       Snow/Sleet [N]
       Over cast [OV]
       Clear [S]
       Partly Cloudy [PC]
       Other [O]
    Jurisdiction         Text, Maximum Length = 100, Jurisdiction
                         Normal, Normal
    PID_Folio number     Text, Maximum Length = 50, Property Identifier
                         Normal, Normal
    HWM                  Numeric, Decimal Places = 1, High water mark
                         Minimum = 0, Maximum = 99999, Default Value = 0
                         Normal, Normal
    Lake_Level           Numeric, Decimal Places = 0
                         Minimum = 0, Maximum = 99999, Default Value = 0
                         Normal, Normal
    Length_frontage      Numeric, Decimal Places = 1, frontage length
                         Minimum = 0, Maximum = 99999, Default Value = 0
                         Normal, Normal
    Land_Use             Menu, Normal, Normal
       SF
       MF
       C
    Veg_removal          Menu, Normal, Normal, vegetation removal age
       historic
       recent
       NA
    Natural              Numeric, Decimal Places = 0, % natural vegetation state
                         Minimum = 0, Maximum = 99999, Default Value = 0
                         Normal, Normal
    Landscaped           Numeric, Decimal Places = 0, % landscaped vegetation state
                         Minimum = 0, Maximum = 99999, Default Value = 0
                         Normal, Normal
    no_vegetation        Numeric, Decimal Places = 0, % no vegetation
                         Minimum = 0, Maximum = 99999, Default Value = 0
```

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                        Normal, Normal
  Disturbed             Numeric, Decimal Places = 0, % site state disturbed
                        Minimum = 0, Maximum = 99999, Default Value = 0
                        Normal, Normal
  PhotoNum              Text, Maximum Length = 100, Roll and print number of photograph
                        Normal, Normal
  Comments              Text, Maximum Length = 100
                        Normal, Normal


Modification            Point Feature, Label 1 = Point_number, Label 2 = Type_Modification
  Point_number          Numeric, Decimal Places = 1, unique point identification number
                        Minimum = 0, Maximum = 99999, Default Value = 0
                        Normal, Normal
  PID_Folio number      Text, Maximum Length = 50, Property Identifier
                        Normal, Normal
  Lot_number            Text, Maximum Length = 50, Property Identifier
                        Normal, Normal
  Type_Modification     Menu, Normal, Normal, Code for feature
      Boat House
      Boat_Launch
      Buoy
      Catchbasin [CB]
      Dam [HOD]
      Detention Pond [DP]
      Dock [DK]
      Dredging [HBDD]
      Effluent [E]
      Fences [HOF]
      Fill_Pile [FP]
      FloodGate [FG]
      Garbage/Pollution [WP]
      Gravel Pit [GP]
      Groyne [Gy]
      Hydro_thermal
      Infill
      Livestock access [LC]
      Log_Dump [LD]
      Logging [LG]
      Marina
      Outbuilding [OB]
      PipeCrossing [PL]
      Pump Station [PS]
      Retain Wall/Bank Stb [EHB]
      Rip_Rap [RR]
      Road [R]
      Trail [TR]
      Utility_Crossing [UC]
      Water Withdrawal [FUP]
      Other [O]
  Type_Material         Menu, Normal, Normal
      Asphalt [AS]
      Bark_Mulch [BM]
      Bio-engineered [BI]
      Concrete [C]
      Dyke [DY]
      Gabions [GB]
      Gravel [G]
      Metal [Mt]
      Mixed [Mx]
      Pilings [P]
      Rip_rap [RR]
      Sandbags [SB]
      Stonework [S]
      Synthetic [Sy]
      Treated_Wood [TW]
      Wood [W]
      Other [O]
  High_Water            Menu, Normal, Normal, Above or below high water level
      Above
      Below
      At
      Unknown    Default
  Sed_Movement          Menu, Normal, Normal, Sediment movement
      Erosion
      Accretion
      Unknown
      NA
  Conditions            Menu, Normal, Normal, Did it meet conditions
      Yes
```

```
   No
   Unknown    Default
Age_Modification    Menu, Normal, Normal, Age of modification
   Historic
   Recent
   Unknown    Default
Construction        Menu, Normal, Normal, state of modification
   complete
   ongoing
Length              Numeric, Decimal Places = 2, Feature length
                    Minimum = 0, Maximum = 1000, Default Value = 0
                    Normal, Normal
Width               Numeric, Decimal Places = 2, Width of Feature
                    Minimum = 0, Maximum = 1000, Default Value = 0
                    Normal, Normal
Height              Numeric, Decimal Places = 2, Height of feature
                    Minimum = 0, Maximum = 1000, Default Value = 0
                    Normal, Normal
_____       Separator
WATER ACT           Separator
WA_approval         Menu, Normal, Normal, Received Water Act approval
   Yes
   No
   Unknown
   NA    Default
WA_Notification     Menu, Normal, Normal, Received Water Act Notification
   Yes
   No
   Unknown
   NA    Default
Size_Compliant      Menu, Normal, Normal
   Yes
   No
   Unknown    Default
Mat_Compliant       Menu, Normal, Normal, Material Compliant
   Yes
   No
   Unknown    Default
SM_Compliant        Menu, Normal, Normal, Sediment movement compliant
   Yes
   No
   Unknown    Default
Roof_Compliant      Menu, Normal, Normal
   Yes
   No
   Unknown    Default
BMP                 Menu, Normal, Normal, Conforms with  Best Management Practices
   Yes
   No
   Unknown    Default
EIA                 Menu, Normal, Normal
   Yes
   No
   Unknown    Default
WAComments          Text, Maximum Length = 100, Water Act Comments
                    Normal, Normal
_____       Separator
LAND ACT            Separator
Land_Act            Menu, Normal, Normal
   Yes
   No
   Unknown
   NA    Default
LASize_Compliant    Menu, Normal, Normal, Land Act Size Compliant
   Yes
   No
   NA    Default
LAMat_Compliant     Menu, Normal, Normal, Material Compliant
   Yes
   No
   NA    Default
LASM_Compliant      Menu, Normal, Normal, Land Act Sediment movement compliant
   Yes
   No
   NA    Default
LARoof_Compliant    Menu, Normal, Normal
   Yes
   No
   NA    Default
```

```
Slip_Compliant      Menu, Normal, Normal
   Yes
   No
   NA    Default
PVT_MCompliant      Menu, Normal, Normal, pvt moorage compliant
   Yes
   No
   NA    Default
LA_EIA              Menu, Normal, Normal, Land Act EIA
   Yes
   No
   NA    Default
_____       Separator
DEVELOPMENT PERMIT  Separator
DP_Area             Menu, Normal, Normal, Development Permit compliant
   Yes
   No
Dev_Permit          Menu, Normal, Normal, Development Permit
   Yes
   No
   Unknown    Default
DP_Compliant        Menu, Normal, Normal, Development Permit compliant
   Yes
   No
   Unknown    Default
DP_EIA              Menu, Normal, Normal, Development Permit EIA
   Yes
   No
   Unknown    Default
RAR                 Menu, Normal, Normal
   Accepted
   Submitted
   Not_Submitted
   Unknown    Default
PhotoNum            Text, Maximum Length = 100, Roll and print number of photograph
                    Normal, Normal
Comments            Text, Maximum Length = 100
                    Normal, Normal


Discharge           Point Feature
   Point_number     Numeric, Decimal Places = 1, unique point identification number
                    Minimum = 0, Maximum = 99999, Default Value = 0
                    Normal, Normal
   Lot_Number       Text, Maximum Length = 30, Parcel lot number
                    Normal, Normal
   Type_Discharge   Menu, Normal, Normal, Code for feature
      Agricultural Runoff [WPA]
      HouseEffluent [WE]
      Landfill Leachates [WPML]
      Pollutant [WP]
      Pulp Mill/Effluent [WPP]
      Storm Drain [WPD]
      Septic Effluent [WPMP]
      Sewer [S]
      Tile Drain [WPI]
      Trench [WPE]
      Other [O]
   Culvert          Menu, Normal, Normal, Culvert material
      Concrete [C]
      Steel [S]
      Wood [W]
      Iron [I]
      PVC [P]
      Asphalt coded [AD]
      Corrugated Steel [CS]
      Other [O]
   Headwall         Menu, Normal, Normal, Does a headwall exist
      Concrete [C]
      Concrete Block [CB]
      Gabion [G]
      Sand bag [SB]
      Wood [W]
   Length           Numeric, Decimal Places = 2, Feature length
                    Minimum = 0, Maximum = 1000, Default Value = 0
                    Normal, Normal
   Width            Numeric, Decimal Places = 2, Width of Feature
                    Minimum = 0, Maximum = 1000, Default Value = 0
                    Normal, Normal
   Diameter         Numeric, Decimal Places = 2, Diameter of feature
```

```
                        Minimum = 0, Maximum = 1000, Default Value = 0
                        Normal, Normal
    Height              Numeric, Decimal Places = 2, Height of feature
                        Minimum = 0, Maximum = 1000, Default Value = 0
                        Normal, Normal
    Temperature         Numeric, Decimal Places = 2, Water temperature
                        Minimum = 0, Maximum = 100, Default Value = 0
                        Normal, Normal
    PhotoNum            Text, Maximum Length = 100, Roll and print number of photograph
                        Normal, Normal
    Comments            Text, Maximum Length = 100
                        Normal, Normal

Waterbody               Point Feature, Label 1 = Point_number, Label 2 = Type_Water
                        location of an adjacent waterbody
    Point_number        Numeric, Decimal Places = 1, unique point identification number
                        Minimum = 0, Maximum = 99999, Default Value = 0, Step Value = 1
                        Normal, Normal
    Water_Name          Text, Maximum Length = 100, Waterbody Name
                        Normal, Normal
    Type_Water          Menu, Normal, Normal, Code for feature
        Tributary [HMT]
        Groundwater Seep
        Natural Springs [HMS]
        Beaver Pond [BP]
        Other   [HM]
    Inlet/Outl          Menu, Normal, Normal
        Inlet
        Outlet
    Length              Numeric, Decimal Places = 2, Waterbody length
                        Minimum = 0, Maximum = 1000, Default Value = 0
                        Normal, Normal
    Width               Numeric, Decimal Places = 2, Bankfull Width
                        Minimum = 0, Maximum = 1000, Default Value = 0
                        Normal, Normal
    Depth               Numeric, Decimal Places = 2, Bankfull Depth
                        Minimum = 0, Maximum = 1000, Default Value = 0
                        Normal, Normal
    Temperatur          Numeric, Decimal Places = 2, Water temperature
                        Minimum = 0, Maximum = 100, Default Value = 0
                        Normal, Normal
    PhotoNum            Text, Maximum Length = 100, Roll and print number of photograph
                        Normal, Normal
    Comments            Text, Maximum Length = 100
                        Normal, Normal

Erosion                 Point Feature, Label 1 = Point_number, Label 2 = Source_Erosion
    Point_number        Numeric, Decimal Places = 1, unique point identification number
                        Minimum = 0, Maximum = 99999, Default Value = 0
                        Normal, Normal
    Source_Erosion      Menu, Normal, Normal, Code for feature
        Bank Erosion [HCEB]
        Culvert [CV]
        Headwall [H]
        Lack of Riparian Veg [WDL]
        Livestock Access [WDC]
        Lakeside Grazing [WDG]
        Landslide
        Sloughing
        Other [O]
    Severity            Menu, Normal, Normal
        Low (<5m sq) [L]
        Moderate (5-10m sq) [M]
        High (>10m sq) [H]
    Exposure            Menu, Normal, Normal
        Clay [C]
        Till [T]
        Bedrock [B]
        Roots [R]
        Soil [S]
        Other [O]
    Length              Numeric, Decimal Places = 2, Feature length
                        Minimum = 0, Maximum = 1000, Default Value = 0
                        Normal, Normal
    Width               Numeric, Decimal Places = 2, Width of Feature
                        Minimum = 0, Maximum = 1000, Default Value = 0
                        Normal, Normal
    Height              Numeric, Decimal Places = 2, Height of feature
                        Minimum = 0, Maximum = 1000, Default Value = 0
```

```
                        Normal, Normal
    Slope               Numeric, Decimal Places = 0
                        Minimum = 0, Maximum = 90, Default Value = 0
                        Normal, Normal
    PhotoNum            Text, Maximum Length = 100, Roll and print number of photograph
                        Normal, Normal
    Comments            Text, Maximum Length = 100
                        Normal, Normal

Flood plain             Point Feature, Label 1 = Point_number, Label 2 = Flood_plain
                        location of flood plain
    Point_number        Numeric, Decimal Places = 1, unique point identification number
                        Minimum = 0, Maximum = 99999, Default Value = 0, Step Value = 1
                        Normal, Normal
    PID_number          Text, Maximum Length = 50, Property Identifier
                        Normal, Normal
    Flood_plain         Menu, Normal, Normal, Elevation level
        200_yr
        MeanAH
        other
    Elevation           Numeric, Decimal Places = 2, Height above sea level
                        Minimum = 0, Maximum = 1000, Default Value = 0
                        Normal, Normal
    Distance            Numeric, Decimal Places = 2, Distance from building
                        Minimum = 0, Maximum = 1000, Default Value = 0
                        Normal, Normal
    Slope               Numeric, Decimal Places = 1, slope to flood plain from lake
                        Minimum = 0, Maximum = 100, Default Value = 0
                        Normal, Normal
    Bearing             Numeric, Decimal Places = 1, Bearing to building
                        Minimum = 0, Maximum = 360, Default Value = 0
                        Normal, Normal
    PhotoNum            Text, Maximum Length = 100, Roll and print number of photograph
                        Normal, Normal
    Comments            Text, Maximum Length = 100, Description of point location
                        Normal, Normal

Photo                   Point Feature, photo point location
    PhotoNum            Text, Maximum Length = 100, Photo number
                        Normal, Normal
    Comments            Text, Maximum Length = 100, Description of photo
                        Normal, Normal

Line_Modification       Line Feature, Modification Line feature
    Type_Modification   Menu, Normal, Normal, Code for feature
        Dredging [HBDD]
        Fences [HOF]
        Livestock crossing [LC]
        Log_Dump [LD]
        Logging [LG]
        Marina
        Railway
        Retain Wall/Bank Stb [EHB]
        Rip_Rap [RR]
        Road [R]
        Trail [TR]
        Other [O]
    Retain_Wal          Numeric, Decimal Places = 0, Retaining walls per segment
                        Minimum = 0, Maximum = 99999999, Default Value = 0
                        Normal, Normal
    Docks               Numeric, Decimal Places = 0, Docks per segment
                        Minimum = 0, Maximum = 99999999, Default Value = 0
                        Normal, Normal
    Groynes             Numeric, Decimal Places = 0, Groynes per segment
                        Minimum = 0, Maximum = 99999999, Default Value = 0
                        Normal, Normal
    Impact              Menu, Normal, Normal, Level of Impact
        Low
        Medium
        High
    High_Water          Menu, Normal, Normal, Above or below high water
        Above
        Below
    PhotoNum            Text, Maximum Length = 100, Roll and print number of photograph
                        Normal, Normal
    Commnt_Mod          Text, Maximum Length = 100, Comments on modification
                        Normal, Normal

1_Riparian              Line Feature
```

```
    Rip_Class           Menu, Normal, Normal, Riparian Class
       Coniferous forest [VNF]
       Broadleaf forest [VBF]
       Mixed forest [VMF]
       Shrubs [VSH]
       Herbs/grasses [VHB]
       Exposed soil [NEL]
       Landscaped [LS]
       Lawn [L]
       Natural wetland [WN]
       Disturbed wetland [DWN]
       Row Crops [NAG]
       Rock [NNB]
    Rip_Stage           Menu, Normal, Normal, Structural Stage
       low shrubs <2m [3a]
       tall shrubs 2-10m [3b]
       sapling >10m [4]
       young forest [5]
       mature forest [6]
       old forest [7]
    Shor_Cover          Menu, Normal, Normal, Shoreline Cover
       None [ ]
       Sparse (<5%) [ ]
       Moderate (5-20%) [ ]
       Abundant (>20%) [ ]
    Rip_Snag            Menu, Normal, Normal, Presence of Snags
       No    Default
       <5
       >=5
    Rip_Commnt          Text, Maximum Length = 100, Comment Riparian
                        Normal, Normal

2_Riparian             Line Feature
    Rip_Class           Menu, Normal, Normal, Riparian Class
       Coniferous forest [VNF]
       Broadleaf forest [VBF]
       Mixed forest [VMF]
       Shrubs [VSH]
       Herbs/grasses [VHB]
       Exposed soil [NEL]
       Landscaped [LS]
       Lawn [L]
       Natural wetland [WN]
       Disturbed wetland [DWN]
       Row Crops [NAG]
       Rock [NNB]
    Rip_Stage           Menu, Normal, Normal, Structural Stage
       low shrubs <2m [3a]
       tall shrubs 2-10m [3b]
       sapling >10m [4]
       young forest [5]
       mature forest [6]
       old forest [7]
    Shor_Cover          Menu, Normal, Normal, Shoreline Cover
       None [ ]
       Sparse (<5%) [ ]
       Moderate (5-20%) [ ]
       Abundant (>20%) [ ]
    Rip_Snag            Menu, Normal, Normal, Presence of Snags
       No    Default
       <5
       >=5
    Rip_Commnt          Text, Maximum Length = 100, Comment Riparian
                        Normal, Normal

1_Substrate            Line Feature, Label 1 = Substrate
    Substrate           Menu, Normal, Normal
       Mud
       Fines
       Gravel
       Gravel_Fine
       Gravel_Coarse
       Cobble
       Cobble_Fine
       Cobble_Coarse
       Boulder
       Bedrock
    Shape               Menu, Normal, Normal, man made refers to angularity
       angular
```

```
        blast rock
        smooth    Default
    Commnt_Sub             Text, Maximum Length = 100, Comment for Substrates
                           Normal, Normal


2_Substrate            Line Feature
    Substrate              Menu, Normal, Normal
        Mud
        Fines
        Gravel
        Gravel_Fine
        Gravel_Coarse
        Cobble
        Cobble_Fine
        Cobble_Coarse
        Boulder
        Bedrock
    Shape                  Menu, Normal, Normal, man made refers to angularity
        angular
        blast rock
        smooth    Default
    Commnt_Sub             Text, Maximum Length = 100, Comment for Substrates
                           Normal, Normal


Sub_Veg                Line Feature, Label 1 = Comment
    Comment                Text, Maximum Length = 30
                           Normal, Normal


Emerg_veg              Line Feature, Label 1 = Comment
    Comment                Text, Maximum Length = 30
                           Normal, Normal
```

**Appendix  D – Brief GPS Overview**

**Global Positioning System (GPS)**

**Theory**

**What is GPS?**

> The Global Positioning System (GPS) is a satellite-based navigation system, providing position information, accurate to approximately 15m, anywhere on earth. Special methods can achieve position accuracy better than 1 mm. Satellites transmit radio signals, used by GPS receivers to compute positional information.

**GPS System Configuration**

> 24 Satellites orbit around the earth with a period of 12 hours. Because the orbits are inclined at 55 degrees to the equator, satellites are not seen to the North in Canada. Reception is difficult where the southern sky is obstructed (e.g., steep north-facing slopes, gullies, buildings in cities). Satellites operate on "sidereal time", based on the earth's rotation, so configurations repeat every 23h 56m ("solar time"). Certain times of the day are better or worse for GPS surveying; these times advance 4 minutes per day (~30 minutes per week).

**Position Computation**

> *How is it done?*
> GPS satellites broadcast a coded time signal;
> GPS receiver computes a distance to the satellite, using the send-time, receive time, and the signal speed (speed of light):
> GPS receivers calculate their position by intersecting ranges from four or more satellites ("triangulation").

**Sources of Error**

> *Clock Errors*
> Receiver clocks have limited accuracy;
> The observed "range" to the satellite (pseudorange) is biased by an unknown clock offset, translating to range errors of hundreds of kilometers.
> Satellites have accurate atomic clocks (to a few trillionths of a second) but small errors cause range errors of a few meters.
>
> *Atmospheric*
> The signal is slowed down due to a magnetic effect as it travels through the atmosphere.
> Common mode
> Signal propagation and satellite errors are the same for receivers within the same general area.
> Can be corrected using a reference receiver at a known location

### *Multipath*
Signals reflects off nearby objects before reaching receiver antenna due to local site conditions

## Increasing Accuracy of Position

## Dilution of Precision (DOP) Mask

DOP measures the geometry of the satellites relative to each other and to the receiver.
Low DOP = good geometry = more accurate (satellites are well spread in sky)
High DOP = poor geometry = less accurate (satellites are close together)
Obstructions (tree cover, buildings, etc.) cause higher DOPs.
GPS can be set to reject positions with DOPs too high **(PDOP limit=8 for SHIM)** to help ensure accuracy

## Position Correction: Differential GPS

Position accuracy is increased by comparing the rover receiver (yours) with a reference receiver at a known location.
Without differential correction, the expected accuracy of GPS positions is about 20 metres.
Differential correction can be done either via post-processing or real-time (in the field).

## Post-Processing Reference Data

After the survey is done, data from the field receiver and a reference receiver is downloaded to a computer and the positions are differentially corrected.

## Real-Time GPS Surveying

Positions stored in the GPS receiver are corrected in the field, before downloading to the computer
Corrections are broadcast as soon as possible to users in a local area
Equipped GPS receivers can correct positions in real-time and store corrected positions in the field
GPS receivers can be configured to store uncorrected GPS data (for later post-processing) when real-time data is not available
Real-time corrections are slightly less accurate than post-corrected GPS, but the difference is not important for most mapping surveys (<1m).

## Sound to Noise Ratio (SNR) Mask

Interference from gases, forest canopy, multipathing, and even GPS cable connections can cause signal attenuation. If the interfering components overwhelm the signal tracing can become difficult. The SNR is a comparison between the signal strength to the noise. **The SNR mask should be set to 3 for SHIM mapping however lowering the SNR mask to 0 allows for faster data collection with little difference to the accuracy of the collected data.**

From:  RIC Standards Training using GPS Technology, September 1998.

## Elevation Mask

Traveling through the atmosphere causes a great deal of noise to the GPS signal.  The elevation mask allows GPS users to limit the length the signal travels through the atmosphere.  **The elevation mask should be set to $15^o$ according to RIC standards.**

From:  RIC Standards Training using GPS Technology, September 1998.

## Accuracy Requirements for SHIM

GPS-derived stream features must be within five metres of the true location, 95 percent of the time (to be compatible with 1:5000 scale municipal maps).  Under typical conditions with local obstructions, forest cover, and other factors, five-metre accuracy is achievable only with the best GPS equipment and careful methods.

## General Field Methods for Poor GPS Reception

Moving the antenna around within a meter can help re-acquire satellite signals, without affecting position accuracy.
Waiting for ten or twenty minutes (sometimes hours in extreme cases) can usually enable surveying.
Conventional methods can be used to supplement GPS methods during these reception "down" periods.
Adjusting the Receiver Configurations
Under forest canopy, configuring the receiver to accept weaker satellite signals will make GPS surveying possible in most situations.
Weaker signals (such as signals passing through foliage)  may be less accurate than strong signals.
Using the manufacturer's default configuration (e.g. SNR mask 6), the best GPS receivers are capable of accuracy better than 1 m in ideal conditions, but usually they work poorly in forest cover – if at all.
Reducing SNR to 0 allows collection of more data under forest canopy and does not degrade accuracy beyond acceptable limits (5 m, 95% confidence).

## Using the Trimble Pathfinder

*Upload  the Data Dictionary from Pathfinder Office*
*Configure GPS*

## Field Mapping

Press on the power.
Select TerraSync Program
Select Data Collection from the main menu.

Select Create new file to create a new rover file. *Never re-open a rover file to add more information. You may lose your data or the file may become corrupted.*
Enter the file name. Decide on a file naming system and use it consistently (for example, Stream name / date: "FERG0601" for Fergus Creek, June 1st).
Select the Data Dictionary you will be using, which is generally the most recent Data Dictionary.
This opens the Start feature menu, from which you can choose to map point or line features.

## Entering Shoreline Information

*Note:  Remember to pause logging before stopping to enter information into the data logger, and resume when you continue walking the stream centreline.*

Reference Information applies to the entire shoreline feature you are mapping.  It is usually entered while standing at the start point, but the timing depends on crew preference.  For example you may prefer to do it at the same time as entering characteristics for the first segment.  In any case, the data logger will not let you end the stream feature until you have entered all the required information.