Standard for Terrestrial Ecosystem Mapping (TEM) - Digital Data Capture in British Columbia

Ecosystem Technical Standards and Database Manual

Prepared by:

Ecological Data Committee
Ecosystems Working Group/Terrestrial Ecosystems Task Force

For:

Resources Inventory Committee (RIC)

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PREFACE

The Resources Inventory Committee members are resource specialists from a number of professional disciplines and represent Provincial, Federal, First Nation and private sector agencies and other resource interests. RIC's objectives are to develop a common set of standards and procedures for provincial resource inventories, as recommended by the Forest Resources Commission in its report 'The Future of our Forests".

Funding of the Resource Inventory Committee work, including the preparation of this document, is provided by the Corporate Resource Inventory Initiative (CRII) and by Forest Renewal BC (FRBC). Preliminary work of the Resources Inventory Committee was funded by the Canada-British Columbia Partnership Agreement of Forest Resource Development FRDA II.

For further information about the Resources Inventory Committee and its various Task Forces, please visit the RIC website at http://www.for.gov.bc.ca/ric

ABSTRACT

The *Standard for Digital Terrestrial Ecosystem Mapping (TEM) Data Capture in British Columbia,* (RIC, 2000) works in conjunction with the Resources Inventory Committee's (RIC) *Standard for Terrestrial Ecosystem Mapping in British Columbia,* (RIC, 1998), along with the *Field Manual for Describing Terrestrial Ecosystems,* (Min. of For *et.* al, 1998), the *Terrain Classification Manual, Version 2.0,* (Howes and Kenk, 1997), the *Standard for Digital Terrain Data Capture in British Columbia, Version 1.0,* (RIC, 1996) and the existing Ministry standards described at BC Environment's World Wide Web site at http://www.elp.gov.bc.ca/rib/wis/tem/

This document sets out procedures and rules for capturing, storing, and distributing ecological data for the ministry's GIS (Geographic Information Systems) and other database systems. Its goal is to help the province acquire and administer this data in an organized fashion throughout the province and commensurate with the objectives of RIC. The Ecological Data Committee under the auspices of the Ecosystems Working Group, Terrestrial Ecosystems Task Force (RIC) compiled this manual. The Ecological Data Committee consists of ecologists, pedologists, geomorphologists, and database and computer-mapping experts from the consulting community and government agencies.

Funding was provided by Forest Renewal British Columbia (FRBC) and Corporate Resources Inventory Initiative (CRII).

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and ask for the Habitat Data Manager at:

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Ministry of Environment, Lands and Parks,
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1 Introduction

1.1 Purpose

This document, in conjunction with the *Standard for Terrestrial Ecosystem Mapping in British Columbia,* (RIC, 1998), the *Field Manual for Describing Terrestrial Ecosystems*, (Min. of For. *et.* Al, 1998), the *Terrain Classification Manual, Version 2.0,* (Howes and Kenk, 1997),and the *Standard for Digital Terrain Data Capture in British Columbia, Version 1.0,* (RIC, 1996) describes how to compile, store, and deliver digital data for Terrestrial Ecosystem Mapping (TEM) in British Columbia. These data, including maps, polygon data, metadata, and legends, are suitable for digital data exchange among business, government, the research community, and the general public.

It is anticipated that all publicly funded mapping projects in BC will comply with the recommendations of the Resources Inventory Committee (RIC). This document will provide consistent terms of reference for mappers, correlators and data managers, whether they work in the private sector, districts, regions or provincial custodian offices. The Ecological Data Committee, under the auspices of the Ecosystems Working Group (RIC), plans annual reviews of this manual to improve functionality and to ensure conformity between standards. A web-based change management procedure will manage feedback and revisions to this Standard. See the Change Management web site at http://www.elp.gov.bc.ca/rib/wis/tem

Provincial ecology and terrain correlators will be available to TEM project leaders, consultants, and other users of this manual for consistent help and direction with TEM mapping projects. As well, GIS, data managers and quality assurance specialists will provide guidance on the use of all ecosystem-related documents. All comments should be forwarded to:

Habitat Data Manager
Wildlife Inventory Section, Resources Inventory Branch,
Ministry of Environment, Lands and Parks,
2nd Floor, 2975 Jutland Road
Victoria, BC

1.2 Scope and Status

This manual currently includes the following sections:

- *Ecosystem Inventory Database Standards*, including information on the attributes collected for the TEM database and conventions used to code those attributes. See Section 2.
- *Data Capture* (DC) V*alidation Standards*, providing an overview of the DC application which will assist mapping contractors with capturing and validating TEM attributes by providing data-entry procedures and coding instructions in an automated database application. See Section 2.
- *Spatial Standards* detailing the specifications for digital storage of terrestrial ecosystem and terrain data in ARC/INFO format and an attribute database. It is intended to simplify the capture, processing, distribution and use of digital terrestrial ecosystem data by explicitly specifying the exact format and content of the data in digital form. See Section 3.
- *Check and Presentation Plots,* detailing the appearance of standard check and presentation plots drawn from a digital terrestrial ecosystem or terrain dataset. See Section 4.

- *Metadata Standards*, providing specifications for both spatial and non-spatial project level metadata. See Section 5.
- *Delivery Standards*, including the location and the format for digital and hard copy files. See Section 6.
- *References*, providing references to those documents specifically mentioned in this document. As well, several additional references are listed to provide supporting information, See Section 7.
- *Appendices,* providing information and example tables for polygon specific data capture and user defined data. As well, TEM dataforms with example data filled in, See Section 8.

In the future it may cover the following areas:

- Automated programs to assist with quality assurance and plotting of map labels (in progress).
- Detailed Quality Assurance check list (in progress).
- Standards on submitting a terrestrial ecosystem point and line (ECF) coverage, which is an arc/point coverage, with feature codes on both arcs and points.

1.3 Using this Document

- Review Tables 2-2 and 2-3 which provide the form name, description, field length, format and csv (comma separated value) field name for each TEM attribute. Strict adherence to the codes is necessary.

- Review Table 2-4, which provides users the opportunity to enter user defined codes for new ecosystem units or attributes that may be valid for a particular project but have yet to be approved for the provincial listing. All new codes that are entered as user defined must be approved by the Regional Ecologist and all new attributes entered must approved by TEM Custodian or prior to submission. Users must also refer to the *Terrestrial Ecosystem Mapping (TEM) Data Capture Application (DC) User Guide. Version 1.0,* (EWG, 2000) (In progress) for detailed instructions on how to submit user defined information.

- Additional information that cannot be entered into the existing project, polygon or user defined attributes can be entered in the project or polygon specific column.
- Review the sample TEM Data Forms (Section 2.5) which lists the attributes for ecosystem data capture and provincial-level storage. Appendix 2 provides populated example TEM Data Forms of TEM attribute codes.
- Users must also refer to the *Terrain Classification Manual, Version 2.0* (Howes and Kenk, 1997) and the *Standard for Digital Terrain Data Capture in British Columbia, Version 1.0, (*RIC, 1996) as coding instructions, digital specifications and mandatory attributes for ecosystem mapping are described for terrain attributes in these manuals. To permit the Geologic Survey Branch to populate the Provincial Terrain Mapping Repository with TEM terrain mapping, the terrain standards must be strictly adhered to.
- If unfamiliar with the TEM system, refer to the manuals listed in the 'References Section', and for general guidance, refer to the web site, http://www.elp.gov.bc.ca/rib/wis/tem/ for terrestrial ecosystem mapping procedures.

2 Database Standards & Data Capture

2.1 Background and Scope

This section includes information on the attributes collected on the TEM data form and conventions used to code those attributes. The mandatory attributes are listed in Table 2-1 followed by Tables 2-2, 2-3 and 2-4 of all ecosystem project, polygon and user defined attributes identifying form name, description, format, and comma separated value name. Example TEM data forms are also included.

Depending on client needs, the user may choose to capture only the mandatory attributes in the database for their project. The coding in the database must adhere to all standards provided in the database procedures to ensure consistency of data.

Each polygon for TEM requires terrain and soil drainage data, therefore the TEM dataform includes a terrain component.

2.2 Mandatory Project and Polygon Attributes

Table 2-1 - Mandatory project and polygon attributes required for TEM

Project (or mapsheet) Specific Attributes - repeated for each mapsheet:
Project name
Geographic Location
Consultant/Department
Mapsheet Number
Ecosystem Mapper
Terrain Mapper
Digital Capture
Map Scale
TRIM Version
Legend
Ecosystem survey intensity level
Terrain survey intensity level
Year Surveyed
Date Recorded
Recorder Name
Air Photo Year
Air Photo Scale
Air Photo Type
Package Version
Polygon Specific Attributes - unique for each polygon:
Recorded once per ecosystem map unit (polygon):
Ecosystem Polygon Tag
Mapsheet number
Polygon number
Data source
Ecosection unit
Biogeoclimatic unit (Zone, subzone, variant, and phase)
Terrain unit: Geomorphological modifying process * (where present)
Terrain unit: Soil drainage

Table 2-1 continued on next page

Table 2-1 continued

Recorded up to three times per ecosystem map unit (polygon):

Ecosystem

Decile
Site series
Site modifier
Structural stage

Terrain

Decile
Terrain texture *
Surficial material
Qualifying descriptor (where present)
Surface expression

User Defined Specific Attributes (The following attributes are mandatory only when user defined information is submitted)

Recorded once per ecosystem map unit or entry

Applies to
Value Type
Length
Required
Description

For wildlife habitat inventory or interpretation projects the following can be included:

Tree crown closure
Stand Composition
Shrub crown closure - for shrub structural stages *

NOTE: Attributes marked with an asterisk (*) are not mandatory but should be captured if possible. Other attributes may be required as project or polygon specific attributes.

NOTE: Although the ECP TAG is a mandatory attribute, it is not required when filling out paper copy forms. Only include the ECP TAG in the digital submission.

2.3 Database Field Definitions For TEM Data Form And Data Capture (DC) Application

The field format for the TEM polygon, project and user defined data form and DC consists of:

- Field length
- Type
- Case

No case code is used for numeric data; fixed-format entries with decimals are right justified and filled with zeroes on the left.

Allowable codes and fields for Table's 2-2, 2-3 and 2-4 (TEM database) follow:

Field Length:

The maximum number of characters which may be entered for a given item, for example:

20	A 20-character field, no implied data type.
5,2	A field of 5 numeric places and 2 numeric places following the right of the decimal point.

Type:

A reference to one of the following categories of data:

N	Numeric. The ten digits 0–9, plus the decimal point and leading blanks (e.g., 010 = 10). Zeroes are used to fill out field to the number of decimals specified in the field length.
D	Date. The date follows the format (yyyy-mm-dd) for project, polygon and user defined data.
C	All possible characters. These include numeric, alphabetic characters and special characters, such as x / ‘ ; - =

Case:

A reference to the following form of character:

L	Lowercase. The data must appear in lowercase characters. Lowercase characters would appear as follows: dx
U	Uppercase. The data must appear in uppercase characters. Uppercase characters would appear as follows: DX
M	Mixed case. The data may appear in upper and lower case characters. Mixed case characters would appear as follows: Dx

2.4 TEM Data Form Attributes

Items 1 through 21 in Table 2-2 describe the TEM project level attribute fields. These attributes must be consistent throughout a mapping project and need only be provided once for the entire project. Items 22 through 180 in Table 2-3 describe the TEM polygon level attribute fields in the TEM database. If the polygons are being mapped and numbered on a mapsheet basis, the mapsheet number must be filled in and every polygon on the data form must fall within the specified mapsheet. Polygons that will extend across mapsheet neatlines should be assigned the mapsheet number that is the largest area in the mapsheet during the mapping process. Items 1 through 13 in Table 2-4 describe the TEM user defined level of attribute fields.

When filling in the paper copies of TEM data forms, the 'Project Name' attribute must be completed on every form to ensure all forms of a particular project are together. See Appendix 2 for examples.

When filling in the paper copies of TEM data forms, the 'Form Of' column must be completed on every polygon data form to ensure all polygon information is in order and together. See Appendix 2 for examples.

A number of fields on the data form require the user to choose from a specific set of values. The *description* column for each of these fields indicates the appropriate code or where to find the code that is to be used.

The *CSV field name* column in Table’s 2-2, 2-3 and 2-4 gives the corresponding attribute name for the comma-separated values (CSV) file.

Table 2-2 - Description of Attribute Fields for Ecosystem Project Data - Project.csv

Field #	Form Name	Description	Length	Type	Case	CSV field name
Note: Items 1 through 21 refer to the project level attributes in the TEM database.						
1	Project Name	The common name of the project – usually a well-known local place or feature.	40	C	M	Proj_Name

2	Geographic Location	The geographic area of the mapping project. The geographic area of the mapping project. The general location in/near which the project takes place. This field must be a gazetted name taken from published map; it may be a town, lake, watershed, etc.	40	C	M	Geog_Loc
3	Consultant/ Department	The public or private-sector organization name responsible for the mapping project.	40	C	M	Org_Name
4	Map Scale	The source scale on which the ecosystem polygons were captured. Ex. 20000 not 1:20000	8	C		Map_Scale
5	TRIM Version	The version of TRIM mapsheets used for Ecosystem mapping. Enter: 1 for TRIM version 1; 2 for TRIM version 2; 3 for a composite of TRIM version 1 and 2; 4 for quad system under TRIM version 1; 5 for quad system under TRIM version 2; or 6 for a quad composite of TRIM version 1 and 2. See Table 3-10 for quad system description.	1	C		Trim_Nbr
6	Legend	A summarized description of all map unit components and map symbols, together with other supporting information including survey objectives, survey intensity, location, field sampling, other data sources, aerial photograph reference numbers, and map credits. *See Standard for Terrestrial Ecosystem Mapping in British Columbia*, Table 5.1 for minimum data required to be included in map legends. To be recorded as an associated Rich Text File (RTF) that is 8.3 compliant, with a maximum of an 8 characters in the name and it must have a 3 character extension. e.g.:<lignumML>.rtf	12	C	M	Legend
7	Expanded Legend	Generally, an expanded legend will contain descriptive information for each mapped ecosystem in a report that accompanies the map. Included in this document should be the Final Report. *See Standard for Terrestrial Ecosystem Mapping in British Columbia,* Section 5 for full a description. To be recorded as an associated Rich Text File (RTF) file or a Portable Document File (PDF), that is 8.3 compliant, with a maximum of an 8 characters in the name and it must have a 3-character extension. e.g.: <project name_EL>.doc – lignum_EL.rtf e.g.: <project name_EL>.pdf – lignum_EL.pdf	12	C	M	Ex_Legend

8	Ecosystem Survey Intensity Level	The sampling intensity characterized according to percentage of polygons that have been field inspected or density of inspections by area. Coding must follow Table 6-3 in the *Standard for Terrestrial Ecosystem Mapping in British Columbia*.	1	C	U	ESIL
9	Terrain Survey Intensity Level	The extent to which the terrain mapping for the current project has been checked on the ground. See Table 2-5.	1	C	U	TSIL
10	Year Surveyed	The year (yyyy) in which the ecosystem mapping for the project is completed.	4	C		Year_Surv
11	Date Recorded	The date (yyyy-mm-dd) project and polygon data is entered into a database.	10	D		Date_Rec
12	Recorder Name	The person who entered the project and polygon data into a database.	40	C	M	Recor_Name
13	Air Photo Year	Year of air photo (yyyy).	4	C		Pho_Yr
14	Air Photo Scale	Scale of air photo.	8	C		Pho_Sc
15	Air Photo Type	Whether air photo is digital or analog and in color or black and white. Enter: 1 - colour 2 - black and white 3 - digital colour 4 - digital black and white	1	C		Pho_Type
16	Version of Package Used	Version of manuals used for ecosystem mapping. As codes have changed the version of manuals used must be indicated to accompany validation routines. Package 1 - *Standard for Terrestrial Ecosystem Mapping in British Columbia (1995); and Addenda to Terrestrial Ecosystems Mapping Standards, (1996).; or* Package 2 - *Standard for Terrestrial Ecosystem Mapping in British Columbia* (RIC, 1998). Enter 1 for package 1 and 2 for package 2.	1	C		Pack_Nbr
17	Mapsheet Number	The mapsheet number that the ecosystem/terrain mapper is working on. Leading zero required for mapsheets not starting with 1, left justified with no decimal separator.	9	C	U	Mapsh_Nbr
18	Ecosystem Mapper	The person who originally captured the Terrestrial Ecosystem Mapping data.	80	C	M	Eco_Map
19	Terrain Mapper	The person who originally captured the Terrain Mapping data.	80	C	M	Tern_Map
20	Digital Capture	The public or private-sector individual or organization responsible for digital data capture.	125	C	M	Dig_Cap

21	Project Specific Comments	This field may be used to record any pertinent information regarding the project. At all times attempt to use referenced classifications which are well defined and understood in the science, or provide thorough definitions for the user.	500	C	M	Proj_Com

Table 2-3 - Description of Attribute Fields for Ecosystem Polygon Data - Polygon.csv

Field #	Form Name	Description	Length	Type	Case	CSV field name
Note: Items 22 through 180 refer to the polygon level attributes in the TEM database.						
22	Ecosystem Polygon Tag	Concatenation of Mapsheet Number and Polygon Number used for unique identification of a polygon. For example, 092G090_124 See NOTE below.	15	C		ECP_TAG
23	Mapsheet Number	In cases where the polygon falls entirely within the bounds of a particular mapsheet, this data element will contain the mapsheet number. Leading zero required for mapsheets not starting with 1, left justified with no decimal separator.	9	C	U	Mapsh_Nbr
24	Polygon Number	An identifying number for polygon being mapped. Polygons may be numbered consecutively within projects, or within projects and mapsheets, depending on the preference of the lead mapper.	5	N		Poly_Nbr
25	Data Source	Source of the data used to determine ecological polygon units. Note that data may be used from previous studies. See Table 2-6 below and Section 6.3.3 in the *Standard for Terrestrial Ecosystem Mapping in British Columbia, (*RIC, 1998).	1	C	U	Source
26	Ecosection	A component of the hierarchical Ecoregion Classification System of British Columbia which describes areas of major physiographical and minor macroclimatic or oceanographic variation. (Demarchi, *1996).*	3	C	U	Eco_Sec
27	BGC Zone	A first-rank unit in the hierarchical Biogeoclimatic Ecosystem Classification (BGC) system of the Ministry of Forests. Coding must follow the *Field Manual for Describing Terrestrial Ecosystems, (*RIC, 1998).	4	C	U	Bgc_Zone
28	BGC Subzone	A second-rank unit in the BGC system occurring` within particular zones. Coding must follow the *Field Manual for Describing Terrestrial Ecosystems, (*RIC, 1998).	3	C	L	Bgc_Subzon
29	BGC Variant	A third-rank unit in the BGC system occurring within particular subzones. Coding must follow the *Field Manual for Describing Terrestrial Ecosystems, (*RIC, 1998).	1	C		Bgc_Vrt

30	BGC Phase	A fourth-rank unit in the BGC system occurring within specific variants, subzones, and zones. Coding must follow the *Field Manual for Describing Terrestrial Ecosystems, (*RIC, 1998*).*	1	C	L	Bgc_Phase
31	Ecosystem Decile, Component 1	The proportion of the polygon covered by Component 1, in deciles. Deciles in components 1–3 must total 10 (e.g., 5–3–2, if the first two deciles total 10 then the third decile is left blank e.g. 6–4). Decile 1 must be greater or equal to Decile 2, which must be greater or equal to Decile 3.	2	N		Sdec_1
32	Realm, Component 1	The Realm is the broadest level of distinction within the ecosystem component and it delineates major biotic types that reflect gross differences in water abundance, quality, and source. Coding must follow the *Field Manual for Describing Terrestrial Ecosystems, (*RIC, 1998*).*	1	C	U	Realm_1
33	Group, Component 1	The Group designates a broad association of functionally similar ecosystems within a Realm. Ecologically relevant environmental features that have a dominant influence on ecosystem structure are used to differentiate between Groups. Coding to be defined.				Group_1
34	Class, Component 1	There is a more refined division of the Group reflecting ecosystems that have broadly similar vegetation physiognomy, hydrology, and water quality. Coding must follow the *Field Manual for Describing Terrestrial Ecosystems, (*RIC, 1998)	1	C	L	Class_1
35	Site Series Number, Component 1	Categorizes sites based on their ability to produce specific climax vegetation within a particular BGC Subzone or Variant. Coding follows the standards found at: http://www.elp.gov.bc.ca/rib/wis/tem/ and the MoF Field Guides to Site Units.	2	C		Site_S1
36	Assumed Site Series Modifier 1, Component 1	The 1st of up to 4 codes describing the typical environmental conditions of the site series in the landscape. These cannot be used as site modifiers to site series. See item 40.	1	C	L	SiteAM_S1a
37	Assumed Site Series Modifier 2, Component 1	The 2nd of up to 4 codes. See item 36.	1	C	L	SiteAM_S1b
38	Assumed Site Series Modifier 3, Component 1	The 3rd of up to 4 codes. See item 36.	1	C	L	SiteAM_S1c
39	Assumed Site Series Modifier 4, Component 1	The 4th of up to 4 codes. See item 36.	1	C	L	SiteAM_S1d

40	Site Series Map Code, Component 1	Categorizes sites based on their ability to produce the same mature or climax plant communities within a particular BGC Subzone or Variant. Coding follows the standards found at: http://www.elp.gov.bc.ca/rib/wis/tem/	2	C	U	SiteMC_S1
41	Site Modifiers 1, Component 1	The 1st of up to 2 codes describing atypical occurrences of the site series in the landscape. Up to two site modifiers can be used per site series, describing variations in topography, moisture, soil and soil characteristics. Coding must follow Table 3.2 in the *Standard for Terrestrial Ecosystem Mapping in British Columbia, (*RIC, 1998)	1	C	L	Site_M1a
42	Site Modifiers 2, Component 1	The 2nd of up to 2 codes. See Item 41.	1	C	L	Site_M1b
43	Structural Stage, Component 1	The structure of the vegetation cover at a point in time. The structure of a plant community changes over time, progressing from a pioneer stage to a climax stage. Coding must follow the provincial listing of the approved mapcodes in the *Provincial Site Series Mapping Codes And Typical Environmental Conditions*. This list should be downloaded from the TEM website at http://www.elp.gov.bc.ca/rib/wis/tem See Table 3.3 in the *Standard for Terrestrial Ecosystem Mapping in British Columbia, (*RIC, 1998) for examples	1	C		Strct_S1
44	Structural Stage Substage **OR** Modifier, Component 1	*Substages* are used to further differentiate structural stages 1 through 3 according to life form, layers and relative cover of individual strata. Coding must follow the provincial listing of the approved mapcodes in the *Provincial Site Series Mapping Codes And Typical Environmental Conditions*. This list should be downloaded from the TEM website at http://www.elp.gov.bc.ca/rib/wis/tem See Table 3.3 in the *Standard for Terrestrial Ecosystem Mapping in British Columbia* for examples*Modifiers* differentiate forest stands based on relative development of overstory, intermediate and surpressed crown classes. See Table 3.4 in the *Standard for Terrestrial Ecosystem Mapping in British Columbia, (*RIC, 1998) for examples.	1	C	L	Strct_M1

45	Stand Composition Modifier, Component 1	Differentiates forest stands based on coniferous, broadleaf and mixed stand composition. Coding must follow the provincial listing of the approved mapcodes in the *Provincial Site Series Mapping Codes And Typical Environmental Conditions*. This list should be downloaded from the TEM website at http://www.elp.gov.bc.ca/rib/wis/tem See Table 3.5 in the *Standard for Terrestrial Ecosystem Mapping in British Columbia* for examples.	1	C	U	Stand_A1
46	Seral Community Type, Component 1	A distinct plant community in the successional plant community development from a pioneer stage to a climax stage. Recognized by the combination of plant species present, along with the BGC Subzone/Variant and Site Series in which the community occurs. A Seral Community Types may occur over several Site Series. Coding must follow the provincial listing of the approved mapcodes in the *Provincial Site Series Mapping Codes And Typical Environmental Conditions*. This list should be downloaded from the TEM website at http://www.elp.gov.bc.ca/rib/wis/tem See Table 3.6 in the *Standard for Terrestrial Ecosystem Mapping in British Columbia, (*RIC, 1998) for examples.	2	C	L	Seral_1
47	Tree Crown Closure, Component 1	The percent of ground area covered by the vertically projected crowns of the tree cover.	2	N		Tree_C1
48	Shrub Crown Closure, Component 1	The percent of ground area covered by the vertically projected crowns of the shrub cover. Shrub crown closure should only be estimated for shrub- or herb-dominated components, not for forest-dominated components. Shrub crown closure is useful for determining wildlife uses.	2	N		Shrub_C1
49	Site Disturbance Class, Component 1	Site Disturbance class is recorded for each component and is the history of a particular site, or ecological unit based on the processes leading to the current successional stage. Coding must follow the *Field Manual for Describing Terrestrial Ecosystems, (*Min. of For.,1998).	1	C	U	Distcls_1
50	Site Disturbance Subclass, Component 1	Site Disturbance subclass is recorded for each component and is the modifier for Site Disturbance class of a particular site, or ecological unit based on the processes leading to the current successional stage. Coding must follow the *Field Manual for Describing Terrestrial Ecosystems, (*Min. of For.,1998).	1	C	L	Distscls_1

51	Site Disturbance Sub-Subclass, Component 1	Site Disturbance sub-subclass is recorded for each component and is the modifier for Site Disturbance class of a particular site, or ecological unit based on the processes leading to the current successional stage. Coding must follow the *Field Manual for Describing Terrestrial Ecosystems, (*Min. of For.,1998).	2	C	L	Dissscls_1
52	Ecosystem Decile, Component 2	See Item 31	1	N		Sdec_2
53	Realm, Component 2	See Item 32	1	C	U	Realm_2
54	Group, Component 2	See Item 33				Group_2
55	Class, Component 2	See Item 34	1	C	L	Class_2
56	Site Series Number, Component 2	See Item 35	2	C		Site_S2
57	Assumed Site Series Modifier 1, Component 2	See Item 36	1	C	L	SiteAM_S2a
58	Assumed Site Series Modifier 2, Component 2	See Item 37	1	C	L	SiteAM_S2b
59	Assumed Site Series Modifier 3, Component 2	See Item 38	1	C	L	SiteAM_S2c
60	Assumed Site Series Modifier 4, Component 2	See Item 39	1	C	L	SiteAM_S2d
61	Site Series Map Code, Component 2	See Item 40	2	C	U	SiteMC_S2
62	Site Modifiers 1, Component 2	See Item 41	1	C	L	Site_M2a
63	Site Modifiers 2, Component 2	See Item 42	1	C	L	Site_M2b
64	Structural Stage, Component 2	See Item 43	1	C		Strct_S2

65	Structural Stage Substage **OR** Modifier, Component 2	See Item 44	1	C	L	Strct_M2
66	Stand Composition Modifier, Component 2	See Item 45	1	C	U	Stand_A2
67	Seral Community Type, Component 2	See Item 46	2	C	L	Seral_2
68	Tree Crown Closure, Component 2	See Item 47	2	N		Tree_C2
69	Shrub Crown Closure, Component 2	See Item 48	2	N		Shrub_C2
70	Site Disturbance Class, Component 2	See Item 49	1	C	U	Distcls_2
71	Site Disturbance Subclass, Component 2	See Item 50	1	C	L	Distscls_2
72	Site Disturbance Sub-Subclass, Component 2	See Item 51	2	C	L	Dissscls_2
73	Ecosystem Decile, Component 3	See Item 31	1	N		Sdec_3
74	Realm, Component 3	See Item 32	1	C	U	Realm_3
75	Group, Component 3	See Item 33				Group_3
76	Class, Component 3	See Item 34	1	C	L	Class_3
77	Site Series Number, Component 3	See Item 35	2	C	U	Site_S3
78	Assumed Site Series Modifier 1, Component 3	See Item 36	1	C	L	SiteAM_S3a

79	Assumed Site Series Modifier 2, Component 3	See Item 37	1	C	L	SiteAM_S3b
80	Assumed Site Series Modifier 3, Component 3	See Item 38	1	C	L	SiteAM_S3c
81	Assumed Site Series Modifier 4, Component 3	See Item 39	1	C	L	SiteAM_S3d
82	Site Series Map Code, Component 3	See Item 40	2	C	U	SiteMC_S3
83	Site Modifiers 1, Component 3	See Item 41	1	C	L	Site_M3a
84	Site Modifiers 2, Component 3	See Item 42	1	C	L	Site_M3b
85	Structural Stage, Component 3	See Item 43	1	C		Strct_S3
86	Structural Stage Substage **OR** Modifier, Component 3	See Item 44	1	C	L	Strct_M3
87	Stand Composition Modifier, Component 3	See Item 45	1	C	U	Stand_A3
88	Seral Community Type, Component 3	See Item 46	2	C	L	Seral_3
89	Tree Crown Closure, Component 3	See Item 47	2	N		Tree_C3
90	Shrub Crown Closure, Component 3	See Item 48	2	N		Shrub_C3
91	Site Disturbance Class, Component 3	See Item 49	1	C	U	Distcls_3

92	Site Disturbance Subclass, Component 3	See Item 50	1	C	L	Distscls_3
93	Site Disturbance Sub-Subclass, Component 3	See Item 51	2	C	L	Dissscls_3
94	Decile of Terrain Component 1	See Item 31.	2	N		Tdec_1
95	Partial Cover Flag, Component 1	A single slash '/' indicates that the overlying material in the terrain component only partially covers the underlying material. It means a moderately extensive but discontinuous cover of surface material. *Note this is a new term added to the Terrain Classification Manual, Version 2.0.* (Howes and Kenk, 1997).	1	C	L	Prtflg_1
96	Terrain Texture 1, Component 1	The 1st of up to 3 codes describing the standard terrain texture at the surface. The size, shape and sorting of particles in clastic sediments (or the proportion and degree of decomposition of plant fibre in organic sediments) in the first stratum of the terrain component 1 in the current terrain polygon. *Note*: Also Known as Surficial Material Texture. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	L	Ttex_1a
97	Terrain Texture 2, Component 1	The 2nd of up to 3 codes. See item 96.	1	C	L	Ttex_1b
98	Terrain Texture 3, Component 1	The 3rd of up to 3 codes. See item 96.	1	C	L	Ttex_1c
99	Surficial Material, Component 1	The formative geomorphological process of the first stratum of surficial material of component 1 of the current terrain polygon. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	2	C	U	Surfm_1
100	Surficial Material Qualifier, Component 1	A code used to specify whether the formative geomorphological process of the first stratum of surficial deposit of component 1 is currently 'active' ('A') or 'inactive' ('I'). The assumed status is not recorded. Note: 'G' is now coded directly with the genetic material (see previous item). See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	U	Surfm_Q1

101	Surficial Material Subtype, Component 1	A project-specific code for the subtype of the surficial material in the first stratum of the component of the current terrain polygon. A surficial material subtype is distinguished by characteristics that cannot be adequately represented by standard terrain classes. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C		Surfm_St1
102	Surface Expression 1, Component 1	The 1st of up to 3 codes describing the three-dimensional shape of the upper surface and the thickness of the first stratum in the component of the current terrain polygon. The first code is the most dominant surface expression. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	L	Surf_E1a
103	Surface Expression 2, Component 1	The 2nd of up to 3 codes. See item 102.	1	C	L	Surf_E1b
104	Surface Expression 3, Component 1	The 3rd of up to 3 codes. See item 102.	1	C	L	Surf_E1c
105	Bedrock Type, Component 1	The type of bedrock in the terrain component. (This is only applicable where surficial material is of origin type 'R'). See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	2	C	L	Bedrock_1
106	Subterrain Texture 1, Component 1	The 1st of up to 3 codes describing the standard terrain texture at the first subsurface stratum. The size, shape and sorting of particles in clastic sediments (or the proportion and degree of decomposition of plant fibre in organic sediments) in the first stratum of the terrain component 1 in the current terrain polygon. *Note*: Also Known as Subsurficial Material Texture. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	L	Sttex_1a
107	Subterrain Texture 2, Component 1	The 2nd of up to 3 codes. See item 106.	1	C	L	Sttex_1b
108	Subterrain Texture 3, Component 1	The 3rd of up to 3 codes. See item 106.	1	C	L	Sttex_1c
109	Subsurficial Material, Component 1	A code representing the formative geomorphological process of the first subsurface stratum of surficial material of the first component of the current terrain polygon. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	2	C	U	Ssurfm_1

110	Subsurficial Material Qualifier, Component 1	A code used to specify whether the formative geomorphological process of the subsurficial stratum of surficial deposit of component 1 is currently 'active' ('A') or 'inactive' ('I'). The assumed status is not recorded. Note: 'G' is now coded directly with the genetic material. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	U	Ssurfm_Q1
111	Subsurficial Material Subtype, Component 1	A project-specific code that indicates a subclass of the genetic material in the second stratum of component 1 of the current terrain polygon. A surficial material subclass is distinguished by characteristics that cannot be adequately represented by the standard surface material origin classes. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C		Ssurfm_St1
112	Subsurface Expression 1, Component 1	The 1st of up to 3 codes describing the three-dimensional shape of the upper surface and the thickness of the second stratum in component 1 of the current terrain polygon. The first code is the most dominant surface expression. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	L	Ssurf_E1a
113	Subsurface Expression 2, Component 1	The 2nd of up to 3 codes. See item 112.	1	C	L	Ssurf_E1b
114	Subsurface Expression 3, Component 1	The 3rd of up to 3 codes. See item 112.	1	C	L	Ssurf_E1c
115	Decile of Terrain Component 2	See Item 31.	1	N		Tdec_2
116	Partial Cover Flag, Component 2	See Item 95.	1	C	L	Prtflg_2
117	Terrain Texture 1, Component 2	See Item 96.	1	C	L	Ttex_2a
118	Terrain Texture 2, Component 2	See Item 97.	1	C	L	Ttex_2b
119	Terrain Texture 3, Component 2	See Item 98.	1	C	L	Ttex_2c
120	Surficial Material of Component 2	See Item 99.	2	C	U	Surfm_2
121	Surficial Material Qualifier of Component 2	See Item 100.	1	C	U	Surfm_Q2

122	Surficial Material Subtype of Component 2	See Item 101.	1	C		Surfm_St2
123	Surface Expression 1, Component 2	See Item 102.	1	C	L	Surf_E2a
124	Surface Expression 2, Component 2	See Item 103.	1	C	L	Surf_E2b
125	Surface Expression 3, Component 2	See Item 104.	1	C	L	Surf_E2c
126	Bedrock Type Component 2	See Item 105.	2	C	L	Bedrock_2
127	Subterrain Texture 1, Component 2	See Item 106.	1	C	L	Sttex_2a
128	Subterrain Texture 2, Component 2	See Item 107.	1	C	L	Sttex_2b
129	Subterrain Texture 3, Component 2	See Item 108.	1	C	L	Sttex_2c
130	Subsurficial Material, Component 2	See Item 109.	2	C	U	Ssurfm_2
131	Subsurficial Material Qualifier, Component 2	See Item 110.	1	C	U	Ssurfm_Q2
132	Subsurficial Material Subtype, Component 2	See Item 111.	1	C		Ssurfm_St2
133	Subsurface Expression 1, Component 2	See Item 112.	1	C	L	Ssurf_E2a
134	Subsurface Expression 2, Component 2	See Item 113.	1	C	L	Ssurf_E2b
135	Subsurface Expression 3, Component 2	See Item 114	1	C	L	Ssurf_E2c
136	Decile of Terrain Component 3	See Item 31.	1	N		Tdec_3

137	Partial Cover Flag, Component 3	See Item 95.	1	C	L	Prtflg_3
138	Terrain Texture 1, Component 3	See Item 96.	1	C	L	Ttex_3a
139	Terrain Texture 2, Component 3	See Item 97.	1	C	L	Ttex_3b
140	Terrain Texture 3, Component 3	See Item 98.	1	C	L	Ttex_3c
141	Surficial Material, Component 3	See Item 99.	2	C	U	Surfm_3
142	Surficial Material Qualifier, Component 3	See Item 100.	1	C	U	Surfm_Q3
143	Surficial Material Subtype, Component 3	See Item 101.	1	C		Surfm_St3
144	Surface Expression 1, Component 3	See Item 102.	1	C	L	Surf_E3a
145	Surface Expression 2, Component 3	See Item 103.	1	C	L	Surf_E3b
146	Surface Expression 3, Component 3	See Item 104.	1	C	L	Surf_E3c
147	Bedrock Type Component 3	See Item 105.	2	C	L	Bedrock_3
148	Subterrain Texture 1, Component 3	See Item 106.	1	C	L	Sttex_3a
149	Subterrain Texture 2, Component 3	See Item 107.	1	C	L	Sttex_3b
150	Subterrain Texture 3, Component 3	See Item 108.	1	C	L	Sttex_3c
151	Subsurficial Material, Component 3	See Item 109.	2	C	U	Ssurfm_3

152	Subsurficial Material Qualifier, Component 3	See Item 110.	1	C	U	Ssurfm_Q3
153	Subsurficial Material Subtype, Component 3	See Item 111.	1	C		Ssurfm_St3
154	Subsurface Expression 1, Component 3	See Item 112.	1	C	L	Ssurf_E3a
155	Subsurface Expression 2, Component 3	See Item 113.	1	C	L	Ssurf_E3b
156	Subsurface Expression 3, Component 3	See Item 114	1	C	L	Ssurf_E3c
157	1st Geomorpholo-gical Process Class	An uppercase letter representing the sole or most significant geomorphological process to affect terrain within the current polygon. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	U	Geop_1
158	1st Process Qualifier	A code used to specify whether the first geomorphologic process of the polygon is currently 'active ('A'), or 'inactive' ('I'). See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	U	Geop_Q1
159	1st Process Subtype	A project-specific numeric code used to further specify the first geomorphological process within the current terrain polygon. Project specific subtypes of the standard geomorphological processes may be established to distinguish characteristics that cannot be adequately represented by the standard process classes alone. These subtypes should be described in the terrain legend. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C		Geop_St1
160	1st Process Subclass 1	The 1st of up to 3 codes describing the first geomorphological process within the current terrain polygon. Subclass modifiers are used to further describe the process. They are usually mapped at a more detailed level. *New subclass modifiers have been added to the classification.* See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	L	Geop_Scm1a
161	1st Process Subclass 2	The 2nd of up to 3 codes. See item 160.	1	C	L	Geop_Scm1b
162	1st Process Subclass 3	The 3rd of up to 3 codes. See item 160.	1	C	L	Geop_Scm1c

163	2nd Geomorpholo-gical Process Class	An uppercase letter representing the second most significant geomorphological process to affect terrain within the current polygon. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	U	Geop_2
164	2nd Process Qualifier	A code used to specify whether the second geomorphologic process of the polygon is currently 'active ('A'), or 'inactive' ('I'). See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	U	Geop_Q2
165	2nd Process Subtype	A project-specific numeric code used to further specify the second geomorphological process within the current terrain polygon. Project specific subtypes of the standard geomorphological processes may be established to distinguish characteristics that cannot be adequately represented by the standard process classes alone. These subtypes should be described in the terrain legend. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C		Geop_St2
166	2nd Process Subclass 1	The 1st of up to 3 codes describing the second geomorphological process within the current terrain polygon. Subclass modifiers are used to further describe the process. They are usually mapped at a more detailed level. *New subclass modifiers have been added to the Terrain Classification Manual, Version 2.0,* (Howes and Kenk, 1997).	1	C	L	Geop_ Scm2a
167	2nd Process Subclass 2	The 2nd of up to 3 codes. See item 166.	1	C	L	Geop_ Scm2b
168	2nd Process Subclass 3	The 3rd of up to 3 codes. See item 166.	1	C	L	Geop_ Scm2c
169	3rd Geomorpholo-gical Process Class	An uppercase letter representing the third most significant geomorphological process to affect terrain within the current polygon. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	U	Geop_3
170	3rd Process Qualifier	A code used to specify whether the third geomorphologic process of the polygon is currently 'active ('A'), or 'inactive' ('I'). See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C	U	Geop_Q3
171	3rd Process Subtype	A project-specific numeric code used to further specify the third geomorphological process within the current terrain polygon. Project specific subtypes of the standard geomorphological processes may be established to distinguish characteristics that cannot be adequately represented by the standard process classes alone. These subtypes should be described in the terrain legend. See the *Terrain Classification Manual, Version 2.0*, (Howes and Kenk, 1997).	1	C		Geop_St3

172	3rd Process Subclass 1	The 1st of up to 3 codes describing the third geomorphological process within the current terrain polygon. Subclass modifiers are used to further describe the process. They are usually mapped at a more detailed level. *New subclass modifiers have been added to the Terrain Classification Manual, Version 2.0,* (Howes and Kenk, 1997).	1	C	L	Geop_ Scm3a
173	3rd Process Subclass 2	The 2nd of up to 3 codes. See item 172.	1	C	L	Geop_ Scm3b
174	3rd Process Subclass 3	The 3rd of up to 3 codes. See item 172.	1	C	L	Geop_ Scm3c
175	1st Soil Drainage Class of Polygon	A lowercase letter that represents the soil drainage class for all or most of the current terrain polygon. Soil drainage refers to the rapidity and extent of water removal from the soil in relation to additions; this refers to the annual moisture status of the soil, not just the permeability. See the *Field Manual for Describing Terrestrial Ecosystems,* (Min. of For., *1998*).	1	C	L	Drain_1
176	Soil Drainage Separator of Polygon	Symbols used where a terrain polygon includes two areas of relatively uniform drainage, indicating the proportion of the polygon occupied by each class. See the *Field Manual for Describing Terrestrial Ecosystems,* (Min. of For., *1998*).	2	C	L	Drain_Sep
177	2nd Soil Drainage Class of Polygon	A lowercase letter that represents the drainage class for less than half of the current terrain polygon. Soil drainage refers to the rapidity and extent of water removal from the soil in relation to additions. See the *Field Manual for Describing Terrestrial Ecosystems,* (Min. of For., *1998*).	1	C	L	Drain_2
178	Mean Aspect of Polygon	The general direction in which the current polygon is facing, measured to the nearest degree of azimuth. See *Standard for Digital Terrain Data Capture in British Columbia, (*RIC, 1996).	3	N		Mean_Asp
179	Polygons of Relatively Low Reliability	A flag indicating that for reasons such as cloud cover on an air photo the current polygon has been mapped with significantly less reliability than adjacent polygons. See *Standard for Digital Terrain Data Capture in British Columbia, (*RIC, 1996).	1	C	U	Lowrel_Flg
180	Polygon Specific Comments	This field may be used to record any pertinent information regarding the polygon. At all times attempt to use referenced classifications which are well defined and understood in the science, or provide thorough definitions for the user. See Appendix 1 for how data will be stored.	500	C	M	Poly_Com

NOTE: Although the ECP TAG is a mandatory attribute, it is not required when filling out paper copy forms. Only include the ECP TAG in the digital submission.

To submit user defined data, users must follow Table 2-4 and provide the required information.

Table 2-4 - Description of Attribute Fields for Ecosystem User Defined Data - Userdef.csv

Field #	Form Name	Description	Length	Type	Case	CSV field name
Note: Items 1 through 13 refer to the user defined attributes in the TEM database.						
1	Applies To	The section of the TEM database that the user defined information pertains to. Ex. Project, Ecosystem, Terrain, etc.	10	C	M	Applies
2	Column Name	The column name of the attribute being referred to. It can be an existing column name or a new 'user defined' column name. Ex. Existing - Mapcode	10	C	M	Colm_Name
3	Value Type	The field format for the category of the type of data to be entered. Ex. C - character or N - numeric See section 2.3 of this document.	1	C	U	Value_Typ
4	Length	The valid or maximum length of the entry. The entry can be of a specific length for a list of specific codes or have a maximum if entry is variable. Ex. Specific length - A 2 letter code or Maximum - Different transect names.	3	N		Length
5	Decimals	How decimal places the entry is taken to.	10	N		Decimal
6	Required	Designates whether the entry a mandatory attribute. Ex. Yes or No	1	C	U	Required
7	Case	The field format for the form of the character. Ex. L - Lower, U - Upper or M - Mixed. See section 2.3 of this document.	2	C	U	Case
8	Minimum Value	The minimum value the entry can be. Ex. Minimum = 1, therefore an entry of 0 or a blank would be invalid.	10	N		Min_Value
9	Maximum Value	The maximum value the entry can be. Ex. Maximum = 99, therefore an entry of 100 would be invalid.	10	N		Max_Value
10	Unit of Measure	The unit of measure implied for the entry. Ex. Centimetres, hectares, etc.	20	C		UofM
11	Description	A description of the column (attribute).	20	C	M	Descrip
12	Value	The valid values for the entry. The entry can be left blank if any data is valid.	10	C	M	Value
13	Value Description	A written description of the value column.	40	C	M	Value_desc

NOTE: Not all user defined attributes are required. See Table 2-1 for a list of required user defined attributes and for instructions on submitting the user defined information in Table 2-4, see Terrestrial Ecosystem Mapping (TEM) Data Capture Application (DC) User Guide. Version 1.0, (EWG, 2000). (In progress).

Table 2-5 - Terrain Survey Intensity Levels

Terrain Survey Intensity Levels	Scale	% of Polygons Field Checked	Field Checks per 100 ha	Method of Field Checking	Typical Objectives
A	> 1:20 000	75 - 100	> 1.5	foot traverses	slope stability in sensitive areas: residential land planning; hazard zonation
B	1:10 000 to 1:50 000	50 - 75	1.0 to 3	foot and vehicle traverses	slope stability assessment
C	1:20 000 to 1:100 000	25 - 50	0.5 to >1.0	foot, vehicle, some flying	inventory mapping; ecosystem mapping
D	1;20 000 to 1:250 000	0 - 25	0 to 0.1	vehicle and flying	regional planning; preliminary mapping
E	any scale	0	none	no field work (airphoto interpretation only)	general reconnaissance

RIC, *Guidelines and Standards for Terrain Mapping in British Columbia* (1996).

Table 2-6 - Data Source

Code	Class Name	Definition
E	Ecosystem Field plots	1998 versions - FS882 (1- 7) 1996 versions - FS882 Previous to 1996 - Luttmerding et al. (DEIF, 1990).
G	Ground Inspection Form(1998)	Revised version of the 1996 Visual Inspection Form. Quick plots where data is recorded to confirm the identification of the ecosystem units and provide some data for characterizing ecosystem attributes e.g. dominant/indicator vegetation list helps to characterize structural stages. Done on the ground by walking to/through a site and characterizing the site, confirming an existing polygon designation, or confirming existing polygon designation along with providing added site information for clarification during the mapping process.
V	Visual Inspection	Site visit to the polygon: Walking or driving with field notes taken.
A	Air Visual Inspection	Site visit flying with field notes taken.
P	Air Photos	

2.5 TEM DATA FORMS

These are to be used only for the hardcopy collection of data. Digital table structures must follow the CSV format and naming conventions mentioned in the standards below.

(1) PROJECT LEVEL DATA FORM
(4) POLYGON LEVEL DATA FORMS

(1)Project Name:										(5)TRIM Version:	(9)T.S.I.L.:	(13)Air Photo Year:
(2)Geographic Location:										(6)Legend:	(10)Year Surveyed:	(14)Air Photo Scale:
(3)Consultant/Dept.:										(7)Expanded Legend:	(11)Date Recorded:	(15)Air Photo Type:
(4)Map Scale:										(8)E.S.I.L.:	(12)Recorder Name:	(16)Package Version:
(17)Mapsheet Number:										(18)Ecosystem Mapper:	(19)Terrain Mapper:	(20)Digital Capture:
(21) Project Comments:												
(21)												
(21)												
(21)												
(21)												

Project Name: Form Of: Page 1 of 4

ECO COMPONENT # 1

22	MAPSHEET NUMBER
23	POLYGON NUMBER
24	DATA SOURCE
25	ECOSECTION
26	BGC ZONE
27	BGC SUBZONE
28	BGC VARIANT
29	BGC PHASE
30	DECILE
31	REALM
32	GROUP
33	CLASS
34	SITE SERIES NUMBER
35	SITE SERIES ASSUMED MODIFIER 1
36	SITE SERIES ASSUMED MODIFIER 2
37	SITE SERIES ASSUMED MODIFIER 3
38	SITE SERIES ASSUMED MODIFIER 4
39	SITE SERIES MAP CODE
40	SITE MODIFIERS 1
41	SITE MODIFIERS 2
42	STRUCTURAL STAGE
43	STRUCTURAL STAGE SUBSTAGE OR MODIFIER
44	STAND COMPOSITION MODIFIER
45	SERAL COMMUNITY TYPE
46	TREE CROWN CLOSURE
47	SHRUB CROWN CLOSURE
48	SITE DISTURBANCE CLASS
49	SITE DISTURBANCE SUBCLASS
50	SITE DISTURBANCE SUB-SUBCLASS

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ECO COMPONENT # 2

51 DECILE	52 REALM	53 GROUP	54 CLASS	55 SITE SERIES NUMBER		56 SITE SERIES ASSUMED MODIFIER 1	57 SITE SERIES ASSUMED MODIFIER 2	58 SITE SERIES ASSUMED MODIFIER 3	59 SITE SERIES ASSUMED MODIFIER 4	60 SITE SERIES MAP CODE		61 SITE MODIFIERS 1	62 SITE MODIFIERS 2	63 STRUCTURAL STAGE	64 STRUCTURAL STAGE MODIFIER	65 STAND COMPOSITION MODIFIER	66 SERAL COMMUNITY TYPE		67 TREE CROWN CLOSURE		68 SHRUB CROWN CLOSURE		69 SITE DISTURBANCE CLASS	70 SITE DISTURBANCE SUBCLASS	71 SITE DISTURBANCE SUB-SUBCLASS	

ECO COMPONENT # 3

72 DECILE	73 REALM	74 GROUP	75 CLASS	76 SITE SERIES NUMBER		77 SITE SERIES ASSUMED MODIFIER 1	78 SITE SERIES ASSUMED MODIFIER 2	79 SITE SERIES ASSUMED MODIFIER 3	80 SITE SERIES ASSUMED MODIFIER 4	81 SITE SERIES MAP CODE		82 SITE MODIFIERS 1	83 SITE MODIFIERS 2	84 STRUCTURAL STAGE	85 STRUCTURAL STAGE MODIFIER	86 STAND COMPOSITON MODIFIER	87 SERAL COMMUNITY TYPE		88 TREE CROWN CLOSURE		89 SHRUB CROWN CLOSURE		90 SITE DISTURBANCE CLASS	91 SITE DISTURBANCE SUBCLASS	92 SITE DISTURBANCE SUB-SUBCLASS	

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TERRAIN COMPONENT 1																					TERRAIN COMPONENT 2																				
93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134
DECILE	PARTIAL COVER FLAG	SURFICIAL MATERIAL TEXTURE 1	SURFICIAL MATERIAL TEXTURE 2	SURFICIAL MATERIAL TEXTURE 3	SURFICIAL (GENETIC) MATERIAL	SURFICIAL QUALIFIER	SURFICIAL SUBTYPE	SURFACE EXPRESSION 1	SURFACE EXPRESSION 2	SURFACE EXPRESSION 3	BEDROCK TYPE	SUBSURFICIAL MATERIAL TEXTURE 1	SUBSURFICIAL MATERIAL TEXTURE 2	SUBSURFICIAL MATERIAL TEXTURE 3	SUBSURFICIAL (GENETIC) MATERIAL	SUBSURFICIAL QUALIFIER	SUBSURFICIAL SUBTYPE	SUBSURFICIAL EXPRESSION 1	SUBSURFICIAL EXPRESSION 2	SUBSURFICIAL EXPRESSION 3	DECILE	PARTIAL COVER FLAG	SURFICIAL MATERIAL TEXTURE 1	SURFICIAL MATERIAL TEXTURE 2	SURFICIAL MATERIAL TEXTURE 3	SURFICIAL (GENETIC) MATERIAL	SURFICIAL QUALIFIER	SURFICIAL SUBTYPE	SURFACE EXPRESSION 1	SURFACE EXPRESSION 2	SURFACE EXPRESSION 3	BEDROCK TYPE	SUBSURFICIAL MATERIAL TEXTURE 1	SUBSURFICIAL MATERIAL TEXTURE 2	SUBSURFICIAL MATERIAL TEXTURE 3	SUBSURFICIAL (GENETIC) MATERIAL	SUBSURFICIAL QUALIFIER	SUBSURFICIAL SUBTYPE	SUBSURFICIAL EXPRESSION 1	SUBSURFICIAL EXPRESSION 2	SUBSURFICIAL EXPRESSION 3

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TERRAIN COMPONENT 3 | GEOMORPHOLOGICAL PROCESSES | DRAINAGE

## DECILE	136 PARTIAL COVER FLAG	137 SURFICIAL MATERIAL TEXTURE 1	138 SURFICIAL MATERIAL TEXTURE 2	139 SURFICIAL MATERIAL TEXTURE 3	## SURFICIAL (GENETIC) MATERIAL	141 SURFICIAL QUALIFIER	## SURFICIAL SUBTYPE	143 SURFACE EXPRESSION 1	144 SURFACE EXPRESSION 2	145 SURFACE EXPRESSION 3	146 BEDROCK TYPE	147 SUBSURFICIAL MATERIAL TEXTURE 1	148 SUBSURFICIAL MATERIAL TEXTURE 2	149 SUBSURFICIAL MATERIAL TEXTURE 3	150 SUBSURFICIAL (GENETIC) MATERIAL	151 SUBSURFICIAL QUALIFIER	152 SUBSURFICIAL SUBTYPE	153 SUBSURFICIAL EXPRESSION 1	154 SUBSURFICIAL EXPRESSION 2	155 SUBSURFICIAL EXPRESSION 3	156 1st GEOMORPHOLOGICAL PROCESS CLASS	157 1st PROCESS QUALIFIER	158 1st PROCESS SUBTYPE	159 1st PROCESS SUBCLASS 1	160 1st PROCESS SUBCLASS 2	161 1st PROCESS SUBCLASS 3	162 2nd GEOMORPHOLOGICAL PROCESS CLASS	163 2nd PROCESS QUALIFIER	164 2nd PROCESS SUBTYPE	165 2nd PROCESS SUBCLASS 1	166 2nd PROCESS SUBCLASS 2	167 2nd PROCESS SUBCLASS 3	168 3rd GEOMORPHOLOGICAL PROCESS CLASS	169 3rd PROCESS QUALIFIER	170 3rd PROCESS SUBTYPE	171 3rd PROCESS SUBCLASS 1	172 3rd PROCESS SUBCLASS 2	173 3rd PROCESS SUBCLASS 3	## 1st SOIL DRAINAGE CLASS	175 SOIL DRAINAGE SEPARATOR	176 2nd SOIL DRAINAGE CLASS	177 MEAN ASPECT (DEGREES)	178 POLYGON OF RELATIVELY LOW RELIABILITY	(179)Poly. Spec. Comments

2.6 Data Capture Overview

Any data form, GIS or database program may be used for data capture, data entry, or short-term storage, but the data must follow the defined standards and must be submitted in the formats described in Delivery Section 6. The Ministry will provide a database application used for recording terrestrial ecosystem mapping project, polygon and user defined attributes and codes called the "TEM Data Capture" (DC) application.

Terrestrial Ecosystem Mapping (TEM) Data Capture Application (DC) User Guide. Version 1.0, (EWG, 2000). (In Progress)

The DC application is available to contractors as a one-step self-installing program via the Ministry web site http://www.elp.gov.bc.ca/rib/wis/tem/ or by contacting the Habitat Data Manager (see Preface). Contractors can install the DC application on a Windows PC and record the non-spatial attributes associated with the spatial features. This is achieved by entering each unique polygon from the manuscript map into the DC application, then entering the applicable non-spatial attribute codes. Business rule validations are performed after data entry is complete. Attributes can be exported in a CSV (* comma separated value) format for loading into whichever proprietary GIS the contractor uses.

The DC application runs in MS Windows 3.x, 95, 98 or NT; and (optionally) MS Excel 5.0a and MS Notepad.

The only accepted attribute database file format for contractor delivery to the Ministry is comma separated value format (csv). The csv field names and formats are described in Table 2-2. See Section 6 for more details on delivery specifications.

NOTE * CSV is a comma separated value file with no quotation symbols. Each is separated by only a comma and when no data is present commas will still separate the field.

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3 Digital Specifications for Spatial Data

3.1 Background and Scope

The BC Government is establishing a common set of standards for field inventory of its natural resources and the digital capture of the data collected. It is intended that these standards be used by all levels of government, crown corporations, and the private sector to simplify capture, processing, distribution, and use of this data.

This section includes information on:

- gathering baseline reference data
- specifications for digital capture of spatial data from photos
- specifications for digital storage of terrestrial ecosystem spatial data in the form of polygons, lines, and field sample site points.
- the format for the appearance of paper plots generated from spatial and attribute data
- information on metadata capture and
- delivery specifications

Maintaining digital standards will help simplify the combination of ecosystem data captured at different times, and by different agencies, for viewing and analysis with analysing software tools.

This section is intended to be used as an attachment to contracts for capture of Terrestrial Ecosystem data, but is not a contract specification in itself.

3.2 Gather Baseline Reference Data

It is the responsibility of the mapping contractor to gather all spatial baseline and other reference data needed for the project. The Ministry maintains a TEM web site at http://www.elp.gov.bc.ca/rib/wis/tem/ with a comprehensive list of reference data. All data originating from the Ministry is presented such that a contractor can select and download desired files directly from the web site. Externally maintained data sets are listed with hot links to their location where they can be downloaded. Reference manuals are identified at the web site including the*: Standard for Digital Terrestrial Ecosystem Mapping Data Capture in BC* (RIC, 1998), the *Standard for Terrestrial Ecosystem Mapping in British Columbia* (RIC, 1998), and the *Terrain Classification System for British Columbia, Version 2* (Howes and Kenk, 1997). Typical digital reference files are listed in Table 3-1.

Table 3-1 - Digital Reference Files

FILE	DESCRIPTION	EXTENT	SOURCE
TRIM	Baseline 1:250,000 scanned.	1;250,000 mapsheet	Geographic Data BC, Ministry of Environment
TRIM	Terrain Resource Information Mapping coverages (includes water features, elevation).	1:20,000 mapsheet	Geographic Data BC, Ministry of Environment (e00)
TRIM Quads	1:20,000 composite created and plotted to 1:50,000.	Pseudo 1:50,000 mapsheet	Ministry of Forests, Forest Practices Branch
Terrain	Terrain polygon coverages	1:20,000 mapsheet	Geological Survey Branch, Ministry of Employment
Forest Cover/VRI	Forest Cover Inventory coverages / Vegetation Inventory	1:20,000 mapsheet	Ministry of Forests (dgn/fc1/fip/vif, veg/vri)
QES_BC	Ecoregion Unit Polygon Coverage	BC	Ministry of Environment, Lands & Parks (e00/Pamap)
BGC	Biogeoclimatic Unit Polygon Coverage	BC / Zone / 1:20,000	Ministry of Forests (Pamap/dxf)
ECP	Any existing adjacent TEM Coverage(s) (to be developed)	Project	Ministry of Environment, Lands & Parks (e00/csv)
DEIF (98)	Soils point coverage	BC	Ministry of Environment, Lands & Parks/RIB/WIS

NOTE: Contractors are responsible for obtaining the most current versions of Digital Reference Files.

Existing TRIM data should be used for the following features where the project scale is less than or equal to a project scale of 1: 20 000. In the case where project scales are greater than 1: 20 000, it is important to consult the contract and QA monitors for an approved base. The following natural boundaries are polygons on the TRIM base maps and therefore do not require further delineation:

- Double line rivers;
- Lake shores; and
- Saltwater shores.

If ecosystem lines or polygons are coincidental (of the same intent) at all scales of TEM mapping as TRIM, then the TRIM lines take precedence.

Digital templates will be stored at the Ministry's TEM Web site at http://www.elp.gov.bc.ca/rib/wis/tem/ to accompany this document. Templates include ministry logo files, populated ARC/INFO symbol tables, ARC/INFO symbology look-up tables, data tables of lookup codes, and in the future, ARC/INFO plotting scripts. Use of these templates simplifies conformance to the specifications in this document. Table 3-2 identifies digital files available at the Ministry web site.

Table 3-2 - Digital Templates stored at ministry web site

http://www.elp.gov.bc.ca/rib/wis/tem/

FILE NAME	DESCRIPTION
bcsiga_p.tif	BC Government logo file.
*.aml	Arc macro language programs for cleaning coverages, building topology, quality assurance etc.
bcenv.lin bcenv.shd bcenv.mrk	Custom lineset, shadeset and markerset files to define standard BC Environment symbology. Copy into your $ARCHOME/symbols directory.
fnt030 fnt035 fnt036	Font files necessary for using custom symbol files. Copy into your $ARCHOME/igl63exe directory.
bcelin_lut.e00 bceshd_lut.e00 bcemrk_lut.e00	Look up tables that translate point, line or polygon feature codes into symbol numbers for display purposes. These are INFO tables in arc export format; use the arc import command to load them into INFO.

NOTE for PC ARC/INFO users: BC Environment currently provides standard symbology files for UNIX and NT ARC/INFO. Symbology files for use with PC ARC/INFO will be made available in the future.

3.3 Spatial Data Standards

The following rules are based on spatial standards described at the Ministry's TEM Web site at http://www.elp.gov.bc.ca/rib/wis/tem/ and information in manuals listed in the Reference section.

Terrestrial ecosystem mapping is collected at a variety of data capture scales including 1:50,000, 1:20,000, 1:10,000 and 1:5,000.

3.3.1 Data layers

Terrestrial Ecosystem mapping is divided into four possible layers: Table 3-3 lists the naming convention for these four layers must be followed. *Place the appropriate character (l, t, x, v) to represent scale at the start of the file name.*

The following scale designators must be followed to indicate mapping scale for TEM naming conventions:

Table 3-3 - Scale designators used in TEM naming conventions

Character	Mnemonic	Scale	Nominal accuracy
l	Roman Numeral fifty	1:50,000	50 metres
t	TRIM	1:20,000	20 metres
x	Roman Numeral ten	1:10,000	10 metres
v	Roman Numeral five	1:5,000	5 metres

1. **Terrestrial ecosystem polygons (ecp)**. This is a polygon coverage with feature codes on all its arcs and polygons. Each polygon represents a terrestrial ecosystem classification made up of one or more arc

segments. The project area polygon forms the outermost boundary of a TEM study area. The attributes for these polygons are specified in the Terrestrial Ecosystem Mapping attribute Table 2-3. Example: tecp_dogcreek.

2. **Field Inspection sites (eci)**. This is an arc/point coverage representing locations of field samples taken during data collection for terrestrial ecosystem mapping (Field Manual for Describing Terrestrial Ecosystems, 1998), with feature codes. Example: teci_dogcreek.
   - Point symbols (e.g. pit)
   - Line symbols (e.g. Sampling transect line)

NOTE: An AML that will create annotation for TEM polygons is available at the TEM website http://www.elp.gov.bc.ca/rib/wis/tem/

It is the responsibility of the mapping company to create a cartographically pleasing product in both hard copy and digital format.

Annotation should be placed as close to the polygon or feature as possible. Overflow/outflow labels are allowable only when all possibilities have been exhausted.

3.3.2 Specifications for Control and Data Capture using Mono-Restitution

The following specifications have been prepared to provide a standard for control, data capture, quality control and project deliverables for data capture using mono-restitution. These follow MoF Resources Inventory Branch procedures.

1. Control Transfer from TRIM

The procedure for transferring control from all the high level TRIM photography is as follows:

- The cascade procedure is required for mapping at scales of 1:5,000 to 1:10,000; from scales 1:20,000 to 1:50,000 a photo identification of planimetric feature control method is allowable if the detail and resolution is adequate and specified in the mappers contract, and the ministry agrees.
- Produce contact film diapositives for each high level TRIM photo to be used.
- Transfer all aerial triangulation points from the original TRIM Aerial Triangulated diapositive to the duplicate diapositive using a point transfer device approved for TRIM aerial triangulation by Geographic Data BC, MELP. Points that were rejected during TRIM aerial Triangulation or Data Capture shall not be used.
- Set the stereo model (overlapping pair of duplicate diapositives) on a TRIM approved photogrammetric workstation. The set-up must meet or exceed the TRIM specifications for model set-up. The stereo-plotter used shall have a TRIM calibration certificate (issued by Geographic Data BC) that is current within 13 months.
- Identify and capture the XYZ coordinates for at least 7 or 8 well distributed points in each low level typed photo. These points must be features that are clearly defined in both the high level (TRIM) and low level (typed) imagery. The points used shall be well defined and stable (in time). Control points situated close to the 4 corners of the typed photo are critical to ensure the accuracy of the mono-restitution set up and transfer. Controlled photos with inadequate or poorly distributed control will be rejected.

- The exact location of the control point shall be identified on the typed photo by a precise pin prick (0.1 mm in diameter). The location of the point shall be indicated by marking a 2 mm diameter circle around the feature, centered on the pin pricked location of the control point. The circle and control point number shall be marked in red using fine tip permanent marker.
- A file containing unique control point numbers with XYZ coordinates, in ASCII format, shall be produced and delivered to the Branch together with the controlled typed photographs. Control point number shall include flight line number and photo number. For example:

Flight line #	Photo #	Control point #
9022	048	3

2. Data Capture using Mono-Restitution

The operator shall follow the operation of procedure by the vender of the Mono-restitution software being used. The following general specifications shall apply:

- A minimum of 4 photogrammetric fiducial marks shall be used to transform tablet coordinates to photo coordinates.
- Calibrated values defining the camera geometry (e.g. focal length, fiducial distances, etc.) shall be used if required by the Mono-Restitution algorithm used. These may be obtained from Geographic Data BC or the vendor of the photos.
- All control points marked on the photos shall be used during the set-up process.
- Rejected control points (e.g. those not meeting the accuracy standard given in section 3.3.2.3 below) shall be documented and brought to the attention of the provincial government.
- At least 6 control points shall be used during the set-up, excluding rejected points. Additional control points shall be added to any photos not meeting this requirement. This may be reduced to 4 for photos with large areas of water.

3. Accuracy Standards

- The control, set up and data capture process shall meet or exceed the following accuracy's:

Average $\leq$ 0.3mm to maximum $\leq$ 0.5mm.

Control Transfer

- Control points marked on the typed photos shall be accurate to within $\pm$ 14m at ground scale.

Mono-Restitution Set up

- The fiducial mark observation shall be accurate to within $\pm$ 4m at ground scale (e.g. 0.2 mm at 1:20,000 photo scale, or 0.27 mm at 1:15,000 photo scale).
- The control point observation shall be accurate to within $\pm$5m at ground scale (e.g. 0.25 mm at 1:20,000 photo scale, or 0.33 mm at 1:15,000 photo scale).

Mono-Restitution Data Capture

- Digitizing of the TEM data shall be accurate to within $\pm$12m (e.g. 0.6 mm at 1:20,000 photo scale, or 0.8 mm at 1:15,000 photo scale).

Total Error for Mono-Restitution

- The total error for the Mono-Restitution process (e.g. including all of the above error sources) shall not exceed ±20m (e.g. 1mm at 1:20,000 photo scale, or 1.33 mm at 1:15,000 photo scale).

Notes on Accuracy

- The above accuracy's are Mean Square Error in Position (e.g. MSEP 63.2% probability).
- All accuracy's are relative to coordinates as defined by the TRIM Aerial Triangulation results.
- The Total MSEP at 90% probability (1.52 X standard deviation) is 30 metres.
- Using the TRIM Map Accuracy Standards, the Circular Map Accuracy Standard (CMAS) at 90% probability (2.14 X standard deviation) is 42.8 metres.

4. Deliverables

In addition to any other project deliverables defined in the contract, the following files, reports and materials shall be submitted to the Branch.

- Original typed document photos and update photos with control marked as per these specifications.
- Digital file containing control points in ASCII format. This control point file shall contain point number, X,Y,Z coordinates (to three decimal places and comma delineated).
- Camera calibration report
- All original source materials provided by the Province, including TRIM prints and diapositives, along with TRIM digital control.
- Mono-restitution set up for each model which clearly provide the following information:

Table 3-4 - Results of mono-restitution model

1.	**Project Identification**
•	Project Name
•	Model Name
•	Operator
•	Tablet resolution
•	Focal length
•	Photo scale
2.	**Orientation Results**
•	Photo positioning: Omega, Phi, Kappa
•	Fiducial digitizing confidence: must meet or exceed 98%

Table 3-4 continued on next page

Table 3-4 continued

3. Control Residuals Report
• All output to be in metres to 3 decimal places
• Mean residual
• Maximum residual
• For each control point (minimum of 6):
The X, Y, Z of the control point
The residual of X
The residual of Y
The residual of Z

NOTE: The ministry is currently investigating the use of stereo softcopy photogrammetry as an alternative to mono-restitution. This method of mapping is showing an increase of use in resource mapping. The ministry will publish in later documents the specifications for the use of such hardware and software. Any use of this technology must be approved by the ministry.

Any other data transfer methods form photos to digital files must be approved by the ministry.

3.3.3 Required Spatial Attributes

Tables 3-5, 3-6 and 3-7 list in data field order (defined after internal attributes) the required ARC/INFO tables and attributes for the Terrestrial Ecosystem Polygon (ECP) and the Terrestrial Ecosystem Field Inspection sites (ECI) coverages.

Table 3-5 - ECP Polygon Attribute Table (PAT)

Field #	Field Name	Description	Length	Type	Case
1	**ECP_TAG**	The unique identifier linking the spatial and non-spatial attributes. It is composed of a mapsheet number followed by an underbar '_' and the unique polygon number: (See section 3.3.5). There are no leading zeros in the polygon number. (e.g.: 082G010_225) Note: If the polygon spans over more than one mapsheet, use the mapsheet with the largest portion area within the polygon.	21	c	l
2	**FCODE**	The feature code assigned to each polygon. All ECP polygons are assigned Ecosystem fcode WI25200100. Polygons within the TEM project area that have not been mapped and represent a "null" value should be a assigned a feature code of: XX00000000	10	c	u

Table 3-6 - ECP Arc Attribute Table (AAT)

Field #	Field Name	Description	Length	Type	Case
1	**FCODE**	The feature code assigned to each arc. All Ecosection (Eco_sec) arcs are assigned Ecosection unit boundary fcode. All Biogeoclimatic (BGC) arcs are assigned Biogeoclimatic unit boundary fcode. Note: See section 3.3.4 for rules.	10	c	u
2	**SRC_FCODE**	The feature code assigned to digitally copied arcs to identify the source. (e.g.: TRIM lake copied to Ecosystem coverage has source fcode attribute src_fcode GB15300000 assigned while the fcode attribute is assigned the Ecosystem unit fcode).	10	c	u

Table 3-7 - ECI Point Attribute Table (PAT)

Field #	Field Name	Description	Length	Type	Case
1	ECI_TAG	The unique identifier linking the spatial and non-spatial attributes. This identifier in the sample site spatial database is called the ECI_TAG. For each GIF, Aircalls, and Visual sample site point, the ECI_TAG should contain an unique Plot Number found in the non-spatial data used to identify each site For example, Plot # RV127 For the Full plots, the 7digit number is unique for the province, e.g.. 9614708.	21	c	l
2	FCODE	The feature code assigned to each point. There is a specific feature code for each type of sample site (e.g. Visuals, GIF, VENUS, Gravitti, etc.) See the searchable database at the following web site for valid feature codes: http://www.env.gov.bc.ca/gis/featurecodes.html	10	c	u

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NOTE: The standard, internal ARC/INFO attributes should not be altered. The one exception is the -ID item, which may be set to any temporary value. There has been NO standard set for use of this item by the Ministry of Environment, Lands and Parks, however polygon number can be used.

Table 3-8 - Meta Attribute Table (META)

- Please include a META info table with each Arc/Info export file. See the Ministry of Environment, Lands and Parks web site at http://www.elp.gov.bc.ca/gis/arcmetadata.html. The Ministry provides an AML to download that allows you to automatically create the table. It only take a few minutes to fill the table out, but will provide extremely important information to users of TEM data in the future. Please include a META info table with each coverage submitted.

Field #	Field Name	Description	Length	Type	Case
1	**KEY**	There should be at least four records in the table, with key values of: • **TITLE** - Short name for this data. (e.g. TEM). • **DESCRIPTION** - What kind of data is it? (e.g. Project Name and Location). • **SOURCE** - Where did this data come from? (e.g. Contractor and method of capture) • **ACCURACY** - How well does this data represent the earth? (e.g. Scale) Other possible key values are: • **WARNING** - Any warnings that users should see before they use this data. • **HISTORY** - What is the origin of the data? What are the important stages, problems, etc. in its history? • **RESOLUTION** - What is the minimum size of a unit or feature? • **PRODUCTION_DATE** - When was it first created in ARC/INFO? • **MODIFIED** - Date, agency or person and how it was modified. e.g.: '07/95 (SSB) Add FCODE symbology.' • **ORACLE_NOTES** - Does it link to Oracle data? How? • **FUTURE** - What changes, additions, etc. are planned for this data and by whom? • **DISTRIBUTION** - what limitations, copyrights, etc., are there on distributing it?	16	C	I
2	**VALUE**	The value field contains the information about the KEY. There should be ***no empty*** 'VALUE' fields. If there is no information on a key value, leave it out.	100	C	u

NOTE: The standard, internal ARC/INFO attributes should not be altered. The one exception is the -ID item, which may be set to any temporary value. There has been NO standard set for use of this item by the Ministry, but polygon number could be used.

3.3.4 Feature codes

All polygons, points and lines in a coverage will be feature coded. The code will be stored in a 10-character item called 'FCODE' consisting of two uppercase letters and eight digits in the associated arc, polygon or point attribute table (<coverage>.aat or <coverage>.pat).

ECP Coverage Polygons: All terrestrial ecosystem polygons (ecp) must be assigned the Ecosystem unit feature code WI25200100.

ECP Coverage Arcs: The rules for assigning feature codes to arcs are:

1. Study boundaries are assigned WI25100110. Study boundaries must have a secondary fcode identifying the source of each arc or a TEM boundary (e.g.: a section of a boundary may derive from a water feature).
2. Mapsheet neatlines are assigned EN10010000. Neatline feature codes are only used in interim TEM coverages where mapping sections may be bounded by a mapsheet. The final TEM coverage will not contain any mapsheet neatline arcs unless they are the boundary.
3. Arcs between polygons with differing Ecosection units are assigned WI25400500.
4. Arcs between polygons with identical Ecosection units but differing Biogeoclimatic units are assigned WI25000130.
5. Arcs between polygons with identical Biogeoclimatic units but differing Ecosystem units are assigned WI25200100.
6. For digitally copied arcs, assign the feature code associated with the source arc to the SRC_FCODE attribute. e.g.: Where features from another coverage are used to bound a polygon (e.g. a lakeshore line from a TRIM dataset), the feature code of the original feature should be retained in the SRC_FCODE attribute. The corresponding FCODE attribute will store the Ecosystem fcode.
7. Polygons within the TEM project area that have not been mapped and represent a "null" value should be a assigned a feature code of XX00000000.

ECI Coverage Points: Each type of sample site has an appropriate feature code associated with it. Please see Table 3-9 for some examples.

All feature codes will conform to the coding scheme detailed in *Volume 1 of the Second Draft report of National Standards for the Exchange of Digital Topographic Data*, July 1984, distributed by the Canadian Council on Surveying and Mapping of Energy, Mines, and Natural Resources Canada.

Table 3-9 lists the common features codes used to mark features in Terrestrial Ecosystem maps. For a complete listing of feature codes, go to: http://www.env.gov.bc.ca/gis/featurecodes.html.

Table 3-9 - Common feature codes associated with TEM mapping

FCODE	FEATURE NAME	SOURCE
WI25100110	Study area boundary	WLD
EN10010000	Map neat lines	WLD
WI25200100	Ecosystem unit	WLD
FI90200000	Biogeoclimatic (Linework)	MOF
WI25000130	Biogeoclimatic boundary	WLD
WI25400500	Ecosection	WLD
FA02650000	Boundary.type International	TRIM
FA02700000	Boundary.type Interprovincial	TRIM
GG05800000	Coastline Definite	TRIM
GB15300000	Lake Definite	TRIM
GA24850000	River/Stream Definite	TRIM

Table 3-9 continued on next page

Table 3-9 continued

GA90000110	River/Stream.type Left Bank	TRIM
GA90000120	River/Stream.type Right Bank	TRIM
FE25755300	Ecosystem (Visual)	WLD
FE25755310	Ecosystem (Ground)	WLD
FE25755311	Ecosystem (GIF)	WLD
FE25755312	Ecosystem (DEIF)	WLD
XX00000000	TEM project areas that have not been mapped and represent a "null" value	BCE

NOTE: Feature codes can be linked to standard ARC/INFO symbology for easier display and plotting.

3.3.5 Unique Polygon Identification

ECP Coverage: Every terrestrial ecosystem feature must have a provincially unique identifier assigned to it. The identifier must be entered into the spatial feature attribute table and the non-spatial attribute tables, and will act as the key link between the spatial and non-spatial data. There shall be a one-to-one relationship between each polygon and its associated attribute record. This identifier is called the ECP_TAG.

When a previously defined Terrestrial Ecosystem polygon is being used (e.g.: extension of an existing unit across a mapsheet neatline), the contractor must use the previously assigned identifier as the ECP polygon tag.

The tag is defined by the mapsheet number and unique polygon number. To code the mapsheet follow guidelines in Table 3-10 (do not use MoF 20 chain mapsheet delineation).

NOTE: If an existing project occurs on the same mapsheet but different location resulting in the same unique polygon identifier, then the number will be re-generated by the province.

Table 3-10 - Map Number Recording Convention

NTS series or BC series - 1:50 000 scale & larger:

Map Series	Mapsheet Number
BCGS series - 1:20 000 scale 92F.057	0 9 2 F 0 5 7
BCGS series - 1:10 000 scale 92F.057.2	0 9 2 F 0 5 7 2
BCGS series - 1:5 000 scale 92F.057.2.2	0 9 2 F 0 5 7 2 2
[1] BCGS series - 1:50 000 (Quad)	0 9 2 F 1 0 5
NTS series - 1:50 000 scale 92F/4	0 9 2 F 0 4

[1] The unofficial naming convention for the BCGS 1:50,000 quad base maps based on 1:20,000 TRIM was created by MOF. This was adapted with the naming convention of: maps are 24 minutes Easting and 12 minutes Northing. Numbering starts at 101 to 125.

e.g.: for BCGS mapsheet series 092F.032 assign ECP_TAG as follows:
<MAPSHEET_NUMBER_POLYGON_NUMBER>

"MAPSH_NBR"_"POLY_NBR"
092F032_125
092F032_126
092F032_127
092F032_2001
092F032_1
092F032_28

ECI COVERAGE: Every point, representative of a sample site, in the sample point spatial database must have a provincially unique identifier assigned to it. This identifier must exist in both the Point Attribute Table and the non-spatial attribute tables, as such they act as a link between the two databases**.** There shall be a one-to-one relationship between each point and its associated attribute record. This identifier in the sample site spatial database is called the ECI_TAG.

This identifier in the sample site spatial database is called the ECI_TAG. For each GIF, Aircalls, and Visual sample site point, the ECI_TAG should contain an unique Plot Number found in the non-spatial data used to identify each site. For example, See Table 3-7.

3.3.6 Spatial Coordinate System

TEM coverages will conform to the coordinate system parameters listed in Table 3-11.

Table 3-11 - Coordinate system parameters

Parameter	Standard	Details
Projection	Albers Equal Area Conic	
Units	Metre	stored without offsets e.g.: in direct Albers projection coordinates
Datum	NAD 83 CNT	Canadian National Transformation
Central Meridian	(-126.0) -126: 00: 00 West Longitude	longitude west (DMS)
First Standard Parallel	(50.0) 50: 00: 00 North Latitude	latitude north
Second Standard Parallel	(58.5) 58: 30: 00 North Latitude	latitude north
Latitude of Projection Origin	(45.0) 45: 00: 00 North Latitude	latitude north
False northing	0.0	zero metre
False easting	1000000.0	one million metre

All coverages must contain a projection file which defines the projection and datum and uses the CNT matrix (e.g.: Datum line in projection file: NAD83 CNT).

NOTE: Datum transformation between NAD27 and NAD83 must use the Canadian National Transformation matrix (version 2.0), as published by the Geodetic Survey of Canada, and endorsed by Geographic Data BC. This matrix consists of regularly-spaced points covering all of Canada, with X and Y shifts between NAD27 and NAD83 for each point. ARC/INFO includes this transformation matrix.

3.3.7 Polygonal Topology Standards

All coverages must be topologically clean. Topology is used to express spatial relationships among map features specifically, area, connectivity, and contiguity. The following rules apply:

Terrestrial ecosystem polygon (ECP) features:

1. All polygons must be explicitly closed areas and must close on themselves at exact coordinated junction points or nodes in x, y, (and z, where applicable).
2. No dangling nodes or undershoots are permitted.
3. No excess vertices are permitted (vertices must be spaced more than 5 metres apart at 1:50,000, 2 metres apart at 1:20,000, 1 metre at 1:10,000 and 0.5 metres at 1:5,000 scale).
4. Except where required by software limitations, arcs should not contain pseudo-nodes (line endpoints with exactly two adjoining arcs with identical attributes).
5. Line and polygon features must be contiguous across coverage boundaries (e.g.: where a single geographic feature is split into adjacent coverages, it should be edge-matched).
6. All polygons shall contain exactly one label point.
7. Every feature (point, arc and polygon) shall have one attribute record and one feature code assigned to it.
8. Coverages shall have arc (from node, to node, left poly, right poly, length) and polygon topology (area, perimeter).
9. No arc shall have the LEFT POLY and the RIGHT POLY being the same or equivalent polygon.
10. The Arc BUILD command should process the coverage without errors or warnings. The Terrestrial Ecosystem polygon map should be built topologically for both line and polygon feature types. Use the Arc BUILD command with the POLY option to build polygon topology and the BUILD command with the LINE option to build arc topology.
11. The Arc LABELERRORS command should generate no warnings on a polygon coverage. With the exception of the universal polygon, 'Polygon 1 has 0 label points'.
12. The Arc NODEERRORS command should generate no warnings on a polygon coverage. When copying from TRIM, if a polygon boundary is partly from TRIM and partly not you can have a pseudo node.

Processing tolerances for polygonal coverages:

Fuzzy tolerance defines the minimum allowable distance between any two arcs, nodes or vertices. Use the following calculation to determine an appropriate fuzzy tolerance or refer to Table 3-12.

Fuzzy Tolerance = Mapscale / 10000

Table 3-12 - Fuzzy Tolerance

Data Capture Scale	Fuzzy Tolerance (metres)
1:50,000	5
1:20,000	2
1:10,000	1
1:5,000	0.5

Dangle tolerance defines the minimum length allowed for dangling arcs. The TEM ECP coverage should have no dangling arcs. All polygons should be closed. Use the following calculation to determine an appropriate dangle tolerance or refer to Table 3-13.

Dangle Tolerance = Mapscale / 1000

Table 3-13 - Dangle tolerances

Data Capture Scale	Dangle Tolerance (metres)
1:50,000	50
1:20,000	20
1:10,000	10
1:5,000	5

Note: If the tolerance is too small, cleaning operations may not find all intersections, may not resolve duplicate line segments, or may not remove slivers. If the tolerance is too big, cleaning operations may merge arcs together undesirably and may move arcs anywhere within the specified tolerance.

Minimum Feature Size:

The generally accepted minimum size of polygon and line features is related to the scale of data capture. In the coverages these will be translated into ground coordinates. The generally accepted sizes are:

TEM polygons should not be less than **0.5 square cm** in page units (7 mm x 7 mm). The smallest allowable polygons in map units are listed in Table 3-14.

Table 3-14 - Minimum polygon size

Data Capture Scale	Minimum Area (page units)	Minimum Area (map units)
1:50,000	0.5 sq cm	12.5 ha
1:20,000	0.5 sq cm	2 ha
1:10,000	0.5 sq cm	0.5 ha
1:5,000	0.5 sq cm	0.125 ha

Exceptions to the minimum polygon size include small islands and lakes originating from the basemaps and should be approved by the Quality Assurance Staff and Protocols from the Ministry.

There is a minimum allowable width between TEM polygons, see Table 3-15 .

Table 3-15 - Minimum Allowable Polygon Widths

Data Capture Scale	Minimum width on ground (metres)	Minimum width on map (millimetres)
1:50,000	250	5
1:20,000	100	5
1:10,000	50	5
1:5,000	25	5

3.3.8 Slivers

A sliver is a gap formed when two lines that should be contiguous are slightly separated in a graphical representation or map. It usually occurs when two adjacent coverages are combined and arcs do not match or overlap one another.

A polygon without attributes or a label ECP_TAG is considered a sliver. There must be no slivers in the TEM polygon coverage. Slivers can be avoided by adhering to standard tolerance guidelines and following the rule of not re-digitizing existing basemap arcs to create a TEM feature (e.g. mapsheet neatlines).

NOTE: BC Environment's World Wide Web site (http://www.elp.gov.bc.ca/gis/arccookbook.html) contains a sample set of procedures to clean an ARC/INFO coverage without accidentally displacing data points or lines.

3.3.9 Point Topology Standards

Terrestrial Ecosystem point field inspection (ECI) features:

1. Point features shall be linked to exactly one attribute record and have a feature code assigned to each feature.
2. The Arc BUILD command should process the coverage without errors or warnings. The Terrestrial Ecosystem ECI should be built topologically for point feature types. Use the Arc BUILD command and use the POINT option to build a point topology.

3.3.10 Data Quality

Storage precision:

ARC/INFO coverage coordinates must be stored in SINGLE precision coordinates (defines numbers eight characters in width). Albers Equal Area Conic projection coordinates can be stored in single precision with a one metre accuracy.

Lineage:

The source scale of baseline maps will vary depending on the source. e.g.: 1:20,000 for TRIM (e.g.: water features), 1:250,000 for ecosections and biogeoclimatic units, 1:20,000 for forest cover.

All baseline digital data sources used shall be approved by the Ministry. Existing digital baseline arcs shall be used where they form part of the ECP polygon boundary only if line meaning is different. TRIM double line rivers, lakes and coastlines should be digitally copied where ECP polygon boundaries are of the same intent.

A polygon may not cross a project boundary. The mapping contractor is responsible for ensuring that terrestrial ecosystems follow natural boundaries (e.g. not mapsheet dependent) but must stop at the project boundary. When the adjacent area is mapped in the future, the incomplete unit boundaries will be extended to complete their natural boundaries (e.g. edge matched).

Resolution:

If terrestrial ecosystem mapping is created in an area where accurate digital topographic Terrain Resource Inventory Mapping (TRIM) from Geographic Data BC exists, the boundaries and features in the terrestrial ecosystem mapping must be registered to the existing digital features.

The required accuracy of mapped features relates to the scale of data capture. Where mapping is captured from existing hardcopy maps, all features must be within **0.5 mm** of the original map features when plotted on a check plot at map scale. For example, features captured from a **1:20,000** scale map be within **10 m**. of their mapped location. Where mapping is captured from new terrestrial ecosystem surveys, all features must be within the specifications for control and data capture using mono-restitution.

Line features for ECP should be no smaller than **0.5 cm** at the data capture scale.

3.3.11 Coverage extents

The geographic extent of a coverage should not match NTS or BCGS mapsheet extents. If an area larger than a mapsheet is being mapped, one should create a seamless coverage using the project study area boundary as the coverage extent, subject to limitations in computer processing of the coverage. Assembling large areas into contiguous coverages reduces the need to edge-match. There should be no mapsheet neatlines in the final coverage, unless they coincide with the study area boundary.

3.3.12 Spatial/Attribute links

The terrestrial ecosystem polygon (ecp) feature attribute table (.pat) must contain a foreign key field called 'ECP_TAG' linking each feature to its textual attributes in the non-spatial database. There must be exactly one database record for each spatial feature (e.g.: one unique key in each feature linked to one database record with that key).

The field inspection sites (eci) feature attribute tables (.pat and .aat) must contain a foreign key field called 'ECI_TAG' linking each sample site to its textual attributes in the non-spatial database. The foreign key must be unique to each terrestrial ecosystem sample site within the Province.

3.3.13 Indexing

To speed up access to the non-spatial database records associated with each coverage, the ARC/INFO **INDEXITEM** command must be run with the foreign key included.

Arc: INDEXITEM <cover_name>.PAT ECP_TAG

To create a spatial index, the ARC/INFO **INDEX** command must be run on all coverages. This command creates a spatial index that increases the speed at which coverages are drawn.

Arc: INDEX <cover_name>

4 Check and Presentation Plots

This section details the appearance of standard check and presentation plots drawn from a digital terrestrial ecosystem or terrain dataset. Check plots are to be generated as an aid to data accuracy and quality assurance validation. Manuscripts, hard copy check plots and digital plot files comprising the complete project area (e.g.: watershed boundary) are to be delivered to the Ministry. Plots must be in UTM (Universal Transverse Mercator) projection at the original input scale and NAD 83 datum to enable comparison with the original manuscripts. Each hardcopy check and presentation must be supplied with a corresponding digital plot file, in a format compatible with HP Designjet plotters. Recommended formats are HP GLZ or HP RTL. Additional formats may be acceptable, check with the contract administrator before submitting. Symbolization of arcs, polygons and labels must be in accordance with section 4.2.

Digital plot files may be requested at any time during the QA process. A complete set of final digital plots should be re-created and submitted to the Ministry once databases have passed quality assurance protocols.

NOTE: Reprojection of digital data from Albers to UTM is needed for check plots and presentations to compare to the original manuscript.

NOTE: The ministry may ask for plots derived from reverse mono-restitution to compare linework against photos.

4.1 Check Plot Information

4.1.1 Plot Types

Check Plots:

A standard dataset should be divided into two separate check plots:

1. Terrestrial ecosystem or terrain polygons with labels derived from their attributes.
2. Terrestrial ecosystem point and line features and sample sites with labels derived from their attributes.
3. (Optional) Reverse-mono plots on film for each photo to confirm accuracy of line and point feature. This will be generated upon request by the ministry or a client.

Presentation Plots:

Terrestrial ecosystem or terrain data may be plotted for presentation purposes. The desired contents of the plot will be specified upon request as they will vary depending on the purpose. Presentation plots contain more cartographic information than a check plot and are to be generated upon request by the Ministry or client.

4.1.2 Cartographic Layout of a Check or Presentation Plots

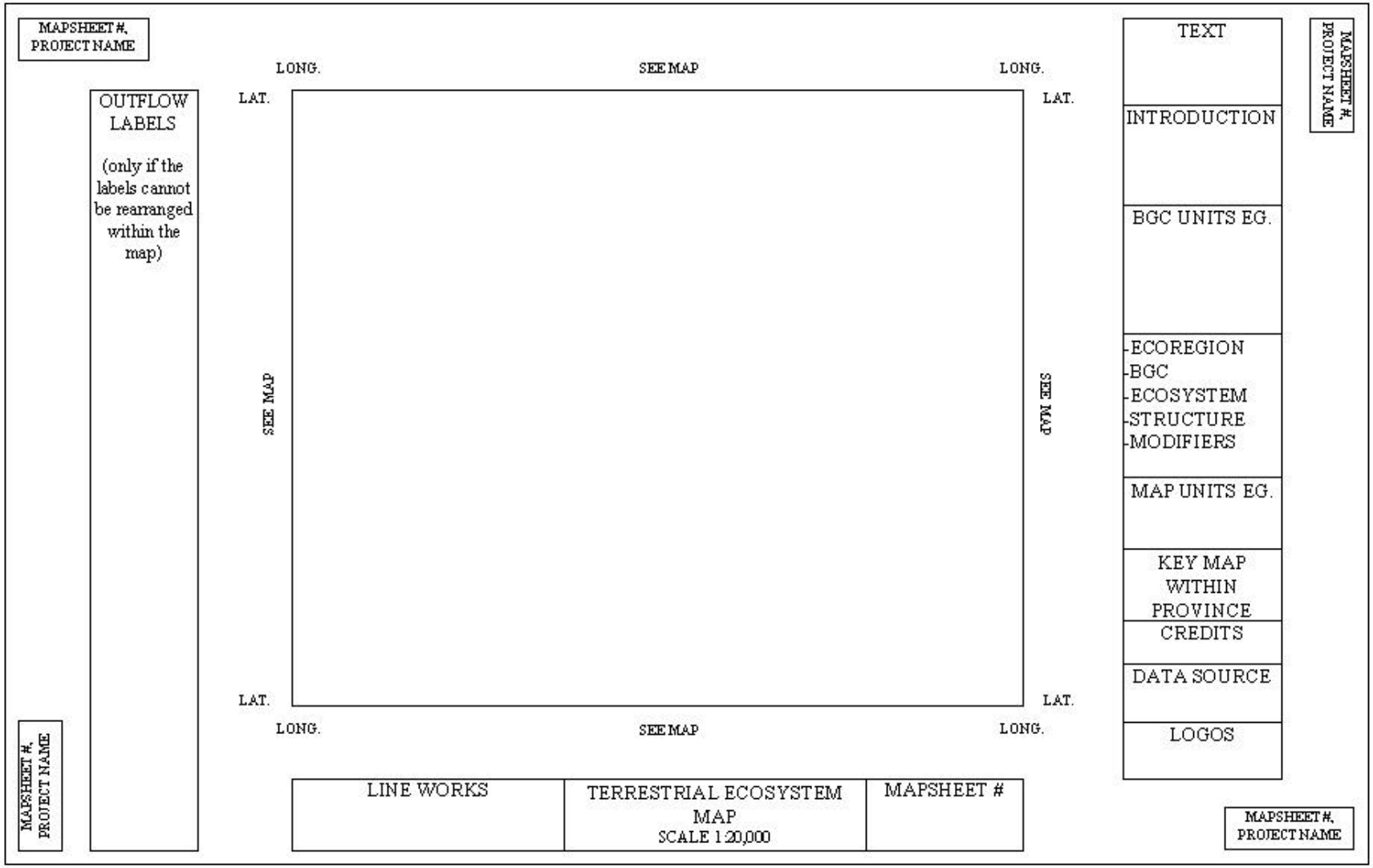
Table 4-1 lists the possible items to include in the map surround for the check and presentation plots. The general layout for a map/plot is shown in Figure 4-1. The specific layout may vary from project to project, and optional categories may be added where required. Table 4-1 describes the attributes in Figure 4-1.

Table 4-1 - Map surround and check plot description

Mapsheet #, Project Name	This area is used for the filing of hardcopy maps, whether the maps be hung in a folder or placed in a map drawer, one corner will always be easily read.
Outflow Labels[1]	This area is used for information that does not fit into the polygon display area on the map. **Outflow/overflow labels should only be used when no other options are available, i.e. if the labels cannot be rearranged within the map.**
See Map[1]	This area is used to display the mapsheet that would adjoin the mapsheet being displayed
Mapsheet #[1]	The number of the mapsheet that is being displayed.
Text[1]	This area includes the title of the map, the date, project area is was produced and all other relevant information.
Introduction	This area is used to describe such things as the map Objective, Study Area, Mapping Approach, Classification, etc.
BGC Units E.g.	This area is used to provide an example and a description of the BGC unit labels that occur within the project area.
Ecoregion	This area is used to provide examples of ecoregions that occur within the project area.
BGC	This area is used to provide examples of biogeoclimatic units that occur within the project area.
Ecosystem	This area is used to provide examples of ecosystem units that occur within the project area.
Structure	This area is used to provide examples of structural units that occur within the project area.
Modifiers	This area is used to provide examples of modifiers that occur within the project area.
Map Units E.g.	This area is used to provide an example of the map unit labels that occur within the project area.
Key Map Within Province	This area is used to show where the mapsheet/project that is being displayed falls within the province.
Logos	This area is used for displaying the logos of the organization that the map has been prepared *for* (and prepared *by)*.
Line works[1]	This area is used for displaying what the line symbols on the map represent.
Terrestrial Ecosystem Map[1]	Label heading (actual words to be displayed).
Scale[1]	This area is used for displaying the scale of the map being presented. (Ratio Scale, 1: . .
Mapsheet #[1]	The number of the mapsheet that is being displayed (to be displayed in a box and in bold font).
Credits[1]	This area is used list all key participants involved in the mapping process.
Data Source[1]	This area is used to list all reference material utilized to create the map being displayed.

NOTE: [1] Indicates attributes that are required for a check plot..

Figure 4-1 - Example Map Surround, 1:20,000



4.1.3 Map Legend

The map legend should only contain summary information that is generally expanded in an expanded legend report that will accompany the map. Contractors should see section 5.0 of the *Standard for Terrestrial Ecosystem Mapping in British Columbia* (RIC, 1998) for further explanation and examples of what should be included in a TEM Map Legend.

It is important to note that the map legend not only appears on the plot file itself, but the information contained in the legend must be submitted in an associated RTF file as well. The name of this file must be recorded in the project metadata. Contractors should see Table 2-2 in Section 2 of this document for further explanation on entering project metadata information.

4.1.4 Annotation text (eca)

Ecosection and Biogeoclimatic labels

Ecosection and Biogeoclimatic labels should be placed on each area of the plot where the classification changes. If the area is large enough, more than one label should be plotted per homogenous area. Table 4-2 gives an example of the label format.

Table 4-2 - Ecosection and biogeoclimatic unit label format

Label Content	Example	Description
Ecosection unit	BUB	Bulkley Basin Ecosection Unit, and
Biogeoclimatic unit	ICHmc2	Interior Cedar-Hemlock **zone**, Moist Cold **subzone**, Hazelton **variant**

Terrestrial Ecosystem labels

Table 4-3 contains indicators for Terrestrial Ecosystem labels.

Table 4-3 - Terrestrial ecosystem label format

Label Content	Example	Description
Decile, Site Series, Site Modifiers, Structural Stage, Structural Stage Modifier, Stand Composition Modifier, Seral Community Type (up to 3 components per polygon)	5HMkn5tC:if 3RDn5tC:ad 2CDn4sB	50% (Hw - Stepmoss) cool aspect, fan, structural stage 5, two storied, coniferous, $plHw -feathermoss seral association. 30% (CwHw - Devil's Club- Oak fern) fan, structural stage 5, two storied, coniferous, $AtEp - dogwood seral association. 20% (ActSx - Dogwood) fan, structural stage 4, single storied, broadleaf.

Table 4-4 contains indicators for Terrain labels.

Table 4-4 - Terrain label format

Label Content	Example	Description of example
Decile, Texture, Surficial Material, Surface Expression, Geomorphological Processes (up to 3 components per polygon)	sgFt	100 % (decile) sandy gravelly (texture) Fluvial (surficial material) terrace (surface expression)

Cartographic labels for the terrestrial ecosystem features must be generated from the polygon's textual attributes (ECP database), to ensure that they accurately represent the attribute contents.

Where labels are too large to fit within their polygons or beside their lines or points, they must be arrowed in or placed in the label overflow area, and linked to their feature with a numeric identifier.

NOTE: An Arc Macro Language algorithm for generating labels is under development and will be available at the TEM website http://www.elp.gov.bc.ca/rib/wis/tem/

4.2 Symbology

Common boundary line specifications for plotting are listed in Table 4-5.

Table 4-5 - Symbology specifications

Fcode	Map Unit	Line Width	Line Type	Colour	Line Symbology
WI25400500	Ecosection Unit	1.2 mm	dashed	green	468
WI25000130	Biogeoclimatic Unit	0.8 mm	Solid	red	203
WI25100110	Study boundary	1.2 mm	Solid	black	219
WI25200100	Ecosystem unit	0.35 mm	Solid	black	470
GA24850000	River/Stream - definite	0.25 mm	Solid	light blue	553
GB15300000	Lake Definite	0.25 mm	Solid	light blue	553
GG05800000	Coastline	0.25 mm	Solid	dark blue	210
FA02700000	Boundary Type Interprovincial	0.25 mm	1 dot - 1 dash 0.5 mm dot - 3 mm dash 2 mm from dash end to dot centre 2 mm between dots	black	233
FA02650000	Boundary Type International	0.25 mm	3 dots - 1 dash 0.5 mm dot - 3 mm dash 2 mm from dash end to dot centre 2 mm between dots	black	217

NOTE: Please refer to http://www.elp.gov.bc.ca/gis/arcsymbols.html for the BC Environment standards and lookup tables. Line symbology is located at the above website in the bcenv.lin file.

Symbology is not scale dependent and is **not** explicitly part of a BC Environment coverage. Symbology is defined in 'plotter' units and one set of symbology is usable for datasets of any scale, so long as the data density is appropriate. ARC/INFO symbology is determined by using BC Environment lookup tables linked to the feature codes (**bcelin.lut**). BC Environment has a custom set of symbol files for ARC/INFO data which define colour and symbology.

The files, **bcenv.lin** for arc symbology, **bcenv.shd** for polygon shading, and **bcenv.mrk** for point symbology, are available for use by the mapper, (requires custom font files **fnt030, fnt035, fnt036**).

All symbol-related files are available by anonymous ftp from ***ftp://ftp.env.gov.bc.ca/*** in the ***/dist/arcinfo*** directory. A **README.TXT** file with instructions is included.

Symbolsets for ArcView can be obtained through downloading an ArcView 3.0 extension called MELPKID. See the following website for details: http://www.env.gov.bc.ca/gis/melpkid/

5 Metadata

Metadata is information about information (e.g.: data quality, spatial referencing, lineage). Two types of Project Metadata will be created. The first set of metadata consists of a record of field mapping information in the header of the TEM database (see fields 1 – 21 in Table 2-2). This is referred to as the PROJECT.CSV.

The second set of metadata should be a META INFO table associated to each coverage, e.g. ECI and ECP. The META INFO table should follow standards at the Ministry of Environment, Lands and Parks web site at http://www.elp.gov.bc.ca/gis/arcmetadata.html. The Ministry provides a Macro (AML) and instructions on how to capture the META info table data.

All metadata must be included with all data sets when submitted to any government repository at the end of a project or contract.

6 Delivery

6.1 Location

TEM digital data is to be delivered to the Ministry ftp site at **ftp.env.gov.bc.ca** in the ***/Branches_Regions/ribftp/pub/incoming/tem/<project_name>*** sub-directory**.** Anonymous login will be used by the contractor to access the ftp site. TEM deliverables will be put under a project code directory created by the contractor. The digital data may also be submitted via CD-ROM. All CD's should be clearly marked with a Project Name, Contractor Name and Contact Information.

Hard copy manuscripts, plots, and data capture methodologies are to be mailed to the Habitat Data Manager at:

Ministry of Environment Lands and Parks,
Resources Inventory Branch, Wildlife Inventory Section,
P.O. Box 9344,
Station Provincial Government,
Victoria, BC
V8W 9M1

6.2 Format and list of required deliverables

Users should always refer to the project contract, referenced materials and all other necessary documentation.

The completed project spatial data file must include the entire project boundary, TEM and terrain features along with the required spatial attributes identified in Section 3.

Sections 6.2.1 through 6.2.5 provide the list of MINIMUM deliverables that must be submitted to the Quality Assurance Staff at the Ministry.

6.2.1 Required spatial databases:

Two ARC/INFO single precision export files:

1. ECP coverage containing the TEM polygon information

Example for Lignum spatial polygon coverage at 1:20,000 the file name should be:

- <scale designator><thematic content>_<map extent> – tECP_lig.e00

2. ECI coverage containing the sample points (plot locations)

Example for Lignum spatial polygon coverage at 1:20,000 the file name should be:

- <scale designator thematic content>_<map extent> - tECI_lig.e00

Export files must be created with the 'NONE' compression option (produces readable ASCII).

6.2.2 Non-spatial attribute databases:

The only file format acceptable by the Ministry for TEM non-spatial data is a comma separated value (CSV) file. The CSV file must be produced by loading and validating the data in the *Terrestrial Ecosystem Mapping (TEM) and Data Capture and Validation Tool* (TEM DC). The TEM DC Tool is available for download at the TEM web site: http://www.env.gov.bc.ca/rib/wis/tem

The non-spatial data files must include the attributes and follow the specifications defined in section 2 of this document.

The following three databases are a mandatory deliverable with each TEM submission. The fourth database is mandatory where applicable.

1. TEM Project database (project.csv): The data base must contain all mandatory fields indicated in Table 2-1 of this document.

- <scale designator><thematic content>_<project name>.csv - tPRO_lig.csv

2. TEM Polygon database (polygon.csv): The data base must contain both ecosystem and terrain attributes:

- <scale designator><thematic content>_<project name>.csv - tECP_lig.csv

3. VENUS database sample site field data: The data submitted from the VENUS system includes field data from both Full plots and GIFs. As well, visual and air call checks may be submitted through the Gravitti form included in VENUS or an Excel spreadsheet as one table.

- <scale designator><venus>_<project name> – tVEN_lig.mdb
- <scale designator><venus>_<project name> – tVEN_lig.xls

4. TEM User Defined database (userdefined.csv): Often other attributes or codes are approved for certain project in certain areas, however they are not yet provincially approved. In these circumstances, it is necessary for the contractor to submit all approved project specific attributes or codes.

- <scale designator><thematic content>_<project name>.csv - tUSR_lig.csv

See the *Terrestrial Ecosystem Mapping (TEM) and Data Capture and Validation Tool* (TEM DC) (In Progress) for further explanation of how to record user defined codes and attributes.

6.2.3 Digital plot files and hardcopy plots

As specified in Section 4.0 of this document, a set of digital plot files in a format compatible with HP Designjet plotters, for each mapsheet within the project area must be submitted:

- <mapsheet>.hp2

As specified in Section 4.0 of this document, hardcopy checks and presentations must be submitted to the address in Section 6.1.

6.2.4 Map Legend

As specified in Section 4.0 of this document, the map legend is to be recorded as associated file in Rich Text Format (RTF). The naming convention must have a maximum of 8 characters in the name and it must have a 3 character extension. See Table 2-2 of this document for further explanation. An example is also given below.

- <project name><ML> - lignumML.rtf

Users should see section 5.0 of the *Standard for Terrestrial Ecosystem Mapping in British Columbia* (RIC, 1998) for further explanation and examples of what should be included in a TEM Map Legend.

6.2.5 Expanded Legend and Final Report

The Expanded Legend and Final Report, when agreed upon as a deliverable in the project contract should contain a data capture methodology report that describes how the data was captured from the source. These documents should be submitted as one file and they must be submitted as a Rich Text File (RTF) file or Portable Document Files (.pdf). Users must be sure to include and describe all appendices. All figures and photos should either be embedded and saved within the document or included as separate files if they are linked in the document.

The naming convention must follow what is described in Table 2-2 of this document. Examples are also given below.

- <project name_EL>.doc – lignm_EL.rtf
- <project name_EL>.pdf – lignm_EL.pdf

Users should see section 5.0 of the *Standard for Terrestrial Ecosystem Mapping in British Columbia* (RIC, 1998) for further explanation and examples of what should be included in a TEM Expanded Legend and Final Report.

Files may optionally be compressed (using zip software).

Mapping contractors must retain a copy of their work for at least one year after the project has been signed off.

NOTE: Although a project may be completed in different stages at different times throughout a contract, the final submission of seamless data must be made all at once in one transfer, not in individual sections.

Some sites to download zip software are:

Info-Zip multi-platform compression/uncompression via anonymous ftp from http://www.cdrom.com***/pub/infozip/Info-Zip.html*** directory; or gzip compression/uncompression software can be downloaded via anonymous ftp from http://www.cdrom.com***/prep.ai.mi.edu/pub/gnu/*** directory.

6.3 Digital Requirements

Original or copies of plot cards and pretyped air photos with control marks must be delivered to the Ministry. All hard copy manuscripts and plots along with data capture methodology reports are to be delivered.

Data capture methodology reports will contain how the data was captured from the source. Projects captured from stereo pairs using mono-restitution or other methodologies will include reports and materials necessary for quality control and assurance.

Table 6-1 - Digital requirements deliverables

The **original** typed document photos and update photos with control marked as per these specifications.
A digital file containing control points in ASCII (CSV) format. This control point file shall contain point numbers, X, Y, Z coordinates (to three decimal places).
Camera calibration (digital) report.
All original source materials provided by the Ministry, including TRIM prints and diapositives, along with TRIM digital control.
Mono-restitution set up (digital) reports for each model.
Each model must clearly provide the following information
1) Project Name
Geographic Location
Model name
Operator
Tablet resolution
Focal length
Photo Scale
2) Orientation Results
Photo positioning: Omega, Phi, Kappa
Fiducial digitizing confidence: must meet or exceed 98 % (0.2)
3)Control Residuals Report
All output to be in meters to 3 decimal places
Mean residual
Maximum residual
For each control point (minimum of 6):
The X,Y,Z of the control point
The residual in X
The residual in Y
The residual in Z

NOTE: Control transfers from TRIM must follow contract procedures. All stereo models will be setup on a stereo plotter that has met TRIM calibrations, issued by Geographic Data BC, that are current. A copy of certification of the equipment may be requested by the province as deliverable during quality assurance.

6.4 Quality Assurance

The TEM digital coverage must conform to all standards discussed in this document and must pass all validation rules.

The check and presentation plots must also conform to all standards in this document. Confirm the check plots are in UTM at correct source scale, have all information required, and check that arcs match the manuscript within acceptable tolerances.

If the TEM coverage does not meet all requirements, an error report will be generated by the Ministry of Environment, Lands and Parks and returned to the contractor. The contractor must rectify any identified problems and resubmit the coverage to the Ministry. Projects will not be accepted until the ministry has received all reports and approved all Quality Assurance measures.

If the ecosystem digital map is stored in a format other than ARC/INFO, it is the responsibility of the contractor to convert the data into the accepted format.

7 References

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ADDITIONAL INFORMATION SOURCES

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AIR PHOTOS, MAPS and DATAFORMS

Information for air photos, maps and field dataforms can be obtained from the Standard for Terrestrial Ecosystem Mapping in British Columbia. 1998. Appendix B: Data Sources.

Information for transferring linework from airphotos to digital files using mono-restitution can be obtained from the Ministry of Forests.

8 Appendix

Appendix 1 - Polygon Specific Data Capture (user defined)

Some TEM projects may have polygon specific attributes. These attributes are not within the standards for digital capture and will not be systematically stored in the provincial data warehouse. However, clients, consulting companies, regions and districts can store and manage this data for their specific applications. This project specific data will be stored in flat file format (csv), unless keyword or standard designations are required, then contact the TEM data custodian. The TEM data custodian will keep records of new or additional classifications, which are commonly used for project specific applications.

With respect to slope classes; the slope tables recorded below provide a format and guide as to how companies can enter their own specific slope classes. However, being that the relationship of slope classes to local and regional topographies can vary, mappers must therefore set their own class limits. See the following 3 tables for examples.

Table 8-1 - Description of Attribute Fields for Slope Class Descriptions - Example

Field #	Field Name	Description	Length	Type	Case	CSV field name
181	Slope Class 1	The dominant slope class of a polygon, by recording a class 1,2,3,4,5 or 6. From Vegetation Resource Inventory. See Table 7-1 below.	1	N		Slpc_1
182	Slope Class Relation	A slope class separator used to show the relation between two slope classes. See Table 7-2 below.	1	C		Slpc_Rel
183	Slope Class 2	The subdominant slope class of a polygon, by recording a class 1,2,3,4,5 or 6. From Vegetation Resource Inventory. See Table 7-1 below.	1	N		Slpc_2

Table 8-2 - Slope classes[1] - Example

Code	Class Name	Definition - Mapper to define their own class limits
1	Slope Class 1	E.g. only (0-5 percent)
2	Slope Class 2	E.g. only (>5-15 percent)
3	Slope Class 3	E.g. only (>15-*30 percent)*
4	Slope Class 4	E.g. only (*>30-60 percent)*
5	Slope Class 5	E.g. only (*>60-100 percent)*
6	Slope Class 6	E.g. only (*>100 percent)*
[1] **Slope class limits must be determined on a project specific basis.**		

Table 8-3 - Slope class separators - Example

Code	Class Name	Definition
,	slope class relation	A slope class separator used to show the relation between two slope classes. A comma indicates two distinct slope classes exist in a polygon.
-	slope class relation	A slope class separator used to show the relation between two slope classes. A dash indicates that all intermediate classes exist between the two slope classes recorded.

NOTE: A dash indicates that all intermediate classes exist between the two slope classes recorded.

Appendix 2 - Example TEM DATA FORMS

1 EXAMPLE PROJECT LEVEL DATA FORM
4 EXAMPLE POLYGON LEVEL DATA FORMS

(1)Project Name: South Chilcotin										(5)TRIM Version: 2	(9)T.S.I.L.: B
(2)Geographic Location:5 Kilometres North of Kamloops										(6)Legend: lignum.doc	(10)Year Surveyed
(3)Consultant/Dept.: Eco-Analysis Ltd.										(7)Expanded Legend: e_lignum.doc	(11)Date Recorded
(4)Map Scale: 20000										(8)E.S.I.L.: 2	(12)Recorder Nam
(17)Mapsheet Number:									(18)Ecosystem Mapper:	(19)Terrain Mapper:	(20)Digital Capture
0	9	2	F	0	5	7			Carol Clement	Jim Roder	Capture Co. Lt
0	9	2	F	0	5	8			Carol Clement	Jim Roder	Capture Co. Lt
0	9	2	F	0	5	9			Carol Clement	Jim Roder	Geomatics Ltd
0	9	2	F	0	6	0			Chris Thompson	Yvonne Gibbons	Geomatics Ltd
0	9	2	F	0	6	1			Chris Thompson	Yvonne Gibbons	Geomatics Ltd
(21) Project Comments: Photos were cloudy and overcast											
(21) MONO used for data capture using cross pugging and high levels											
(21)											
(21)											
(21)											

Project Name: | Fo

22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	4
								ECO COMPONENT # 1														
MAPSHEET NUMBER	POLYGON NUMBER	DATA SOURCE	ECOSECTION	BGC ZONE	BGC SUBZONE	BGC VARIANT	BGC PHASE	DECILE	REALM	GROUP	CLASS	SITE SERIES NUMBER	SITE SERIES ASSUMED MODIFIER 1	SITE SERIES ASSUMED MODIFIER 2	SITE SERIES ASSUMED MODIFIER 3	SITE SERIES ASSUMED MODIFIER 4	SITE SERIES CODE	SITE MODIFIERS 1	SITE MODIFIERS 2	STRUCTURAL STAGE	STRUCTURAL STAGE SUBSTAGE OR MODIFIER	STAND COMPOSITION MODIFIER
0 9 2 F 0 5 7	2 3	P	S O B	B G	x h	1		1 0				0 1	d	j	m		S W	f		3	a	
0 9 2 F 0 5 8	1 2 1	G	W I M	C W H	v h	1		5				0 1	d	j	m		H S			7		C

Examples

Polygon 23

Ecosection - SOB

BGC zone - BG

BGC subzone - xh

BGC variant - 1

SOB
BGxh1

Polygon 23

Ecosystem components

decile - 10

Site series code - SW

Structural stage - 3

Structural stage modifier - a

Seral community type - nw

10SWf3a:nw

Polygon 121

WIM
CWHvh1

Ecosystem components

6FG7C

3SS6sM

2SE7C

Project Name:		Form

ECO COMPONENT # 2

51 DECILE	52 REALM	53 GROUP	54 CLASS	55 SITE SERIES NUMBER	56 SITE SERIES ASSUMED MODIFIER 1	57 SITE SERIES ASSUMED MODIFIER 2	58 SITE SERIES ASSUMED MODIFIER 3	59 SITE SERIES ASSUMED MODIFIER 4	60 SITE SERIES MAP CODE	61 SITE MODIFIERS 1	62 SITE MODIFIERS 2	63 STRUCTURAL STAGE	64 STRUCTURAL STAGE MODIFIER	65 STAND COMPOSITION MODIFIER	66 SERAL COMMUNITY TYPE	67 TREE CROWN CLOSURE	68 SHRUB CROWN CLOSURE	69 SITE DISTURBANCE CLASS	70 SITE DISTURBANCE SUBCLASS	71 SITE DISTURBANCE SUB-SUBCLASS
				1 4	d	m			S S			6	s	M		5 5				

ECO COMPONENT # 3

72 DECILE	73 REALM	74 GROUP	75 CLASS	76 SITE SERIES NUMBER	77 SITE SERIES ASSUMED MODIFIER 1	78 SITE SERIES ASSUMED MODIFIER 2	79 SITE SERIES ASSUMED MODIFIER 3	80 SITE SERIES ASSUMED MODIFIER 4	81 SITE SERIES MAP CODE	82 SITE MODIFIERS 1	83 SITE MODIFIERS 2	84 STRUCTURAL STAGE	85 STRUCTURAL STAGE MODIFIER	86 STAND COMPOSITON MODIFIER	87 SERAL COMMUNITY TYPE
	E		s	1 8					S E			7		C	

Project Name:																																				
TERRAIN COMPONENT 1																									TERRAIN COMPONENT 2											
93		94	95	96	97	98		99	100	101	102	103	104		105	106	107	108		109	110	111	112	113	114	115	116	117	118	119		120	121	122	123	12
DECILE		PARTIAL COVER FLAG	TERRAIN TEXTURE 1	TERRAIN TEXTURE 2	TERRAIN TEXTURE 3	SURFICIAL (GENETIC) MATERIAL		SURFICIAL QUALIFIER	SURFICIAL SUBTYPE	SURFACE EXPRESSION 1	SURFACE EXPRESSION 2	SURFACE EXPRESSION 3	BEDROCK TYPE		SUBTERRAIN TEXTURE 1	SUBTERRAIN TEXTURE 2	SUBTERRAIN TEXTURE 3	SUBSURFICIAL (GENETIC) MATERIAL		SUBSURFICIAL QUALIFIER	SUBSURFICIAL SUBTYPE	SUBSURFICIAL EXPRESSION 1	SUBSURFICIAL EXPRESSION 2	SUBSURFICIAL EXPRESSION 3	DECILE	PARTIAL COVER FLAG	TERRAIN TEXTURE 1	TERRAIN TEXTURE 2	TERRAIN TEXTURE 3	SURFICIAL (GENETIC) MATERIAL		SURFICIAL QUALIFIER	SURFICIAL SUBTYPE	SURFACE EXPRESSION 1	SURFACE EXPRESSION 2	SURFACE EXPRES…
	6			g	s	F	G			h	r														4											
1	0			z	r	C				x	v		z	l				R				m														

Polygon 23 — **6**αsFGhr**4**Ft
r-w

Polygon 121 — <u>zrCxv</u> -V
zlRm
m

Project Name:

TERRAIN COMPONENT 3 | **GEOMORPHOLOGICAL PROCESSES**

135	136	137	138	139	140		141	142	143	144	145	146		147	148	149	150		151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
DECILE	PARTIAL COVER FLAG	TERRAIN TEXTURE 1	TERRAIN TEXTURE 2	TERRAIN TEXTURE 3	SURFICIAL (GENETIC) MATERIAL		SURFICIAL QUALIFIER	SURFICIAL SUBTYPE	SURFACE EXPRESSION 1	SURFACE EXPRESSION 2	SURFACE EXPRESSION 3	BEDROCK TYPE		SUBTERRAIN TEXTURE 1	SUBTERRAIN TEXTURE 2	SUBTERRAIN TEXTURE 3	SUBSURFICIAL (GENETIC) MATERIAL		SUBSURFICIAL QUALIFIER	SUBSURFICIAL SUBTYPE	SUBSURFICIAL EXPRESSION 1	SUBSURFICIAL EXPRESSION 2	SUBSURFICIAL EXPRESSION 3	1st GEOMORPHOLOGICAL PROCESS CLASS	1st PROCESS QUALIFIER	1st PROCESS SUBTYPE	1st PROCESS SUBCLASS 1	1st PROCESS SUBCLASS 2	1st PROCESS SUBCLASS 3	2nd GEOMORPHOLOGICAL PROCESS CLASS	2nd PROCESS QUALIFIER	2nd PROCESS SUBTYPE	2nd PROCESS SUBCLASS 1	2nd PROCESS SUBCLASS 2	2nd PROCESS SUBCLASS 3	3rd GEOMORPHOLOGICAL PROCESS CLASS	3rd PROCESS QUALIFIER	3rd PROCESS SUBTYPE
																								V														