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# **Quality Assurance Guidelines: Terrestrial Ecosystem Mapping (TEM)**

Draft

Prepared by  
Ministry of Sustainable Resource Management  
Terrestrial Information Branch  
for the  
Resource Information Standards Committee

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## Preface

The Government of British Columbia provides funding for the work of the Resources Information Standards Committee (RISC), including the preparation of this document. To support the effective, timely and integrated use of land and resource information for planning and decision-making, RISC develops and delivers focussed, cost-effective, common provincial standards and procedures for information collection, management and analysis. Representatives on the Committee and its Task Forces are drawn from the ministries and agencies of the Canadian and British Columbia governments, as well as academic, industry and First Nations stakeholders.

RISC evolved from the Resources Inventory Committee (RIC), which received funding from the Canada-British Columbia Partnership Agreement on Forest Resource Development (FRDA II), the Corporate Resource Inventory Initiative (CRII), and Forest Renewal BC (FRBC). RIC addressed concerns of the 1991 Forest Resources Commission.

For further information about RISC, please access the RISC website at: <http://srmwww.gov.bc.ca/risc/>.

## Acknowledgements

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# 1. Introduction

## 1.1. General Approach

A general approach to quality assurance (QA) on ecological data-collection projects is described in the document *Introduction to Quality Assurance Procedures*.

## 1.2. Scope

These TEM QA guidelines outline the procedures for completing a QA review of a TEM project.

This document does *not* provide detailed QA review procedures for all stages of the TEM process. It must be used in conjunction with other QA guideline documents and RISC standards, as shown in the following table:

QA Guideline*	RISC Inventory Standard	Required for...
Intro QA		Background and general guidelines for QA
DTEIF QA,	<i>Manual for Describing Terrestrial Ecosystems in the Field</i> (1998)	Reviews of field data
TEM QA	<i>Standard for Terrestrial Ecosystem Mapping in British Columbia, version 1</i> (1999)	Reviews of TEM projects
TEM-DDC QA	<i>Standards for Terrestrial Ecosystems Mapping - Digital Capture in BC</i> (2000)	Reviews of spatial and non-spatial TEM databases
WHR QA	<i>BC Wildlife Habitat Rating Standards, version 2</i> (1999)	Reviews of PEM projects with a Wildlife Habitat Ratings component
TEM QA	<i>Standard and Procedures for Integration of Terrestrial Ecosystem Mapping (TEM) and Vegetation Resources Inventory (VRI) in British Columbia Version 1.0</i>	Reviews of TEM projects completed in conjunction with VRI (VRI QA review to be completed according to RISC standards)

\*For abbreviations, see Introduction to QA Procedures, section 1.2 Scope.

This document also does not cover the procedures for reliability/accuracy assessments of TEM. Further information regarding TEM reliability/accuracy assessments is provided in the *Introduction to Quality Assurance Procedures*, section 1.2.2, Accuracy Assessments (TEM and PEM).

## **2. Quality Assurance Procedures for TEM**

This section provides specific guidelines for TEM QA. These guidelines are in addition to the general QA guidelines outlined in the *Introduction to Quality Assurance Procedures*. There is also a generic guideline for the development of TEM QA contracts included in Appendix A. This contract guideline only includes the standard TEM QA requirements and should be modified to suite specific project objectives.

### **2.1. QA Procedures – Review Stages**

The following review stages outline the QA procedures common to all TEM projects. Where other RISC standard attributes are included as a component of TEM, the applicable QA guidelines should be followed (See section 1.2 Scope).

#### **1. Project Planning**

This review stage typically involves a meeting between the QA contractors and the mapping team, as well as the client, the contract monitor and anyone else involved in the project. The main objectives are to:

- Familiarize the QA contractors with all aspects of the project
- To familiarize the mappers, the client, the contract monitor with the QA process
- To review the project design for conformance with RISC standards
- To clarify role of each individual during each stage of the QA process

The QA contractors should ensure that the list of background materials for the project is complete and that the correct digital information is used (boundary lines for edge matching to adjacent mapped areas, base maps, etc.). They should review the contract, so that everyone fully understands the objectives of the project and is familiar with the intended project deliverables and deadlines. The project mapping methodology should also be discussed, particularly anything that differs from the RISC standard for TEM (1998). The QA contractors should ensure that the intended methodology meets all the project objectives. All issues of fieldwork should be addressed, including a discussion of what field information should be collected, based on both the minimum standards and the project objectives. The QA contractors should ensure that the client is aware of all mapping options. Any changes to the project at this stage must be amended in the contract.

**Deliverable:** QA Form T1.

#### **2. Alpine Tundra and Parkland Boundary Review**

This stage of the review is the responsibility of the QA ecologist; however the line work should be approved by the provincial ecologist. The intent of the alpine and parkland review stage is to ensure that the linework meets the RISC standard for TEM, specifically that it is consistent with the provincial definitions of alpine and parkland and adheres to the mapping criteria outlined by the mapper.

The general questions on the QA form should be answered with specific examples noted on the air photo pairs or overlays, to give the mapper a clear idea of any areas that need modification, field verification, etc. These comments should also be documented and included in the QA report.

**Note:** This stage of review should be completed and signed off prior to the pretyping of bioterrain/ecosystem polygons (stage 3).

**Deliverable:** QA Form T2.

### 3 Bioterrain and Ecosystem Pretyping

Pretyping QA should be conducted during the early stages of the bioterrain and/or ecosystem polygon delineation. This stage should include both the QA bioterrain specialist and the QA ecologist, to ensure that the mapping meets all RISC standards for both TEM and terrain mapping. In particular, polygon delineation and labelling will be reviewed.

The general questions on the QA form should be answered and specific examples should be noted on the air photo pairs or on overlays to give the mapper a clear idea of any areas that need modification, field verification, etc. These comments should also be documented and included in the QA report. Any subclasses designated by the mapper should be approved by the provincial bioterrain specialist.

**Deliverable:** QA Form T3.

### 4. Field Sampling

This stage of QA has both a field and post field component. The QA ecologist and the QA bioterrain specialist should both be involved. During the field work QA is conducted to ensure that field data are collected and recorded to RISC standards. If other specialties are included on the mapping field crews (e.g., foresters for SIBEC, wildlife biologist for wildlife ratings, etc.), then QA contractors qualified in these disciplines should be included in the QA team. Field visits are essential to ensure that individual field crews are collecting data consistently and meeting the RISC standard. Wherever multiple field crews are collecting data, each crew must be assessed separately. The post field review ensures that all required data have been collected to standard and that the number and location of field sites meet the project objectives.

Detailed review procedures are outlined in both this manual and in the associated DTEIF QA document. All recommendations made should be recorded, whether made in the field or in the office, and submitted as part of final QA report.

**Deliverables:** QA Form T4 and all relevant DTEIF QA forms.

### 5. Ecosection and BGC Boundary Review

The intent of this review stage is to ensure the proper application of biogeoclimatic (BGC) zonation concepts. This includes all aspect and valley-bottom elevational relationships relative to regional BGC mapping and takes into account any field data collected near BGC boundaries. It is the responsibility of the QA ecologist to ensure that the data collection contractor has received regional ecologist's approval and that the BGC mapping is consistent and correct. Good communications with the regional ecologist and the provincial ecologist will facilitate this stage of review. A preliminary review of both the BGC and Ecosection linework should be performed by the QA ecologist. All BGC mapping must be reviewed and approved by the regional ecologist, prior to finalizing the BGC lines. If significant changes in the BGC linework occur then the placement of the Ecosection linework should also be assessed. Any significant changes in the placement of the ecosection linework should be reported to provincial ecologist (SRM) for approval.

**Deliverable:** QA Form T5.

## **6. Site Series Review**

The QA ecologist will review the plot data: first, to assess the allocation of plots into existing site series classification and, secondly, to assess the recognition of new ecosystem units. Any discrepancies or disagreements relative to the allocation of site series and/or new ecosystem units should be directed to either the regional ecologist and/or provincial ecologist for clarification.

**Note:** All new ecosystem units must be approved by the regional ecologists prior to mapping. Naming and coding confirmation of these new units must then be approved by the provincial ecologist (SRM), prior to the completion of mapping.

**Deliverable:** QA Form T6.

## **7. Initial (Draft) Ecosystem Mapping**

A sample of draft ecosystem mapping should be reviewed, to ensure that the mapping is being completed to RISC standards for TEM. The QA ecologist will address a number of mapping issues during this review stage, such as ecosystem unit labelling, designations and distribution; polygon complexity; the use of site modifiers; and the application of structural stages and modifiers. If available, the map legend and associated databases (spatial and non-spatial) should also be reviewed at this time. The QA ecologist should communicate with the QA bioterrain specialists to ensure that the ecosystem linework adequately supports all deliverables.

The general questions in the QA form should be answered with specific examples and/or comments noted on the air photo pairs and/or mapsheets to give the mapper a clear idea of any areas that need modification. All polygon-specific comments and general comments must be documented and submitted as part of the final QA report.

**Deliverable:** QA Form T7.

## **8. Final Bioterrain Mapping**

Final Bioterrain QA is conducted as a review of the completed bioterrain typing on the air photos or of the air photos and hard-copy maps (if stand-alone terrain maps and terrain interpretive maps are produced). This stage of QA is the responsibility of the QA bioterrain specialist and it is intended to ensure that all final bioterrain mapping and related products meet RISC standards. The reviewer should consider how BGC lines and other ecological linework are incorporated into the terrain linework and symbols. They should also ensure that all bioterrain information has been reassessed in any areas where new polygons have been created by the mapping ecologist. The bioterrain QA reviewer should communicate with the QA ecologist and other QA disciplines if applicable, to ensure that the terrain linework adequately supports all deliverables and project objectives. The QA bioterrain specialist should also ensure that comments and feedback from preceding stages of QA have been adequately addressed.

**Deliverable:** QA Form T8.

## **9. Final Ecosystem Mapping**

In this stage, a final review of photo interpretation, mapping, and databases (as listed above for the review of the initial ecosystem mapping) is conducted before acceptance of the mapping. This

stage is the responsibility of the QA ecologist. The QA ecologist should ensure that comments and feedback from preceding stages of QA have been adequately addressed. The general questions in the QA form should be addressed and all polygon specific comments and/or general comments must be documented and submitted as part of the final QA report.

**Deliverable: QA Form T9.**

### 10. Spatial and Non-spatial Database

This purpose of this stage of TEM QA is to ensure that the data being submitted is in the correct format and meets the TEM-DDC QA document. This stage of review involves all of the QA contractors (QA ecologist, QA bioterrain specialist, and QA GIS specialist) as each specialty must review the data relevant to their area of expertise.

Please see the TEM-DDC QA document for a detailed description of the spatial and non-spatial data QA procedures. All TEM data must be submitted to the province in accordance with the *Standard for TEM Data Capture (RISC, 2000)*.

Deliverables: All **QA Forms from** the TEM-DDC QA document.

The database used to store the field data that is collected for TEM is called VENUS. VENUS has its own internal set of validation rules which, when turned on, only allow standard DTEIF codes to be entered in the appropriate fields. Please see the DTEIF QA document for a detailed description of field data (VENUS) QA procedures.

**Deliverables: All of the QA Forms from the DTEIF QA document.**

**Note:** The nature of the data collected for TEM makes it very difficult for these automated datacapture tools to detect every possible error. These tools are unable to detect errors that fall within acceptable ranges or are subjective by both definition and application. Recognizing this, the QA contractors must also review the digital data by using unique sorts and spot checks to catch common errors, anomalies, and illogical attribute combinations that are beyond the capability of these tools. The QA procedures for creating unique sorts are outlined in the TEM-DDC QA document. Note that in addition to the TEM DC tool and VENUS datacapture tools, additional tools are being developed by MSRM to assist in the QA procedures. For critical data elements subject to zero error tolerance, electronic data checking is imperative. In order to increase efficiencies, the QA contractors should inform the provincial specialists of any common errors or misconceptions not captured by these tools. Future upgrades can incorporate such recommendations.

### 11. Final Mapping Deliverables

Upon project completion, all final deliverables should be reviewed and signed off accordingly, if acceptable. This stage of review must involve the entire team of QA contractors. Deliverables typically include complete TEM databases, field data in VENUS format, hardcopies of plot cards, complete set of typed air photos, the final digital project report(s), and final digital maps. The QA contractor must ensure all project deliverables have been delivered as outlined in the original TEM contract. The intent of QA at this stage is to ensure all products / data are provided in the standard formats required for loading into the provincial database. The QA team should ensure that comments and feedback from preceding stages of QA have all been adequately addressed. There will be a zero tolerance for errors in data submitted to the province. For more detailed

review procedures please refer to the TEM-DDC QA document. The final TEM report, including legends, should be thoroughly reviewed by each QA contractor to ensure that it is correct and complete (i.e., includes all necessary sections) for each area of expertise.

Deliverables: QA form T10, plus each of the applicable sign-off forms from the DTEIF and TEM DDC QA guidelines.

## **12. QA Summary and Sign-off**

Upon delivery and acceptance of all final deliverables, the QA summary and sign-off form (Form T11) must be completed and submitted as part of the final QA report. The number of submissions required before acceptance of each individual mapping stage should be indicated along with the date of the final signoff.

Deliverable: QA Form T11

## **2.2. QA Deliverables**

The final QA deliverables must be submitted as described in *Introduction to Quality Assurance Procedures*, section 1.3 How to Use These Guidelines. The final QA deliverables include all TEM QA sign off forms and any applicable sign off forms from other QA guidelines. It is the responsibility of the client to deliver all final TEM QA data to the province via the following ftp site: <ftp://env.gov.bc.ca/pub/incoming/TEM>

The final TEM QA Report should include:

- All completed review and sign-off forms (Form #T1-T11) – either signed off by a third party QA contractor or by the data collection contractor;
- All additional review and sign-off forms from other QA Guidelines - either signed off by a third party QA contractor or by the data collection contractor;
- (if applicable) All e-mail messages from the QA specialists' to the client or from the data collection contractor to the client, in place of hardcopy signatures; and
- Any additional review documentation, comments and/or concerns

Note: It is the responsibility of the client to deliver all final TEM data to the province once all QA review is complete and signed off.

### 3. QA Forms

QA forms, complete with project information fields, checklists, review questions and sign-off, are provided in this section. They are to be used to document all QA correspondence for each review stage. Separate forms should be filled out for multiple submissions of a particular stage (e.g., if it takes three submissions to pass review stage 2 then three T2 forms should be filled out).

The top of each form includes the form number and title followed by several fields for general project information including submission number, date of the review, project name, and the names of the QA contractors and the mappers. The second section is a checklist that lists all of the materials to be submitted by the mapping contractor to the QA contractors for each review stage. The third section on the forms is a list of QA questions intended to guide the review process. Some require specific information, such as the number of air photos reviewed (e.g. 14) or air photo numbers (e.g., BCB 985764#103). Others are yes/no review questions that should be supplemented with comments and recommendations, including the following information:

- An explanation of errors and omissions with specific examples from the mapping project, where appropriate
- An indication of the extent of an error, expressed either qualitatively (e.g., several, few, minor, major, etc.) or quantitatively (e.g., three out of the 60 polygons reviewed);
- Recommendations on how to correct the error.

A field is provided under each question for these comments. Additional space can be added as required. Additional questions can be added to the end of the list. All polygon-specific comments and recommendations should be recorded in a separate PDF or Word file and submitted as part of the final QA report (please see section 1.3.2 of the *Introduction to Quality Assurance*). Where no polygon numbers are available, it is recommended that each comment be numbered and indicated on the airphoto or mapsheet. It is critical that the QA comments clearly indicate any / or all corrections that are required for successful completion of the mapping process.

The final section on each of the forms is for sign-off. Each QA contractor must indicate whether or not the particular submission meets the RISC standard in their area of expertise. A stage of review is only considered to be signed-off once each of the required QA contractors have checked the 'yes' box under 'Acceptable?' and signed their name(s). In situations where the QA of a given stage was not completed, the mapping contractor must provide sign off for the particular project deliverable. In addition to the QA forms provided for each of the review stages there is also a TEM QA summary sign-off form (Form #T11). This form includes a field to indicate the total number of submissions that were required before the completion and sign-off of each review stage. The summary sign-off form should be kept up to date and used as a method of tracking project status. Note that these forms must be submitted electronically as part of the QA report (please see section 1.3.2 of the *Introduction to Quality Assurance* for further QA reporting details).

It is recommended that prior to the detailed review of any mapping stage, the QA contractors familiarize themselves with the structure and content of the individual QA forms, in particular the QA questions. These review questions are general in nature and are meant to stimulate thought in terms of the common errors and trends with respect to the material being reviewed. Therefore, it is essential that the QA contractors review these generic questions before they begin their detailed review. Once the QA contractors are satisfied with the extent of their review, they should address

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the general QA questions. Any examples that are applicable to a specific question should be provided, along with the review comments and recommendations.

It is recommended that mapping contractors use these forms to perform internal quality control prior to the submission of any project materials.

The following forms are included for these guidelines:

- Form T1: Project Planning QA
- Form T2: Alpine Tundra and Parkland Boundaries QA
- Form T3: Bioterrain and Ecosystem Pretyping QA
- Form T4: Field Work QA
- Form T5: Ecosection and BGC Boundaries QA
- Form T6: Site Series QA
- Form T7: Initial (draft) Ecosystem Mapping QA
- Form T8: Final Bioterrain Mapping QA
- Form T9: Final Ecosystem Mapping QA
- Form T10: Final Deliverables QA
- Form T11: QA Summary and Sign-off

**Form T1: Project Planning QA**

**Date** \_\_\_\_\_

**Project Name** \_\_\_\_\_

<b>QA Contractors</b>	<b>Ecologist</b>	<b>Bioterrain specialist</b>	<b>GIS specialist</b>	<b>Other specialists</b>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

**Mappers** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Materials checklist:**

- List of background information
- Study area boundaries to be used
- List of project information including the total number of air photos, maps, area (ha), mapping team, contact information, etc
- Outline of the project plan and persons responsible for each role as outlined in the contract
- Project objectives as outlined in the contract

**Project Planning QA Review Questions:**

1. Study objectives are clearly defined and appropriate. Yes No  
 Comments/Recommendations: \_\_\_\_\_

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2. All relevant RISC standards are listed in the contract. Yes No  
 Comments/Recommendations: \_\_\_\_\_

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3. The methods are appropriate for the stated objectives. Yes No  
 Comments/Recommendations: \_\_\_\_\_

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4. The mapping team has all necessary qualifications.. Yes No  
 Comments/Recommendations: \_\_\_\_\_

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5. Review of existing data sources adequately covers the information known to be available for the study area (i.e. research papers and reports). Any previous and/or related mapping, such as soils, forest cover, terrain or geology mapping, has been identified. Yes No  
 Comments/Recommendations: \_\_\_\_\_

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6. Project and study area boundaries are appropriate and have been outlined on maps at the scale specified in the contract. Boundaries from adjacent areas that have been previously mapped have been taken into account. Yes No  
 Comments/Recommendations: \_\_\_\_\_

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7. The TEM survey intensity levels, including the ratio of plot types (i.e. FS882's, GIFs, and visuals), and Terrain Survey Intensity Levels are appropriate for the stated objectives. Yes No  
 Comments/Recommendations: \_\_\_\_\_

8. Other: \_\_\_\_\_ Yes No  
 Comments/Recommendations: \_\_\_\_\_

**QA Sign Off: (Please Print)**

Name QA Contractor(s)	Signature	Acceptable?	Review Date
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____

**Form T2: Alpine and Parkland Boundaries QA**

**Submission #** \_\_\_\_\_ **Date of Submission** \_\_\_\_\_  
**Project Name** \_\_\_\_\_  
**QA Ecologist** \_\_\_\_\_  
**Mapping Team** \_\_\_\_\_

**Materials checklist::**

- Airphotos (including stereo pairs) with Alpine Tundra and parkland boundaries delineated
- Photos should include initial photo prep (see TEM standards, RIC 1998)
- An outline of mapping criteria (i.e. elevations used, variations)
- A small-scale map of study area w/ project boundary & flightlines clearly marked
- Topographic maps at scale of mapping (TRIM or NTS)
- Relevant small scale BGC mapping
- A list indicating the areas mapped by each of the mappers (if more than one individual involved in the mapping)

**Air Photo Specific Comments:**

If completed, specific comments and/or recommendations relating to individual air photos must be documented in a separate PDF or word file and included as part of the final QA report.

**Alpine and Parkland boundaries QA Review Questions:**

1. Have the elevations been consistently applied? Yes No  
 Comments/Recommendations: \_\_\_\_\_
2. Have the elevations been adequately adjusted on warm and cool aspects? Yes No  
 Comments/Recommendations: \_\_\_\_\_
3. Have continuous areas of AT/Parkland been mapped where appropriate? Yes No  
 Comments/Recommendations: \_\_\_\_\_
4. Have significant areas of cold air drainage been taken into account? Yes No  
 Comments/Recommendations: \_\_\_\_\_

**MEMORANDUM OF AGREEMENT**

5. Is the delineation of polygons consistent between mappers? Between airphotos? Yes No  
 Between mapsheets? Over the study area?  
 Comments/Recommendations: \_\_\_\_\_
6. Have All alpine/parkland lines (i.e. entire study area) been reviewed? Yes No  
 Comments/Recommendations: \_\_\_\_\_
7. Was more than one person involved in the mapping? Yes No  
 If yes, please list the areas mapped by each individual \_\_\_\_\_
8. Record the number of air photos submitted \_\_\_\_\_ Record the number of air photos reviewed \_\_\_\_\_  
 List the air photo numbers that were reviewed \_\_\_\_\_
9. Record the number of mapsheets submitted \_\_\_\_\_ Record the number of mapsheets reviewed \_\_\_\_\_  
 List the mapsheet numbers that were reviewed \_\_\_\_\_
10. Other: Yes No  
 Comments/Recommendations: \_\_\_\_\_

**QA Sign Off:** (Please Print)

Name QA Contractor(s)	Signature	Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Review Date
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____

**Form T3: Bioterrain and Ecosystem Pretyping QA**

**Submission #** \_\_\_\_\_ **Date of Submission** \_\_\_\_\_

**Project Name** \_\_\_\_\_

**QA Ecologist** \_\_\_\_\_

**QA Bioterrain Sp** \_\_\_\_\_

**Ecology Mapper(s)** \_\_\_\_\_

---

**Bioterrain  
Mapper(s)**

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**Materials checklist:**

- An agreed upon, representative sample of air photos w/ preliminary terrain and ecosystem pretyping - this sample should represent the terrain and ecosystem diversity of the study area.
- Draft working legends and topographical sequences (site diagrams) for each subzone
- Small-scale map of study area w/ project boundary & flightlines clearly marked
- Topographic base maps at scale of mapping (TRIM or NTS)
- Forest cover maps relative to the study area
- Terrain/soil/geology maps used to develop the current mapping
- Relevant small scale BGC mapping
- A list indicating the areas mapped by each of the mappers (if more than one individual involved in the mapping)

**Polygon Specific Comments:**

All polygon specific comments and/or recommendations must be documented in a separate PDF or word file and included as part of the QA report. It is recommended that mapping corrections be numbered and/or indicated on the stereo-pair or on an overlay. Comments associated with each number can then be kept in a separate file.

**Bioterrain and Ecosystem Pretyping QA Review Questions:**

1. Is the level of detail being captured appropriate? (polygon size) Yes No  
Comments/Recommendations: \_\_\_\_\_
2. Is the linework precise and accurate? Yes No  
Comments/Recommendations: \_\_\_\_\_
3. Does polygon delineation and terrain labels represent the bioterrain attributes in the landscape? Yes No  
Comments/Recommendations: \_\_\_\_\_
4. Does the polygon delineation and ecosystem labelling (if available) represent the variability of the ecosystems and structural stages found in the study area? Yes No  
Comments/Recommendations: \_\_\_\_\_
5. Does the mapping reflect the project objectives? (i.e. is ecosystem variation in the study area and features relevant to the needs of the client captured) Yes No  
Comments/Recommendations: \_\_\_\_\_
6. Are there additional attributes that should be captured to meet the project objectives (e.g. slope classes)? Yes No  
Comments/Recommendations: \_\_\_\_\_
7. Is the delineation of polygons consistent between mappers? Between airphotos? Yes No  
Between mapsheets? Over the study area?

**MEMORANDUM OF AGREEMENT**

Comments/Recommendations: \_\_\_\_\_

8. Are the drainage classes consistent between mappers? Between airphotos? Yes No  
 Between mapsheets? Over the study area? Do the drainage classes reflect the slope position, material, vegetation?

Comments/Recommendations: \_\_\_\_\_

9. Are all codes and symbols used consistent with provincial mapping standards? Yes No

Comments/Recommendations: \_\_\_\_\_

10. Have areas of uncertainty been marked for field verification? Yes No

Comments/Recommendations: \_\_\_\_\_

11. Was more than one person involved in the mapping? Yes No

If yes, please list the areas mapped by each individual \_\_\_\_\_

- |   |   |
|---|---|
| 12. Record the number of air photos reviewed _____  | Record the number of air photos typed _____ |
| List the air photo numbers that were reviewed _____ | _____                                       |

- |  |  |
|--|--|
| 13. Record the number of mapsheets reviewed _____  | Record the number of mapsheets typed _____ |
| List the mapsheet numbers that were reviewed _____ | _____                                      |

14. Other: Yes No

Comments/Recommendations: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**QA Sign Off:** (Please Print)

Name QA Contractor(s)	Signature	Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Review Date
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____

**Form T4: Fieldwork QA**

**Submission #** \_\_\_\_\_ **Date of Submission** \_\_\_\_\_

**Project Name** \_\_\_\_\_

**QA Team** \_\_\_\_\_

Field crew(s)

Fieldwork Dates

Method of review

**Materials checklist:**

- Field work details including the total number of full, ground and visual sites, dates of field work, field crews,
- Complete, edited field forms with field site locations marked on associated photos and/or maps
- Map showing field traverses (foot, helicopter, road) to show coverage of the study area.

**Plot Specific Comments:**

All plot specific comments and/or recommendations must be documented in a separate PDF or word file and included as part of the QA report.

**Sampling Plan QA Review Questions:**

1. Does the sampling address all the objectives of the project (additional interpretive products e.g., WHR)? Yes No  
Comments/Recommendations: \_\_\_\_\_
2. Does the sampling address bioterrain mapping needs (i.e. have all of the major terrain types been covered) ? Yes No  
Comments/Recommendations: \_\_\_\_\_
3. Does the sampling plan adequately address the ecological variation in the study area (i.e., subzone, site series, parent materials, slope, aspect, etc...) Yes No  
Comments/Recommendations: \_\_\_\_\_
4. Is there adequate rationale for the number and distribution of sampling types (i.e. where and why FS882's, ground or visual inspections will be completed)? Yes No  
Comments/Recommendations: \_\_\_\_\_
5. Is the proposed timing of the sampling plan logical? Have all of the access issues been accounted for? Are there contingency plans in place? Yes No  
Comments/Recommendations: \_\_\_\_\_
6. Does the working legend account for all of the typical terrain types and environmental site conditions found in the study area? Are the ecological relationships outlined in the working legend logical? Yes No  
Comments/Recommendations: \_\_\_\_\_

**Field work QA Review Questions:**

General Mapping Questions

1. Have the DTEIF standards been followed? (see the QA guidelines for DTEIF) Yes No  
Comments/Recommendations: \_\_\_\_\_
2. Record the number of field sites visited/reviewed? \_\_\_\_\_  
Comments/Recommendations: \_\_\_\_\_



*Draft Terrestrial Ecosystem Mapping Quality Assurance Guidelines*

5. Did the mapping ecologist refine the working legend in the field? Were the questions raised during pretyping investigated in the field? Were adequate mapping notes being kept to facilitate correction of the linework and/or ecosystem labels? Yes No

Comments/Recommendations: \_\_\_\_\_

6. Does the mapping ecologist(s) have a consistent, clear view of BGC zonation concepts relative to the selection of their sample site locations? Are they able to distinguish BGC subzone changes on the ground? Yes No

Comments/Recommendations: \_\_\_\_\_

7. Have the definitions outlined in the DTEIF standard (RISC 1998) been correctly and consistently interpreted (i.e. structural stages, successional status, % cover, soil moisture regime, soil nutrient regime, etc...)? Yes No

Comments/Recommendations: \_\_\_\_\_

8. Are the field ecologists interpretations of the sample site environmental conditions logical and consistent over the study area (i.e. are the site series / ecosystem unit designations logical and consistent)? Yes No

Comments/Recommendations: \_\_\_\_\_

9. Was relevant data collected for all additional interpretations (e.g., field verification of erosion potential classes, polygon slope classes, wildlife habitat attributes, SEI, etc.)? Yes No

Comments/Recommendations: \_\_\_\_\_

Other: Yes No

Comments/Recommendations: \_\_\_\_\_

**QA Sign Off: (Please Print)**

Name QA Contractor(s)	Signature	Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Review Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

**Form T5: Ecosession and BGC Boundaries QA**

**Submission #** \_\_\_\_\_ **Date of Submission** \_\_\_\_\_

**Project Name** \_\_\_\_\_

**Reg. Ecologist** \_\_\_\_\_

**Prov. Ecologist** \_\_\_\_\_

**Mapper(s)** \_\_\_\_\_

**Materials checklist:**

- Topographic maps/airphotos showing proposed BGC and ecosession linework changes and relevant lot locations
- All supporting field data

**Ecosession and BGC Boundaries QA Review Questions:**

1. Is the placement of the modified BGC lines supported by the field data? Yes No  
Comments/Recommendations: \_\_\_\_\_

2. Is the placement of BGC lines accurate and precise? Yes No  
Comments/Recommendations: \_\_\_\_\_

5. Is the placement of ecosession lines in accordance with the BGC linework, as depicted on the small scale BGC mapping? Yes No  
Comments/Recommendations: \_\_\_\_\_

Other: Yes No  
Comments/Recommendations: \_\_\_\_\_

**QA Sign Off: (Please Print)**

Name QA Contractor(s)	Signature	Acceptable?	Review Date
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____

**Form T6: Site Series QA**

**Submission #** \_\_\_\_\_ **Date of Submission** \_\_\_\_\_

**Project Name** \_\_\_\_\_

**Reg. Ecologist** \_\_\_\_\_

**Prov. Ecologist** \_\_\_\_\_

**Mapper(s)** \_\_\_\_\_

**Materials checklist:**

- Completed plot forms and VENUS database for the entire study area
- Summary of proposed new ecosystem units (if any) – indicate relevant plot numbers and rationale.
- Plot location map with plots clearly marked
- Air photos with plot locations indicated (usually pin pricked and noted on the back of the photo)
- A map of the study area showing study area boundaries and flight lines
- Topographic base map at the scale of mapping (TRIM or NTS)
- Forest cover maps

**Ecosystem Unit QA Review Questions:**

Assess each proposed new ecosystem unit relative to the following criteria (questions # 1-5 below):

1. Is the proposed new unit supported by the field data? Yes No
2. Given the scale of mapping, is the proposed unit mappable? Yes No
3. Can the proposed new unit be amalgamated with any existing units? Yes No
4. Is the proposed new mapcode unique within the given subzone (see provincial mapcodes list)? Yes No
5. Does the proposed new mapcode duplicate any of the sparsely vegetated, non-vegetated, anthropogenic or generic small scale map units (see provincial mapcodes list)? Yes No

BGC subzone	Mapcode	Ecosystem Name	Acceptable?	Comments/Recommendations
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____

6. Have all of the new ecosystem units, listed above, been approved by the regional ecologist? Yes No  
 Comments/Recommendations: \_\_\_\_\_
7. Have all of the new mapcodes, listed above, been approved by the provincial ecologist? Yes No  
 Comments/Recommendations: \_\_\_\_\_
8. Other: Yes No

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Comments/Recommendations: \_\_\_\_\_  
\_\_\_\_\_

**QA Sign Off: (Please Print)**

<b>Name QA Contractor(s)</b>	<b>Signature</b>	<b>Acceptable?</b>	<b>Review Date</b>
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____

## Form T7: Initial Ecosystem Mapping QA

Submission # \_\_\_\_\_ Date of Submission \_\_\_\_\_

Project Name \_\_\_\_\_

QA Ecologist \_\_\_\_\_

Mapping Team \_\_\_\_\_

### Materials checklist:

- A sample of draft ecosystem maps with completed labels (ecosystem, BGC, ecoregion) map legends and linework. This can include a portion of a single mapsheet or a representative sample from different portions of the study area and should include representative samples of mapping from each mapper (if more than one mapper involved).
- Draft map legends, and expanded legend/report if available, listing all mapped units (including both ecosystem unit two-letter codes and associated site series numbers, along with ecosystem unit names, descriptions, site modifiers and structural stages)
- Typed air photos (including standard terrain labeling)
- A small scale map of study area w/ project boundary & flightlines clearly marked
- Topographic base map at scale of mapping (TRIM or NTS)
- Plot data for submitted area
- Applicable forest cover mapping
- Working legend

### Polygon Specific Comments:

All polygon-specific comments and/or recommendations must be documented in a separate PDF or Word file and included as part of the QA report. It is recommended that mapping corrections be numbered and/or indicated on the stereo-pair or on an overlay. Comments associated with each number can then be documented in a separate file.

### Initial Ecosystem Mapping QA Review Questions:

1. Does the coding of ecosystem units follow RISC standards? Yes No  
Comments/Recommendations: \_\_\_\_\_
2. Is the format and content of the map legend to standard? Have all the required elements been included? Are all mapped ecosystem units listed in the legend? Yes No  
Comments/Recommendations: \_\_\_\_\_
3. Have ecosystem units been mapped consistently and accurately? Yes No  
Comments/Recommendations: \_\_\_\_\_
4. Is the photo interpretation of all ecosystem attributes consistent and accurate? Yes No  
Comments/Recommendations: \_\_\_\_\_

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- 5. Is the ecosystem mapping consistent with respect to polygon size and the level of detail in the mapping? Have small but important features been pulled out in a consistent manner (e.g., wetlands)? Does the level of detail meet project objectives? Yes No  
Comments/Recommendations: \_\_\_\_\_

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- 6. Have the non-vegetated, sparsely vegetated and anthropogenic units been mapped consistently and correctly? Yes No  
Comments/Recommendations: \_\_\_\_\_

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- 7. Are ecosystem unit proportions (deciles) consistent with other polygons and with the terrain unit proportions, where applicable? Yes No  
Comments/Recommendations: \_\_\_\_\_

---

- 8. Have site series and other non-correlated ecosystem units been mapped consistently over the entire study area, between adjacent polygons, across biogeoclimatic boundaries, between mappers and relative to the legend? Yes No  
Comments/Recommendations: \_\_\_\_\_

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- 9. Have site series and other non-correlated ecosystem units been correctly mapped relative to existing knowledge (MOF regional field guides, previous mapping, adjacent mapping), terrain attributes, field data, forest cover attributes, topography and site conditions? Yes No  
Comments/Recommendations: \_\_\_\_\_

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- 10. Have site modifiers been consistently and correctly mapped over the entire study area, within polygons, between adjacent polygons, across biogeoclimatic boundaries, and between ecosystem mappers? Have they been mapped alphabetically? Yes No  
Comments/Recommendations: \_\_\_\_\_

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- 11. Have site modifiers been consistently and correctly mapped relative to the terrain attributes, plot data, topography, site conditions and the assumed site modifiers? Yes No  
Comments/Recommendations: \_\_\_\_\_

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- 12. Have structural stages and structural stage modifiers been mapped consistently and correctly between polygons, over the study area, relative to the field data and relative to the forest cover maps or air photos? Yes No  
Comments/Recommendations: \_\_\_\_\_

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- 13. Was the entire project area submitted for review? Yes No  
What percent of the study area was reviewed? \_\_\_\_\_  
Comments/Recommendations: \_\_\_\_\_

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- 14. Was more than one person involved in the mapping? Yes No  
If yes, please list the areas mapped by each individual \_\_\_\_\_

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- 15. Record the number of air photos reviewed \_\_\_\_\_ Record the number of air photos typed \_\_\_\_\_

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List the air photo numbers that were reviewed \_\_\_\_\_

16. Record the number of mapsheets reviewed \_\_\_\_\_  
 List the mapsheet numbers that were reviewed \_\_\_\_\_

Record the number of mapsheets typed \_\_\_\_\_

17. Record the number polygons reviewed \_\_\_\_\_  
 Record the number of polygons in agreement (i.e. acceptable) \_\_\_\_\_  
 Record the number of polygons in disagreement (i.e. not acceptable) \_\_\_\_\_

Record the number of polygons typed \_\_\_\_\_

18. Other: \_\_\_\_\_  Yes  No  
 Comments/Recommendations: \_\_\_\_\_

**QA Sign Off:** (Please Print)

Name QA Contractor(s)	Signature	Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Review Date
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____

**Form T8: Final Bioterrain Mapping QA**

**Submission #** \_\_\_\_\_ **Date of Submission** \_\_\_\_\_

**Project Name** \_\_\_\_\_

**QA Bioterrain Sp** \_\_\_\_\_

**Mapper (s)** \_\_\_\_\_

**Materials checklist:**

- Terrain map legend
- typed air photos (including standard terrain labeling)
- a small scale map of study area w/ project boundary & flightlines clearly marked
- topographic base map at scale of mapping (TRIM or NTS)
- plot data for submitted area
- additional mapping information/notes (subtypes, mapping conventions, peculiarities, mapping criteria, etc.)
- Non special data base (if available).

**Polygon Specific Comments:**

All polygon specific comments and/or recommendations must be documented in a separate PDF or word file and included as part of the QA report. It is recommended that mapping corrections be

## MEMORANDUM OF AGREEMENT

numbered and/or indicated on the stereo-pair or on an overlay. Comments associated with each number can then be kept in a separate file.

### Final Bioterrain mapping QA Review Questions:

1. Record the number of air photos reviewed \_\_\_\_\_ Record the number of air photos typed \_\_\_\_\_  
List the air photo numbers that were reviewed \_\_\_\_\_

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1. Record the number of mapsheets reviewed \_\_\_\_\_ Record the number of mapsheets typed \_\_\_\_\_  
List the mapsheet numbers that were reviewed \_\_\_\_\_

---

1. Record the number polygons reviewed \_\_\_\_\_ Record the number of polygons typed \_\_\_\_\_  
Record the number of polygons in agreement (i.e. acceptable) \_\_\_\_\_  
Record the number of polygons in disagreement (i.e. not acceptable) \_\_\_\_\_
4. Was more than one person involved in the mapping? Yes No  
If yes, please list the areas mapped by each individual \_\_\_\_\_

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1. Was the entire project area submitted for review? Yes No  
What percent of the study area was reviewed? \_\_\_\_\_  
Comments/Recommendations: \_\_\_\_\_

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2. Were the field observations incorporated into the mapping (in the vicinity of the site and in similar polygons throughout the study area)? Yes No  
Comments/Recommendations: \_\_\_\_\_

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3. Do the bioterrain labels reflect ecological splits? Yes No  
Comments/Recommendations: \_\_\_\_\_

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4. Is the bioterrain mapping (air photo interpretation, labels and linework) adequately support TEM and any other deliverables? Yes No  
Comments/Recommendations: \_\_\_\_\_

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5. Were the comments and recommendation from previous stages of review addresses? Yes No  
Comments/Recommendations: \_\_\_\_\_

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6. Do the terrain labels follow Howes and Kenk 1997? Yes No  
Comments/Recommendations: \_\_\_\_\_

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7. Is the bioterrain mapping, drainage and any other terrain interpretations mapped consistently throughout the study area (between mappers and across mapsheets and flightlines)? Yes No  
Comments/Recommendations: \_\_\_\_\_

---

8. Is there consistency between the ecosystem mapping and the bioterrain mapping (e.g., site modifiers, drainage, percent rock)? Yes No

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Comments/Recommendations: \_\_\_\_\_

9. Has the bioterrain mapping been reassessed and updated in all areas where new polygons were created by the ecosystem mapper?  Yes  No

Comments/Recommendations: \_\_\_\_\_

9. Is the bioterrain mapping consistent with respect to polygon size and the level of detail in the mapping? Have small but important features been pulled out in a consistent manner (e.g., wetlands)? Does the level of detail meet project objectives?  Yes  No

Comments/Recommendations: \_\_\_\_\_

10. Is the format and content of the bioterrain map legend to RISC standard? Have all subtypes used in the mapping been included in the legend?  Yes  No

Comments/Recommendations: \_\_\_\_\_

11. Does the non-spatial database have any anomalies or errors (perform unique sorts and use the auto filter function)?  Yes  No

Comments/Recommendations: \_\_\_\_\_

12. If a stand alone terrain map or terrain interpretive maps are produced, do they meet all RISC standards?  Yes  No

Comments/Recommendations: \_\_\_\_\_

13. Does the bioterrain mapping conform to all relevant RISC standards?  Yes  No

Comments/Recommendations: \_\_\_\_\_

14. Have all project objectives relating to bioterrain been met?  Yes  No

Comments/Recommendations: \_\_\_\_\_

- Other:  Yes  No

Comments/Recommendations: \_\_\_\_\_

**QA Sign Off:** (Please Print)

Name QA Contractor(s)	Signature	Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Review Date
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____

**Form T9: Final Ecosystem Mapping QA**

Submission # \_\_\_\_\_ Date of Submission \_\_\_\_\_

Project Name \_\_\_\_\_

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QA Ecologist

Mapper(s)

Materials checklist:

- A sample of draft ecosystem maps with completed labels (ecosystem, BGC, ecoregion) map legends and linework. This can include a portion of a single mapsheet or a representative sample from different portions of the study area and should include representative samples of mapping from each mapper (if more than one mapper involved)..
Draft map legends, and expanded legend/report if available, listing all mapped units (including both ecosystem unit two-letter codes and associated site series numbers, along with ecosystem unit names, descriptions, site modifiers and structural stages)
Typed air photos (including standard terrain labeling)
A small scale map of study area w/ project boundary & flightlines clearly marked
Topographic base map at scale of mapping (TRIM or NTS)
Plot data for submitted area
Applicable forest cover mapping
Working legend

Polygon Specific Comments:

All polygon specific comments and/or recommendations must be documented in a separate PDF or word file and included as part of the QA report. It is recommended that mapping corrections be numbered and/or indicated on the stereo-pair or on an overlay. Comments associated with each number can then be kept in a separate file.

Final Ecosystem Mapping QA Review Questions:

- 1. Does the coding of ecosystem units follow RISC standards?
Comments/Recommendations:
2. Is the format and content of the map legend to standard? Have all the required elements been included? Are all mapped ecosystem units listed in the legend?
Comments/Recommendations:
3. Have ecosystem units been mapped consistently and accurately?
Comments/Recommendations:
4. Is the photo interpretation of all ecosystem attributes consistent and accurate?
Comments/Recommendations:
5. Is the ecosystem mapping consistent with respect to polygon size and the level of detail in the mapping? Have small but important features been pulled out in a consistent manner (e.g., wetlands)? Does the level of detail meet project objectives?
Comments/Recommendations:
6. Have the non-vegetated, sparsely vegetated and anthropogenic units been mapped consistently and correctly?
Comments/Recommendations:

*Draft Terrestrial Ecosystem Mapping Quality Assurance Guidelines*

- 
7. Are ecosystem unit proportions (deciles) consistent with other polygons and with the terrain unit proportions, where applicable? Yes No  
Comments/Recommendations: \_\_\_\_\_
- 
8. Have site series and other non-correlated ecosystem units been mapped consistently over the entire study area, between adjacent polygons, across biogeoclimatic boundaries, between mappers and relative to the legend? Yes No  
Comments/Recommendations: \_\_\_\_\_
- 
9. Have site series and other non-correlated ecosystem units been correctly mapped relative to existing knowledge (MOF regional field guides, previous mapping, adjacent mapping), terrain attributes, field data, forest cover attributes, topography and site conditions? Yes No  
Comments/Recommendations: \_\_\_\_\_
- 
10. Have site modifiers been consistently and correctly mapped over the entire study area, within polygons, between adjacent polygons, across biogeoclimatic boundaries, and between ecosystem mappers? Have they been mapped alphabetically? Yes No  
Comments/Recommendations: \_\_\_\_\_
- 
11. Have site modifiers been consistently and correctly mapped relative to the terrain attributes, plot data, topography, site conditions and the assumed site modifiers? Yes No  
Comments/Recommendations: \_\_\_\_\_
- 
12. Have structural stages and structural stage modifiers been mapped consistently and correctly between polygons, over the study area, relative to the field data and relative to the forest cover maps or air photos? Yes No  
Comments/Recommendations: \_\_\_\_\_
- 
13. Was the entire project area submitted for review? Yes No  
What percent of the study area was reviewed? \_\_\_\_\_  
Comments/Recommendations: \_\_\_\_\_
- 
14. Was more than one person involved in the mapping? Yes No  
If yes, please list the areas mapped by each individual \_\_\_\_\_
- 
15. Record the number of air photos reviewed \_\_\_\_\_ Record the number of air photos typed \_\_\_\_\_  
List the air photo numbers that were reviewed \_\_\_\_\_
- 
16. Record the number of mapsheets reviewed \_\_\_\_\_ Record the number of mapsheets typed \_\_\_\_\_  
List the mapsheet numbers that were reviewed \_\_\_\_\_
-

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17. Record the number polygons reviewed \_\_\_\_\_ Record the number of polygons typed \_\_\_\_\_  
 Record the number of polygons in agreement (i.e. acceptable) \_\_\_\_\_  
 Record the number of polygons in disagreement (i.e. not acceptable) \_\_\_\_\_

18. Other:  Yes  No  
 Comments/Recommendations: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**QA Sign Off:** (Please Print)

Name QA Contractor(s)	Signature	Acceptable?	Review Date
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____

**Form T10: Final Deliverables QA**

**Submission #** \_\_\_\_\_ **Date of Submission** \_\_\_\_\_

**Project Name** \_\_\_\_\_

**QA Ecologist** \_\_\_\_\_

**QA Bioterrain Specialist** \_\_\_\_\_

**QA GIS specialist** \_\_\_\_\_

**Mapping Team** \_\_\_\_\_

**Materials checklist:**

- Final TEM spatial and nonspatial data in standard format, including spatial plot files
- Final map legend
- Final typed air photos
- Final expanded legend and report
- Final plot data (original or copies of plot cards)
- Final VENUS database for GIF and FS882 field plots (field data for visual plots can either be submitted in VENUS format or as a separate Excel file)

**Final Deliverables QA Review Questions:**

Data:

1. Does the spatial data meet the standards? See the QA guidelines for TEM Digital Datacapture in B.C. (RISC, 2000).  Yes  No  
 \_\_\_\_\_

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Comments/Recommendations: \_\_\_\_\_

2. Does the nonspatial data meet the standards? See the QA guidelines for TEM Digital Datacapture in B.C. (RISC, 2000). Yes No

Comments/Recommendations: \_\_\_\_\_

3. Has all the required plot data been entered into VENUS? Does it pass validation (see the QA guidelines for DTEIF)? Yes No

Comments/Recommendations: \_\_\_\_\_

4. Have all the original (or copies) field plot cards been submitted? Yes No

Comments/Recommendations: \_\_\_\_\_

5. Have all of the airphotos been submitted? Yes No

Comments/Recommendations: \_\_\_\_\_

10. Other Yes No

Comments/Recommendations: \_\_\_\_\_

Legends and Reports:

1. Has the final map legend been submitted? Does it meet the standards? Yes No

Comments/Recommendations: \_\_\_\_\_

2. Has the final expanded legend been submitted? Is it acceptable? Yes No

Comments/Recommendations: \_\_\_\_\_

3. Does the vegetation description for each ecosystem unit include a listing of the dominant and associate plant species for each of the potential structural stages? Yes No

Comments/Recommendations: \_\_\_\_\_

4. If a number of site modifiers have been mapped, have the compositional and/or structural differences been noted and if necessary, described in a separate vegetation table? Yes No

Comments / Recommendations: \_\_\_\_\_

5. Has the final report been submitted? Is it acceptable? Yes No

Comments/Recommendations: \_\_\_\_\_

6. Have the project objectives been clearly stated? Yes No

Comments/Recommendations: \_\_\_\_\_

7. Have all of the data sources and background information been identified, including any existing mapping or inventory that was used, field guides, personnel, etc...? Yes No

Comments/Recommendations: \_\_\_\_\_

8. Has the physiography of the area been described, including topography, bedrock geology, and geomorphological (including glacial) history? Yes No

Comments/Recommendations: \_\_\_\_\_

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9. Has each surficial material been described, including a description of the most common textures, expressions, geomorphological processes, and drainages? Yes No

Comments/Recommendations: \_\_\_\_\_

10. Have the bioterrain and ecosystem mapping methods been described, including the use of different terrain and ecosystem attributes (i.e. surficial materials, textures, site modifiers, structural stages, etc...)? Yes No

Comments/Recommendations: \_\_\_\_\_

11. Have the methods for field sampling been described, including the numbers and types of plots that were completed? Yes No

Comments/Recommendations: \_\_\_\_\_

12. Have the aspects of map reliability been discussed, including discussions regarding the limitations of photo interpretation (i.e. poor resolution and scale), limitations due to the survey intensity level, difficulties encountered during field sampling (i.e. access issues), and/or limitations in the classification (i.e. poorly classified subzones or ecosystem units)? Yes No

Comments/Recommendations: \_\_\_\_\_

13. If interpretative products have been created, have the methods of production (including any assumptions made), the results, and the recommendations been outlined? Yes No

Comments/Recommendations: \_\_\_\_\_

14. Are the attributes listed in the expanded legend, report and map legend consistent with one another and with attributes found in the nonspatial database? A unique sort of the non-spatial data is recommended to ensure that all attributes mapped have been described. Yes No

Comments/Recommendations: \_\_\_\_\_

15. Other Yes No

Comments/Recommendations: \_\_\_\_\_

**QA Sign Off:** (Please Print)

Name QA Contractor(s)	Signature	Acceptable?	Review Date
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____
_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	_____

**Form T11: QA Summary and Sign-off**

This section is intended to track project status relative to the final sign-off of each stage of review. The QA contractor(s) must provide a date and signature on this form once a particular review stage has been deemed complete and acceptable. Any additional comments not covered in the forms above should be included at this time. Also, please record the total number of

*Draft Terrestrial Ecosystem Mapping Quality Assurance Guidelines*

submissions reviewed for each of QA stages in the space provided. Note this form must be submitted in electronic format as part of the QA report (see QA deliverables section).

**Project Planning QA:**

The project planning stage has been completed to an acceptable standard.

Print Name QA Contractor(s)	Signature	Date
<b>Additional Comments/Recommendations:</b>		

- This represents the final signoff, and represents submission number \_\_\_ of \_\_\_ submissions received for the project planning stage.

**Alpine and Parkland Boundaries QA:**

The alpine and parkland boundaries have been completed to an acceptable standard.

Print Name QA Contractor(s)	Signature	Date
<b>Additional Comments/Recommendations:</b>		

- This represents the final signoff, and represents submission number \_\_\_ of \_\_\_ submissions received for the alpine and parkland boundaries review stage.

**Bioterrain and Ecosystem Pretyping QA:**

The bioterrain and ecosystem pretyping has been completed to an acceptable standard.

Print Name QA Contractor(s)	Signature	Date
<b>Additional Comments/Recommendations:</b>		

- This represents the final signoff, and represents submission number \_\_\_ of \_\_\_ submissions received for the bioterrain and ecosystem pretyping stage.

**Fieldwork QA:**

The fieldwork has been completed to an acceptable standard.

Print Name QA Contractor(s)	Signature	Date

**MEMORANDUM OF AGREEMENT**

<b>Additional Comments/Recommendations:</b>	

- This represents the final signoff, and represents submission number \_\_\_ of \_\_\_ submissions received for the fieldwork stage.

**Ecosection and Biogeoclimatic boundaries QA:**

The Ecosection and Biogeoclimatic boundaries have been completed to an acceptable standard.

<b>Print Name QA Contractor(s)</b>	<b>Signature</b>	<b>Date</b>
<b>Additional Comments/Recommendations:</b>		

- This represents the final signoff, and represents submission number \_\_\_ of \_\_\_ submissions received for the ecosection and BGC boundaries review stage.

**Site Series and Ecosystem Unit QA:**

The site series and ecosystem units have been completed to an acceptable standard.

<b>Print Name QA Contractor(s)</b>	<b>Signature</b>	<b>Date</b>
<b>Additional Comments/Recommendations:</b>		

- This represents the final signoff, and represents submission number \_\_\_ of \_\_\_ submissions received for the site series and ecosystem unit review stage.

**Initial Ecosystem Mapping QA:**

The initial ecosystem mapping has been completed to an acceptable standard.

<b>Print Name QA Contractor(s)</b>	<b>Signature</b>	<b>Date</b>
<b>Additional Comments/Recommendations:</b>		

- This represents the final signoff, and represents submission number \_\_\_ of \_\_\_ submissions received for the initial ecosystem mapping review stage.

**Final Bioterrain Mapping QA:**

The final bioterrain mapping has been completed to an acceptable standard.

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<b>Print Name QA Contractor(s)</b>	<b>Signature</b>	<b>Date</b>
<b>Additional Comments/Recommendations:</b>		

- This represents the final signoff, and represents submission number \_\_\_ of \_\_\_ submissions received for the final ecosystem mapping review stage.

**Final Ecosystem Mapping QA:**

The final ecosystem mapping has been completed to an acceptable standard.

<b>Print Name QA Contractor(s)</b>	<b>Signature</b>	<b>Date</b>
<b>Additional Comments/Recommendations:</b>		

- This represents the final signoff, and represents submission number \_\_\_ of \_\_\_ submissions received for the final bioterrain mapping review stage.

**Final Deliverables QA:**

All of the final deliverables meet RISC standards.

<b>Print Name QA Contractor(s)</b>	<b>Signature</b>	<b>Date</b>
<b>Additional Comments/Recommendations:</b>		

- This represents the final signoff, and represents submission number \_\_\_ of \_\_\_ submissions received for the final deliverables review stage.

# Appendix A: Guideline for Contract Development – TEM QA

## MEMORANDUM OF AGREEMENT

Made *month/day/year*

### BETWEEN

<*organization receiving final deliverables - paying for services*>, hereafter referred to as the “Client or Client Group”

### AND

<*organization completing Quality Assurance of TEM final deliverables*>, hereafter collectively referred to as the “QA Group”

Whereas the Client requires Quality Assurance of their project “Terrestrial Ecosystem Mapping with Wildlife Habitat Ratings”, which is being completed by <*the mapping contractor hired by Client Group*>, hereafter referred to as the “Consultant”.

Whereas the QA Group has the responsibility of maintaining the quality of data to be warehoused by the Province.

Now, therefore, this Agreement witnesses that in consideration of the mutual promises hereafter set out, the Parties agree as follows:

## 1. PURPOSE

The terrestrial ecosystem map displays a hierarchy of ecosystem units including: Ecoregions, Biogeoclimatic Subzone/Variant, Site Series, Site Modifiers, Structural Stages and Terrain Attributes. Application of prescribed standards results in a set of typed airphotos, a polygon (spatial) database linked to a polygon attribute (nonspatial) database, and for point locations of ground samples, a spatial database linked to a point attribute database. The mapping is supported by a detailed map legend, expanded legend and project report. The expertise required for this project includes a terrain specialist, a plant ecologist, a wildlife biologist and a GIS/data base specialist. A Quality Assurance review is required for Bioterrain, Terrestrial Ecosystem Mapping (TEM) and for Wildlife Habitat Rating (WHR) components of the project. This agreement outlines the requirements for conducting Quality Assurance of those components.

## 2. OBLIGATIONS OF THE PARTIES

### Obligations of the Client

The Client will provide funding to enable the QA Group to proceed with Quality Assurance (QA) of the Bioterrain mapping, the Terrestrial Ecosystem Mapping, and the Wildlife Habitat Ratings for the study areas: <*study area and project boundary*> This agreement may include the wages and benefits of staff, and consulting fees, where aspects of the work are sub-contracted by the QA

## *Draft Terrestrial Ecosystem Mapping Quality Assurance Guidelines*

Group. Funds will be limited to a maximum of \$<*total dollar amount of agreement*>. The Client has provided direction to the Consultant <<*the mapping contractor hired by Client Group*>. on the schedule for deliverables. Further details on QA services, QA reports, and payments are outlined in Schedules A and B below.

The Client will ensure that the Consultant will complete the Bioterrain, Ecosystem (TEM) and WHR work and will provide the deliverables to the QA Group in a timely fashion, according to a schedule agreed upon by the Client, Consultant and QA Group. The Client will notify the QA Group of any changes to the delivery schedule. Deliverables will include:

- Manuscript airphotos, typed and labeled for bioterrain;
- Initial TEM Map Units (Site Mapcodes);
- Initial TEM Localized BGC Linework;
- Final TEM field data (hardcopies);
- Final TEM field data digital copy in VENUS format (FS882s and GIFs) and visuals;
- Final TEM Project Meta Data;
- Final TEM Attribute Database(s);
- Final TEM Spatial File(s);
- Final TEM map legend, expanded legend and report;
- Final WHR Project Meta Data;
- Final WHR Species Account(s); and
- Final WHR Wildlife Report;
- Final WHR Table(s)
- Final WHR Map.

### **Obligations of the QA Group**

The QA Group will undertake Quality Assurance of all relevant stages of the project, and will ensure a timely delivery of all reviews, as outlined in Schedule A “Terms of Work”. The QA Group agrees to report on each Quality Review within **15 working days** of receipt of a given set of deliverables.

### **3. ACTIVITIES TO BE UNDERTAKEN BY THE QA GROUP**

Schedule A describes the activities to be undertaken by the QA Group in detail. Schedule B sets out financial considerations.

### **4. DURATION**

This Agreement shall bind the Parties for the period beginning on the date of signing and ending on <*mmm-dd-yyyy*>

### **5. TERMINATION**

Either the Client or the QA Group may terminate this Agreement on one (1) month written notice to the other Parties to this Agreement.

6. AMENDMENTS

This Agreement may be amended. Any amendment to this Agreement shall be in writing and signed by the Parties. Any significant change in projected costs must be made by amendment to this Agreement.

7. ENTIRE AGREEMENT

This Memorandum of Agreement, along with the Terms of Work for the Client’s TEM with WHR and the any other schedules and appendices to this agreement, shall constitute the entire and sole Agreement between the Parties and shall supersede all other communications, negotiations, arrangements and agreements of any nature between them prior to the date of this Agreement.

IN WITNESS WHEREOF the Parties have executed this Agreement on the day of the completion of signing of the Agreement.

**FOR:** < organization receiving final deliverables - paying for services> (Client Group)

**FOR:** < organization receiving final deliverables - paying for services> (Client Group)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date (mon-dd-yyyy)

\_\_\_\_\_  
Date (mon-dd-yyyy)

\_\_\_\_\_  
Witness

\_\_\_\_\_  
Witness

**FOR:** <organization completing Quality Assurance of TEM final deliverables)>,

**FOR:** <organization completing Quality Assurance of TEM final deliverables)>,

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date (mon-dd-yyyy)

\_\_\_\_\_  
Date (mon-dd-yyyy)

\_\_\_\_\_  
Witness

\_\_\_\_\_  
Witness



**SCHEDULE A:****TERRESTRIAL ECOSYSTEM MAPPING QUALITY ASSURANCE - TERMS OF WORK****DEFINITIONS**

In this document, acronyms and words have the following meanings:

- (a) **BEC** means Biogeoclimatic Ecosystem Classification
- (b) **Bioterrain** means terrain mapping to support PEM
- (c) **BGC** means Biogeoclimatic (subzone, variant, phase)
- (d) **Client** means <*organization receiving final deliverables - paying for services*> (Client Group)
- (e) **Consultant** means the mapping contractor hired by *Client Group*.
- (f) **GIS** means Geographic Information System
- (g) **KB** means knowledge base
- (h) **Location** means the <*area of study and project boundary*>
- (i) **MSRM** means Ministry of Sustainable Resource Management
- (j) **MoF** means Ministry of Forests
- (k) **Province** means Ministry of Sustainable Resource Management and/or Ministry of Forests
- (l) **QA** means Quality Assurance
- (m) **QA Group** means <*organization completing Quality Assurance of TEM final deliverables*>
- (n) **QA Guidelines** refers to the Quality Assurance Guidelines for TEM and TEM Digital Data Capture, as well as all other associated QA guideline documentation
- (o) **RIC** means Resources Inventory Committee
- (p) **TEM** means Terrestrial Ecosystem Mapping
- (q) **TIB** means Terrestrial Information Branch
- (r) **TRIM** means Terrain Resource Information Management
- (s) **WHR** means Wildlife Habitat Ratings

**OVERVIEW OF SERVICES**

Upon completion of each Quality Review, the responsible agency will prepare and deliver a QA summary report to the Client and Consultant, as outlined in the QA Guidelines.

- a) QA Group (*QA Ecologist*) will undertake the review of proposed Alpine and Parkland BGC boundaries.
- b) QA Group (**Bioterrain QA**) will undertake Quality Review #1 – Bioterrain pre-typing on air-photos;
- c) QA Group (*QA Ecologist*) will undertake the review of the preliminary sampling plan and working legend;
- d) QA Group (*Ecologist / Bioterrain / Wildlife QA*) will undertake a review of the field sampling and data collection;
- e) QA Group (*QA Ecologist*) to coordinate the MoF (*Regional Ecologist*) Quality Review of the Localized BGC linework and the proposed Map Units, and ensure MoF approval;

## *Draft Terrestrial Ecosystem Mapping Quality Assurance Guidelines*

- f) QA Group (*QA Ecologist*) will undertake review of field data in VENUS and GRAVITI format.
- g) QA Group (*QA Ecologist*) to coordinate the MSRM (*Provincial Correlator*) review of ecosystem unit coding (Site Mapcode), and ensure MSRM approval;
- h) QA Group (*QA Ecologist*) to undertake review of the initial ecosystem mapping with draft legend and draft expanded legend;
- i) QA Group (**Bioterrain QA**) will undertake final review of Bioterrain typing on air-photos;
- j) QA Group (*QA Ecologist*) to undertake review of the final ecosystem mapping;
- k) QA Group (*Ecologist / Bioterrain / GIS / Technical QA*) will undertake Final Review of spatial and non-spatial data - including field data point coverage, spatial polygon coverage, non-spatial ecosystem and terrain attributes file, and final VENUS data;
- l) QA Group (*Ecologist / Bioterrain QA*) will undertake review of the final report and expanded legend; and
- m) QA Group (*Wildlife Habitat Ratings QA*) will undertake Quality Review #7 – Wildlife Habitat Ratings (species accounts, wildlife report, ratings table(s) and spatial file(s)).

The QA Group shall:

1. Provide Quality Assurance review following the Quality Assurance procedures outlined in the Quality Assurance Guidelines. See the **<(location to be determined or attach as schedule ##)>**
2. Ensure that the Services are carried out in accordance with the technical standards set out in the edition of the following documents and that was the most up-to-date at the time the contract between the Client and the Consultant was signed:
  - *Standard for Terrestrial Ecosystem Mapping in British Columbia*. Ecosystems Working group, Terrestrial Ecosystems Task Force, Resources Inventory Committee, May 1998;
  - *Standards For Terrestrial Ecosystem Mapping – Digital Data Capture In British Columbia*. Version 3.0. 2000. RIC, Ecosystems Working Group;
  - *Digital Terrestrial Ecosystem Mapping (TEM) and Wildlife Habitat Ratings (WHR) Data Capture in (DC) User’s Guide*. 1999 RIC, Ecosystem Working Group;
  - *Digital Terrestrial Ecosystem Mapping (TEM) and Wildlife Habitat Ratings (WHR)*

*Data Capture and Ratings Table Application;*

- *Standard for Digital Terrain Data Capture in British Columbia.* Terrain Technical Standard & Database Manual. June, 1998 Version 1. Resources Inventory Committee;
- Howes, D.E. and E. Kenk. 1997. *Terrain Classification System for British Columbia. Revised Edition.* Manual 10. B.C. Ministry of Environment, Lands, and Parks. Victoria, B.C.;
- *Ecosystem Field Forms* FS882 (1-7). 1998. Province of B.C.;
- VENUS Version 5.0. (2001). RIC Ecosystems Working Group;
- *Provincial Site Series Mapping Codes and Typical Environmental Conditions.* RIC, Ecosystems Working Group;
- *Field Manual for Describing Terrestrial Ecosystems.* 1998. Land Management Handbook No. 25. BC Ministry of Environment, Lands, and Parks and Ministry of Forests. Victoria, B.C.;
- Douglas, G.W., G.B. Straley, and D. Meidinger. 1989, 90, 91, 94. *The Vascular Plants of British Columbia.* Parts 1-4. Special Report Series Nos. 1-4. Research Branch, B.C. Ministry of Forests. Victoria, B.C.;
- *British Columbia Wildlife Habitat Rating Standards.* Version 2.0 1999. RIC Ecosystems Working Group;
- [\*Standard for Wildlife Habitat Rating \(WHR\) Digital Data Capture in British Columbia – Digital Data Capture In British Columbia. Version 1.0.\*](#) 2000. Wildlife Interpretations Subcommittee, Resources Inventory Committee; and
- *Wildlife Habitat Ratings (WHR) Mapping Tool (WHR103.avx).*

Note: RIC documents are available in regional Ministry libraries and on the RIC website (<http://www.for.gov.bc.ca/ric/standards.htm>).

Predictive Ecosystem Mapping documents are available through the TEM alternatives website (<http://www.for.gov.bc.ca/research/temalt/>).

Ministry of Forests publications are available through Ministry of Forests representatives and, in some cases, on the Ministry of Forests website. (<http://www.for.gov.bc.ca/>).

Terrestrial Ecosystem Mapping documents and support tools are available through the TEM website (<http://www.elp.gov.bc.ca/rib/wis/tem>)

Wildlife Habitat Ratings documents and support tools are available through the TEM website (<http://www.elp.gov.bc.ca/rib/wis/whr>)

All other listed materials are available through the regional MSRM library.

**DELIVERABLES**

The QA Group shall deliver the following to the Client (required documentation is outlined in QA guidelines):

1. A report on the quality of the Consultant's initial bioterrain typing on airphotos.
2. A report on the localized BGC linework review, including formal approval (signoff) as well as any recommendations made by the Regional Ecologist.
3. A report on the field work component of the project, including review of the sampling plan, working legend, field sampling, and field data.
4. A report on the proposed Map Units (Site Mapcodes), including formal approval (signoff) as well as any recommendations made by the Regional Ecologist and/or the Ecology Correlator.
5. A report on the quality of the initial ecosystem mapping, including the initial review of the spatial and non-spatial attribute data.
6. A report on the quality of the initial map legend, expanded legend and report.
7. A report on the quality of the final deliverables for the Terrestrial Ecosystem Mapping projects – including: final bioterrain and ecosystem linework, project metadata database file(s), attribute database(s), spatial file(s), plot locations and a final project legends and reports from the Consultant that should include a description of the study area and the project objectives.
8. A report on the quality of the wildlife habitat ratings (CSV files), including: Species Accounts, Report and Ratings Table(s) and Spatial File(s).

Upon acceptance of the final TEM deliverables from the Consultant, the QA Group will delivery all final QA reports, as per the QA Guidelines, to the Client. The Client will then delivery all final TEM and TEM QA deliverables, in standard format, to the province.

**SCHEDULE B**

This Agreement is subject to the terms agreed upon between the Client and the QA Group.

- 1) The Client agrees, subject to the terms and conditions of this Agreement, to pay all eligible costs that are incurred by the QA Group for the activities described in this Agreement, up to a maximum of \$ *(excluding GST) - \$ (QA cost) and \$ (contingency)*.
- 2) The payment schedule will be based upon the agreed upon figures below and payments made upon completion of significant milestones as outlined below.

The QA Group: *<total # person days>*, *\$<dollar amount>*.

Bioterrain QA: *<# person days>*, *\$<dollar amount>*.

Quality Review #1 – Initial Bioterrain typing on air-photos;

QA Ecologist: *<# person days>*, *\$<dollar amount>*.

Quality Review #2 – coordinate localized BGC linework review and ensure MoF approval;

QA Ecologist / Bioterrain: *<# person days>*, *\$<dollar amount>*.

Quality Review #3 – field data and sampling plan;

QA Ecologist: *<# person days>*, *\$<dollar amount>*.

Quality Review #4 – coordinate review of Map Units (Site Mapcodes) and ensure MoF approval for new units and MSRM approval for new mapcodes;

QA Ecologist: *<# person days>*, *\$<dollar amount>*.

Quality Review #5 – Initial ecosystem mapping;

Ecologist / Bioterrain QA: *<# person days>*, *\$<dollar amount>*.

Quality Review #6 – Initial map legend, expanded legend and report;

Ecologist / Bioterrain / GIS QA: *<# person days>*, *\$<dollar amount>*.

Quality Review #7 – Final deliverables (bioterrain and ecosystem linework, non-spatial data, spatial files, legends, reports, and field data);

Wildlife Habitat Ratings QA: *<# person days>*, *\$<dollar amount>*.

Quality Review #8 – Wildlife Habitat Ratings (species accounts, report, ratings table(s) and spatial file(s)).

**NOTE:** Additional funds required for **travel for field QA** or **Accuracy Assessment** are **not** recorded in this document. Contact Client Project Monitor for this information. Add applicable QA specialists for additional project specific deliverables.

- 3) Contingency funds for the project limited to *\$<dollar amount>*
- 4) The QA Group agrees that the payments referred to above shall be applied to the following expenditures:

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- Salaries and professional services contracts;
- 5) The QA Group shall provide with claim for payment, a report outlining expenses incurred and a progress report.
- 6) Within the limits of the aforementioned terms, the Client agrees to pay the QA Group as follows:
- Invoices from the QA Group must be accompanied by notification of successful completion of Quality Review reports 1 through 8.
  - Quality Review reports will be communicated to the Client upon completion of each review.
  - Payment to the QA Group should be addressed to:
    - <organization>
    - <address>
    - <city, province>
    - <postal code>
    - <phone>
    - <fax>
    - <e-mail>
  - Cheques are to be made payable to the <organization completing Quality Assurance of TEM final deliverables>.
- 7) All invoices or requests for payment should be sent to:
- Client Project Monitor:**
- <organization>
  - <address>
  - <city, province>
  - <postal code>
  - <phone>
  - <fax>
  - <e-mail>
- 8) The QA Group agrees to keep proper accounts and records of the revenues and expenditures for the subject matter of the Agreement:
- 9) The QA Group shall provide the Quality Assurance Services within **15 working days** of receipt of the Consultant's deliverables or within **15 working days** of agreed upon delivery date (as per schedule outlined below).
- 10) If the QA work is not completed within **15 working days** of receiving deliverables, the Client reserves the right to withhold part of or all of the relevant payment in Schedule B.
- 11) If the QA work is not completed within **15 working days** of receiving deliverables, due to the Consultant failing to produce satisfactory products, it is the responsibility of the QA Group to inform the client of the problem. The QA Group will not be held responsible and all of the relevant payment outlined in Schedule B would be due, unless otherwise agreed to.

It is the Client's responsibility to notify the QA Group of any deviations from the following schedule (Table II):

**Table II: Submission Schedule**

<b>Service/Deliverable</b>	<b>Delivered by:</b>
Preliminary Pre-typing on Air Photos	mmm-dd-yyyy
Localized BGC units	mmm-dd-yyyy
Initial Input data quality assessment report, including plots of spatial feature control shift	mmm-dd-yyyy
Proposed Mapping Entities	mmm-dd-yyyy
Initial Knowledge Base and its reliability report, including required revisions to procedures and schedule	mmm-dd-yyyy
Proposed Map Entities (Site Mapcodes)	mmm-dd-yyyy
Final Knowledge Base	mmm-dd-yyyy
Final Structural Stage: Knowledge Base and Attribute and Spatial file(s)	mmm-dd-yyyy
Final Input Data Quality Report and Database	mmm-dd-yyyy
Final Metadata (standard and non-standard) Report(s) and Database(s)	mmm-dd-yyyy
Final Attribute and Spatial file(s)	mmm-dd-yyyy
Final WHR: Species Account(s), Wildlife Report and Attribute and Spatial file(s)	mmm-dd-yyyy

The QA Group shall provide the Services outlined in this agreement and in accordance with the schedule listed above (Table II).

**Quality Reviews**

Quality reviews will be made upon completion of the following tasks and submission of the associated deliverables:

- ⇒ **Quality Review #1**  
Initial Bioterrain typing on air-photos;
- ⇒ **Quality Review #2**  
Coordinate localized BGC linework review and ensure MoF approval;
- ⇒ **Quality Review #3**  
Field data and sampling plan;
- ⇒ **Quality Review #4**  
Coordinate review of Map Units (Site Mapcodes) and ensure MoF approval for new units and MSRM approval for new mapcodes;
- ⇒ **Quality Review #5**  
Initial ecosystem mapping;
- ⇒ **Quality Review # 6**  
Initial map legend, expanded legend and report;
- ⇒ **Quality Review # 7**  
Final deliverables (bioterrain and ecosystem linework, non-spatial data, spatial files, legends, reports, and field data);
- ⇒ **Quality Review # 8**  
Wildlife Habitat Ratings (species accounts, report, ratings table(s) and spatial file(s)).

## **MINISTRY CONTACTS**

All localized BGC, mapping entities, and proposed knowledge base inquiries shall be directed to the:

**MoF Regional Ecologist:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>

All inquiries regarding RISC standards and/or QA Guidelines shall be directed to the MSRM Representative. All PEM map entity coding requests shall be directed to the ecology correlator.

**Ecology Correlator:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>

**Bioterrain Correlator:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>

**Wildlife Habitat Ratings Specialist:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>

## **QA GROUP CONTACTS**

**QA Ecologist:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>

**Bioterrain QA:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>

**Wildlife Habitat Ratings QA:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>

**GIS/Spatial QA:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>

**Database/Non-spatial QA:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>

**CLIENT CONTACTS****Client Project Monitor:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>

**CONSULTANTS CONTACTS**

**Consultant Project Coordinator:**

<organization>  
<address>  
<city, province>  
<postal code>  
<phone>  
<fax>  
<e-mail>