
Terrestrial Ecosystem Information Data Loading Checklist – Contractor Package

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Version	Date	Description/Rationale for Change
3.0	2019	<i>Excel template</i>
4.0	2023-01-19	<i>Conversion of excel template into new word template</i>
4.1	2023-08-22	<i>Minor revisions</i>

Document Purpose:

This document is designed to support data submitters to run data through the Contractor Package produced by the Terrestrial Ecosystem Information (TEI) Unit, Knowledge Management Branch of the BC Ministry of Water, Land and Resource Stewardship (the Ministry). The Contractor Package allows data submitters to verify that data meets recognized standards for quality and consistency, as well as meets spatial and aspatial requirements necessary to integrate data into provincial repositories. This document outlines how to use the Contractor Package to process, review and validate ecosystem mapping data so that it is ready for submission to TEI. This resource should be used in conjunction with the 'Terrestrial Ecosystem Information Digital Data Submission Standard' (RISC 2023) document, and any other relevant standards required for a given mapping type.

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Project Initiation

Step 1 – Initiate contact with TEI Unit and Regional Research Vegetation (and BEC) Ecologists / Biologists

Once funding is in place, the Terrestrial Ecosystem Information (TEI) Unit, Knowledge Management Branch of the BC Ministry of Water, Land and Resource Stewardship (the Ministry) should be contacted for project approval. Contact can be initiated via email at TEI_Mail@gov.bc.ca. Communication of project intent should also be initiated with the appropriate government specialists for the type of mapping that will be undertaken during the project. Consultation with the TEI Unit and other government specialists, such as Regional Research Vegetation (and BEC) Ecologists, Soil Scientists, Geomorphologists, Hydrogeologists, and Wildlife Biologists, should occur at this stage. Expected primary users, interim applications, and end use of the project should be documented. Project sensitivities and/or need for inclusion in provincial data repositories, should be established. The Ministry should be consulted during project planning phases to verify the status of current data and information, with communication throughout all phases the project recommended. Communication with the Ministry and regional staff early in the process is important as there may be relevant information for the project area that is not publicly available.

All RISC standard provincially funded TEI project data must be submitted to the Ministry, through the TEI Unit email address (TEI_Mail@gov.bc.ca). Project data funded by other levels of government, by the private sector, or other proponents, particularly those funded by, or collected in partnership with, the Provincial Government, should also be delivered to the Ministry. Where appropriate this project data will be loaded and stored to the BC Geographic Warehouse (BCGW) to facilitate access. The specifications for data loading are outlined in *Spatial Data Specifications* discussed in Step 3.

Step 2 – Download latest Contractor Package

Data must be loaded into the template feature classes that are included in the *Contractor Package*. This package is available for download at:

<https://www.env.gov.bc.ca/esd/distdata/ecosystems/TEI/ContractorPackage/>.

Once downloaded, the file can be unzipped and installed in a location accessible to the data submitter. This package is authorized for capture of RISC standard data to be submitted to the TEI data custodian and published through the BCGW and the BC Data Catalogue. Redistribution or modification is not authorized. Any other uses require written permission obtained from the Ministry at TEI_mail@gov.bc.ca.

The use of the *Contractor Package* tools and templates is highly recommended for submission of terrestrial ecosystem information. Data submitters will be required to address any formatting issues and/or erroneous content prior to the Ministry's final acceptance of the data. The *Contractor Package* is designed to work with the ArcGIS Desktop suite of products by Esri, version 10.6 or higher. All requirements for hardware and software can be found at <https://desktop.arcgis.com/en/system-requirements/10.6/arcgis-desktop-system-requirements.htm>. The *Contractor Package* is not yet optimized to work ArcGIS Pro (Python 3.x). The *Contractor Package* contains the following folders and geodatabases:

- Documentation
- Scratch
- Scripts
- Stage1.gdb
- Tools_and_Templates.gdb

Step 3 – Review Contractor Package Contents and Spatial Data Specifications

The 'Documentation' folder in the *Contractor Package* contains this checklist, process flowcharts, as well as the 'Terrestrial Ecosystem Information Digital Data Submission Standard' RISC document to help guide the data submitter through the digital capture and submission process. It is important to note that upon final delivery to the Ministry, the data must be captured and adhere to the spatial data specifications summarized in the 'Terrestrial Ecosystem Information Digital Data Submission Standard' and throughout this document, including:

- Final data must be loaded or captured as Single-Part polygons into the template feature classes that are included in the *Contractor Package* and adhere to the domain and ranges supplied within package. Templates provided within the *Contractor Package* are in ESRI File Geodatabases (FGDB) version 10.6 or higher with an BC Environment Albers Projection System.
- Topology must be implemented, enforced, and reviewed in the Quality Assurance (QA) stage.
- TEI spatial data must be registered to the Provincial Baseline Digital Atlas 1:20 000 (TRIM) / 1:10 000 (TRIM 2).
- Linkages to TEI attributes must be maintained (i.e., PROJPOLYID, TEIS_ID, BAPID).
- User defined values for existing fields must be submitted to and approved by the Ministry prior to the submission of final deliverables.
- Validation tools supplied within the *Contractor Package* must be run prior to delivery to the Ministry. These validation tools perform automated error detection and reporting to flag the following:
 - Missing mandatory attributes
 - Null and zero values
 - Values outside of allowable domains and ranges
 - Geometry errors

Step 4 – Request BAPID number and Standards Variances

To track the progress of multiple TEI projects, a Business Area Project Identifier (BAPID) must be requested from the Ministry and is typically assigned at the onset of any project. A BAPID is a unique numerical identifier used in the naming of all project files, folders, and feature classes, as well as any project correspondence. The BAPID number assigned to a project is applied to all associated project components (spatial data, tables, reports, photographs, etc.) and maintains the link between components and project metadata. This information will be needed for the data capture process. When requesting a BAPID, a completed version of the TEI Project Submission Form

(https://www.env.gov.bc.ca/esd/distdata/ecosystems/TEI/Docs/TEI_ProjectInformationSubmission.xlsx) must be supplied to the Ministry through an email request to TEI_mail@gov.bc.ca.

TEI digital standards, outlined in the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document, are to be used in conjunction with the applicable TEI inventory standards. TEI inventory standards can be found on the following website: <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/ecosystems/tei-standards>. Requests for variances to the TEI inventory and/or digital standards can be submitted at the same time as the BAPID request and must be submitted to the Ministry for approval prior to project initiation.

Data Capture

Step 5 – Review Digital Data Capture Specifications

Prior to final delivery to the Ministry, the practitioner should understand which data capture/inventory standard(s) the data should adhere to appropriately capture information for the given project type. This is important as data capture/inventory specifications will change depending upon the project type, for example the inventory scale and user/project requirements. Data capture/inventory specifications should be specified for each project in the final report included with data submission. A full list of general specifications is described in the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document as supplied within the *Contractor Package* to assist in the creation of digital data. Some examples of general specifications include:

- Quality of digital data capture which is generally composed of accuracy, resolution, and tolerance. This information should be specified for each project in the final report included with data submission. Interpretation Accuracy/Error can be determined by referring to the appropriate RISC standard. The Survey Intensity Levels can be included as project level metadata in the TEI_Project_Details table. It is recommended to use the default XY resolution and tolerance values (0.0001m and 0.001m respectively) for feature class templates in the *Contractor Package*.
- Minimum feature size and minimum feature widths should be derived from the specific field inventory standards as appropriate for the inventory type.
- Maximum zoom for digitizing polygons should be specified and must pass ArcGIS topology rules (e.g., "Must Not Overlap" and "Must Not Have Gaps").
- Linear features must be digitized in the downward or downstream direction and must pass ArcGIS topology rules (e.g., "Must Not Self-Overlap" and "Must Not Self-Intersect").
- Z-values are not supported within the feature class templates included within the *Contractor Package* and thereby will not be incorporated.
- Tiled data must be provided in a single seamless dataset, not in separate tiles defined by any standard or non-standard mapsheet grid.

(Option A) Step 6 – Digital Data Capture

If data is created or digitized directly into the templates provided in the latest version of the *Contractor Package* – complete all steps in the '(Option A) Step 6 – Digital Data Capture' section of this document, before moving on to Step 8. Do not complete Step 7.

Step 6.1 – Populate TEI_Long_Tbl Feature Class

This process assumes that the practitioner will be manually populating the primary dataset in the submitted *Operational_Data.gdb* using data digitizing processes. The *TEI_Long_Tbl* feature class is a mandatory deliverable for all projects and contains the detailed polygon information for all project types. Data capture via digitizing will allow the practitioner to pick field values from domain-controlled pick lists to help enforce data standards and validation.

(Option B) Step 7 – Import TEI Data

If data has already been created or digitized into a custom template chosen by the practitioner – complete all steps in the '(Option B) Step 7 – Import TEI Long Table' section of this document, before moving on to Step 8. Do not complete Step 6.

Step 7.1 – Run 'Load Data' Script

Run the 'Load Data' script to automate the import of existing data into the *Stage1.gdb* within the *Contractor Package*. If the imported feature class does not contain the standard fields required as part of the TEIS environment, then the option exists to input a standalone table in the CSV, DBF or FGDB Table formats.

Script Parameters:

- 1) Path to the *Stage_1.gdb* within the *Contractor Package*
e.g., C:\<local path>\Contractor_Package_<date>\Stage_1.gdb
- 2) Feature class containing the TEI data to import
e.g., C:\<local path>\Operational_Data_<BAPID #>.gdb\TEI_Long_Tbl
- 3) OPTIONAL - External path to the table containing new ecosystem codes (See Step 8). This parameter is only required if the *TEI_Ecosystem_Code_Submission* table is populated and is in a location other than the *Stage_1.gdb*.
e.g., C:\<local path>\Operational_Data_<BAPID #>.gdb\TEI_Ecosystem_Code_Submission
- 4) OPTIONAL - Attribute table to join on the feature class if the feature class does not contain attributes. This table can be a CSV, DBF, or FGDB table
e.g., C:\<local path>\TEI_Long_Tbl_Attributes.csv
- 5) OPTIONAL - Field name in the input feature class used for the attribute table join in parameter #4.
e.g., TEIS_ID
- 6) OPTIONAL - Field name in the attribute table (parameter #4) used to join to the feature class
e.g., TEIS_ID

Script Outputs:

- 1) *TEI_Long_Tbl* in the *Stage_1.gdb*

Step 8 – Populate Ecosystem Code Submission Deliverable

Proposed new ecosystem code values must be submitted to, and approved by, the Ministry prior to the submission of final deliverables. See *TEI_Ecosystem_Code_Submission* table in the *Tools_and_Templates.gdb* for required information. This process should be documented in the project report.

Practitioners will need to report on these newly approved ecosystem codes using the *TEI_Ecosystem_Code_Submission* table including providing associated metadata such as Ecosystem Code, Ecosystem Name, Ecosystem Code Description, Rationale, and associated Field Site Number(s). If only published ecosystem codes are used, as per the current *TEI Ecosystem Mapping Codes* list, then submission of this table is not required.

Step 9 – Populate User-defined Tables

User-defined data may exist for existing fields (e.g., new site series modifiers in the SITE_M1A, SITE_M1B and SITE_M2A fields in the *TEI_Long_Tbl*) or new user-defined fields that do not currently exist in any of the provided feature classes or tables in the *Contractor Package*. It is important to note when approval is required by the Ministry:

- New values for existing fields must be submitted to, and approved by, the Ministry prior to the submission of final deliverables.
- New fields that do not already exist do not require pre-approval from the Ministry, rather they can be added to the *TEI_Usr_Dfn_Fields* table. Refer to the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document for detailed specifications when populating these tables.

Step 10 – Populate TEI_Project_Details with Project Level Metadata

When requesting a BAPID from the Ministry, the data submitter will have submitted project level details in the TEI Project Submission Form (https://www.env.gov.bc.ca/esd/distdata/ecosystems/TEI/Docs/TEI_ProjectInformationSubmission.xlsx). These details should be directly populated into the relevant fields for all project records within the *TEI_Long_Tbl*. All other relevant project metadata should be populated in the *TEI_Project_Details_Tbl*.

Data Review and Validation

Step 11 – Review and Populate Mandatory Deliverable Feature Classes (if applicable)

The two primary datasets that are mandatory deliverables for all projects are the:

- *TEI_Long_Tbl*
- *TEI_Project_Details*

However, there are some feature classes that are also mandatory if associated data is collected. Refer to the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document for detailed specifications when populating these tables. Mandatory (if collected) feature classes are summarized below:

- Terrestrial Ecosystem Information Linear Sample Site Locations (*TEI_Sample_Site_Lines*)
- Terrestrial Ecosystem Information Point Sample Site Locations (*TEI_Sample_Site_Points*)
- Terrestrial Ecosystem Information Lines (*TEI_Lines*)
- Terrestrial Ecosystem Information Points (*TEI_Points*)
- Terrestrial Ecosystem Information Polygons (*TEI_Polys*)
- Terrestrial Ecosystem Information User-defined Data (*TEI_Usr_Dfn_Data*)
- Terrestrial Ecosystem Information User-defined Fields (*TEI_Usr_Dfn_Fields*)
- Terrestrial Ecosystem Information User-defined Domains (*TEI_Usr_Dfn_Domains*)
- Terrestrial Ecosystem Information Ecosystem Code Submission (*TEI_Ecosystem_Code_Submission*)

Step 12 – Review and Populate Optional Deliverable Feature Classes (if applicable)

If data corresponding to any of the following feature classes is collected, then submission of these is optional. Refer to the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document for detailed specifications when populating these table.

- Terrestrial Ecosystem Information Project Boundaries Polygon (*TEI_Project_Boundaries*)
- Terrestrial Ecosystem Information Short Table Polygon Attributes (*TEI_Short_Tbl*)
- Terrestrial Ecosystem Information Long Table Polygon Lines (*TEI_Long_Tbl_Arcs*)
- Terrestrial Ecosystem Information Polygon Lines (*TEI_Polys_Arcs*)

Step 13 – Run 'Validate Load' Script

This script is included within the *Contractor_Package_Toolbox.tbx*. This script will validate data that has either been added into the *TEI_Long_Tbl* through conventional editing (Step 6) or loaded into the *Stage_1.gdb* using the *load_data* script (Step 7). It uses existing scripts used in the TEI data load process to validate and ensure the data captured meets the standards required by the Ministry. Error summary tables are created as an output of the script should be reviewed prior to delivery and submitted as part of the project submission deliverables (Step 14).

Script Parameters:

- 1) Path to the *Stage_1.gdb* within the *Contractor Package*:
e.g., C:\<local path>\Contractor_Package_<date>\Stage_1.gdb

Script Outputs:

- 1) One or more *Operational_Data.gdb* with the BAPID number in the name:
e.g., C:\<local path>\Contractor_Package_<date>\Stage_1.gdb \Operational_Data_<BAPID #>.gdb

Step 14 – Review Error Summary Tables and Correct Data as Required

In ArcMap or other related software, view the error tables created by 'Validate Load' script. Errors that are present in either the *TEI_Long_Tbl_CriticalRangeErrors* or *TEI_Long_Tbl_CriticalFieldErrors* tables must be fixed prior to final submission to the Ministry. Review all other errors and fix all errors, where possible. Do not delete any of the error summary tables, as these must be included as part of the project submission package to the Ministry.

- *TEI_Long_Tbl_CriticalFieldErrors*
- *TEI_Long_Tbl_CriticalRangeErrors*
- *TEI_Long_Tbl_DomainErrors*
- *TEI_Long_Tbl_GeometryErrors*
- *TEI_Long_Tbl_RangeErrors*
- *TEI_Long_Tbl_SummaryErrors*
- *TEI_Long_Tbl_TopologyErrors*

Step 15 – Run 'Reset Database' script (if necessary)

The 'Reset Database' script will delete data that has been loaded into the *Stage_1.gdb* by either method described in Step 6 or 7 and resets all feature classes back to an empty state. Only run this script if necessary as it will delete all existing data.

Script Parameters:

1) Path to the *Stage_1.gdb* within the *Contractor Package*:

e.g., C:\<local path>\Contractor_Package_<date>\Stage_1.gdb

Script Outputs:

1) empty feature classes within the *Stage_1.gdb*:

e.g., C:\<local path>\Contractor_Package_<date>\Operational_Data_<BAPID #>.gdb

GIS Quality Assurance and Quality Control

Step 16 – Spatial Data QA/QC

Quality Assurance and Quality Control (QA/QC) of spatial data are based primarily on the utilization of the *Contractor Package* through templates and validation tools that perform automated error detection and reporting. Providing that the data submitter ran the 'Validate Load' scripts after data capture or import, errors will either be fixed by the script or present in the error report tables to aid in the QA/QC process. However, the *Contractor Package* validation tools should not be the only QA/QC applied to the data. It is the responsibility of the practitioner to perform spatial data QA/QC to ensure accuracy and quality of the data submitted to the Ministry and that the data conform to the standards outlined in 'Terrestrial Ecosystem Information Digital Data Submission Standard' document. QA/QC of the inventory content is achieved through internal quality control procedures and/or third-party quality assurance. Guidelines are available at the following link:

<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/ecosystems/tei-standards>. It is essential that the data submitter runs through a rigorous internal QA/QC procedure including, but not limited to, the following checks:

- **ATTRIBUTES:** Verify that field names and types match those of the templates provided in the *Tools_and_Templates.gdb* provided in the *Contractor Package*. Values in the submitted feature classes and tables must also conform to the domains, ranges, and cross-field relationships as specified in the *Metadata_Items* and *Metadata_Tables* tables within the *Contractor Package*.
- **GEOMETRY:** Verify that the submitted feature classes do not contain any invalid or null geometry.
- **TOPOLOGY:** Verify that the submitted feature classes have passed the "Must Not Overlap" and "Must Not Have Gaps" topology rules. Topology errors must be eliminated before submission.
- **ADJACENT PROJECT BOUNDARIES:** Verify that the submitted feature classes coincide exactly with boundaries of adjacent projects of a similar project type and mapping scale. Gaps or overlapping areas should not exist between the polygons of the feature class being submitted and the adjacent project boundary polygon.

Review and Prepare Non-Spatial Data

Step 17 – Review Naming Conventions

Non-spatial files are to be named using the following general convention:

<broad project type>_<BAPID>_<thematic content>.<extension>

e.g., ter_2345_rpt.pdf for a terrain project report

A list of thematic content codes and broad project types can be reviewed in the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document and assigned accordingly.

Step 18 – Prepare Project Report(s)

The final project report, must be delivered in PDF format and should be named with the following convention:
<broad project type>_<BAPID>_rpt.pdf
e.g., tem_1234_rpt.pdf

The project report must contain specific sections as outlined in the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document. All appendices, figures, scanned documents, photos, legends, maps and/or other tables must be included in the project report file. Files that are submitted separately from the report should be named according to the conventions out line in the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document.

Step 19 – Prepare Field Data Non-Spatial Databases

If a digital data capture system has not been used, the field data must be entered into a digital format, such as VPro (VENUS Professional), so that it is easily stored and accessible for analysis. VPro is freeware (<https://www.for.gov.bc.ca/hre/becweb/resources/software/vpro/index.html>), developed and managed by the Ministry of Forests. All attributes submitted through the VPro application must adhere to the specifications documented in the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document and delivered accordingly.

If paper forms are filled out in the field, along with the digital data entry, they must be scanned into one PDF and submitted as per the guidance outlined in the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document.

Final Project Completion

Step 20 – Complete Project Completion Certificate

A Project Completion Certificate is required with each project submission to certify that the project data delivered is complete and meets the appropriate mapping standards (TEM/PEM/SEI/etc.), as well as specifications in the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document. A Project Completion Certificate template is provided in the *Contractor Package*.

The file name should follow the naming conventions below:
<broad project type>_<BAPID>_cert.pdf
e.g., ter_1234_cert.pdf

The practitioner must retain a copy of their work after the project has been signed off for the period of time indicated by their professional association legislation or for any period of time indicated in relevant legal documentation.

Step 21 – Complete Accuracy Assessment (AA) Reports (if necessary)

Final Accuracy Assessment reports and associated data must be included in the project submission package to the Ministry, if completed. Consult the “Protocol for Accuracy Assessment of Ecosystem Maps” for further explanation of the AA review procedures found at this site:
<http://www.for.gov.bc.ca/hfd/pubs/Docs/Tr/Tr011.htm>.

The file name(s) should follow the naming conventions below:

pem_<BAPID>_aa.<file extension>
e.g., pem_4145_aa01.pdf

If more than one AA report is delivered, each should be named sequentially:

e.g., pem_4145_aa02.pdf and pem_4145_aa03.pdf.

The practitioner must retain a copy of their work after the project has been signed off for the period of time indicated by their professional association legislation or for any period of time indicated in relevant legal documentation.

Step 22 – Complete Quality Assurance & Quality Control Reports (if necessary)

Quality Assurance and Quality Control (QA/QC) documents, if completed, must also be submitted as a PDF and must indicate which steps in the mapping process were reviewed and that the final deliverables are in accordance with the applicable standards. QA/QC reporting may be performed by a qualified third party or may be completed internally by mappers or data submitters. In both cases, the applicable QA reports and project completion certificate assuring the quality of the deliverables must be signed-off. Consult the most current version of the inventory specific QA guidelines for further explanation of the QA review procedures.

The file name(s) should follow the naming conventions below:

pem_<BAPID>_qa.<file extension>
e.g., pem_4145_qa01.pdf

If more than one QA/QC report is delivered each should be named sequentially.

e.g., pem_4145_qa02.pdf and pem_4145_qa03.pdf.

A *PreSubmission QA Checklist* is provided in the *Contractor Package* and should be submitted with final deliverables.

The practitioner must retain a copy of their work after the project has been signed off for the period of time indicated by their professional association legislation or for any period of time indicated in relevant legal documentation.

Data Submission

Step 23 – Submitting Interim Deliverables (if necessary)

Some TEI project types, specifically Terrestrial Ecosystem Mapping (TEM) projects, require the submission of interim deliverables for review and approval prior to project completion. Any proposed changes to the provincial Biogeoclimatic (BGC) linework and/or proposed new ecosystem map units must be submitted to the TEI Unit (TEI_Mail@gov.bc.ca) and approved by the Ministry of Forests Regional Research Vegetation (and BEC) Ecologist(s) prior to the production and submission of the final mapping. More information on the extent of

localized BGC mapping is available at:

http://www.for.gov.bc.ca/hre/becweb/resources/maps/index.html#bgc_mapping. For more information on proposed ecosystem map codes and linework submissions refer to the in the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document.

Once approved by the Ministry of Forests Regional Research Vegetation (and BEC) Ecologist(s), the data custodian will be notified, and the mapping can be finalized.

Step 24 – Submitting Final Deliverables

Deliverables must be placed in a single ZIP file, using the standard folder structure, file formats and naming conventions specified below. All non-spatial files are to be delivered in the ZIP folder with the format and naming conventions outlined in 'Terrestrial Ecosystem Information Digital Data Submission Standard' document. The spatial files are to be delivered in the same ZIP folder using a subfolder named <project type>_<BAPID>_Spatial. Example deliverable folder and file structure:

```
tem_1234.zip
  tem_1234_spatial
    Operational_Data_1234.gdb
  tem_1234_rpt.pdf
  tem_1234_eci.mdb
  tem_1234_wl.pdf
  tem_1234_qa.pdf
  tem_1234_cert.pdf
```

Refer to the 'Terrestrial Ecosystem Information Digital Data Submission Standard' document if submitting any non-standard spatial data files (e.g., shapefiles, CAD based files, etc.), plot files (e.g., HPGL/2: HP2, Raster Transfer Language: .RTL, .PostScript: PS, etc.), and non-spatial files that are in non-standard formats.