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Electronic Letter of Interpretation (e-LOI) SHAPEFILE CREATION & TECHNICAL GUIDE

A Technical Guide for the Shapefile Requirements of the e-
LOI Submission Process



Department of Environmental Protection
Division of Watershed Land Management
Bureau of Program Development (GIS)



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Section 1 Preparing Electronic LOI Shapefiles

The following instructions provide an overview of shapefiles, required shapefile extension files, and the desired structure of a shapefile’s attribute table. Additionally, downloadable links are provided below for users looking for empty shapefile templates to help configure the required fields.

Esri’s **ArcGIS desktop software** (ex. ArcGIS Desktop and ArcGIS Pro) can generate shapefiles at all licensing levels. **Quantum GIS (QGIS)** is a free, open-source desktop GIS application that also provides capabilities for creating Esri shapefiles and includes several file conversion utilities. While the electronic service does not accept CAD files, Autodesk’s AutoCAD Map 3D provides the option to export CAD files to Esri shapefiles. However, exported CAD files that are converted to shapefiles must contain all required extensions. Programs such as ArcGIS desktop software or Quantum GIS may be required in order to configure the shapefiles properly.

1.1 What is a Shapefile?

A shapefile is a simple format for storing location and attribute information of geographic features. Geographic features in a shapefile can be represented by points, lines, or polygons (areas). Shapefiles may also contain attribute tables, which can store information that is associated to a feature within the shapefile. The appearance of these attribute tables is similar to a spreadsheet and can be viewed in any GIS-based software, as well as CAD-based applications.

For this online submission service, lines and points are not accepted as valid shapefiles. The service requires a shapefile with a closed polygon boundary that delineates a site, footprint of disturbance, wetlands, and/or transition area. The shapefile must contain an attribute table that follows a specific schema outlined in Appendix A.

1.2 LOI Shapefile Types

There are empty shapefile templates available for users to download in Section 1.4. The following table indicates which shapefile templates are required for different LOI types:

Table 1 - Shapefile Template Types

LOI Type	Shapefile Template			
	Site*	Footprint	Wetlands	Transition Areas
Presence/Absence	Required	N/A	N/A	N/A
Footprint of Disturbance	Required	Required	N/A	N/A
Line Delineation	Required	N/A	N/A	N/A

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LOI Type	Shapefile Template			
	Site*	Footprint	Wetlands	Transition Areas
Line Verification	Required	N/A	Required If Present**	Required If Present**

*A **Site Shapefile** contains the legal boundary of the project, typically parcel(s) are used to determine the site boundary. If there is more than one parcel for a project, the site polygon must represent the outer boundary of the parcels combined. For a right-of-way, the site boundary must be the legal boundary of the property or right-of-way of all contiguous land owned or controlled by the same person(s). Review to [N.J.A.C. 7:7A 1.3](#) for the full definition of “site”.

**For Line Verification LOI’s, a site may contain wetlands and/or transition areas onsite or wetland and/or transition areas offsite that extend within the site boundaries. The application requires a minimum of wetlands or transition area shapefiles to be uploaded with the site shapefile. However, the user should include both if they are present within the boundaries of the site.

Note: All features in the shapefiles for an LOI submission must be closed polygons. If there are wetlands and/or transition areas that extend beyond the site boundaries, the polygons must be clipped to the site boundary. Notice in the example below (Figure 1), the wetlands extend outside of the site boundary shown in red (Figure on the left). For the purposes of the ELOI, the wetlands have been clipped to the boundary of the site (Figure on the right).

Figure 2 - Wetlands Clipped to Site Boundary



1.3 Shapefile File Extensions

When a shapefile template is downloaded, there are **five** required file extensions within the downloaded folder [.shp, .shx, .dbf, .prj, .shp.xml]. There may be other shapefile extensions after editing & saving a project in GIS software [i.e., .cpg, .sbn, and/or .sbx]; these

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files are optional and will not hinder your submission if present within your zipped folder submission.

Figure 2 - Example of File Extensions within a GIS Shapefile

Name	Type
LOIPA_Site_FWL11Test.shx	SHX File
LOIPA_Site_FWL11Test.shp	XML Document
LOIPA_Site_FWL11Test.shp	SHP File
LOIPA_Site_FWL11Test.sbn	SBN File
LOIPA_Site_FWL11Test.prj	PRJ File
LOIPA_Site_FWL11Test.dbf	DBF File
LOIPA_Site_FWL11Test.CPG	CPG File

The first three file extensions are the basic parts that comprise an Esri shapefile:

- *your_shapefile_name.shp* – contains the feature geometry (shape) data.
- *your_shapefile_name.shx* – the index file.
- *your_shapefile_name.dbf* – contains the feature attribute table data.

The shapefile template contains a shapefile [**.shp**] consisting of an empty file (containing no polygon features) and must be populated prior to submitting an eLOI. The index file [**.shx**] is compiled from the **.shp** file and does not need to be edited. The attribute table file [**.dbf**] has the required table structure & parameters including field names, field widths, and data types. This attribute table must be populated by the user.

The next two file extensions are required by the DEP and are just as important:

- *shapefile_name.prj* – contains the coordinate system information.
- *shapefile_name.shp.xml* – contains the shapefile’s ‘metadata.’

The projection file [**.prj**] is a text file (but with a **.prj** filename extension, not .txt) containing the shapefile’s spatial reference parameters. It is already set with the mandated spatial reference system parameters (New Jersey State Plane coordinate system, **NAD83** horizontal datum) and does not need to be edited. *It is important that applicants create their shapefiles with the NAD83 datum in order for the .prj file to be accepted within the service.* Be advised that the root name of the **.prj** file must match the root name of the **.shp**, **.shx**, and **.dbf** component files (e.g., ‘shapefilename.shp’, ‘shapefilename.shx’, ‘shapefilename.dbf’, ‘shapefilename.prj’).

The metadata file in the template [**.shp.xml**] is the vital “who, what where, why, how” of the shapefile’s data. The template has most of the metadata fields prepopulated with standardized information required for an eLOI shapefile; However, this file must be edited to



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provide application information unique to the site (e.g. surveyor name, dates, etc.). An applicant may download the shapefile templates and edit the metadata file to include specific information, then use this modified template set as a basis for creating new LOI shapefiles.

The information is maintained using the XML format, a standard data file exchange format that can be opened with a text editor. However, *editing an XML file in this fashion is not recommended*. It can be confusing or difficult for those not familiar with the XML file structure.

The U.S. EPA has developed a metadata editor, the EPA Metadata Editor (EME). EME is a [free download](#) and does not require a desktop GIS application to be resident on the same computer.

A template can be customized to include information specific to an organization (e.g., the firm’s name, their standard practices for performing surveys, methods used, accuracy statement, etc.) for any items that would vary little from project to project.

- *shapefile_name.sbn*– store the spatial index of the features
- *shapefile_name.sbx*– store the spatial index of the features.

The final two file extensions - the **.sbn** and **.sbx** files – are added to the shapefile folder and are updated when a shapefile is edited and saved within a GIS application. These files help to store minor spatial index information and do not need to be edited; they are completely optional for this electronic service.

All five primary component files listed within this section *must* be compressed together into a single zipped file (.zip extension) that will serve as your GIS data upload file.

1.4 Download Shapefile Templates

- You can download empty (devoid of features) LOI shapefile templates that have the required attribute table structures for a **Site**, **Footprint of Disturbance**, **Wetland**, or **Transition Area** ([use section 1.1 as guidance](#)). Click on links below to download.

Site (Shapefile Type 'S')	Wetlands (Shapefile Type 'W')
Footprint of Disturbance (Shapefile Type 'F')	Transition Areas (Shapefile Type 'T')

- Save this file to your computer drive.



Section 2 CAD Workflow

Every organization, including survey and engineering firms and/or the individuals within those firms, will have a workflow for creating CAD files. We suggest that for those firms and individuals who plan on submitting e-LOI applications to the Division, changes be made in that workflow to accommodate the following requirements which will be necessary to successfully convert CAD files to Shapefiles.

2.1 CAD Conversion Checklist

- ✓ CAD files should be georeferenced into the NJ State Plane Coordinate System, NAD 83 datum, US Feet units, or the data export routine must be configured to correctly re-project the output shapefile to this system.
- ✓ Layers in CAD must be created as closed polygons prior to shapefile conversion. This requirement includes the site boundary layer and any other required layers such as a footprint of disturbance layer, wetlands layer and/or a transition area layer (See [Section 1.2](#)). Boundaries for wetlands and transition areas that extend beyond the site boundary must incorporate the site boundary in order to close and form a complete polygon.
- ✓ Wetland and/or transition area layers may contain multiple polygons and there may be instances where a wetland polygon contains upland areas. This should be shown as a polygon with one or more “donut holes” in it. The complete polygon is defined by its external boundary ring (an array of coordinates) and any internal rings representing the holes.
 - Optional: If possible, the polygons should be “unfilled” so that just the border appears. If the polygon is filled, some level of transparency should be applied if possible.
- ✓ All CAD files to be converted should have the layers to be converted clearly labeled: Site Boundary, Footprint of Disturbance, wetlands and/or a transition area.
- ✓ Each LOI feature type (site, footprint of disturbance, wetland, and transition area) should have its own dedicated layer defined in the CAD file. In this way all wetland polygons are stored in the wetland layer, all transition area polygons are stored in the transition area layer. No other CAD file features are to be stored in these layers.
- ✓ A further challenge when exporting from CAD to shapefile is the integration of the necessary LOI feature attributes (as described in Appendix B). Typically, CAD file layer attributes describe drawing parameters for the lines that make up the drawing (Layer, Color, Line type, Line weight, etc.) but not the kind of descriptive feature attributes (LOI type, LOI feature type, Firm name, Surveyor, etc.) that are necessary for the exported

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shapefile. The drawing parameter attributes are not expected to be included in the resultant shapefile, only the descriptive LOI feature attributes.

Section 3 Preparing CAD Files to Shapefiles

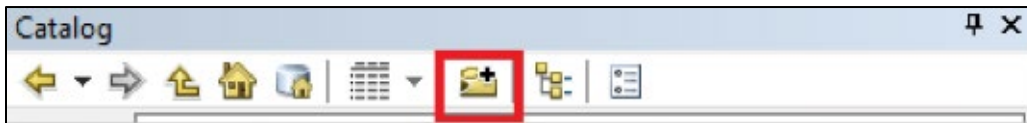
3.1 Instructions for ESRI ArcGIS Software

The following instructions show step-by-step guidance using ESRI Software (ArcMap) to convert CAD Files into shapefiles for the E-LOI service. You may use any software that works for you.

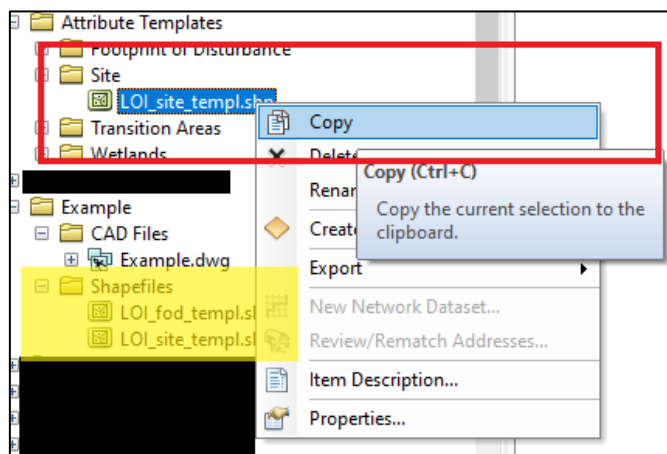
- To prepare, download the shapefile templates required for your project in [Section 1.4](#).

3.1.1 Setting up your Shapefiles

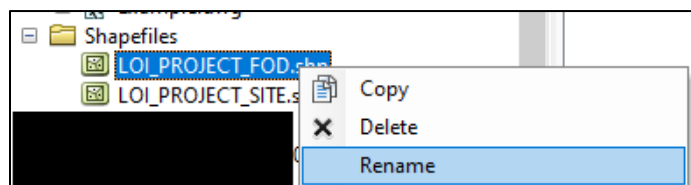
- Set up a connection to your templates in the catalog pane.



- Copy and paste the templates into your working folder. You can right-click **copy** on the shapefile in catalog and right-click **paste** within the destination folder. In this example, we will create a Footprint of Disturbance (FOD) application. A FOD application requires a site shapefile and a FOD shapefile.

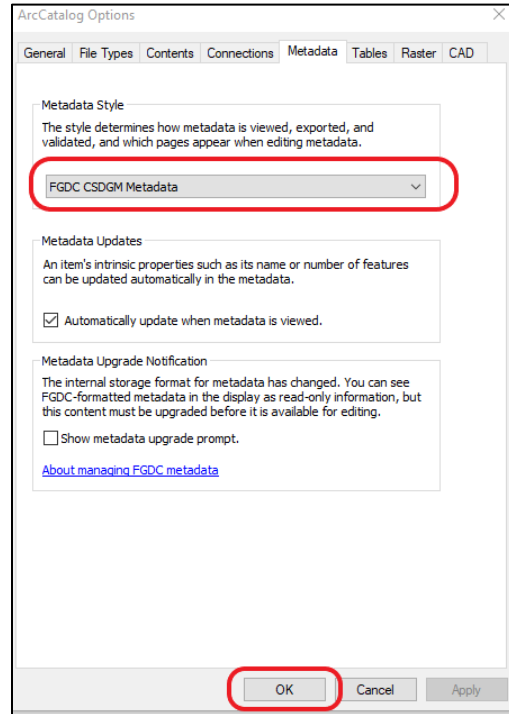


- Rename the template to your project (right-click **Rename**).

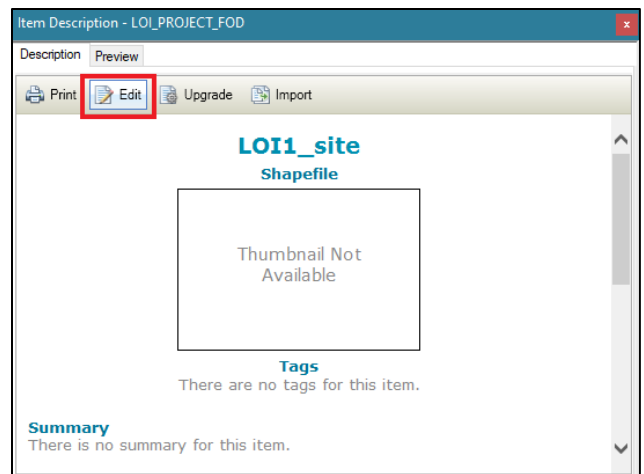



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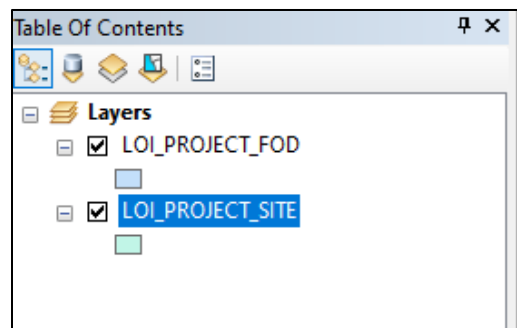
- Update the metadata of the shapefile(s). Metadata should be in the style of the [FDGC Metadata Standards](#). **Open ArcCatalog** and select **customize** (on the top menu bar) and click on the **metadata** tab. **Select the FDGC CSDGM Metadata Style** in the window and click **ok**.



- You can close ArcCatalog and open ArcMap and navigate to the shapefile that you created. Right-click on the shapefile in the catalog window and click **item description**. Click **edit** in the window pop-up and updated the **tags, summary, description, use limitations, contacts, credits** (all that is applicable).



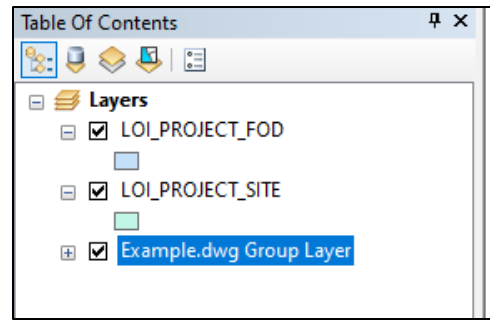
- Add the shapefiles that you prepared into the **Table of Contents** pane by dragging them from the **Catalog** pane or by using the **Add Data** button 



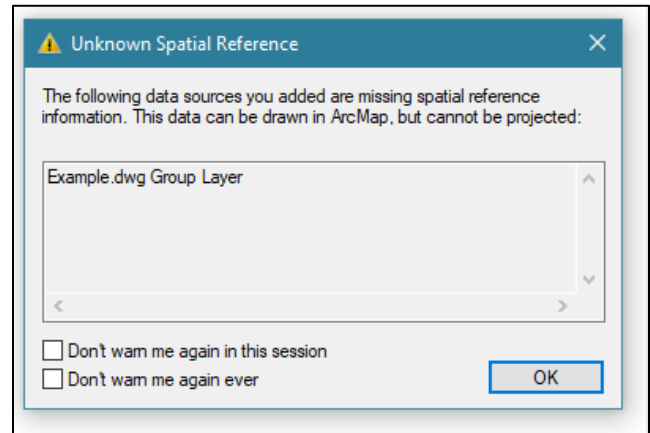
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3.1.2 Converting CAD Files to Shapefiles

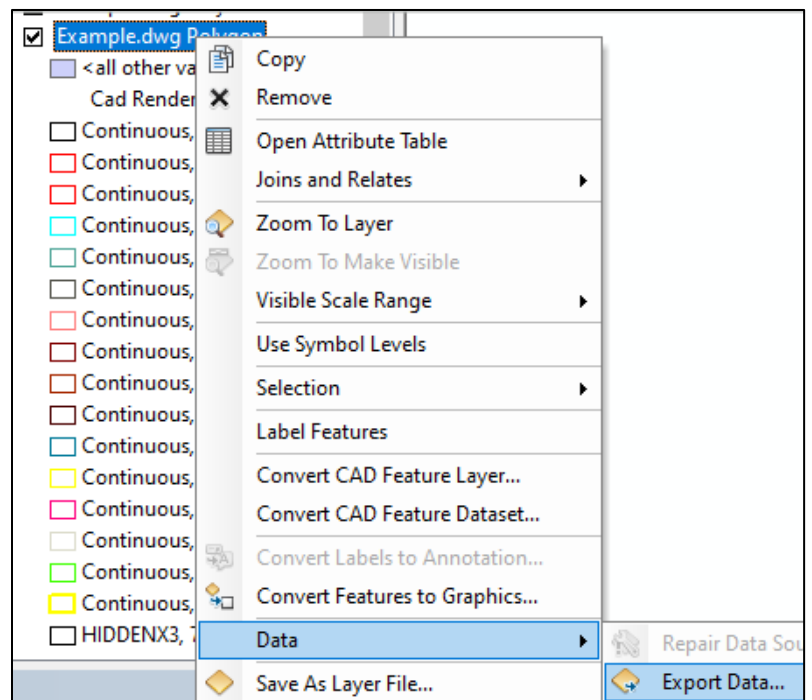
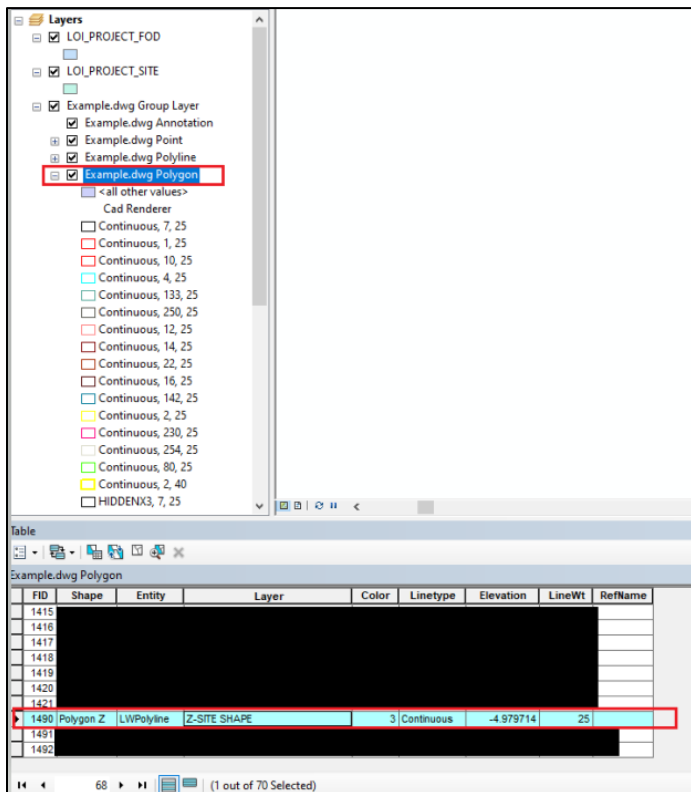
1. **Add** your CAD File to the **Table of Contents** pane: use the catalog to either drag the file into the map or use the add data button



2. If the CAD file did not have a defined projection, you will need to convert the create polygons into shapefiles. Click **ok** in the **Unknown Spatial Reference** window.

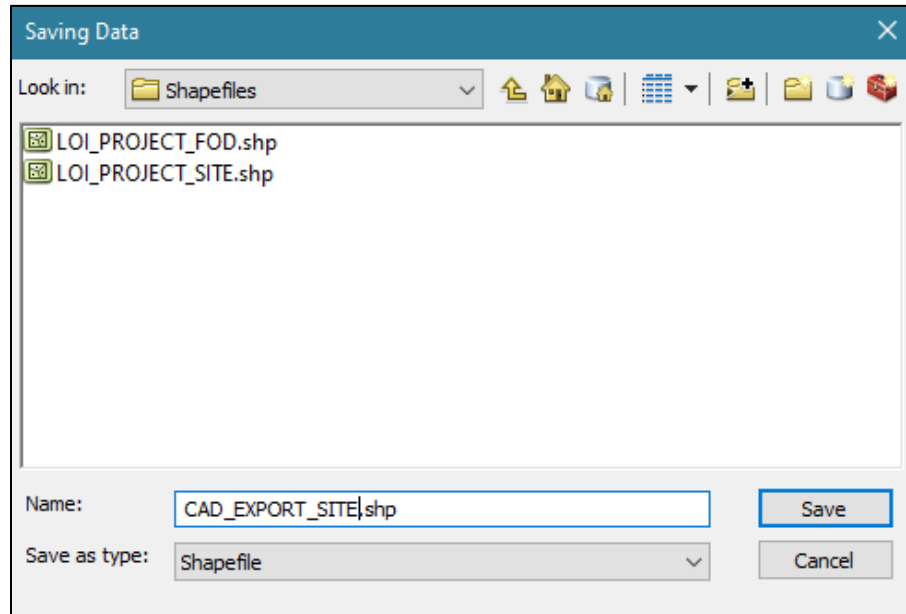


3. Open the attribute table of the **polygon layer** in your CAD file and **select/highlight** your **site polygon**. Right-click on the polygon layer and select **Export Data**.

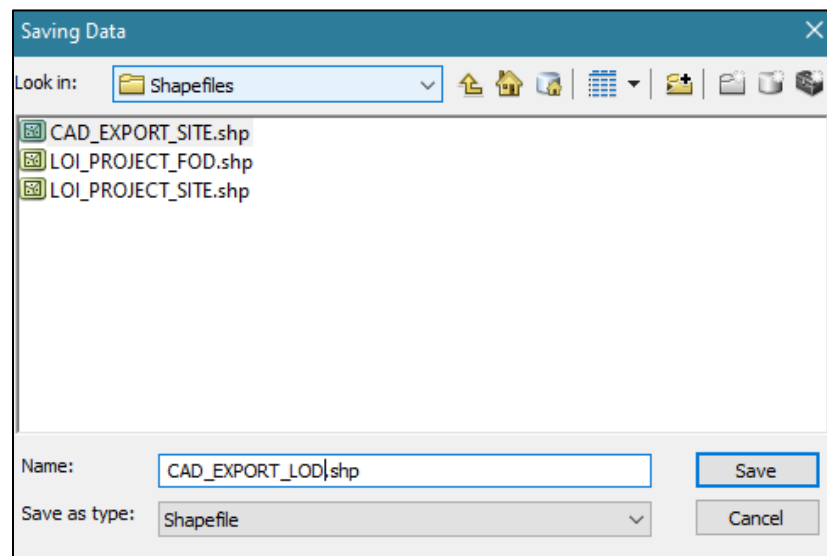


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4. Save and name it in your working folder (this is a temporary shapefile you will use to help you fill the template).

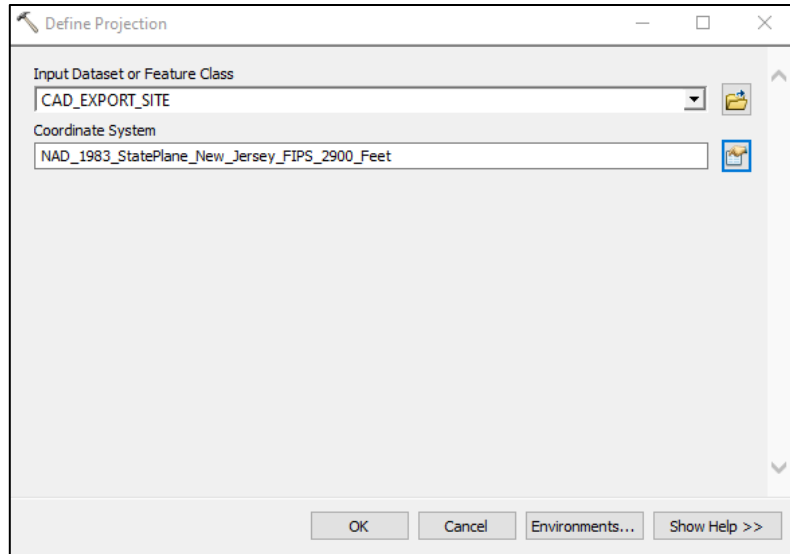


5. Repeat step 3 and 4 for your other shapefiles (footprint of disturbance, transition area, wetlands). In this example only a footprint of disturbance and site shapefile is required.



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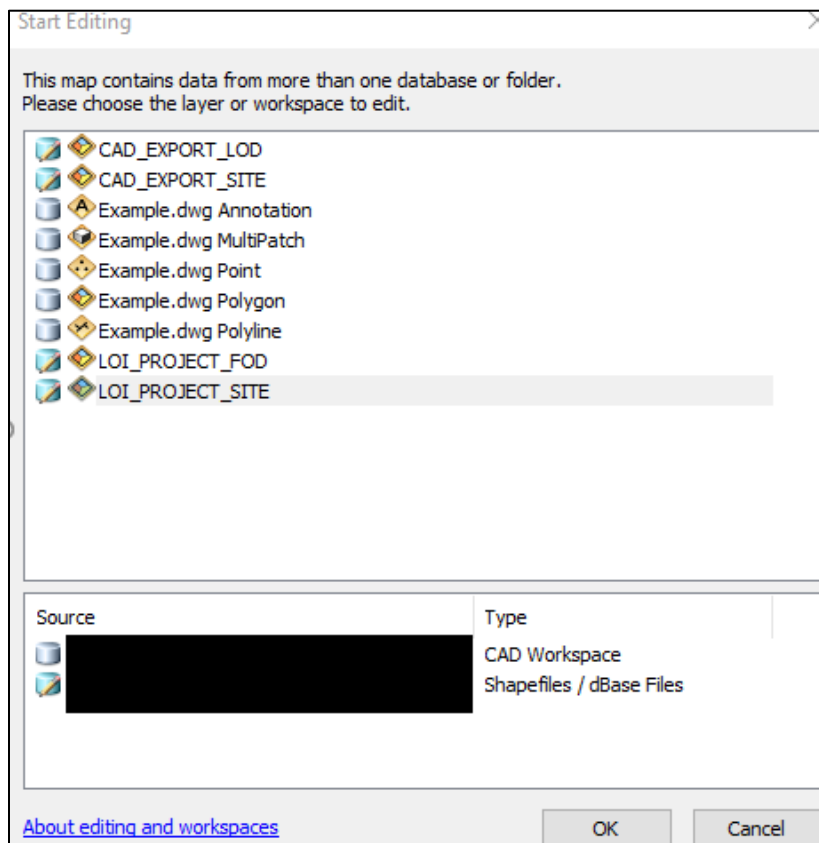
- Project your shapefiles in the NAD 1983 State Plane New Jersey exported from CAD by using the **Define Project** tool. **Repeat this step for all the CAD Exported Shapefiles.**



- Start **Editing** the **template site shapefile** by using the editor tool bar.

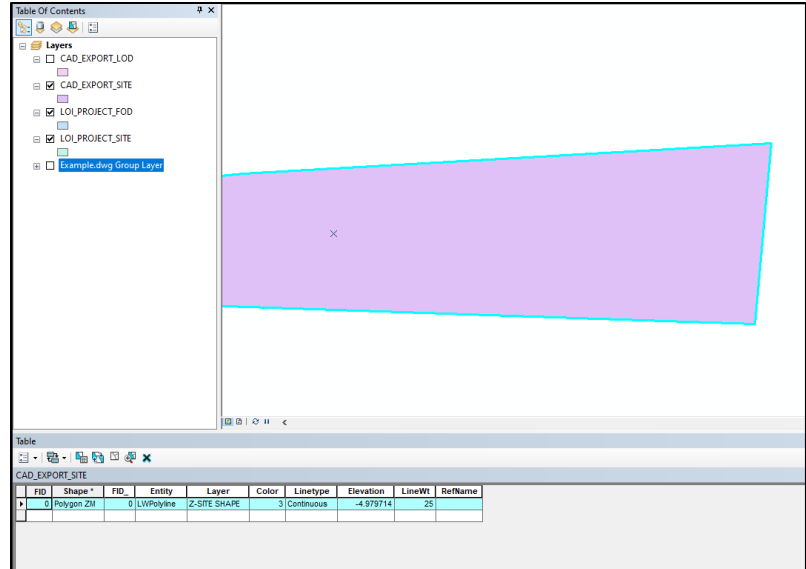


- Select** the template site shapefile and click **ok**.



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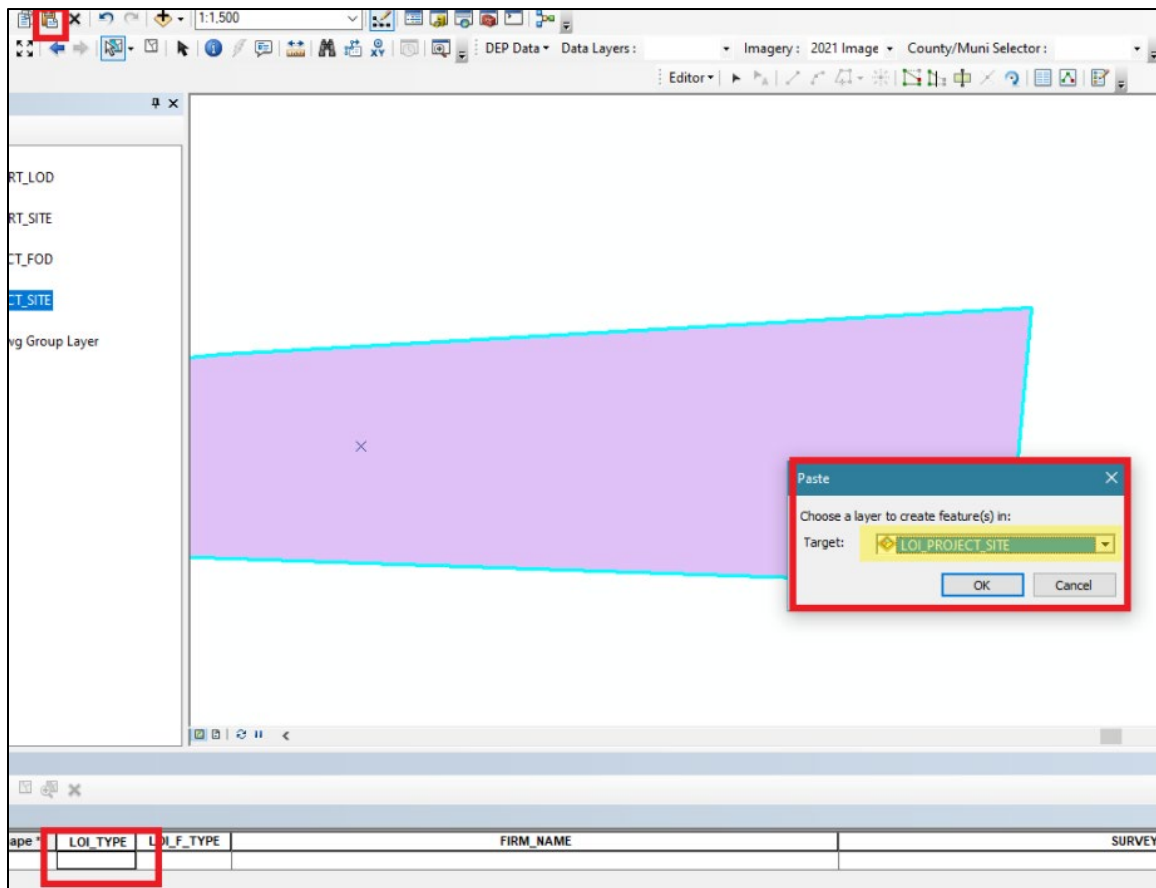
9. **Select** the polygon from your CAD exported shapefile by using the ***select tool*** or by ***opening the attribute table and highlighting the row.***



10. Click on the ***copy*** icon located on the top menu bar



11. **Open** the attribute table of the template site shapefile, click inside the empty row, and click on the ***paste*** icon. **Select** the template site shape file (i.e. LOI_PROJECT_SITE) as the target destination.

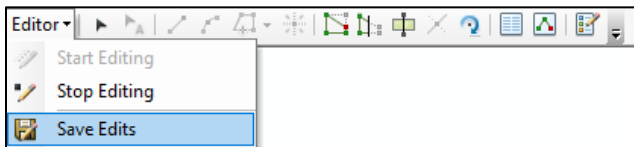


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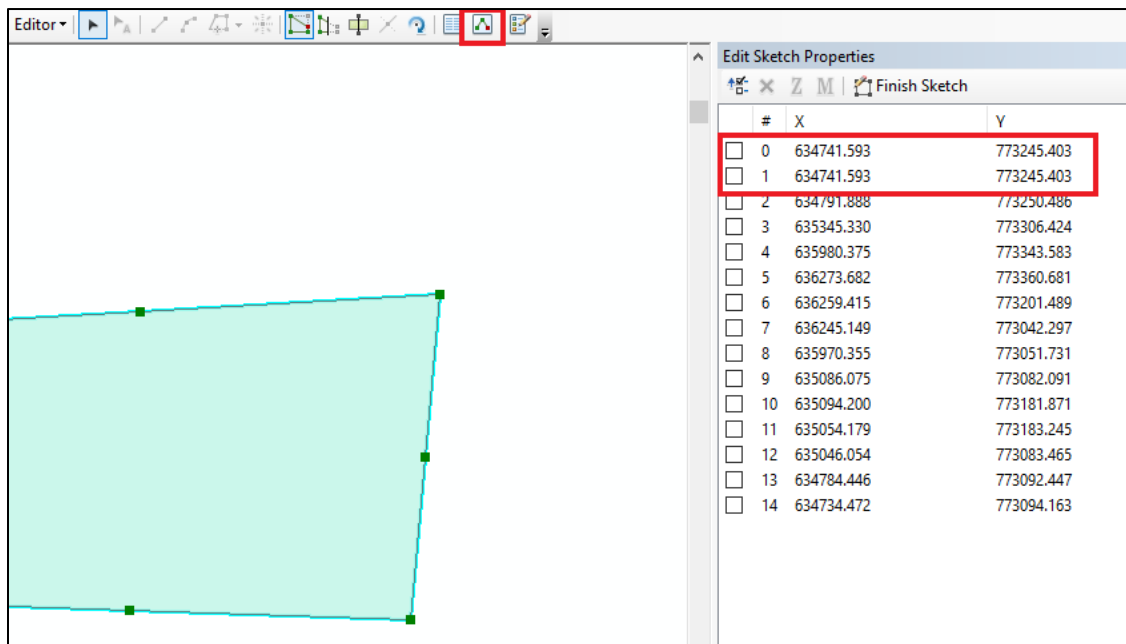
12. **Edit** the attribute fields accordingly (use [Appendix A](#) to help).

FID	Shape *	LOI_TYPE	LOI_F_TYPE	FIRM_NAME	SURVEYOR	LIC_NUM	PLAN_DATE	REV_DATE	HPOS_AC_RP	HPOS_AC_V	LOG_CON_RP
0	Polygon	FWL4	S	Example Firm	FIRST LAST NAME	123456789	1/1/22	12:00:00 AM	<0.1 m - related	Explain	Explain

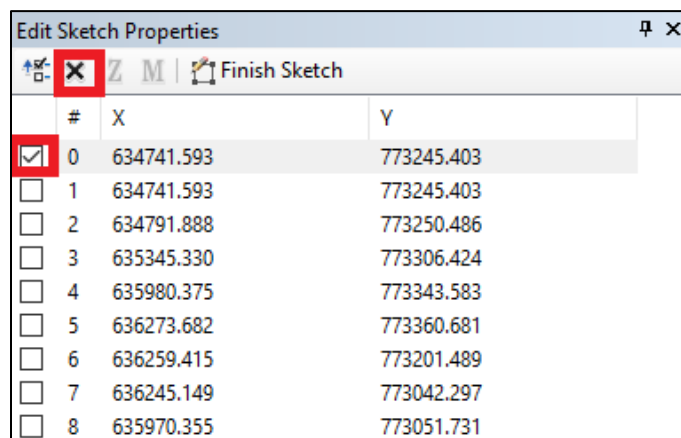
13. Click **save** in the editor tool bar.



14. Check for any duplicated vertex points by clicking on the **sketch properties** icon located in the editor toolbar and double click on the polygon boundary to activate the window.



15. Notice there are two vertices that have the same coordinates. To delete, check one of them and click on the x to remove it.



16. **Save** your edits.

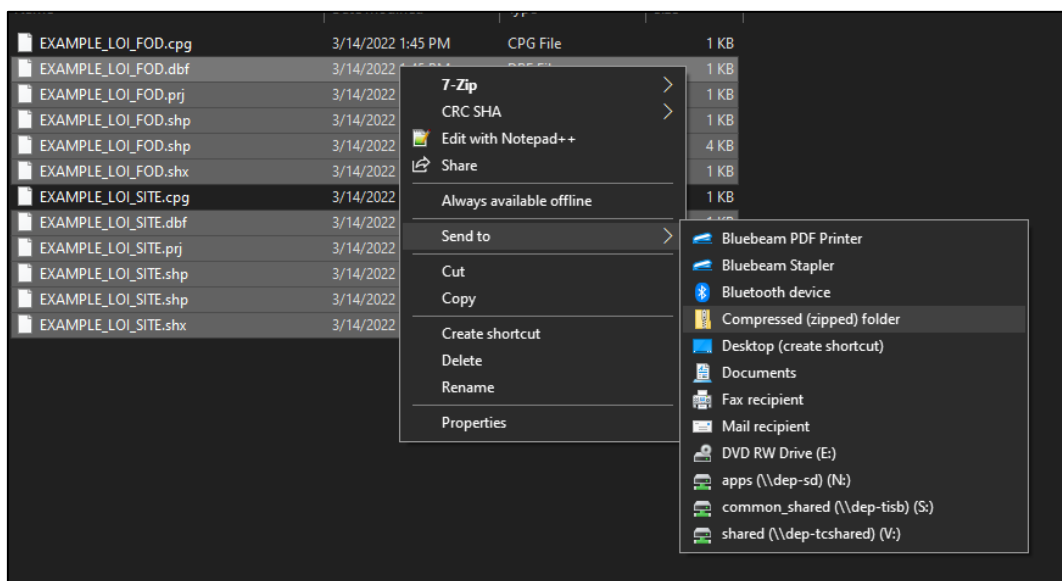
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17. **Repeat** 7-15 for your other shapefiles (Footprint of Disturbance, Wetlands, and/or Transition Area). Please be sure to that any footprint of disturbance is under 1 acre in size and is within the boundary of the site. In addition, if there are wetlands or transition areas that extend offsite, please clip the polygons to the site boundary (regardless of what is on the PDF survey). You can use the **clip tool** in the [ArcToolbox](#).

3.1.3 Zip the shapefile

After you have compiled the shapefile(s) and tables, the information must be combined into a zip file. To zip a file, open File Explorer and locate the files or folders that your shapefiles are stored in. Windows refers to a Zip file as a “compressed folder,” so the terms are interchangeable in this case. *NOTE: Only one zip file per service, so for submissions with multiple shapefiles, be sure to have all of your polygon files together into one zip file.*

1. In windows explorer click select all the extension required **.dbf, .prj, .shp, .shp.xml** (this extension may online list .shp but the type will read XML document see above), **.shx** and right click → **Send to** → **compressed (zipped) folder**.



3.2 Instructions for QGIS (Open-Source Software)

The following instructions show step-by-step guidance using open-source software (QGIS) to covert CAD Files into shapefiles for the E-LOI service. You may use any software that works for you; however, this is just one option that is available for anyone.

- To prepare, download the following:
 - The shapefile templates required for your project in [Section 1.4](#)
 - [QGIS Software](#)

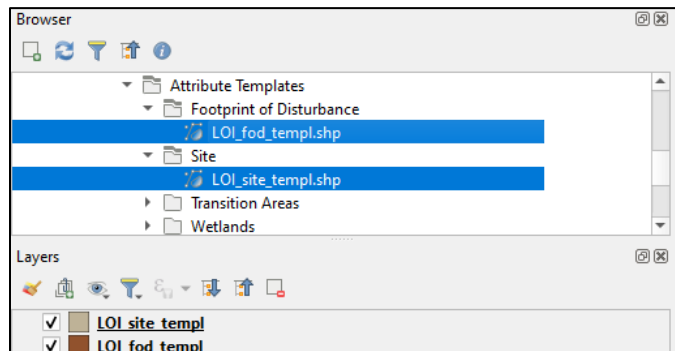
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- A free file converter from dwg format to DXF (search through web browsing or use your CAD program if it has that ability)
- Export your .dwg file or .dgn files into .dxf files (using your CAD program or a file converter online)
- Open QGIS

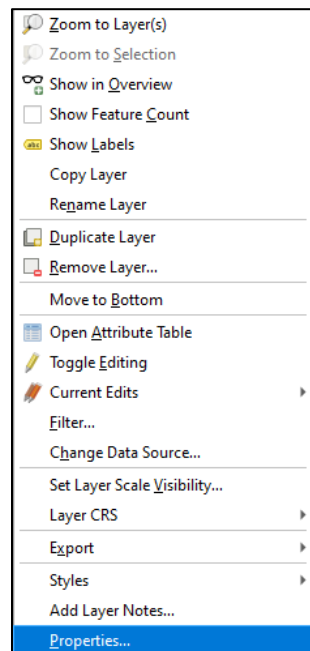


3.2.1 Setting up your shapefiles

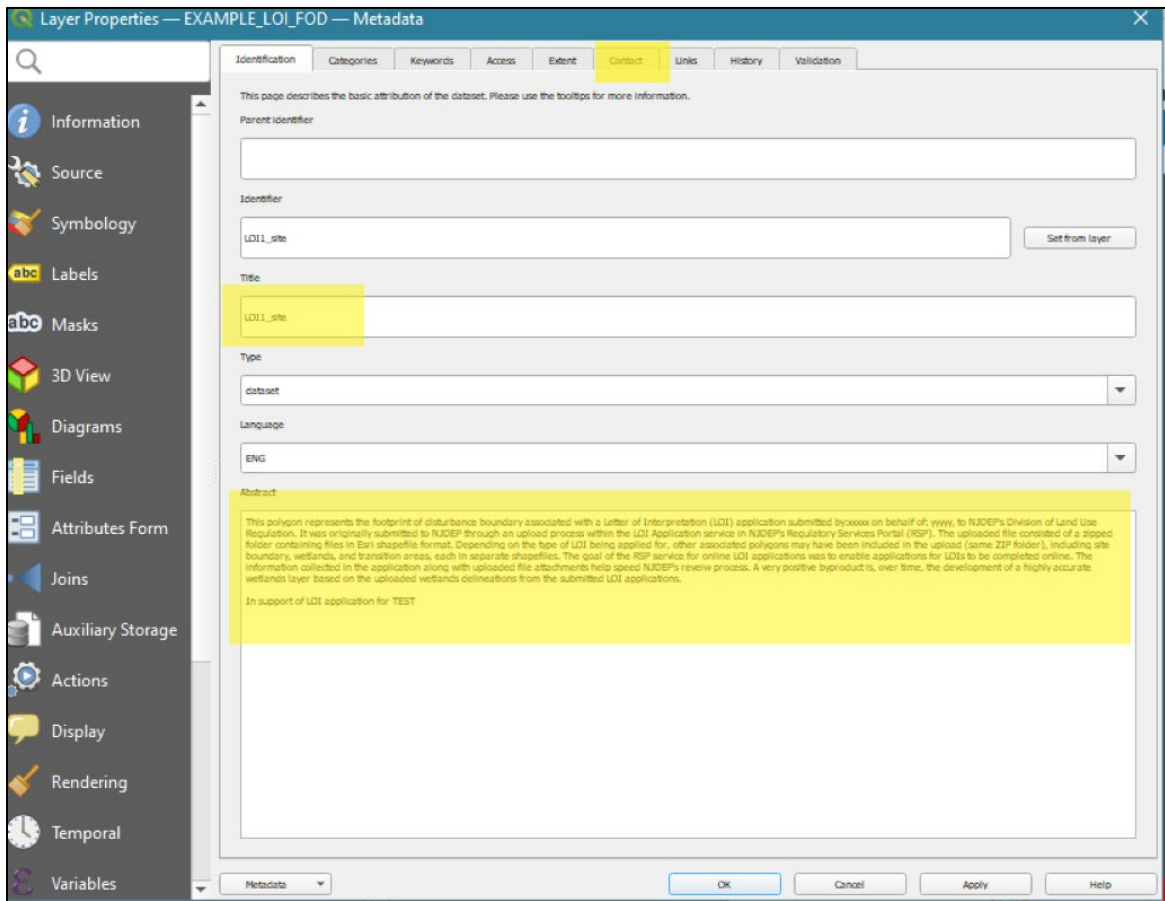
1. **Add** the Shapefile Templates into your map, by dragging them in from the Browser and into the map.



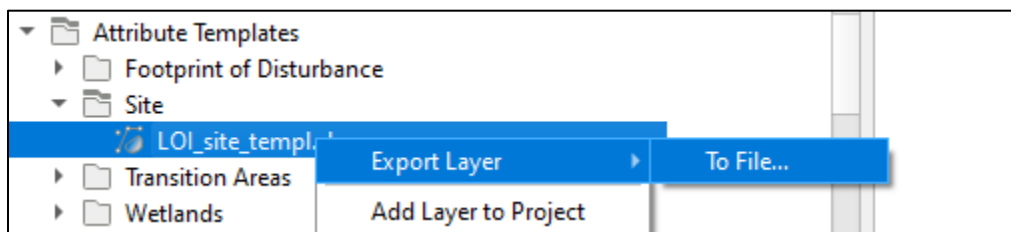
2. **Right-click** on a template (i.e. LOI_site_tmpl) and click **properties**.



3. **Edit** the metadata such as the *title, abstract, and contact*.

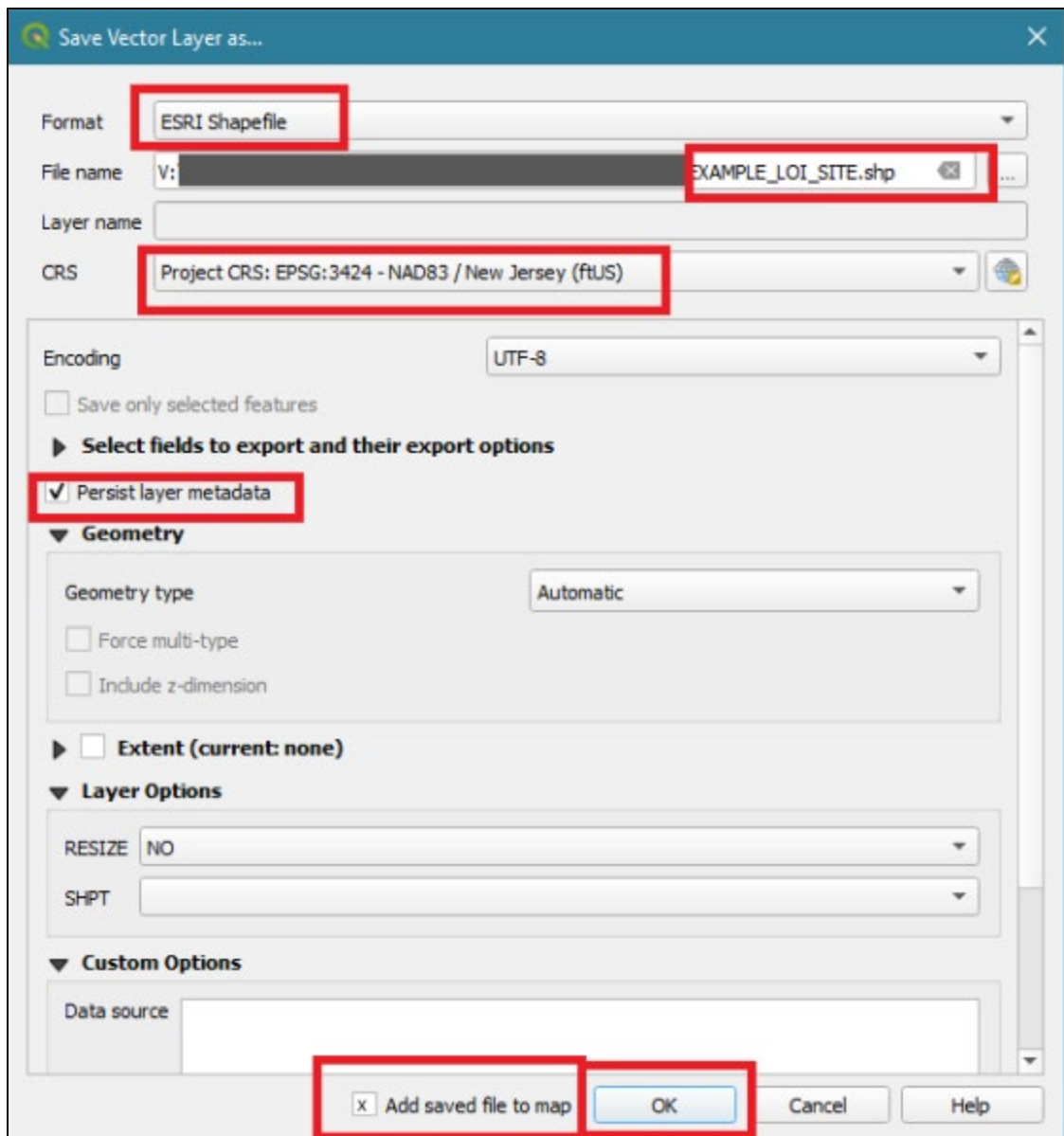


4. **Repeat** this for all templates that you will use. You are now ready to create a copy of your template.
5. Make a **copy** of the template shapefiles. In this example, we will create a footprint of disturbance application. A FOD application requires a site shapefile and a FOD shapefile.
6. **Copy** the shapefile templates by using the browser in QGIS to find the file location and **click export layer to file**.



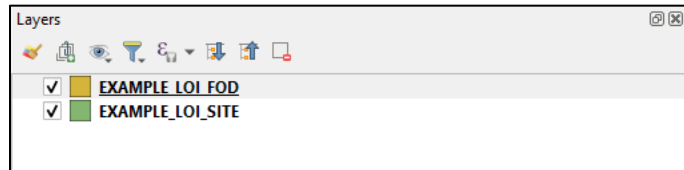
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7. **Select ESRI Shapefile**, **save** the file name and location as desired, **select** the CRS (Coordinate Reference System) to *Project CRS: EPSG:3424-NAD83 / New Jersey (ftUS)*, **select persist layer metadata**, **select Add saved file to map**, **click ok**.

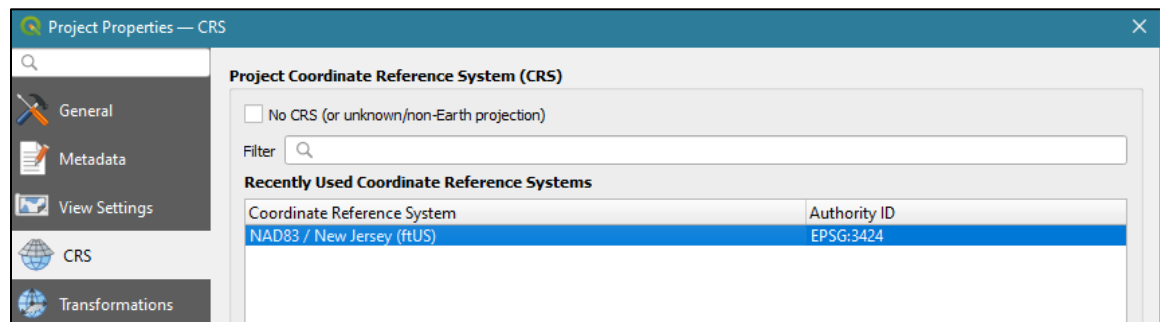
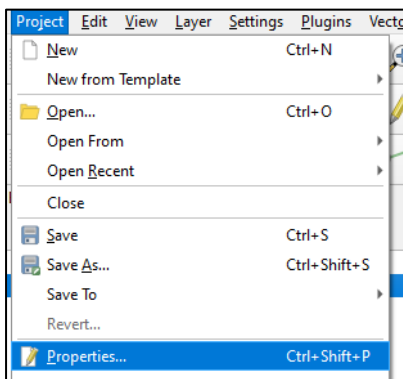


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8. **Repeat** for other templates to be used (in this example we need a *footprint of disturbance* and *site* template. Once the layers are added to the map, they will appear in the layer list.

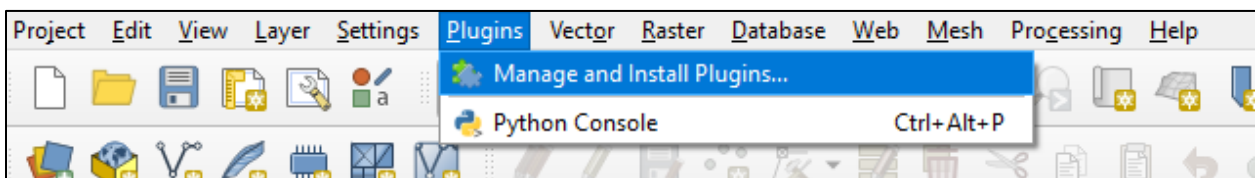


- a. Check that the map properties have the correct coordinate reference system. Click on **Project** → **Properties** → **CRS**

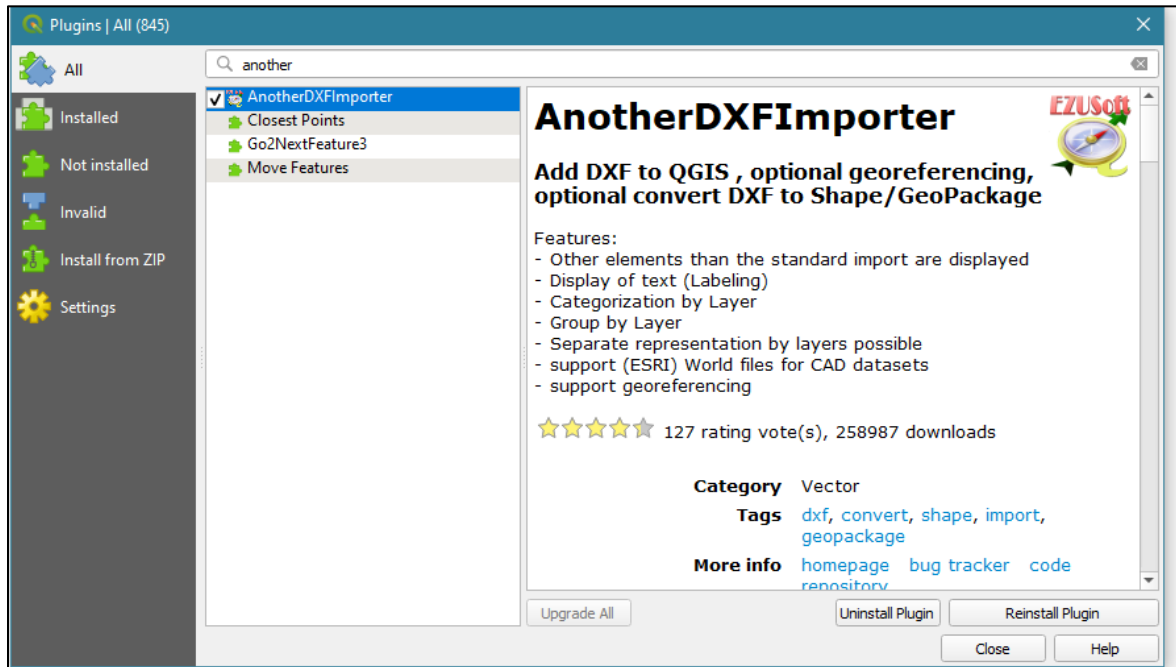


3.2.2 Converting CAD Files to Shapefile

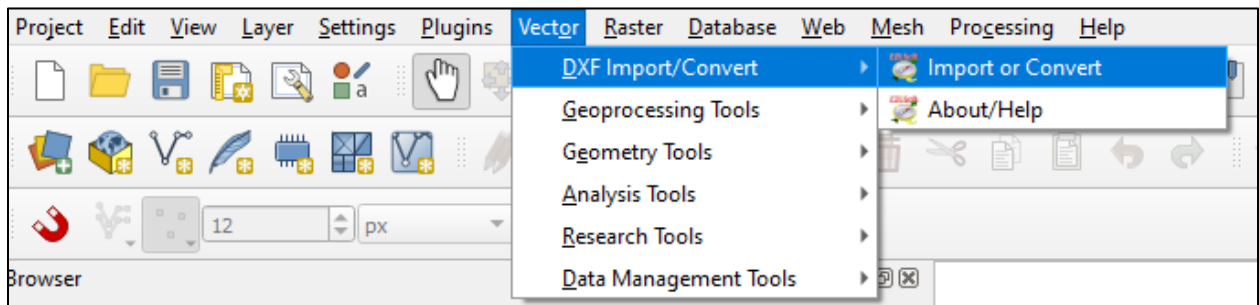
1. **Install the *AnotherDXFImporter* Plug-In.**
2. **Click *plugins*** on the top menu and ***manage and install plugins***.



3. Search for *AnotherDXFImporter* and click *install plugin* on the bottom.

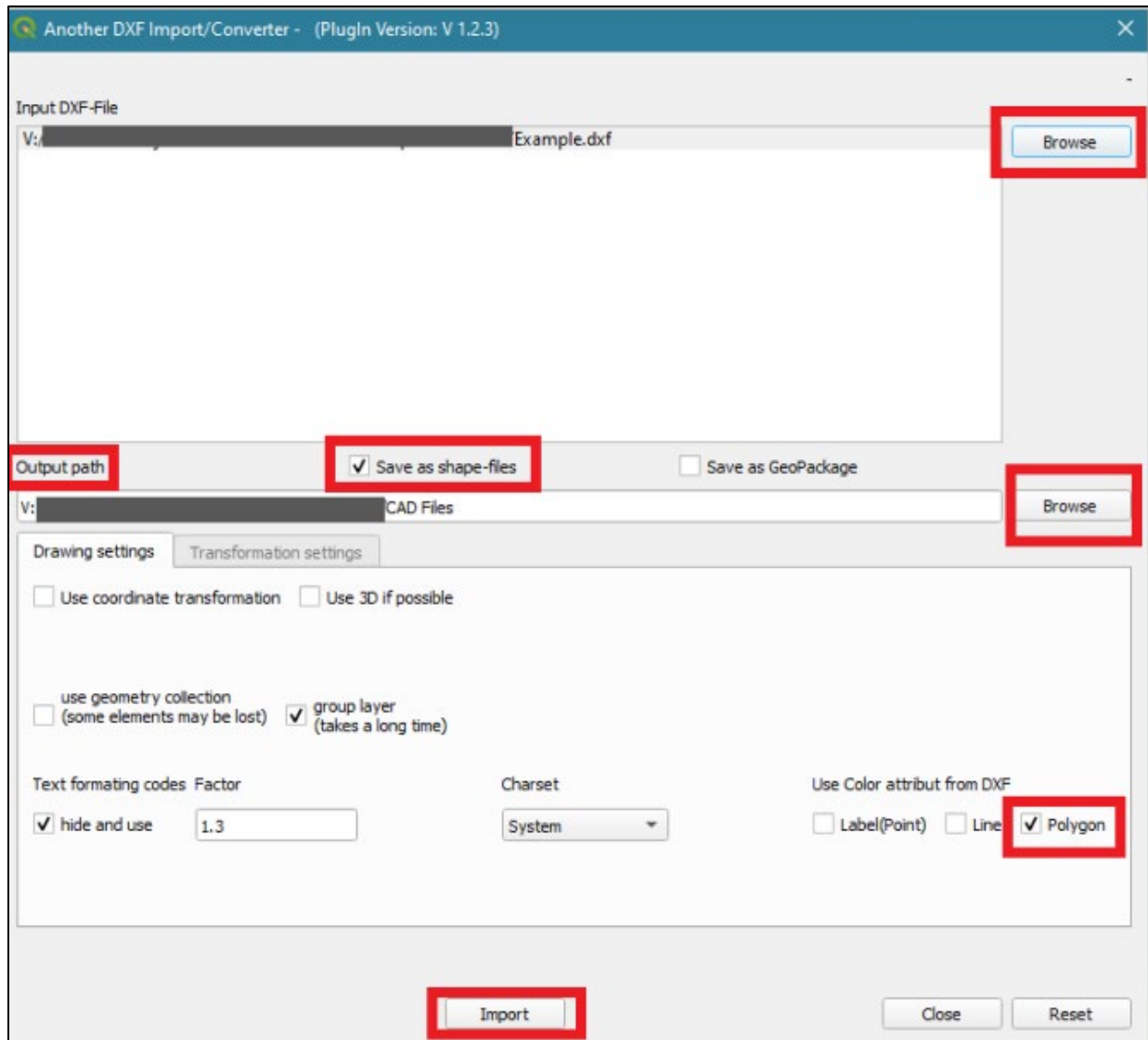


4. Once complete click *close*.
5. Check to see that the plug in is installed and open the converter under *Vector* → *DXF Import/Convert* → *Import or Convert*.



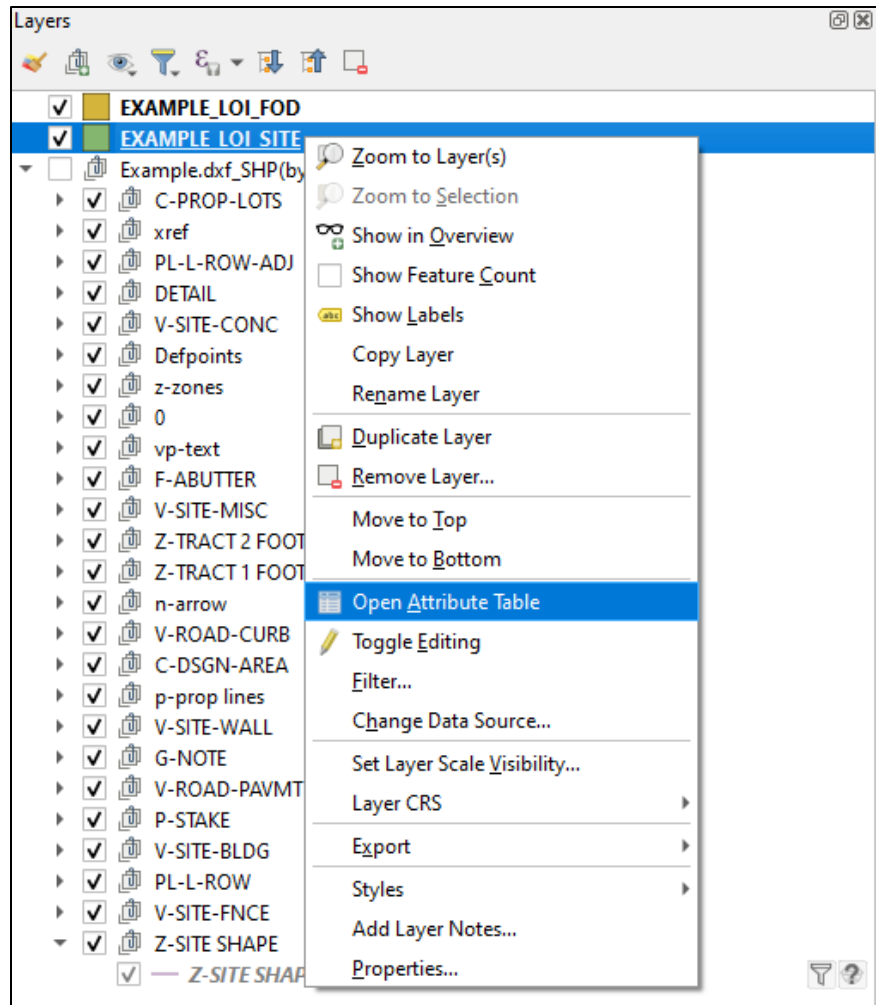
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6. Select the **DXF File**, output path, click **Save as shape-files**, click **Polygon** (This is optional as it just selects the color based on the polygon), and **click import**. You will see the CAD files appear in the layer list (**click close** when complete).



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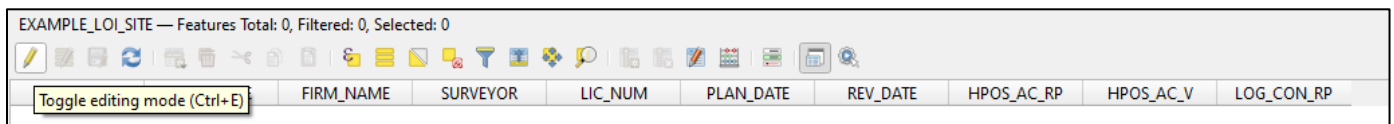
- Open the attribute table of your *LOI Site Template*, right-click on the layer and select *open attribute field*.



- Dock your attribute table to the application by clicking on the dock button.



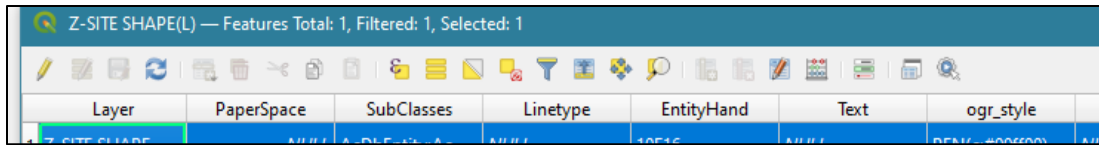
- Click on *Toggle editing mode*.



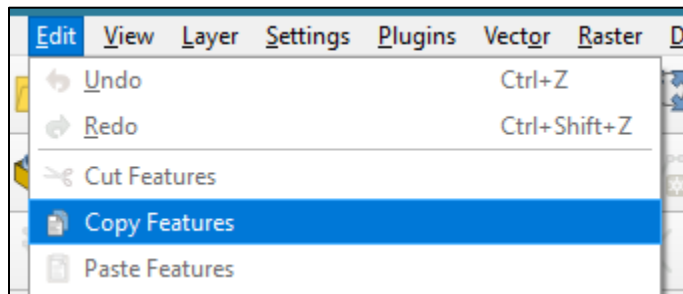
This will enable editing mode for the layer you selected.

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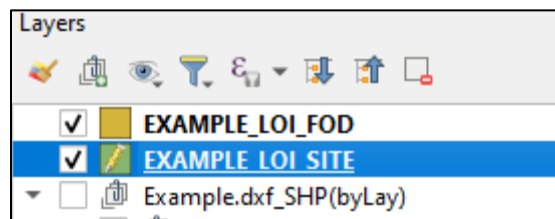
10. **Right-click** on your CAD Polygon Site Layer and open the attribute table. Highlight the row/polygon you want to copy into the *LOI Site Template*.



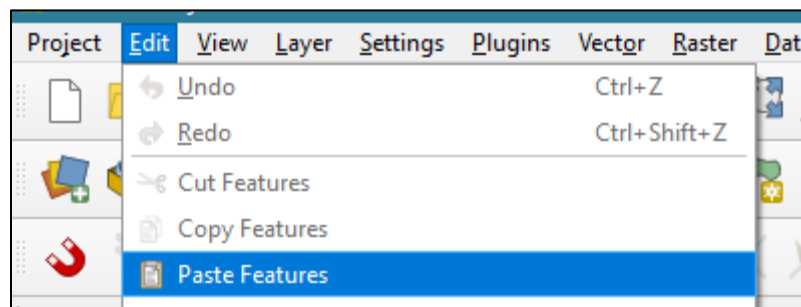
11. Click **Edit** and **Copy Features** in the menu bar on the top.



12. Click on the *LOI Site Shapefile Template*.

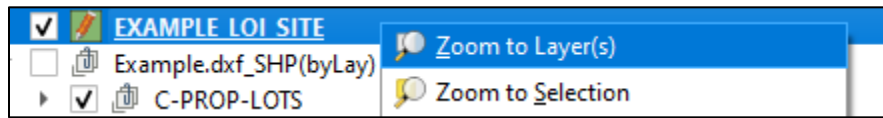


13. Click **Edit** → **Paste Features** in the editor menu on the top.

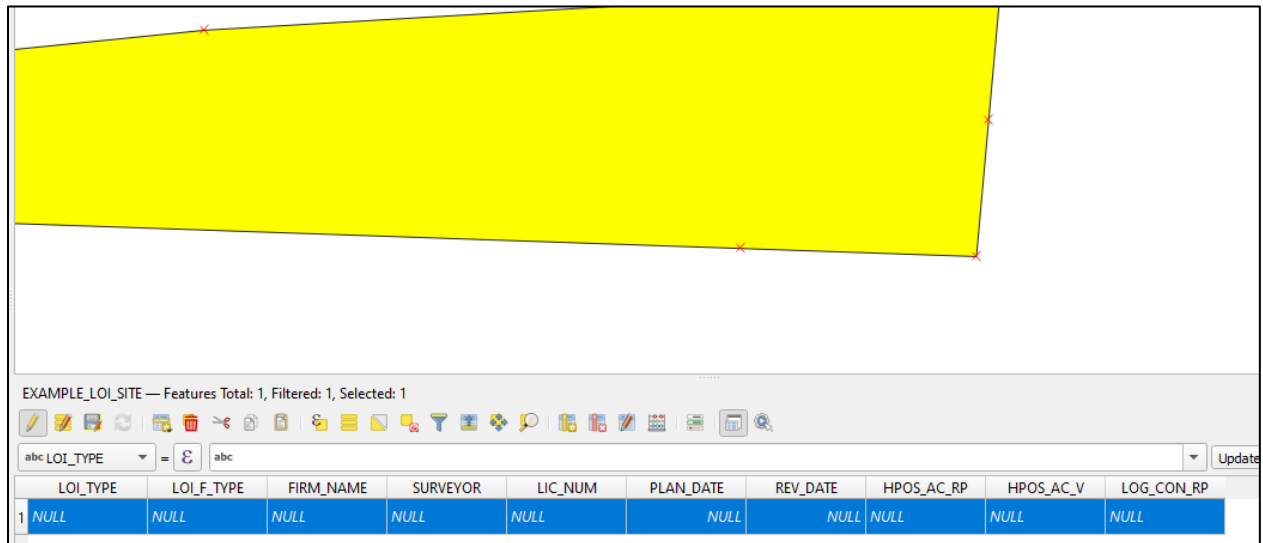


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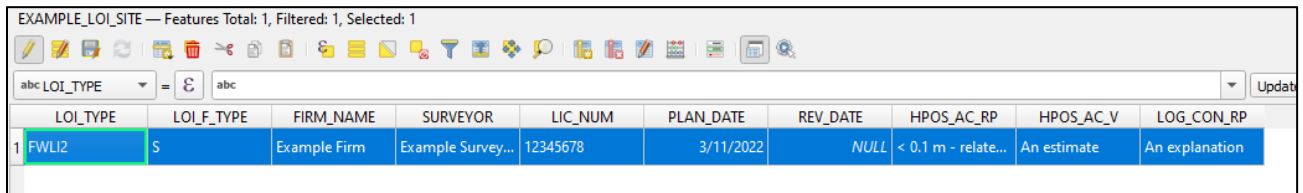
14. If your polygon doesn't appear on the screen, **right-click on the template and click *zoom to layer***.



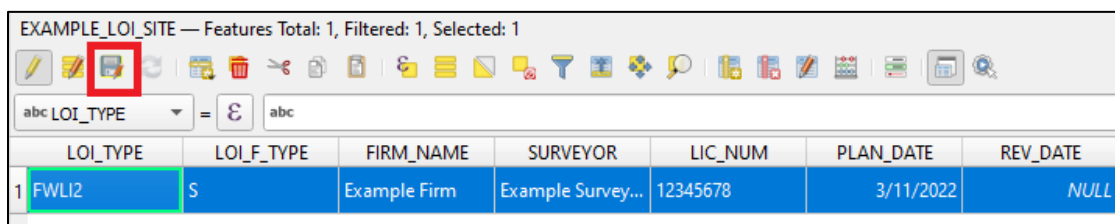
15. The site should appear on the map and the template should now have a polygon within the template.



16. **Edit** the attribute fields accordingly (use [Appendix A](#) to help).

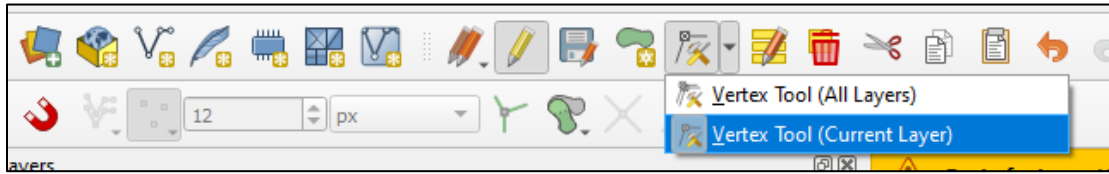


17. **Click save.**

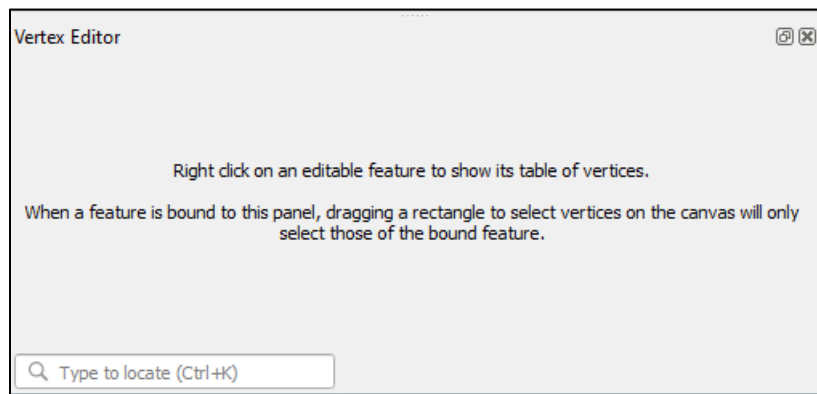


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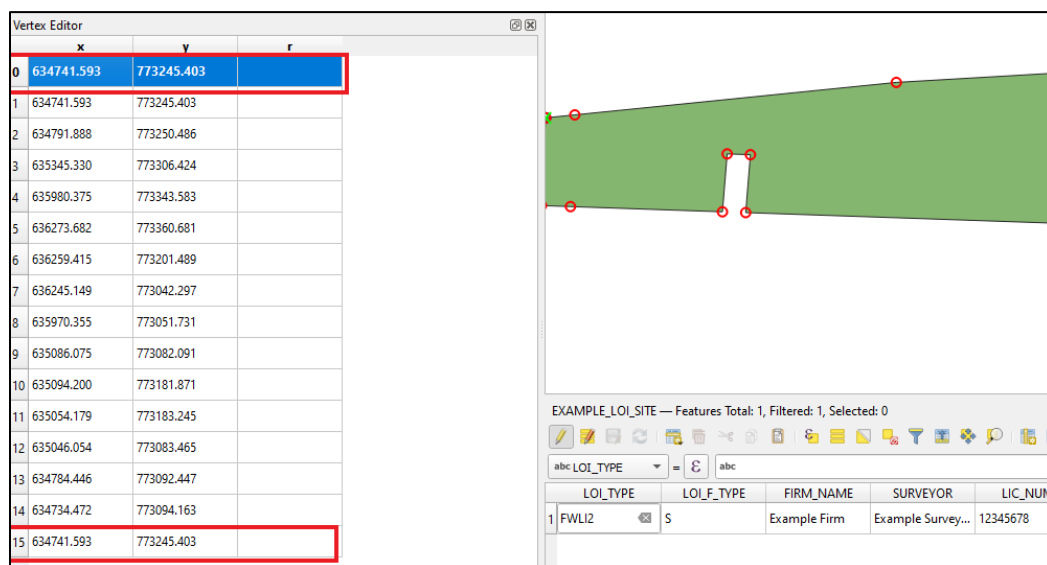
18. Check that there are no duplicate vertices in the polygon by **clicking on the vertex tool** → **Current Layer**.



A screen will pop up on the bottom.



19. **Right-click on the layer in the map** and the Vertex Editor will show the vertices. If there are any duplicates, delete them by clicking on the row and click delete on your keyboard (make sure nothing else is highlighted in the map or attribute table).



20. Click **Save** in the attribute table.

21. **Repeat these steps** for the other template shapefiles (FOD and/or Wetlands and/or Transition Area).

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22. Once complete open your windows explorer and **change the .qmd extension to .shp.xml** by clicking right-click and **rename**.

EXAMPLE_LOI_FOD.cpg	3/14/2022 1:45 PM	CPG File	1 KB
EXAMPLE_LOI_FOD.dbf	3/14/2022 1:45 PM	DBF File	1 KB
EXAMPLE_LOI_FOD.prj	3/14/2022 1:45 PM	PRJ File	1 KB
EXAMPLE_LOI_FOD.qmd	3/14/2022 1:45 PM	QMD File	4 KB
EXAMPLE_LOI_FOD.shp	3/14/2022 1:45 PM	SHP File	1 KB
EXAMPLE_LOI_FOD.shx	3/14/2022 1:45 PM	SHX File	1 KB
EXAMPLE_LOI_SITE.cpg	3/14/2022 1:41 PM	CPG File	1 KB
EXAMPLE_LOI_SITE.dbf	3/14/2022 2:34 PM	DBF File	1 KB
EXAMPLE_LOI_SITE.prj	3/14/2022 1:41 PM	PRJ File	1 KB
EXAMPLE_LOI_SITE.qmd	3/14/2022 1:41 PM	QMD File	4 KB
EXAMPLE_LOI_SITE.shp	3/14/2022 2:34 PM	SHP File	1 KB
EXAMPLE_LOI_SITE.shx	3/14/2022 2:34 PM	SHX File	1 KB

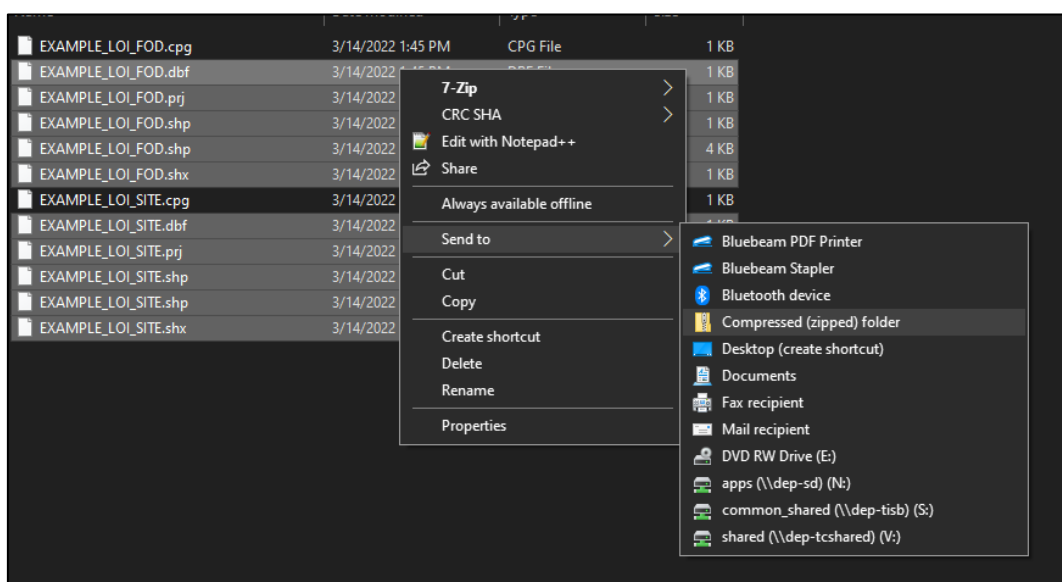
EXAMPLE_LOI_FOD.cpg	3/14/2022 1:45 PM	CPG File	1 KB
EXAMPLE_LOI_FOD.dbf	3/14/2022 1:45 PM	DBF File	1 KB
EXAMPLE_LOI_FOD.prj	3/14/2022 1:45 PM	PRJ File	1 KB
EXAMPLE_LOI_FOD.shp	3/14/2022 1:45 PM	SHP File	1 KB
EXAMPLE_LOI_FOD.shp	3/14/2022 1:45 PM	XML Document	4 KB
EXAMPLE_LOI_FOD.shx	3/14/2022 1:45 PM	SHX File	1 KB
EXAMPLE_LOI_SITE.cpg	3/14/2022 1:41 PM	CPG File	1 KB
EXAMPLE_LOI_SITE.dbf	3/14/2022 2:34 PM	DBF File	1 KB
EXAMPLE_LOI_SITE.prj	3/14/2022 1:41 PM	PRJ File	1 KB
EXAMPLE_LOI_SITE.shp	3/14/2022 2:34 PM	SHP File	1 KB
EXAMPLE_LOI_SITE.shp	3/14/2022 1:41 PM	XML Document	4 KB
EXAMPLE_LOI_SITE.shx	3/14/2022 2:34 PM	SHX File	1 KB

23. You are now ready to zip the shapefile.

3.2.3 Zip the shapefile

After you have compiled shapefile(s) and tables, the information must be combined into a zip file. To zip a file, open File Explorer and locate the files or folders that your shapefiles are stored in. Windows refers to a Zip file as a “compressed folder,” so the terms are interchangeable in this case. NOTE: Only one zip file per service, so for submissions with multiple shapefiles, be sure to have all of your polygon files together into one zip file.

- In windows explorer click select all the extension required **.dbf, .prj, .shp, .shp.xml** (this extension may only list as **.shp** but the type will read “XML document” - see above), **.shx** and right click → **Send to** → **compressed (zipped) folder**.





Section 4 Validations & Common Error Messages

This section describes the validation checks performed on your uploaded shapefile(s) and provides an example of the map from the "Site Information" portal page that displays uploaded shapefile features.

Once the process is initiated, a series of validation tests begins. This validation step takes less than 30 seconds to complete, and the results are communicated back to the applicant as "OK" with additional data displayed along with the LOI features displayed on the embedded map, or with an "Error" message explaining any problems discovered.

4.1 Step-by-Step Online Validations & Error Codes

The following outlines the first sequence of validation steps performed behind the scenes by the service to validate the uploaded shapefiles. Descriptions of error messages are outlined below.

4.1.1 Initial Errors: Extracting and Examining Contents

Upon adding your completed zip file to the service, the validation process begins. You may encounter the following prompt, "**GP Error Encountered! Error: Unable to complete operation.**" This is an issue that most often happens when there has not been a recent LOI submission, indicating that the ArcGIS server is not 'awake' caused by inactivity on the GIS server. If you click on the Remove button and try again to upload the same zip file, the service resumes checking the contents of the uploaded zip file.

If you receive this same error even after re-attempting to upload the file, it is important that you check all of your metadata within your shapefile (including the attribute table) so that there are no typos, extraneous spaces or false integers within your data.

The following errors occur during the step "extract files and examination of the contents." There will be no file uploaded:

1. **Error: File "<zipFileName>" is not a valid ZIP file.** All shapefiles must be zipped prior to upload. The service checks to make sure it is an actual zip file.

Fix: Remove the file you are attempting to upload, then zip your file and try to upload again.

2. **Error: File "<zipFileName>" contains extraneous files not associated with shapefiles.**

Fix: Remove any files that do not contain one of the following extensions [.shp, .shx, .dbf, .prj, .shp.xml, .sbn, .sbx], then re-zip your file and try to upload again.

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4.1.2 Shapefiles: Test of Presence of Required Component Files

After these initial zip file content evaluations, the process evaluates the shapefile for completeness. All shapefiles submitted for the online LOI service are required to include the component files: .shp, .shx, .dbf, .prj, .shp.xml (metadata), .sbn, and .sbx component files (see Section 2 above for more information on these). All of these errors require you to remove the uploaded zip file and fix.

The following error occurs when there are problems with the shapefile components:

- **Error: File "[<zipFileName>]" does not contain valid shapefile(s). Each shapefile in the ZIP file needs to include *.shp, *.shx, *.dbf, *.prj, *.shp.xml, *.sbn, and *.sbx component files.** This means that the zip file you tried to upload does not contain a complete, valid shapefile (.shp).

Fix: *When combined within the same folder, the component files form the overall '.shp' file that is required for this service. If you do not see the '.shp' file extension in the zipped folder when uploading your file, return to your GIS software and save your shapefiles again, or re-export your shapefiles if using applications such as AutoCAD.*

Note: *If there is still no '.shp' extension observed and all component files are present, consult your GIS technician or contact [NJDEP's Bureau of GIS](#) at 609-777-0672.*

Regardless of the number of GIS features in any LOI shapefile, the summary should only find one unique occurrence of the LOI_F_TYPE, meaning all features should be either just 'S' (site), just 'F' (footprint), just 'W' (wetlands), or just 'T' (transition area). Also, based on the LOI application type there are certain shapefile types required. The following error occurs when there are problems with shapefile types contained in the zip file:

1. **Error: "<#>" LOI_F_TYPE codes found in "<shapeFileName>". There should only be one LOI_F_TYPE in "<shapeFileName>". All features in "<shapeFileName>" should have the same LOI_F_TYPE attribute value.** This means there is more than one feature that exists within zip file. The error will identify shapefile(s) are invalid.

Fix: *The field "LOI_F_TYPE" refers to the type of the shapefile (Site, Footprint of Disturbance, etc.). For the values to use for any type of shapefile, see "[1.4 Attribute Table Details](#)" on Page 5.*

To resolve this issue, open the attributes table in your GIS editing software and scroll to the "LOI_F_TYPE" field. There must be no more than 1 "LOI_F_TYPE" occurrence in each shapefile. Depending on the type of shapefile, there must be an 'S,' 'F,' 'W,' or 'T' value within this field. Be sure to check for any syntax errors, i.e. spaces or incorrect letters / numbers.



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2. **Error: The following shapefile(s) are missing LOI feature type values:** `<invalidShapeFileName>`". This error means that you are missing LOI feature types in the shapefile(s).

Fix: The field "LOI_TYPE" refers to the type of LOI that you are applying for (Presence / Absence, Line Verification, etc.). For the values to use for any type of LOI, see "[1.4 Attribute Table Details](#)" on Page 5.

To resolve this issue, open the attributes table of your **Site shapefile** in your GIS editing software, and scroll to the "LOI_TYPE" field. There must be no more than 1 "LOI_TYPE" occurrence in each shapefile. Depending on the type of shapefile, there must be an 'FWLI1,' 'FWLI2,' 'FWLI3,' or 'FWLI4' value within this field. Be sure to check for any syntax errors, i.e. spaces or incorrect letters / numbers.

3. **Error: "<LOI_F_TYPE>" feature(s) were included in "<shapeFileName>". The uploaded ZIP file should only include one shapefile for each type of feature (S=Site, F=Footprint of Disturbance, W=Wetlands, T=Transition Areas) required for the LOI type.** This error means multiple feature file type shapefiles were found (e.g. 2 Site Shapefiles were found).

Fix: Remove any duplicates of a certain shapefile type from your zip folder. Check to make sure that only one of a certain type of shapefile (Site, Footprint of Disturbance, Wetlands, or Transition Area) is present in your submission. Within each shapefile's attribute table, check to make sure that there is only 1 row of information, not 2 or more.

4. **Error: <filetype(S,F,W)>" shapefile is missing and required for this "<submissionType>" LOI submission."** OR **"The following shapefile(s) are unnecessary for this "<submissionType>" submission: "<shapeFileNameF, shapeFileNameW, shapeFileNameT>"** Either an expected feature shapefile is missing, or an unnecessary feature shapefile was discovered. Based on your selection on the Application Selection page of the online service, the system checks to ensure the zip file contains the required shape. For example, only the Site shapefile type should be uploaded for a Presence/Absence; however, for a Footprint of Disturbance application, a site and Footprint of Disturbance shapefile should be contained in the zip file. The applicant is notified which feature shapefile(s) are missing or unnecessary. Evaluates online application type to the "LOI_F_TYPE" fields on the attribute table.

Fix: An incorrect shapefile type is being submitted for a specific LOI type. Remove the extraneous shapefile type and be sure that all the necessary shapefile types are present within your submission. *See '1.1 Shapefile Types' chart on Page 2*

4.1.3 Shapefiles: Check Geometry of Polygon Errors

All of these errors require you to remove the uploaded zip file and fix.

1. **Error: "<fileType>" polygons in the "<shapeFileName>" shapefile has "<numGeomErrs>" geometry errors. Check polygon(s) for vertex errors or self-intersections.** Geometry error was detected in the feature shapefile.

Fix: *This is likely due to a vertex error or a self-intersection. Check to make sure that the polygon is enclosed completely, and/or all lines are connected with no spaces in-between. A geometry error may also be triggered if the incorrect date format within 'PLAN_DATE' and 'REVISED_DATE' fields is present; check to make sure that these fields are following the 'DD/MM/YYYY' format, or that they are left as '<Null' to indicate that there is no value needed.*

2. **Error: The "<fileType>" polygon(s) from the uploaded "<shapeFileName>" shapefile are not in the correct projection. The correct spatial reference is NJ State Plane, NAD83, US feet units. Denotes an incorrect projection (.prj) for the submitted feature shapefile."**

Fix: *Within your GIS editing software – or through the application that you used pre-export of your shapefiles – reproject your project to the NJ State Plane, NAD83, US Feet coordinate system.*

3. **Error: "The attribute table schema for the "<fileType>" polygon(s) from the uploaded "<shapeFileName>" shapefile is invalid."**This occurs when checking the schema of the attribute table, indicating a difference in the attribute table (fields) for the submitted feature shapefile.
4. **Error: All features should be polygons.** This occurs when checking the geometry feature type (shape - should be polygon) for the submitted feature shapefile.
5. **Error C4 – No "<fileType>" polygons were found in shapefile: "<shapeFileName>".** At least one of the one polygon has to be present for each shapefile type. The applicant is notified which shapefile type has the issue.
6. **Error C5 – Too many shapefiles for shapefile type.** Note: Site and Footprint of Disturbance shapefiles should only contain a single polygon. The applicant is notified which shapefile type has the issue.
7. **Error C6 –** The LOI applications that are restricted to be 1 acre have an additional validation against the size of its corresponding polygon. If the polygon is greater than 1 acre you will receive this error. The applicant is notified which shapefile type has the issue.
8. **Error C7 –** All polygons must be a single part or this error generates. The applicant is notified which shapefile type has the issue.



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NOTE: When shapefiles are generated with software other than ArcGIS, often the results do not produce the required projection (.prj) component file. The projection component file is essentially a text file that includes spatial reference projection parameters in a specific format expected by ArcGIS. It is in WKT (Well Known Text) format, and for a shapefile that is referenced to the New Jersey State Plane coordinate system, NAD83 horizontal datum, US survey feet units (FIPS code 2900), it looks like this:

```
PROJCS["NAD_1983_StatePlane_New_Jersey_FIPS_2900_Feet",GEOGCS["GCS_North_America  
n_1983",DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137.0,298.25722210  
1]],PRIMEM["Greenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION["Transvers  
e_Mercator"],PARAMETER["False_Easting",492125.0],PARAMETER["False_Northing",0.0],PARA  
METER["Central_Meridian",-  
74.5],PARAMETER["Scale_Factor",0.9999],PARAMETER["Latitude_Of_Origin",38.8333333333  
334],UNIT["Foot_US",0.3048006096012192]]
```

This same .prj file can be used for every shapefile, as long as the spatial data in the shapefile is referenced to the New Jersey State Plane coordinate system, NAD83 horizontal datum, US survey feet units. There are a few variations of the NJ State Plane, NAD83, US survey feet system – that specify a particular year (e.g. NJ State Plane, NAD83 (2011), US Feet). Those should not be used – it will result in an error. If the LOI submitter is positive that the mapping of the polygons was done in the NJ State Plane, NAD83, US feet units’ system, then they can associate the projection (.prj) component file from the shapefile template without concern.

4.1.4 Attribute Table Errors

The next set of validations are associated with values included in the attributes table and related to the “metadata.” All of these errors require you to remove the uploaded zip file and fix.

1. Error **A1**-- Empty or inconsistent value for FIRM_NAME for "<shapeFileName>"
2. Error **A2** - Empty or inconsistent value for SURVEYOR for "<shapeFileName>"
3. Error **A3** – Empty or inconsistent value for LIC_NUM for "<shapeFileName>"
4. Error **A4** – Empty or inconsistent value for PLAN_DATE for "<shapeFileName>"
5. Error **A5** – Inconsistent value for REV_DATE, or REV_DATE occurs before PLAN_DATE for "<shapeFileName>"
6. Error **A6** – LOI_TYPE attribute value in Site shapefile does not match the LOI type for this application
7. Error **A7** – Empty or inconsistent value for HPOS_AC_RP for "<shapeFileName>"
8. Error **A8** – Empty or inconsistent value for HPOS_AC_V for "<shapeFileName>"
9. Error **A9** – Empty or inconsistent value for LOG_CON_RP for "<shapeFileName>"

Note: An “empty or inconsistent value” means that a required field is empty, or the entered data is different between the Site shapefile and others that might be part of the submittal.



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4.1.5 Site/ Property Boundary Validations

1. Error **P1** - Wetlands, Transition Area or Footprint of Disturbance polygons intersect associated Site polygon. Note: if these areas extend beyond the site polygon boundaries, clip the polygons to the site polygon. This error requires you to remove the uploaded zip file and fix.
2. Error **P2** - Site polygon does not intersect the Municipality entered on the online service site location page. Check that the municipality chosen for this service is correct. Sometimes the applicant chooses the mailing address municipality and not the actual physical site location. The physical location is required.

Appendix A: Attribute Table Requirements

The attribute table is the information pertaining to your property that is stored within the shapefile itself, in a style much like an Excel Spreadsheet (with labeled columns & rows). The attribute table that you create ensures that your submitted feature shapefile(s) are properly analyzed and accepted by the LOI electronic service.

The tables below provide detailed information on the shapefile attribute tables, which will assist in your uploaded shapefile to pass validation and be accepted by the portal. There is **one** structural difference between the attribute tables for the different shapefile types:

- The 'Site Shapefile' table has one additional field, 'LOI_TYPE'.

Table 1 - LOI "Site" Shapefile Attribute Table

Field Name	Data Type	Width	Required	Descriptions and Domains
FID	Object ID		Y	Feature object ID.
Shape	Geometry		Y	Feature geometry type (Polygon).
LOI_TYPE	Text	6	Y	Enter 1 of the following codes: FWLI1 - for Presence/Absence FWLI2 - for Footprint of Disturbance FWLI3 - for Line Delineation, or FWLI4 - for Line Verification <i>Note: the "I" in FWLI is the letter "I" and not the digit "1"</i>
LOI_F_TYPE	Text	1	Y	"S" for Site.
FIRM_NAME	Text	75	Y	Name of the survey firm that produced the LOI feature shapefile.
SURVEYOR	Text	75	Y	Name of the licensed surveyor that signed and sealed the surveyed boundary delineation.
LIC_NUM	Text	30	Y	Surveyor's license number.
PLAN_DATE	Date		Y	Corresponding site plan date (MM/DD/YYYY).
REV_DATE	Date		N	Site plan revision date (if revised, otherwise leave blank) (MM/DD/YYYY). <i>Note: this date later than the PLAN_DATE. Also, some conversions add a time value into this field which results in a "geometry error" when you try to upload. Delete the time value entered in the REV_DATE field.</i>
HPOS_AC_RP	Text	50	Y	An explanation of the accuracy of the horizontal coordinate measurements relative to the NJSPCS reference system and a description of the tests used. < 0.1 m - related to NJSPCS 0.1 - 1 m - related to NJSPCS 1 - 5 m - related to NJSPCS
HPOS_AC_V	Text	15	Y	An estimate of the accuracy of the horizontal coordinate measurements in the data set expressed in ground (US survey) feet.
LOG_CON_RP	Text	250	Y	An explanation of the reliability of data. Provide an overview of the types of tests performed to determine data integrity (consistency of features in the data set, as opposed to attributes or overall positional accuracy).



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Table 2 - Example of an LOI Site Shapefile's Attribute Table

Field Name	Data Type
FID	0
Shape	Polygon
LOI_TYPE	FWLI2
LOI_F_TYPE	S
FIRM_NAME	For Example Engineering
SURVEYOR	John Doe
LIC_NUM	8939349
PLAN_DATE	09/23/2020
REV_DATE	12/03/2020
HPOS_AC_RP	0.1 - 1 m – related to NJSPCS
HPOS_AC_V	0.5 feet
LOG_CON_RP	Attributes adhere to DEP standards for LOI spatial data collection, and values checked against supporting documents. All polygons are topologically clean and in agreement with corresponding site plans.

Table 3 - LOI Footprint of Disturbance, Wetlands, and Transition Area Shapefile Attribute Tables

Field Name	Data Type	Width	Required	Descriptions and Domains
FID	Object ID		Y	Feature object ID.
Shape	Geometry		Y	Feature geometry type (Polygon).
LOI_F_TYPE	Text	1	Y	"F" for Footprint of Disturbance, "W" for Wetlands, "T" for Transition Area.
FIRM_NAME	Text	75	Y	Name of the survey firm that produced the LOI feature shapefile.
SURVEYOR	Text	75	Y	Name of licensed surveyor that signed/sealed the surveyed boundary delineation.
LIC_NUM	Text	30	Y	Surveyor's license number.
PLAN_DATE	Text		Y	Corresponding site plan date (MM/DD/YYYY format only)
REV_DATE	Text		N	Site plan revision date (MM/DD/YYYY format only) enter only if revised
HPOS_AC_RP	Text	50	Y	An explanation of the accuracy of the horizontal coordinate measurements relative to the NJSPCS reference system and a description of the tests used. < 0.1 m - related to NJSPCS 0.1 - 1 m - related to NJSPCS 1 - 5 m - related to NJSPCS
HPOS_AC_V	Text	15	Y	An estimate of the accuracy of the horizontal coordinate measurements in the data set expressed in ground (US survey) feet.
LOG_CON_RP	Text	250	Y	An explanation of the reliability of data. Provide an overview of the tests performed to determine data integrity (consistency of features in the data set, as opposed to attributes or overall positional accuracy).

Table 4- Example of an LOI "Footprint of Disturbance" Attribute Table

Field Name	Data Type
FID	0
Shape	Polygon
LOI_F_TYPE	F
FIRM_NAME	For Example Engineering
SURVEYOR	John Doe
LIC_NUM	8939349



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PLAN_DATE	09/23/2020
REV_DATE	12/03/2020
HPOS_AC_RP	0.1 - 1 m – related to NJSPCS
HPOS_AC_V	0.5 feet
LOG_CON_RP	Attributes adhere to DEP standards for LOI spatial data collection, and values checked against supporting documents. All polygons are topologically clean and in agreement with corresponding site plans.

Table 5 - Example of an LOI "Wetlands" Attribute Table

Field Name	Data Type
FID	0
Shape	Polygon
LOI_F_TYPE	W
FIRM_NAME	For Example Engineering
SURVEYOR	John Doe
LIC_NUM	8939349
PLAN_DATE	09/23/2020
REV_DATE	12/03/2020
HPOS_AC_RP	0.1 - 1 m – related to NJSPCS
HPOS_AC_V	0.5 feet
LOG_CON_RP	Attributes adhere to DEP standards for LOI spatial data collection. Values checked w/ supporting documents. All polygons are topologically clean and in agreement with corresponding site plans.

Table 6 - Example of an LOI "Transition Area" Attribute Table

Field Name	Data Type
FID	0
Shape	Polygon
LOI_F_TYPE	T
FIRM_NAME	For Example Engineering
SURVEYOR	John Doe
LIC_NUM	8939349
PLAN_DATE	09/23/2020
REV_DATE	12/03/2020
HPOS_AC_RP	0.1 - 1 m – related to NJSPCS
HPOS_AC_V	0.5 feet
LOG_CON_RP	Attributes adhere to DEP standards for LOI spatial data collection. Values checked against supporting documents. All polygons are topologically clean and in agreement with corresponding site plans.