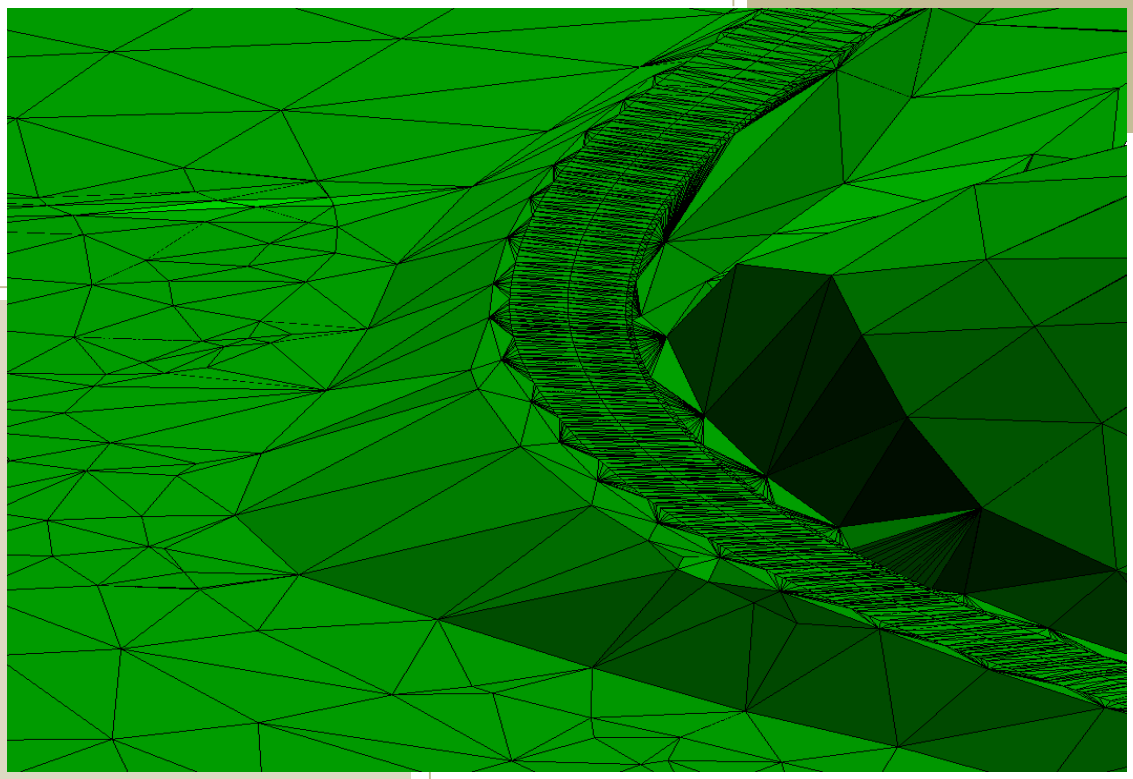
State of Georgia

Department of Transportation

InRoads Photogrammetry Guidelines

InRoads Select Series 2



InRoads Photogrammetry Guidelines

1/31/2019

Revision 2.5

Atlanta, Georgia 30308

GDOT Georgia Department of Transportation

This document was developed as part of the continuing effort to provide guidance within the Georgia Department of Transportation in fulfilling its mission to provide a safe, efficient, and sustainable transportation system through dedicated teamwork and responsible leadership supporting economic development, environmental sensitivity and improved quality of life. This document is not intended to establish policy within the Department, but to provide guidance in adhering to the policies of the Department.

Your comments, suggestions, and ideas for improvements are welcomed.

Please send comments to:

State Design Policy Engineer

Georgia Department of Transportation

One Georgia Center

600 W. Peachtree Street, 26th Floor

Atlanta, Georgia 30308

DISCLAIMER

The Georgia Department of Transportation maintains this printable document and is solely responsible for ensuring that it is equivalent to the approved Department guidelines.

Revision Summary

Date	Revision Number	By	Section	Description
02-01-13	1.00	CB-HC-JB	All	All
07-15-13	1.1	CB-HC-JB	2-4,2-5, 3-5	Revised data import process from AMSA to import of Photogrammetry Graphics from DGN File.
“”	“”	“”	2-8	Revised GDOT Standard Photogrammetry Code Table to depict the new K Codes for DGN file import.
“”	“”	“”	Appendix A	Removed Appendix A which listed the AMSA Numerical Program conversion process. This method is no longer utilized.
09-03-13	1.2	CB-HC-JB	2-10	Added new Feature Codes/Feature Styles TOPO_E_SBF and TOPO_E_SXS for use on 404 Permit for Perennial Streams – Culverts.
01-13-14	1.3	CB-HC-JB	2-10	Added new Feature Codes/Feature Styles TOPO_E_DBOD and TOPO_E_DTOD for Drainage Bottom and Top of Ditch.
10-31-14	1.4	CB-HC	1-8, 1-9	Updated reference location of the GDOT 3D seed file.
“”	“”	“”	2-3	Added reference for naming convention of the PI#_MapUTLE file.
“”	“”	“”	2-8	Added TEAD K5 Code.
“”	“”	“”	2-10, 2-11	Revised “Utilities” Feature Codes/Feature Styles to contain a “UU” Prefix for use in the UTLE DGN file.

Date	Revision Number	By	Section	Description
“”	“”	“”	2-11	Added new Feature Codes/Feature Styles UUTLE_E_ PCL, UUTLE_E_TSB, UUTLE_E_FM, SUEBOT, SUETOP
“”	“”	“”	2-12,2-14	Revised following Topo Feature Codes/Feature Styles to UTLE_E_ UTRCR, UTLE_E_UTRCL, UTLE_E_UTSATDSH, UTLE_E_UTMPR
“”	“”	“”	2-13	Added new Feature Codes/Feature Styles UTLE_E_ UXXA, UTLE_E_UXXB
“”	“”	“”	3-2, 3-5, 3-6, 3-7	Revised deliverable list and QA Check list to reflect the deliverable of the MapUTLE DGN file.
04-30-15	1.5	CB-HC	1-3, 1-4, 3-6	Revised document Hyperlinks to reference/open the associated GDOT TravelSmart Web Page links.
10-15-15	1.6	CB-HC	2-9 to 2-15	Revised the organization of several Survey Feature Codes in Section 2 to reflect correct location under sub-headings.
04-01-17	1.7	VJ	2-10	Replaced DHWE with DHWT and DCWE with DHWB. Removed DDCB and revised DCB description.
4-28-17	2.0	JB & VJ	All	Converted to standard template
7-25-17	2.1	JB	2.5	Updated Photogrammetry Codes chart to include all items used in Mapping; added levels used; removed K

Date	Revision Number	By	Section	Description
				codes and InRoads Alpha codes.
“”	“”	“”	2.6	Removed TOPO_E_TBRDGCEN Added feature style for bottoms of bridge beams: TOPO_E_TBBB. Added TOPO_E_TSTP.
11-9-17	2.2	JB	2.6	Changed feature style TOPO_E_TBBB from a Point to a Chain Type. Added feature style for Junction Boxes. Manhole Storm Sewer, Top has been changed from a Utility to a Topo item. Removed feature styles UTLE_E_UUMHST and UTLE_E_UUMHSTF and added TOPO_E_UHMST.
12-8-17	2.3	JB	2.5	Changed SWIMMING POOL triangulate field to Yes. Change RAILROAD, TOP OF RAIL description to RAILROAD, CENTERLINE
9-7-18	2.4		All	Updated GDOT logo throughout
1-31-19	2.5	JB	2.5, 2.6	Both sections are now standalone documents. Removed both tables and included hyperlinks to new location.

Intentionally Left Blank

Preface

Photogrammetry utilizes measurements obtained from aerial photography and stereo plotters to generate digital map data that contains man-made and natural terrain features which are referenced to the State Plane Coordinate System of Georgia. This data is then submitted to Survey Data Engineers as planimetric MicroStation (.DGN) files and topographic 3D mapping Digital Terrain Model (.DTM) files in InRoads. The digital mapping data is used as a database in the development of highway project plans.

These Photogrammetry Guidelines have been developed as part of the statewide GDOT implementation of MicroStation V8i and InRoads V8i Select Series 2. The intent of this document is to provide guidelines and standards for processing photogrammetric data in InRoads V8i Select Series 2. These guidelines must be followed in detail in order to conform to the current GDOT standards for producing the required photogrammetric deliverables. Updates to this document will be made periodically when minor revisions, additional information, and/or enhancements are added.

If there is any approved deviation from the standard file and data naming/feature style conventions as prescribed by this document - a detailed description of the deviation(s) and approved reasons for the deviation(s) shall be documented and included with the project files in electronic format.

Contact Information

To submit any comments or questions regarding the information contained in this document, please contact the **Office of Design Policy & Support** by email at the following address:

SolutionsCenter@dot.ga.gov

In the Email Subject Header, please reference the **InRoads Photogrammetry Guidelines**

List of Effective Chapters

Document	Revision Number	Revision Date
Preface	2.1	9/7/18
Contact Information	2.1	9/7/18
List of Effective Chapters	1.4	1/31/19
Table of Contents	2.2	9/7/18
Overview	2.1	9/7/18
Chapter 1. Project Initialization Standards	2.1	9/7/18
Chapter 2. Standard Conventions	2.5	1/31/19
Chapter 3. Photogrammetry Project Deliverables	2.1	9/7/18

Intentionally Left Blank

Table of Contents

Intentionally Left Blank

Overview

These Guidelines cover the GDOT standards for processing Photogrammetric (Mapping) Survey Data by utilizing the MicroStation V8i and InRoads V8i Select Series 2 software(s). These procedures depict the Project Initialization Standards and Conventions to create an InRoads Mapping Project to GDOT format and the processes to create/generate the files which are to be submitted as deliverables to the Survey Data Engineer.

For detailed Photogrammetric processing instructions, please refer to the Training Manual: *Introduction to InRoads for Photogrammetry*

Document Content

Below is a list of topics covered in this document:

- Project Initialization Standards
- Standard Conventions
- Photogrammetry Project Deliverables

Intentionally Left Blank

Chapter 1. Project Initialization Standards - Contents

Chapter 1. Project Initialization Standards

Project Initialization Standards have been established in order to promote consistency and assist in the organization of project data. These standard project schemes help to ensure uniformity for all users who may work on the project.

This section covers the following topics:

- GDOT Standard Files (MicroStation and InRoads)
- Standard Project Structure
- Starting MicroStation V8i and InRoads V8i Select Series 2
- Overview of InRoads Interface
- InRoads Project Defaults
- Survey Default Preferences
- InRoads "Locks"
- Application and Variable Manager Add-Ins

1.1 GDOT Standard Files – MicroStation and InRoads

In order to conform to current policy for plan deliverables – GDOT provides the requisite files needed to standardize InRoads and MicroStation to GDOT requirements. The first step in the development of an InRoads and MicroStation Project is to ensure that these standard files are being utilized. Instructions for downloading/installing the executables are included on the GDOT web page (see the links depicted below). These files are required for any Photogrammetry Projects generated for GDOT.

- ***MicroStation Standard Files Location for Internal GDOT Users*** – a server location has been established to map a drive (an N:\ Drive) in order to access the latest MicroStation Files. Once the internal user maps the N:\ drive – all of the standard MicroStation Files will be available through this mapped drive.
- ***MicroStation Standard Files Location for External Users*** - a MicroStation (CaddALL.exe) executable file is available and located in a download executable which can be accessed from the GDOT web page. This executable contains all of the GDOT MicroStation V8i Select Series 2 standard files. This file can be downloaded by navigating to the MicroStation and InRoads links from the following location:

  http://www.dot.ga.gov/PS/DesignSoftware/Microstation

- ***InRoads Standard Files Location for Internal and External Users*** - an InRoadsALL executable file (InRoadsALL.exe) is available and located in a download executable which can be accessed from the GDOT web page. This executable contains all of the GDOT InRoads V8i Select Series 2 standard files. This file can be downloaded by navigating to the MicroStation and InRoads links from the following location:

  http://www.dot.ga.gov/PS/DesignSoftware/InRoads

The **InRoadsALL.exe** file contains all of the standard GDOT files which are required to generate projects to GDOT standards. The user will perform the following steps to extract and set-up the GDOT Standard InRoads Files:

1. Close MicroStation V8i and InRoads V8i Select Series 2 if they are still open.
2. Navigate to the InRoads links from the following web page: http://www.dot.ga.gov/PS/DesignSoftware/InRoads
3. Save the ***InRoadsALL.exe*** file to the hard drive and then double click the file.
4. The self-extractor will download the GDOT InRoads Standard Files to the following locations:
   a. **C:\InRoads Data\Standards**
      - GDOT_Standard V8i_SS2.xin
      - GDOT_Standard V8i_SS2.itl
      - Project_Data_Sheet_MultipleAlign.docm
      - Photogrammetry_InRoads QA.pdf
      - Survey Data Processing_InRoads QA.pdf
      - Design Data_ InRoads QA.pdf
      - GDOT (PI#) Pay Item Database.mdb
   b. **C:\InRoads Data\Component Documentation**
      - GDOT Component Description Help Documentation
   c. **C:\InRoads Data\Style Sheet Documentation**
      - GDOT Style Sheet Help Documentation
   d. **C:\InRoads Data\Style Sheets\GDOT**
      - GDOT Style Sheets
5. For detailed instructions on downloading and installing **InRoadsALL.exe** - navigate to the InRoads links from the GDOT web page and click on the ***Downloading and Running InRoadsALL.pdf*** document for installing these standard files.

1.2 Standard Project Structure

The standard File Structure for InRoads is a Project Folder (which is named for the PI # of the Project – **1234567**) located as a sub-folder under **C:\InRoads Data** – *Example*: **C:\InRoads Data\1234567**. The Project Files are then located in a **Photogrammetry** sub-folder under the PI # – Example: **C:\InRoads Data\1234567\Photogrammetry** -- This Project Folder contains the individual InRoads Data Files. (See *Table 1.1*)

Table 1.1

InRoads Project Structure	
InRoads Project Structure	C:\InRoads Data\PI Number\ Photogrammetry
InRoads Project Structure (Example)	C:\InRoads Data\1234567\ Photogrammetry

Some examples of InRoads Data File Types are:

1. **.DTM** ------- (Digital Terrain Model File) – contains Surface data
2. **.FWD** ------- (Survey File) – contains Field Survey data
3. **.ALG**-------- (Geometry File) – contains Geometric Point, Horizontal and Vertical data
4. **.IRD** -------- (Roadway Design File) – contains the Design Surface data
5. **.RWK**------- (Project File) – contains project data for InRoads files in ASCII format
6. **.ITL**--------- (InRoads Template File) – contains InRoads Templates for cross-sections
7. **.SDB**-------- (Drainage File) – contains the InRoads Storm and Sanitary data

Although InRoads consists of the above file types -- the "Photogrammetry Data" will usually consist of the following file types and will be located in the **C:\InRoads Data\PI Number\ Photogrammetry** folder:

- Processed DTM Surface file (**PI#_ Map.dtm**)
- Processed Topographical DGN file (**PI#_Map.dgn**)
- Processed Utility DGN File (**PI#_MapUTLE.dgn**)
- Processed DGN PDF Plot Files (**PI#_Map1.pdf**, **PI#_Map2.pdf**, etc)

It is highly recommended to backup the Project Folder (which contains these individual data files) after each work session to your Group Account on the GDOT Server if you are a GDOT Employee (or to an appropriate Business Server if you are a GDOT Consultant).

1.3 Starting a Photogrammetry Project in InRoads

After creating the Photogrammetry Project folder of C**:\InRoads Data\PI Number\Photogrammetry** – the Photogrammetrist will then copy the **Standards** folder (which is downloaded through the InRoadsALL.exe executable) to the **C:\InRoads Data\PI Number\Photogrammetry** folder.

1.3.1 Copy the Standards Folder which is Downloaded from InRoadsALL.exe

Important Step:

After installing InRoadsALL.exe – the user will copy the **Standards** folder under **C:\InRoads Data** to the Project Location. The rest of the Standard Files will remain in the default install location.

Whenever a new Project is created – the Photogrammetrist will download and install InRoadsALL.exe. The files will be extracted to the Default Location(s). The reason for the install is to ensure the user has the latest published XIN File. The Photogrammetrist will then perform the following step:

- The user will copy the **C:\InRoads Data\Standards** Folder to the **InRoads Data\PI# \ Photogrammetry** folder. (Example: **C:\InRoads Data\1234567\Photogrammetry\Standards**).

Table 1.2

Copy Standards Folder to Project Folder

C:\InRoads Data\Standards	**Copy To ►►**	**C:\InRoads Data\PI #\ Photogrammetry**

1.4 Starting MicroStation V8i and InRoads V8i

The user will be working in both **MicroStation V8i Select Series 2** (the CADD Software) and **InRoads Suite V8i Select Series 2** (the Survey/Design Software). The **MicroStation CADD Software** is used for the viewing and manipulation of graphics derived from **InRoads**. The **InRoads Software** is the database in which the Photogrammetry and Surveying data is created and processed. The user will select the standard GDOT 3D "seed" file to use as the "seed" DGN in order to create the three dimensional "Working" DGN file. This "Working" DGN file is used to display the temporary and/or permanent graphics in **InRoads**.

This section details the following processes:

- Steps to Create a Photogrammetry "Working" DGN File
- Steps to Open an existing Photogrammetry "Working" DGN File

The "Working" DGN file will be saved to the following folder location:
C:\InRoads Data\PI Number\ Photogrammetry\Standards

Table 1.3	
Standard Naming Convention of the "Working" DGN File	
Working DGN File Name	**C:\InRoads Data\PI Number\Photogrammetry\Standards** GDOT 3D Working File.dgn

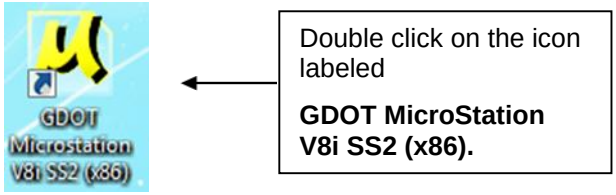
The **MicroStation** software will open first before **InRoads**. After the **MicroStation** Splash Screen appears, the **MicroStation Manager** dialog (See *Figure 1-1*) will open so that a "**Working**" DGN file can be created or an existing "**Working**" DGN file can be opened. The **InRoads** software can then be initiated.

1.4.1 Steps to Create a Photogrammetry "Working" DGN File

The Photogrammetry "Working" DGN file will be created from the **GDOT_V8_3D.dgn** or seed file.

Please Note: The current seed file in the MicroStation configuration defaults to a 2D Seed File. In order to view spikes in the DTM and for additional 3D Checks, the user will need to browse to select the 3D Seed file as depicted in the steps below. Following are the steps to create a **Photogrammetry "Working" DGN File**:

1. From the desktop, double-click on the **GDOT MicroStation V8i SS2 (x86)** icon.



2. After the **MicroStation** Splash Screen appears, the **MicroStation Manager** dialog box will open. (See *Figure 1-1*).

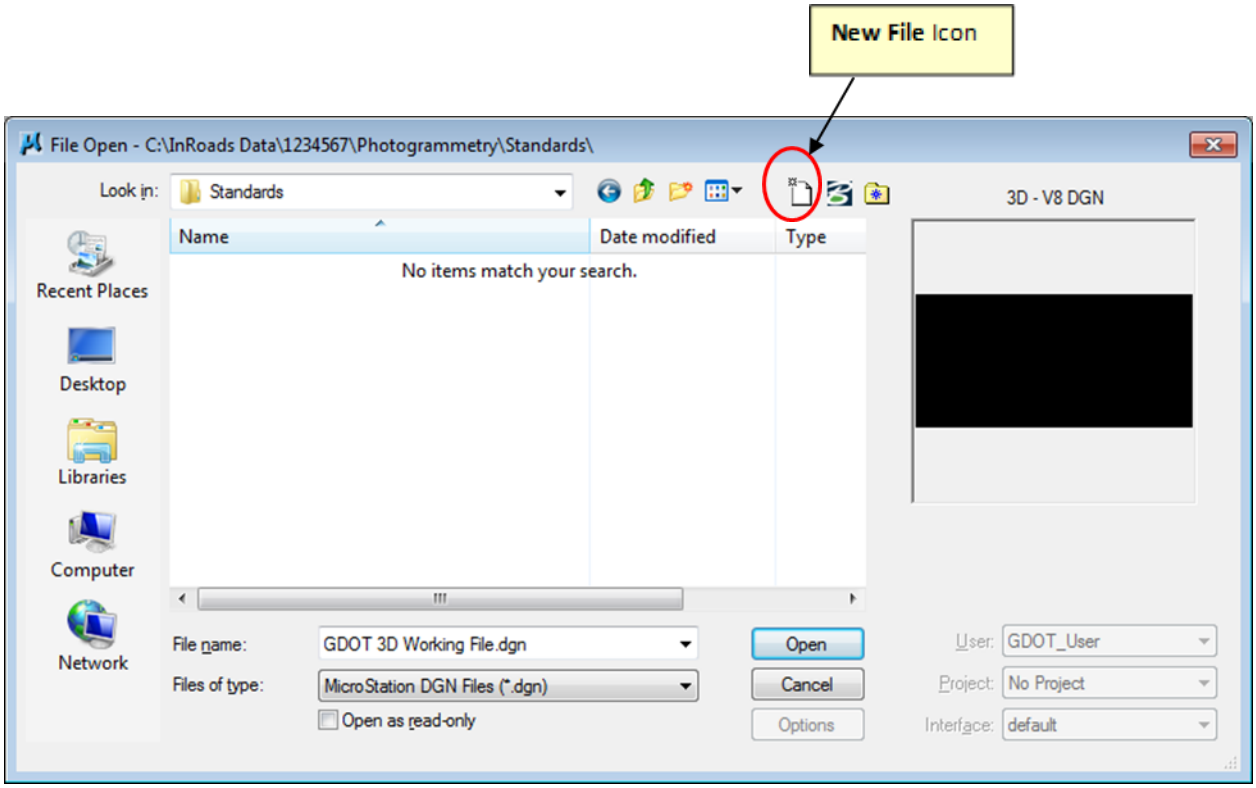


Figure 1-1 Starting MicroStation V8i and InRoads V8i

3. In the **MicroStation Manager** dialog box, click on the **New File** icon  (See *Figure 1-1*) depicted above. The **New File** command will be used to create the "Working" DGN file.

4. After the **New File**  command is selected, the **MicroStation New File** dialog box will open. (See *Figure 1-2*).
   - Click in the **Save in:** Pulldown - and browse to the ***C:\InRoads Data\PI Number\Photogrammetry\Standards*** location to save the new "Working" DGN file
   - In the **File name:** Pulldown – enter ***GDOT 3D Working File.dgn***
   - In the **Save as type:** Pulldown – select ***MicroStation DGN Files (*.dgn)***
   - In the **Seed:** Field - Click the **Browse** button to select the seed file named **GDOT_V8_3D.dgn**

   The Seed File should already be entered in the field based on the current MicroStation configuration.

   The inputs should now correspond to the screen capture depicted in *Figure 1-2* (as shown below).

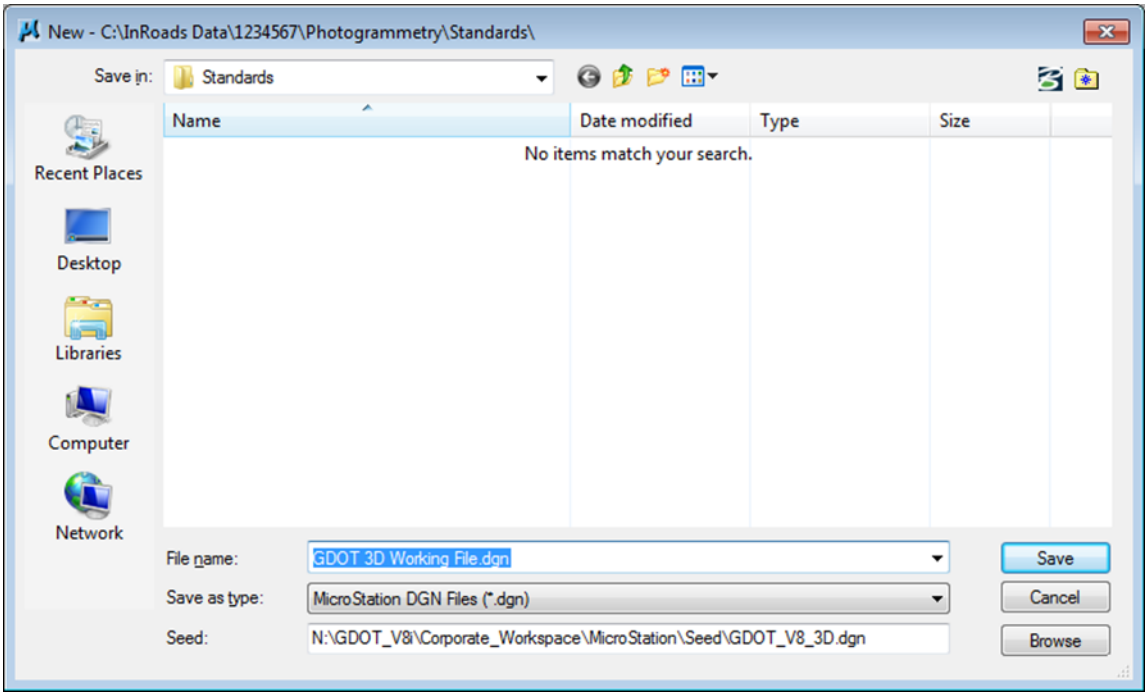
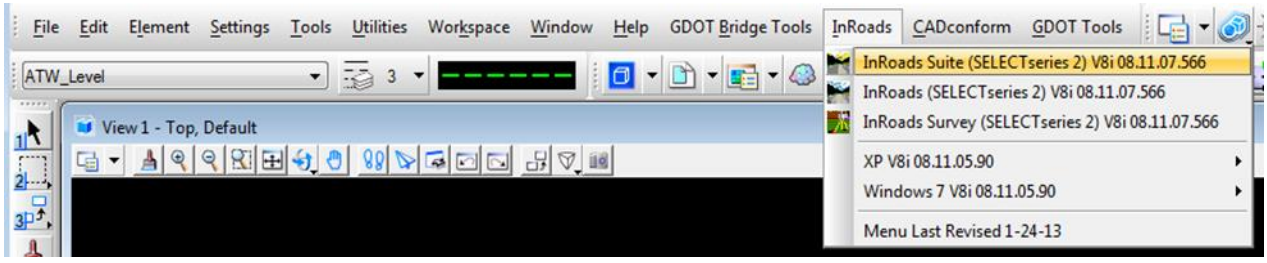


Figure 1-2 MicroStation New File Window

5. Click the **Save** command button and the **MicroStation Manager** dialog box will appear.
6. In the **MicroStation Manager** dialog box – highlight the file just created (***GDOT 3D Working File.dgn***) and click the **Open** button.
7. The **MicroStation V8i Select Series 2** interface will then finish opening.
8. In the ***Main MicroStation Pull-down Menu*** – click on the following InRoads pull-downs:



9. Select ***InRoads ► InRoads Suite (SELECTseries 2) V8i 08.11.07.566*** — and the **InRoads V8i Select Series 2** interface will open. Once **InRoads** and **MicroStation** are up and running, the desktop should look similar to that of *Figure 1-3* and *Figure 1-4*.

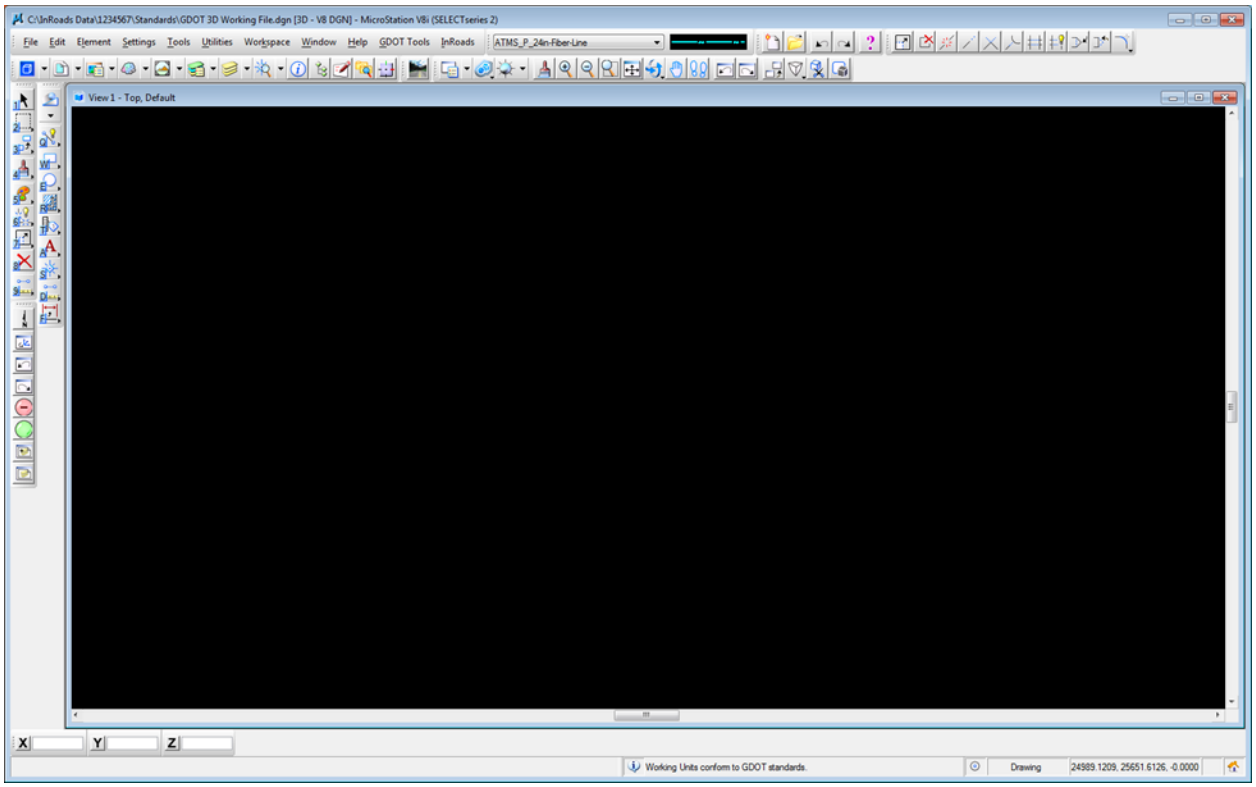


Figure 1-3 Main MicroStation V8i Window

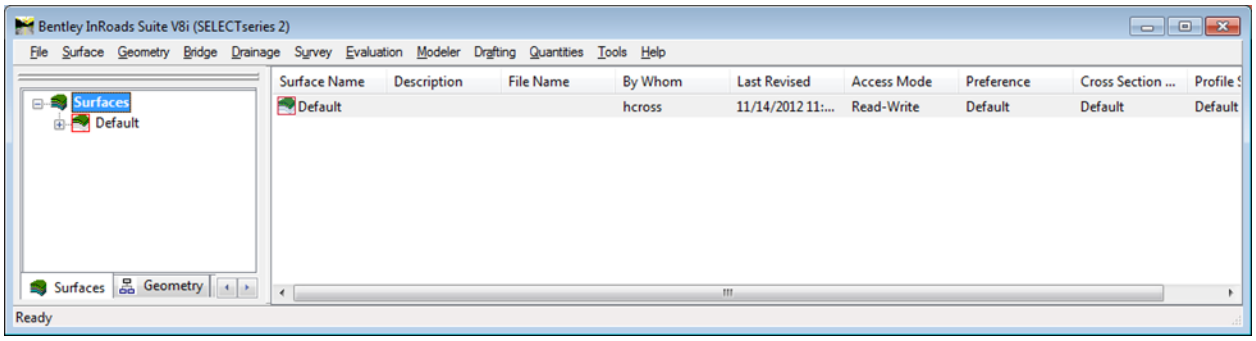


Figure 1-4 Main InRoads V8i Window

1.4.2 Steps to open an existing Photogrammetry "Working" DGN File

If the Photogrammetry "Working" DGN file has been created previously – use the following steps to open a **Photogrammetry "Working" DGN File**:

1. From the desktop, double-click on the **GDOT MicroStation V8i SS2 (x86)** icon.

Double-click on the icon labeled

GDOT MicroStation V8i SS2 (x86).

2. After the **MicroStation** Splash Screen appears, the **MicroStation Manager** dialog box will open. (See *Figure 1-5*).

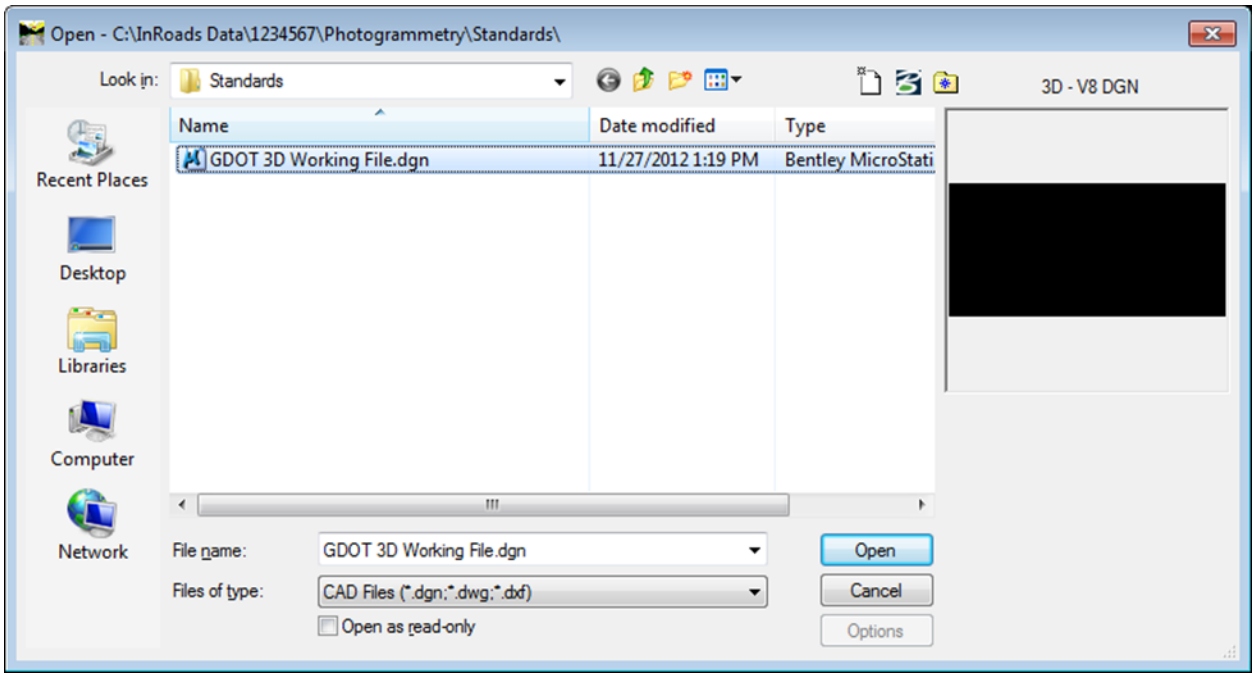


Figure 1-5 Starting MicroStation V8i and InRoads V8i

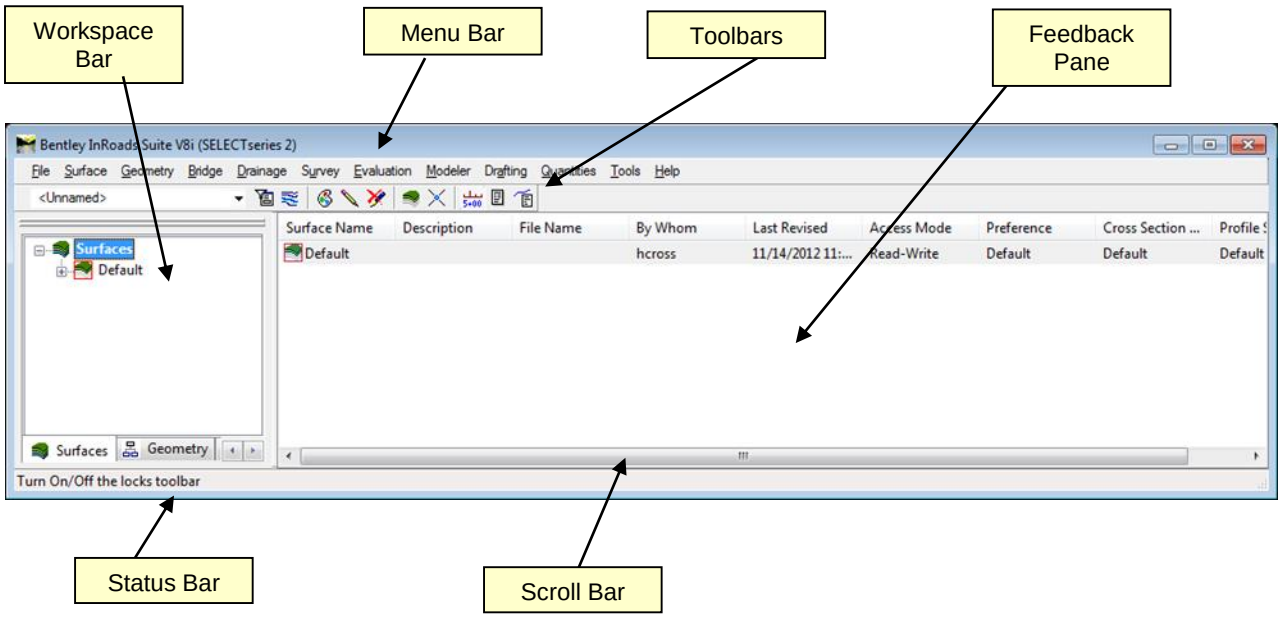
3. In the **MicroStation Manager** dialog box, browse to the ***C:\InRoads Data\PI Number\Photogrammetry\Standards*** location and highlight the (***GDOT 3D Working File.dgn***) and click the **Open** button.

4. The **MicroStation V8i Select Series 2** interface will then finish opening. Then select ***InRoads ▶ InRoads Suite (SELECTseries 2) V8i 08.11.07.566*** — and the **InRoads V8i Select Series 2** interface will open. Once **InRoads** and **MicroStation** are up and running, the desktop should look similar to that of previous screen captures *Figure 1-3* and *Figure 1-4*.

1.5 Overview of InRoads Interface

As mentioned previously - the user will be working in both the **InRoads Design Software** and the **MicroStation CADD Software**. The **InRoads Software** is the database in which the Photogrammetry and Surveying data is created and processed.

Shown below is a **diagram** which depicts the InRoads Explorer objects and a brief overview of the InRoads Explorer Interface:



- **Workspace Bar** – Contains all of the InRoads Project Data information
- **Menu Bar** – Contains the pull-down menus to access InRoads commands
- **Toolbars** – Contains default and customized toolbars to access InRoads commands
- **Feedback Pane** – Contains details of selected Project Data from the Workspace Bar
- **Scroll Bar** – Enables the user to view more of the InRoads Explorer Interface. (The Scroll Bar may not be visible if the InRoads Interface is already viewed to extents).
- **Status Bar** – Contains InRoads messages and prompts (Please note: InRoads may direct you to locate something graphically in MicroStation -- some of these prompts may display in the MicroStation Status Bar instead). It is very important that the user review both the InRoads and the MicroStation Status Bar for prompts and information.

1.6 InRoads Project Defaults

The **InRoads Project Defaults** setting allows you to define the "default folder locations" for projects. A ***Project Default*** configuration can then be saved for each project so that multiple projects can be accessed. This configuration allows you to easily navigate between projects. Once the Project Folder locations are saved in the Configuration, the projects can then be accessed by selecting the appropriate Project Configuration Name. The Project Defaults also contain the location for selecting the standard GDOT InRoads Preference File (**GDOT_StandardV8i_SS2.xin**).

The standard Project Default configuration for Photogrammetry projects will be **PI#_ Mapping**. Each Photogrammetry Project Default will consist of this naming structure in order to easily navigate between projects. (See *Table 1.4*)

Once the Project Default Location is set for a particular project – this will also be the default folder location whenever the InRoads commands of **File ▶ Save and **File ▶ Close** are used.

Table 1.4	
Project Defaults Configuration	
Project Default Structure	PI Number_Mapping
Project Default Structure (Example)	1234567_Mapping

Following are the steps to create a **Photogrammetry Project Default Configuration (Substitute the appropriate PI # as required):**

1. Click **File ▶ Project Defaults** from the InRoads pull-down menu to access the **Set Project Defaults** dialog box.
2. Click **New** and enter **1234567_ Mapping** in the **New Configuration** dialog box. Then click **OK**.
3. Under the Default Preferences section - Click in the **Preferences (*.xin):** field and then click the **Browse** button to navigate to the following file: **C:\\InRoads Data\1234567\Standards\GDOT_Standard V8i_SS2.xin** file and click **Open**.
4. Under the Default Directory Paths Section - Click in the **Project Default Directory:** field and then click the **Browse** button to navigate to the folder: **C:\InRoads Data\1234567\Photogrammetry**. Next - click **Open**.
5. Under the Default Directory Paths Section – copy and paste the following text into each entry field shown below: **C:\InRoads Data\1234567\ Photogrammetry**

    - Report Directory: - **C:\InRoads Data\1234567\Photogrammetry**
    - Projects (*.rwk): - **C:\InRoads Data\1234567\Photogrammetry**
    - Surfaces(*.dtm): - **C:\InRoads Data\1234567\Photogrammetry**
    - Geometry Projects: (*.alg): - **C:\InRoads Data\1234567\Photogrammetry**
    - Template Libraries:(*.itl): - **C:\InRoads Data\1234567\Photogrammetry**
    - Roadway Design: (*.ird): - **C:\InRoads Data\1234567\Photogrammetry**
    - Survey Data: (*.fwd): - **C:\InRoads Data\1234567\Photogrammetry**
    - Drainage: (*.sdb): - **C:\InRoads Data\1234567\Photogrammetry**
    - Quantity Manager: (*.mdb): - **C:\InRoads Data\1234567\Photogrammetry**
    - Site Modeler Projects (*.gsf): - **C:\InRoads Data\1234567\Photogrammetry**

6. Under the Default Directory Paths Section - Click in the **Style Sheet (*.xsl):** field and then click the **Browse** button to navigate to the folder:
C:\InRoads Data\Style Sheets\GDOT. Next - click **Open**.

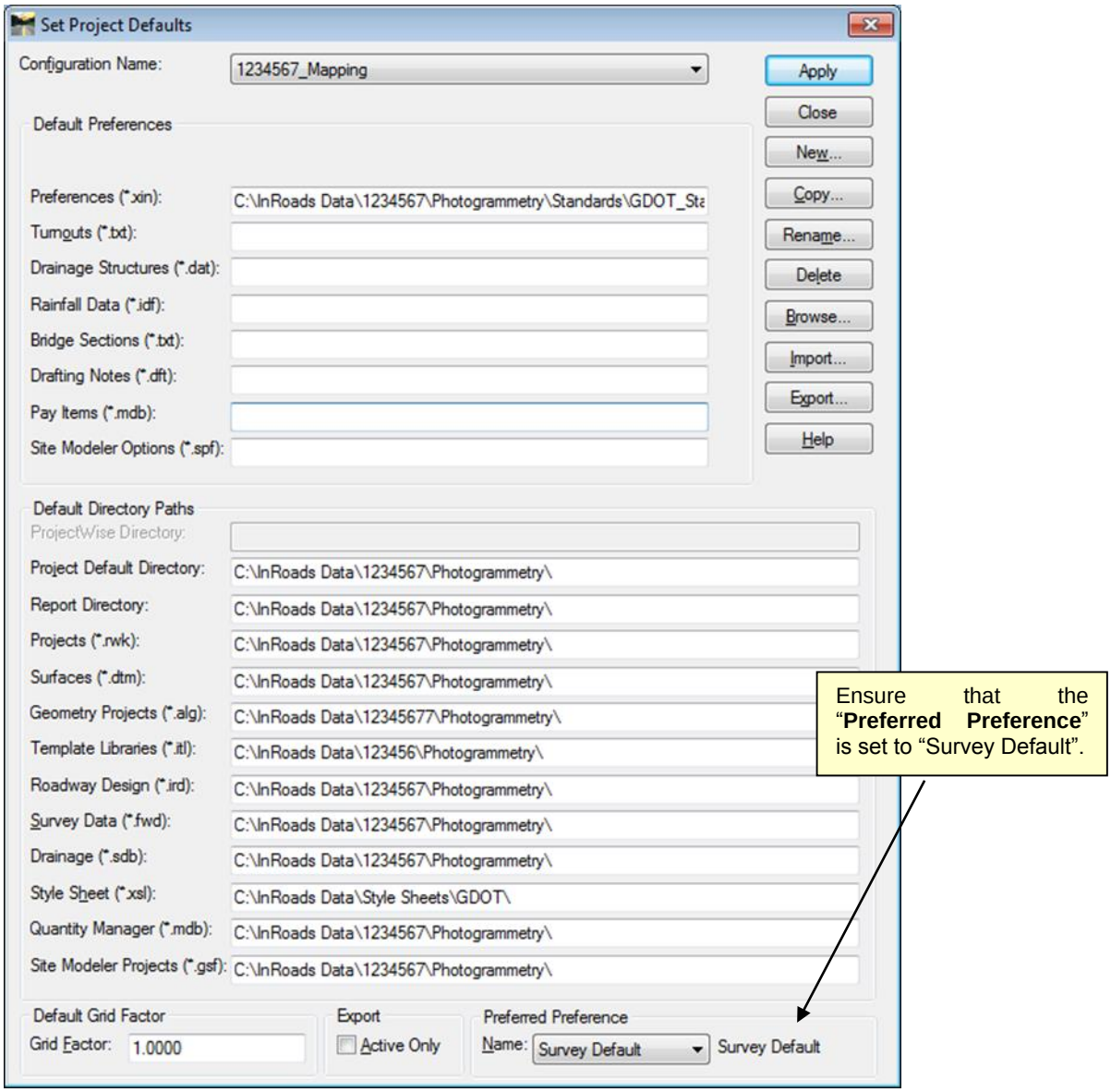


Figure 1-6 Project Defaults

8. The **Project Defaults** should look similar to the screen capture depicted in *Figure 1-6* (as shown above). Click **Apply** and then click **Close**.

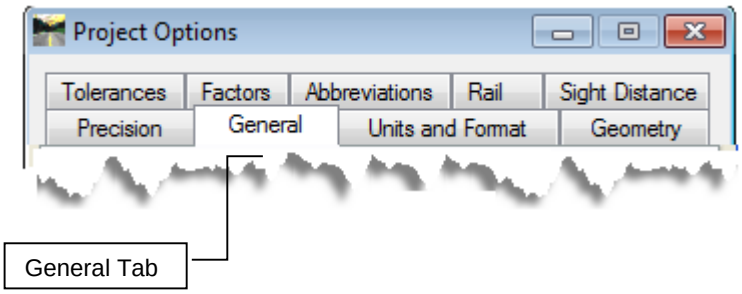
1.7 Survey Default Preferences

The **Survey Default** Preferences must be loaded in InRoads in order to conform to standards for the processing of Mapping Projects. This is a very important step to ensure that standards are followed for any Photogrammetric data that will be processed. The **Survey Default** Preference loads the

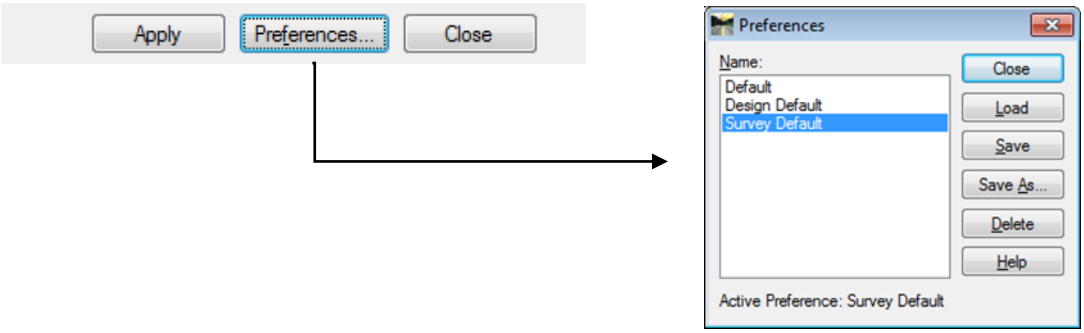
Precision Settings, Tolerances, Units and Formats, etc. Once the **Survey Default** Preference is loaded – the project will retain these settings each time the project is accessed.

Following are the steps to set the **Survey Default Preferences**:

1. Click **File ▶ Project Options** from the InRoads pull-down menu to access the **Project Options** dialog box.
2. In the **Project Options** dialog box - click on the **General Tab** and the ***General Tab*** dialog box will appear.



3. In the **General Tab** dialog box click the command button named **Preferences…** (Located at the bottom of the dialog box) and the **Preferences** dialog box will open.



4. In the **Preferences** dialog box – select **Survey Default**. Then click **Load** and then click Close.
5. The **Survey Default** Preference should now correspond to the screen capture depicted in *Figure 1-7* (as shown below).

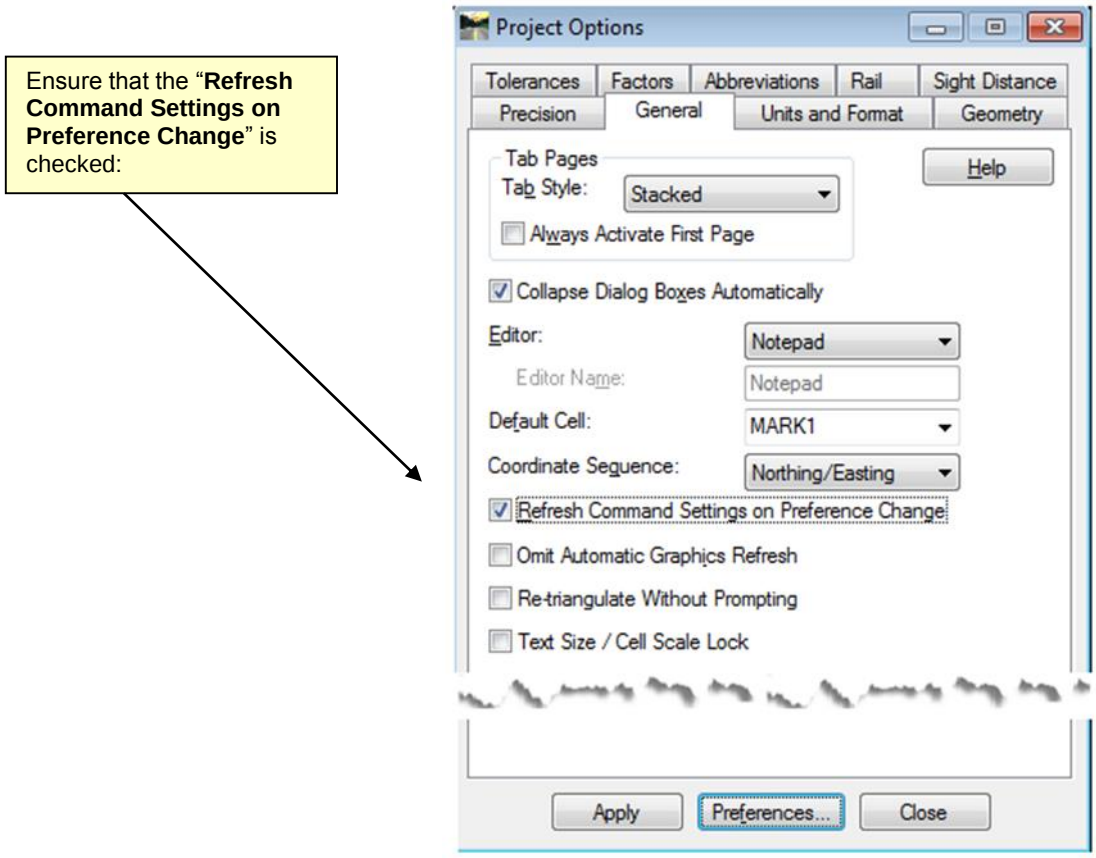


Figure 1-7 Survey Default Settings

6. Click **Apply** and then click **Close**.

The **Survey Default** Preference is now loaded. This Preference loads the appropriate data for ALL of the tabs in the **Options** dialog box. The individual tabs (Tolerances, Geometry, Units and Format, etc.) will automatically be configured for use in Survey calculations. The Point and Alignment Numbering scheme(s) are also automatically configured for the standard Survey conventions in the **Survey Default** Preference. These individual tab options will NOT need to change. Once the **Survey Default** Preference is loaded – the project will retain these settings each time the project is accessed on this computer. These settings are specific to this computer Profile/XIN file. If the Project is accessed on another computer – these settings may need to be re-applied in order to load the correct **Survey Default** Preference.

1.8 InRoads "Locks"

InRoads contains several "Locks" which are used by many InRoads commands to control different aspects of the selection and viewing of data as well as the reporting of data. There are basically two types of "Locks" – On/Off "Locks" and Switch "Locks". (Switch "Locks" contain different modes but one mode is always active and the user can switch between modes). Both types of "Locks" can be changed by the user as the situation dictates during the course of the database generation. These locks affect many commands – so it is very important that the user understand the use of these locks.

If an InRoads command does not function as expected when utilizing the Surface Viewing or Reporting commands -- a “Lock” may have been inadvertently turned on/off.

The following section contains a brief overview of some of the InRoads “Locks”. Only the “Locks” pertaining to the Photogrammetry aspect will be reviewed. As mentioned previously the “Locks” may be changed as situations dictate – but the settings depicted in the following section are applicable for most Photogrammetry Projects. It is a very important step to ensure that the “Locks” are set accordingly. (See *Table 1.5*)

Following are the steps to access the InRoads “Locks””:

Click **Tools ▶ Locks** from the InRoads pull-down menu. Each time a “Lock” is changed – the pull-down menu will close and the user must click on **Tools▶Locks** again to access the Locks pull-down.

Table 1.5

InRoads Locks Settings	
Feature Filter	Unchecked
Feature Highlight	Unchecked
Style	Unchecked
Pencil/Pen	Set to Pencil
Delete Ink	Unchecked
Locate	Set to Features
Point Snap	Checked
Element Snap	Unchecked
Station	Unchecked
Report	Unchecked
Cogo Audit Trail	Checked
Toolbar	Checked

Following is a brief overview of the InRoads "Locks": (See *Table 1.6)*

Table 1.5
InRoads Locks Overview

Feature Filter
displays or obscures Surface Features based on a filter (also controls Survey Style Filter)

Feature Highlight
highlights the feature in plan view when selected from a list

Style
determines if a dialog box is displayed for a surface command or cross sections

Pencil/Pen
controls the redisplaying of Graphics

Delete Ink
allows redisplayed graphics to replace graphics in pen mode

Locate
controls if Locate Buttons snap to Graphics or Features

Point Snap
controls the ability to snap to points in Geometry Project

Element Snap
controls the ability to snap to elements in Geometry Project

Station
controls the Stationing as it pertains to Cross Sections

Cogo Audit Trail
controls the reporting of coordinate geometry results to a text file

Report
controls if Report is displayed or not displayed in a dialog box

Toolbar
displays or turns off the Locks Toolbar

1.9 Application and Variable Manager Add-Ins

InRoads contains several Application and Variable Manager "Add-Ins" which must be selected and added to the InRoads Program in order to access the standard GDOT customized menu

applications/translators for Photogrammetry and Survey. Once the Application and Variable Manager Add-Ins are selected – the settings are written to registry keys in the user's profile. This ensures that each time InRoads is accessed in the user profile -- these settings will already be available. These add-ins will only need to be added once and will then be accessible in all of the InRoads Modules and InRoads Projects.

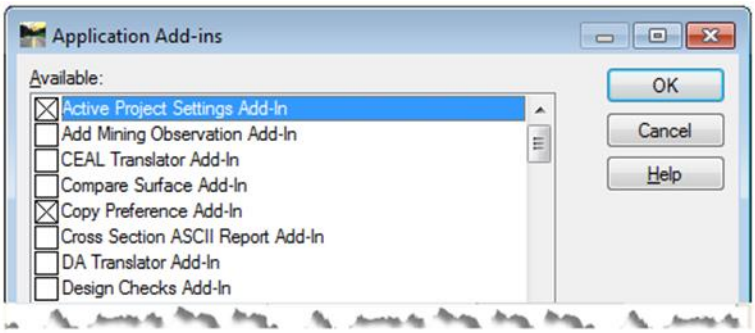
The "Application and Variable Manager Add-Ins" must be set accordingly in order to access the required GDOT Photogrammetry/Survey commands and translators.

This section details the following processes:

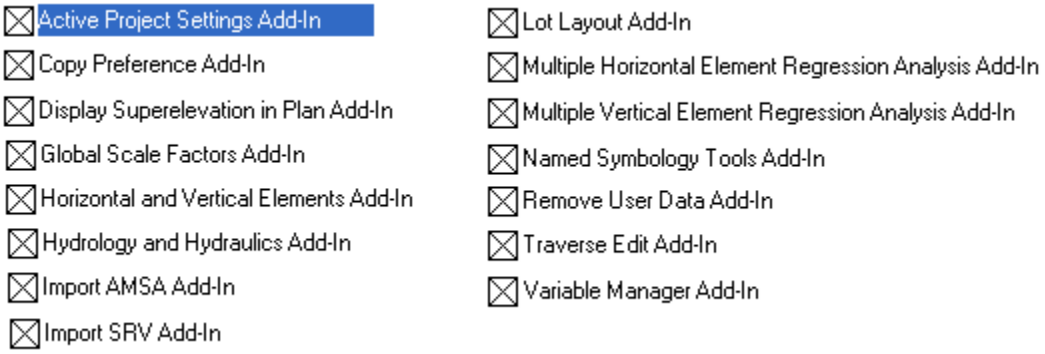
- Steps to select the Application Add-Ins
- Steps to select the Variable Manager Add-Ins

1.9.1 Steps to Select the Application Add-Ins:

1. Click **Tools►Application Add-Ins** from the InRoads pull-down menu and the following dialog box will appear:



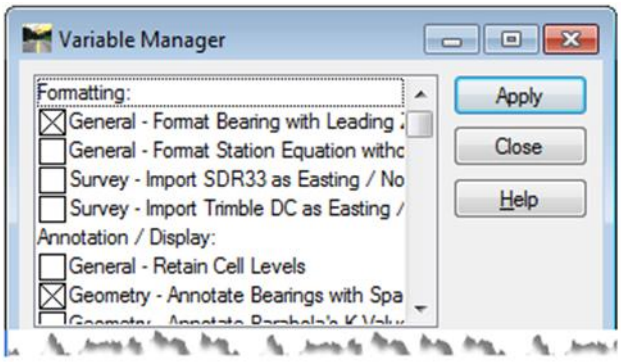
2. Select the following Application Add-Ins by clicking an ☒ by the appropriate Add-In:



3. Click **OK** to accept the settings and to close out of the dialog box.

1.9.2 Steps to Select the Variable Manager Add-Ins:

1. Click **Tools▶Variable Manager** from the InRoads pull-down menu and the following dialog box will appear:



2. Select the following Variable Manager Add-Ins by clicking an ☒ by the appropriate Variable:

☒ General - Format Bearing with Leading Zero Option

☒ Geometry - Annotate Bearings with Spaces

☒ Geometry - Alphanumeric Names in Create/Edit Alignment by Cogo Points

3. Click **Apply** to accept the settings and then click **Close** to close out of the dialog box.

Intentionally Left Blank

Chapter 2. Standard Conventions - Contents

Chapter 2. Standard Conventions

This section provides an overview of the GDOT standard Project, File and Object naming conventions. The standard Feature Types for DTM (Digital Terrain Model) data are discussed and the GDOT Preference File (.XIN) is reviewed. Feature Code Tables are also listed which provide the standard Feature Codes/Feature Styles to utilize for Photogrammetric and/or Field Survey Projects.

This section covers the following topics:

- Project and File Naming Conventions
- Standard Surface Feature Object Names
- Standard Surface Feature Types
- Standard Preference File (XIN)
- GDOT Standard InRoads Photogrammetry Feature Codes
- GDOT Standard InRoads Field Survey Feature Codes

2.1 Project and File Naming Conventions

As mentioned previously in Section One - in order to ensure Project and File Naming consistency – standard Project and File Naming conventions have been established.

This section details the following Standard Naming Conventions:

- Standard Project Naming Conventions
- Standard File Naming Conventions

2.1.1 Standard Project Naming Conventions

The standard File Structure for InRoads is a Project Folder named for the PI Number of the project. A sub-folder – named ***Photogrammetry*** – will be located under this PI Number. This is the folder location where the core Photogrammetry File data is located. When submitting project deliverables to the District Location Engineer and/or Survey Data Engineer – submit the entire Project Folder (*Example: the PI Number Folder and the associated Photogrammetry sub-folder*). This will ensure that all of the applicable files are submitted to the end-user. (See *Table 2.1*)

Table 2.1	
Standard Project Naming Conventions	
InRoads Project Structure	C:\InRoads Data\PI Number\ Photogrammetry
InRoads Project Structure (Example)	C:\InRoads Data\1234567\ Photogrammetry

2.1.2 Standard File Naming Conventions

InRoads contains several different file types but the Photogrammetry data will usually consist of file types pertaining to the .DTM (Digital Terrain Model) and the associated Topographical and Utility .DGN (MicroStation Design File) file deliverables. Following are the applicable file naming conventions (See *Table 2.2*)

Table 2.2	
Standard File Naming Conventions	
File Type	**File Name**
3D "Working" DGN file	GDOT 3D Working File.dgn
Processed DTM Surface file	PI#_ Map.dtm
Processed Topographical & Utility DGN file(s)	PI#_Map.dgn PI#_MapUTLE.dgn
Processed DGN PDF Plot Files	PI#_Map1.pdf, PI#_Map2.pdf, etc

2.2 Standard Geometry Object Names and Feature Styles

InRoads contains an **Import ▶ Surface Advanced** command which imports the 3D Photogrammetric Data from the Softcopy MicroStation DGN file into a format that is usable for InRoads. The **Surface Advanced** command imports the 3D DGN elements into InRoads based on the Level of the Features in MicroStation as well as the Level and Cell for Random Terrain Points. The 2D planimetric DGN elements are not imported into InRoads from the DGN file. After the elements are imported into InRoads as Surface Features, these Features are then processed and triangulated. (The DGN importation process is discussed in more detail in the *Introduction to InRoads for Photogrammetry*).

The end result is that the 3D Mapping DGN data is imported in as surface features into a surface. Each Feature object is assigned a unique naming scheme based on the Feature Style – Example: M_TPBL1, M_TPBL2, M_TPBL3, etc. The internal surface points are numbered consecutively in the particular Feature Object - Example: 1, 2, 3, etc. Each Feature can be made up of one or many points. The Feature Style determines if the Feature will be included in the triangulation process.

The Feature Type affects how the DTM triangles are formed. The Feature Type can be a breakline, random point, etc. and is determined based on a setting in the corresponding Feature Style. The attribute of the Surface Feature (whether it is 3D topographic or a 2D planimetric Feature) and the triangulation effect is also determined during the translation process.

The Standard Object Names for the Surface Features are determined by the Feature Code/Feature Style – this is an automated process so that the Standard Object Names are already defined for the user.

Following are some examples of the imported Features located in the DTM surface: (See Table 2.3)

Table 2.3

Example Standard Object Names

Feature Style	Feature Name
TOPO_E_TPBL	M_TPBL991
TOPO_E_TRCRE	M_TRCRE10
TOPO_E_TWFB	M_TWFB12

The Mapping Exterior Boundary will be named as **MBOUNDARY**. (See Table 2.4)

Table 2.4
Example Exterior Boundary Naming Conventions

Exterior Boundary Type	Feature Name	Feature Style
Mapping Exterior Boundary	MBOUNDARY	TOPO_E_TLIML
Full Field Survey Boundary	XBOUNDARY	TOPO_E_TLIML

2.3 Standard Surface Feature Types

InRoads contains five Feature Types: **Breakline, Random, Contour, Interior** and **Exterior**. These Feature Point Types are set according to the corresponding Feature Code/Feature Style in the standard GDOT Preferences file (**GDOT_Standard V8i_SS2.xin**). As mentioned previously, the Feature Point Type determines how DTM triangles are formed when the points are connected. When the data in the DGN file is imported during the Photogrammetric DGN import process – the correct Feature Type is automatically assigned by the Feature Style and to the Feature Object which is imported into the Surface. Following are examples of the Feature Types: (See *Table 2.5*)

Table 2.5	
Example Surface Feature Types	
Feature Type	**Description**
Breakline	Linear connected points that represent discontinuities in a surface
Random	Randomly spaced points that are independent of other points
Contour	Connected points that form a linear segment based on elevation
Interior	Interior connected points that represent areas in a DTM that are undefined or obscured
Exterior	Exterior connected points that represent the outer limits of a DTM surface and can be used to trim extraneous triangulated data

2.4 Standard Preferences

InRoads Standards for the Photogrammetric process have been set up in a “Preference” file (also known as an XIN file). This preference file contains the Georgia Department of Transportation’s standards for Feature Codes, Feature Styles, Feature Filters, Dialog Box Settings, Linestyles, Lineweights, colors, and numerous other settings. The XIN file is basically a compilation of INI Files (Initialization files) which controls the standardization of the InRoads settings and display options. This preference file is critical for use in the InRoads Photogrammetric Process and for accurate Digital Terrain Model creation. The XIN file is used in conjunction with MicroStation V8i’s ByLevel settings and configuration files to assist in the viewing of project data and in the generation of topographical and utility DGN plan file deliverables.

The standard GDOT XIN file is named **GDOT_Standard V8i_SS2.xin** and is included in the **InRoadsALL.exe** download.

After downloading and executing the **InRoadsALL.exe** – a **Standards** folder is created directly under the C:\InRoads Data folder. The Photogrammetrist will copy this **Standards** folder to the Project Folder: (See Example in *Table 2.6*).

Table 2.6	
Name and Location of the GDOT Standard XIN File	
GDOT Standard XIN File	C:\InRoadsData\1234567\Photogrammetry\Standards\GDOT_Standard V8i_SS2.xin

NOTE: The XIN file contains Named Symbology and Feature Styles which correspond with the ByLevel Settings in MicroStation. Please note that if any modifications or additional Feature Styles/Named Symbology are added by the user to the XIN – the MicroStation Levels may not view with the correct Symbology for those modified Feature Styles. It is advisable to NOT add additional Named Symbology or Styles in order for the XIN file to be consistent with the current MicroStation Bylevel settings so that utilities for Plans Productions will function correctly.

NOTE: For all Mapping Project DTM's – the Photogrammetrist should use the Preference named **EXISTING** when viewing the DTM Triangles:

EXISTING	**View Triangles**	Surface ▶ View Surface ▶ Triangles ▶ Preferences	For use when viewing the Existing DTM.

2.4.1 Standard Preference File (XIN) Details

The XIN File contains the GDOT configuration settings for use in Photogrammetry/Survey/Design. These settings contain the current GDOT standards for plan development and processing of Photogrammetry/Survey/Design Data. Following are some of the Configuration Settings contained in the XIN:

- **Named Symbology** – This controls how elements such as points, lines, text, etc. appear in plan, cross section and profile views in MicroStation. The GDOT named symbology is also set to ***ByLevel*** which references the Level Settings for Symbology in the MicroStation DGNLIB. ByLevel controls the Symbology (weight, color, linestyle) and the Named Level on which the elements are located. The Named Symbology can also be set in the InRoads Named Symbology Manager by selecting each symbology (color, weight, linestyle, etc.) separately but GDOT uses the ByLevel Symbology to correspond with the DGNLIB Levels. (The Named Symbology determines "How" an element is viewed"). .

- **Feature Styles** – InRoads contains Features which represent elements such as points, lines, arcs, spirals, etc. The Feature Style for each Geometry, Survey, DTM and Component element is used to determine how the elements view. The elements can be set to view in plan view, profile, cross section, DTM, etc. The Feature Style references the associated Named Symbology to view the element with the appropriate corresponding Symbology. The Feature Style determines "Where" the element is viewed.

- **Preferences** – When using commands in the InRoads dialog boxes – it is useful to set Preferences which can be loaded later without having to re-enter information into the dialog

boxes. Preferences are basically entries in dialog boxes which can be saved and then selected to automatically configure the settings of a dialog box without manual re-entry.

- **Filters** – Filters are commands in dialog boxes which can be used to "filter" selections of data based on set criteria. This can include selection of Points, Alignments, Features or other entities by using a filter based on the entities' Style, Name, etc.

These are some of the GDOT standards that have been configured for use in the XIN file. These settings are used to assist in the Photogrammetry/Survey/Design process to ensure that standards are consistent for development of GDOT project plans.

2.5 GDOT Standard InRoads Photogrammetric Feature Codes

To see the most current GDOT InRoads Photogrammetric Features and the Levels used for them, please see the InRoads Photogrammetric Features document, found on the GDOT ROADS webpage.

2.6 GDOT Standard InRoads Field Survey Feature Codes

To see the most current GDOT InRoads Survey Feature Codes/Styles, please see the InRoads Field Survey Feature Codes document, found on the GDOT ROADS webpage.

Intentionally Left Blank

Chapter 3. Photogrammetry Project Deliverables - Contents

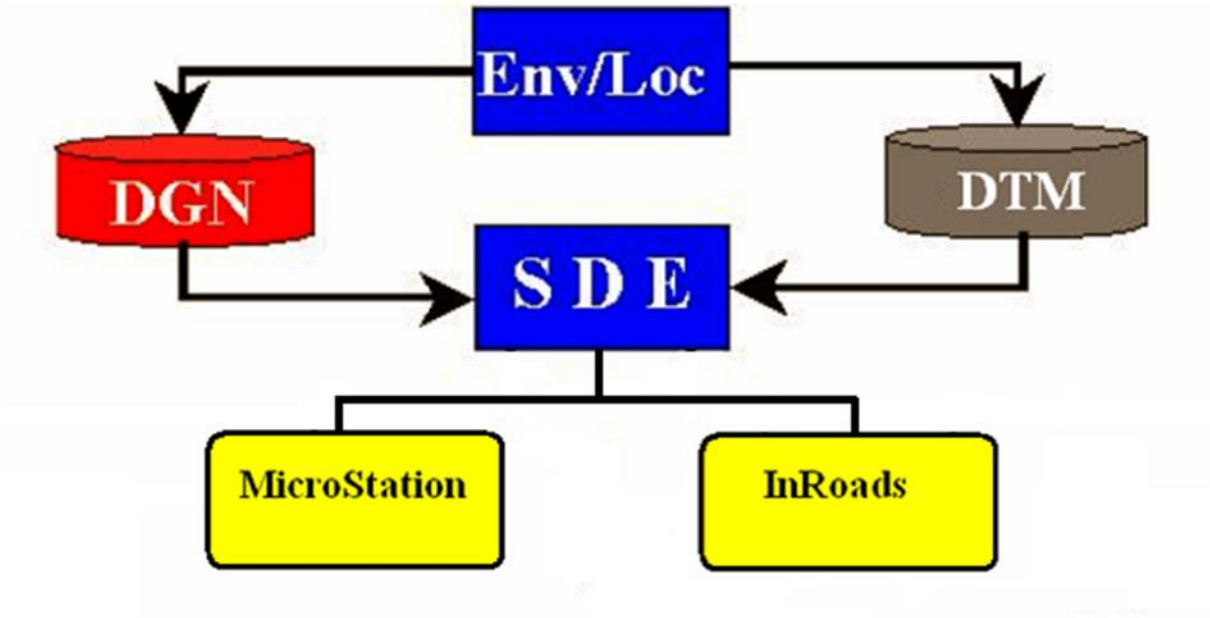
Chapter 3. Photogrammetry Project Deliverables

This section provides an overview of the Photogrammetry Project Deliverables which will be submitted to the District Location Engineer/District Survey Data Engineer.

This section covers the following topics:

- Processing of the Mapping Surface
- Generation of the Topographical and Utility DGN File(s)
- Listing of the Photogrammetry Project Deliverables

Mapping Process Overview



3.1 Processing of the DTM Surface

For detailed instructions regarding the generation and processing of the Photogrammetry Data and the creation of the DTM Surface – please refer to the "***Introduction to InRoads for Photogrammetry***" Training Tutorial. Detailed information for the processing of the Photogrammetry Data is listed and described in **Labs 1-7**.

Following are some Quality Assurance Verification Items to review in order to insure that an accurate DTM Model is created:

Photogrammetry Data:

- Make sure that all crossing segments are resolved
- Ensure that there is only one Exterior Boundary
- Verify that the Exterior Boundary Feature Name is MBOUNDARY
- Ensure that the Exterior Boundary is a closed shape entity
- Verify that all Interior Boundaries are closed shape entities
- Check to ensure there are no erroneous (bad) point elevations
- Verify that Standard GDOT Naming Conventions and Feature Styles are used

DTM Surface Data:

- Make sure that the DTM is created using the "EXISTING" Preference
- Ensure that the Maximum Triangle Length of 300.00 is used.
- Verify that the DTM contains no erroneous "Spikes"
- Verify that all extraneous triangles are trimmed
- Ensure that all MOBSC Features (obscured areas) are obscured
- Make sure to compress the DTM Surface before submittal to the SDE

After the DTM Surface data has been verified and all errors corrected - the next step is the completion of the final processing of the DTM Surface. The DTM Surface will be re-triangulated and compressed (which will release memory slots that contain deleted data).

1. **Save the InRoads Surface File**

   After re-triangulating and compressing the DTM Surface – the data will need to be saved. As mentioned previously, InRoads retains the data in temporary memory but does not save the data on the fly. Whenever a change has been made to an InRoadsSurface Project – Save the project and its associated modifications or changes.

   Select **File ▶ Save ▶ Surface** from the **InRoads Menu** and save to the following location:

   C:\InRoads Data\1234567\ Photogrammetry

   Please Note: (The "Save As" dialog box may not appear because the Surface has already been saved initially).

2. The **PI#_Map.dtm** Surface Project is now ready for submittal to the District. This file will be sent to the District SDE as a completed Surface Project. This .**DTM** file replaces the CAiCE .SRV file format. The **DTM** file contains all of the Features (random points, breaklines, border,

obscured features, etc.) that used to be contained in the CAICE .SRV File. The DTM Surface is already triangulated for the SDE so that he can begin adding the field enhancements.

3.2 Generation of the Topographical DGN File and Utility DGN Files

The Topographical DGN File will be generated from the Photogrammetry Softcopy software. This DGN file will contain both the 2D and the 3D Photogrammetry elements.

As an additional step the UTLE DGN file will also be created from the Topographical DGN file by using a MicroStation Filter or Macro to select the Utility Levels to write out to the UTLE DGN file.

These DGN files will need to be saved with a standard naming convention in order to submit to the District.

Table 3.1

Standard Topographical and Utility DGN File Names

Topographical DGN Path/File Name	C:\InRoads Data\PI Number\ Photogrammetry\ PI#_Map.dgn
Topographical DGN Path/File Name (Example)	C:\InRoads Data\1234567\ Photogrammetry 1234567_Map.dgn
Utility DGN Path/File Name	C:\InRoads Data\PI Number\ Photogrammetry\ PI#_MapUTLE.dgn
Utility DGN Path/File Name (Example)	C:\InRoads Data\1234567\ Photogrammetry 1234567_MapUTLE.dgn

In the [MicroStation Software] –

"Fit the Active View" so that all the data appears in the MicroStation View Window.

1. Select **File▶Save As▶** from the [MicroStation Menu].

   Save the DGN File (Example: ***1234567_Map.dgn***) to the path shown below -- under the folder **Photogrammetry** --

   C:\InRoads Data\1234567\ Photogrammetry

2. In the [MicroStation Software] –

   Select **File▶Compress▶Design** from the [MicroStation Menu].
   (This will compress and reduce the size of the MicroStation file).

3. Perform Steps 1 and Step 2 (listed above) to generate the ***PI#_MapUTLE.dgn*** file as an additional deliverable.

   The 1234567_Map.dgn and 1234567_MapUTLE files are now ready for submittal to the District.

3.3 Listing of the Photogrammetry Project Deliverables

After the DTM Surface has been processed (1234567_Map.dtm) and the DGN file (1234567_Map.dgn) has been generated - the Office of Design Policy and Support/Location Bureau will submit the following information to the Districts either by delivery of a CD or submittal on a Network Share:

The Final Deliverables include the following:

- A processed DTM Surface file (PI#_Map.dtm)
- A Topographical DGN file (PI#_Map.dgn)
- A Utility DGN file (PI#_MapUTLE.dgn)
- DGN Plot Files (.pdf)
- Mapping Photographs
- A Roll Plot of the topographical DGN data (if required)
- A Photogrammetry Quality Assurance Checklist Document

PLEASE NOTE:

A **Photogrammetry Quality Assurance Checklist** will be documented by the GDOT Office of Design Policy and Support/Location Bureau and/or the Consultant Firm performing the Photogrammetry Processing work. This document lists several areas including the Photogrammetry Data, DTM Surface and Final Deliverables which need to be verified before Project Submittal. This Document is a required Deliverable and will be submitted with the previously listed Deliverables.

The following page contains the example Photogrammetry QA form which will be completed and submitted. The **Photogrammetry Quality Assurance Checklist** is available for download by navigating to the MicroStation and InRoads links from the following location:

http://www.dot.ga.gov/PS/DesignSoftware/InRoads

Georgia Department of Transportation

P.I. Number:	
County:	
Project Description:	
QA Reviewer:	
Phone Number:	

GDOT Photogrammetry Quality Assurance Checklist

(Instructions: In the Verified Column – enter YES, NO or N/A for the Verification QA Status)

CATEGORY	TASK	VERIFIED
Photogrammetry Data	All crossing segments and crossing overlaps are resolved	_____
	There is only one Exterior Boundary	_____
	The Exterior Boundary Feature Name is MBOUNDARY (for Mapping Projects)	_____
	The Exterior Boundary is a closed shape entity	_____
	All Interior Boundaries are closed shape entities	_____
	All erroneous (bad) point elevations have been resolved	_____
	Standard GDOT Naming Conventions and Feature Styles used	_____
DTM Surface	The DTM is created using the “EXISTING” Preference	_____
	A Maximum Triangle Length of 300.00 is used	_____
	All erroneous DTM ‘Spikes’ have been corrected	_____
	All extraneous triangles are trimmed	_____
	All MOBSC Features (obscured areas) are obscured	_____
	Compress the DTM Surface before Submittal to SDE	_____
Final Deliverables	A processed DTM Surface File named (PI#_Map.dtm)	_____
	A topographical DGN File named (PI#_Map.dgn)	_____
	A utility DGN File named (PI#_MapUTLE.dgn)	_____
	DGN Plot Files (.PDF)	_____
	Mapping Photographs	_____
	Roll Plot of the Topo DGN (if required)	_____

CATEGORY	TASK	VERIFIED
	Photogrammetry Quality Assurance Checklist	_____