InRoads Photogrammetry Guidelines

Georgia Department of Transportation

Engineering Software Standards & Support

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07-01-10	1.0	CJB - HAC	All	All
07-15-10	1.1	HAC - CJB	1.4,1.5	Removed Reference to working file.

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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. The intent of this document is to provide guidelines and standards for processing photogrammetric data in InRoads V8i. 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 **Engineering Software Standards and Support** by email at the following address:

SolutionsCenter@dot.ga.gov

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

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Overview

These Guidelines cover the GDOT standards for processing Photogrammetric (Mapping) Survey Data by utilizing the MicroStation V8i and InRoads V8i 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 Training Guide

Document Content
Below is a list of topics covered in this document:

- Project Initialization Standards
- Standard Conventions
- Photogrammetry Project Deliverables
- Converting Projects from CAiCE to InRoads
- Appendix A

1

Project Initialization Standards

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
- 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 R.O.A.D.S. 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 V8i (CaddALLV8i.exe) executable file is available and located in a download executable which can be accessed from the GDOT R.O.A.D.S. web page. This executable contains all of the GDOT MicroStation V8i standard files. This file can be downloaded by navigating to the MicroStation and InRoads links from the following location:

  http://www.dot.ga.gov/doingbusiness/PoliciesManuals/roads/software/Pages/default.aspx

- ***InRoads Standard Files Location For Internal and External Users*** - an InRoadsALL executable file (InRoadsALLV8i.exe) is available and located in a download executable which can be accessed from the GDOT R.O.A.D.S. web page. This executable contains all of the GDOT InRoads V8i standard files. This file can be downloaded by navigating to the MicroStation and InRoads links from the following location:

  http://www.dot.ga.gov/doingbusiness/PoliciesManuals/roads/software/Pages/default.aspx

The **InRoadsALLV8i.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 if they are still open.

2. Navigate to the InRoads links from the following web page:
   http://www.dot.ga.gov/doingbusiness/PoliciesManuals/roads/software/Pages/default.aspx

3. Save the ***InRoadsALLV8i.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.xin
      - GDOT_Standard V8i.itl
      - Project_Data_Sheet_MultipleAlign.docm
      - Photogrammetry_InRoads QA.docx
      - Survey Data Processing_InRoads QA.docx
      - Design Data_ InRoads QA.docx

   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:\Program Files\Bentley\InRoads Group V8.11\XML Data\GDOT**
      - GDOT Style Sheets

5. For detailed instructions on downloading and installing **InRoadsALLV8i.exe** - navigate to the InRoads links from the GDOT R.O.A.D.S. web page and click on the ***Downloading and Running InRoadsALLV8i.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 – *Example:* **123456**) located as a sub-folder under **C:\InRoads Data** – *Example:* **C:\InRoads Data\123456**. The Project Files are then located in a Photogrammetry sub-folder under the PI # – *Example:* **C:\InRoads Data\123456\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\123456\ 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 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 MicroStation V8i and InRoads V8i

The user will be working in both **MicroStation V8i** (the CADD Software) and **InRoads Suite V8i (**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

*(*IF the ***Standards*** folder – does not yet exist – the user will need to create the folder).

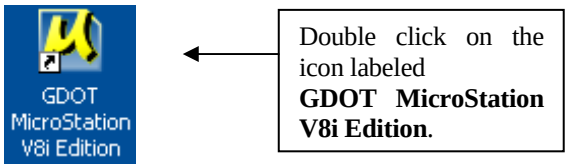
Table 1.2	
Standard Naming Convention of the "Working" DGN File	
Working DGN File Name	**C:\InRoads Data\PI Number\ Photogrammetry\Standards** GDOT 3D Working File.dgn

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.

1.3.1 Steps to Create a Photogrammetry "Working" DGN File

The Photogrammetry "Working" DGN file will be created from the **GDOT_V8_3D.dgn** seed file. Following are the steps to create a **Photogrammetry "Working" DGN File**:

1. From the desktop, double-click on the **GDOT MicroStation V8i Edition** icon.



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

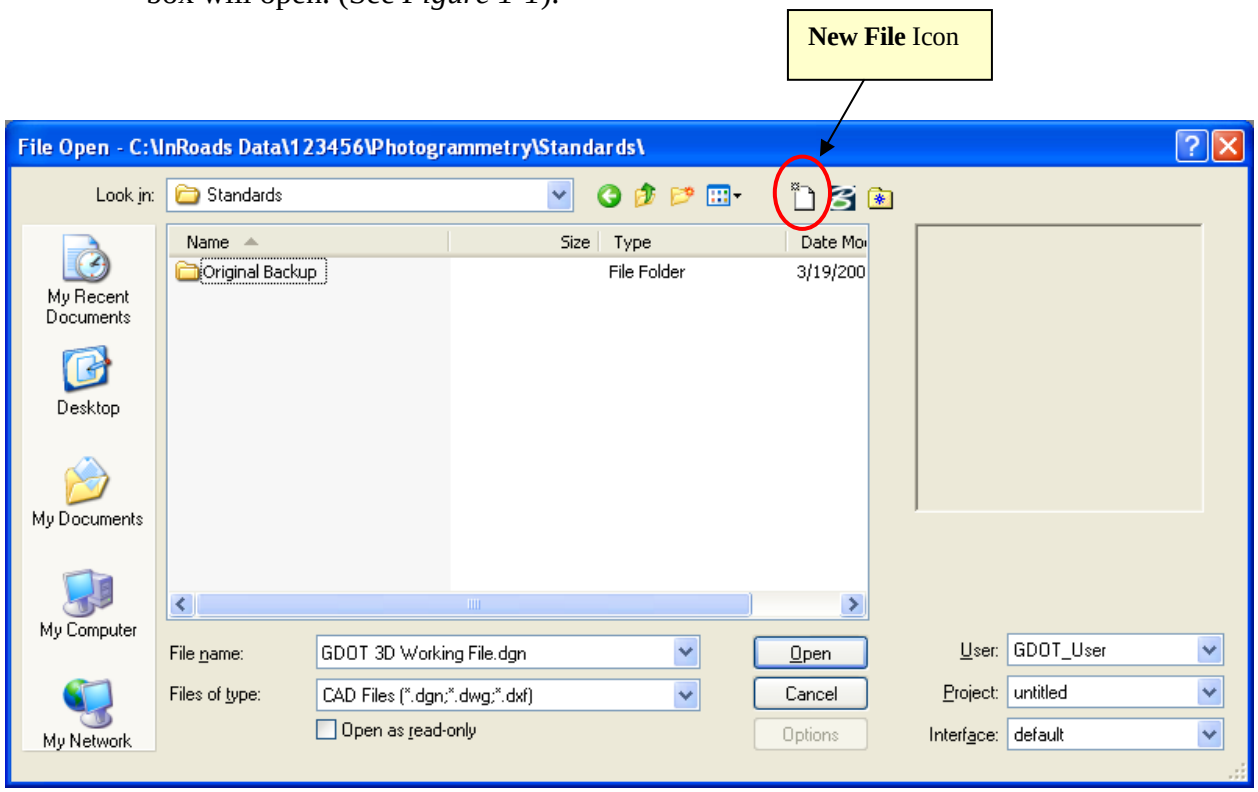


Figure 1-1 Starting MicroStation V8i and InRoads V8i

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 - ensure the seed file name is **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).

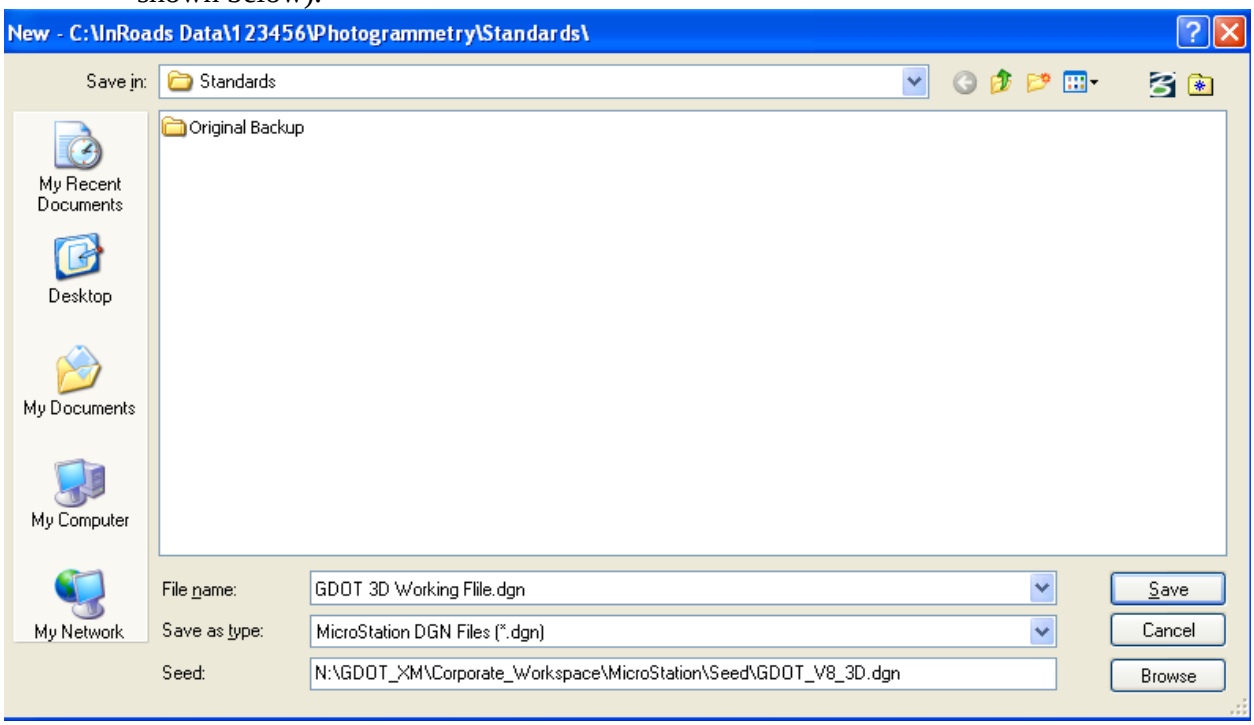
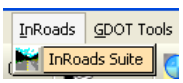


Figure 1-2 MicroStation New File Window

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** interface will then finish opening.

8. In the ***Main MicroStation Pull-down Menu*** – click on the InRoads pull-down: 

9. Then select ***InRoads Suite*** — and the **InRoads V8i** 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*.

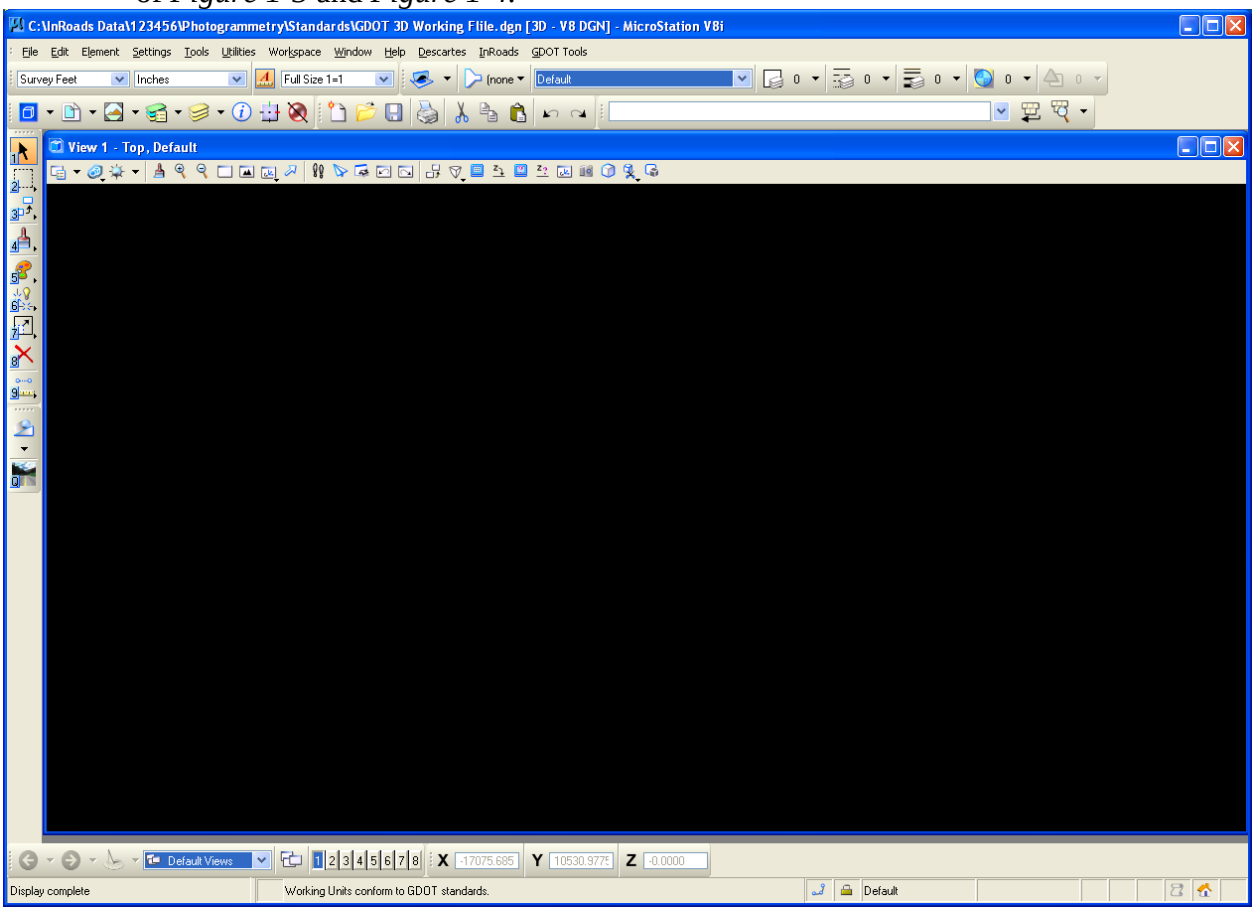


Figure 1-3 Main MicroStation V8i Window

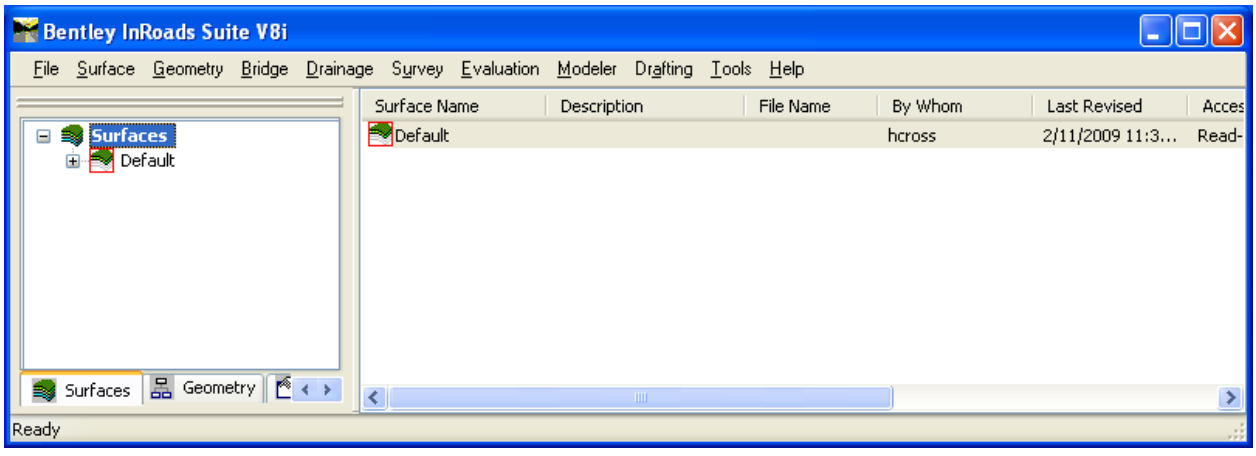


Figure 1-4 Main InRoads V8i Window

1.3.2 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 Edition** icon.

Double click on the icon labeled **GDOT MicroStation V8i Edition**.

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

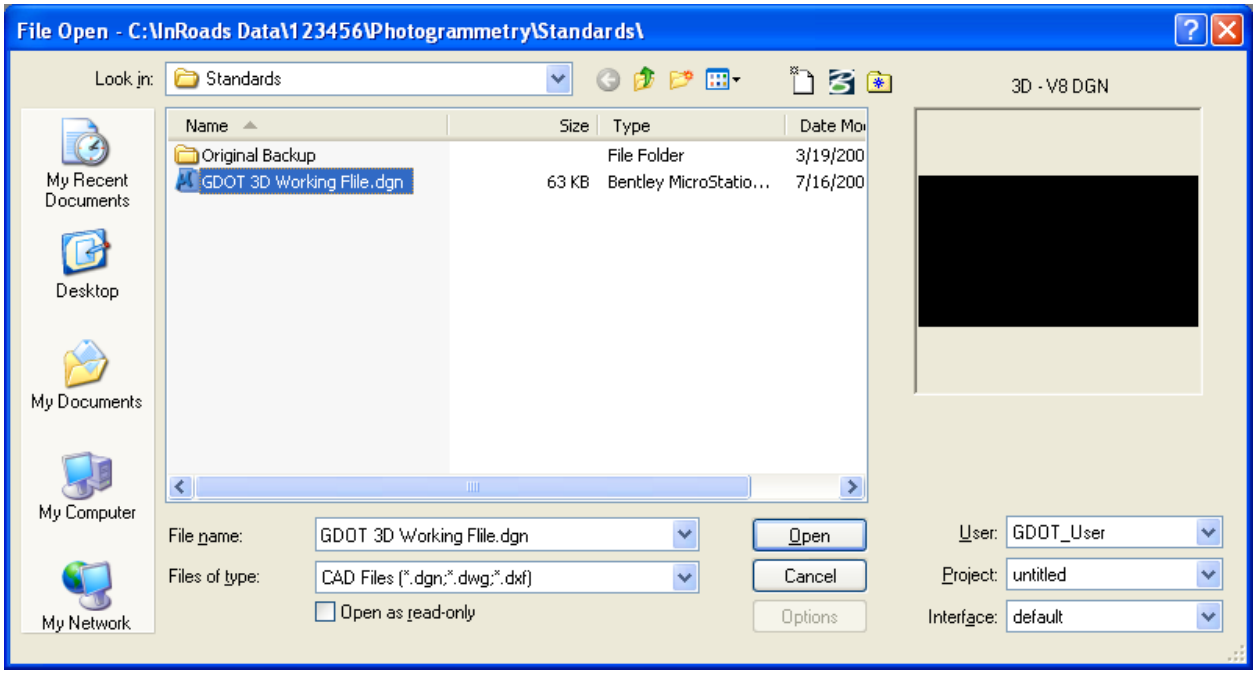


Figure 1-5 Starting MicroStation V8i and InRoads V8i

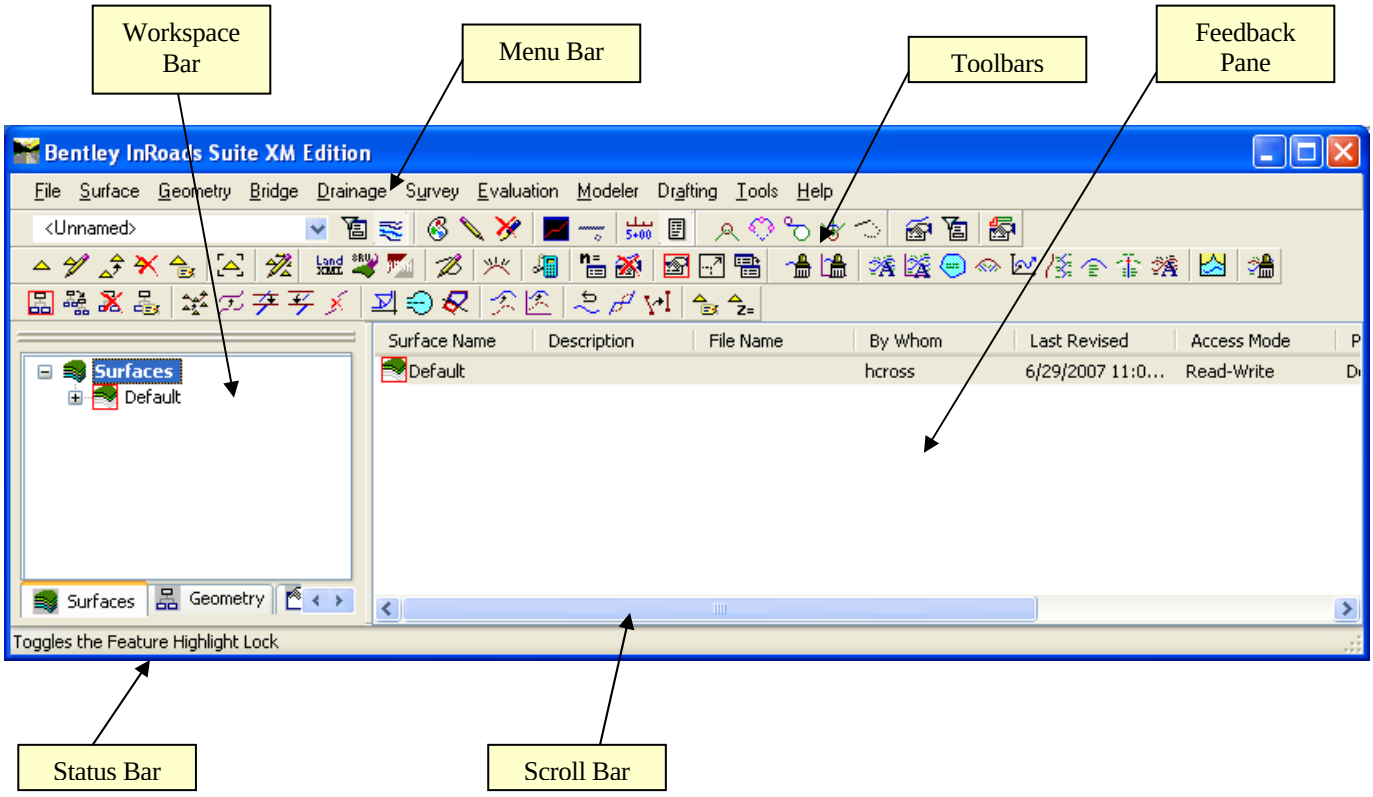
3. In the **MicroStation Manager** dialog box, browse to the ***C:\InRoads Data\PI Number\ Photogrammetry\Standards*** location and highlight the (***GDOT 3D Working File.dgn***) and click the **Open** button.

4. The MicroStation V8i interface will then finish opening. Then select ***InRoads>>InRoads Suite*** from the Main MicroStation Pull-down Menu. Once **InRoads** and **MicroStation** are up and running, the desktop should look similar to that of the previous screen captures depicted in *Figure 1-3* and *Figure 1-4*.

1.4 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.

1.5 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_Standard V8i.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 1.3*)

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 1.3	
Project Defaults Configuration	
Project Default Structure	PI Number_Mapping
Project Default Structure (Example)	123456_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 **123456_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\123456\Photogrammetry\Standards\GDOT_Standard V8i.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\123456\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\123456\Photogrammetry**

- Report Directory: - **C:\InRoads Data\123456\Photogrammetry**
- Projects (*.rwk): - **C:\InRoads Data\123456\Photogrammetry**
- Surfaces(*.dtm): - **C:\InRoads Data\123456\Photogrammetry**
- Geometry Projects: (*.alg): - **C:\InRoads Data\123456\Photogrammetry**
- Template Libraries:(*.itl): - **C:\InRoads Data\123456\Photogrammetry**
- Roadway Design: (*.ird): - **C:\InRoads Data\123456\Photogrammetry**
- Survey Data: (*.fwd): - **C:\InRoads Data\123456\Photogrammetry**
- Drainage: (*.sdb): - **C:\InRoads Data\123456\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:\Program Files\Bentley\InRoads Group V8.11\XML Data\GDOT**. Next - click **Open**.

The **Project Defaults** should look similar to the screen capture depicted in *Figure 1-6* (as shown below).

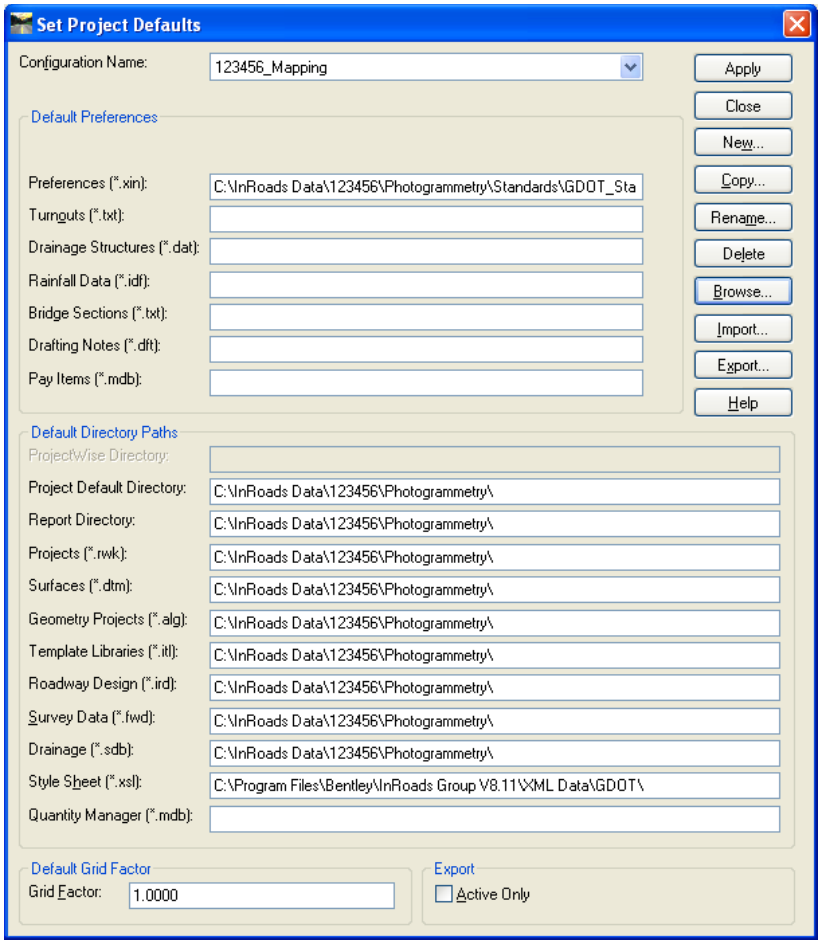


Figure 1-6 Project Defaults

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

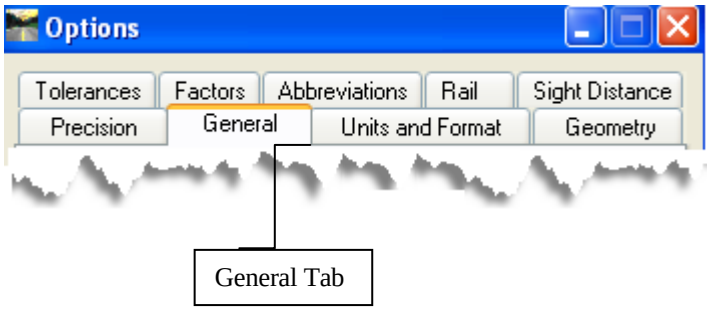
1.6 Survey Default Preferences

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 **Tools**▶**Options** from the InRoads pull-down menu to access the ***Options*** dialog box.

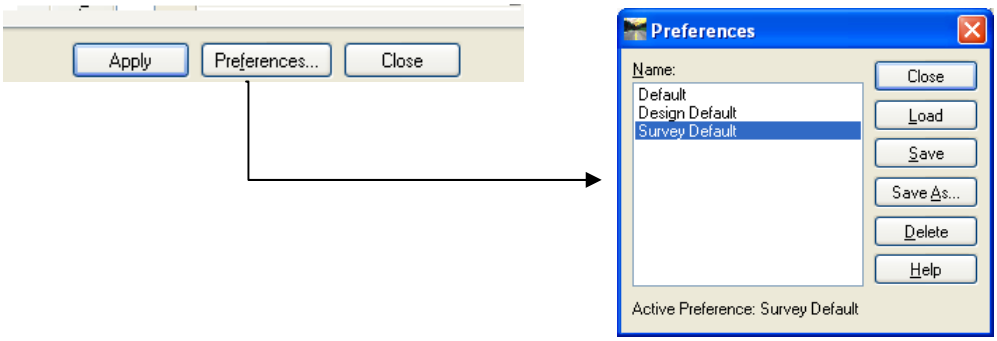
2. In the **Options** dialog box - click on the **General Tab** and the ***General Tab*** dialog box will appear.



3. In the **General Tab** dialog box select the pull-down next to **Preferred Preference Name:**

   Select **Survey Default** – to load the Survey Default Preference Settings.

4. 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.



5. In the **Preferences** dialog box – select **Survey Default**. Then click **Load** and then click **Close**.

6. The **Survey Default** Preference should now correspond to the screen capture depicted in *Figure 1-7* (as shown below).

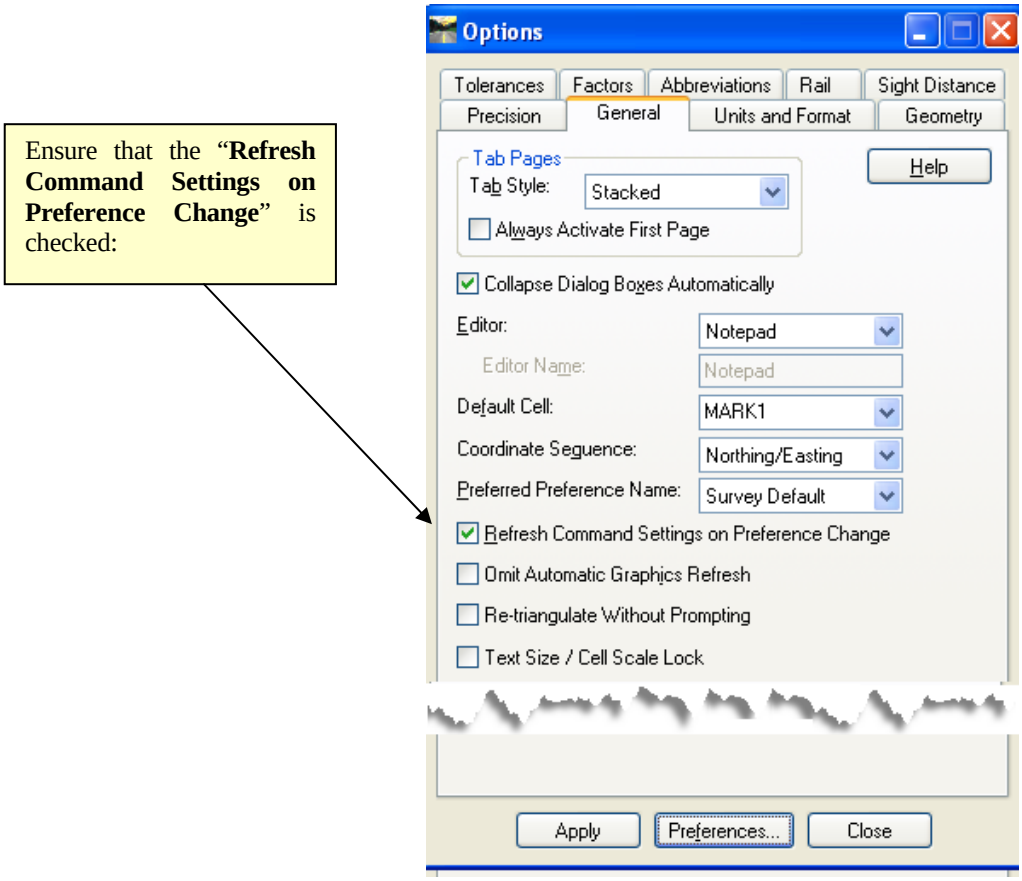


Figure 1-7 Survey Default Settings

7. 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 Mapping and Photogrammetry. 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.

1.7 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 1.4*)

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 1.4

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
Cogo Audit Trail	Unchecked
Report	Checked
Toolbar	Checked

Following is a brief overview of the InRoads "Locks":
(See *Table 1.5)*

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

1.8 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.

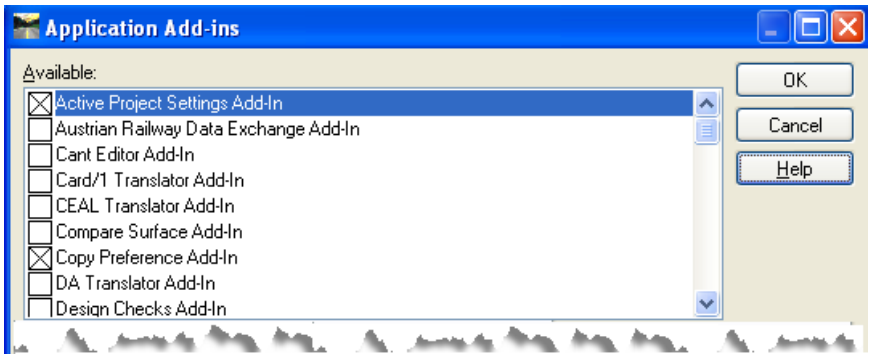
The "Application and Variable Manager Add-Ins" must be set accordingly in order to access the required GDOT Photogrammetry/Survey commands and translators.

This section details the following processes:

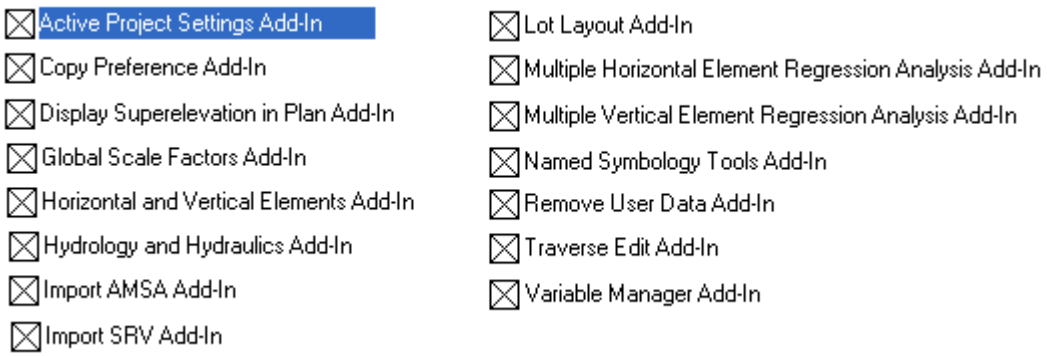
- Steps to select the Application Add-Ins
- Steps to select the Variable Manager Add-Ins

1.8.1 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:



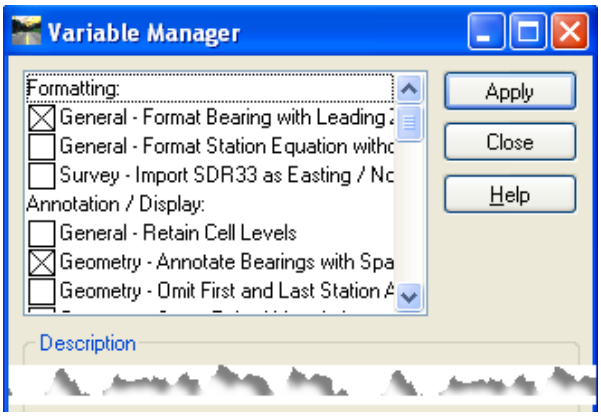
2. Select the following Application Add-Ins by clicking an ☒ by the appropriate Add-In:



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

1.8.2 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.

1.9 Starting a Photogrammetry Project in InRoads

After creating the Photogrammetry Project folder of **C:\InRoads Data\PI Number\Photogrammetry**, setting the Project Default Settings and the Survey Default Settings – the Photogrammetrist will then copy the **Standards** folder (which is downloaded through the InRoadsALLV8i.exe executable) to the **C:\InRoads Data\PI Number\Photogrammetry** folder.

1.9.1 Copy the "Standards" folder which is downloaded from InRoadsALLV8i.exe

Important Step:

After installing InRoadsALLV8i.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 InRoadsALLV8i.exe. The files will be extracted to the Default Location(s). 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\123456\Photogrammetry\Standards**).

Table 1.6		
Copy Standards Folder to Project Folder		
C:\InRoads Data\Standards	**Copy To ►►**	**C:\InRoads Data\PI #\Photogrammetry**

2

Standard Conventions

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
- GDOT Photogrammetry Code Conversion Table -- CAiCE to InRoads

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\123456\ 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 .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 DGN file	PI#_Map.dgn
Processed DGN PDF Plot Files	PI#_Map1.pdf, PI#_Map2.pdf, etc

2.2 Standard Surface Feature Object Names

The .RAW AMSA (Automated Mapping System-Advanced) files are imported directly into InRoads through an internal Import AMSA Translator. The InRoads AMSA translator then parses the RAW file coordinate and point data directly into a DTM surface. (The RAW AMSA importation/translation process is discussed in more detail in the *Introduction to InRoads for Photogrammetry Training Guide*).

The end result is that the AMSA 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: TPBL1, TPBL2, 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 is based on the associated numeric Feature Code and is assigned during the AMSA Import Translation process. 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 translated Features located in the DTM surface: (See *Table 2.3*)

Table 2.3
Example Standard Object Names

Feature Style	Feature Name
TOPO_E_TPBL	TPBL991
TOPT_E_TPBL	TPBL992
TOPO_E_TRCRE	TRCRE10
TOPO_E_TWFB	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.xin**). As mentioned previously, the Feature Point Type determines how DTM triangles are formed when the points are connected. When the data in the RAW file is imported during the AMSA translation 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 DGN plan file deliverables.

The standard GDOT XIN file is named **GDOT_Standard V8i.xin** and is included in the **InRoadsALLV8i.exe** download.

After downloading and executing the **InRoadsALLV8i.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\123456\Photogrammetry\Standards\GDOT_ Standard V8i.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

The following spreadsheet contains the standard **Numeric AMSA Codes** and the associated **InRoads Alpha Codes** for use in Photogrammetry. The **Triangulate (Yes/No)** column is for informational use only. This column denotes the status of the Alpha Code and lists whether it is triangulated or not triangulated in the DTM Surface.

GDOT STANDARD PHOTOGRAMMETRY CODES

AMSA Code	Description	InRoads Alpha Code	Triangulate (Yes/No)
1	TERRAIN POINT ON BREAK LINE	TPBL	Y
2	RANDOM TERRAIN POINT	TRP	Y
27	EDGE OF ASPHALT PAVEMENT	TEAP	Y
28	EDGE OF ASPHALT SHOULDER	TEAS	Y
33	CURB & GUTTER, TOP	TCGT	Y
34	CURB & GUTTER, F/L	TCGF	Y
35	V-GUTTER	TVG	Y
57	DRAINAGE OBSCURE AREA	DOBSC	Y
96	WALL FACE, TOP	TWFT	Y
97	WALL FACE, BOTTOM	TWFB	Y
127	LIMIT LINE	TLIML	N
128	CONSTRUCTION BOUNDARY, ACTV	TCBA	Y
150	JOB LIMIT LINE	MJLL	N
151	DITCH FLOW LINE	MDITCHFL	Y
155	TOP OF RAIL ROAD RAIL	TRCRE	Y
157	SEW LINE	MSEWLINE	Y
159	OBSCURE AREA	MOBSC	Y

2.6 GDOT Standard InRoads Field Survey Feature Codes

The following spreadsheet contains the standard **Numeric SMI Codes** and the associated **InRoads Alpha Codes** for use in Field Survey. The **Point Type and Chain Type Triangulate (Yes/No)** column(s) are for informational use only. This column denotes the status of the Alpha Code and lists whether it is triangulated or not triangulated in the DTM Surface and whether it is a Point Type or a Chain Type.

GDOT STANDARD FIELD SURVEY CODES

SMI Code	Description	InRoads Alpha Code	Point Type Triangulate (Y/N)	Chain Type Triangulate (Y/N)	Group Code
	Ground Elevations				
1	TERRAIN POINT ON BREAK LINE	TPBL		Y	4
2	RANDOM TERRAIN POINT	TRP	Y		2
	Property and Right-of-Way				
3	RIGHT-OF-WAY MARKER FOUND	RWM	N		1
4	RIGHT-OF-WAY POINT COMPUTED	RWC	N		1
5	RIGHT-OF-WAY UTILITY COMPANY	RWU	N		1
6	RIGHT-OF-WAY PRESCRIPTION PT	RWE		N	3
7	POINT ON EASEMENT LINE	POEL	N		1
8	PROPERTY CORNER FOUND	PCF	N		1
9	PROPERTY POINT ON LINE	PPOL	N		1
10	PROPERTY POINT COMPUTED	PPC	N		1
	Alignment				
15	POINT ON TANGENT, EXISTING	APOT	N		1
16	POINT OF CURVATURE, EXISTING	APC	N		1
17	POINT ON CURVE, EXISTING	APOC	N		1
18	POINT OF TANGENCY, EXISTING	APT	N		1
19	POINT OF INTERSECTION	API	N		1
20	ALIGNMENT CENTERLINE	ACL		N	3
	Roadways				
24	EDGE OF DIRT ROAD	TEDR		Y	4
25	EDGE OF ASPHALT DRIVE	TEAD		Y	4
26	EDGE OF CONCRETE DRIVE	TECD		Y	4
27	EDGE OF ASPHALT PAVEMENT	TEAP		Y	4
28	EDGE OF ASPHALT SHOULDER	TEAS		Y	4
29	EDGE OF CONCRETE PAVEMENT	TECP		Y	4
30	EDGE SURFACE TREATMENT ROAD	TEST		Y	4
31	CURB, ASPHALT	TAC		Y	4

	Roadways				
32	CURB, HEADER	THC		Y	4
33	CURB & GUTTER, TOP	TCGT		Y	4
34	CURB & GUTTER, F/L	TCGF		Y	4
35	V-GUTTER	TVG		Y	4
36	BRIDGE APPROACH SLAB, EDGE	TBAS		Y	4
37	BRIDGE END, CENTER	TBRDGCEN		N	4
38	BRIDGE END, CORNER	TBRDGCOR		N	4
39	BRIDGE COLUMN, CENTER	TCOLC	N		1
40	BRIDGE COLUMN, EDGE	TCOLE	N		1
41	BRIDGE GUTTER LINE	TBGL		N	4
42	BRIDGE CENTERLINE	TBCL		N	4
43	ENDROLL	TENDROLL		Y	4
44	BRIDGE CAP	TBCAP	N		2
	Drainage				
45	SINGLE CATCH BASIN, Gutr F/L	DCB	N		2
47	DOUBLE CATCH BASIN, Gutr F/L	DDCB	N		2
49	DROP INLET, TOP	DDI	N		2
50	SPUR DIKE	DSPURDK		Y	4
51	TOP OF WATER ELEVATION	DWE	N		2
52	STREAM CENTER, F/L	DSC		Y	4
53	STREAM EDGE	DSE		Y	4
54	STREAM BANK TOP	DSB		Y	4
55	DAM, TOP	DDT		Y	4
56	DAM, TOE	DADB		Y	4
57	OBSCURED AREA	DOBSC		Y	4
59	HEAD WALL, END	DHWE		N	3
60	CULVERT, WINGWALL END	DCWE		N	3
61	EDGE OF WATER	DEW		N	3
62	SWAMP EDGE	DSWE		N	3
63	WETLAND BOUNDARY	DWB		N	3
	Utilities				
68	STRAIN POLE	USTRPOL	N		1
69	ELECTRICAL BOX	UELBOX		N	3
70	OVERHEAD ELECTRICAL LINE	UOEL		N	3
71	OVERHEAD TELEPHONE LINE	UOTL		N	3
72	POWER POLE, CENTER	UPP	N		1
73	LIGHT POLE, CENTER	ULP	N		1
74	TELEPHONE POLE, CENTER	UTP	N		1

	Utilities				
75	TELEPHONE PEDESTAL, CENTER	UTPD	N		1
76	GUY POLE, CENTER	UGP	N		1
77	POLE ANCHOR	UPGA	N		1
78	YARD LIGHT, ELECTRICAL	UYLE	N		1
79	YARD LIGHT, GAS	UYLG	N		1
80	WATER METER, CENTER	UWM	N		1
81	WATER VALVE	UWV	N		1
82	FIRE HYDRANT, CENTER	UFH	N		1
83	MANHOLE STORM SEWER, TOP	UMHST	N		2
84	MANHOLE STORM SEWER, F/L	UMHSTF	N		2
85	MANHOLE, TELEPHONE, TOP	UMHT	N		2
86	MANHOLE, ELECTRICAL, TOP	UMHE	N		2
87	MANHOLE, SANITARY SEWER, TOP	UMHSS	N		2
88	MANHOLE, SANITARY SEWER, F/L	UMHSSF	N		2
89	SANITARY SEWER LINE, CENTER	USSL	N		1
90	GAS METER, CENTER	UGM	N		1
91	GAS VALVE, CENTER	UNGV	N		1
92	GAS VENT PIPE	UNGVP	N		1
93	GAS LINE MARKER	UNGLM	N		1
	General Topo				
95	WALL FACE	TWF		N	3
96	WALL FACE, TOP	TWFT		Y	4
97	WALL FACE, BOTTOM	TWFB		Y	4
98	IRRIGATION PIVOT POINT	TIRRPVTP	N		1
99	IRRIGATION LIMITS	TIRRLMT	N		1
100	SIGN, CENTER	TSC	N		1
101	GASOLINE MONITORING WELL	TGMW	N		1
102	GASOLINE FILLER VALVE	TGFV	N		1
103	GASOLINE VENT PIPE	TGVP	N		1
104	GASOLINE PUMP	TGP	N		1
105	GASOLINE STORAGE TANK, END	TGST		N	3
106	GASOLINE PUMP ISLAND	TGPI		N	3
107	CANPOY	TCAN		N	3
108	BUILDING CORNER	TBLD		N	3
109	BUILDING ROOF LINE CORNER	TBLDRL		N	3
110	HOUSE CORNER	THCR		N	3
111	HOUSE ROOF LINE CORNER	THRL		N	3
112	MOBILE HOME CORNER	TMHCR		N	3
113	MOBILE HOME ROOF LINE CORNER	TMHRL		N	3
115	WOODS LINE	TWL		N	3

	General Topo				
116	CULTIVATION LINE	TCUL		N	3
117	FENCE, FIELD WIRE	TFFW		N	3
118	FENCE, BARB WIRE	TFBW		N	3
119	FENCE, WOOD	TFW		N	3
120	RAILROAD, TOP OF RAIL	TRCR		N	4
121	RAILROAD, CENTERLINE	TRCL		N	3
122	CEMETERY LINE	TCEM		N	3
123	GRAVE	TGRV		N	3
124	GUARDRAIL	TGR		N	3
125	SIGN, END	TSE		N	3
126	SATELLITE DISH	TSATDSH	N		1
127	LIMIT LINE	TLIML		Y	4
128	CONSTRUCTION BOUNDARY, ACTV	TCBA		Y	4
129	CONSTRUCTION BOUNDARY, FIND	TCBF		Y	4
	Boundaries				
130	COUNTY LINE	BCOL		N	3
131	CITY LIMIT LINE	BCTL		N	3
132	LAND DISTRICT LINE	BLDL		N	3
133	LAND LOT LINE	BLLL		N	3
134	STATE LINE	BSL		N	3
	New Codes				
**152	HIGH WATER MARK	DHWM	N		2
**153	FLOOR ELEVATION	TFE	N		2
**154	EDGE OF DIRT DRIVE	TEDD		Y	4
**156	GATE	TG		N	3
**158	UNCOVERED DECK	TUD		N	3
160	MAP CHECK GROUND	MPCKGRD	N		2
161	MAP CHECK PAVEMENT	MPCKPAV	N		2
**162	VINYL (PVC) FENCE	TVF		N	3
**163	FUEL TANK	TFT		N	3
**164	PAVE DITCH	DPD		Y	4
**165	BRICK COLUMN	TBC		N	3
**166	SEPTIC TANK CENTER	DSTC	N		1
**167	STEPS	TS		N	3
**168	HISTORICAL MONUMENT	THM		N	3
**169	FLAG POLE	TFP	N		1
**170	DRAIN LINES	DDL		N	3

	Surveyor Defined				
171	Surveyor Defined Value	XXA		Y	4
172	Surveyor Defined Value	XXB		Y	4
173	Surveyor Defined Value	XXC		Y	4
174	Surveyor Defined Value	XXD		Y	4
175	Surveyor Defined Value	XXE		Y	4
176	Surveyor Defined Value	XXF		Y	4
177	Surveyor Defined Value	XXG		Y	4
178	Surveyor Defined Value	XXH		N	3
179	Surveyor Defined Value	XXI		N	3
180	Surveyor Defined Value	XXJ		N	3
181	Surveyor Defined Value	XXK		N	3
182	Surveyor Defined Value	XXL		N	3
183	Surveyor Defined Value	XXM		N	3
184	Surveyor Defined Value	XXN		N	3
185	Surveyor Defined Value	XXO	Y		2
186	Surveyor Defined Value	XXP	Y		2
187	Surveyor Defined Value	XXQ	Y		2
188	Surveyor Defined Value	XXR	Y		2
189	Surveyor Defined Value	XXS	Y		2
190	Surveyor Defined Value	XXT	Y		2
191	Surveyor Defined Value	XXU	Y		2
192	Surveyor Defined Value	XXV	N		1
193	Surveyor Defined Value	XXW	N		1
194	Surveyor Defined Value	XXX	N		1
195	Surveyor Defined Value	XXY	N		1
196	Surveyor Defined Value	XXZ	N		1
197	Surveyor Defined Value	XXZA	N		1
198	Surveyor Defined Value	XXZB	N		1
199	Surveyor Defined Value	XXZC	N		1
	Dimension Codes: (Drainage)				
200	DRAINAGE PIPE, F/L, C	DPC		N	4
201	DRAINAGE PIPE, F/L, M	DPM		N	4
202	DRAINAGE PIPE, F/L, P	DPP		N	4
**203	CULVERT END, F/L	DCEF		N	4
	Dimension Codes (General Topo)				
210	SIDEWALK, CENTER	TSW		N	3
211	FENCE, CHAIN LINK	TFCL		N	3
212	TREE, CENTER	TTRE	N		1
213	WELL	TWELL	N		1

	Dimension Codes (Roadway)				
225	DIRT ROAD, C/L	TDR		N	3
227	DIRT DRIVE, C/L	TDD		N	3
235	MILE POST, RAILROAD	TMPR	N		1
236	KM POST, HIGHWAY	TKMP	N		1
237	MILE POST, HIGHWAY	TMPH	N		1
	Survey control				
240	NGS CONTROL MONUMENT	SNGSCM	N		2
241	LOCATION CONTROL MONUMENT	SLCM	N		2
242	LOCATION CONTROL DELTA	SLCD	N		2
243	DISTRICT CONTROL DELTA	SDCD	N		2
244	CONTROL RE-SHOT FOR CHECK	SCCHK	N		2
245	BENCHMARK	SBNCHMK	N		2
250	MISCELLANEOUS	MISC	N		2

****SMI # = For InRoads Use Only! Do NOT use in CAiCE.**

SMI Codes For InRoads

User Defined Codes

171-177 Group Code 4
178-184 Group Code 3
185-191 Group Code 2
192-199 Group Code 1

Group Codes

Code 1 2-D Point
Code 2 3-D Point
Code 3 2-D Chain
Code 4 3-D Chain

2.7 GDOT Photogrammetry Code Conversion Table -- CAiCE to InRoads

Several AMSA Feature Codes have been consolidated and/or updated to correspond to the InRoads Software Standards. The following spreadsheet contains the Photogrammetry Code Conversion Table which depicts the "old" CAiCE AMSA Code along with the "new" associated InRoads AMSA Code. This table is for reference only ---

Old AMSA Feature Code	Old CAiCE Feature Code	Converted >>>	New AMSA Feature Code	InRoads Alpha Code
150	BORDER	⇨	150	MJLL
151	DITCH	⇨	151	MDITCHFL
152	EPSHLD	⇨	27	TEAP
153	EP	⇨	28	TEAS
154	TOC	⇨	33	TCGT
155	BOC	⇨	34	TCGF
156	CL	⇨	1	TPBL
157	CLIP	⇨	157	MSEWLINE
158	RANDOM	⇨	2	TRP
159	OBSC	⇨	159	MOBSC
160	LAKE	⇨	159	MOBSC
161	RRCL	⇨	155	TRCRE
162	RIVERED	⇨	159	MOBSC
163	TOWALL	⇨	96	TWFT
164	BOWALL	⇨	97	TWFB
165	BREAKLIN	⇨	1	TPBL
166	CONSTRB	⇨	128	TCBA
5	PAVEROAD	⇨	27	TEAP
6	PAVESHLD	⇨	28	TEAS
8	CURBROAD	⇨	33	TCGT
35	CURBPARK	⇨	33	TCGT
43	DITCH	⇨	151	MDITCHFL
63	PVDDRAIN	⇨	35	TVG
241	TOC	⇨	33	TCGT
242	BOC	⇨	34	TCGF
243	BREAKLIN	⇨	1	TPBL
244	DEADIN	⇨	57	DOBSC
245	RANDOM	⇨	2	TRP
246	BORDER	⇨	127	TLIML

3

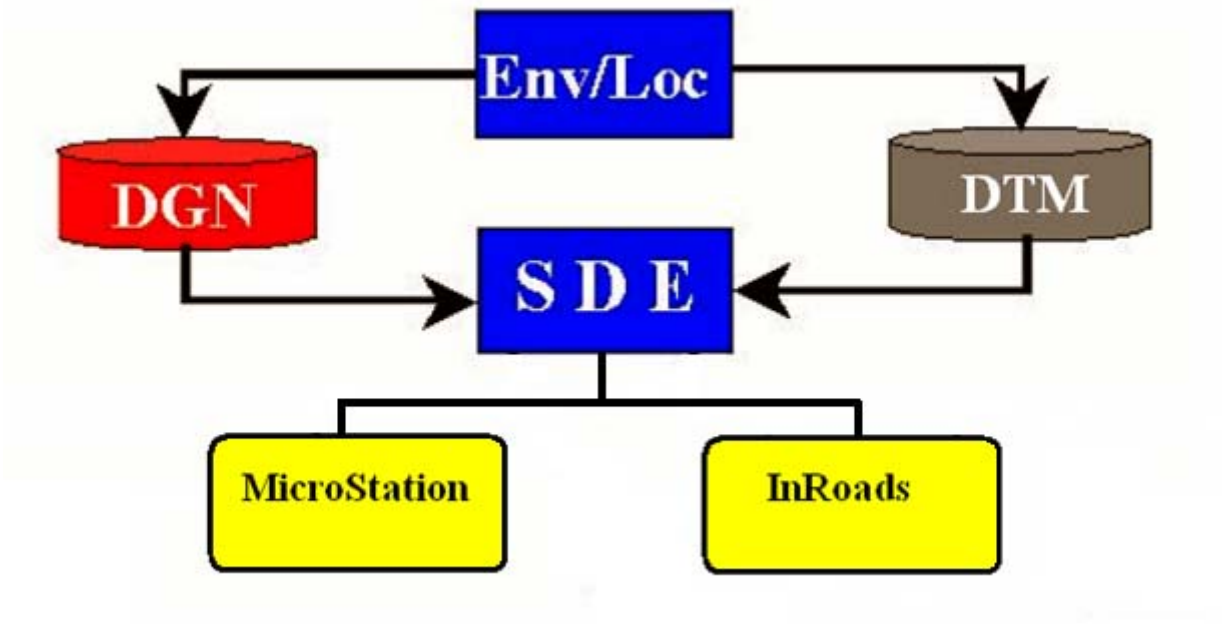
Photogrammetry Project Deliverables

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 DGN File
- Listing of the Photogrammetry Project Deliverables



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 and crossing overlaps 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\123456\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

After the final processing of the DTM Surface, a topographical DGN file will be generated for submission to the Districts. This file will include all of the 2D topographical data obtained from the photogrammetric survey.

The initial TOPO file will be generated from AMSA in a MicroStation J (V7) format. A translation table has been created which can be used to convert the V7 file to a V8i format. All of the "old" Number Levels will automatically be converted to the new associated V8i "Named Levels". The process for generating this data is detailed in a separate MicroStation "Translation Process" Guideline.

1. **Save the DGN File with a New Name:**
   After using the translation table to create the MicroStation Topographical V8i file -- the DGN file will need to be saved with a standard naming convention in order to submit to the District.

Table 3.1	
Standard Topographical DGN File Name	
Topographical DGN Path/File Name	C:\InRoads Data\PI Number\ Photogrammetry\ PI#_Map.dgn
Topographical DGN Path/File Name (Example)	C:\InRoads Data\123456\ Photogrammetry 123456_Map.dgn

In the [MicroStation Software] –

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

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

   Save the DGN File as (***123456_Map.dgn***) to the path shown below -- under the folder **Photogrammetry** --

   C:\InRoads Data\123456\Photogrammetry

3. In the [MicroStation Software] –

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

   The 123456_Map.dgn File is now ready for submittal to the District.

3.3 Listing of the Photogrammetry Project Deliverables

After the DTM Surface has been processed (123456_Map.dtm) and the DGN file (123456_Map.dgn) has been created - 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)
- 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/doingbusiness/PoliciesManuals/roads/software/Pages/default.aspx

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	_____
	The Exterior Boundary is a closed shape entity	_____
	All Interior Boundaries are closed shape entities	_____
	There are no erroneous (bad) point elevations	_____
	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	_____
	The DTM contains no erroneous ‘Spikes’	_____
	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)	_____
	DGN Plot Files (.PDF)	_____
	Mapping Photographs	_____
	Roll Plot of the Topo DGN (if required)	_____
	Photogrammetry Quality Assurance Checklist	_____

4

Converting Projects from CAiCE to InRoads

4. Converting Projects from CAiCE to InRoads

This section provides a brief summary of the procedure to convert CAiCE Photogrammetry Projects to InRoads Photogrammetry Projects. A stand alone program has also been coded which will translate “old” CAiCE Codes to the new “InRoads” Codes.

This section covers the following topics:

- CAiCE to InRoads Conversion Criteria Overview
- Overview of CAiCE to InRoads Project Conversion
- Review of the AMSA XLS Numerical Code Converter

4.1 CAiCE to InRoads Conversion Criteria Overview

The following section depicts an overview of the criteria of determining whether a CAiCE Project is a good candidate for conversion to an InRoads Project. There are several deciding factors which must be considered and discussed before converting a CAiCE Project.

It is critical that all parties involved in the decision to convert a CAiCE Project to an InRoads Project be aware of all the data, conversion processes and conversion time required. Following is an excerpt from a Design Policy Interdepartmental Correspondence which is dated April 13, 2010.

"The CAICE platform will continue to be maintained by the Department's Engineering Software Group to support projects already under development with CAiCE. Projects with a database collected in CAiCE prior to May 1, 2010, may be converted to InRoads. A decision to convert from CAiCE to InRoads should be made mutually between the Project Manager, Design Phase Leader, and the Statewide Location Bureau Chief."

The following section depicts some criteria to keep in mind when discussing possible CAiCE to InRoads Conversions:

- There is currently no automated direct process to convert a CAiCE Survey Project to an InRoads Survey Project. The only method at this time is to convert the RAW Photogrammetry Data and RAW Field Survey Data (using customized GDOT Conversion Programs) to an InRoads format. After processing this data – the Survey Data Engineer must manually re-create the Property/Parcel Alignments in InRoads which can be a very time-consuming process.
- There is also no automated direct process to convert CAiCE Design Data to an InRoads format. The Designer must manually re-input all the Horizontal Alignments, Vertical Alignments, Templates, Cross-Sections, and Required R/W Alignments from Reports and Plans generated from CAICE.
- There is also an InRoads Software learning curve for Surveyors, Survey Data Engineers and Designers. This in turn will extend the projected project schedule for completion.
- Manpower and productivity is also a consideration. Converting a CAiCE Project to InRoads will result in Survey Data Engineers and Designers having to basically start at the beginning of a Project. Although the Photogrammetry/Survey RAW data can be converted with minimal effort (and no additional Field Survey Work) – the time allotted for Survey Data Engineers and Designers to recreate the InRoads work can affect much of the Project Schedule.
- As mentioned in the Design Policy Excerpt in the paragraph above – Project Conversion is a mutual decision that must be determined and approved by all parties involved on a case by case basis.

4.2 Overview of CAiCE to InRoads Project Conversion

The following section depicts an overview of the methods used to convert a CAiCE Photogrammetry Project to an InRoads Photogrammetry Project.

Please Note:

ALL conversions of Photogrammetry data from CAiCE to InRoads will be performed by the Office of Design Policy and Support/Location Bureau. If the Project Manager, Design Phase Leader, and the Statewide Location Bureau Chief determine a need for project conversion – the Project Manager should contact the *Engineering Management/Operations Manager* of the Office of Design Policy and Support for details.

It has been determined that the best method for converting CAiCE to InRoads projects is to utilize the "base" RAW AMSA Files (which contain the old CAiCE Feature Codes) for the conversion. Please note that any processing done in CAiCE will be lost when going back to the RAW file. There are several reasons for utilizing the RAW AMSA Files instead of a direct CAiCE to InRoads Conversion:

Issues with direct CAiCE to InRoads Conversion:

- There are significant differences between CAiCE and InRoads as it pertains to the creation of Digital Terrain Models. Although the standard TIN (Triangulated Irregular Network) method is utilized – the format and naming conventions of the points and breaklines are considerably different from CAiCE. Therefore a direct DTM import from CAiCE to InRoads is not feasible.

- There has been a considerable change in the AMSA Feature codes for InRoads. The AMSA codes have been updated and consolidated to correspond more closely with the associated SMI Codes. CAiCE projects will contain the "old" CAiCE AMSA codes. Therefore the importation of CAiCE projects into InRoads is not feasible because of the discrepancy in Feature Codes. The CAiCE codes will not import into InRoads correctly.

The conversion of the (CAiCE format) RAW AMSA files will ensure an accurate translation of "old" CAiCE Photogrammetry data to "new" InRoads Photogrammetry data. This will entail rebuilding the DTM and resolving any crossing segments, etc. but it will also result in an accurate conversion method.

There is a stand-alone program which has been coded for use in CAiCE Photogrammetry data conversions.

- AMSA XLS Numerical Code Converter

This program will translate and convert the "old" format CAiCE Feature Codes to the "new" format InRoads Feature Codes/Feature Styles. The following sections(s) details the conversion program which are available to convert the CAiCE Photogrammetry Data to InRoads compatible data.

4.3 Review of the AMSA XLS Numerical Code Converter

This stand-alone program converts the "old" CAiCE RAW AMSA Feature Codes to the "new" InRoads RAW AMSA Feature Codes. These converted files can then be imported directly into InRoads as RAW AMSA files. The **AMSA XLS Numerical Code Converter** is included in the InRoadsALL.exe download. (See **Section 1.1** for InRoadsALLV8i.exe download information).

The Translation table which is used in the conversion is depicted in **Section 2.7** (**GDOT Photogrammetry Code Conversion table – CAiCE to InRoads**).

Following are the steps to utilize the **AMSA XLS Numerical Code Converter**:

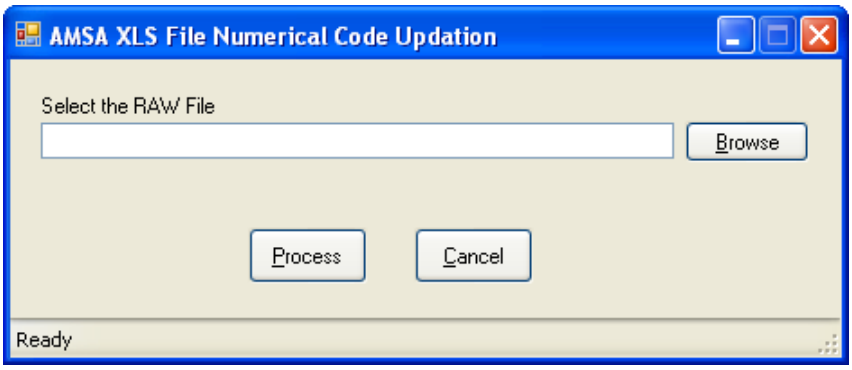


Figure 4-1 AMSA XLS Numerical Code Converter

1. ***Open*** the **AMSA XLS Numerical Code Converter** program by double clicking the **InRoads AMSA Converter** (Desktop Shortcut).

2. ***Browse*** to the "old" AMSA file which is to be converted.

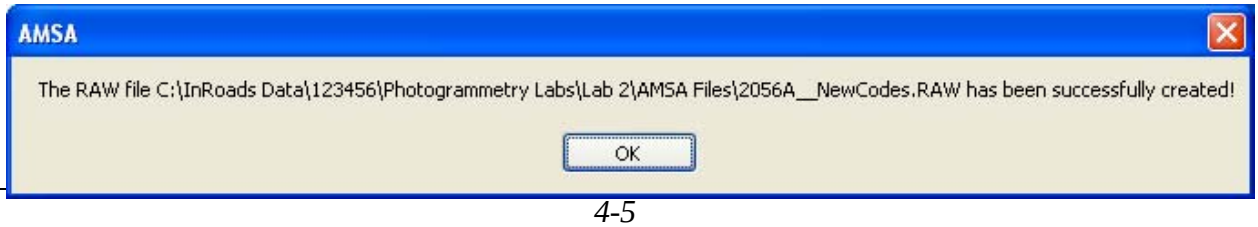
3. Select the appropriate AMSA file and then click ***Process***.

4. A message will appear in the bottom left-hand corner of the program which informs the user that the data is being processed.

5. It may take a while for the file to process depending on the size of the file.

6. In Order to access the **InRoads AMSA Converter** "Help File" – browse to the folder ***C:\Program Files\InRoads_AMSA_Converter\Help***

7. After processing is complete – a message box will appear listing the location of the created file. (The word "**_NewCodes**" will be appended to the original name of the file. (See example screen capture below):



Appendix

A

Reference Guide to Photogrammetry Tables

APPENDIX A REFERENCE GUIDE TO PHOTOGRAMMETRY TABLES

Table A-1	
InRoads Project Structure	
InRoads Project Structure	C:\InRoads Data\PI Number\ Photogrammetry
InRoads Project Structure (Example)	C:\InRoads Data\123456\ Photogrammetry

Table A-2	
Standard Naming Convention of the "Working" DGN File	
Working DGN File Name	**C:\InRoads Data\PI Number\ Photogrammetry\Standards** GDOT 3D Working File.dgn

Table A-3	
Project Default Configuration	
Project Default Structure	PI Number_Mapping
Project Default Structure (Example)	123456_Mapping

Table A-4	
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
Cogo Audit Trail	Unchecked
Report	Checked
Toolbar	Checked

Table A-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 snaps 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

Table A-6	
Standard Project Naming Conventions	
InRoads Project Structure	C:\InRoads Data\PI Number\ Photogrammetry
InRoads Project Structure (Example)	C:\InRoads Data\123456\ Photogrammetry

Table A-7	
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 DGN file	PI#_Map.dgn
Processed DGN PDF Plot Files	PI#_Map1.pdf, PI#_Map2.pdf, etc

Table A-8	
Example Standard Object Names	
Feature Style	**Feature Name**
TPBL	TPBL991
TPBL	TPBL992
TRCRE	TRCRE10
TWFB	TWFB12

Table A-9 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

Table A-10 Example 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

Table A-11 Standard Name and Location of the GDOT Standard XIN File	
GDOT Standard XIN File	C:\InRoadsData\123456\Photogrammetry\Standards\GDOT_Standard V8i.xin

Table A-12	
Standard Exterior Boundary Name and Feature Style	
Exterior Boundary Seed Name	**Exterior Boundary Feature Style**
MBOUNDARY	TOPO_E_TLIML

Table A-13	
Standard Topographical DGN File Name	
Topographical DGN Path/File Name	C:\InRoads Data\PI Number\ Photogrammetry\ PI#_Map.dgn
Topographical DGN Path/File Name (Example)	C:\InRoads Data\123456\ Photogrammetry 123456_Map.dgn