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## 1.1 Current Versions

<b>Application Name:</b>	ODOT_StormSewerPlan.mvba
<b>Current version:</b>	v14.01.29
<b>Required MicroStation Version:</b>	MicroStation XM or V8i
<b>Required GEOPAK Version:</b>	GEOPAK XM or V8i

<b>Application Name:</b>	ODOT_StormSewerPlanLabels.mvba
<b>Current version:</b>	V11.04.15
<b>Required MicroStation Version:</b>	MicroStation XM or V8i
<b>Required GEOPAK Version:</b>	GEOPAK XM or V8i

<b>Application Name:</b>	ODOT_StormSewerProfile.mvba
<b>Current version:</b>	V12.01.20
<b>Required MicroStation Version:</b>	MicroStation XM or V8i
<b>Required GEOPAK Version:</b>	GEOPAK XM or V8i

<b>Application Name:</b>	ODOT_StormSewerXS.mvba
<b>Current version:</b>	v14.02.07
<b>Required MicroStation Version:</b>	MicroStation XM or V8i
<b>Required GEOPAK Version:</b>	GEOPAK XM or V8i

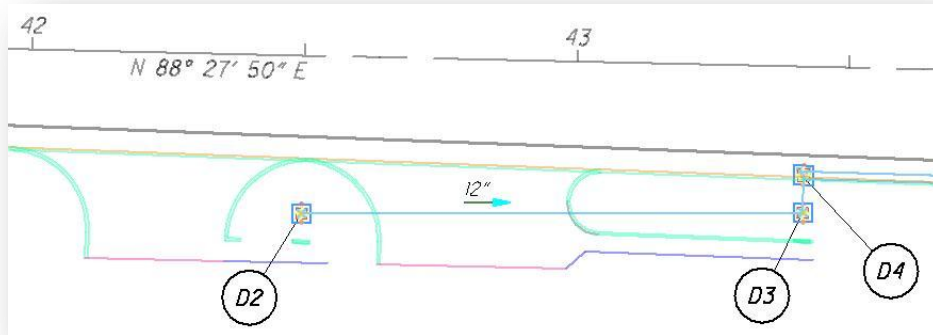
<b>Application Name:</b>	ODOT_StormSewer3D.mvba
<b>Current version:</b>	v11.10.21
<b>Required MicroStation Version:</b>	MicroStation V8i
<b>Required GEOPAK Version:</b>	GEOPAK V8i

<b>Application Name:</b>	ODOT_StormSewerPipeBends.mvba
<b>Current version:</b>	v11.04.15
<b>Required MicroStation Version:</b>	MicroStation V8i
<b>Required GEOPAK Version:</b>	GEOPAK V8i

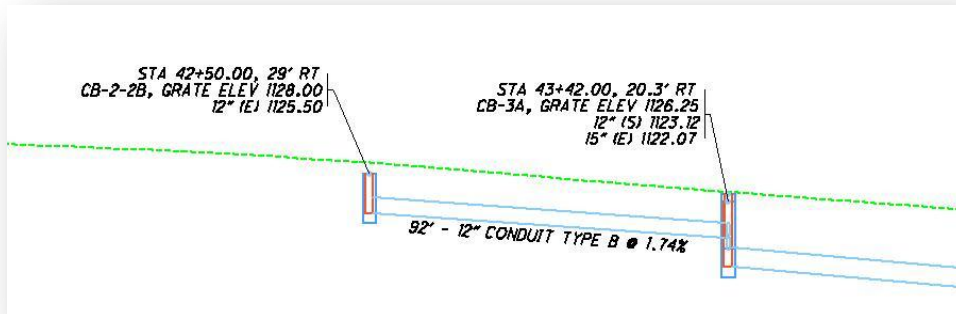
## 1.2 Overview

These applications are used to assist the drainage engineer with the task of drafting the proposed storm sewers on the plan, profile, and cross sections. The applications tag the plan view graphics with GEOPAK adhoc attributes which are used in the profile and cross section contexts. Examples for each context are shown below.

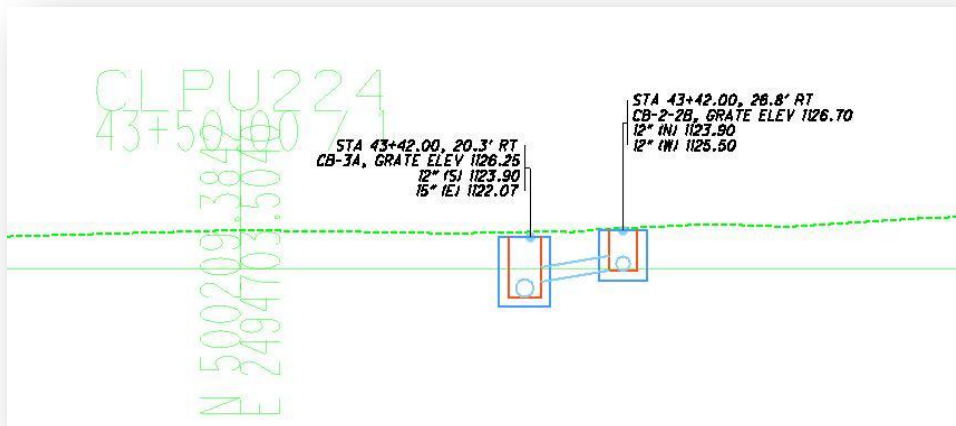
### Plan View



### Profile View



### Cross Section View



## 1.3 Supporting Files and Standards

### 1.3.1 ODOT\_Drainage.cel

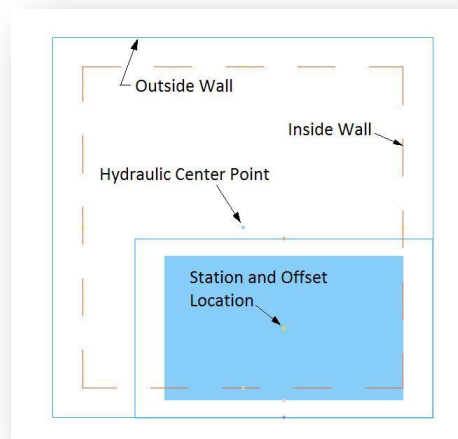
**ODOT\_Drainage.cel**, version **09.04.17** or higher is required for these applications.

The ODOT Standard cell library **ODOT\_Drainage.cel** contains the plan view graphics for the cells placed by the ODOT\_StormSewer\_Plan-Structures.mvba application. Extensive modifications were done to the cells for the **April 17, 2009** release of the ODOT CADD Standards in order to accommodate the Storm Sewer mvba applications. Prior versions of **ODOT\_Drainage.cel** will not work with these applications.

The cells are drawn with specific symbology that is required for the Storm Sewer applications. The following symbology requirements apply:

Feature	Element Type	Color	Weight
Outside Wall	Shape	23	NA
Inside Wall	Shape	192	NA
Station and Offset Location Point	Line (Active Point)	20	4
Hydraulic Center Point	Line (Active Point)	17	4

It is assumed that there is only one graphical element in the cell definition that meets the parameters listed above. For example, there can only be one shape with color 23 in the cell graphics. If there is more than one shape with color 23, the processing will use the first shape that was drawn in the cell definition as the outside wall. An example of a drainage structure cell is shown below.



The Station and Offset Location Point is tagged with a GEOPAK adHoc attribute with the following parameters:

adHoc Name	Type	Value
"Label"	String	The name of the structure

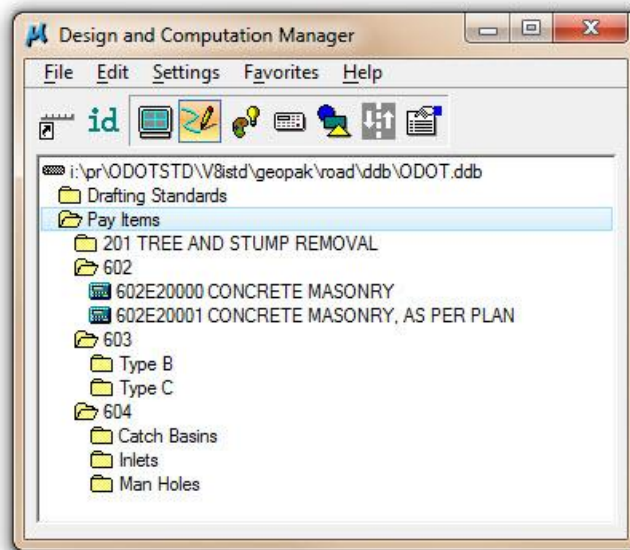
The Label adHoc attribute is used in the annotation for the structure on the profile and the cross section.

### 1.3.2 ODOT.ddb

This documentation refers to the old 603 and 604 pay item categories. These categories have been combined in the 611 category in ODOT.ddb. The old 603 and 604 categories have been removed from ODOT.ddb.

**Note:** These applications previously used a separate ddb file named ODOT\_StormSewers.ddb. The required pay items have been moved to ODOT.ddb. ODOT\_StormSewers.ddb is no longer used by these applications.

The ODOT Design and Computation Manager database, ODOT.ddb, has been populated with the 602, 603 and 604 Pay Items necessary for storm sewers.



Items for drive pipes, culverts, and underdrain have not been included in the ddb and are not supported by the Storm Sewer applications at this time.

The ODOT Storm Sewer applications automatically load the database when one of the programs is activated. The applications use the configuration variable **V8iSTD** to locate the folder where the ddb file is stored. The ddb is assumed to be located in the following folder:

```
\ODOTstd\V8iSTD\GEOPAK\road\ddb\ODOT.ddb
```

For the computation of pay item quantities for 602 Items, the following file is necessary:

```
\ODOTstd\V8iSTD\GEOPAK\road\ddb\3PC\602_CY.3PC
```

## 1.4 ODOT\_StormSewerPlan2013.mvba

This documentation refers to the old 603 and 604 pay item categories. These categories have been combined in the 611 category in ODOT.ddb. The old 603 and 604 categories have been removed from ODOT.ddb.

The **ODOT\_StormSewerPlanStructures2013.mvba** application is used to place the plan view information for the storm sewers. Catch Basins, Manholes, and Inlets are placed as cells. The cells are read from the ODOT standards cell library ODOT\_Drainage.cel. Storm Sewer pipes are placed as line elements.

The application can be accessed from the MicroStation pull-down menu by selecting **ODOT > Drainage Apps > Proposed Storm Sewers > Plan**. The application can also be accessed with the following key-in command:

```
vba load ODOT_StormSewerPlan.mvba; vba run modMain.ssPlanMain
```

When the application is accessed, the dialog shown below is opened.

Storm Sewer Plan v09.07.17

Mode: Place 604 Items Job: 185

Chain: CLPJAME Station: 10+00.00 Offset: DP

Grate Elev.: Invert: Ref. No.:

Catch Basins  Inlets  Man Holes

604E00400	CATCH BASIN, NO. 3
604E00401	CATCH BASIN, NO. 3, AS PER PLAN
604E00420	CATCH BASIN, NO. 3 WITH DIAGONAL GRATE
604E00421	CATCH BASIN, NO. 3 WITH DIAGONAL GRATE, AS PER PLAN
604E00450	CATCH BASIN, NO. 3 WITH SUMP
604E00800	CATCH BASIN, NO. 3A
604E00801	CATCH BASIN, NO. 3A, AS PER PLAN
604E00820	CATCH BASIN, NO. 3A WITH DIAGONAL GRATE
604E00821	CATCH BASIN, NO. 3A WITH DIAGONAL GRATE, AS PER PLAN

Edit 604 Item Place 604 Item

The **Mode** option provides the following options:

Mode: Place 604 Items

- Place 602 Items
- Place 603 Items
- Place 604 Items

Chain:

Each mode is described in the following pages.

### 1.4.1 Mode: Place 604 Items

When **Place 604 Items** is selected, the dialog appears as shown below. This mode is used to place Catch Basins, Inlets, and Manholes in the plan view.

The screenshot shows a software dialog box titled "Storm Sewer Plan v09.07.17". At the top, there are two dropdown menus: "Mode:" set to "Place 604 Items" and "Job:" set to "185". To the right of the Job dropdown is a question mark icon. Below these are several input fields: "Chain:" with a dropdown menu showing "CLPJAME", "Station:" with the text "10+00.00", "Offset:" with an empty field, "Grate Elev.:" with an empty field, "Invert:" with an empty field, and "Ref. No.:" with an empty field. A "DP" button is located between the Station and Offset fields. Below the input fields are three radio buttons: "Catch Basins" (selected), "Inlets", and "Man Holes". A list box contains the following items:

604E00400	CATCH BASIN, NO. 3
604E00401	CATCH BASIN, NO. 3, AS PER PLAN
604E00420	CATCH BASIN, NO. 3 WITH DIAGONAL GRATE
604E00421	CATCH BASIN, NO. 3 WITH DIAGONAL GRATE, AS PER PLAN
604E00450	CATCH BASIN, NO. 3 WITH SUMP
604E00800	CATCH BASIN, NO. 3A
604E00801	CATCH BASIN, NO. 3A, AS PER PLAN
604E00820	CATCH BASIN, NO. 3A WITH DIAGONAL GRATE
604E00821	CATCH BASIN, NO. 3A WITH DIAGONAL GRATE, AS PER PLAN

At the bottom of the dialog are two buttons: "Edit 604 Item" and "Place 604 Item".

Each dialog item is described below.

#### Job

Select the GEOPAK GPK file job number for the project.

#### Chain

Select the desired chain used to place the structures.

#### Station

Key-in the station on the selected Chain to place the selected structure.

#### Offset

Key-in the offset from the selected Chain for the selected structure. Negative numbers are used to place structures to the left of the selected Chain.

#### Grate Elevation

Key-in the elevation for the grate.

#### Invert

Key-in the flow line elevation for the bottom of the structure.

#### Ref. No.

Key-in field used to identify the balloon reference number to be associated with the structure.

**Catch Basin/Inlets/Manholes**

Choose the desired option button to place Catch Basins, Inlets, or Manholes. The list of items is read from the ODOT standard Design and Computation Manager data base file, ODOT.ddb.

**Edit 604 Item**

Select this button to edit a previously placed drainage structure cell.

**Place 604 Item**

Select the button to place a drainage structure cell using the current parameters.

**1.4.1.1 Adhoc Attributes**

When a drainage cell is placed, the application will tag the cell with multiple GEOPAK adhoc attributes. These attributes are used by the other ODOT storm sewer applications to draw information in the plan, profile, and cross section views. The adhoc attributes listed below are stored with the cells:

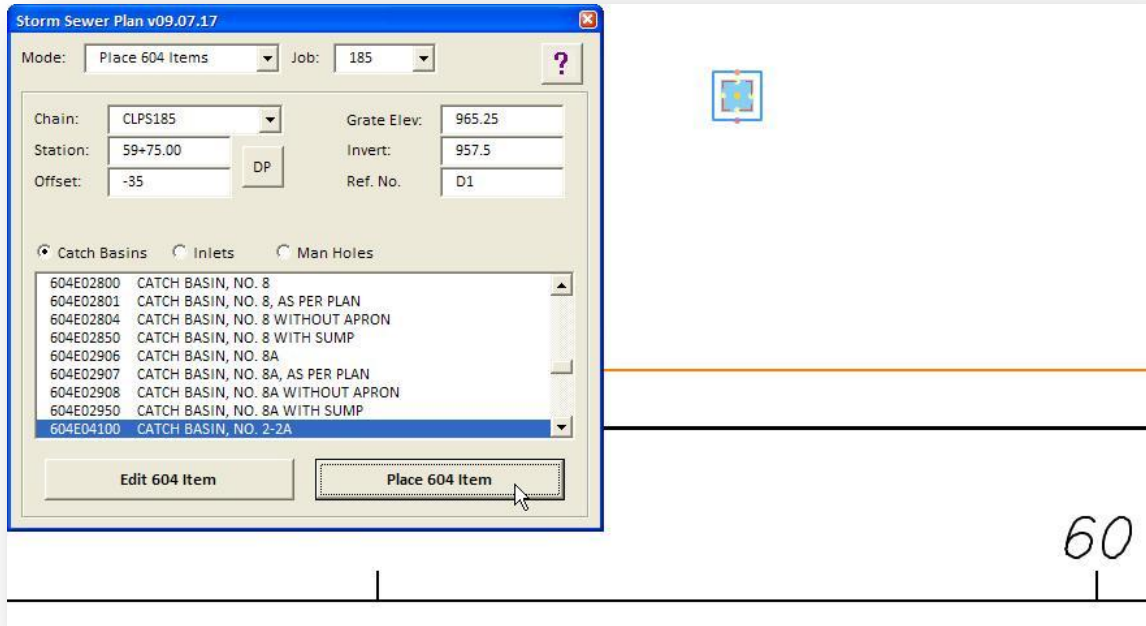
adhoc Attribute Name	Type	Value
ODOT_Drainage	String	"TRUE"
Chain	String	The name of the Chain used to place the cell
Reference	String	The Ref. Number value entered by the user
Grate Elev	Numeric	The Grate Elev value entered by the user
FlowElev	Numeric	The Invert Elev value entered by the user
Label	String	The Label value stored with the original cell definition
Description	String	The Sump value entered by the user (where applicable)

These attributes can be reviewed and edited using GEOPAK functions; however it is recommended that you use the Edit 604 Item function to edit storm sewer cells that were previously placed using the ODOT application.



### 1.4.1.2 Placing Structures

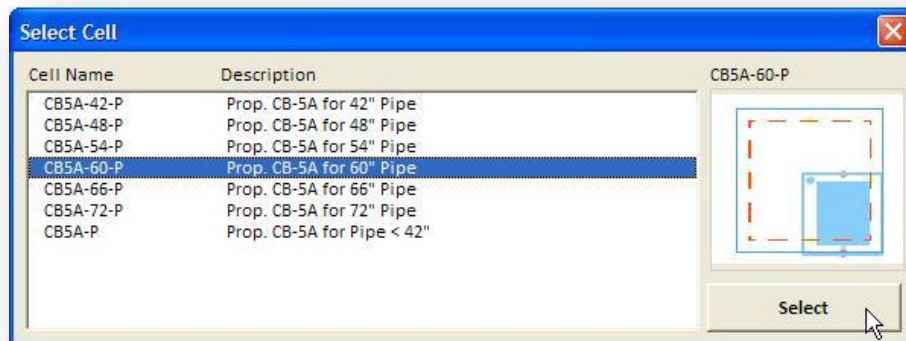
To place structures, key in the required information, select the desired structure type, and press the **Place 604 Item** button. The cell is automatically rotated tangent to the alignment so that the front of the structure is facing the chain.



Rotating the structure cell after it has been placed will not cause any problems with the various ODOT storm sewer programs. For example, a catch basin located along the radius return can be rotated for correct orientation relative to the radius return after the structure has been initially placed.

### 1.4.1.3 Structures with Multiple cells options

Some catch basin, inlet, or manhole items have multiple cells available for placement. When one of these items is selected, the program will open a second dialog box with a list of cells as shown in the example below. The selected cell will be placed at the station and offset location.



#### 1.4.1.4 Editing previously placed structures

The **Edit Structure** option is used to edit previously placed storm sewer catch basins, inlets, or manholes.

To edit a structure, select the **Edit Structure** button and then select the cell in the design file that represents the structure. The current adhoc attribute values are read from the structure and the dialog is populated with the values as shown in the example below. The selected cell is deleted from the design file. Make the necessary changes to the structure parameters, and then select the Place Structure button. The structure is placed in the file as if it were a new structure.

Storm Sewer Plan v09.07.17

Mode: Place 604 Items Job: 185

Chain: CLPS185 Grate Elev:

Station: 59+75.00 DP Invert:

Offset: Ref. No.:

Catch Basins  Inlets  Man Holes

604E01701	CATCH BASIN, NO. 5 WITH B GRATE, AS PER PLAN
604E01750	CATCH BASIN, NO. 5 WITH SUMP
604E01800	CATCH BASIN, NO. 5A
604E01801	CATCH BASIN, NO. 5A, AS PER PLAN
604E01804	CATCH BASIN, NO. 5A WITHOUT APRON
604E01900	CATCH BASIN, NO. 5A WITH B GRATE
604E01901	CATCH BASIN, NO. 5A WITH B GRATE, AS PER PLAN
604E01950	CATCH BASIN, NO. 5A WITH SUMP
604E02000	CATCH BASIN, NO. 6

Edit 604 Item Place 604 Item

#### Notes:

The rotation angle of the new structure is set relative to the station and offset along the selected chain. If the structure being edited was manually rotated by the user the new structure will not match the previous rotation.

Pipes that have been drawn connected to the edited structure are not automatically updated. These pipes will need to be edited using the **Place 603 Items** mode application.

## 1.4.2 Place 603 Items

When **Place 603 Items** is selected, the dialog appears as shown below. This mode is used to place Type B and Type C pipes in the plan view.

Storm Sewer Plan v09.07.17

Mode: **Place 603 Items** Job: 185

**Upstream Location**  
 By Structure  By Station

**Downstream Location**  
 By Structure  By Station

Item: [ ]  
 Ref No: [ ]  
 Chain: [ ]  
 Station: [ ]  
 Grate: [ ]  
 Invert: [ ]

Pipe Invert: [ ]

**Type B**  **Type C**  Ref. No. [ ]

603E00100	4" CONDUIT, TYPE B
603E00101	4" CONDUIT, TYPE B, AS PER PLAN
603E00900	6" CONDUIT, TYPE B
603E00901	6" CONDUIT, TYPE B, AS PER PLAN
603E01800	8" CONDUIT, TYPE B
603E01801	8" CONDUIT, TYPE B, AS PER PLAN
603E03100	10" CONDUIT, TYPE B
603E03101	10" CONDUIT, TYPE B, AS PER PLAN
603E04400	12" CONDUIT, TYPE B

Supplemental Description [ ]

**Edit 603 Item** **Place 603 Item**

Each dialog item is described below.

### Job

Select the GEOPAK GPK file job number for the project.

### Upstream Location

The upstream location of the pipe can be specified by selecting a previously drawn catch basin, inlet, or manhole, or by specifying a station and offset location.

### Downstream Location

The Downstream location of the pipe can be specified by selecting a previously drawn catch basin, inlet, or manhole, or by specifying a station and offset location.

### Pipe Invert (Upstream Location, Downstream Location)

These Key-in fields are used to specify the pipe invert elevation at the upstream and downstream locations.

**Type B/Type C**

These option buttons are used to select whether a Type B or a Type C pipe will be placed. The list of items is read from the ODOT standard Design and Computation Manager data base file, ODOT.ddb.

**Ref. No.**

Key-in field to specify the optional balloon reference number for the pipe.

**Supplemental Description**

This key-in field is used to store an optional supplemental description with the drainage pipe.

**Edit 603 Item**

Select this button to edit a previously drawn drainage pipe item.

**Place 603 Item**

Select the button to draw the drainage pipe in the design file.

**1.4.2.1 Adhoc Attributes**

When a drainage pipe is placed, the application will tag the line element with multiple GEOPAK adhoc attributes. These attributes are used by the other ODOT storm sewer applications to draw information in the plan, profile, and cross section views. The adhoc attributes listed below are stored with the pipes:

adhoc Attribute Name	Type	Value
ODOT_Drainage	String	"TRUE"
Chain	String	The name of the Chain used to place the upstream cell
Chain2	String	The name of the Chain used to place the downstream cell
Reference	String	The Ref. Number value entered by the user
Elev1	Numeric	The Pipe Elevation value entered for the upstream location
Elev2	Numeric	The Pipe Elevation value entered for the downstream location
Size	String	The size of the pipe, used to label the pipe
Type	String	The selected Type, either Type B or Type C
Rise	Numeric	The rise value for the pipe size
Span	Numeric	The span value for the pipe size
Description	String	The supplemental description entered by the user

These attributes can be reviewed and edited using GEOPAK functions; however it is recommended that you use the Edit 603 Item function to edit storm sewer pipes that were previously placed using the ODOT application.

### 1.4.2.2 Selecting the Upstream and Downstream Location

The **Select Structure** buttons are used to identify the upstream and downstream structures. When a structure is selected, the adhoc attribute values are read from the structure and displayed on the dialog box as shown in the example below.

The screenshot shows a dialog box with two panels: 'Upstream Location' and 'Downstream Location'. Both panels have radio buttons for 'By Structure' (selected) and 'By Station'. The 'Upstream Location' panel contains the following fields: Item: CB-3A, Ref No: D6, Chain: CLPU224, Station: 45+70.00 22' LT, Grate: 1120.55, Invert: 1117.42, and Pipe Invert: [empty]. A mouse cursor is clicking on a 'Select Structure' button (represented by a small icon with a crosshair) next to the Ref No field. A tooltip 'Select Structure 1' is visible over the button. The 'Downstream Location' panel is currently empty.

The upstream location can be specified by identifying a previously placed structure, or by specifying a station and offset location as shown in the example below.

The screenshot shows the same dialog box. In the 'Upstream Location' panel, the 'By Station' radio button is selected. The fields are: Chain: CLPU224 (dropdown), Station: 45+70.00, Offset: 22, and a 'DP' button. The 'Downstream Location' panel now has data: Item: CB-3A, Ref No: D5, Chain: CLPU224, Station: 45+70.00 22' RT, Grate: 1120.7, Invert: 1116.79, and Pipe Invert: [empty].

**Note:** When the upstream location is specified by a station and offset, the downstream location can only be specified by selection a previously placed structure cell. At this time, the application does not support placing open pipes or culverts by specifying an upstream and downstream station and offset.

When the upstream location is specified by selecting a previously placed structure cell, the value of the **Ref. No.** field is populated with the value that was stored with the structure cell.

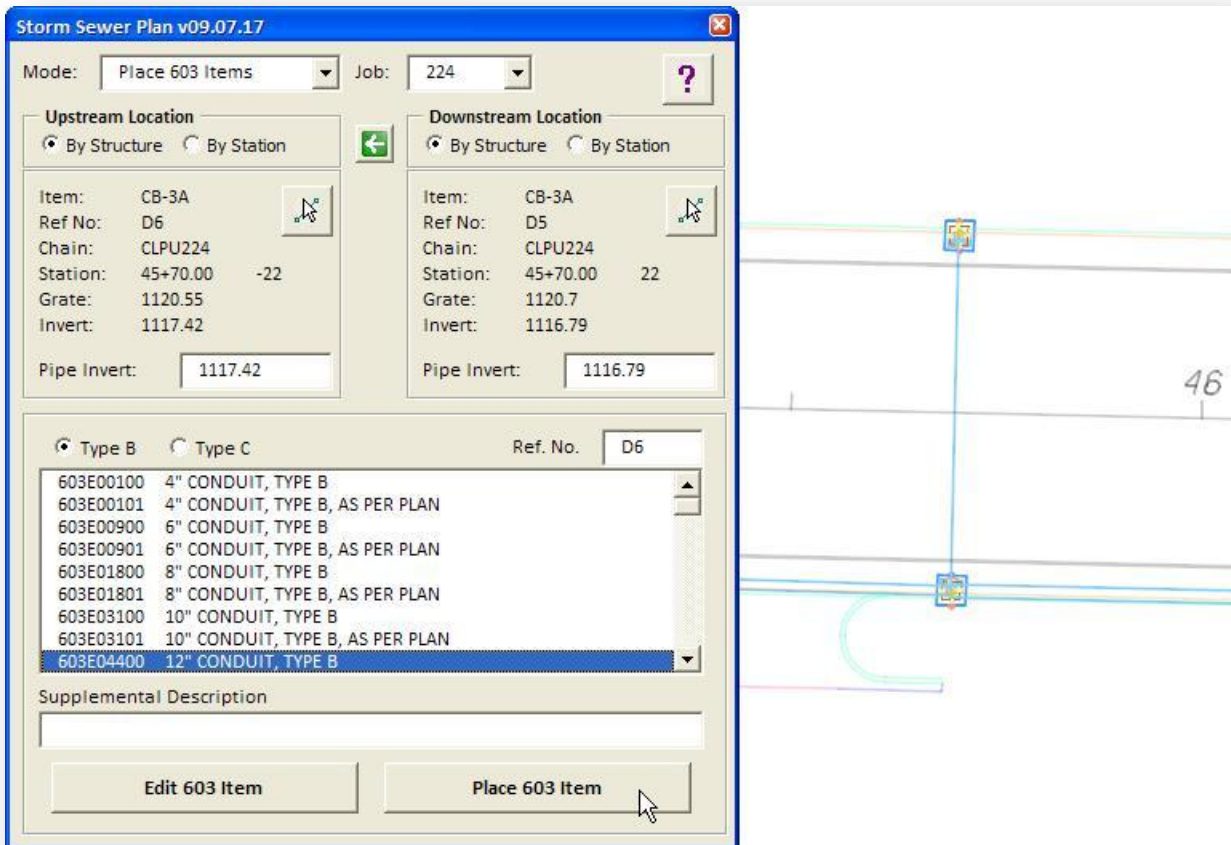
The screenshot shows the dialog box with both panels populated. The 'Upstream Location' panel has the same data as in the first screenshot. The 'Downstream Location' panel has: Item: CB-3A, Ref No: D5, Chain: CLPU224, Station: 45+70.00 22' RT, Grate: 1120.7, Invert: 1116.79, and Pipe Invert: [empty]. At the bottom of the dialog, there are radio buttons for 'Type B' (selected) and 'Type C', and a 'Ref. No.' field containing the value 'D6'.

The arrow button is used to copy the **Downstream Location** information to the **Upstream Location** information. When the button is selected, the **Downstream Location** information is cleared. This option is useful for putting in a run of pipes from structure to structure.

The screenshot shows two side-by-side panels for 'Upstream Location' and 'Downstream Location'. Both panels have radio buttons for 'By Structure' (selected) and 'By Station'. The 'Upstream Location' panel contains the following data: Item: CB-3A, Ref No: D5, Chain: CLPU224, Station: 45+70.00 22, Grate: 1120.7, Invert: 1116.79, and Pipe Invert: 1116.79. The 'Downstream Location' panel contains: Item: (empty), Ref No: (empty), Chain: (empty), Station: (empty), Grate: (empty), Invert: (empty), and Pipe Invert: (empty). A green arrow button with a left-pointing arrow is located between the two panels, and a mouse cursor is clicking it.

### 1.4.2.3 Placing Pipes

Once the dialog has been populated with the necessary information, select the **Place 603 Item** button to draw the pipe in the design file as shown in the example below.



When the **By Structure** option is used, the endpoint of the pipe is placed at the Hydraulic Center Point of the selected structure.

### 1.4.2.4 Editing previously placed pipes

To edit a pipe, select the **Edit 603 Item** button and then select the line in the design file that represents the structure. The current adhoc attribute values are read from the line and the dialog is populated with the values as shown below. The selected element is deleted from the design file.

Storm Sewer Plan v09.07.17

Mode: Place 603 Items Job: 224

Upstream Location:  By Structure  By Station

Downstream Location:  By Structure  By Station

Item: CB-3A Ref No: D6 Chain: CLPU224 Station: 45+70.00 -22 Grate: 1120.55 Invert: 1117.42

Item: CB-3A Ref No: D5 Chain: CLPU224 Station: 45+70.00 22 Grate: 1120.7 Invert: 1116.79

Pipe Invert: 1117.42 Pipe Invert: 1117.29

Type B  Type C  Ref. No. D6

603E00100 4" CONDUIT, TYPE B  
 603E00101 4" CONDUIT, TYPE B, AS PER PLAN  
 603E00900 6" CONDUIT, TYPE B  
 603E00901 6" CONDUIT, TYPE B, AS PER PLAN  
 603E01800 8" CONDUIT, TYPE B  
 603E01801 8" CONDUIT, TYPE B, AS PER PLAN  
 603E03100 10" CONDUIT, TYPE B  
 603E03101 10" CONDUIT, TYPE B, AS PER PLAN  
 603E04400 12" CONDUIT, TYPE B

Supplemental Description

Edit 603 Item Place 603 Item

The application will also scan the design file for any structure cells that share the same coordinates as the beginning and ending point of the line. If any structures are found, they are automatically selected as the **Upstream** and **Downstream location** as shown in the example above. If no structure cell is found at the endpoint of the line, the station and offset value at the end of the line that does not have a corresponding structure cell is set. It is assumed that there is at least one structure cell at either the start or end point of the selected line.

Make the necessary changes to the pipe parameters, and then select the **Place 603 Item** button. The pipe is placed in the file.

### 1.4.3 Place 602 Items

When **Place 602 Items** is selected, the dialog appears as shown below. This mode is used to place headwalls in the plan view.

The screenshot shows a software dialog box titled "Storm Sewer Plan v09.07.17". At the top, there are two dropdown menus: "Mode:" set to "Place 602 Items" and "Job:" set to "185". Below these is a list of "Cell Name" and "Description" items:

Cell Name	Description
HW1.1-15-42-P	HW-1.1, 15° for 42" Pipe
HW1.1-15-48-P	HW-1.1, 15° for 48" Pipe
HW1.1-15-54-P	HW-1.1, 15° for 54" Pipe
HW1.1-15-60-P	HW-1.1, 15° for 60" Pipe
HW1.1-15-72-P	HW-1.1, 15° for 72" Pipe
HW1.1-15-84-P	HW-1.1, 15° for 84" Pipe

Below the list is a "Pay Item" section with two entries:

602E20000	CONCRETE MASONRY
602E20001	CONCRETE MASONRY, AS PER PLAN

There are two radio buttons for "Pipe Material": "Concrete" (selected) and "Steel". To the right are "Headwall Attributes" with input fields for "CY Conc." and "Lbs". A "Chain:" dropdown is set to "CLPJAME" and a "Ref. No." field is empty. At the bottom are two buttons: "Edit 602 Item" and "Place 602 Item".

Each dialog item is described below.

#### Job

Select the GEOPAK GPK file job number for the project.

#### Cell Name

List of headwall cells available for placement. This list is populated by reading all the headwall cells contained in ODOT\_Drainage.cel.

#### Pay Item

Choose the desired Pay Item. The list of items is read from the ODOT standard Design and Computation Manager data base file, ODOT.ddb.

#### Pipe Material

Some headwall types can be used with either Concrete or Steel pipes. Depending on the material type, the quantities for the headwall vary. These options are used to select the pipe material type when placing the headwall.

#### Headwall Attributes

The attributes are read from an ASCII text file. If the selected Pay Item is an "AS PER PLAN" item, these attributes can be edited. The attributes are stored with the headwall cell and are used when computing quantities for the headwall items.



**Chain**

Select the desired chain used as a reference for the headwall location.

**Ref. No.**

Key-in field to specify the optional balloon reference number for the headwall. When a drainage pipe is selected for placement of the headwall, the reference number from the selected drainage pipe is automatically populated in the dialog. If you wish to use a different reference number, key-in the new number after the pipe graphic has been selected and before placing the headwall cell.

**Edit 602 Item**

Select this command button to initiate the process of editing a previously placed headwall cell.

**Place 602 Item**

Select this command button to initiate placement of the selected headwall cell.

**1.4.3.1 Adhoc Attributes**

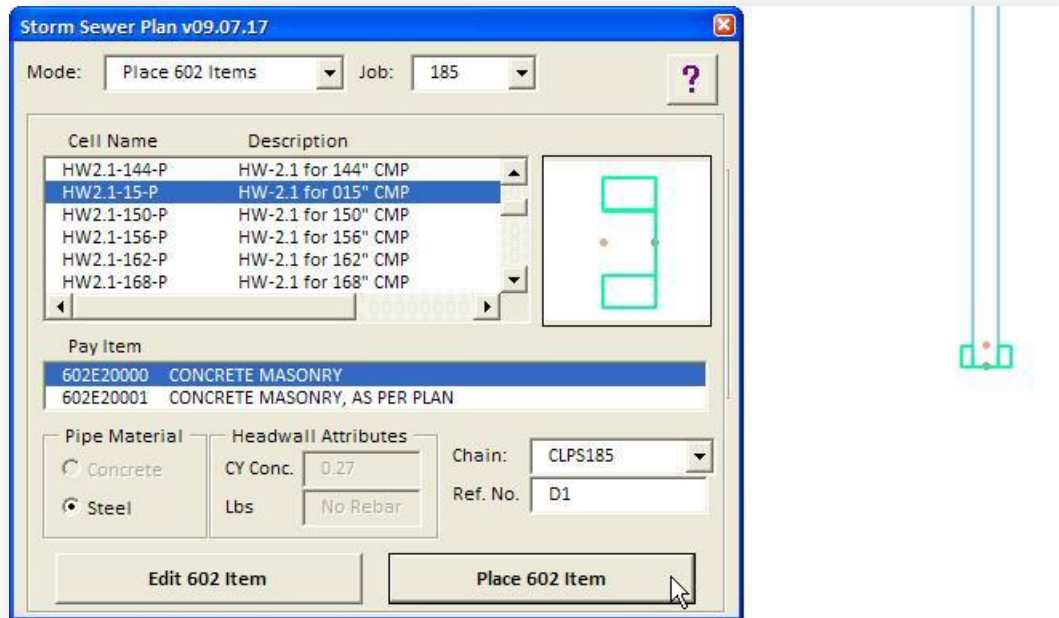
When a headwall cell is placed, the application will tag the element with multiple GEOPAK adhoc attributes. These attributes are used by the other ODOT storm sewer applications to draw information in the profile, and cross section views. The adhoc attributes listed below are stored with the headwall cell:

adhoc Attribute Name	Type	Value
ODOT_Drainage	String	"TRUE"
Chain	String	The name of the Chain (used in Pay Item computation)
Elev	Numeric	The Pipe Elevation
Rise	Numeric	The rise value for the pipe size
Span	Numeric	The span value for the pipe size
Reference	String	The Ref. Number value entered by the user
CYMasonry	Numeric	Cubic Yards of Concrete Masonry (used in pay item computation)
LBSRebar	Numeric	Pounds of rebar (stored for reference only)
Dimension-H	Numeric	The headwall height
Dimension-T	Numeric	The headwall thickness (for HW-2.1 and HW-2.2 cells)
Dimension-a	Numeric	The dimension "a" value (for HW-1.1 cells)
Dimension-b	Numeric	The dimension "b" value (for HW-1.1 cells)

These attributes can be reviewed and edited using GEOPAK functions; however it is recommended that you use the Edit 602 Item function to edit headwall cells that were previously placed using the ODOT application.

### 1.4.3.2 Placing Headwalls

Headwall cells are placed as a line terminator on the end of the selected pipe element as shown in the example below.



When the pipe element is selected, the headwall is displayed at the nearest endpoint of the selected line. Issue a data point to complete the headwall placement.

The values for the Headwall Attributes, as well as the dimensions stored as AdHoc Attributes, are read from the following ASCII file:

```
\ODOTstd\V8istd\vba\data\602_HW.txt
```

The format for this file is documented here and should never be edited by the user.

Column Number	Value
1	Headwall Cell Name
2	Cubic Yards Concrete
3	Cubic Yards Steel
4	Pounds Rebar for Steel Pipes
5	Standard Drawing
6	Headwall Height
7	Headwall dimension "a" (Std. drawing HW-1.1)
8	Headwall dimension "b" (Std. drawing HW-1.1)
9	Headwall Thickness (Std. drawing HW-2.1 or HW-2.2)

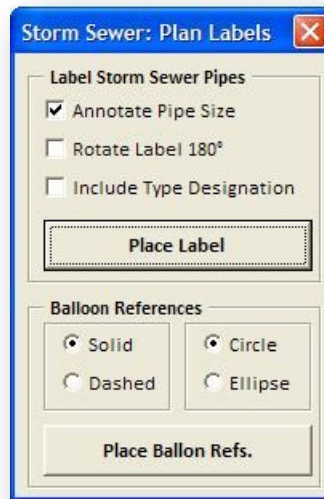
## 1.5 ODOT\_StormSewerPlanLabels.mvba

The **ODOT\_StormSewerPlanLabels.mvba** application is used to label storm sewer structures and pipes in the plan view.

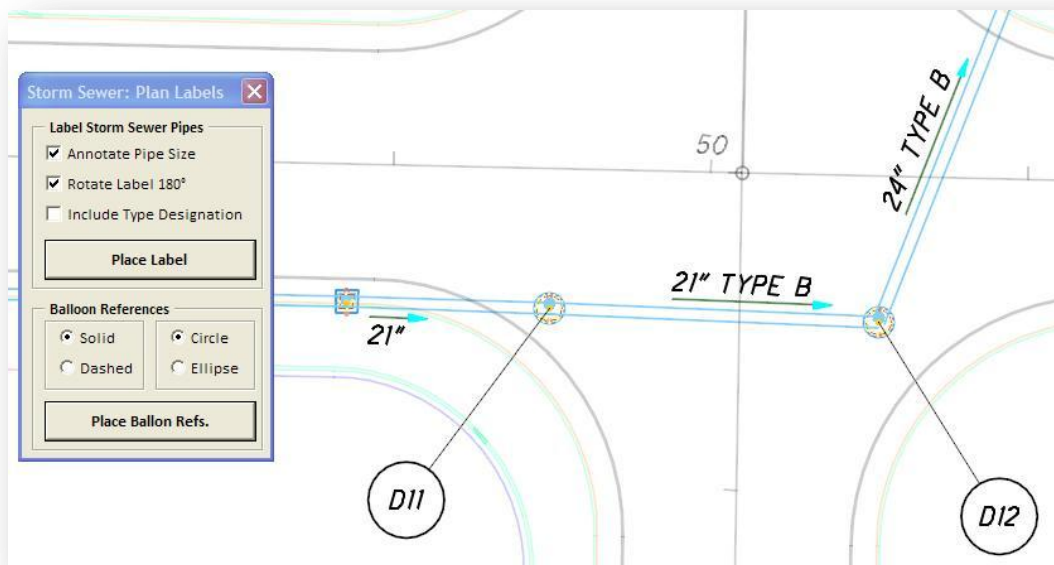
The application can be accessed from the MicroStation pull-down menu by selecting **ODOT > Drainage Apps > Proposed Storm Sewers > Plan: Labels**. The application can also be accessed with the following key-in command:

```
vba load ODOT_StormSewerPlanLabels.mvba; vba run modMain.LabelPlanMain
```

When the application is accessed, the dialog shown below is opened.



An example of the labels is show below.



### 1.5.1.1 Drainage Pipe Labels

Drainage pipes can be labeled with a flow arrow and optionally the pipe size.



Toggle on **Annotate Pipe Size** to include the size of the pipe in the label. With this option toggled off, only a flow arrow will be placed.

Toggle on **Rotate Label 180°** to change the orientation of the text size portion of the label.

Toggle on the **Include Type Designation** option to include the pipe type in the label.

The adhoc Attributes stored with the line representing the pipe are used to determine the flow direction of the pipe and the content of the size label.

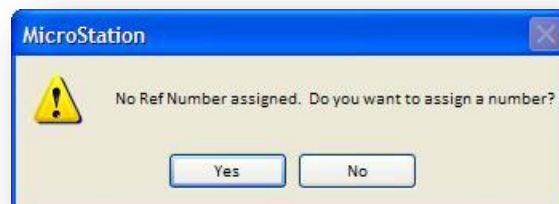
The text is placed on level DR\_P\_Text using the active Text Style and the active Model Annotation Scale.

### 1.5.1.2 Balloon References

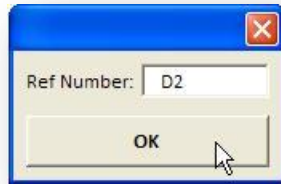
Balloon reference numbers can be placed for selected pipes or structures.



The adhoc attribute for the Ref. No. is read to generate the content of the balloon reference. If no reference number was stored with the selected pipe or structure element, the user is prompted whether they want to assign a number as shown below.



Select **Yes** to enter a reference number. The dialog shown on the following page is opened.



Select **OK** to assign the reference number to the element.

**Note:** The reference number is written as an adhoc attribute to the selected element. If the element is in a reference file attachment, the application will write the value to the element if the file is not currently opened by another user.

Options are available to set the symbology of the balloon graphics as **Soild**, **Dashed**, or as a **Circle** or an **Ellipse**.

The text is placed on level DR\_P\_Text using the active Text Style and the active Model Annotation Scale.

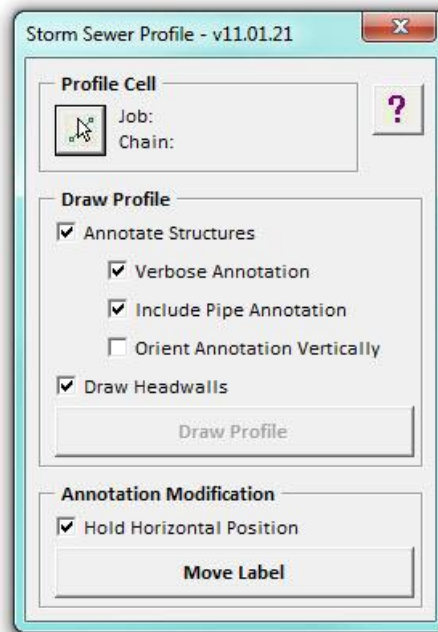
## 1.6 ODOT\_StormSewerProfile.mvba

The **ODOT\_StormSewerProfile.mvba** application is used to draw drainage profiles. The profile can be placed relative to the centerline profile, or relative to a profile that has been generated along the flow line of the pipes.

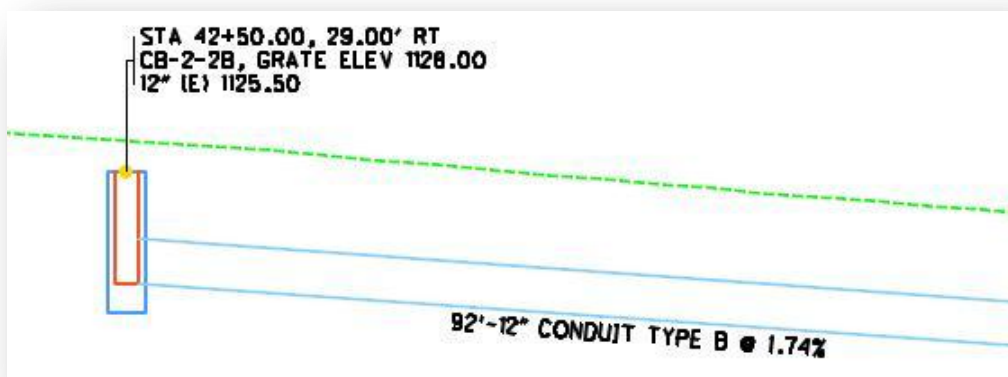
The application can be accessed from the MicroStation pull-down menu by selecting **ODOT > Drainage Apps > Proposed Storm Sewers > Profile**. The application can also be accessed with the following key-in command:

```
vba load ODOT_StormSewerProfile.mvba; vba run StormSewerProfileMain
```

When the application is accessed, the dialog shown below is opened.



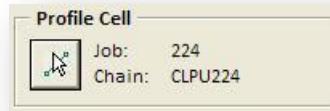
A partial example of the profile drawn by this application is shown below.



The dialog is split into three main sections. Each section is detailed on the following pages.

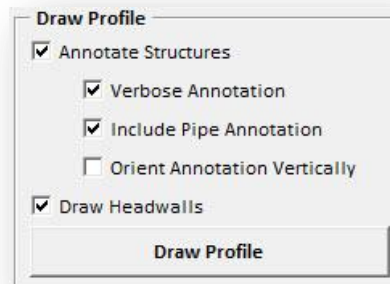
### 1.6.1.1 Profile Cell

This option is used to select the GEOPAK profile cell that will be used to draw the profile graphics. The **Job** number and **Chain** name are populated from the selected profile cell.



### 1.6.1.2 Draw Profile

These options are used to draw the profile and optionally annotate the structures. The options are shown below.

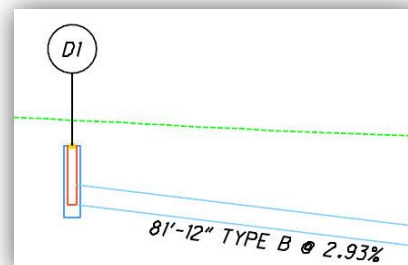
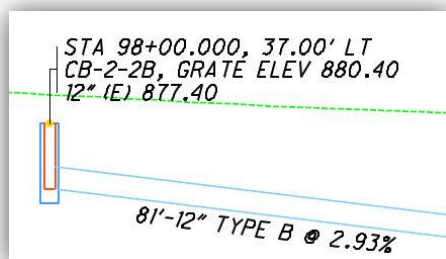


#### Annotate Structure

Toggle on this option to annotate the structures.

#### Verbose Annotation

Toggle this option on to annotate the structures with Station, Offset, and elevation information. Toggle this option off to annotate the structures using the balloon reference number that was assigned to the plan view graphic when the structure was initially placed in the plan view DGN file. An example of each annotation option is shown below. Note: If no balloon reference number has been assigned to the plan view graphics, a "?" will be placed in the balloon.



### Include Pipe Annotation

When the **Verbose Annotation** option is selected, the information for each pipe terminating within a structure can be annotated with the structure by toggling on the **Include Pipe Annotation** option.

### Orient Annotation Vertically

Optionally, the annotation can be oriented vertically as shown below by selecting this option.



### Draw Headwalls

Headwalls can be optionally drawn on the drainage profile. If you are projecting the storm sewer profile onto the roadway profile, headwalls on pipes that run perpendicular to the roadway profile are not drawn.

### Draw Profile

Select this button to draw the storm sewer profile on the selected GEOPAK profile cell.

The profile graphics are generated by reading the adhoc attributes from plan view graphics representing the drainage structures and pipes. As such, it is necessary for the designer to reference the plan view graphics to the profile design file in order to select the storm sewer items that will be drawn in the profile. A select set is used to choose which storm sewer items will be drawn on the profile.

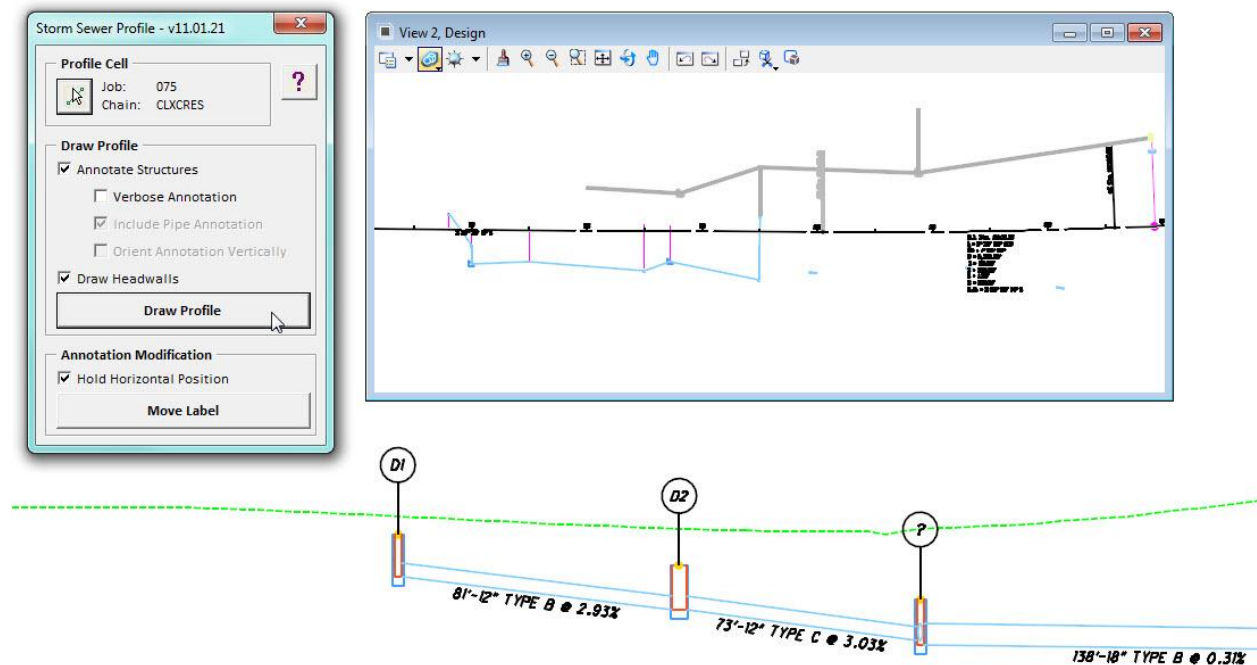


In the example below, the drainage profile is generated using the following steps:

- The drainage basemap is attached to the profile design file
- MicroStation View window 2 is open with the referenced plan view information displayed
- The **Profile Cell** has been identified on which the drainage profile will be drawn
- The plan view elements, shown in view 2, are selected using the MicroStation Element Selection tool

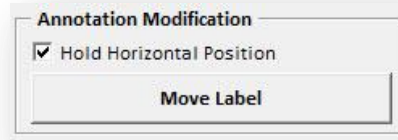
When **Draw Profile** button is selected, the profile is drawn as shown in the example below.

- The structures are drawn at the correct station and elevation based on the values read from the adhoc attributes stored with the plan view cells
- The pipes are drawn using the values read from the adhoc attributes stored with the plan view lines
- The graphics for the pipes and structures are drawn on the level DR\_P\_Storm\_Sewer
- The annotation is placed on the level DR\_P\_Text using the current Text Style and Model Annotation Scale values. Note that some cleanup work may be necessary depending on the length of each pipe and the active Text Style and Model Annotation Scale values.



### 1.6.1.3 Annotation Modification

The **Annotation Modification** group contains options to modify the annotation for a drainage structure drawn in the profile.



#### **Hold Horizontal Position**

Toggle on **Hold Horizontal Position** to place or move the label with the leader line constrained to the horizontal location of the catch basin station.

#### **Move Label**

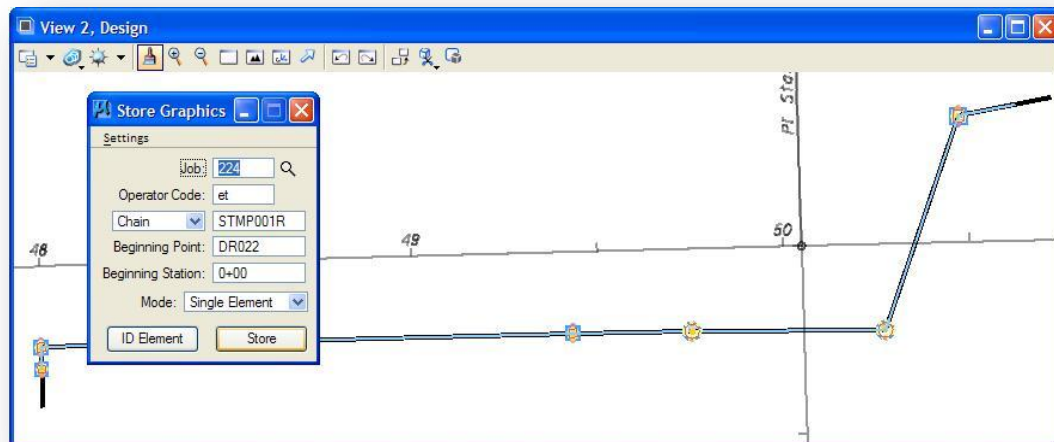
Select this button to move a label that has been previously placed with this application.

Structures can be annotated when the profile is drawn, as described in the previous section, or individually after the profile has been drawn. An example is described on the following page.

### 1.6.1.4 Plotting a profile generated along the drainage line

In some cases, the user may wish to create a storm sewer profile that follows the drainage line instead of projecting the storm sewer profile to the centerline profile. An overview of the process to generate the storm sewer profile is presented below:

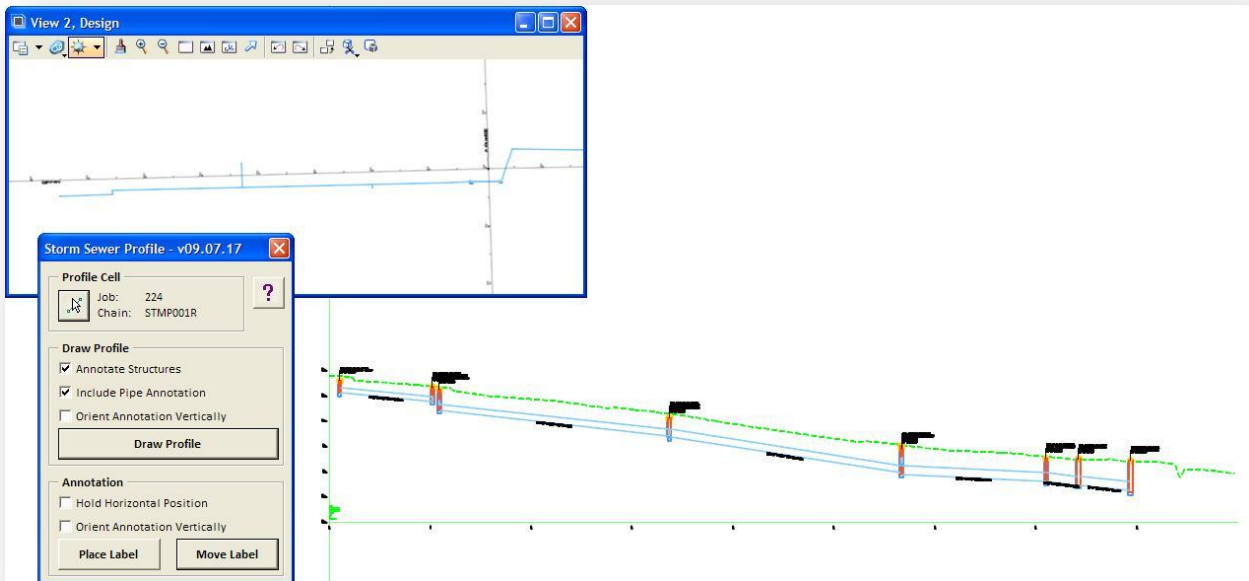
- Create a GEOPAK COGO Chain that follows the plan view location of the drainage run. The easiest way to do this is to draw a MicroStation line string for the drainage run, and then use the GEOPAK Store Graphics command to store a COGO Chain from the line string element.



**Important!** Be sure to extend the line string at least 10' beyond the limits of the drainage run at each end in order for the profile to adequately cover the length of the drainage run. The idea is to make sure that the chain length extends beyond the width of any structure cells that are at the beginning or end of the run.

**Note:** The **Beginning Station** of the chain is irrelevant. The structures will be placed at the correct interval along the drainage line profile and annotated with the station and offset values relative to the chain that was used to initially place the structure cell.

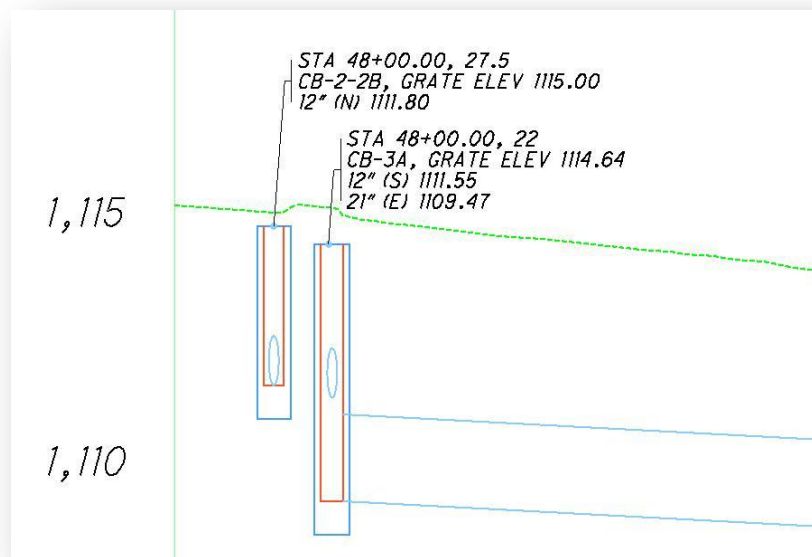
- Generate a COGO profile of the existing ground along the storm sewer line chain. Plot the profile in the desired design file using the GEOPAK Design and Computation Manager
- Proceed to plot the profile as previously describe by selecting the storm sewer profile control cell instead of the roadway centerline profile cell. An example is shown on the following page.



#### Additional Notes:

The program evaluates the distance between structures to determine whether to draw the pipes as an ellipse or lines between the structures. If the distance is 10' or less, an ellipse will be drawn for each end of the pipe. If the distance is greater than 10', the pipe will be drawn as two lines representing the length and the inside diameter of the pipe.

In the example above, which is further illustrated below, the first two structures are close enough that the program drew the pipe as an ellipse in each structure. The user will need to redraw this pipe as two lines and delete the ellipses in order to show this as a continuous drainage profile.



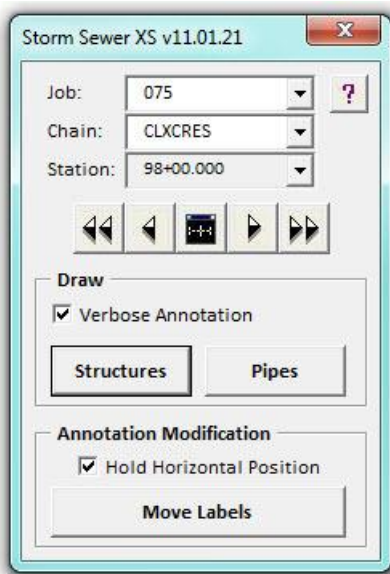
## 1.7 ODOT\_StormSewerXS.mvba

The **ODOT\_StormSewerXS.mvba** application is used to draw the storm sewer information on the cross sections.

The application can be accessed from the MicroStation pull-down menu by selecting **ODOT > Drainage Apps > Proposed Storm Sewers > Cross Sections**. The application can also be accessed with the following key-in command:

```
vba load ODOT_StormSewerXS.mvba; vba run StormSewerXSmain
```

When the application is accessed, the dialog shown below is opened.



The cross section graphics are generated by reading the adhoc attributes from plan view graphics representing the drainage structures and pipes. As such, it is necessary for the designer to reference the plan view graphics to the cross section design file in order to select the storm sewer items that will be drawn in the cross sections. A select set is used to choose which storm sewer items will be drawn on the cross sections.

The dialog has the following options:

### **Job**

Select the GEOPAK GPK file job number for the project.

### **Chain**

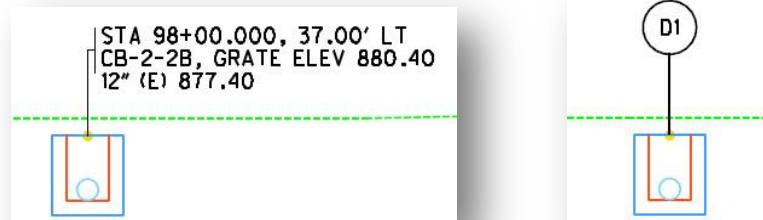
Select the GEOPAK Chain that was used to draw the cross sections.

### **Station/XS Navigation**

Tools to select which cross section is currently displayed onscreen and to navigate through the cross sections.

### Verbose Annotation

Toggle this option on to annotate the structures with station, offset, and elevation information. Toggle this option off to annotate the structures using the balloon reference number that was assigned to the plan view graphic when the structure was initially placed in the plan view DGN file. An example of each annotation option is shown below. Note: If no balloon reference number has been assigned to the plan view graphics, a “?” will be placed in the balloon.



### Draw Structures

Select this command button to draw the cross section graphics for the selected structures. Pipes that terminate within a structure are also drawn along with the structure.

### Draw Pipes

This command is used to draw a circle or ellipse at the location where a pipe intersects a cross section. This is further explained later in the documentation.

### Move Labels

This option is provided to easily move previously drawn storm sewer structure labels.

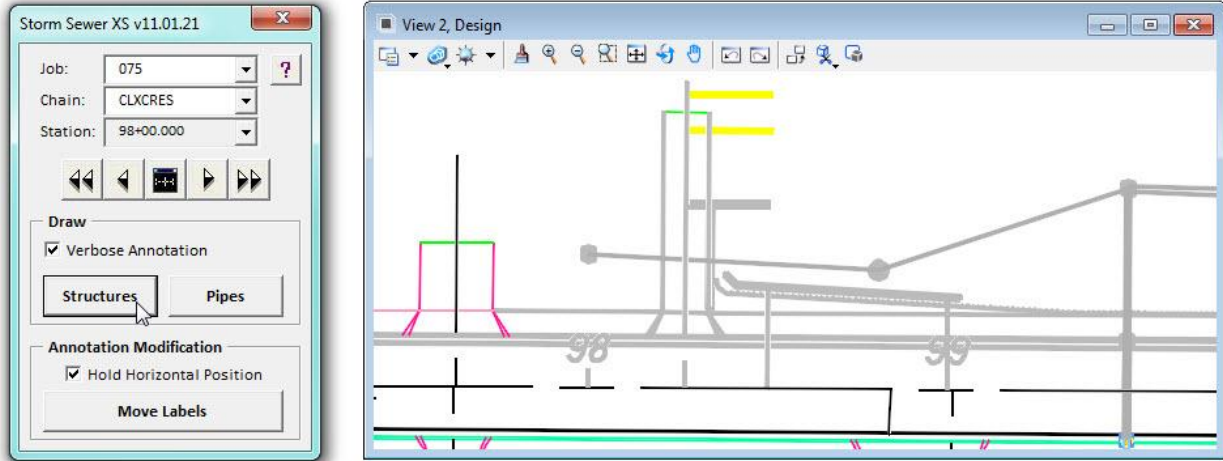
**Note:** The application is used to draw the storm sewer information on cross sections that are perpendicular to the centerline alignment. Skewed sections are not currently supported.

#### 1.7.1.1 Draw Structures

The application uses a MicroStation selection set to determine which storm sewer structures, pipes, and headwalls are drawn on the cross sections. The adhoc attributes tagged with the plan view graphics are read to draw the storm sewer cross sections. The storm sewer cross sections are drawn with the following steps:

- The drainage basemap is attached as a reference file to the cross section design file
- MicroStation View window 2 is open with the run of drainage pipes, headwalls, and structures that are to be drawn in the profile displayed
- The plan view elements are selected using the MicroStation Element Selection tool

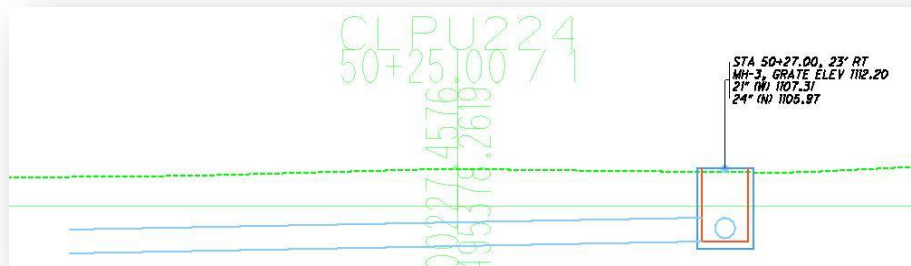
When **Draw Structures** button is selected, the cross sections are drawn as shown in the example on the following page.



STA 98+00.000, 37.00' LT  
 CB-2-2B, GRATE ELEV 880.40  
 12" (E) 877.40

**Notes:**

- The graphics for the pipes and structures are drawn on the level DR\_P\_Storm\_Sewer
- Structures that do not fall at a cross section location are projected to the nearest cross section
- Labels are placed using the current Text Style and Model Annotation Scale value
- The structure and pipe information is annotated as shown in the example above
- The pipes and headwalls are drawn at the structure location using the following rules:
  - If the beginning and ending offset of the pipe (measured from the centerline) is within 5' of each other, the pipe is drawn as an ellipse in the structure as shown in above.
  - Pipes that run parallel to the centerline are only drawn at the structure location. To draw an ellipse representing pipes that run parallel to the centerline on the intermediate cross sections, use the **Draw Intersecting Pipes** command.
  - Pipes that have a beginning and ending offset greater than 5' are draw emanating from the structure for the actual length of the pipe. An example is shown below.

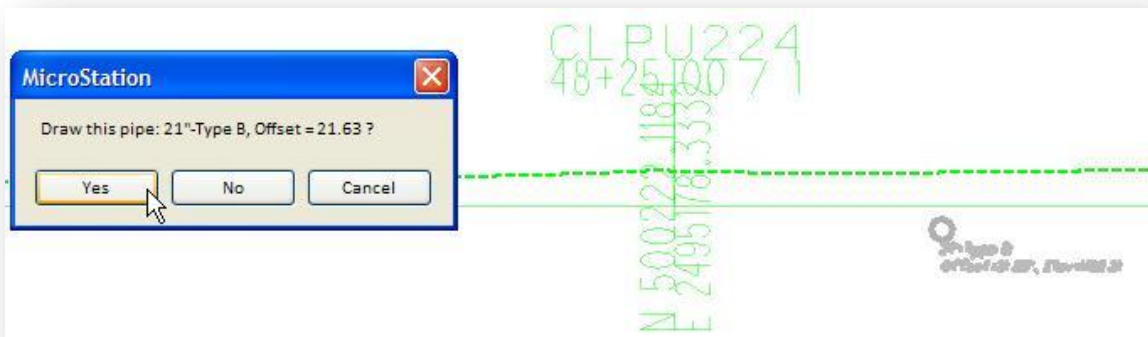


### 1.7.1.2 Draw Intersecting Pipes

This command is used to draw pipes that run roughly parallel to the centerline on the cross sections at the stations between storm sewer structure locations.

To process the pipes, select the desired plan view storm sewer graphical elements and then pick the **Draw Pipes** command.

The process will cycle through each cross section looking for an intersection with a storm sewer pipe. When an intersection is found, temporary graphics are displayed showing the location of the pipe intersection. The user is prompted whether to draw the pipe as shown in the example below.



Select **“Yes”** to draw the pipe.

#### Notes:

- Since the **Draw Structure** command will draw the pipes at the structure location, the user should normally choose **“No”** when prompted to draw the pipes at these locations.
- The graphics for the pipes are drawn on the level DR\_P\_Storm\_Sewer
- The pipe is annotated with the size and type as shown below



- Supplemental information for the offset and elevation is annotated on level SC\_Scratch1 for the designer's information only.

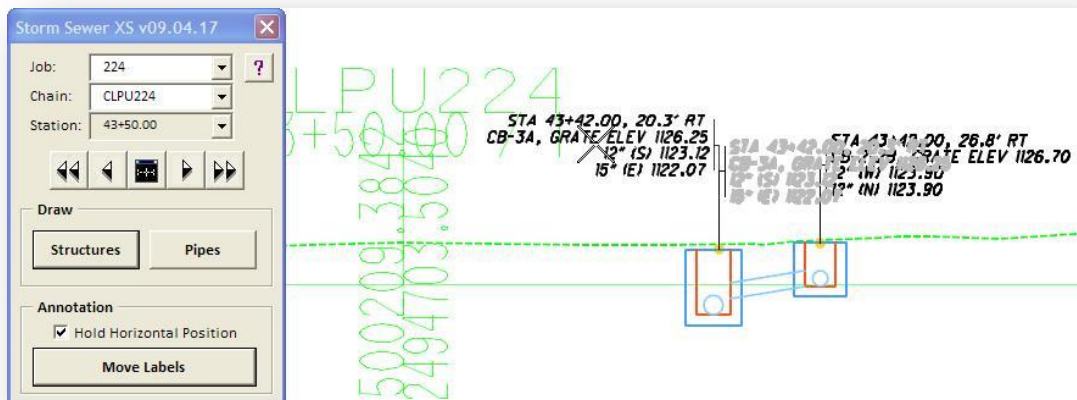


### 1.7.1.3 Move Labels

The **Move Labels** option is provided to allow the user to easily move a label while maintaining the original location of the label leader line.

Toggle on **Hold Horizontal Position** to place the label with the leader line constrained to the horizontal location of the catch basin station.

- Select **Move Labels** to initiate the process.
- Select the text node of the label you wish to move
- The text and the leader lines dynamically move as you move the cursor
- Issue a data point to identify the new location for the label



## 1.8 Tabulating Storm Sewer Quantities

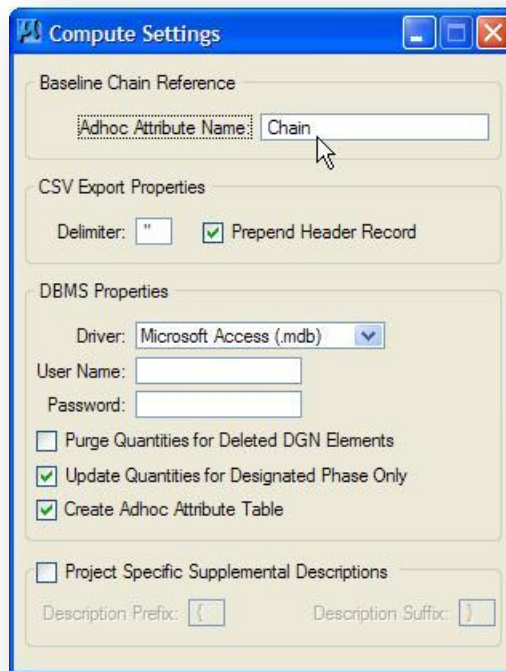
The GEOPAK Design and Computation Manager can be used to tabulate quantities from the plan view storm sewer graphics. An overview of the process is presented here. See the GEOPAK online help for further details regarding computing quantities.

The storm sewer items are defined in ODOT.ddb. Open this file from the GEOPAK Design and Computation Manager dialog by selecting **File > Open**. The file is located in the following folder:

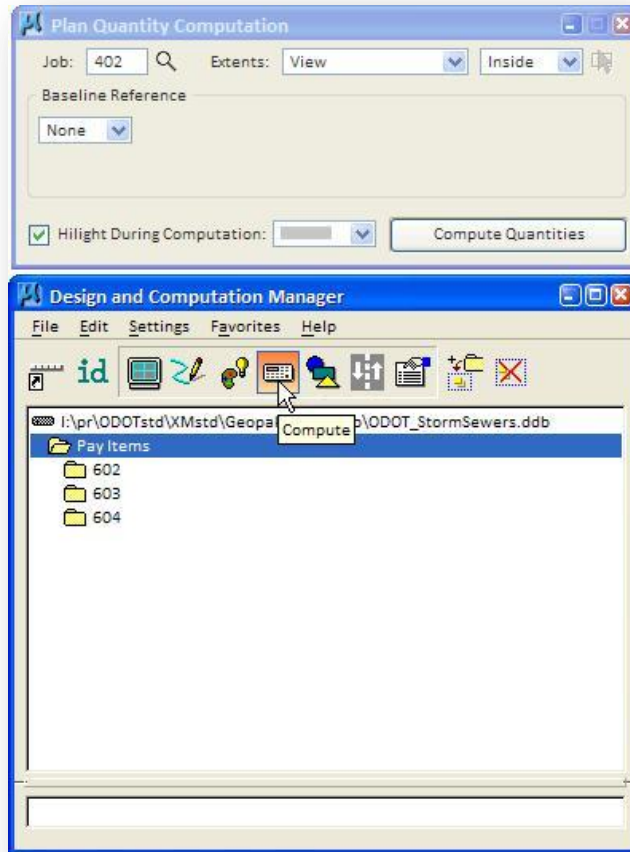
**i:\ODOTstd\V8iSTD\Geopak\Road\ddb\ODOT.ddb**

When the storm sewer quantities are tabulated, users have the option to compute the station and offset information related to a selected COGO Chain. Storm sewer graphics drawn using the ODOT mvba applications are tagged with an adhoc attribute containing the name of the chain that was used to originally place the storm sewer graphics. To use this chain in the computation, take the following steps:

- Select **Settings > Compute** to access the *Compute Parameters* dialog shown below
- Enter the **Adhoc Attribute Name** of “Chain” as shown below

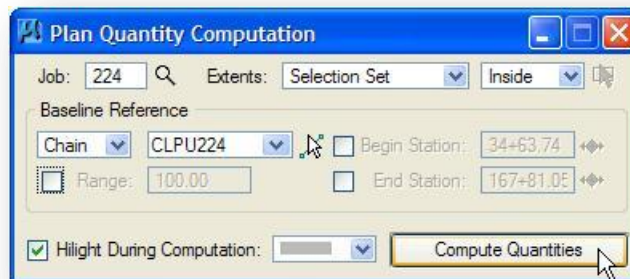


From the *Design and Computation Manager* dialog, select **Compute** to access Compute mode as shown below.



Quantities will be computed for the selected category or item. In the example above, quantities will be tabulated for all items in the **Pay Items** category.

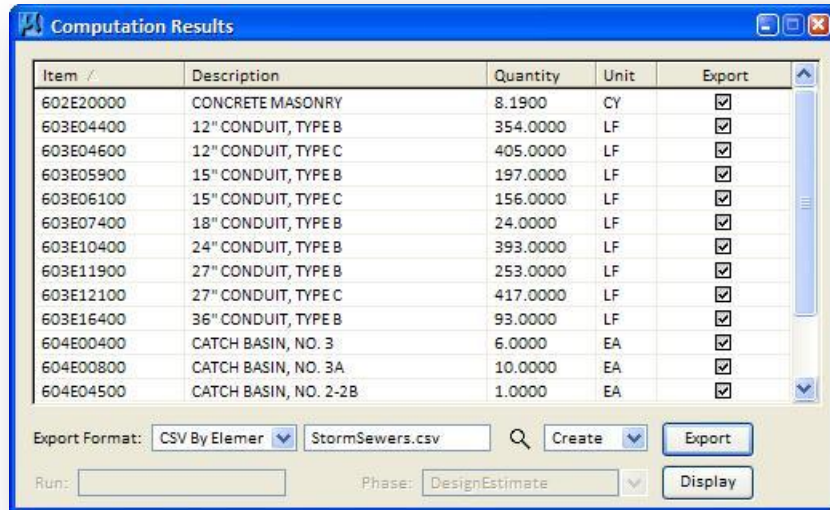
The *Plan Quantities Computation* dialog contains the settings to determine how the quantities will be tabulated. In the example below, a **Selection Set** is used to compute the quantities.



Select **Compute Quantities** to access the *Computation Results* dialog shown on the following page.

The *Computation Results* dialog contains a summary of the tabulated quantities. You can selectively export these values to toggling on/off the **Export** option.

The **Export Format** option is used to export the quantities to a variety of formats. To export a comma separated value file that can be imported into Excel, select **CSV By Element**, enter the file name, and select **Export** as shown below.



An example shown some of the data that is exported with the **CSV By Element** option is shown in Excel, below.

	A	B	C	D	E	F	G	H	I	J
1	Item Name	Item Description	Unit	Baseline	Minimum Station	Minimum Offset	Minimum North	Minimum East	Maximum Station	Maximum Offset
2	604E04500	CATCH BASIN, NO. 2-2B	EA	CLPU224	42+50.00	29	500177.7137	2494604.317	42+50.00	29
3	604E04500	CATCH BASIN, NO. 2-2B	EA	CLPU224	43+42.00	26.8	500182.3793	2494696.225	43+42.00	26.8
4	604E04500	CATCH BASIN, NO. 2-2B	EA	CLPU224	48+00.00	27.5	500193.9581	2495154.08	48+00.00	27.5
5	604E00800	CATCH BASIN, NO. 3A	EA	CLPU224	43+42.00	20.3	500188.877	2494696.051	43+42.00	20.3
6	604E00800	CATCH BASIN, NO. 3A	EA	CLPU224	45+70.00	22	500193.29	2494924.015	45+70.00	22
7	604E00800	CATCH BASIN, NO. 3A	EA	CLPU224	45+70.00	-22	500237.2742	2494922.835	45+70.00	-22
8	604E00800	CATCH BASIN, NO. 3A	EA	CLPU224	48+00.00	22	500199.4561	2495153.932	48+00.00	22
9	604E00800	CATCH BASIN, NO. 3A	EA	CLPU224	49+43.00	22	500203.2898	2495296.881	49+43.00	22
10	604E31500	MANHOLE, NO. 3	EA	CLPU224	49+75.00	22	500204.1476	2495328.869	49+75.00	22
11	604E31500	MANHOLE, NO. 3	EA	CLPU224	50+27.00	23	500204.5165	2495380.852	50+27.00	23
12	603E04400	12" CONDUIT, TYPE B	LF	CLPU224	42+50.00	29	500177.7137	2494604.317	43+42.00	26.8
13	603E04400	12" CONDUIT, TYPE B	LF	CLPU224	45+70.00	21.63	500193.6649	2494924.005	45+70.00	-21.625
14	603E04400	12" CONDUIT, TYPE B	LF	CLPU224	48+00.00	21.63	500199.8309	2495153.922	48+00.00	27.5
15	603E04600	12" CONDUIT, TYPE C	LF	CLPU224	43+42.00	19.93	500189.2519	2494696.041	43+42.00	26.8
16	603E05900	15" CONDUIT, TYPE B	LF	CLPU224	43+42.00	19.93	500189.2519	2494696.041	45+70.00	21.625
17	603E07400	18" CONDUIT, TYPE B	LF	CLPU224	45+70.00	21.63	500193.6649	2494924.005	48+00.00	21.625
18	603E08900	21" CONDUIT, TYPE B	LF	CLPU224	48+00.00	21.63	500199.8309	2495153.922	49+43.00	21.625
19	603E08900	21" CONDUIT, TYPE B	LF	CLPU224	49+43.00	21.63	500203.6646	2495296.871	49+75.00	22
20	603E08900	21" CONDUIT, TYPE B	LF	CLPU224	49+75.00	22	500204.1476	2495328.869	50+27.00	23
21	603E10400	24" CONDUIT, TYPE B	LF	CLPU224	50+27.00	23	500204.5165	2495380.852	50+48.00	-33.5
22	604E04900	CATCH BASIN, NO. 2-3	EA	CLPU224	50+48.00	-33.5	500261.5372	2495400.394	50+48.00	-33.5
23	603E11900	27" CONDUIT, TYPE B	LF	CLPU224	50+48.00	-33.5	500261.5372	2495400.394	50+81.25	-36.46

It is up to the individual user to determine whether this information is useful and how it will be applied. We encourage users to experiment with different output reports to find the format that is most beneficial your project requirements.

**Note:** As of GEOPAK V8i (SELECTseries 1), AdHoc Attribute information is now included in the csv file.

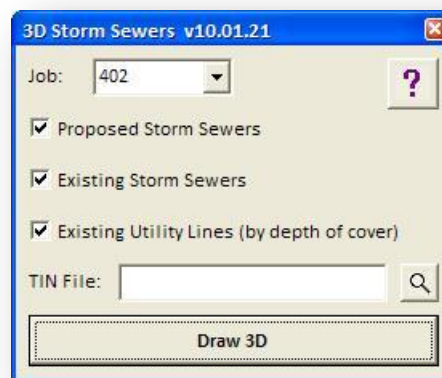
## 1.9 ODOT\_StormSewer3D.mvba

The **ODOT\_StormSewers3d.mvba** application is used to draw existing and proposed storm sewers in a 3D model. The resulting graphics are used for checking the drainage system for conflicts only. Additionally, 3D line strings can be drawn representing underground utilities.

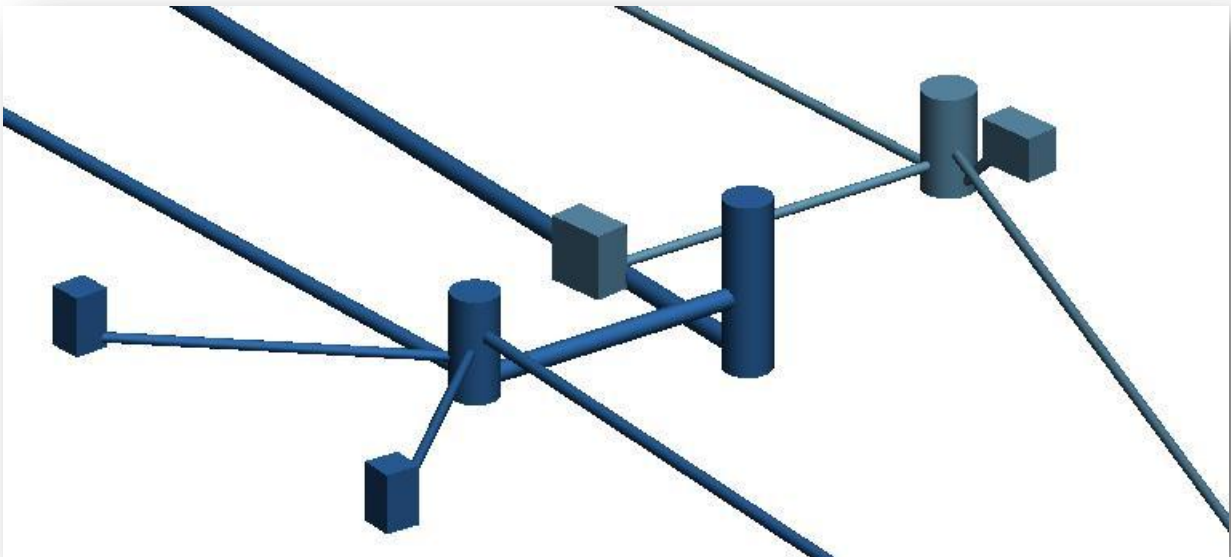
The application can be accessed from the MicroStation pull-down menu by selecting **ODOT > Drainage Apps > Proposed Storm Sewers > 3D Storm Sewers**. The application can also be accessed with the following key-in command:

```
vba load ODOT_StormSewer3D.mvba; vba run StormSewer3DMain
```

When the application is accessed, the dialog shown below is opened.



An isometric view of the 3D graphics drawn by this application, representing existing and proposed storm sewers, is shown below.



### Processing notes for storm sewers:

3D graphics for the existing storm sewer information is drawn on the levels **DR\_X\_Storm\_Sewers** and **DR\_X\_Cells**.

3D graphics for the proposed storm sewer information is drawn on the levels **DR\_P\_Storm\_Sewers** and **DR\_P\_Cells**.

The elevation data for proposed storm sewer items is read from the AdHoc attributes stored on the graphical elements.

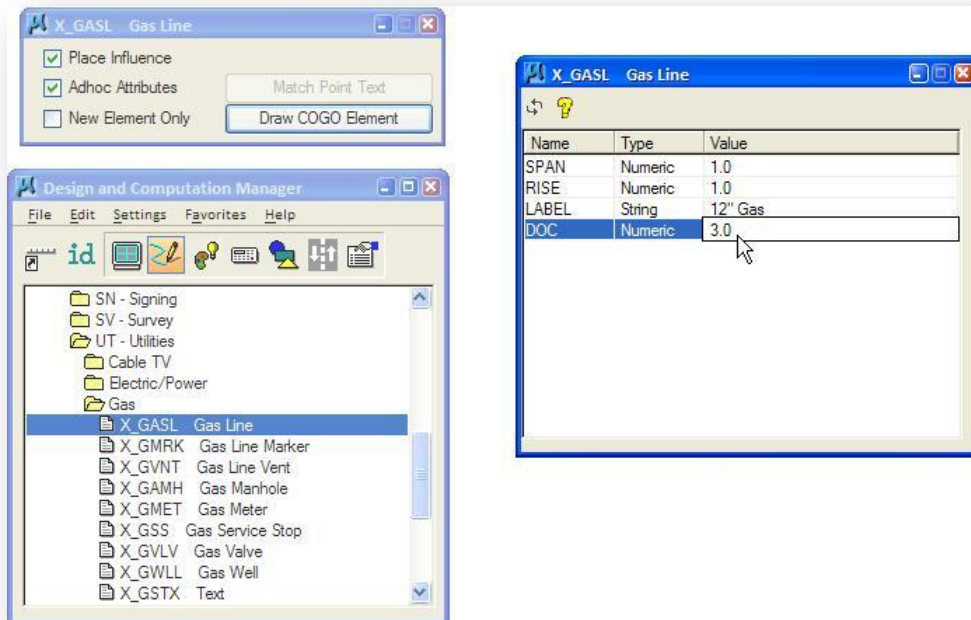
The elevation data for existing storm sewer items is read from COGO points representing the storm sewer structures in the selected **Job** file.

The plan view information for existing and proposed storm sewers must be drawn using the various ODOT drainage applications in order to ensure that the necessary data is written to the graphics.

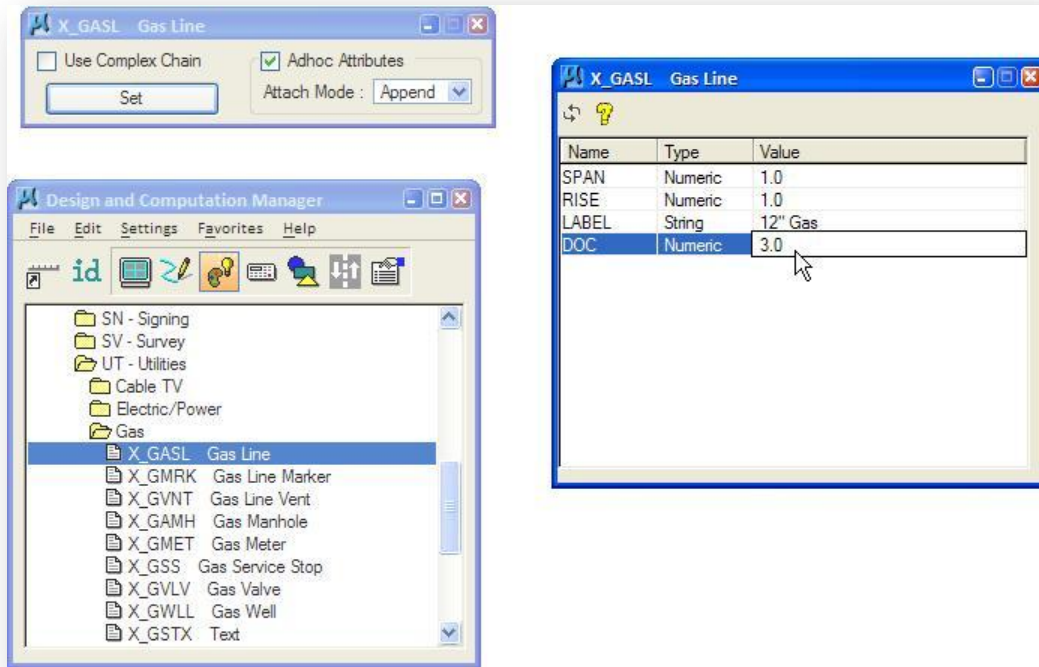
### Processing notes for underground utilities:

The elevation information for underground utilities is generated by projecting the selected utility lines on the selected **TIN File**, and then subtracting the depth of cover (DOC) value.

The DOC for each utility line is specified by an adhoc attribute named "DOC" stored on the graphical element. This AdHoc attribute can be assigned using the GEOPAK D&C Manager when the element is initially drawn or added later. An example defining the DOC adhoc attribute when a Gas line is drawn is shown on the following page.



The DOC adhoc can be assigned to previously drawn utility lines using **Set** mode as shown below.



Once the item is selected, and the adhoc attribute values are set, select the **Set** button and then select the element.

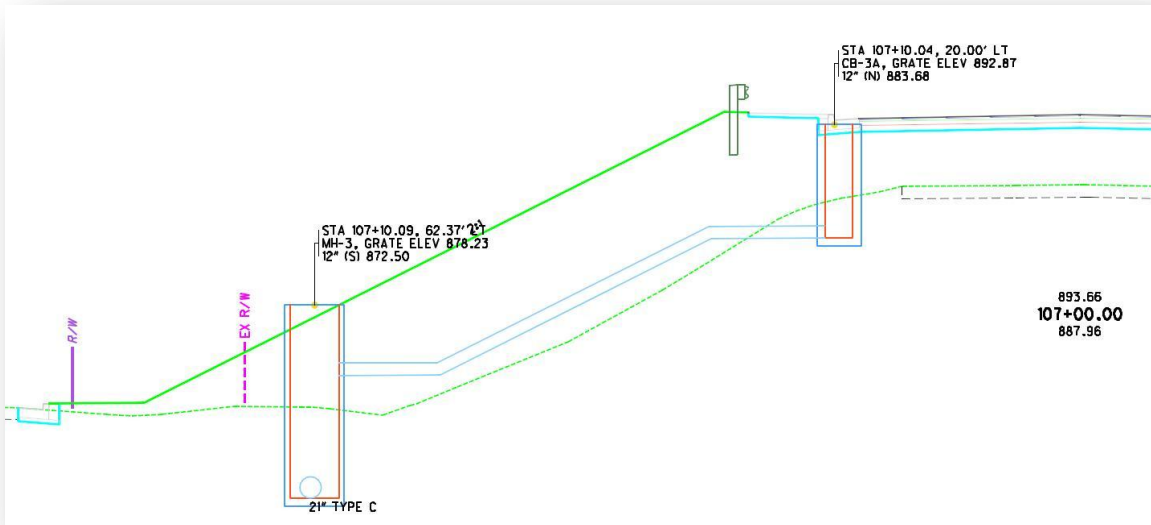
### Drawing the 3D graphics

The application requires the user to be in a 3D Model when initiated. Before running the application, create a 3D model and reference in the plan view graphics for the existing and proposed storm sewer information, and the underground utility lines.

The application uses a selection set to determine which storm sewer or utility information is drawn in 3D. Once the graphics have been referenced into the 3D model, select the storm sewer and underground utility elements that you wish to draw in 3D. Select the **Draw 3D** button to initiate the process.

## 1.10 ODOT\_StormSewerPipeBends.mvba

The **ODOT\_StormSewerPipeBends.mvba** application is used to tag pipe bend data on previously drawn plan view storm sewer pipes. The bend data is read by the profile, cross section, and 3D pipes applications to draw the pipes with bends as shown in the cross section example below.



The application can be accessed from the MicroStation pull-down menu by selecting **ODOT > Drainage Apps > Proposed Storm Sewers > Storm Sewer Plan: Pipe Bends**. The application can also be accessed with the following key-in command:

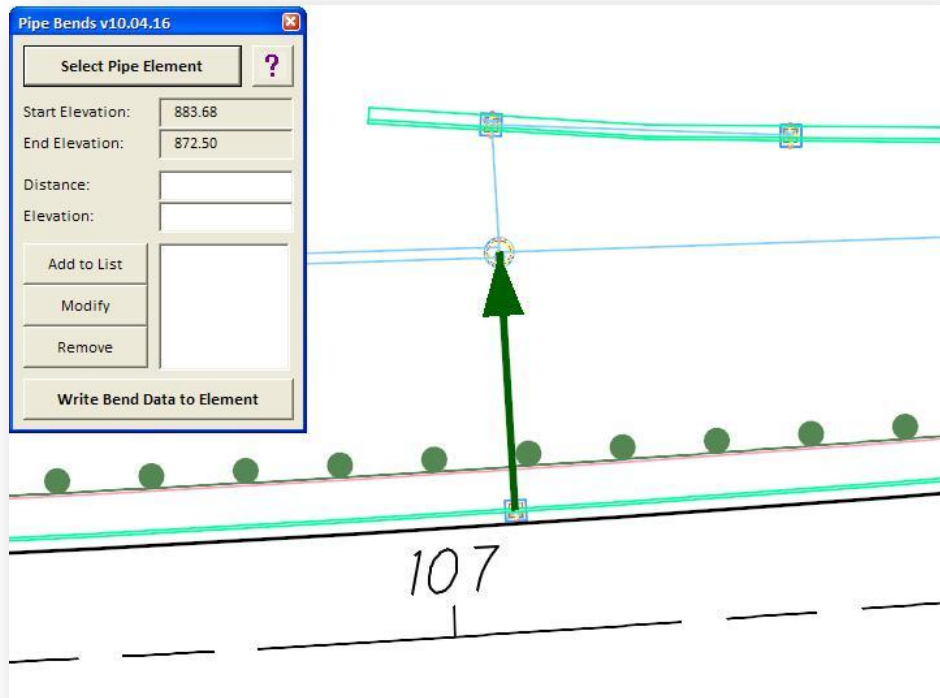
**vba load ODOT\_StormSewerPipeBends.mvba; vba run PipeBendsMain**

When the application is accessed, the dialog shown below is opened.



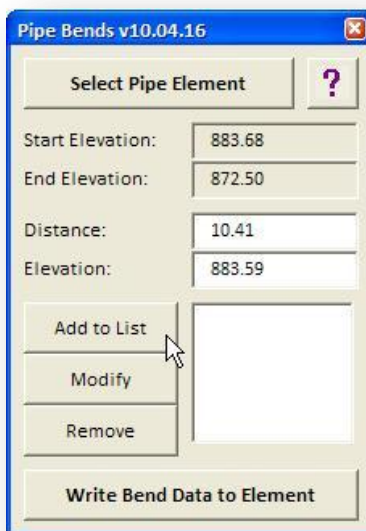
### Select Pipe Element

Select the **Select Pipe Element** command button and identify the previously drawn storm sewer pipe element that you wish to use to assign the bend data. The **Start Elevation** and **End Elevation** for the selected pipe are displayed in the dialog as shown below. A dark green arrow is temporarily displayed over the selected pipe element showing the flow direction.



### Entering Bend Data

Bend data is entered using the **Distance** and **Elevation** key-in fields. The distance to the bend is measured from the start point of the storm sewer line.

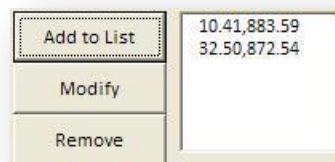


Select the **Add to List** button to add the bend data to the list.

The data is stored in distance, elevation format.

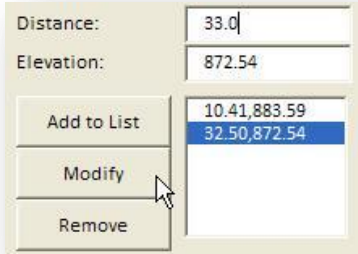
Additional pipe bends can be added by keying in the **Distance** and **Elevation** values and selecting **Add to List**.

In the example below, data for two pipe bends has been added to the list.



### Modify Bend Data

When a storm sewer pipe is selected, any pipe data that has been previously stored on the pipe will be displayed in the dialog. Selecting a pipe bend from the list will populate the Distance and Elevation fields as shown below.



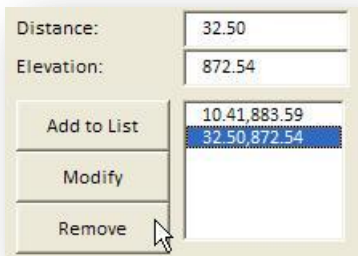
Distance:	33.0
Elevation:	872.54
Add to List	10.41,883.59
	32.50,872.54
Modify	
Remove	

Select the **Modify** button to accept the new value.

Select the **Write Bend Data to Element** option to save the new values with the currently selected storm sewer pipe element

### Remove Bend Data

The Remove button is used to delete the selected bend data from the list. Select the desired item, and then select Remove as shown below.



Distance:	32.50
Elevation:	872.54
Add to List	10.41,883.59
	32.50,872.54
Modify	
Remove	

### Write Bend Data to Element

Select the **Write Bend Data to Element** option to store the bend data on the currently selected storm sewer pipe element. The data is written as GEOPAK AdHoc attributes.

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## 1.11 Contacts

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If you have any questions, suggestions, or problems please contact the ODOT Office of CADD and Mapping Services CADD Support team or use the following form on the ODOT web site at:

<http://www.dot.state.oh.us/Divisions/Engineering/CADDMapping/CADD/Pages/suggestions.aspx>