North Carolina
Department of
Transportation

Hydraulics Unit

Hydraulics Unit VBA Manual

11/18/13

Overview of Hydraulics Unit VBAs

The Hydraulics Unit VBAs are accessed from the Hydraulics toolbar, under the *Geopak Drainage* tab. These programs automate Storm Drain Computation spreadsheets, compilation of Drainage Summary Sheets, and assignment of structure numbers. Their names and brief descriptions are:

Report (BERG.mvba): This VBA creates the Inlet and Storm Drain Computation Sheets in NCDOT format.

PayItem Utility (PU.mvba): This VBA assigns payitem adhocs to various drainage features. When running PayItem Utility Legacy (see below), the user must answer multiple, tedious questions about pipes. The current PayItem Utility program does not require this user input because of a change in workflow during the design process. Now, a database allows the user to pick class of concrete, gauge of steel, etc, in the Pipe Definition dialog box of *Geopak Drainage*, during design and placement of pipes. The workflow change relates to the belief that the user would rather answer these questions when placing pipe, rather than when running the VBA.

PayItem Utility Legacy (PU_legacy.mvba): This program is the original payitem utility VBA. It is needed for legacy projects. This VBA should not be run on new projects. When PayItem Utility Legacy is run, the user will have to answer questions about each pipe.

Box Number Symbol (SNAP.mvba): This VBA places the ID numbers for *Geopak Drainage* nodes in the Drainage Structure Number cell and/or places the top and invert elevations in the file.

Edit PayItem (SIAM.mvba): This VBA allows the user to edit "hand design" features (see definitions below) that have been "power selected".

Drainage Summary Sheet (PADSS.mvba): This VBA creates the Drainage Summary Sheet as an Excel file and populates it with data that have been adhoced to elements in the drn file.

Station and Offset (SOAP.mvba): This VBA helps the user adhoc the station, offset, alignment, and structure numbers (for drive pipes) for hand design drainage elements.

Definition of Terms

Several special terms used throughout this document are defined below:

Drainage Design: Features placed by the *Geopak Drainage* program.

Hand Design Features: Features placed either by selection from the Hydraulics Unit toolbar or by selection of cells from within *MicroStation*.

Primary Payitem: An adhoc that defines the main payitem number for the feature selected.

Secondary Payitem: An adhoc that defines the payitem number for a feature directly connected to the primary payitem. (eg: When a catch basin is placed, a masonry structure must be placed as well. Primary Payitem = Catch Basin, Secondary Payitem = Masonry Structure.)

Supplemental Payitem: An adhoc that further defines the primary payitem, and is necessary for cost determination. (eg: The gauge or thickness of steel and aluminum pipes.)

Unapparent Adhoc: An adhoc not easily verified by comparison to cell or level names. (eg: Rip rap fabric area.)

Workflow: "To Hydro" through "From Hydro" Dates

Design the project.

Run Reports to create the Inlet and Storm Drain Computation spreadsheets.

Run PayItem Utility.

Have project reviewed by manager.

Make revisions and, in most cases, rerun PayItem Utility.

Run Station and Offset.

Run the Drainage Summary Sheet.

Run Box Number Symbol.

Workflow: "From Hydro" through "Let" Dates

Make minor changes to hand design features.

Run Edit PayItem on changed items. Run Station and Offset on the same items.

For changes made to a single *Geopak Drainage* system or several systems:

Run PayItem Utility or PayItem Utility Legacy. Choose the option "Get pay items for elements that have changed in the selected network". This program must be run for each system.

For changes made to most of the systems in *Geopak Drainage*:

Run PayItem Utility or PayItem Utility Legacy. Choose the option "Get pay items for all networks".

For multiple changes to both *Geopak Drainage* systems and hand design features:

Run PayItem Utility or PayItem Utility Legacy. Choose the option "Get payitems for all elements".

Run Station and Offset on the hand design features.

Run the Drainage Summary Sheet.

Manually shift the structure numbers and add additional structure numbers. Delete all top and invert elevation annotations in the design and rerun Box Number Symbol to repost the elevation annotations.

PayItem Utility VBA and Adhocs – Comments and Cautions

PayItem Utility places *Geopak* adhoc attributes on hydraulic drainage elements for two purposes: 1) the TransPort program uses the adhoc attributes to automate quantities and 2) the Drainage Summary Sheet VBA uses the adhoc attributes to populate the Drainage Summary Sheet. This version of PayItem Utility does not

address all drainage elements, but rather addresses the elements that are used most often. An exclusion list at the end of this section lists elements that are either partially addressed or not addressed at all.

Geopak Road documentation provides the following comments concerning adhoc placement:

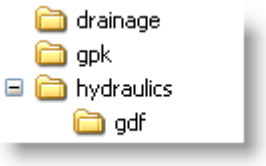
> *Adhoc attributes can be used in the computations and provide maximum flexibility. Each element can have a maximum of 255 adhocs and each adhoc has a Name, Type and Value. They can be attached via the adhocs option in D&C, criteria, 3PC, VBA or using the Adhoc Attribute Viewer tool.*
>
> *There are five types of adhocs:*
> - *Numeric - 123.45*
> - *String - Used as Description for Pay item - 255 char. max*
> - *Unit - Any valid unit as defined in the .CSV file*
> - *Quantity - actual numeric value to use as quantity (if present, this will override the graphical quantity that would have been derived from the element)*
> - *Remarks - additional information that will be exported to the QM database*

PayItem Utility places several adhocs on each feature based on the feature's type. The different types of adhocs are outlined later in this document.

These adhocs are recorded for each feature as they are quantified during the Design and Computation Manager Compute command. From that calculation, the data can then be exported to a *MicroSoft Access* database format, which in turn can then be sent to the TransPort program for final payment output.

File Structure

PayItem Utility requires that supporting files be placed in specific folder locations. A specific folder structure must exist for the program to work properly. The folder structure shown here matches the folder structure for projects on the Project Store server.



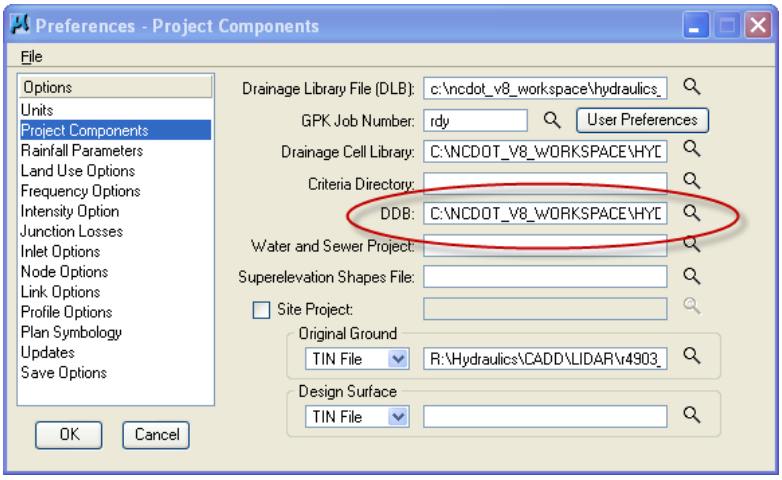
The drn file can be placed in the Drainage folder or in the Hydraulics\ CADD folder. If the design was done with *Geopak Drainage*, the accompanying gdf file must be placed in the Hydraulics\ gdf folder.

There can only be one gdf file in the gdf folder.

Several VBA files are needed to produce the Drainage Summary Sheet. The VBA files named PU.mvba, PU_Legacy.mvba, SIAM.mvba, SOAP.mvba, and BERG.mvba must be in the Hydraulics workspace, using the folder path NCDOT_V8_WORKSPACE\ HYDRAULICS_STDS\ Standards\ vba. The supporting hydro_payitems.mdb and hydraulic payitems.ddb files must be in the NCDOT_V8_WORKSPACE\ HYDRAULICS_STDS\ Standards\ data Folder.

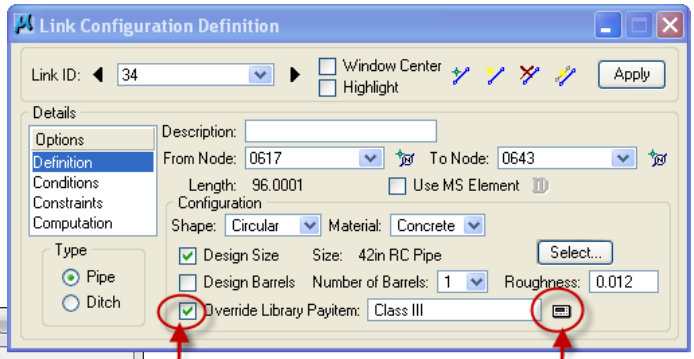
Setting the DDB Path in the Preferences Dialog Box

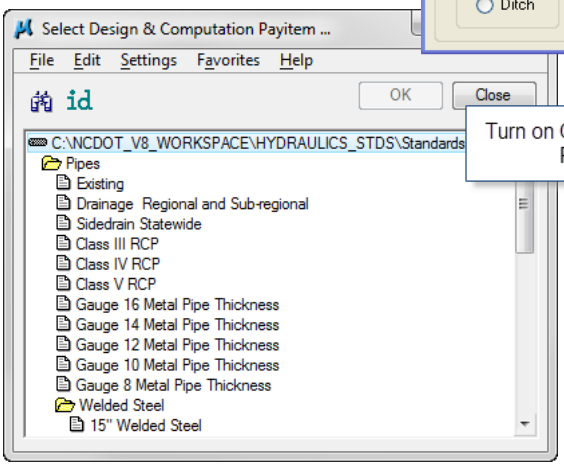
Select the commands Geopak Drainage >Project >Preferences to open the Preferences dialog box. In the Options column, select Project Components. For the DDB field, browse for NCDOT_V8_WORKSPACE\ HYDRAULICS_STDS\ Standards\ data\ hydraulic payitems.ddb.



Selecting Pipe Type

For new projects, pipe type is selected in *Geopak Drainage*. By selecting the pipe type here, PayItem Utility doesn't have to stop at each pipe and ask the user what the class of concrete is or what the gauge thickness is. For alternate pipe, using *Geopak Drainage* is the easier method to select between Subregional / Regional Tier and Statewide tier.



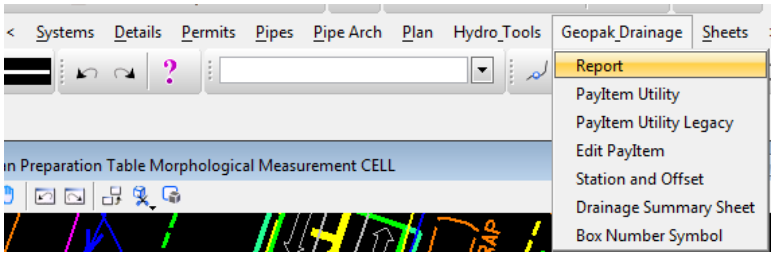


Turn on Override Library Payitem

Click on the database button

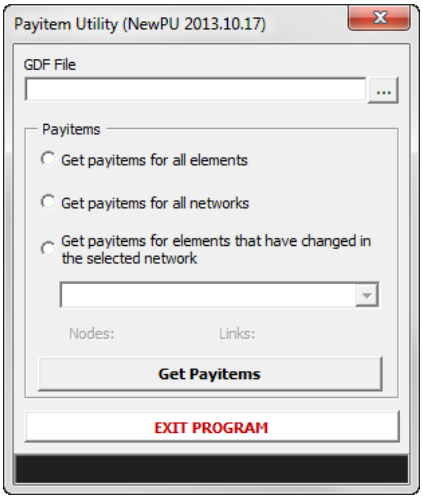
As illustrated in the diagrams, enable Override Library Payitem, then click on the database button. In the resulting dialog box select the correct Pipe Type.

Running PayItem Utility



Use the Hydraulics Unit menu bar to launch PayItem Utility.

This VBA initiates at the zoom setting of the current view. However, zooming and panning functions are incorporated in the VBA's dialog boxes. The user may optimize the zoom setting to allow distinguishing feature types as the VBA moves from feature to feature.



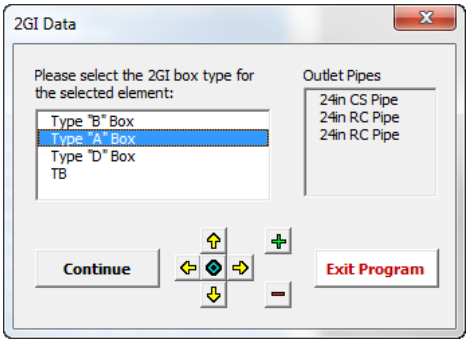
The first dialog box allows the user to browse for the GDF file and select payitems that need to be adhoced.

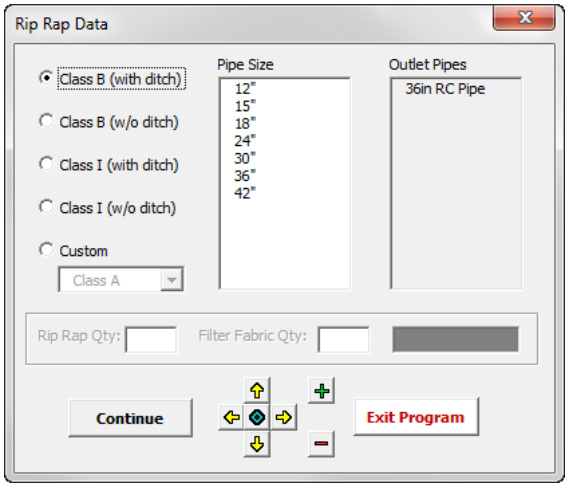
If the VBA is being run for the first time on the project, select "Get payitems for all elements". Selecting this option places adhocs on every drainage feature.

For subsequent runs of the VBA, you only need to update the *Geopak Drainage* systems, and then select either "Get payitems for all networks" or "Get payitems for elements that have changed in selected networks." Selecting this last option will only adhoc the features for the *Geopak Drainage* network selected by the user.

Once the options have been properly set, select the Get Payitems button to start the VBA on its first phase, which assigns adhocs to the *Geopak Drainage* designed features. Once the phase starts, the user is presented a message noting that the assignment process has begun and that this process may take a few minutes to complete. The program then passes through each feature and adds the adhoc information that it can harvest from the gdf file. If the VBA was run previously, the existing adhocs will be removed from each element prior to addition of the new information. This payitem related information includes feature types and variables, such as drop inlet, catch basin, junction box, station and offset distance, pipe type, and invert elevation. When the automated adhoc process is complete, an information dialog box advises the user of the completion.

After acknowledging this dialog box by pressing OK the program starts its next phase. In this phase it asks the user for drainage information that cannot be harvested from the gdf file. The dialog boxes change as different features are occupied. The user is presented with pulldowns or lists that allow selection of the required variables. Examples of the different dialog boxes are shown here.





Note the navigational buttons in the lower portion of each dialog box. Because *Microstation* commands, including view commands, are unavailable while running the VBA, these buttons provide for view navigation.

The “+” and “-“ buttons control zooming. The green button located in the middle of the four pan buttons centers the current feature in the view window.

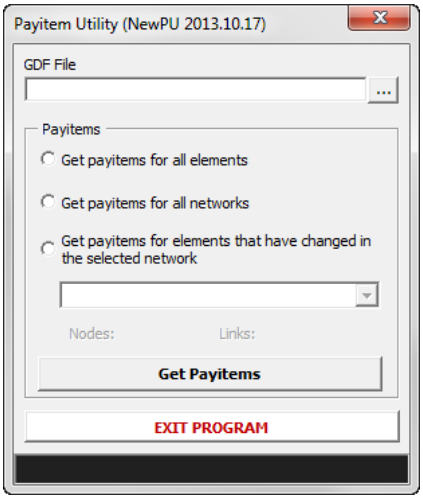
Note that the Rip Rap dialog box has a custom option that allows the user to add user calculated quantities for fabric and stone.

The second phase of the VBA is complete when a dialog box indicates the drainage design features have been adhoced.

In the third phase of the program, hand design (non Geopak Drainage) features are adhoced. The process is the same as outlined above with the exception that data cannot be derived from the gdf file. The user is presented the same dialog boxes as before.

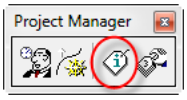
When this process is complete the user again sees a completion dialog box. Then the final phase begins. Prior to this last phase, drainage links (pipes) have been on the Default level. Now, the VBA automatically moves these drainage links to their proper levels in *MicroStation*.

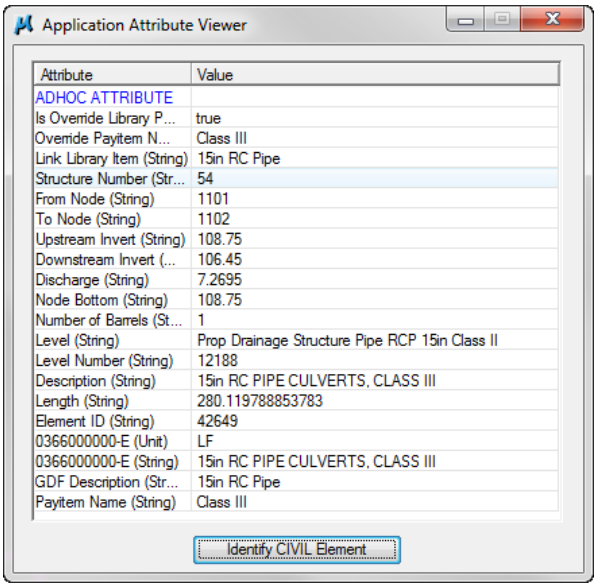
At the end, the main Payitem Utility dialog box reappears. The user can either run another system or exit the program. **It is critical to use the Exit button and not the “X” in the upper right hand corner of the dialog box.** If the user selects the “X”, the program does not properly unload, which interferes with running subsequent VBAs.



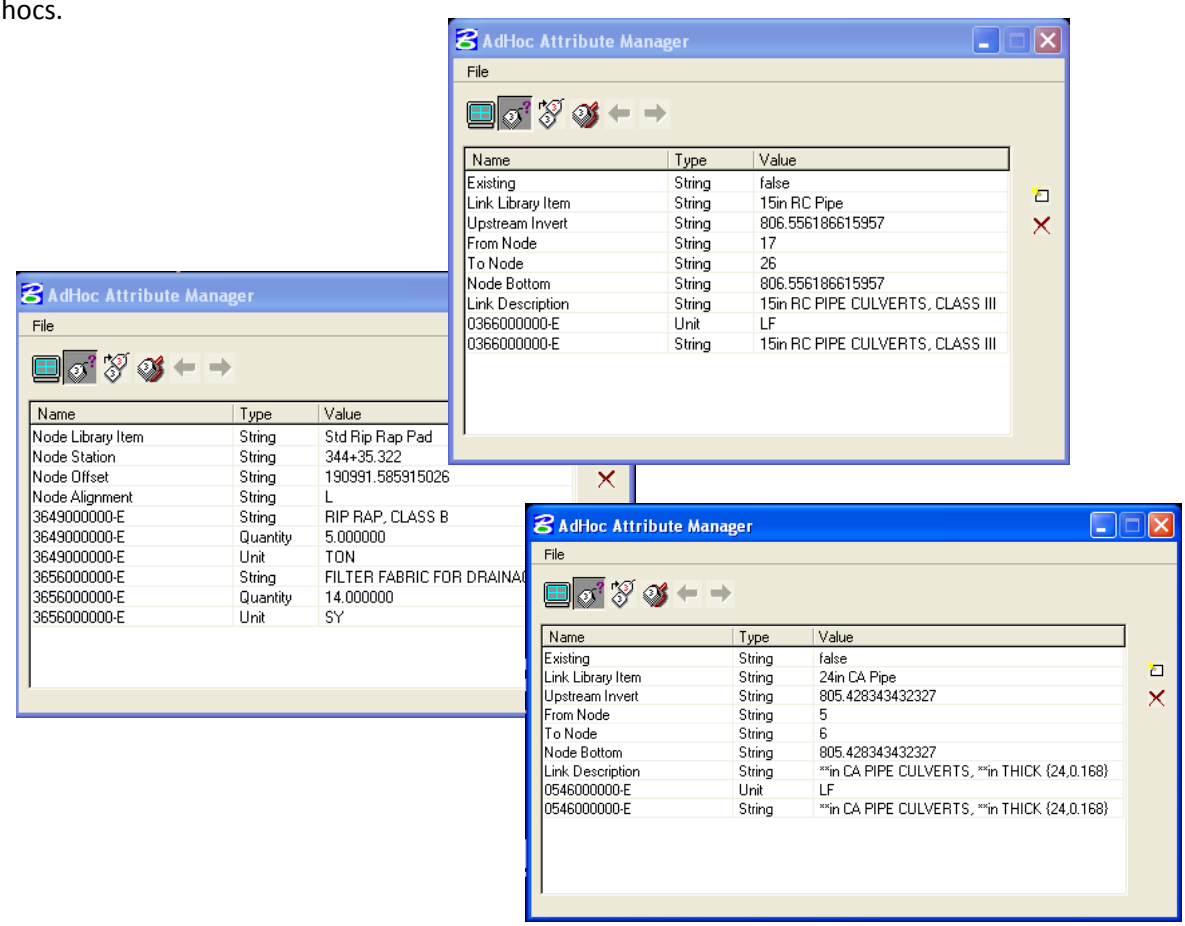
Adhoc Examples

The user is advised to review all adhocs after each run of PayItem Utility, to ensure that all features are adhoced correctly. Shown here are assigned adhocs from within the *Geopak* 3P Attribute Manager. This tool is located in the Project Manager toolbox, as shown here.





Features vary in the number of adhocs that are attached by the VBA. Some features have just a primary payitem, some have both primary and secondary payitems, and some have both, with unapparent adhocs as well. Note that initially drainage design features have more adhocs than hand design features. For example, none of the hand design features have adhocs for station and offset. The location adhocs for hand design features will be picked up later when the user runs Station and Offset. Shown below are examples of several features and their adhocs.



Adhoc Format

For an adhoc payitem number and value to be used in the TransPort quantity calculation, it must be in a specific format. Using the last example shown above, note that the Link Description's value includes "**". The actual information to replace the "**" is shown in brackets at the end of the value, in this case, "24,0.168". The information in the brackets is the supplemental payitem number used to further define the primary payitem. This format is mandatory.

Exclusion List for Drainage Summary Sheet

Headwalls – No payitem number assigned
Tees – No payitem number assigned
BCCS and PCP (HPDE) Pipes - No payitem number assigned
Stub Outs – No payitem number assigned
Funnel Drains - No payitem number assigned
Tapered Ends - No payitem number assigned

Parallel/Flared Ends - No payitem number assigned
Driveway DI - No payitem number assigned
Converts - primary adhocs are assigned but no secondary adhocs are assigned
Adjusts - primary adhocs are assigned but no secondary adhocs are assigned
Jurisdictional Stream Rip Rap - No payitem number assigned

Running Station and Offset

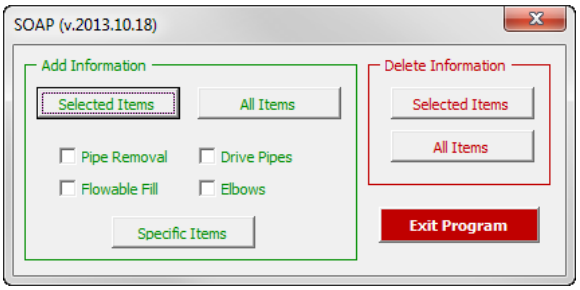
The Station and Offset VBA (SOAP) should only be run on elements that were hand designed (placed without using *Geopak Drainage*; ie, placed with *MicroStation* tools). Station and Offset prompts for alignment on most structures and structure numbers for sidedrain (driveway) pipes. With this alignment, the VBA determines the respective station and offset. The information gathered by this VBA (structure number, alignment, station, and offset) is adhoced to the element, eventually passing to the Drainage Summary Sheet by another VBA.

Station and Offset does not prompt for the structure numbers for pipe removal, flowable fill, or elbows, but it does need the alignments for these features.

Steps

1. While in the drainage (dsn) file, attach the first plan sheet file.

2. The user may power select elements before launching the VBA. If not selected before launch, the user is restricted to groups of elements related to checkboxes in the SOAP dialolg box (see image).



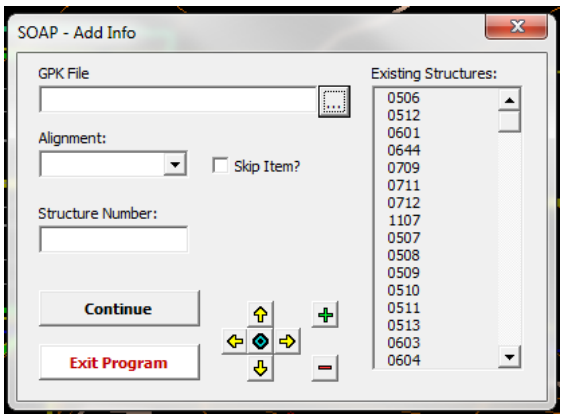
3. Launch Station and Offset.

   If elements were power selected before launch, click the green Select Items button. Otherwise, enable the desired checkboxes and click the Specific Items button.

   If Station and Offset has previously been run on this project, then select the red Selected Items button. The resulting deletion clears adhoc values associated with previous runs of Station and Offset. Once the deletion process has finished, select the green "Selected Items" button to re-add the location adhocs.

4. The SOAP – Add Info dialog box opens. In this dialog box, select the GPK file and alignment for a given structure. Then enter the related structure number. Click the "Continue" button. Repeat the cycle for all relevant structures.

   (Note that structure numbers are displayed in the right portion of the dialog box, but that they are only partially sorted.)



5. When you finish the first plan sheet, you must exit Station and Offset before continuing with the next sheet.

After exiting Station and Offset, detach the completed plan sheet file and attach the next plan sheet file. Repeat the process for all necessary plan sheet files.

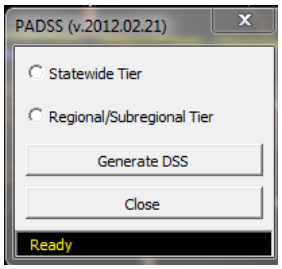
6. When you finish running SOAP on all of the plan sheet files, it is time to use another program, Drainage Summary Sheet (PADSS), to populate the Drainage Summary Sheet.

Running Drainage Summary Sheet

Warning: you must not have *Excel* open when you run Drainage Summary Sheet (PADSS).

Steps

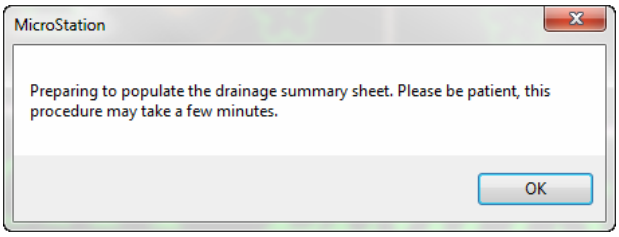
1. From the custom Hydraulics tools launch Drainage Summary Sheet (PADSS) by selecting Geopak Drainage Tools > Drainage Summary Sheet.



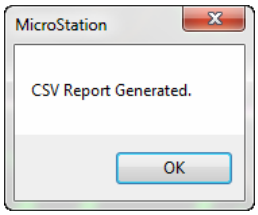
2. In the PADSS dialog box, select the appropriate tier option for the project.

3. Select the "Generate DSS" button and then be patient.

4. When the MicroStation advisory dialog box opens, select OK, and again be patient.



5. When the second MicroStation dialog box opens, advising that the report has been generated, select OK.



6. The report is an Excel spreadsheet file. Drainage Summary Sheet (PADSS) automatically saves this file in the project's Drainage folder, with a name of the format:

tipnumber_yyyymmdd_DSS.xlsm

Open the Excel file. On the Home worksheet, select the correct type of pipe for the project from the CS vs CAA Pipe dropdown list. You DO NOT have to do anything else on the Home worksheet.

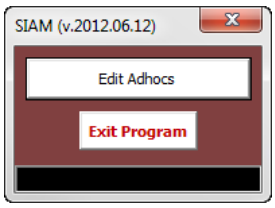
Go to the 48orLess worksheet. Review items in the Dump column to insure that no "normal" items are present. Address issues as necessary. (If items are in the Dump column that are supposed to be there, you do not need to do anything.)

Responsibilities of the Hydro User

Run Geopak Drainage.
Run the necessary Hydraulics VBAs to produce the Drainage Summary Sheet file.
Open the file, select the pipe type (CS verses CAA), and review the 48orLess worksheet for problems.

SOAP and PADSS are not dynamically linked to Geopak Drainage or the drainage design file. Therefore, after you run these applications, if you alter the drainage in the file, say by changing a system, or adding a driveway pipe, you must run selected VBA's again. If you place a driveway pipe, use the application under the Hydraulics Geopak Drainage Tools called "Edit Payitem". (Before you run it, you need to power select the "NON GEOPAK DRAINAGE" features that you have added.) If you added something to a Geopak Drainage system, then run that system in Payitem Utility.

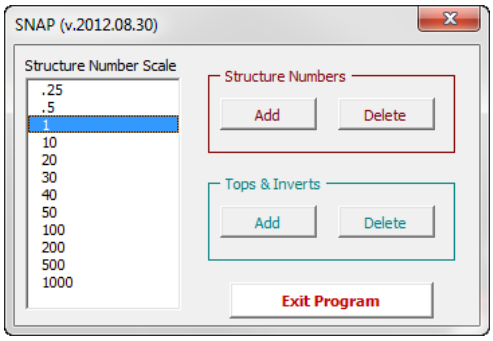
Running Edit PayItem (SIAM)



Edit Payitem (SIAM) is a Geopak Drainage option on the Hydraulics Unit menu bar. This VBA allows the user to adhoc payitems to a group of power selected elements that were placed by hand design. Do not run this VBA on elements placed using Geopak Drainage.

Currently, the user must run Station and Offset on these elements. Planned, future enhancements to Edit PayItem include the ability of the VBA to adhoc location information to the features, without having to separately run Station and Offset.

Running Box Number Symbol (SNAP)



Box Number Symbol (SNAP) places the ID numbers for nodes placed in Geopak Drainage in the drainage structure symbol cell. The cell is placed automatically offset from the upper right hand corner of the node based on "true north." The user will have to rotate the cells to orient the cells correctly with each plan sheet and move the cells to an open area. There was no reasonable way for the programmer to be able to write a program that knows which way each plan sheet is rotated and where the open areas are.

This VBA also places the top and invert elevations for each node offset from the bottom right hand corner of the node cell.