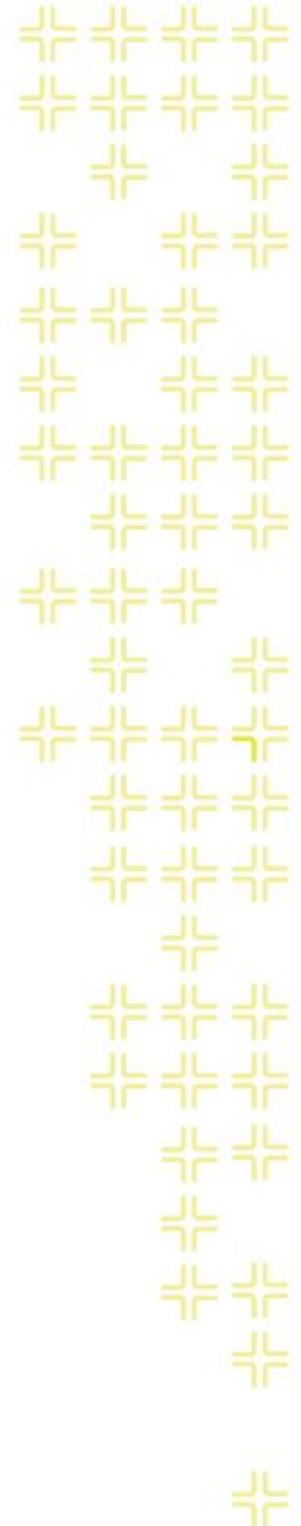# GIS Changes for Sewer and Storm

# GIS Changes for Sewer and Storm

In this session, we'll cover sewer and storm changes made since the 7.4 release and how they may impact users.

## Table of Contents

# Overview of 7.4 Changes

Lucity 7.40 contains significant changes that impact the Sewer and Storm modules and their interactions with various GIS tools.

- Single Identifier for Sewer Pipes and Storm Conduits

- An associated structure is no longer necessary for Sewer Pump Stations, Storm Pump Stations and Storm Detention Basins.

- Changes to sewer and storm edit tools
  - Reverse flow tools have been removed
  - Editing process for changing a pipe route

# Single Identifier for Sewer Pipes and Storm Conduits

Lucity 7.40 will modify how Sewer Pipes and Storm Conduits are uniquely identified within the software. In Lucity 7.30 and prior, Storm Conduits and Sewer Pipes were uniquely identified using the combination of the upstream and downstream structures. With 7.40, Lucity will continue to store, track, populate, and use the upstream and downstream structure information, **but will move to using a single field to uniquely identify these assets**.

We first informed users of this change in a mass email distributed the first week of May.

Dear [ ],

Lucity developers and staff are working hard on Version 7.40 which will be released late summer. This version has a couple important changes that we want to prepare you for prior to upgrading.

- Sewer Pipes and Storm Conduits will use a single unique identifier instead of using Upstream Structure and Downstream Structure. Lucity will continue to display and support the Upstream and Downstream values but these values will no longer be used to uniquely identify a pipe (External TV Inspection imports will continue to support Upstream and Downstream identification).

  Clients who have Sewer Pipe and Storm Conduit assets will need to do some planning and possibly some data updates prior to being able to upgrade to 7.40 for these changes. Please see the following guide to preparing for the Sewer Pipe and Storm Conduit Alt Id changes: [insert link to PDF here].

- Custom assets will only support a single identifier. If you use custom assets and rely on using both the Link 1 and Link 2 fields to identify your features, we want to hear from you soon!

A couple of other notes you may be interested in:

- We will be supporting SQL Server 2012 with the 7.40 release. We will continue to support all other SQL versions 2000+ as well.
- If ESRI releases ArcGIS 10.1 by the end of May we will be supporting ArcGIS 10.1 and 10.0 for Web and Mobile GIS and ArcGIS 10.1, ArcGIS 10.0, and ArcGIS 9.3.x for desktop GIS.

Please contact us with questions or concerns regarding any of these changes.

## Prior to 7.4 Upgrade

Before upgrading to Lucity 7.40 there are several things that should be considered in light of these changes. For agencies that use GIS linked to Lucity the following steps MUST be taken before upgrading to avoid the GIS and Lucity components from getting out of sync.

1. Create or Choose a field in the feature classes for the AltID

   - The Storm Conduit and Sewer Pipe GIS feature classes must have a field that contains the new identifier which maps to the Alt Conduit Id and Alt Pipe ID. If you are using the ESRI Local Government data model, the FacilityId is a prime candidate for mapping to this field in Lucity. Do not use a read only field such as the OID.

2. Link the Geodatabase field to Lucity

   - Update the custom geodatabase configuration for Lucity to properly map the Facility Id (or other unique field) to the relevant Pipe Number or Conduit Number fields.

3. Decide what the Pipe and Conduits Unique Id's should be

   - You must decide how you will populate and maintain these new unique identifier fields. It will need to be populated with unique ids before you will be able to push GIS Sewer Pipe and Storm Conduit attribute changes to Lucity.

4. Generate the ID's in ArcMap

   - This field must be properly populated in your GIS prior to this upgrade. This may require adding a new field to the feature class and populating it.

5. Check ID's for uniqueness

   - If you are using an existing identifier such as FacilityId, it is important to check and make sure the FacilityId is unique. Having multiple Sewer Pipes with the same facility Id or multiple Storm Conduits with the same facility Id will cause problems. It is okay for a sewer pipe to have the same FacilityId as a storm conduit.

6. Synchronize the features

   - After configuring the mapping, the GIS records should be synchronized to Lucity. This can be done by selecting and forcing a synch on the records.

7. Verify that all pipe and conduit records in Lucity have an Alt ID

   - You should verify that all records in the Sewer Pipe module and Storm Conduit module now have the Alt Id shown in the screen caps above. This is important. If you have records that are not populated you will need to determine why (are they not in your GIS? Are they abandoned?) We recommend that even if these pipes are not in the GIS and are abandoned or some other status that they be given a unique Id prior to upgrading to 7.40.

All of these steps should be done prior to upgrading to Lucity 7.40. Even if you do not plan to upgrade for several months, these changes can be made now without any adverse affect on the current operation of the software.

Lucity will still populate upstream and downstream manhole information from GIS and certain processes (such as TV Inspections) may still use this information to identify a pipe. However, the primary mechanism to identify the asset will now be the single unique Id.

# Configuring the Lucity Geodatabase Configuration

You will want to use the Geodatabase Configuration tool in ArcCatalog to make sure that the Lucity AltID fields are mapped to a field in your geodatabase. The following shows the fields that would need to be mapped for each feature class linked to the Lucity's Sewer Pipe Inventory and Storm Conduit Inventory modules:

## Maintaining the new pipe unique number fields

There are several options for maintaining the unique pipe number fields.  You may already have processes for generating and maintaining new unique Ids for your other feature classes, if so; extend them to this feature class as well.  If not, Lucity has a tool that can automatically populate these fields with unique numbers through ArcMap.  This tool can increment and create a number like this 1, 2, 3, 4 or 00001, 00002, 00003 or 1001, 1002, 1003.  It can also use a grid or basin system and generate numbers like A1-001, A1-002, and B1-001.  Details on this tool are in the Lucity manual under <u>Lucity GIS for ArcGIS 10 [or 9.3] > ArcCatalog Tools > Geodatabase configuration tool > Number Generator</u>.  This is a screen shot that shows the screen where this tool is configured in ArcCatalog.
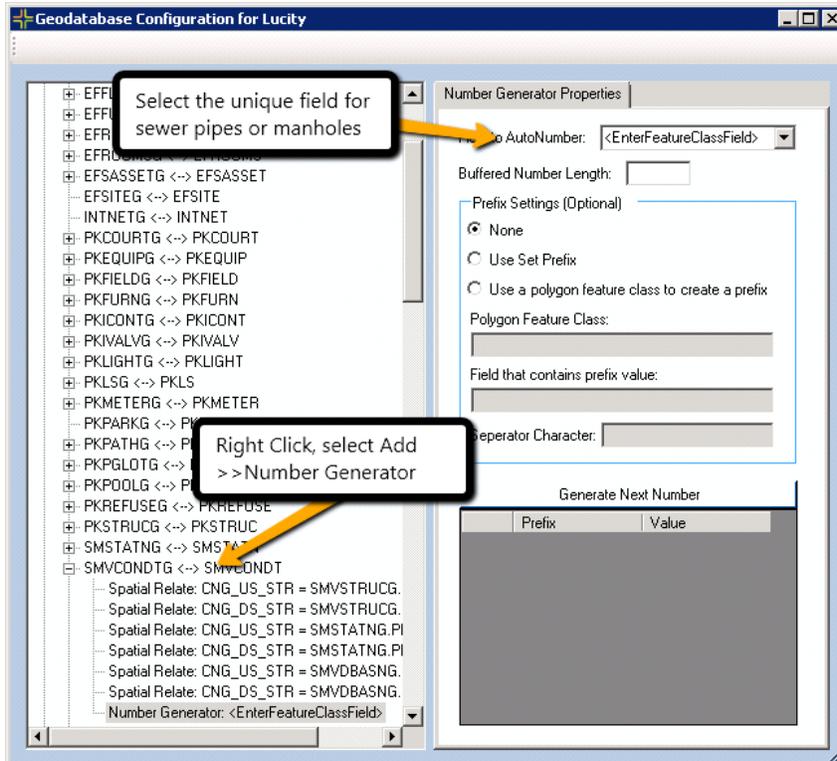


## Initially populating the AltID field

It is important that this field is uniquely populated in the GIS system and that the GIS system is synchronized to Lucity prior to upgrading to 7.40.  If Lucity finds sewer pipe and conduit records without a unique id in the Lucity Sewer Pipe module and the Lucity Sewer Conduit module, it will automatically populate the unique id these records.  This unique id will then not correspond to what is stored in your GIS and will require some manual rectification.

The method for initially populating this data will depend on how the field is to be maintained.  If a custom unique number generator is used, most likely this can be used to generate the numbers.

If Lucity's Number Generator is used, it will automatically populate this data when the data is synchronized to Lucity.  You will need to select all records in the map and force a synch.  This is time consuming and uses a lot of resources locally on the workstation.   It is, therefore, a good idea to do this in chunks.  Chunks of 20k records are usually fairly reasonable but you may want to adjust this up or down depending on your experience and the time it takes for the synch to finish.

## Verifying the Sewer Pipe or Sewer Conduit Id is unique

Lucity provides tools in ArcCatalog that make it very easy to verify if a field is unique (and not null).  On the Lucity toolbar in ArcCatalog select Lucity GIS Tools>>QA/QC.
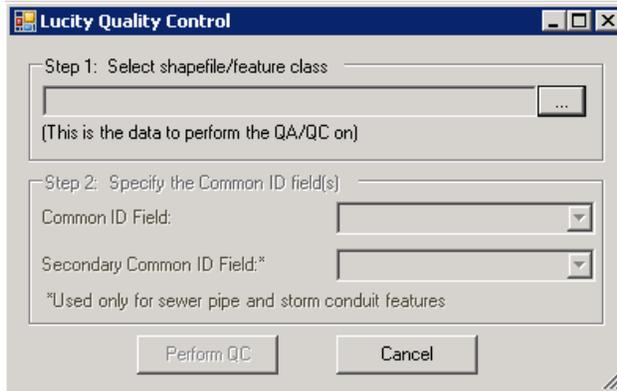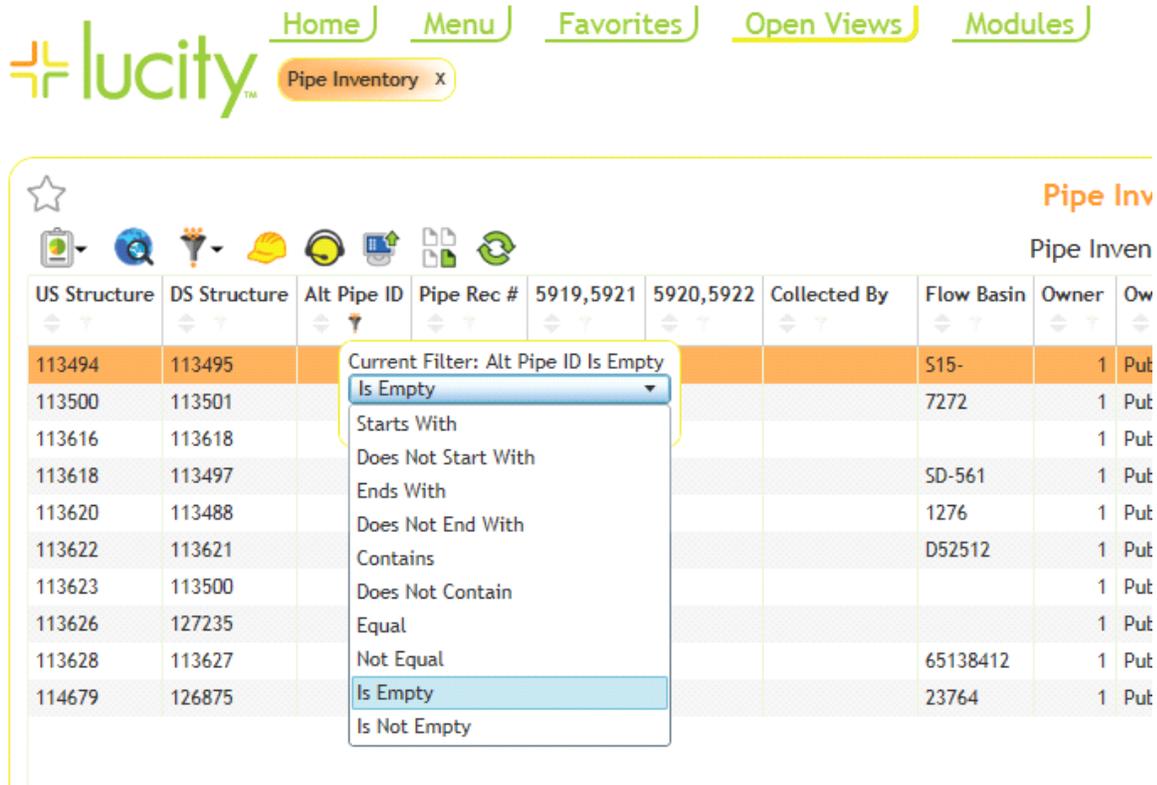


Select the field.  This will be FacilityId or whatever the field is that will be mapped to the Alt Sewer Pipe Id or Alt Conduit Id.  It will return results warning of any potential problems found.
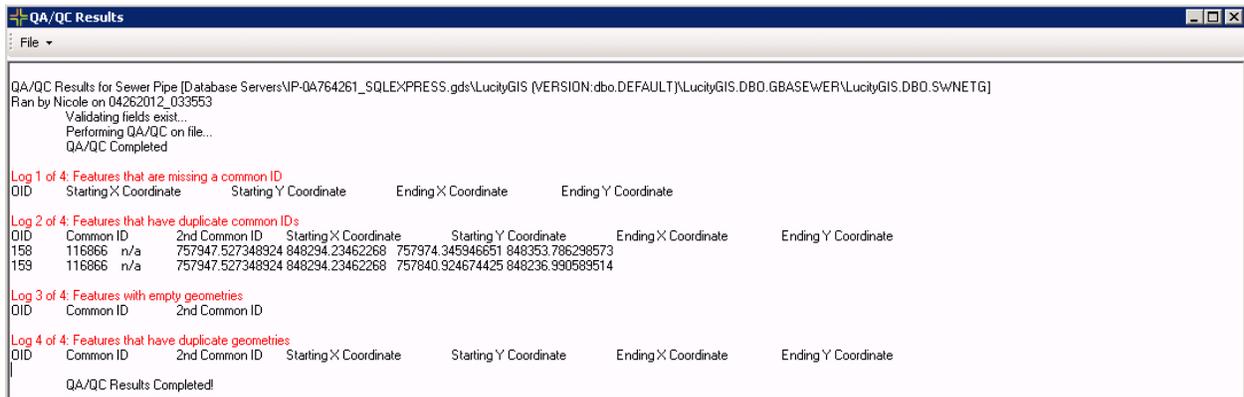
## Checking for Null Values in the Alt Pipe Id or Alt Conduit Id fields

To check for null or missing values in the Alt Pipe Id or Alt Conduit Id fields using Lucity Web, make sure that the Alt Pipe ID or Alt Conduit Id are in the Sewer Pipe View and the Storm Conduit View. Enter the module with no filter applied and set a column filter for Alt Pipe ID Is Empty.



This brief video clip demonstrates this as well:

http://www.youtube.com/watch?v=BkqyARngyAM

To find records where the fields are null in the desktop software requires an advanced filter.

For sewer pipes use the following filter

**SQL Server:**  SWNET WHERE NT_NUMBER IS NULL OR NT_NUMBER = "

**Oracle:** SWNET WHERE NT_NUMBER IS NULL

For Storm Conduits use the following filter:

**SQL Server:** SMVCONDT WHERE CN_NUMBER IS NULL OR CN_NUMBER = "

**Oracle:** SMVCONDT WHERE CN_NUMBER IS NULL

This video clip demonstrates finding this data using the desktop module:

http://www.youtube.com/watch?v=IzypUIUoFss

# Removed Associated Structure Requirement

Starting with version 7.4, it is no longer a requirement that a sewer pump station, storm pump station, or storm detention basin be associated to a structure. The ability to associate a structure to these inventory assets will still be available and existing associations will remain, but it will no longer be a requirement that this association exists.

If you still want to associate these assets to a structure no additional steps are required after the upgrade. If you wish to remove these requirements from the GIS side there are a couple of settings that you should review:

# Geodatabase Configuration tool in ArcCatalog
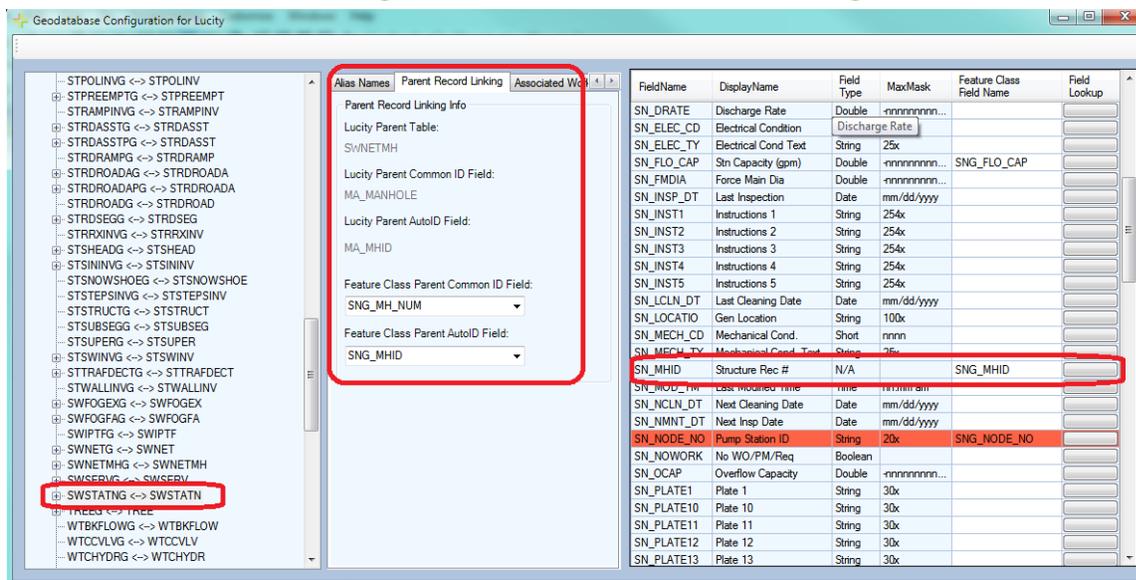


For each of your feature classes linked to the sewer pump station, storm pump station and storm detention basin modules you'll want to remove the following information:

- On the Parent Record Linking tab, remove the feature class fields from the drop down box. Note: You may also want to delete these fields from your feature class schema if they are no longer being used!

- In the fields grid, remove the feature class field name from the row that maps to the Lucity structure record number.

It is always good practice that after you make modifications to your geodatabase configuration, that you run the validation tool to confirm there are no issues with your configuration.

# System Settings in Lucity Administrator
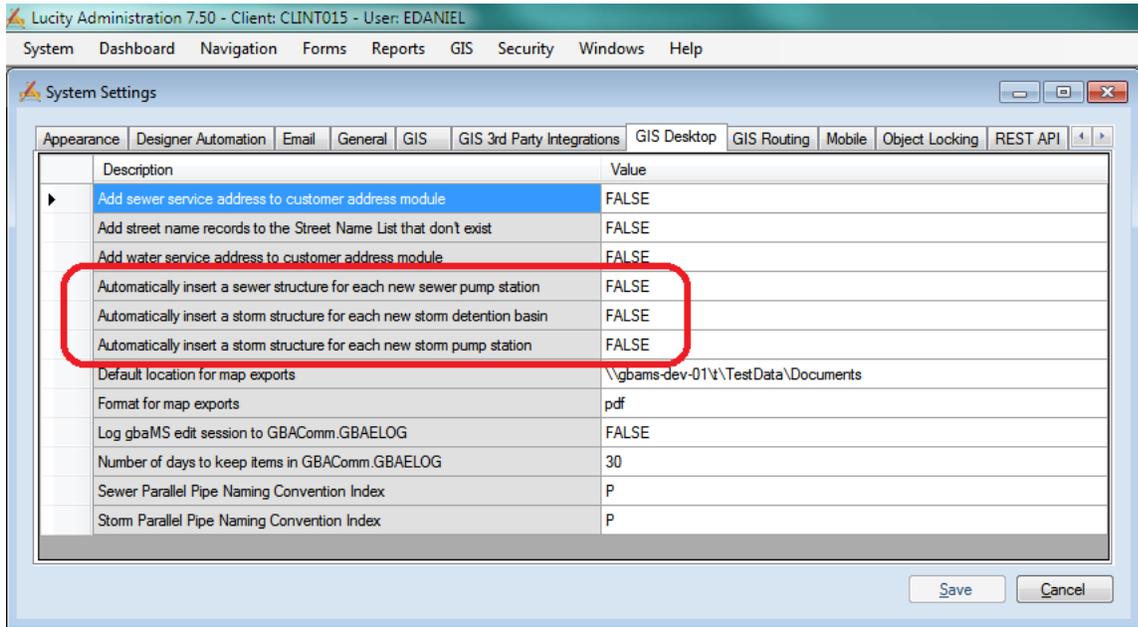


In Lucity Admin under the GIS Desktop tab in System Settings there are three options that can be used with the Lucity GIS extension in ArcMap. These settings would automatically create a structure for each pump station or detention basin added in the map. If you were previously using this setting you and you no longer wish to keep this requirement then you should change the following settings to FALSE:

- Automatically insert a sewer structure for each new sewer pump station
- Automatically insert a storm structure for each new storm pump station
- Automatically insert a storm structure for each new storm detention basin

# New edit process for changing pipe direction

Lucity's Sewer and Storm edit tools in ArcMap previously contained a Reverse Flow tool. Prior to 7.4, this tool was required when changing the pipe direction (i.e. flipping) to ensure that the existing pipe record in Lucity was updated correctly with the new upstream and downstream structure information. If users didn't use Lucity's Reverse Flow tool to perform a flip, the Lucity application would have been incorrectly updated often resulting in two pipe records in Lucity.

Since sewer and storm lines are now keyed off a single ID instead of the upstream and downstream combination, the use of Lucity's Reverse Flow tool is no longer required.

To change the direction of flow users can now use the ESRI's Flip command:
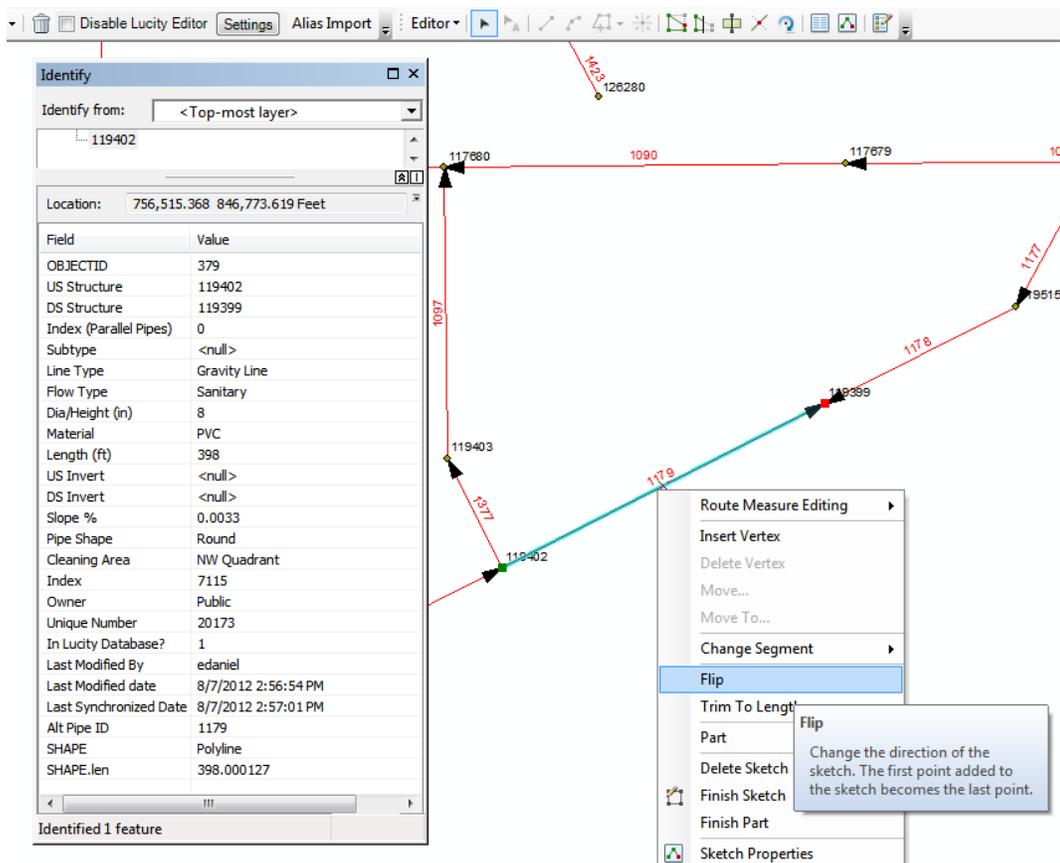


1. In an ArcMap session with the Lucity extension loaded, use ESRI's Edit tool to select the line that needs to be flipped.
2. Right-click on the line and a context menu will appear containing the Flip command. Select the Flip command.

3. Save the edit session.  You will receive the following message informing you that Lucity will be updated with your changes.  Select OK.
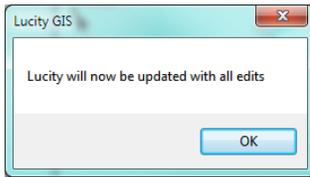


4. Once saved, you will notice the line direction would have changed, along with the US and DS Structure attribute fields.
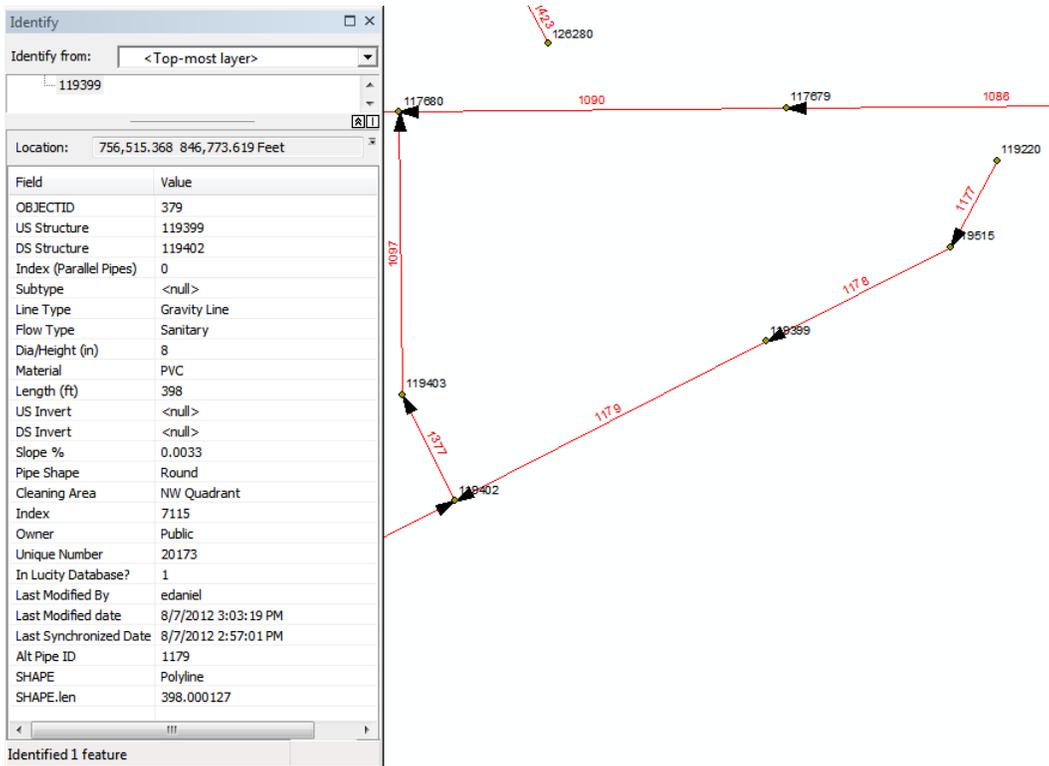


*NOTE:   This process assumes your geodatabase configuration still contains a spatial relationship setup for your upstream and downstream structure fields.  Since the geometry of the line was changed with the flip command the Lucity Edit extension automatically recalculates all spatial relationships for the feature.*

# Changing a Pipe Route

Since sewer and storm lines are no longer keyed off the upstream and downstream structure fields, the ability to change a pipe's route is much easier.

Lucity's Sewer and Storm edit tools in ArcMap previously contained a Reverse Flow tool. Prior to 7.4, this tool was required when changing the pipe direction (i.e. flipping) to ensure that the existing pipe record in Lucity was updated correctly with the new upstream and downstream structure information. If users didn't use Lucity's Reverse Flow tool to perform a flip, the Lucity application would have been incorrectly updated often resulting in two pipe records in Lucity.

Changing a pipe route can be done by using the tools provided by Esri to modify the existing line:
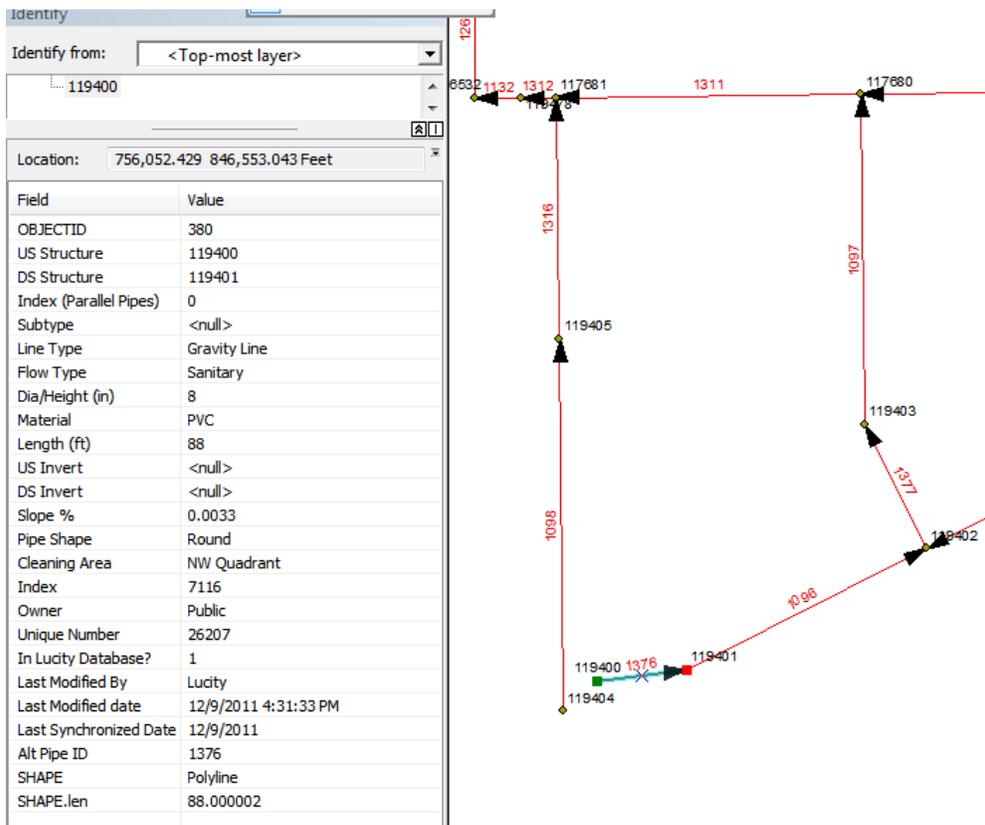


1. In an ArcMap session with the Lucity extension loaded, use ESRI's Edit tool to select the line that needs to be edited.

2. Use can use ESRI's Edit Vertices tools to move the end of the line to the proper manhole.

3.  Save the edit session.  You will receive the following message informing you that Lucity will be updated with your changes.  Select OK.

| Lucity GIS |
|---|
| Lucity will now be updated with all edits |
| OK |
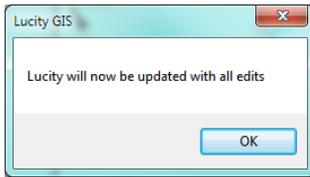
4.  Once saved, you will notice the line direction would have changed, along with the US and DS Structure attribute fields.



| Field | Value |
|---|---|
| OBJECTID | 380 |
| US Structure | 119400 |
| DS Structure | 119404 |
| Index (Parallel Pipes) | 0 |
| Subtype | <null> |
| Line Type | Gravity Line |
| Flow Type | Sanitary |
| Dia/Height (in) | 8 |
| Material | PVC |
| Length (ft) | 43.5 |
| US Invert | <null> |
| DS Invert | <null> |
| Slope % | 0.0033 |
| Pipe Shape | Round |
| Cleaning Area | NW Quadrant |
| Index | 7116 |
| Owner | Public |
| Unique Number | 26207 |
| In Lucity Database? | 1 |
| Last Modified By | edaniel |
| Last Modified date | 8/7/2012 3:21:45 PM |
| Last Synchronized Date | 8/7/2012 3:22:05 PM |
| Alt Pipe ID | 1376 |
| SHAPE | Polyline |
| SHAPE.len | 43.49035 |

*Note:  This process assumes your geodatabase configuration still contains a spatial relationship setup for your upstream and downstream structure fields.  Since the geometry of the line was changed the Lucity Edit extension automatically recalculates all spatial relationships for the feature.*

*Considerations:  This may alter the length of the line and depending on your system settings you may need to determine if Lucity should be updated with the new length.  Also, any inspection history tied to the line may become invalid due to changes in the length of the pipe.*

# Overview of 7.5 Changes

Lucity 7.50 contains some changes that impact the Sewer and Storm modules and their interactions with various GIS tools.

## Sewer

- New asset inventory modules were added to Lucity that can be represented in the GIS:
    - Sewer Node
    - Sewer Control Valve
    - Sewer System Valve
    - Sewer Service Connection
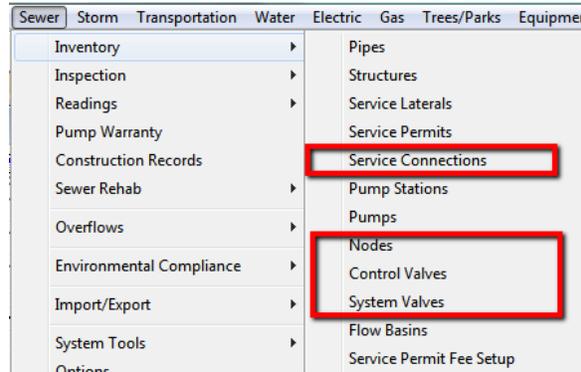


- Sewer Split Tool – The sewer split tool allows users to specify the rim elevation and depth for the newly inserted structure and with this information updates the pipes' elevation and slope data.

## Storm

- New asset inventory modules where added to Lucity that can be represented in the GIS:
    - Storm Node
    - Storm Control Valve
    - Storm System Valve
    - Storm Discharge Points
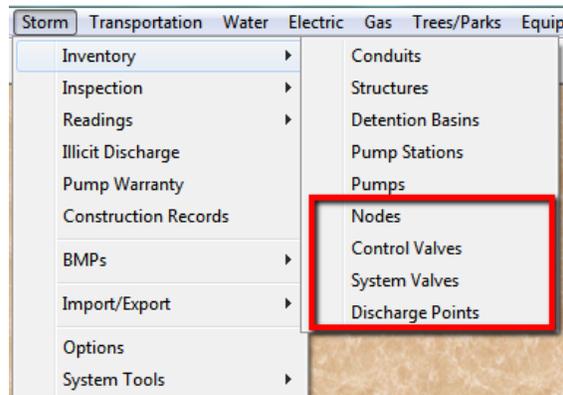
# Overview of 7.6 Changes

Lucity 7.60 contains significant changes that impact the Sewer and Storm modules and their interactions with various GIS tools.

- New asset inventory modules were added to Lucity that can be represented in the GIS:
  - Sewer IPT Monitoring Points
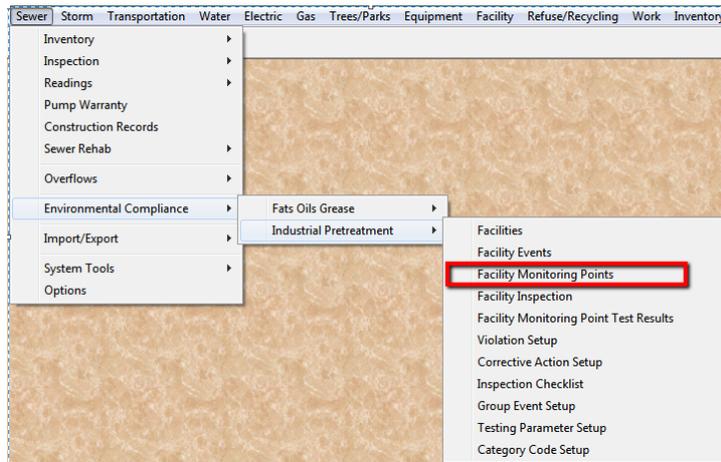


  - Storm BMP Sites and Assets
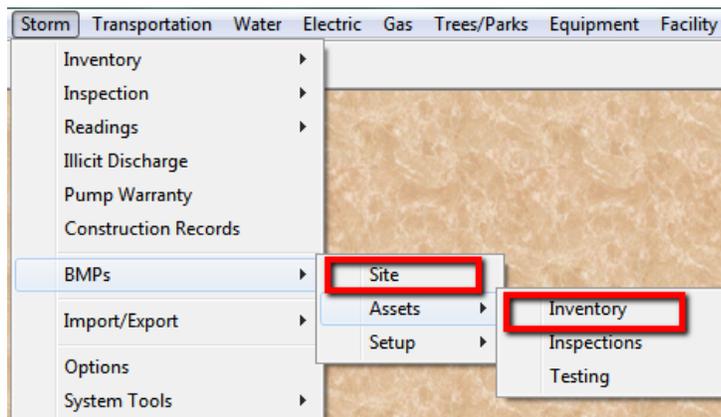


- The sewer pipe and storm conduit inventory modules can now use Structures, Nodes, Pump Stations, Control Valves and System Valves as end points.
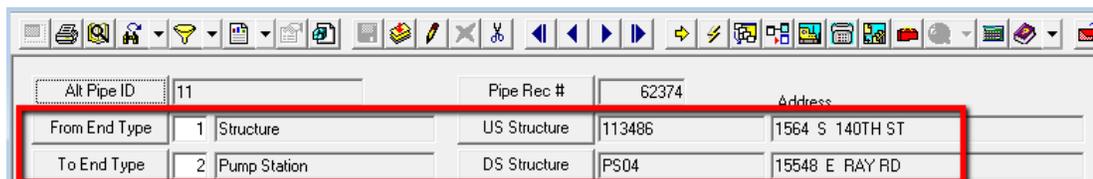


  - The sewer and storm edit tools (split, merge, renumber) have been updated to support the multiple asset end types.

  - The Lucity editor extension will now automatically calculate the pipe/conduit's to/from node and node type.

- o The 7.6 upgrade will delete any existing spatial relationship configured to the following fields.  Since these are now automatically calculated by the Lucity extension you should not add them back after the upgrade!
  - SWNET.NT_USMAN
  - SWNET.NT_DSMAN
  - SMVCONDT.CN_US_STR
  - SMVCONDT.CN_DS_STR

# Synch Process for Sewer Pipes and Storm Conduits

Starting with 7.6, the Lucity editor extension in ArcMap processes sewer pipe and storm conduit features similar to water pipes.

Things to keep in mind:

- Don't setup spatial relationships for the us/ds node or node type fields.  Not only will it slow down your synch process the results will get overwritten anyway by the Lucity editor extension.

- Don't edit the us/ds node or node type fields.  The Lucity editor extension will repopulate these fields during the save.

- Don't run the Update Spatial Relationships tool to update the us/ds node or node type fields.  Instead you should run the Force Synch tool if you want to update the us/ds node info and are not editing the feature.

- Do make sure related feature classes are in the map.  In order for the Lucity editor extension to calculate the us/ds nodes the node features must be in the map.  You only need to add the feature classes that you are actually using out of Structures, Pump Stations, Nodes, Control Valves, and/or System Valves.

- Do synch endpoint features prior to pipe/conduits.  This hasn't changed, the endpoint features must exist in Lucity before they can be associated to the us/ds fields of the pipe/conduit.

- Do draw features in the direction of flow.  This hasn't changed, if you want the proper us/ds node and node types to be calculated this still requires the feature to be drawn in the proper direction.

- Do make sure the pipe endpoints are snapped to the related us/ds node.  This hasn't changed, if you want the proper us/ds node and node types to be calculated this still requires the features to be snapped to the ends of the pipe.

- If you map a feature class field to the new to/from node type fields, the GIS field type must be numeric.  The Lucity editor extension will attempt to populate GIS fields mapped to the to/from node type with the node type code not description (4 not 'Control Valve').

When a sewer pipe or storm conduit feature is synched...

1. Loops through all feature classes linked to Structures, Pump Stations, Nodes, Control Valves, and System Valves
    a. Gets feature class in map
    b. Performs a spatial query to get all features that intersect the from and to point of the pipe/conduit.
    c. The first feature found it used

2. Takes the existing insert or update SQL and includes the following field info.  **If no feature was found the values will be updated to null**:
    a. us/from node field (NT_USMAN or CN_US_STR)
    b. us/from node type fields xx_FTYP_CD and xx_FTYP_TY fields
    c. ds/to node field (NT_DSMAN or CN_DS_STR)
    d. ds_to node type fields xx_TTYP_CD and xx_TTYP_TY fields

3. Updates the pipe/conduit feature class to/from node fields linked to the following fields. These field mappings are optional, so any update is only attempted if the field mapping exists. **If no feature was found the values will be updated to null**:
    a. us/from node field (NT_USMAN or CN_US_STR)
    b. us/from node type field (NT_FTYP_CD or CN_FTYP_CD)
    c. ds/to node field (NT_DSMAN or CN_DS_STR)
    d. ds_to node type field (NT_TTYP_CD or CN_TTYP_CD)

4. The Lucity database is updated with the SQL statement modified in step 2.