Complying with Statement No. 34 of the Governmental Accounting Standards Board (GASB 34) Requirements using GIS

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Abstract

Preparation of Governmental Accounting Standards Board Statement 34 (GASB 34) financial reports was completed for the City of Rochester, MN – Public Works Division (RPW) utilizing geographic information system (GIS) technology. The following infrastructure networks were analyzed: bridges, sanitary sewers, sidewalks, bike paths, storm ponds, storm sewers, streets, and traffic signals. RPW estimated the financial value of each asset at the time of installation. Having this financial value provided the baseline information needed for City of Rochester, MN – Finance Department (RF) to depreciate the value of each asset, a requirement of GASB 34. After all GASB 34 information was populated in the infrastructure networks, summary reports were generated and submitted to RF.

Introduction

"The Governmental Accounting Standards Board or GASB is an independent, private-sector, not-for-profit organization that—through an open and thorough due process—establishes and improves standards of financial accounting and reporting for U.S. state and local governments. Governments and the accounting industry recognize the GASB as the official source of generally accepted accounting principles (GAAP) for state and local governments. In line with its mission, the GASB issues standards that:

- Result in useful information for users of financial reports (for example, owners of municipal bonds and members of citizen groups) and
- Guide and educate the public, including issuers, auditors, and users about the implications of those financial reports." (Governmental Accounting Standards Board, n.d.)

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The GASB is not a federally funded organization, but a private, non-profit organization that is funded through publication sales and voluntary contributions from state and local governments. Nominal voluntary fees from municipal bonds also help fund the GASB organization (Governmental Accounting Standards Board, n.d.). The GASB does not have any authority to enforce its standards, but if these standards are not followed, the governmental organization is considered not in compliance with GAAP and the bond rating of a municipality can be negatively impacted (Governmental Accounting Standards Board). This lower rating causes the municipality to pay higher interest rates on the municipal bonds it issues, and could negatively impact the number of potential bond investors. The lower the bond rating a municipality has, the higher risk to the investor. Rochester, Minnesota currently has the highest bond rating of AAA (Standard and Poor's, 2006). It is in the City's best financial interest to follow the GASB standards to retain this high bond rating.

In June 1999, the GASB adopted Statement No. 34 that set a new standard with how government entities report the value of their capital assets and how much it will cost to maintain their infrastructure (South Georgia GIS, n.d.). Each government agency can choose one of two methods to comply with the GASB 34 standard. They are as follows:

- Depreciation – involves a complete inventory of all infrastructure assets and applying a historical cost to those assets. A depreciation schedule is then applied to the assets that spans the expected lifetime of the asset. This approach can be misleading because an asset may be depreciated to $0 due to its age, but the asset is still in use (Parker, n.d.).
- Modified Approach – requires a complete inventory of all infrastructure assets, an asset condition rating, condition inspections every three years, and an estimate of how much money will be required to maintain the asset at a certain quality determined by the governing authority (Parker, n.d.) [E.g. a pavement engineer might require all streets be maintained at a pavement condition index of 60].

Both methods require an accurate inventory of the infrastructure assets, which makes developing an accurate GIS to inventory and manage those assets a logical solution. However, creating a GIS to manage the inventory is not a requirement.

Infrastructure assets are defined as "long-lived capital assets that normally are stationary in nature and can be preserved for a significantly greater number of years than most other capital assets." (Robbins and Brown, 2002). Examples include streets, sanitary sewers, storm sewers, storm ponds, sidewalks, and bike paths. GASB allows for the grouping of these assets into networks. For example, a storm sewer system is composed of pipes, manholes, catch basins, and culverts. Rather than calculating the cost for each individual asset, a network cost can be calculated. In the case of storm sewer, an average per linear foot cost may be used that takes into account the cost of all of the other features connected to each pipe segment.

The GASB 34 reporting schedule (Table 1) shows that compliance with GASB 34 is a tiered system. Larger governmental organizations will be required to submit reports first followed by smaller organizations. Organization size is based on annual revenue. The first reports require (starting in 2001 for large government agencies) infrastructure built during that fiscal year. Starting in 2005, the reports will have to include infrastructure values for assets built in 1980 and subsequent years. (McNamee et al., 1999)

The City of Rochester, Minnesota chose to use the depreciation method to comply with the GASB 34 requirements. Management staff from both RPW and RF chose this method because the group felt there were not sufficient resources available to conduct inspections on the entire city infrastructure every three years.

Methods

Technology

The hardware and software requirements for this project included: ArcGIS 9.1 GIS suite, Microsoft Access and Excel, and Trimble's ProXR Global Positioning System (GPS) unit and Trimble Pathfinder Office software.

Table 1. GASB 34 Implementation Reporting Schedule (McNamee et al., 1999).

Major Reporting Requirements	Fiscal Years Beginning After June 15						
	2001	2002	2003	2004	2005	2006	2007
Report New Infrastructure							
• Phase 1 Governments							
• Phase 2 Governments							
• Phase 3 Governments							
Report Retroactively on New Infrastructure Built or Improved in Fiscal Years Ending after June 30, 1980							
• Phase 1 Governments							
• Phase 2 Governments							
• Phase 3 Governments						Optional	
Phase 1 Governments have total annual revenues of $100 million or more in fiscal year 1999							
Phase 2 Governments have total annual revenues of $10 million or more in fiscal year 1999							
Phase 3 Governments have total annual revenues of less than $10 million							

Data Acquisition and Manipulation

Seven fixed infrastructure networks were identified by RF and RPW staff to be included in the city's GASB 34 report and consisted of the following networks:

- Bridges
- Sanitary Sewers
- Sidewalks and Bike Paths
- Storm Ponds
- Storm Sewers
- Streets
- Traffic Signals

All data associated with this project were developed within RPW, with an exception of the bike path dataset which was a combination of RPW and the city's Park Department maintained data. Some features were captured using the Trimble ProXR GPS. Any datasets that were stored in a shapefile format were converted to a personal geodatabase to provide better data integrity and allow the use of coded attribute domains. A preliminary examination of all networks revealed over 30,000 features would be summarized in the final reports.

A key component of the project required that each network feature have a unique identifier. This provided a method of tracking additions and retirements of assets from year to year. Verification of unique identifiers was completed on each dataset. It was discovered that both the sanitary and storm sewer networks (approximately 20,000 features) did not have unique identifiers assigned. RPW staff desired to have a correlation between the point features' unique identifiers and line features' unique identifiers. For example, a pipe that flows from point feature 200 to point feature 201 would be identified as 200-201.

Several ArcGIS models were built to generate the unique identifiers in the storm and sanitary sewer datasets. Prior to running the models, topology was built and validated, verifying that every line end point was covered by a storm or sanitary point feature. Another prerequisite to running the models was that each sanitary or storm point feature had a unique identifier. The last requirement was each storm or sanitary line feature class needed to have four fields added: [TEMP_ID], [UPPER_GIS_ID], [LOWER_GIS_ID], and [GIS_ID]. The [TEMP_ID] field was calculated with a unique number that was later used in subsequent models.

To simplify explanation of how the models work, the storm sewer network will be used as an example. The same models were also run on the sanitary sewer network.

Both the storm and sanitary datasets existed in north and south halves of the city. The reason for the split was because two people update the datasets in the winter. Since the datasets are in personal geodatabase formats, a split of the data was necessary because personal geodatabases do not support multiple concurrent editors. Each model performed the same geoprocessing on each half of the dataset and was merged together before any of the final analysis was completed.

The first model, Build Start and End Node Layers for Pipes (Appendix A), performed the following geoprocessing tasks:

1. The Vertices to Points tool created two new feature classes using the start point and end point options. One of the results of running this tool was that each pipe feature's attributes were copied into each node feature.
2. The Delete Field tool deleted all of the fields in each node feature class attribute table, except for the [TempID] field.
3. The Near tool was then used to compare each node feature to the storm point feature. The Near tool created two new fields [NEAR_DIST] and [NEAR_FID] in the node feature class attribute table. The [NEAR_DIST] field contained the distance from the node feature to the nearest storm point feature. The [NEAR_FID] field contained the [OBJECT_ID] of the nearest storm feature.
4. The Add Join tool joined the storm point attribute table to the node attribute table based on the [Object_ID] field values matching [NEAR_FID] field values.
5. The ADD Field tool added a field named [UPPER_GIS_ID] to the start nodes feature class.
6. The Calculate field tool calculated [UPPER_GIS_ID] equal to the [GIS_ID] field of the storm point feature class. Likewise, a [LOWER_GIS_ID] field was added to the end nodes feature class and was calculated equal to the [GIS_ID] field of the storm point feature class.

The second model, Calculate GIS ID on Pipes (Appendix B) performed the following geoprocessing tasks:

1. The Add Join tool joined the start nodes feature class to the storm pipe feature class with [TEMP_ID] as the join field names.
2. The Calculate Field tool calculated the [UPPER_GIS_ID] field in the storm pipe attribute table equal to the same field name in the start node attribute table. This process was repeated with the end nodes feature class.
3. The final steps in this model removed the joins using the Remove Join tool and used the Calculate Tool to calculate [GIS_ID] field of the storm pipe attribute table equal to the upper and lower GIS identifier separated by a hyphen (Figure 1).

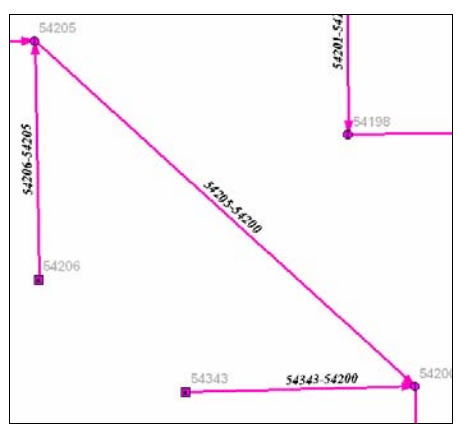


Figure 1. Portion of Storm sewer network with GIS ids labeled.

Four GASB 34 fields were created in each network's attribute table (Table 2). The first

Table 2. GASB 34 field names added to all networks attribute tables.

Field Name	Description
GASB_YEAR	Year that the structure was put into service
GASB_RATE	Unit rate for the structure as determined by RPW's engineering staff
GASB_VALUE	Estimated dollar value of the structure at time of installation
GASB_QUAL	Yes/No Boolean field Private and structures owned or maintained by other agencies are not to be included in RPW's final report. Therefore, did not qualify

field populated was the [GASB_QUAL] field. If a feature was privately owned or maintained by another department or agency, then it was given a "No" value. Features with a "No" value were not included in the final GASB 34 reports because RPW was not responsible for maintaining those features. All other features were given a "Yes" value.

The [GASB_YEAR] field was calculated by using one of the existing fields in each network. Typically, there was a [Year_Inst] field. In cases where the [Year_Inst] was blank or null, other features nearby were examined in ArcMap to estimate the year installed.

Manipulations of an Excel spreadsheet (Table 3) were required before it could be joined to each infrastructure network's attribute table to populate the [GASB_RATE] field.

Table 3. Excerpt of the storm sewer network cost / linear foot for each group of pipe types.

Year	6 RCP VCP PVC	8 RCP VCP PVC
1908	$1.00	$1.00
1909	$0.94	$0.94
1910	$0.99	$0.99
1911	$0.96	$0.96
1912	$0.94	$0.94
1913	$1.03	$1.03
1914	$0.92	$0.92

Using the storm sewer network as an example, a new rate sheet was created that concatenated the year with the pipe size and pipe type. The linear foot cost was put into a separate column (Table 4). Similar spreadsheets were created for each network.

Table 4. Excerpt from spreadsheet that grouped rates by year, size, and pipe type group.

Year and Pipe Type	**Cost/Linear Ft**
1908 6 RCP VCP PVC	1.00
1909 6 RCP VCP PVC	0.94
1910 6 RCP VCP PVC	0.99
1911 6 RCP VCP PVC	0.96
1912 6 RCP VCP PVC	0.94
1913 6 RCP VCP PVC	1.03
1914 6 RCP VCP PVC	0.92
1915 6 RCP VCP PVC	0.96
1916 6 RCP VCP PVC	1.34
1917 6 RCP VCP PVC	1.87
1918 6 RCP VCP PVC	1.95

Because of the variety of network types, each network had a slightly different rate structure (Table 5).

Table 5. Rate used per infrastructure network.

Infrastructure Network	GASB_RATE
Bridges	Not Used Because Actual Construction Cost of each Bridge
Sanitary Sewer	Cost/Linear Foot grouped by Year and Pipe Size
Sidewalks	Cost/Square Foot grouped by Year
Bike Paths	Cost/Linear Foot grouped by year
Storm Ponds	Cost/Square Foot of 100 Year Storm Event Water Level grouped by year
Storm Sewer	Cost/Linear Foot grouped by Year, Pipe Size, and Pipe Type
Streets	Combination of Year and Pavement Type/Length
Traffic Signals	Year/Signal

Analysis

A Microsoft Access database was created for each infrastructure network. Each network's GIS attribute table from the current year and previous year was then imported into the database. The current year's imported table was renamed to "Current" and the previous year's attribute table was renamed to "Previous." Two versions of attribute tables allowed for a comparison that showed which new features were added and which previously existing features were retired. New and retired assets need to be accounted for from year to year to keep the infrastructure network's assessed value accurate. Additionally, the modified spreadsheets containing the rate information was also imported.

Several select and update queries were created to update and summarize the data. Calculation of the [GASB_RATE] field was accomplished by joining the network attribute table to the imported rate table based on a common field between the two tables. The [GASB_VALUE] field was calculated by multiplying the [GASB_RATE] field by the number of units in the feature (e.g. linear feet, or square feet).

With all the required fields populated, the individual features of the network were summarized with the following options: total count, total value, and total length or area, grouped by year (Table 6).

Table 6. Summarized storm sewer features by year.

GASB_ Year	Count	Length	Value
1945	388	44,653	$179,709
1946	611	62,084	$303,040
1947	144	12,726	$70,515
1948	56	6,026	$33,501
1949	47	4,165	$28,074
1950	133	15,247	$157,179
1951	109	10,307	$87,189
1952	48	3,001	$20,001
1953	77	7,546	$60,730
1954	185	16,969	$141,864

A similar query was created for the previous year's network data. The final summary query joined the two previous queries by year so a comparison could be made between each year's data (Table 7).

Table 7. Current year's storm sewer value versus previous year's storm sewer value.

GASB_ Year	Current Count	Current Length	Current Value	Previous Count	Previous Length	Previous Value	Count Change	Valuation Change
1945	388	44,653	$179,709	385	44,701	$179,866	3	($157)
1946	611	62,084	$303,040	607	61,993	$303,330	4	($290)
1947	144	12,726	$70,515	144	12,386	$69,046	0	$1,469
1948	56	6,026	$33,501	56	6,026	$33,501	0	$0
1949	47	4,165	$28,074	47	4,168	$28,083	0	($9)
1950	133	15,247	$157,179	128	14,903	$153,552	5	$3,627
1951	109	10,307	$87,189	109	10,279	$87,033	0	$156
1952	48	3,001	$20,001	48	3,001	$19,991	0	$10

Another requirement of RPW and RF staff (outside of the GASB 34 requirements) was the final reports must break out the developer contributed infrastructure versus city built infrastructure for the current year. This allowed the RF staff to match up actual costs within the J.D. Edwards OneWorld accounting software the RF staff uses. These actual costs will eventually be imported into the network GIS.

Additional analysis was conducted outside of the requirements of the GASB 34 report. It was desirable to show how the infrastructure was concentrated based on dollars spent. This was accomplished by creating a density grid using ArcGIS Spatial Analyst (Figure 2).

Before the grid could be created all line features had to be converted to point features using the mid-point option. With all networks represented as points, they were each merged into a new point feature class. The density tool in ArcGIS Spatial Analyst was used to create the grid from the new point feature class with the following parameters: population field set to [GASB_VALUE], density type set to Kernel, search radius set to 2000 feet, area units set to square miles, and cell size set to 25 feet.

The density grid (Figure 2) showed that the central business district (as one might expect) contained the highest density of dollars spent per square mile on infrastructure. This area of the city most likely has the highest quantity of infrastructure features per square mile and would explain why this area also had the most dollars spent.

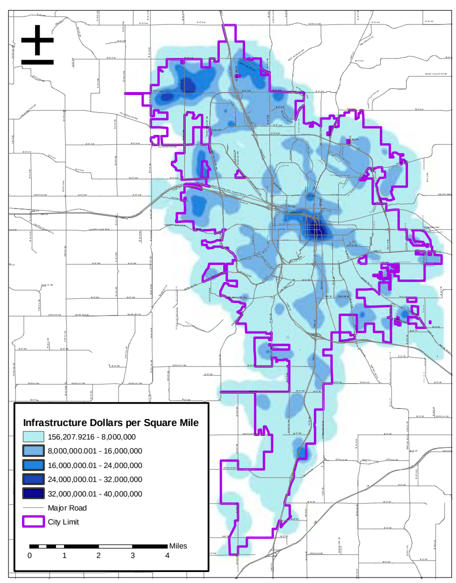


Figure 2. Dollars spent on infrastructure per square mile at the time of installation for the City of Rochester, MN.

The northwest portion of the city also showed a high density. Two factors may explain why: 1) The northwest area of Rochester was where most new development was occurring. Therefore the installation costs would be higher than in older parts of town. 2) The quantity of infrastructure installed would be greater than other areas of the city because newer developments have more stringent infrastructure requirements than previously built areas.

A second grid (Figure 3) was created for the purposes of identifying the areas of the city that would be the most expensive to replace in the event of a natural disaster. To accomplish this task all the infrastructure networks' features had to have a 2005 estimated installation cost calculated using the same procedures used in creating the GASB 34 reporting costs. This replacement grid (Figure 3) showed similar patterns as the installation grid (Figure 2).

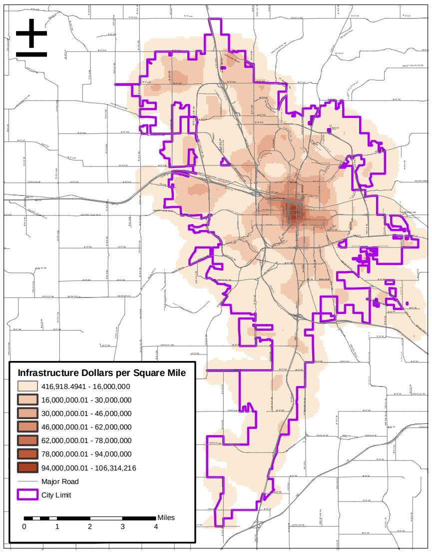
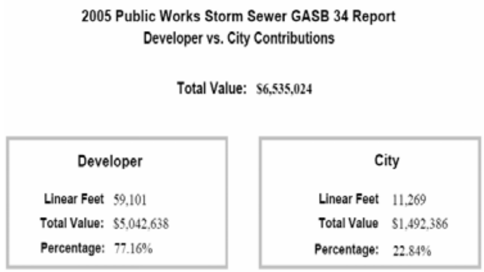


Figure 3. Estimated dollars needed to replace infrastructure per square mile using 2005 estimated installation values for the City of Rochester, MN.

Results

Two reports per infrastructure network were required. One report showed a comparison of the infrastructure built as City projects versus infrastructure built by developers that were turned over to the City upon completion (Figure 4). Developer built infrastructure are managed through city owner contracts. The other report compared


2005 Public Works Storm Sewer GASB 34 Report
Developer vs. City Contributions

Total Value: $6,535,024

Developer		City	
Linear Feet	59,101	Linear Feet	11,269
Total Value:	$5,042,638	Total Value	$1,492,386
Percentage:	77.16%	Percentage:	22.84%

Figure 4. Storm sewer developer vs. city contribution final report.

the current year's infrastructure network's value versus the previous year's infrastructure network's value by year, with grand totals located at the bottom of each report (Table 8). Each of the reports were created utilizing Microsoft Access' reporting functions, and then converted into an Adobe Acrobat PDF format.

Upon submittal of these reports to the RPW and RF staff, it was decided that an Excel spreadsheet version of the final reports were also needed. In this format the RF staff could do additional calculations as needed. The spreadsheet included one additional sheet that showed the totals of each infrastructure network (Table 9 and Table 10).

Table 8. Storm sewer 2004 vs. 2005 reported values.

2004 Reported Values			2005 Reported Values			2004-2005
Year	Linear Ft	Total Value	**Year**	**Linear Ft**	**Total Value**	Valuation Change
1999	37,475	$2,703,479	**1999**	**37,473**	**$2,703,214**	($265.00)
2000	43,014	$3,587,482	**2000**	**43,785**	**$3,613,245**	$25,763.00
2001	19,418	$1,709,390	**2001**	**19,420**	**$1,709,518**	$128.00
2002	44,505	$3,691,637	**2002**	**46,293**	**$3,820,021**	$128,384.00
2003	132,891	$10,055,143	**2003**	**134,602**	**$10,182,621**	$127,478.00
2004	14,946	$1,234,384	**2004**	**18,870**	**$1,958,485**	$724,101.00
2005			**2005**	**70,369**	**$6,535,024**	
	Total Length (Ft)	1,255,264		**Total Length (Ft)**	**1,343,041**	
	2004 Grand Total	$56,594,598		**2005 Grand Total**	**$64,486,049**	

Conclusions

Using GIS to comply with GASB 34 requirements has proven to be a useful tool for the City of Rochester, MN. Not only does using GIS to track infrastructure values changes satisfy RF needs, but also has resulted in overall improvements to RPW's GIS datasets and development of others that did not exist before. Another benefit of this analysis was if a natural disaster were to strike Rochester, RPW could give a much more accurate estimate of what it would cost to replace the damaged infrastructure.

Over 31,000 features were included in the analysis with a net value of over $374 million dollars. It should be noted that this is the total value calculated using costs at the time of installation and is not replacement cost. Replacement cost was nearly double the installation cost (Table 9).

Table 9. Summary of each infrastructure network's number of features, GASB 34 value, and estimated replacement cost.

	# of GIS Features	GASB34 Value	Estimated Replacement Cost	Estimated Replacement Cost minus GASB34 Value	Estimated Replacement Cost vs. GASB 34 Value Cost Factor
Bridges	34	$10,613,832	$20,575,644	$9,961,812	1.94
Sanitary Sewer	11,422	$93,887,106	$196,913,970	$103,026,864	2.10
Traffic Signals	118	$9,720,028	$23,843,137	$14,123,109	2.45
Storm Sewer	14,868	$64,486,049	$126,017,356	$61,531,307	1.95
Storm Ponds	153	$19,267,041	$22,689,659	$3,422,618	1.18
Streets	3,908	$166,720,344	$315,695,161	$148,974,817	1.89
Public Works Sidewalks	355	$2,009,866	$3,346,082	$1,336,216	1.66
Public Works Bituminous Path	182	$8,212,082	$10,344,564	$2,132,482	1.26
Grand Total	**31,040**	**$374,916,347**	**$719,425,572**	**$344,509,225**	**1.92**

Table 10. Summary of each infrastructure network's developer versus city contributions of infrastructure in 2005.

	GASB34 Value	Developer Contribution	Percent Developer Contribution	Percent City Contribution	Percent City Contribution
Bridges	$3,025,832	0	0%	$3,025,832	100%
Sanitary Sewer	$9,009,449	$6,554,202	73%	$2,455,247	27%
Traffic Signals	$592,037	$0	0%	$592,037	100%
Storm Sewer	$6,535,024	$5,042,638	77%	$1,492,386	23%
Storm Ponds	$3,541,484	$0	0%	$3,541,484	100%
Streets	$12,949,717	$4,992,461	39%	$7,957,256	61%
Public Works Sidewalks	$26,064	$4,569	18%	$21,495	82%
Public Works Bituminous Path	$455,386	$110,637	24%	$344,749	76%
Grand Total	**$36,134,993**	**$16,704,507**	**46%**	**$19,430,486**	**54%**

ArcGIS' model builder helped automate repetitive tasks such as adding the GIS identifiers. The other benefit to using model builder was it provided graphical representations of the geoprocessing tasks performed.

Microsoft Access proved to be an invaluable tool in summarizing and calculating values in the data. Many of these calculations could have been performed within ArcGIS, but Access' ability to store queries and generate reports made it a much more efficient tool. Another benefit of using Access is that the queries are reusable each year without needing modifications, provided the new rate and attribute tables are imported and renamed with the same names as the previous year's tables.

The importance of unique identifiers to identify each feature in each GIS dataset was also recognized during this project. It is true that points, lines, and polygons can be created without a unique identifier specified. However, by not using a unique identifier, it makes it difficult to find certain features by using attribute queries. Also, it is nearly impossible to make comparisons between different versions of the dataset outside of spatial queries. Even using a spatial query could lead to misleading results if a feature was moved slightly from one position to another. The assumption that all features in the current dataset that do not intersect the previous version of the dataset are "new" would be incorrect in this case.

Some modifications to the project could make this process easier in future years. Adding another field that would store the feet or square feet of each feature might make it easier to verify all necessary information has been populated. Since this field did not exist, there was not a standardized field to use in the value calculations, therefore requiring those queries to be slightly different within each network.

Now that the core data structures and protocols have been developed, repeating this process should be much less time consuming when preparing next year's reports.

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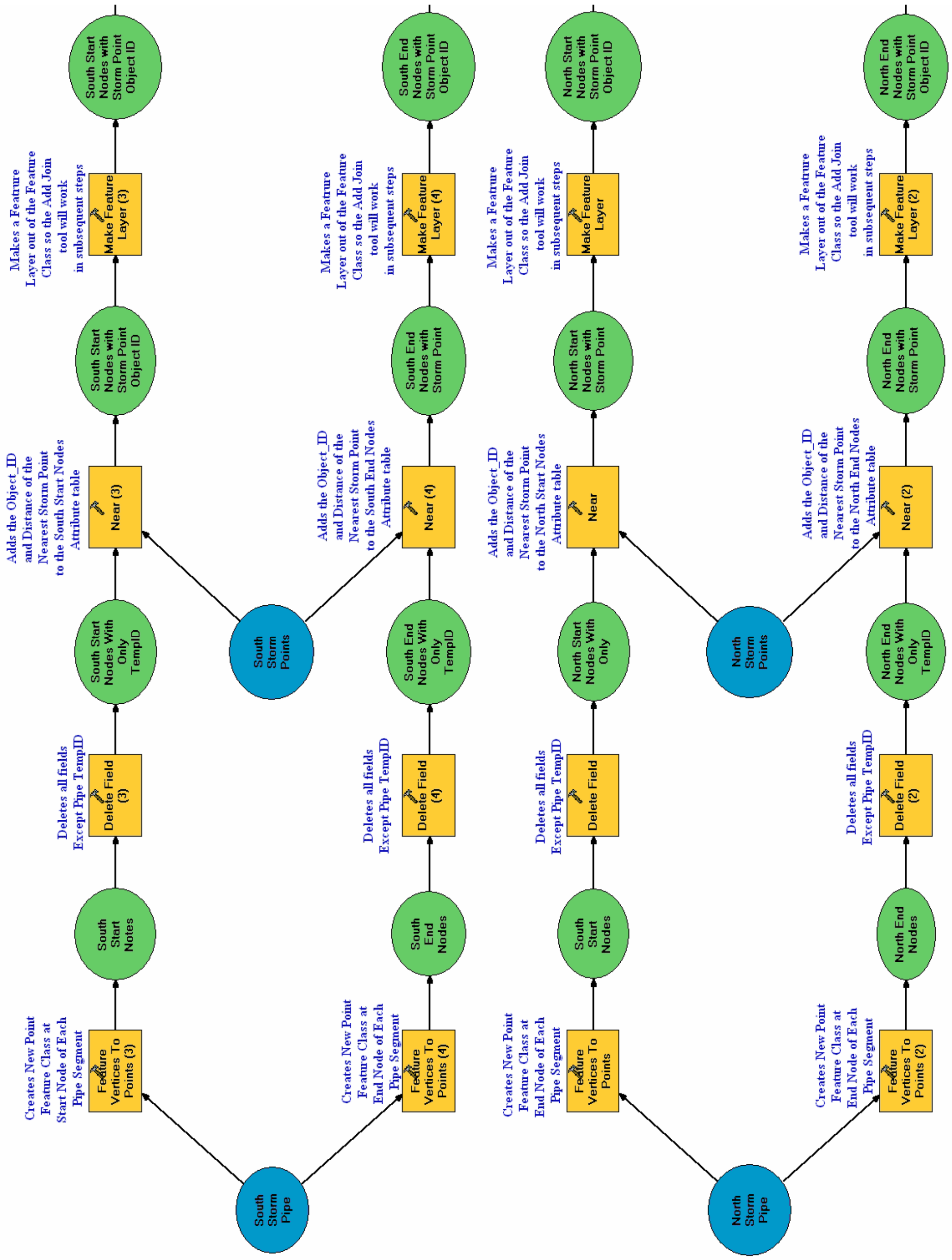
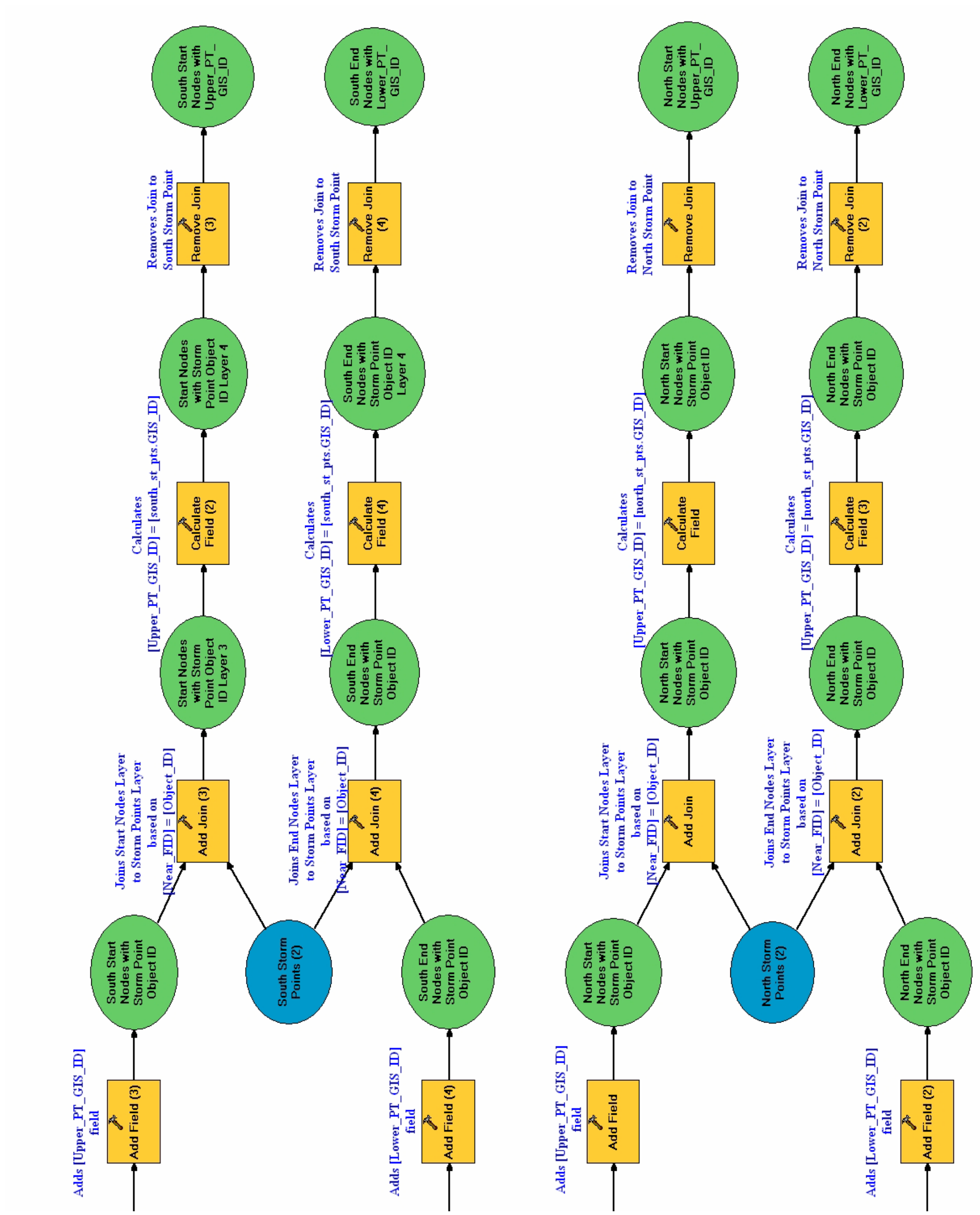
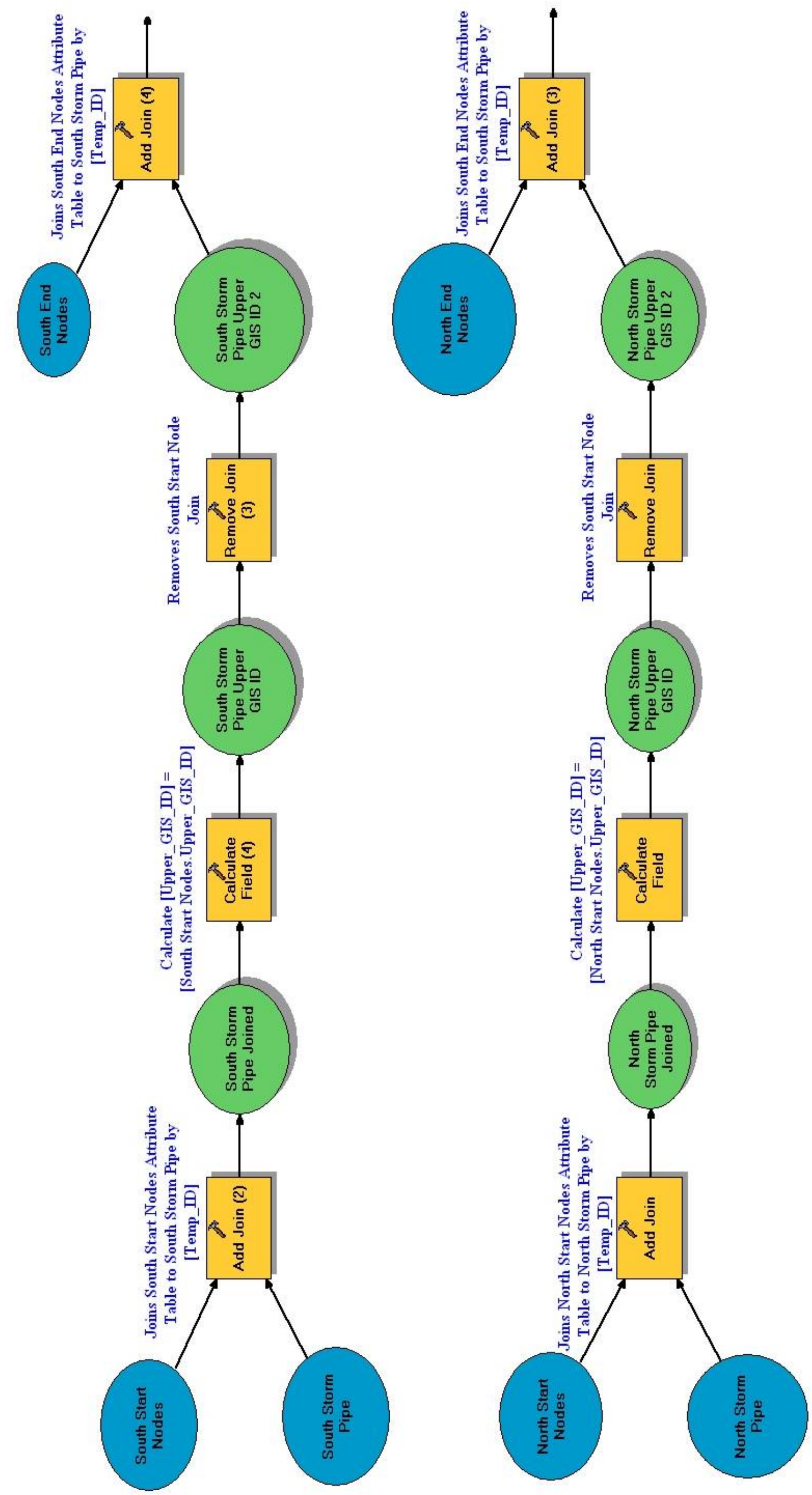
Appendix A. ArcGIS Model 1 - Build Start and End Node Layers for Pipes.



Appendix A. ArcGIS Model 1 - Build Start and End Node Layers for Pipes cont.



Appendix B. ArcGIS Model 2 – Calculate GIS ID on Pipe



Appendix B. ArcGIS Model 2 – Calculate GIS ID on Pipes cont.