Detroit Water and Sewerage Department

Wastewater Master Plan

DWSD Project No. CS-1314

GIS and Data Management Process

Technical Memorandum
Original Date: March 3, 2003
Revision Date: May 31, 2003
Author: CDM

Table of Contents

1. Introduction and Purpose 1

2. Master Plan Computer Systems 1

2.1 Computer Hardware 1
2.2 Computer Peripherals 2
2.3 Computer Software 2
2.5 Project Web Site 3

3. Data Transfer Specifications and Procedures 3

3.1 Data Types 4
3.2 Transfer Media 4
3.3 Transfer Procedures 4

4. Data Conversion Process 5

4.1 DWSD Sanitary System Data 5
4.2 DWSD Section Map 7
4.3 Greater Detroit Regional Sewer System (GDRSS) Data 8
4.4 Digital Elevation Model Data 8
4.5 Oakland County Data 9
4.6 Wayne County Data 9
4.7 Michigan Geographic Framework 9
4.8 Environmental Systems Research Institute (ESRI) 10

5. Recommended Training 10

6. Recommended Hardware and Software 12

Appendix A - Data Transfer Examples And Forms 14

Appendix B - DWSD Sanitary Sewer Data Tables 17

Appendix C – GDRSS Arcview Shape File Details 22

Appendix D - Recommended Training Program Details 24

GIS and Data Management Process

1. Introduction And Purpose

The purpose of this technical memorandum (TM) is to present the elements of the master planning GIS and related databases established for the Wastewater Master Plan. The following accomplishments are described in this TM:

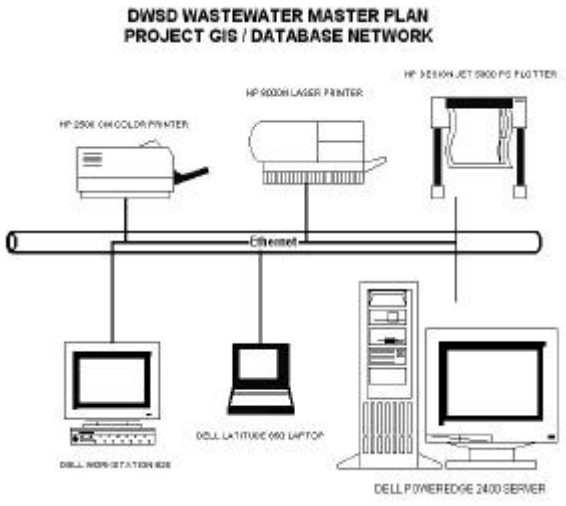
- Procured and installed project computer systems.
- Developed specifications for transmitting electronic data from DWSD to the project.
- Analyzed and recommended GIS tools for use in the project and ultimate use by DWSD.
- Recommended prerequisite training for software products.
- Specified and procured base map and demographic data.
- Obtained and converted the existing data on the DWSD collection and interceptor systems.
- Obtained and integrated the GDRSS model data into the project system.

Many of these topics are presented as sections of this TM.

2. Master Plan Computer Systems

The Wastewater Master Plan (WWMP) project is supported by a comprehensive GIS and data management environment. The WWMP computer environment consists of hardware, software, datasets and technical staff that assembled and delivered the information. All hardware and software information was maintained in an MS Access database, which was updated quarterly.

2.1 Computer Hardware



At the heart of the Master Plan Computer System (see figure to right) is a server, which performed as the main data repository for WWMP GIS and attribute data. The server is attached to an uninterruptible power supply to provide backup power in event of power failure or severe power fluctuations. Daily back-ups of all server hard drives are performed using a tape drive installed in the server in conjunction with backup software.

Attached to the server are two GIS workstations. The workstation is the primary unit for map creation, data maintenance and spatial analysis work.

Several laptops were also purchased to provide a mechanism to support the display of computer generated meeting presentations, GIS system demonstrations and for training sessions.

2.2 Computer Peripherals

Several computer peripherals were integrated into the Wastewater Master Plan project. Three printing devices were purchased and installed for the project including:

- A Plotter that supports plotting of color and black and white pages up to 42" x the length of the paper roll.
- A color printer which provides color and black and white printing of pages up to 11" x 17" in size.
- A laser printer providing high speed black and white laser printing of pages up to 11" x 17" in size.
-

These printers provide the WWMP project with the production facilities needed for reports, technical memoranda, maps, etc.

2.3 Computer Software

In addition to the computer hardware obtained for the WWMP project, several key software products were also purchased and integrated into the project. In a perfect world, a single GIS software package would meet all the needs of the WWMP Project. Unfortunately, there is no one perfect piece of software. However, by leveraging the strengths of several packages we arrived at a suite of GIS tools more capable and robust than any one individual package.

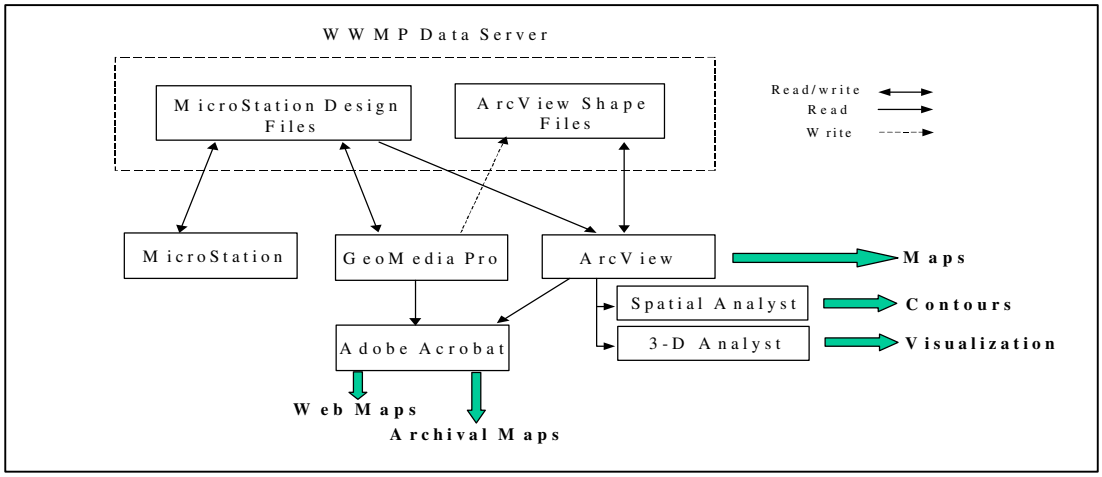
A variety of GIS software tools were evaluated for use with the WWMP GIS. Software was evaluated for a number of criteria including but not limited to:

- Suitability to need
- Availability
- Ease-of-use
- Cost
- Functionality
- Ability to work with Project data formats

To complete the work required, a variety of software packages were required including the following:

- GeoMedia Professional 4.0 – Intergraph desktop GIS software
- Microstation Geographics 7 – Intergraph CAD software
- ArcView 3.2a – ESRI desktop GIS software

- ArcView 3-D Analyst 1.0 – ESRI spatial analysis software used for 3-D visualization
- ArcView Spatial Analyst 2.0a - ESRI raster data analysis software
- Dream Weaver – HTML web development tool
- Cold Fusion 5 – Web application development tool
- Paintshop Pro 7.0 – Image editing tool
- MS Visual Studio – Application development tools
- Adobe Acrobat – Portable document file (PDF) creator
- MS Office – Database, presentation, spreadsheet and word processor
- MS Visio – Information systems and business processes diagramming tool
- MS Project – Project management tool



2.5 Project Web Site

The WWMP supports a project web site, which is hosted on a Windows 2000 server, currently located at CDM's Cambridge Massachusetts office. Internet Information Server 5 is used as the Web Server software and Cold Fusion 5 is the application server software. Software was purchased for the project web site, including FrontPage, Dream Weaver and Cold Fusion.

3. Data Transfer Specifications and Procedures

The WWMP project required the establishment of digital data transfer specifications and procedures between the consultant teams and the DWSD. The following section

describes the types of data that will be transferred back and forth between the project teams and DWSD; the transfer specifications; and procedures for requesting and obtaining the data.

3.1 Data Types

The WWMP utilized information from a variety of sources within DWSD. The primary data provider was the Engineering Records Section who maintains the water and sewer information. The following is a list of the data types that were transferred between the project teams and DWSD.

- MicroStation DGN files
- Oracle data export / dump files
- GeoMedia Warehouse (GWS)
- Spreadsheets (EXCEL)
- Text documents (WORD)
- Other databases (ACCESS)
- WEB information (HTML, JPG, GIF, etc.)

3.2 Transfer Media

There were several ways of transferring the information to and from DWSD Engineering. These include:

- Floppy disks – 1.44 MB
- CDROM – up to 650 MB
- Zip disk – up to 100 MB or 250 MB (depending upon ZIP drive type)

The media of choice for any given information transfer was dependent upon the size of the files being transferred. It is recommended that Email transfer of data requests NOT be utilized in this project and that the parties involved should use physical data transfer media.

3.3 Transfer Procedures

The transfer procedures include the following:

- Complete the data request memorandum/ form (See example in Appendix A), which describes, in enough detail, the information that is being requested. Information being submitted to DWSD should include a memorandum describing the information in the submittal.

- Complete the web approval form (if appropriate) (see form in Appendix A). This form is ONLY required if the information is being given to DWSD for posting to the DWSD web site (www.dwsd.org)

- Get approval from the DWSD Project manager - G. Haberer (Email or letter), the project point of contact. Mr. Haberer obtains the necessary internal approvals and notifies the DWSD data owner of the request. For information going to DWSD, an approval is not required.

- Complete the data transfer form (signature required for both parties) (See attached example in Appendix A). This form is required for BOTH data requests and data submittals.

- Contact the DWSD data owner and obtain the data in a pre-defined data format and transfer media (See section above).

- Pick up the data from DWSD and obtain signatures on the data transfer form.

- The process is relatively straightforward. The process has allowed project team members to obtain the information needed from DWSD staff plus maintain a paper trail of what information was delivered to whom by whom.

4. Data Conversion Process

Data for the WWMP project GIS were obtained from a number of different sources and arrived in various file formats, datums and projections. In order to provide a common data format and to ensure consistency for use with the project software, each data set was examined for system compatibility and processed as necessary. The following section describes the steps followed for those data sets requiring processing.

4.1 DWSD Sanitary System Data

DWSD sewer system data created under DWSD contracts CS-1211 and CS-1213 were maintained in a GIS/ mapping system utilizing MicroStation GeoGraphics. In this system, MicroStation is used to create/ maintain graphic features, while attribute data for the sanitary system are stored in an Oracle database. A link between the graphic feature and the Oracle database record is established through the use of the GeoGraphics software. It is referred to as the MSLINK value.

Although the project GIS software, GeoMedia, offers a strong toolset for working with MicroStation DGN files, it does not offer a native interface to the GeoGraphics data model. In other words, it can easily work with the graphic features, but cannot connect to the associated attribute data stored in the Oracle database. The following procedures were used to produce a GeoMedia-friendly representation of the DWSD data.

- DWSD's sanitary system attribute database was exported from the DWSD Oracle database to an Oracle dump file, which replicated the database structure and data tables.

This dump file was then imported into the WWMP Oracle database. In order to increase accessibility and ease of use, the Oracle data tables were then exported to a Microsoft Access database.

- MicroStation GeoGraphics maintains the link between graphic features and database rows through the use of "MSLINK" values that are stored both with the graphic feature and the database row. Any graphic feature can have multiple MSLINK values assigned to associate it with different rows in different tables. However, when GeoMedia accesses a DGN file, it reads only the first, or "primary", MSLINK value it encounters. In order to ensure that only data pertinent to the WWMP is extracted, it is necessary to remove all other MSLINK values.

- A GeoMedia CADD Server file was created to allow all of the individual DGN files to be read as a single seamless coverage. GeoMedia was then used to import and re-project the DGN data to NAD 83 State Plane Feet, as well as import the database tables from the Access database. A join was performed between the MSLINK field of the graphic features and the MSLINK field of the appropriate database table to associate the graphics with their database attributes. This dataset was then exported to an ESRI ArcView shape file (SHP), which maintains both the graphic features and database attributes. The ArcView shape file is used for map production.

Graphic features are stored in 662 section map files in MicroStation DGN file format using the Michigan State Plane Coordinate System, South Zone, NAD 27 with units of feet. Files include the following feature types (as provided by DWSD):

- 3" – 11" Sewers/ cross-over
- 12" – 15" Sewers/ cross-over
- 16" – 23" Sewers/ cross-over
- 24" – 10' Sewers/ cross-over
- 12' and larger Sewers/ cross-over
- 3" – 11" Sanitary only/ cross-over
- 12" – 15" Sanitary only/ cross-over
- 16" – 24" Sanitary only/ cross-over
- 12" – 15" Storm sewers/ cross-over
- 16" – 23" Storm sewers/ cross-over
- 24" – 10' Storm sewers/ cross-over

- 12' and larger Storm sewers/ cross-over
- Abandoned Sewers and manholes
- Lamp hole
- Manhole
- Bulkhead
- Regulator
- Backwater Gate
- Sewer Pump
- Sewer Metering Facility
- Catch Basin
- Tunnel Shaft
- IWC Facility
- DWSD Easement Line
- Outfall
- Interceptor 4' –13'
- Existing Sewer
- Sewer pipe for modeling

Attribute data stored in ORACLE is organized in 14 tables with the associated attributes fields. These are presented in Appendix B.

4.2 DWSD Section Map

An AutoCAD drawing (DWG) formatted file of the DWSD Sewer Index Map (Maintenance Districts – City Only) was obtained from DWSD's Division of Maintenance and Repair. The file was stored in CAD or model space and therefore needed to be transformed to enable it to fit with the Project GIS data. The transformation was accomplished using the GeoMedia vector registration tool. The DWG file was imported to GeoMedia and the grid boundaries were stretched to coincide with community boundaries where appropriate. Determinations of vector registration points were made using the Index of Detail Maps, City of Detroit Topological Survey, July 1, 1954.

4.3 Greater Detroit Regional Sewer System (GDRSS) Data

GDRSS data were obtained from the GDRSS project team as ArcView shape files in the Michigan State Plane Coordinate System, South Zone, NAD 1927, units of feet. In order to use the data in the WWMP Project GIS, the data was re-projected using the ArcView projection utility to:

Zone: Michigan South (FIPS: 2113)
Datum: North American Datum of 1983
Units: Feet

These ESRI ArcView SHAPE files included those listed below. Details on each file are presented in Appendix C.

- File Name: SBC34.shp Description: Sewer Sub-Basin Coverage
- File Name: svcdistricts.shp Description: DWSD Wastewater Service Customer Districts
- File Name: gdrssofalls.shp Description: GDRSS v3.12 Modeled Outfalls
- File Name: gdrsspipes.shp Description: GDRSS v3.12 Modeled Sewer Pipes
- File Name: sbc_increment_trib.shp Description: Sewage Meter (dry weather) Flow Tributary Areas. (Derived from Ph4trib_gdrss.shp)
- File Name: Ph4trib_gdrss.shp Description: Flow Tributary areas
- File Name: prometer.shp Description: DWSD Modeled Billing Meters

The pipe network map prepared for use with the GDRSS model was created as a schematic representation of the pipes in the sewer system and does not necessarily depict accurate spatial pipe locations. In order to display the GDRSS model output in a spatially accurate manner, each GDRSS modeled pipe was matched with its corresponding DWSD pipe segment(s). This association of pipes was accomplished by overlaying the GDRSS pipes on top of the DWSD pipe network and using such information as pipe diameter, length, directional change, intersections with other pipes, etc. to identify related pipes. Once related pipes were determined, the GDRSS pipe ID was appended to the DWSD pipe segment attribute table establishing the link between the GDRSS pipes and the DWSD pipes.

4.4 Digital Elevation Model Data

Thirty-meter digital elevation model (DEM) data was obtained from Spatial Insights Inc. to create contour lines and for use in data analysis and display.

The data was received in ARC/ INFO GRID format in geographic coordinates (latitude/ longitude). In order to use the data in the WWMP Project GIS, the grid data was re-projected in ARC/ INFO from geographic coordinates to the state plane projection using the following parameters:

Zone: Michigan South (FIPS: 2113)
Datum: North American Datum of 1983
Units: Feet

For the generation of contour data, the GRID was re-sampled in ARC/ INFO using a bilinear interpolation method, which yielded an approximate GRID cell size of 7.5 meters.

4.5 Oakland County Data

The Oakland county interceptor sewer network was obtained from the Oakland County Drain Commission as an AutoCAD drawing (DWG) formatted file. The file was displayed in ArcView using the ArcView Cad Reader extension and then saved as an ArcView shape file using the *Theme, Convert to Shape File* option. Since the AutoCAD file was already in the WWMP Project GIS coordinate system (Michigan State Plane, South, NAD83, feet), no projection or transformation was required.

4.6 Wayne County Data

A variety of data sets were obtained from the Wayne County GIS Management Unit (GISMU), including street centerlines and examples of digital ortho-imagery. Fortunately, all of the obtained data sets were of the same datum and projection that are used by the project and, therefore, required no additional processing.

4.7 Michigan Geographic Framework

The base map is an integral component of the overall project GIS, providing enough basic reference information so that users can associate and locate features and attribute data for purposes of comparison or geographical correlation. The intent was to use the same base map for both the Comprehensive Water (CS-1278) and Wastewater (CS-1314) Master Plan Projects to provide consistency and continuity. In choosing a base map, several factors were considered: cost, availability, accuracy, spatial extent and maintainability and several sources were investigated.

The Michigan Geographic Framework (MGF) is the successor to the Michigan DNR MIRIS program and has data available for the entire state of Michigan at no cost. MGF data consists of features and attributes from the current TIGER/ Line Files and base map features from the MDNR MIRIS files. MIRIS data is based upon USGS 1:24,000 quad sheets. The DWSD service area occupies a region where data processing is incomplete, resulting in minor discontinuities at county boundaries. These discrepancies will be eliminated in phase 3 of the MGF program. All data is updated on an ongoing basis. The master plan projects continually avail themselves of these base maps as they are improved over time.

Base map data, such as roads, railroads, rivers/ streams, drains, lakes, and county and community boundaries, were obtained from the Michigan Geographic Framework. Data was received in a format compatible with the Project GIS and required no further processing. However, in order to view roads at multiple scales, the *allroads* layer was separated into local roads, expressways and service ramp layers.

An updated version of MGF data (2a) became available in the summer of 2002. The data was downloaded from the Michigan Geographic Data Library (MGDL) (http:/ / www.state.mi.us/ webapp/ cgi/ mgdl/) by county for the entire planning area. The data layers were then appended so as to create a single, planning area wide layer for each feature type. Once appended, each feature layer was converted from the MGDL standard Michigan GeoRef coordinate system to the project standard Michigan State Plane Coordinate System, NAD83, South Zone, with units of feet.

Dynamap 2000 data purchased from Geographic Data Technology was used extensively on the GDRSS project and is based on TIGER/ Line Files. Accuracy, availability and extent are similar to MGF data. Updates may be purchased in quarterly, semi-annual, and annual releases.

Many counties in the DWSD service area currently have or are building their own GIS and would be willing to share their data through data sharing agreements. This data tends to be more accurate and up-to-date than both MGF and Dynamap 2000 data. Therefore, it is recommended, and the process has been initiated, to establish data sharing agreements with these counties where available.

Due to its accuracy, extent, no cost and scheduled updates by the state, MGF data has been acquired as a base for both the Comprehensive Water and Wastewater Master Plans and later, when possible, will be supplemented with data from the individual counties as data sharing agreements are put in place.

In addition, demographic data, based on the 1990 census, was obtained from SEMCOG along with Traffic Analysis Zone boundaries for incorporation into the GIS. This data was subsequently updated after data from the 2000 census had been released.

4.8 Environmental Systems Research Institute (ESRI)

ESRI supplied data was used to provide an intermediate scale road network between major highways and local roads. The ESRI data was obtained in geographic (latitude/ longitude) format and was converted in ArcView 3.2a by setting the View projection to Michigan State Plane Coordinates, South Zone, NAD 83 and View units to feet and using the 'Convert to shape file' option from the Theme menu to create a new shape file in the desired datum and projection.

5. Recommended Training

To effectively and efficiently make use of the Information Management System (IMS) and related tools created for the Wastewater Master Plan (WWMP),

a comprehensive training program has been designed to familiarize users with the information and the tools available. These tools include the Geographical Information System (GIS), relational databases, and integrated applications for data analysis and modeling.

Due to the many similarities in software and data sets used by both the Comprehensive Water Master Plan (CS-1278) and the Wastewater Master Plan (CS-1314), it is recommended that one Master Plan Training Program be developed for both projects to optimize both trainer and trainee time.

Training was designed to address three different levels of user needs:

- Management - This includes people involved in the project from a senior management level such as Mr. Qaqish, Dr. Gill, Mr. Doshi, etc., requiring an overview of the project IMS.
- Technical Staff - Staff actively involved in the daily operations of the projects such as Mr. Haberer, Mr. Witt, Mr. Nadella, etc., requiring an understanding of the IMS, the tools available and how they interact.
- Support Staff - This is staff that would be supporting the technical staff in areas of data entry, map production, etc. They would need to be intimately familiar with the operation of the tools and data available.

The Master Plan Training Program was designed as a series of modules with each training session, or module, designed to address an appropriate user level and need. The first module provided a general overview of the GIS/ Data environment. Each subsequent module provided more detail and specificity regarding the project application tools and available data.

Currently, five training sessions have been identified for development including

- Master Planning GIS/ Data Management Overview
- Introduction to Master Plan GIS Software
- Introduction to CWMP Applications
- Introduction to WWMP Applications
- Introduction to Project Web Site Management

As the project has evolved the original training strategy, as outlined above and detailed in appendix D, has been modified to more closely address the needs of the project. The second session "Introduction to GIS Software" was changed to "Using ArcExplorer". The purpose of this training module is to acquaint users with the GIS data available from the project and to show them how to use ArcExplorer, a free desktop GIS tool from ESRI, for viewing and querying the data.

By introducing ArcExplorer and deploying the project data to an Intranet server, access to the data has been greatly enhanced.

Due to its limited focus and technical nature, it was determined that session five "Introduction to Project Web Site Management" was not required.

6. Recommended Hardware and Software

Maintaining the project GIS system at the Engineering Division of DWSD for use in future master planning efforts will require a suitable set of hardware and software.

The following recommendations outline what we consider to be the minimum set of hardware and software required for continued GIS system operation.

These recommendations are being made with the assumption that water and wastewater section maps will continue to be maintained in MicroStation as individual section maps. It is also understood that the *PC-1367 Expanded GIS Services and Implementation* contract may develop its own set of hardware and software requirements that could supersede the recommendations set forth here.

Hardware enables the storage and distribution of data, the production of maps and reports and provides the platform from which to run the system software. Due to the evolving capabilities and performance of computer hardware and peripherals, detailed specifications are not be given for hardware components, but rather recommendations are made for the types of components and general capabilities they should possess. It is anticipated that DWSD Information Services will provide detailed hardware specifications at the time of implementation.

Hardware recommendations include:

Data Server – The data server serves as the main data repository for the GIS system, including both spatial and attribute data. The server should have adequate disk storage space to accommodate existing data and also allow for future growth. The processing capacity should allow for adequate performance for the anticipated number of users. To avoid power related problems, the server should be hooked to an uninterruptible power supply (UPS). Data backups are critical to preserving mission-critical data. Therefore, some mechanism for doing daily backups through tape drives or other means should be implemented.

GIS Workstation – The GIS workstation is the main device for accessing, maintaining and using the GIS system. The workstation should consist of a high-performance desktop PC with a large (19" or greater) monitor. To allow for data transfer of large data sets, the workstation should contain a high capacity read/ write removable media storage device such as a CD or DVD writer.

Color Plotter – An inkjet color plotter capable of up to E-size (34" x 44") printing enables production of large color and black and white maps.

Color Printer – An inkjet color printer capable of up to tabloid (11" x 17") size printing allows for the preparation of report size color and black and white maps and drawings.

Laptop Computer – While not essential, a high-performance laptop computer facilitates meeting presentations, GIS demonstrations and training sessions.

Software recommendations include:

GeoMedia Professional – GeoMedia Pro is recommended primarily for its ability to easily and dynamically append the over 650 section map files into one continuous map layer, which facilitates spatial analysis and map production. As individual section maps are periodically updated, a new seamless map layer can be easily developed.

ArcView GIS – While GeoMedia has proven to be an excellent tool for combining the multiple section maps into single uniform layers, its map layout and production tools are not as robust and versatile as other GIS products. ArcView GIS has proven to be a very capable map creation tool. In addition, it provides better address matching capabilities and a greater range of spatial analysis tools than the current GeoMedia version 4.0 used by the project. A new version of GeoMedia Pro, 5.0, has been released and should be reviewed as a possible substitute for ArcView GIS.

Adobe Acrobat – Adobe Acrobat allows for efficient storage and distribution of maps, including the posting of maps to the web through the use of Adobe portable document files (pdf). Acrobat integrates seamlessly with ArcView and other applications and allows for the direct creation of pdf files from within applications.

ArcExplorer – ArcExplorer is a free, easy to use GIS data viewing and query tool developed by ESRI. Its intended use is to provide basic access to project GIS data to a large number of users at a minimum cost.

Appendix A - Data Transfer Examples And Forms

Example Data Request Memorandum…

TO: George Haberer, Project Manager (CS-1314)
FROM: Your Name Here
CC: Carl Johnson, CDM
DATE: Today's Date
RE: Information Request From _____

Example Text

The WWMP GIS Team is continuing to build the information required by the project team. We need to obtain from DWSD Engineering Records Section the following:

- The Tile Index and vicinity files for the water system network.

The WWMP project team needs this information as soon as possible.
Please contact Charlie Bristol (313.963.1313) or Steve Rood (313.964.8889) when the information is available. We will come to DWSD to pick up the information.
As more information is required, we will submit future memoranda requesting the information.
Your cooperation in this matter is greatly appreciated. Thank you for your attention to this information request.

DWSD CS-1314
Waste Water Master Plan

Web Information Approval Form

This form is to be used to transmit digital information to DWSD for posting on the DWSD web site (www.dwsd.org).

Title of Attachment: _____
Attachment Format: _____ (*.DOC; *.HTML; *.JPG, etc.)
Name of Author _____
Organization: _____
Phone: _____
Email: _____

Approvals:

CDM Project Manager: _____
DWSD Project Manager: _____
DWSD A.D. - Engineering Services: _____
Submit signed form with printed attachment and digital file attachment to the DWSD WebMaster (to be determined).

Information to be Completed by DWSD
DWSD Division Name: _____
Group / Section Name: _____
Contact Name: _____
Contact Phone: _____
Contact Email: _____

CDM Camp Dresser & McKee Inc.

DWSD CS-1314
Waste Water Master Plan

Data Transfer Form

Date: _____
Transfer to DWSD: _____ Transfer from DWSD: _____
Title of Information:
_____

Type of Data	City	Suburban	Comments
MicroStation DGN			
Oracle Export/ Dump			
GeoMedia GWS			
Spreadsheet			
Text Document			
Other Databases			
WEB Information			

DWSD Number of Hours: _____ DWSD Account Number: _____
Media Type: FLOPPY ____ CDROM ____ ZIP DISK _____
Signatures:
DWSD Staff_____ Date: _____
Signature: _____
Consultant Name: _____ Date: _____
Signature: _____
Submit signed form to project files.

CDM Camp Dresser & McKee Inc.

Appendix B - DWSD Sanitary Sewer Data Tables

Backwater_gate

Attribute fields

- Community_county
- Section_map_no
- Cross_street_n_s
- Cross_street_e_w
- Location
- Contract_no
- Drawing_no
- Date_installed
- Gate_dam_id_no
- Regulator_id_no
- Gate_dam_size
- Comments

Catch-basin

Attribute fields

- Community_county
- Section_map_no
- Cross_street_n_s
- Cross_street_e_w
- Location
- Type_of
- Trapped
- Material
- Last_cleaned_out
- Comments

Chamber

Attribute fields

- Community_county
- Section_map_no
- Cross_street_n_s
- Cross_street_e_w
- Location
- Size_of
- Type_of
- Material
- Date_installed
- Date_inspected

Comments

Dwsd_Property

Attribute fields

Community_county
Section_map_no
Cross_street_n_s
Cross_street_e_w
Name_of_site
Location_address
Contract_no
Date_purchased
Comments

Iwc_facility

Attribute fields

Community_county
Section_map_no
Cross_street_n_s
Cross_street_e_w
Location_address
Contract_no
Drawing_no
Contact_person
Phone_no
Comments

Outfall

Attribute fields

Community_county
Section_map_no
Cross_street_n_s
Cross_street_e_w
Location
Contract_no
Drawing_no
No_of_barrels
Size_of
Date_inspected
Comments

Regulator

Attribute fields

- Community_county
- Section_map_no
- Cross_street_n_s
- Cross_street_e_w
- Location
- Contract_no
- Drawing_no
- Size_of
- Type_of
- Reg_id_no
- Date_installed
- Comments

Sew_easement

Attribute fields

- Community_county
- Section_map_no
- Cross_street_n_s
- Cross_street_e_w
- Location
- Contract_no
- Size_ft
- Owner
- Comments

Sew_ent_manhole

Attribute fields

- Community_county
- Section_map_no
- Cross_street_n_s
- Cross_street_e_w
- Location
- Contract_no
- Drawing_no
- Size_of
- Type_of
- Date_installed
- Material
- Depth
- Rim_elevation
- Comments

Sew_lamp_hole

Attribute fields

- Community_county
- Section_map_no
- Cross_street_n_s
- Cross_street_e_w
- Location
- Contract_no
- Drawing_no
- Date_installed
- Sewer_size
- Comments

Sew_meter

Attribute fields

- Community_county
- Section_map_no
- Cross_street_n_s
- Cross_street_e_w
- Location
- Contract_no
- Drawing_no
- Size_of
- Type_of
- Manufacturer
- Meter_serial_no
- Dwsd_meter_no
- Date_installed
- Date_meter_set
- Comments

Sew_secton_map

Attribute fields

- Community_county
- Section_map_no
- Section_no
- Comments

Sewer

Attribute fields

- Community_county
- Section_map_no

Cross_street_n_s
Cross_street_e_w
Location
Contract_no
Drawing_no
Size_of
Type_of
Material
Date_installed
Shape_of
Avg_depth_of_cover
Date_last_repaired
Comments

Tunnel_shaft

Attribute fields

Community_county
Section_map_no
Cross_street_n_s
Cross_street_e_w
Location
Contract_no
Btwn_station_point
Type_of
Material
Date_completed
Length_of
Diameter
Depth
Comments

Appendix C - GDRSS Arcview Shape File Details

A number of ArcView shape files were obtained from the Greater Detroit Regional Sewer System (GDRSS) Team for use in the Wastewater Master Plan (WWMP) Project GIS. These include:

File Name: SBC34.shp
Description: Sewer Sub-Basin Coverage
Attributes:

FIELD NAME	DESCRIPTION
SB_ID	Sub-basin ID for GDRSS model
Subdistric	Drainage district
Phs4trib	Ph 4 meter to which tributary
Class	Type of sewer system
Dciaregion	Used for DCIA distribution/ calculation
Inlet_id	GDRSS inlet node
Storm_Inle	if class = storm then field should be populated
District	Drainage district political
Dwfdistrict	District used for dry weather flow distributions
Submodel	RUNOFF submodel for GDRSS – total 6
Interceptor	Interceptor to which tributary

File Name: svcdistricts.shp
Description: DWSD Wastewater Service Customer Districts
Attributes:

FIELD NAME	DESCRIPTION
District	district name

File Name: gdrssofalls.shp
Description: GDRSS v3.12 Modeled Outfalls
Attributes:

FIELD NAME	DESCRIPTION
ID	GDRSS model node ID

File Name: gdrsspipes.shp
Description: GDRSS v3.12 Modeled Sewer Pipes (Explicit and Implicit)
Attributes:

FIELD NAME	DESCRIPTION
LENGTH	Length of pipe
DIR_INDIR	Dir = directly modeled; Indir = indirectly modeled
NCOND	Model conduit ID
NAME	Primary sewer name

File Name: sbc_increment_trib.shp
Description: Sewage Meter (dry weather) Flow Tributary Areas. (Derived from Ph4trib_gdrss.shp)
Attributes:

FIELD NAME	DESCRIPTION
Ph4trib2	Tributary area ID

File Name: Ph4trib_gdrss.shp
Description: Tributary Areas
Attributes:

FIELD NAME	DESCRIPTION
Ph4trib2	Tributary area ID
Area	Area of tributary area
Perimeter	Perimeter of tributary area
Acres	Total acres of tributary area
Flow_acre	Flow (cfs) / acre

File Name: prometer.shp
Description: DWSD Modeled Billing Meters
Attributes:

FIELD NAME	DESCRIPTION
MeterID	Integer meter ID
Description	Meter description
Meter2	DWSD meter ID

Appendix D - Recommended Training Program Details

Session One - GIS/Data Overview
Goals / Objective - To provide an overview of the project Information Management Systems (GIS, databases and applications)

Attendees - DWSD Managers, Technical Staff, Support Staff. This session would be open to anyone who may utilize the data sets associated with the Master Plan projects

Duration - The session would last one half day from 9:00 am to Noon in a presentation style classroom.

Topics

Overview of the Master Planning Process
- Plan/ Design/ O&M Hierarchy
- Wastewater Master Plan Scope
- Comprehensive Master Plan Scope
- Master Planning Process

Overview of GIS
- What is it?
- What questions can it answer?

Utility GIS Examples

Overview of Existing DWSD data
- Graphics – CAD files
- Attribute – Oracle Data

Overview of Available Project Data
- State of Michigan, SEMCOG, Wayne County, Oakland County, commercial sources, and other

Overview of Using the Project GIS
- Spatial Data
- Modeling Support

Project Web Site
- WEB Site – How does it work? How is it maintained?

Session Two - Introduction to GIS Software
Goals / Objectives – To provide an initial exposure to the functions within the GIS software applications.

Attendees - DWSD Technical Staff and End Users.

Duration - The session would last one half day from 9:00 am to Noon in a hands on style classroom.
Topics

Review the Basics of GIS
- Coordinates, datums and projections

Review of Data Available
- State of Michigan, SEMCOG, Wayne County, Oakland County, commercial sources, aerial imagery and other

Project Software
- Microstation GeoGraphics
- GeoMedia, GeoMedia Pro
- ArcView, Spatial Analyst, 3-D Analyst
- Adobe Acrobat

The Basics of GeoMedia
- Preferred Uses
- Making Maps
- Querying Data
- Import and Export
- Printing Maps

The Basics of ArcView
- Preferred Uses
- Making Maps
- Querying Data
- Printing Maps
- Geocoding

Using Adobe Acrobat Map Files
- Creating Map pdf files
- Printing

Session Three - Introduction to CWMP Applications
Goals / Objectives – To provide an introduction to the applications used to support the Water Model.

Attendees - DWSD Technical Staff and End Users.

Duration - The session would last two hours in a hands on style classroom.

Topics

- The Basics of RunManager
  - What it is
  - Overview of Database Structure
  - Managing your Model Runs
  - Creating a Model Run
  - Importing EPANET Data
  - Creating EPANET Input Files
  - Loading EPANET Result files
  - Creating Excel Spreadsheets

Session Four - Introduction to WWMP Applications
Goals / Objectives – To provide an introduction to the applications used to support the Wastewater Model.

Attendees - DWSD Technical Staff and End Users.
Duration - The session would last one half day from 9:00 am to Noon in a hands on style classroom.
Topics

- Basic Introduction to the WWMP GIS Tools
  - Additional content to be determined based upon tools selected.

Session Five - Introduction to Project WEB Site Management
Goals / Objectives – To provide an introduction to using the Web to access GIS data sets and maps and project related information.

Attendees - DWSD Management Staff; Technical Staff and End Users.

Duration - The session would last 1 hour in a hand on style classroom.

Topics

Project Web Site
- Overview of Structure
- Information Available
- How Information is updated