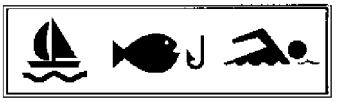
THE ROUGE RIVER PROJECT
A WORLD CLASS EFFORT



BRINGING OUR RIVER BACK TO LIFE

Rouge River National Wet Weather Demonstration Project

Wayne County, Michigan

TASK PRODUCT MEMORANDUM

RPO Data Needs

Data Management Work Plan No. 2, Task No. 1

RPO-DAT-TPM17.00

October 1995

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Data Management Work Plan No. 2, Task No. 1

Author: Ellen Taylor

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Rouge River National Wet Weather Demonstration Project

MISSION STATEMENT

The mission of the Rouge River National Wet Weather Demonstration Project is to restore the water quality in the Rouge River as necessary to:

- provide a safe and healthy environment for ourselves and future generations,
- protect downriver water resources such as the Detroit River and Lake Erie, and
- re-establish a healthy and diverse ecosystem within the Rouge River watershed.

This will be accomplished through the development, implementation, and financial integration of a technical, social, and institutional framework leading to cost efficient, and innovative, watershed based solutions to control the wet weather problems in the Rouge River Watershed.

PREFACE

The Rouge River has historically suffered and continues to suffer from the combined stress of pollutant loadings from various sources. The vast majority of continuous point sources have been eliminated through the issuance and enforcement of National Pollutant Discharge Elimination System (NPDES) permits for municipal and industrial dischargers. Yet, as established in the Rouge River Remedial Action Plan (RAP), the river remains polluted primarily because of sources associated with wet weather flow.

The Rouge River National Wet Weather Demonstration Project (Rouge Project) is intended to evaluate each of the various sources of wet weather pollution; implement alternative remedial measures; investigate wet weather waste load allocations; establish associated pollutant load reductions; examine the financial and institutional impediments to wet weather pollution control; and recommend a plan and procedure for watershed-wide pollution control which is "implementable" in the Rouge and can be readily transferred to similar urban watersheds throughout the country.

The effort is not being conducted in isolation. The Rouge RAP provides a baseline from which Rouge Project efforts have begun. In fact, the Rouge Project can be viewed as the key component of the initial implementation of the RAP. In addition, ongoing regulatory efforts aimed at controlling Combined Sewer Overflow (CSO) discharge have also been integrated into the Rouge Project and all construction facilities will be in accordance to NPDES permits.

It is widely recognized, and reinforced by RAP recommendations, that CSO control by itself will not be sufficient to restore water quality to acceptable levels in the Rouge River and other similar urban rivers. The project has established a watershed-wide concept as its focus. Within the Rouge River watershed, a range of pollution sources have been identified. They include: traditional urban runoff, illicit connections to drainage facilities, abandoned dumps within the river flood plain, wet fall and dry fall air deposition, and contaminated sediments within the river channel and impounded lakes.

The Rouge Project has incorporated efforts to develop analysis tools, organize existing and future data, conduct field surveys, collect and analyze water quality samples, develop and implement water quality models, design and test structural and nonstructural best management practices (BMPs), and establish loadings from nontraditional wet weather sources. Additionally, it includes components that will involve watershed residents in pollution control planning, and will study the institutional structure and financial capabilities of those entities responsible for long term implementation of the recommended watershed plan.

To efficiently manage an effort with diverse objectives, the project has been divided into ten program elements. Each of these has a specifically defined technical or operational purpose. Within each of these elements, work plans are developed to define specific activities to be performed as part of the project. These work plans define the Tasks and level of effort.

The program elements that have been established are as follows:

Geographic Information System (GIS) and Mapping
Data Collection and Management
Sampling and Analytical Program
Modeling and Decision Support System (DSS)
Nonpoint Source Best Management Practices (BMPs)
Combined Sewer Overflow (CSO) Design, Build and Test Facilities
Value Engineering
Public Information and Involvement
Financial and Institutional
Project Management, Coordination and Reporting

This document has been generated under the Data Collection and Management Program Element. Its purpose is to define the data that the Wayne County Rouge Program Office (RPO) will need to incorporate into a database; to define the reasons of the chosen database management system software package; and to identify future steps in structuring the RPO database.

ABSTRACT

This Document is a summary of the data needs, as identified by the technical teams of the Rouge Program Office (RPO). The purpose is to define the data specifically in terms of type, users, purpose and requirements for data management. A number of attachments detail information meetings with each team. Also included is the rational behind the selection of the database management software, and the initial strategies that lead to more formal database design.

INTRODUCTION

The purpose of this memorandum is to define the data that the Rouge Program Office (RPO) will need to incorporate into a database, to enumerate the reasons behind the selection of the database management system software package, and to identify future steps in structuring the RPO database.

All of the information identified below needs to be stored in an organized, efficient, and accessible management structure. In addition, a distinction needs to be made between file structured data/information and database data/information. File structured data may consist of all types of data files (i.e., ASCII, QuattroPro, WordPerfect, etc.). Such files will not necessarily be inserted into a database and can be managed by file structures within the normal environments of a personal computer. The data identified as database/information throughout this memorandum is required to be maintained in a database management software package.

DATA NEEDS OF ROUGE PROJECT PROGRAM ELEMENT TEAMS

The first task required of the Data Management Team was to identify the program element team's immediate needs and perceived future data needs. In order to establish an inventory of data needs, meetings were held with the Modeling, Nonpoint, CSO and Sampling Teams. Notes of each of these meetings were kept and condensed editions of each are attached to this memorandum. Please note that the lists reflect the element teams' first perceptions of their data needs and that some of these perceptions have changed over the intervening months as work has progressed. In addition, as the work on the project continued, the element teams were able to more clearly define and to be more specific about their data needs. From the beginning, a recurring theme was the need for historical data which would help to refine data handling procedures, modeling procedures, sampling activities, and output procedures (i.e., reports, graphs, plots).

The following is the data inventory compiled after identifying each of the program element team's data requirements, as of November 1993:

Modeling Team

Sampling data collected from different sampling equipment locations:

- Depth, Flow
- Continuous Water Quality Monitors
- Laboratory Sampling Data

Others:

- RPO Rain, Temperature
- USGS Rain, Temperature

- SEMCOG 76' Historical Water Quality Data
- MDNR 88' Historical Water Quality Data

Nonpoint Team

- RPO Newburgh Lake Survey
- Sediment Reconnaissance
- Sand Filter Data
- BMP Data (six sites)
  - Online Media Polishing Device
  - Swales
  - Wet Detention Pond
  - Dry Detention Pond
  - On Site Wet Detention Pond
- Air Deposition Data
- Wetlands

CSO Team

- Surrogate Sampling Data

Sampling Team

- Sampling Site Equipment Records (problems, repairs, etc.)

Geographic Information System Team

- Sampling Site Data
- Rain Data
- Soil Data
- Illicit Business Data
- 307 Site Data
- NPDES Permit Data

Data Management Team

- Data inventory/centralized database (logged maps, reports, studies, etc.)

Selected Database Management System

After reviewing the data needs and researching data sources, the necessary sampling fields and database parameters were defined in detail. The processing of the data needs in this method enabled us to note minor restrictions on the data structure, such as being able to handle only one result flag per sample. Once the preliminary data structure requirements were defined we were able to

determine that the Data Management Team would need to utilize ORACLE's database management package to design the data structure.

The following are the factors considered in selecting ORACLE along with reasons for its continued use by the RPO:

- The UNIX version 7.0 of ORACLE was originally purchased to handle the GIS data needs.

- ORACLE is the most widely used database management system.

- ORACLE's methods and SQL language are 100 percent ANSI standard. This is an important factor for external users when the data and SQL scripts become available.

- ORACLE fully supports ANSI standard declarative integrity constraints, which will allow us to enforce all of our referential and entity integrity rules without programming.

- ORACLE provides a transparent distributed database. This allows the users to treat a physically distributed database as a single logical database. A user can access and update data anywhere in a distributed network with the same ease as if the data resided on a single, local machine. ***The RPO recognized the need of a PC - Workstation direct link connection.***

- ORACLE is fully portable to more than 80 distinct hardware and operating system platforms. This portability provides complete freedom to choose database server platforms best suited for the individual's needs and applications.

- ORACLE provides transparent SQL and procedural access to data from virtually any source with SQL* Connect and Open Gateway products. Data can be accessed from many systems.

- ORACLE supports distributed query processing. A single SQL statement can query data from multiple databases and even perform complex table relation transparently.

- ORACLE provides an advanced security architecture based on roles, which are named collection privileges. Roles significantly reduce security management by allowing privileges on tables and other database objects to be grouped together which could be granted to individuals or groups.

- ORACLE provides unrestricted row-level locking for both data and indexes on transactions, tables or database. Users can run transaction processing and decision support system applications on the same critical data.

- Other database vendors recognize ORACLE to be the leader in the database market by providing links or gateways to ORACLE's databases.

- ORACLE interoperates with the industry's largest collection of third-party software products.

- ORACLE leads the technical field on moving towards open, relational systems.

- Several local agencies and communities are using ORACLE as their prime database management software package. This will make transporting of data much easier now and in the future.

Overall, the decision to select ORACLE as RPO's primary database management system was based on careful study of the requirements placed on the system by the data needs, the import and export capabilities of the system and the universal standards supported by the software. ORACLE will allow all RPO element teams, regardless of the operating platform they are utilizing, to access the data stored in the RPO database. It will also provide for the transfer of data to and from end users in organizations and agencies outside of the RPO. For these reasons ORACLE was judged to be the best choice for the RPO's database management system.

The next steps were to:

- Organize all the identified data in a relevant manner.

- Determine the amount of space needed for the data environment.

- Design ORACLE data structures that are necessary to properly manage the data in an efficient manner.

- Test the structures for efficiency and accessibility by populating and retrieving data.

APPENDIX A

APPENDIX A

Notes on CSO Meeting June 17, 1993 at 3:00-5:15 p.m.
Meeting topic: CSO needs of GIS and Data Management

Attendees: Ellen Taylor
Donna Ryder
Fayek Zabaneh
Ray Rammo
Jerry Neibert

The CSO Team supplied a spreadsheet of issues that the CSO Team wanted to discuss. The CSO Team was well prepared for this meeting. The CSO spreadsheet will be updated to concatenate issues and add more issues that were discussed..

Issues brought up:

Topic #1 **Identify industrial users.** Industrial Pre-Treatment Program (IPP) industries should be located in the GIS. The RPO will contact the Detroit Water and Sewerage Department for these IPP's.

Topic #2 **Identify Industrial discharges directly to the river.** All NPDES points should be identified in the GIS since these points flow directly to the river. Data fields that need to be associated with these points are industry name, NPDES number, and outfall identification number.

The CSO Team is also interested in the local businesses Standard Industrial Classification (SIC) and address listings which the Nonpoint Source Team is ordering. The GIS Team will supply a list of available SIC codes. This information is needed by August 1, 1993.

Topic #3 **Finalize CSO Outfall and basin locations.** CSO outfall locations will be identified in the GIS. The GIS Team and the CSO Team will meet with the Modeling Team to understand the field reconnaissance and CSO outfall locations. The GIS Team has converted all the existing EPA CSO data and are working with additional locations identified. The Modeling Team is in the process of evaluating the locations of all the outfalls.

Data fields for the GIS database were discussed. The following fields will be needed by the CSO Team immediately:

- *Name*
- *Identification number*

- *NPDES Permit number*
- *flow data*
- *size of pipe (diameter)*
- *elevation (if available)*
- *overflows per year*
- *average annual overflow (million gallons)*
- *duration of overflow per year (minutes)*
- *design capacity*

Possible additional fields in the future:
volume of discharge
quality of discharge - number in terms of parts per million

The CSO Team also noted that they would like three different sewer systems: combined, storm and sanitary-mapped in different colors for the MDNR report due in September. It was suggested that the CSO Team should look into the county sewer/sanitary maps to see if these would be sufficient.

Topic #4 **Coordinate with Modeling Team RE: Delineation of Combined Sewer Drainage Areas.** CSO drainage areas will be identified in the GIS; the GIS Team will be acquiring community maps where the areas have been drawn on, and will insert these areas into the GIS.

Topic #5 **Identify Pervious/Impervious Areas.** The CSO Team will meet with the modeling Team to develop this pervious information which will eventually be entered into the GIS. This data is *not urgent*.

Topic #6 **Identify Percentage of Residential/Commercial/Industrial Areas.** Spatial analysis needs to be implemented in the GIS to calculate the percentages of residential, commercial and industrial areas within sub-watersheds. The GIS Team is planning to create reports on this information for the Rouge River Watershed, sub-watersheds, and communities.

Topic #7 **Collect Data and Conduct Literature Search on Water Conservation Strategies - Retrieve Ordinances on Water Conserving Fixtures.** The CSO Team would like any available stormwater management studies or ordinances that have been completed in the watershed. It was mentioned that the Nonpoint Source Team is putting together an ordinance matrix to send to all the communities, and suggested that the CSO Team add water conservation strategies to this matrix. The communities will be asked for all ordinances listed in the matrix.

Topic #8 **Retrieve Water Consumption Data - Identify Water Source and Amount for each Community, including Detroit.** The CSO Team has been looking at Plymouth township as a study area on water consumption. Is this data available? The CSO Team will look into this question. Whichever area is selected for the water conservation study will require retrieval of the water consumption data.

Topic #9 **Retrieve Population Count - Retrieve Number Of Equivalent Households.** The following census data is needed: total number of toilets, faucets, and shower heads. The 1990 Census data is available in book form but has not been investigated thoroughly enough to know if this is suitable. The GIS Team will find out if this Census data can be bought in digital form from SEMCOG.

Topic #10 **Identify Industrial Flows into Conveyance System.** The CSO Team would like to have the before pre-treatment and after pre-treatment flow into sewers and pipes. It was decided that if this information was available in digital form it would be put into the GIS database. The Detroit Water and Sewerage Department will be contacted for all IPP information.

Topic #11 **Identify amount of Flow Capacity and Contract Capacity for each Community.** Data indicating the maximum amount of flow allowed by the communities is important to the CSO Team.

Topic #12 **Excessive Infiltration And Inflow Sources.** Infiltration and Inflow studies - are usually associated with DPW departments.

Topic #13 **Identification of Unauthorized Connections to Conveyance Systems**

Topic #14 **Information on Sewers that are Cracked Depressed, and are of Questionable Integrity.** Any available information pertaining to the conditions of sewers will be useful. (Examples: TV inspections (videos) or field investigations:)

Topic #15 **Information on Flow Restrictions due to Sludge Build-Up or Other Conditions**

Topic #16 **Assessment of each Regulator**

APPENDIX B

APPENDIX B

Notes on Modeling Meeting June 21, 1993 at 2 p.m.
Meeting topic: Modeling needs of GIS and GIS database.

Attendees: Ellen Taylor
Donna Ryder
Clint Cantrell
Ed Kluitenberg
John Foley

Topic #1 **Stream Methodology.** Modeling is working in the Middle 2 subwatershed first. The river will be broken into sections approximately every half mile. These sections will differ depending on dams, and other non-discrete locations. Approximately 300 nodes or identification points dividing the river will be needed. Each modeling node will hold attribute data such as the elevation, location, etc... Each channel (or link - distance between two nodes) will need data associated to it: (Examples given: area, channel bottom width, right slope, left slope, surface area, volume of channel, average depth, slope from upstream to downstream, and Manning C factors fields.) The need for connectivity information between these channels was brought to the table. The idea of having two fields *to* flow and *from* flow, was discussed. Streams and lakes will be separate coverages within the GIS. It was determined that the RPO will refer to partitions of the Rouge watershed (drainage) as subwatersheds and subareas.

Topic #2 **Subwatershed Delineation Methodology.** It was stated that the Modeling Team were in the process of creating two types of drainage areas in the Middle 2 subwatershed. The two types of drainage areas are CSO drainage areas and storm runoff drainage areas. The Modeling Team will submit the Middle 2 subwatershed delineations to the GIS Team to digitize. They will continue to submit other subarea delineations as they are determined. A major concern was the connectivity between the subareas; the same approach of having two fields associated with each area was discussed. However, it was noted that it is possible to have more than one subarea draining to a specified subarea .

Topic #3 **Rain Gauge Methodology.** All the primary, secondary, tertiary and proposed rain gauges will be identified in the GIS; this process is already in progress. Theissen polygons will be calculated around each primary rain gauge. The Modeling Team would like to review the GIS and experiment (change, update, etc.) with the number and location of gauges included in the Theissen polygon network. As a second priority, the Modeling Team would like to overlay the drainage areas over the Theissen polygons and query the rain gauge points for location, maintenance responsibility, owner and other information. It was suggested that all raw data be kept in the GIS database for terms of availability in the future.

Topic #4 **Land Use Needs.** The land use information as well as the soil information for each subwatershed is imperative for the Modeling Team to create SWMM watershed models. It was stated that this spatial information is of highest priority for the Modeling Team. The GIS Team does not need to sub-classify all 171 MIRIS classifications. The modeling's software package (Link Watershed Model) will allow them to interactively sub-classify the MIRIS classifications into their needed five or six classifications. The possibility of plotting maps using their defined classification was a concern. The GIS Team does not need to calculate the percentage of pervious areas, this calculation will probably just be populated into the database (from LINK).

Topic #5 **Soil Needs.** The main topic under soils was that the three different counties have their own soil classifications. This is a problem because the soil type classifications between the counties are not on a one to one correspondence. The MIRIS soil coverage contains all three separate coding methods that the counties follow. The Modeling Team needs to associate a hydrologic group and permeability classification with each of the three county soil types, which they will define (for input into the GIS as attributes).

Topic #6 **Possible Applications for the GIS.** The idea of computing the average ground slope in the direction of the main drainage point was discussed along with computing the length of the main drainage channel. These calculations could be done by creating applications to run in the GIS. The Modeling Team stated that they would like us to experiment these ideas within the pilot area (Middle 2 subwatershed). These ideas would be classified as a third priority and the modeling Team will determine if the idea of recalculating the main drainage channel would be worth doing.

Topic #7 **Topography.** The Modeling Team does not need topography data in digital form.

Topic #8 **Sewer/Sanitary.** The Modeling Team is interested in digitized data of combined sewer pipework from the outfalls to the regulators and the interceptor sewers. They are not interested in any other detail of the sewer/sanitary data (excluding the additional drainage system). The Modeling Team educated the GIS Team on the relation of outfall points, interceptors and regulators.

APPENDIX C

APPENDIX C

Notes on Nonpoint Meeting June 15, 1993 at 3:15-4:30 p.m.
Meeting topic: Nonpoint needs of GIS and GIS database.

Attendees: Ellen Taylor
Donna Ryder
Jim Ridgway
Jim Wineka
John O'Meara
Kelly Cave

The meeting started with the GIS matrix of data needs and priorities. It was intended to discuss the data that the Nonpoint Team indicated as their need and to talk about applications or functions they foresee as necessities in the GIS.

Topic #1 **Nonpoint Monitoring Points.** All nonpoint monitoring points should be mapped by location and type of monitoring point. Named types are BMP's (26 at a minimum including wetlands), five air stations, and 30-40 landfill sites. The Nonpoint Team would like this data in separate layers; data from a year must be associated with each monitoring point. It was stated that it would be great if we could highlight high concentrations of certain pollutants of monitoring points.

Topic #2 **Rain Gauges.** Rain gauges need to be mapped with data associated with these points. It was decided that any significant rain storm data would probably be put into the GIS. Some examples of rain data given were: flow, rain, sample time (every 15 minutes), and gauge identification number. The Nonpoint would like to generate histograms comparing the rain and flow data.

Topic #3 **Permitted Facilities.** Permitted facilities were requested to be mapped in the GIS. A list of NPDES, Act 64, Act 641, Act 347, Industrial PreTreatment, air pollution permits, and permitted points was provided. The Nonpoint Team would like to query any of these points for information such as owner, identification number, enforcement authority of point as well as authority of district (basin). It was suggested that color coding be used to shade each polygon area with a different authority.

Topic #4 **Landfills.** Landfill sampling points will be mapped by location with data associated with each sampled point (such as pollutant concentrations).

Topic #5 **Air Pollutants.** Air pollutants (permitted facilities) will be mapped by location.

Topic #6 **Hydrology.** A discussion was held on how to separate hydrology (streams and open drains). There was a concern that the GIS won't have all the different types of

drainage flowing together if we keep the different types in separate coverages. There were four types of drains: open, natural, improved, and enclosed.

Topic #7 **Transportation**. It was noted that an ownership field needs to be added on the transportation network. Examples were: Michigan Department of Transportation (MDOT), Wayne, Oakland, or Washtenaw Counties, and the Detroit Department of Transportation (DDOT).

Topic #8 **Drainage Districts.** It was again stated that the importance of drainage districts and enforcement authorities.

The following are topics or acts that were discussed in terms of enforcement agency association:

- 64
- 136
- 641
- 347
- Air Pollution
- Drinking Water
- Stormwater Management
- Industrial Pre-treatment

APPENDIX D

APPENDIX D

Notes on Sampling Meeting June 28, 1993
Meeting topic: Sampling needs of GIS and GIS database.

Attendees: Ellen Taylor
Donna Ryder
Khalil Atasi
Vyto Kaunelis
Glenn Hummel
Victor Capton
John Foley

The Sampling Team with the help of the Data Management Team, provided an agenda of topics to discuss. The meeting was set to identify data needs and applications that the Sampling Teams could see the GIS supplying.

Topic #1 **Watershed Drainage Areas.** The need for open drain networks is not immediate, and the Sampling Team will wait for the Modeling Team's re-delineated watersheds. It was stated that the CSO drainage areas should be in the GIS and it was also suggested that the communities be contacted for their own versions of drainage areas.

Topic #2 **Storm Sewer Network.** The Sampling Team is concerned only about the outfall points and outfall point flow. The is no need for a sewer network in the near future, but could possibly be needed eight months down the road.

Topic #3 **Combined Sewer Service Areas.** The drainage and service areas were a concern to the Sampling Team; they would like to have these areas included in the GIS.

Topic #4 **Sampling Locations.** All 100 sampling points will be mapped into the GIS. The Sampling Team and the GIS Team will be working together to insert these points into the GIS. Some data fields that were identified are:

- *what source? (point, instream)*
- *method? (auto, grab, continuous)*
- *number of samples*
- *time frame*
- *dates*
- *facility id number*
- *site id number*

The Sampling Team stated that they will be breaking the river into six sections: 1) The Middle Rouge, 2) the Lower Rouge, 3) the Upper Rouge and 4) the Main Rouge with three sections. There will be eighteen continuous sampling points.

It was stated that "**all**" the data needs to be available to "**all**". Besides the sampling locations, the Sampling Team would like to see standard mathematical calculations done and displayed, either in the GIS or some other spreadsheet/database package. (Graphs comparing and connecting different sampling locations was also a concern for all future application.) The idea of overlaying the land use coverage with the sampling data to analyze certain situations, like a nearby landfill was also suggested. The idea of displaying a raster image of a sampling point sketch or drawing when that point is selected was an additional function desired.

Topic #5 **EDM - Progress Data Talk.** The Sampling Team presented the proposed sampling schedule concerning the sampling equipment and data collection. The Sampling Team has received the sampling equipment and are in the process of installing this equipment. Within the next two or three weeks continuous sample data will be collected. The data will be stored on 3 1/2" diskettes and will be in SOLOMAT software format, there was concern about where the diskettes would be stored; it was noted that the Sampling Team will come up with naming and labeling conventions. The lab reports will **all** be in a standardized format in a spreadsheet. It was agreed that once a certain type of data was received from the Sampling Team, they would give the Data Management Team time to experiment and find the best procedure of populating the database or just store the data as well as thoroughly document every step taken to best fulfill this procedure. The Sampling Team supported this front-end procedure with great enthusiasm.

The Sampling Team will be providing the exact field declarations of the sampling data. These maps and standard reports will be established once we get a good grip on all of the data.

Within four to seven weeks the Sampling Team anticipates that all 100 of the stations will be installed. From this point, data would be flowing within two weeks.

There are four different types of sampling points that the Data Management Team will be dealing with:

1. Continuous Monitoring Points - which could have eight to 12 different fields.

2. Instream Automatic Sampler Points - which will create flow data and sampling data. The flow (depth) data will be continuous at approximately 15 minute intervals. The sampling data will be taking on a much broader

basis and will contain up to 40 different data fields. Some of them are: date, time, flow, location and observation notes (invalid, problems).

3. Automatic Point Source Sampler - flow data is not continuous but will have flow records specific to the outfall point.

4. Grab Sampler Point - location varies.

The last three types of sampling points will be in the same format and contain the same data fields. The Data Management Team will be dealing with two different types of data format from the Sampling Team as well as lab reports.