Wayne County Rouge Valley Sewage Disposal System

Service Agreement Renewals

District Characteristics

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Foreword

In 2008, Wayne County began making preparations to negotiate two related service agreements for the Rouge Valley Sewage Disposal System (RVSDS): a new service agreement between Wayne County and the City of Detroit for disposal of wastewater from the RVSDS, and a new service agreement between Wayne County and RVSDS customers for wastewater transport and disposal.

In March of 2009, Wayne County met with RVSDS customers to propose an action plan for negotiating a new service agreement for the RVSDS. The action plan was to include completion of technical analyses in support of the new service agreement and legal negotiations for the terms and conditions of the new service agreement, concurrently.

The technical analyses were to be such that:

- Consistent and high quality data sources would be used to characterize customer communities; and
- A technically sound and equitable method for allocating capacity would be developed and used to determine new contractual capacities.

During the period March 2009 through November 2011, Wayne County completed the technical analyses to support a new service agreement. These analyses are summarized in three related reports:

1. District Characteristics;
2. Allocation of Wastewater Capacity; and
3. District Wastewater Transport Capacity.

Wayne County and RVSDS customers met numerous times during this period to review data, assumptions, and methodologies used in the technical analyses. RVSDS customers were also provided multiple drafts of each document for review and comment.

The capacity allocations that were developed in this set of reports are technically sound and represent fair allocations, based on the then-best available data to Wayne County. Currently, Wayne County and some RVSDS customers have Amended Consent Orders (ACOs) with the Michigan Department of Environmental Quality (MDEQ) that require the study, design and implementation of improvements to reduce sanitary sewer overflow (SSO) discharges. The

capacity allocations that were developed in this set of reports are not intended to solely resolve an ACO or the future occurrence of SSOs by Wayne County or its customers.

Concurrently during the technical review period, Wayne County undertook negotiations with legal representatives of RVSDS customers and the City of Detroit, for a new service agreement for wastewater transport and disposal, respectively. Legal negotiations remain ongoing at this time.

Also, a Short-Term Corrective Action Plan (STCAP) that included pipe lining, pipe grouting, manhole repairs, comfort station work, and a new siphon downstream of Lift Station 1A (LS1A) was being implemented to reduce interceptor system inflow and infiltration (I/I) and improve the transport capacity of the interceptor system.

Monitoring of the STCAP improvements is to be done from July 1, 2012 to June 30, 2013. After the STCAP improvements are evaluated, a Long-Term Corrective Action Plan (LTCAP) is understood to be needed under the ACOs. These LTCAP improvements may include community sewer and interceptor system improvements which may result in recommendations for contractual modifications of flow rates and peak wet weather flow rates.

Currently, further work on developing the technical basis for allocating capacity amongst RVSDS customers has been held in abeyance. It is anticipated that technical analysis will resume when the STCAP improvements are completed and evaluated, the LTCAP analysis is underway, and as agreed to by Wayne County and the RVSDS customers.

This document, titled “District Characteristics,” reflects technical comments from RVSDS customers through November 2011. This document will be finalized, and amended as necessary, as available data is updated and improvements to the RVSDS are completed.

1. EXECUTIVE SUMMARY

In this report, the characteristics of the RVSDS communities were determined for current conditions and estimated for future conditions. These characteristics were used in developing wastewater capacity needs and to fairly allocate the available wastewater capacity among customer communities for a new service agreement.

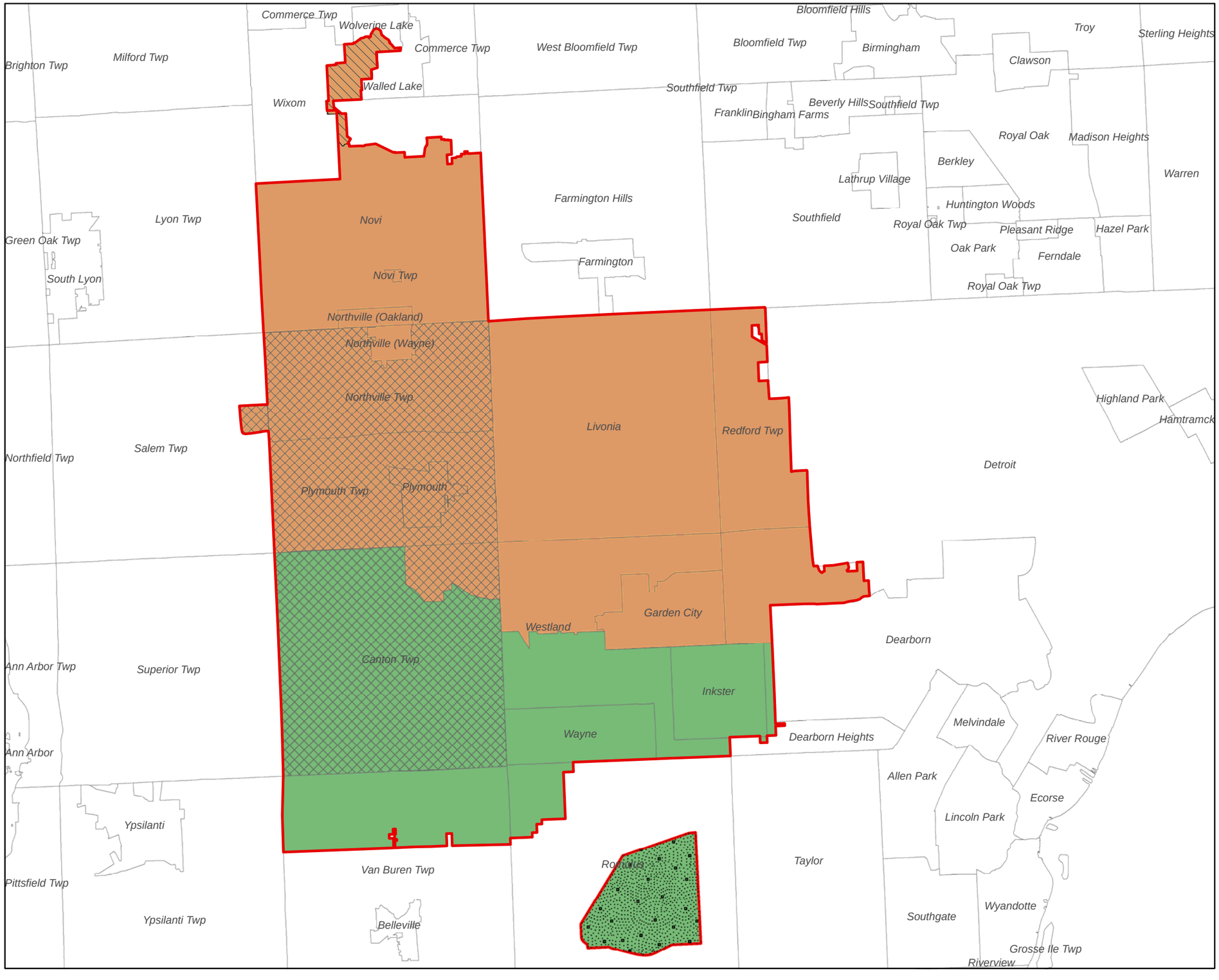
The RVSDS transports wastewater from 14 communities in Wayne County, in 3 communities in Oakland County and 1 community in Washtenaw County (the "District") to the City of Detroit's Wastewater Treatment Plant for treatment and disposal. The purpose of this report is to describe the characteristics of the District and its individual customers. The characteristics tabulated in this report include the District boundary, residential population, employment, housing age, land use, and Significant Industrial Users (SIUs). These data, which were obtained from consistent and high quality sources such as the U.S. Census Bureau, the Detroit Water and Sewerage Department (DWSD) and the Southeast Michigan Council of Governments (SEMCOG), are being used to develop an equitable and technically sound methodology for allocating capacity in the RVSDS among its customers.

The District boundary is shown on Figure 1 and represents the area currently being served by the RVSDS. Table 1 presents a listing of the communities served all or partly by the RVSDS. The City of Novi is located in Oakland County. The Washtenaw County community is Salem Township and is limited to leachate from a landfill.

Table 1

Communities in the District 2011

Community	All or Part
Canton Township	All (flows split)
Commerce Township	Part
Dearborn Heights	Part
Garden City	All
Inkster	All
Livonia	All
Northville	All
Northville Township	All (flows split)
Novi	Part
Plymouth	All
Plymouth Township	All (flows split)
Redford Township	Part
Romulus	Part
Salem Township (landfill)	Part
Van Buren Township	Part (flows split)
Wayne	All
Westland	All
Wolverine Lake	Part



Rouge Valley Sewage Disposal System

N
W E
S

Legend

- District Boundary
- Community Boundaries
- Lower Rouge Service Area
- Middle Rouge Service Area

Areas Splitting Flow:
- WTUA Service Area
- Metro Airport Service Area
- Walled Lake - Novi Diversion Area

Figure 1
District and Community Boundaries

0 0.5 1 2 3 4 Miles

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The District was formed in August 1961 through an agreement between the City of Detroit and Wayne County for transport and treatment of wastewater from the District. An agreement between Wayne County and the customer communities at the time was also made in August 1961 for transport of wastewater from the customer communities to the Detroit wastewater collection system. The agreements between Wayne County and the customer communities were amended in 1983, 1984 and 1988 to adjust contractual capacities, the District boundary, communities served, and to assign cost allocations for interceptor system improvements. All of the service agreements for the RVSDS will expire in August 2011. Wayne County and the City of Detroit currently are negotiating a new agreement for transport and treatment of wastewater from the District. Wayne County has initiated the process of negotiating a new service agreement with customer communities.

In 1988, three communities (Canton, Northville and Plymouth Townships) formed the Western Townships Utility Authority (WTUA). WTUA operates an interceptor system and two equalization basins and also has an agreement for sewage disposal with the Ypsilanti Community Sewer Authority (YCUA). The WTUA communities split their wastewater discharges between the District and the YCUA connections. In the past 4 years, from 29.0% to 47.8% of the wastewater from the WTUA communities has been discharged to the RVSDS.

In 2007, a gated diversion chamber and connection to the RVSDS from the interceptor that delivers wastewater to the Walled Lake Wastewater Treatment Plant was constructed. This diversion is being used to send peak flow rates on an emergency basis to the RVSDS from parts of Novi and Commerce Township and all of Wolverine Lake. The diversion is being intermittently used during high wet weather conditions. However, the Novi flow rate at Meter BG1 has remained below the current contract capacity during recent storm events. Wayne County has requested that Oakland County close this connection. Therefore, the diversion area is not included in the community characteristics.

Table 2 presents a summary of the characteristics of the communities which contribute wastewater flows to the RVSDS. Information is given for the entire WTUA communities. Information is given for the parts of Dearborn Heights, Romulus and Van Buren Township that are within the District boundary. The data for Novi includes Novi Township.

Additional data obtained for each community (e.g., community sewer system data and flow meter data) are presented in the documents “Capacity Allocation Alternatives” and “District Wastewater Transport Capacity” prepared by Wayne County. All of these data are being used to develop an equitable allocation of contractual capacity using a consistent and sound technical basis.

Table 2

Rouge Valley Sewage Disposal System

Summary Data for District

Community	Population			Employment			Housing Units									Year 2000 Land Use Data (acres)						Year 2035	SIU Daily Flow Rate	
							Year 2000			Year 2009			Year 2035												
	Year 2000	Year 2009	Year 2035	Year 2000	Year 2010	Year 2035	Pre-1970	Total	Median Year Built	Pre-1970	Total	Median Year Built	Pre-1970	Total	Median Year Built	Residential	Commercial	Industrial	Institutional	Total Developed	Total in District	Total Developed Land (acres)	1999	2009
Canton Township (2)	76,366	84,672	98,793	26,841	22,319	26,591	3,067	28,418	1983	2,893	34,522	1986	2,893	39,777	1991	8,606	874	883	445	10,809	23,102	12,808	0.15	0.08
Dearborn Heights (1)	37,603	35,933	34,109	9,726	7,291	7,589	13,299	15,577	1959	13,245	15,744	1960	13,245	15,744	1960	3,465	333	43	276	4,117	5,293	4,117	0.04	0.00
Garden City	30,047	27,664	25,546	11,437	8,405	8,114	10,299	11,719	1956	10,266	11,843	1957	10,266	11,843	1957	2,967	254	89	337	3,647	3,751	3,647	0.01	0.01
Inkster	30,115	29,237	25,633	5,788	5,322	6,181	9,656	12,364	1960	9,483	12,396	1961	9,483	12,396	1961	2,448	209	146	312	3,116	4,001	3,116	0.20	0.17
Livonia	100,545	95,269	95,779	105,019	98,090	97,807	26,434	38,655	1965	26,301	39,763	1966	26,301	39,959	1966	12,435	1,980	2,613	1,571	18,599	22,929	18,693	2.21	2.36
Northville	6,459	6,232	6,470	5,909	4,242	4,316	1,440	2,786	1963	1,400	2,843	1964	1,400	2,946	1966	852	76	57	26	1,011	1,318	1,048	0.00	0.01
Northville Township (2)	21,036	26,853	34,192	6,908	7,105	7,479	1,747	8,479	1981	1,700	11,805	1987	1,700	14,763	1994	3,536	266	78	510	4,390	10,596	5,922	0.01	0.11
Novi (1)	38,457	43,963	56,415	28,025	31,840	41,710	1,697	14,694	1984	1,618	18,446	1988	1,618	23,251	1995	5,958	938	1,186	0	8,083	16,616	10,727	0.32	0.08
Plymouth	9,022	8,676	9,181	8,237	9,329	9,353	3,547	4,556	1955	3,524	4,862	1958	3,524	5,117	1962	796	208	114	93	1,211	1,417	1,211	0.05	0.05
Plymouth Township (2)	27,798	26,800	29,915	24,569	23,505	22,501	4,183	10,984	1975	4,121	11,646	1977	4,121	12,877	1981	4,475	411	1,115	304	6,305	10,242	7,012	0.41	0.31
Redford Township (1)	50,340	47,380	44,553	18,468	15,088	16,015	18,812	19,971	1954	18,747	20,142	1954	18,747	20,142	1954	4,547	537	520	473	6,078	7,054	6,078	0.15	0.09
Romulus (1)	2,331	2,460	2,740	2,364	2,462	2,676	142	833	1995	124	946	1996	124	1,072	1999	311	14	428	0	753	1,712	868	0.52	0.70
Van Buren Township (1)	5,004	5,895	8,216	5,738	7,559	7,592	607	1,991	1978	598	2,628	1984	598	3,727	1995	1,010	54	538	65	1,667	8,001	2,587	0.02	0.04
Wayne	19,051	18,054	17,214	19,051	16,070	15,739	5,753	7,655	1959	5,721	7,822	1960	5,721	7,822	1960	1,483	247	773	329	2,832	3,852	2,832	2.01	3.19
Westland	86,602	82,281	87,088	27,069	26,383	28,002	21,844	37,723	1968	21,748	39,093	1969	21,748	41,187	1972	7,190	1,082	542	842	9,656	13,085	10,192	0.15	0.13
Totals	540,776	541,369	575,843	305,149	285,010	301,665	122,527	216,403	1968	121,489	234,500	1971	121,489	252,623	1974	60,081	7,484	9,125	5,583	82,273	132,968	90,856	6.26	7.33
WTUA Totals	125,200	138,325	162,900	58,318	52,929	56,571	8,997	47,881	1981	8,714	57,973	1985	8,714	67,417	1990	16,617	1,551	2,077	1,260	21,504	43,940	25,746	0.57	0.50

Sources:

A) Year 2000 Population was obtained from the U.S. Bureau of the Census, Census 2000, Block Group Data.
B) SEMCOG, Community Profiles for Southeast Michigan, July 2009.
C) SEMCOG, 2035 Regional Forecast.
D) U.S. Bureau of the Census, Profile of Selected Housing Characteristics: Census 2000.
E) SEMCOG 2000 Regional Land Use Coverage.
F) DWSD Wastewater Master Plan Vol. 1: Planning Criteria, prepared by CDM, October 2003.
G) DWSD SIU list with permitted daily flow rate data, December 2009.

Notes:

1) Information is given for the part of the community within the District excluding the Walled Lake-Novi Diversion area.
2) Canton Township, Plymouth Township and Northville Township are the WTUA communities.
3) District boundary verified by participating communities.
4) Walled Lake-Novi Diversion area is an intermitten relief connection to RVSDS therefore these areas have been excluded from the totals for community characteristics.
5) The Land Use Summary by Line Connection table in the District Wastewater Transport Capacity Memo has slightly different community totals than what are shown here. The differences are due to the removal of open space areas. The totals given above are the most accurate for the full community.

2. DISTRICT BOUNDARY

The District is served by two Wayne County interceptor systems. The Middle Rouge Interceptor system runs along the Middle Branch of the Rouge River from Northville to Dearborn and serves parts of Canton Township, Dearborn Heights, Novi, Commerce Township, Wolverine Lake, Redford Township, Salem Township and Westland and all of Garden City, Livonia, Plymouth, Plymouth Township, Northville, and Northville Township. The Lower Rouge Interceptor system runs along Michigan Avenue and the Lower Branch of the Rouge River from Canton Township to Dearborn. It serves parts of Canton Township, Dearborn Heights, Romulus, Westland and Van Buren Township and all of Inkster and Wayne. The sewer service areas of Canton Township, Dearborn Heights and Westland are split between the two interceptor systems.

Figure 1 depicts the District boundary, along with the Lower and Middle Rouge Interceptor system service areas. The District includes 132,968 acres of land in the communities, 4819 acres of land at the Wayne County-Detroit Metropolitan Airport and 651 acres of land in the Walled Lake–Novi diversion area. Therefore, the total acreage of land tributary all or in part to the RVSDS is 138,438 acres of land.

The District boundary shown in Figure 1 was developed by refining the District boundary presented in the Detroit Water and Sewerage Department (DWSD) 2003 Wastewater Master Plan map given in Appendix A. Additional historic District boundary maps are also included as references in Appendix A. Refinements to the boundary shown in the DWSD Master Plan were made based on information from the 2003 Greater Detroit Regional Sewer System (GDRSS) Storm Water Management Model (SWMM) tributary area map. Additionally, the District boundary was updated for Dearborn Heights, Novi, Redford Township, Romulus, Salem Township, and Van Buren Township, based on community provided current service areas and master planned service areas.

Novi Township is not currently a customer of the RVSDS. The City of Novi's sewer system, however, was designed to transport flows from the sixty-six homes in the Township currently served on onsite sewage disposal (septic) systems, if needed. The City of Novi community characteristics presented in this document therefore includes Novi Township.

Salem Township in Washtenaw County historically has not been served by the RVSDS. The Veolia Environmental Services-Arbor Hills West Landfill, which is in Salem Township along the border with Northville Township, currently discharges its leachate through Northville Township to the RVSDS. This area is shown within the District boundary. However, data for Salem Township is not included in the analysis of District characteristics as the discharge is treated as an industrial contribution to the RVSDS.

There are three areas in the District where wastewater is discharged to both the RVSDS and to other wastewater systems. They are:

- the three WTUA communities;
- the Walled Lake-Novi Diversion area; and
- Wayne County-Detroit Metropolitan Airport.

For the WTUA communities, wastewater is equalized at two basins and discharged to both the RVSDS and to YCUA. The amounts discharged to each system vary depending on weather conditions and operational factors. Therefore, the WTUA communities are included in their entirety within the District boundary for the RVSDS.

Wastewater from the Walled Lake-Novi Diversion area which includes portions of Novi, Commerce Township and Wolverine Lake normally flows to the Walled Lake Wastewater Treatment Plant. There is a connection to the RVSDS through a relief outlet that includes a gate valve operated by the Oakland County Water Resources Commissioner. The connection is used during high flow conditions on an emergency basis. The gate valve was opened during storm events in March 2009, April 2009 and June 2010. The flow rate for Novi measured at Meter BG1 did not exceed the current contract capacity during these events. Wayne County has requested that Oakland County close this connection.

Wastewater from the Wayne County-Detroit Metropolitan Airport, which is operated by the Wayne County Airport Authority (WCAA), is currently discharged to the Wayne County Downriver Sewage Disposal System. In 2009, Wayne County and the WCAA executed an agreement so that WCAA can discharge up to 1 MGD (1.55 cfs) of spent aircraft deicing fluid mixed with storm water to the RVSDS as an alternative outlet for proper disposal when conditions do not allow the WCAA to discharge into the Downriver Sewage Disposal System. The agreement provides for discharge into the RVSDS only during dry weather conditions. WCAA's new outlet to the RVSDS is currently under construction. The Airport covers about 4819 acres. This area is not included in the District characteristics since the only wastewater contribution will be the deicing fluid. The discharge is considered an institutional contribution to the RVSDS.

3. SERVICE AREA CHARACTERISTICS

This section describes the sources of the data and the characteristics of the District excluding Walled Lake-Novi Diversion area and the Wayne County-Detroit Metropolitan Airport. District population and housing information were obtained from the U.S. Bureau of Census (American Fact Finder website, http://factfinder.census.gov/home/saff/main.html). The most recent data available are from the year 2000 Census, and both "100%" data sets and "sample" data sets were obtained and analyzed. Table 3 summarizes the Census 2000 data availability for the RVSDS.

Table 3 Census 2000 Data Availability							
Parameter Name	Census ID	Data Availability					
		Tract		Block Group		Block	
		100 % Data	Sample Data	100 % Data	Sample Data	100 % Data	Sample Data
Population	P1	√	NA	√	NA	√	NA
Housing Units	H1	√	NA	√	NA	√	NA
Housing Units per structure	H30	NA	√	NA	√	NA	NA
Year Structure Built	H34	NA	√	NA	√	NA	NA
Median Year Structure Built	H35	NA	√	NA	√	NA	NA

The 100% data sets are derived from the surveys given to every household. The more detailed sample data sets contain information from surveys given to about 1/6th of the households. The Census data are also available for different geographical subdivisions: Nation, State, County, Minor Civil Division (City or Township), Tract, Block Group and Block.

Electronic geographic ("shape") files for tracts, block groups and blocks were downloaded from the Topologically Integrated Geographic Encoding and Referencing system (TIGER) from the following website: http://www.census.gov/geo/www/tiger/. These files were used as a basis to calculate population and housing information. The Table DP-4 Profile of Selected Housing Characteristics: 2000, was downloaded for each community.

The Southeast Michigan Council of Governments (SEMCOG) website provided several useful reports including: Population and Household Estimates for Southeast Michigan, July 2009; Historical Population and Employment by Minor Civil Division, Southeast Michigan, June 2002; and Community Profiles for Southeast Michigan, July 2009. In addition to these reports, the year 2000 Regional Land Use shape and data files and the U.S. Bureau of Census, Census 2000, MCD/County–to–MCD/County Worker Flow data files were obtained.

As previously discussed, wastewater from the WTUA communities is equalized and discharged to both the YCUA system and the RVSDS. The split of the wastewater between the systems varies daily depending on weather conditions and other factors. The WTUA communities do not have areas that are dedicated to either system. Therefore, the characteristics for the entire WTUA communities are given in this memorandum.

a) Population

Table 4 details the year 2000 residential population in the District for each of the communities. Arc Map 9.3 software was used to overlay the District boundary, community boundaries and year 2000 census block group boundaries. For block groups that were divided by community boundaries, population density for the block group was used to split the population for each community. As previously noted the population of Novi Township is included in the population of the part of the City of Novi in the District.

Table 4

Existing and Projected Residential Population in District

Community	Year 2000 Census Population	Year 2009 SEMCOG Estimated Population	Year 2015 SEMCOG Projected Population	Year 2025 SEMCOG Projected Population	Year 2035 SEMCOG Projected Population
Canton Township	76,366	84,672	86,548	90,200	98,793
Dearborn Heights (1)	37,603	35,933	34,060	34,155	34,109
Garden City	30,047	27,664	26,388	26,255	25,546
Inkster	30,115	29,237	26,970	25,805	25,633
Livonia	100,545	95,269	94,819	94,588	95,779
Northville	6,459	6,232	6,348	6,398	6,470
Northville Township	21,036	26,853	27,109	30,071	34,192
Novi (1)	38,457	43,963	45,461	50,182	56,415
Plymouth	9,022	8,676	8,815	9,150	9,181
Plymouth Township	27,798	26,800	27,667	28,584	29,915
Redford Township (1)	50,340	47,380	45,095	44,248	44,553
Romulus (1)	2,331	2,460	2,306	2,434	2,740
Van Buren Township (1)	5,004	5,895	6,025	6,634	8,216
Wayne	19,051	18,054	17,620	17,303	17,214
Westland	86,602	82,281	84,929	85,909	87,088
Totals	540,776	541,369	540,160	551,916	575,843
WTUA Totals	125,200	138,325	141,324	148,855	162,900

(1) Information is given for the part of the community within the District

The population estimates for year 2009 and projections through year 2035 are also given in Table 4 for each District community. These population estimates were taken from the SEMCOG, Population and Household Estimates for Southeast Michigan, July 2009.

Dearborn Heights, Novi, Redford, Romulus and Van Buren Township are only partially in the District. For these communities, population estimates for the District for year 2009 and projections for future years were calculated using the percentage of the year 2000 population within the District. The population breakdown to the block group level was used. The percentage factors are shown in Table 5 for communities that are partly within the District.

Table 5

Data for Communities Partially Within District

Community	Dearborn Heights	Novi & Novi Township	Redford	Romulus	Van Buren Township
Year 2000 Residential Population	58,264	47,579	51,622	22,979	23,559
Year 2000 Estimated Residential Population in District	37,603	38,457	50,340	2,331	5,004
Population within District	64.5%	80.8%	97.5%	10.1%	21.2%
Year 2000 Residential Area (acres)	5,154	7,128	4,654	3,435	4,368
Year 2000 Residential Area in District (acres)	3,465	5,958	4,547	311	1,010
Residential Area within District	67.2%	83.6%	97.7%	9.1%	23.1%
Year 2000 Commercial, Industrial and Institutional Area (acres)	1,061	2,652	1,548	8,108*	1,214
Year 2000 Commercial, Industrial and Institutional Area in District (acres)	652	2,124	1,531	491*	656
Commercial, Industrial and Institutional Area within District	61.5%	80.1%	98.9%	6.1%	54.1%
Total Community Area (acres)	7,529	20,081	7,196	23,009	23,080
Area within District (acres)	5,293	16,616	7,054	1,712	8,001
Land Area within District	70.3%	82.7%	98.0%	7.4%	34.7%
Total Community Housing Units	23,913	19,657	20,605	8,943	10,422
Housing Units in District	15,577	14,694	19,971	833	1,991
% of Housing in District	65.1%	74.8%	96.9%	9.3%	19.1%

*Transportation Area was included for Romulus.

b) Employment

The employment numbers for the District are provided in Table 6. Employment information was taken from SEMCOG, Community Profiles for Southeast Michigan, July 2009, and the SEMCOG 2035 Regional Forecast. The employment in the District in Dearborn Heights, Novi, Redford, Romulus and Van Buren Township were estimated by using the percentage of commercial, industrial and institutional land area in the District to the total commercial, industrial and institutional land area in the community. The commercial, industrial and institutional land area is the portion of the developed area that is non-residential. The percentage of non-residential land area in the District for these communities is presented in Table 5.

SEMCOG estimated the employment in each community for the years 2000 and 2005 using the U. S. Bureau of Economic Analysis (BEA) data that is based on the number of people for whom unemployment tax is paid. The forecasted employment numbers for 2010 through 2035 are derived by SEMCOG from data provided to them by the University of Michigan. These data exclude farming, construction, military and the self-employed.

Table 6

Employment and Projected Employment

Community	Year 2000	Year 2005	Year 2010	Year 2015	Year 2020	Year 2025	Year 2030	Year 2035
Canton Township	26,841	21,733	22,319	23,573	24,467	25,041	25,701	26,591
Dearborn Heights (1)	9,726	7,129	7,291	7,489	7,610	7,591	7,559	7,589
Garden City	11,437	8,342	8,405	8,407	8,376	8,273	8,149	8,114
Inkster	5,788	5,052	5,322	5,660	5,886	6,023	6,074	6,181
Livonia	105,019	100,537	98,090	94,346	94,994	95,857	96,681	97,807
Northville	5,909	4,246	4,242	4,348	4,412	4,351	4,314	4,316
Northville Township	6,908	6,874	7,105	7,328	7,438	7,426	7,419	7,479
Novi (1)	28,025	29,209	31,840	33,688	35,971	38,070	39,769	41,710
Plymouth	8,237	9,518	9,329	9,360	9,382	9,299	9,273	9,353
Plymouth Township	24,569	25,261	23,505	22,918	22,930	22,578	22,406	22,501
Redford Township (1)	18,468	15,390	15,088	15,367	15,634	15,715	15,836	16,015
Romulus (1)	2,364	2,513	2,462	2,491	2,558	2,587	2,617	2,676
Van Buren Township (1)	5,738	8,000	7,559	7,498	7,578	7,543	7,544	7,592
Wayne	19,051	16,992	16,070	15,843	15,976	15,904	15,763	15,739
Westland	27,069	25,881	26,383	27,185	27,776	27,763	27,802	28,002
Total	305,149	286,676	285,010	285,501	290,988	294,021	296,907	301,665
Total WTUA	58,318	53,868	52,929	53,819	54,835	55,045	55,526	56,571

(1) Information is given for the part of the community within the district.

c) Housing Units

The age of housing unit data for the District is shown in Table 7 for year 2000. The number and age of housing units in each community were derived from the U.S. Bureau of the Census, Profile of Selected Housing Characteristics: Census 2000 Report. Percentages of population in the District, from Table 5 were used to estimate number of housing units in the District for Dearborn Heights, Novi, Romulus and Van Buren Township. Novi Township is included in the part of the City of Novi within the District. Homes built before 1970 likely have footing drains connected to the sanitary sewer system.

Table 7

Year 2000 Age of Housing Units in District

Community	1939 & Earlier	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	1990-After	Total Pre-1970	Total	% Built Before 1970	Median Year Built
Canton Township	311	315	770	1,672	11,688	4,426	9,236	3,067	28,418	10.8%	1983
Dearborn Heights (1)	629	1,440	7,204	4,026	1,220	672	386	13,299	15,577	85.4%	1959
Garden City	637	1,349	6,589	1,724	1,032	181	207	10,299	11,719	87.9%	1956
Inkster	945	1,466	4,368	2,877	2,058	340	310	9,656	12,364	78.1%	1960
Livonia	1,542	2,203	12,187	10,503	5,563	3,747	2,910	26,434	38,655	68.4%	1965
Northville	630	95	310	405	499	597	250	1,440	2,786	51.7%	1963
Northville Township	227	211	405	904	2,367	2,196	2,169	1,747	8,479	20.6%	1981
Novi (1)	179	91	675	752	4,446	4,075	4,476	1,697	14,694	11.5%	1984
Plymouth	1,226	455	957	909	444	379	186	3,547	4,556	77.9%	1955
Plymouth Township	383	402	1,118	2,280	2,754	1,731	2,316	4,183	10,984	38.1%	1975
Redford Township	1,310	3,471	12,154	1,876	712	176	271	18,812	19,971	94.2%	1954
Romulus (1)	44	31	35	32	25	18	648	142	833	17.1%	1995
Van Buren Township (1)	155	146	152	155	500	444	439	607	1,991	30.5%	1978
Wayne	851	1,459	2,167	1,277	1,156	336	410	5,753	7,655	75.2%	1959
Westland	1,147	2,519	9,386	8,793	7,056	4,061	4,762	21,844	37,723	57.9%	1968
Total	10,215	15,653	58,476	38,183	41,520	23,379	28,815	122,496	216,201	56.7%	1968
WTUA Total	921	928	2,293	4,856	16,809	8,353	13,722	8,997	47,881	18.8%	1981
District - WTUA - Novi	9,115	14,634	55,509	32,576	20,265	10,951	10,617	111,802	153,627	72.8%	1962

(1) Information is given for the part of the community within the District.

Table 8 presents an update of the housing unit data for year 2009. The SEMCOG, Residential Building Permits, 2000-2009 report summarizes the building and demolition permits issued by communities. These data were used to estimate the housing unit data for the District for year 2009. The housing units that were demolished were assumed to be built in the median year for year 2000 in the update.

Table 8

Year 2009 Age of Housing Units in District

Community	2000				2009					
	Pre-1970 Housing Units	Total Housing Units	% Pre-1970	Median Year Built	Building Permits 2000-2009	Demo-litions 2000-2009	Pre-1970 Housing Units	Total Housing Units	% Pre-1970	Median Year Built
Canton Township	3,067	28,418	10.8%	1983	6,278	174	2,893	34,522	8.4%	1986
Dearborn Heights (1)	13,299	15,577	85.4%	1959	222	54	13,245	15,744	84.1%	1960
Garden City	10,299	11,719	87.9%	1956	157	33	10,266	11,843	86.7%	1957
Inkster	9,656	12,364	78.1%	1960	205	173	9,483	12,396	76.5%	1961
Livonia	26,434	38,655	68.4%	1965	1,241	133	26,301	39,763	66.1%	1966
Northville	1,440	2,786	51.7%	1963	97	40	1,400	2,843	49.2%	1964
Northville Township	1,747	8,479	20.6%	1981	3,373	47	1,700	11,805	14.4%	1987
Novi (1)	1,697	14,694	11.5%	1984	3,831	79	1,618	18,446	8.8%	1988
Plymouth	3,547	4,556	77.9%	1955	329	23	3,524	4,862	72.5%	1958
Plymouth Township	4,183	10,984	38.1%	1975	724	62	4,121	11,646	35.4%	1977
Redford Township	18,812	19,971	94.2%	1954	236	65	18,747	20,142	93.1%	1954
Romulus (1)	142	833	17.1%	1995	130	18	124	946	13.1%	1996
Van Buren Township (1)	607	1,991	30.5%	1978	646	9	598	2,628	22.8%	1984
Wayne	5,753	7,655	75.2%	1959	199	32	5,721	7,822	73.1%	1960
Westland	21,844	37,723	57.9%	1968	1,466	96	21,748	39,093	55.6%	1969
District Total	122,527	216,403	56.6%	1968	19,135	1,038	121,489	234,500	51.8%	1971
WTUA Total	8,997	47,881	18.8%	1981	10,375	283	8,714	57,973	15.0%	1985
District -WTUA - Novi	111,834	153,829	72.7%	1962	4,929	676	111,158	158,082	70.3%	1963

(1) Information is given for the part of the community within the District.

Table 9 presents an update of the housing unit data for year 2035. The population estimates as shown in Table 4 were taken from SEMCOG, Population and Household Estimates for Southeast Michigan, July 2009. The 2035 population estimates were used to estimate the number of new housing units assuming a District-wide average of 2.3 persons per housing unit. Housing density for each community was then used to project the new developed area for year 2035. The housing units that were added were assumed to be built in the year 2022 in the update for year 2035. Communities with a negative population change were assumed to have zero growth.

Table 9

Year 2035 Age of Housing Units in District

Community	New Housing Units Since 2009	Total Housing Units	Median Year Built	Developed Area (acres)
Canton Township	5,255	39,777	1991	12,808
Dearborn Heights (1)	0	15,744	1960	4,117
Garden City	0	11,843	1957	3,647
Inkster	0	12,396	1961	3,116
Livonia	196	39,959	1966	18,693
Northville	103	2,946	1966	1,048
Northville Township	2,958	14,763	1994	5,922
Novi (1)	4,806	23,251	1995	10,727
Plymouth	255	5,117	1962	1,211
Plymouth Township	1,231	12,877	1981	7,012
Redford Township	0	20,142	1954	6,078
Romulus (1)	127	1,072	1999	868
Van Buren Township (1)	1,099	3,727	1995	2,587
Wayne	0	7,822	1960	2,832
Westland	2,094	41,187	1972	10,192
District Total	18,123	252,623	1974	90,856
WTUA Total	9,444	67,417	1990	25,746
District -WTUA - Novi	3,873	161,955	1965	54,384

(1) Information is given for the part of the community within the District.

d) On-Site Sewage Disposal Systems

Table 10 shows the percentage of housing units on public sewer as reported in the 1990 Census. The remainder of the housing units are assumed to be served by on-site sewage disposal systems. Note that the percentage of housing units on public sewer were not included in the 2000 Census. Canton Township, Northville, Northville Township, Novi, Plymouth Township, Van Buren Township and Romulus have a significant percentage of housing units not served by public sewer. Van Buren Township and Romulus are only partially in the District and have a relatively small number of housing units tributary to the RVSDS.

Dearborn Heights provided an actual count of 12 housing units served by septic systems and that number was used. Novi estimated that about 95% of the housing units in the District were within 100 feet of a public sewer. However, this was not considered a complete survey of housing units on public sewer.

For each community, the number of housing units served by on-site sewage disposal systems was calculated using 1990 Census data and these numbers were assumed to remain constant with time. All housing units built after 1990 were assumed to be served by public sewer. Updated percentages of housing units on public sewer were then calculated for years 2009 and 2035.

Table 10

On-Site Sewage Disposal Systems

Community	1990			2009				2035	
	Housing Units in Community	Census Percentage on Public Sewer	Estimated Homes Served by On-Site Sewage Disposal Systems in Community	Year 2000 Census Percentage of Housing Units in District to Total for Community	Estimated Homes Served by On-Site Sewage Disposal Systems in District	Year 2009 Housing Units in District	Year 2009 Estimated Percentage of Housing Units on Public Sewer	2035 Housing Units in District	Year 2035 % on Public Sewer
Canton Township	20,309	94.1%	1198	100.0%	1,198	34,522	96.5%	39,777	97.0%
Dearborn Heights (1)	23,939	99.8%	48	65.1%	12	15,744	99.9%	15,744	99.9%
Garden City	11,374	99.7%	34	100.0%	34	11,843	99.7%	11,843	99.7%
Inkster	12,045	99.3%	84	100.0%	84	12,396	99.3%	12,396	99.3%
Livonia	36,641	99.2%	293	100.0%	293	39,763	99.3%	39,959	99.3%
Northville	2,583	95.9%	106	100.0%	106	2,843	96.3%	2,946	96.4%
Northville Township	6,518	85.7%	932	100.0%	932	11,805	92.1%	14,763	93.7%
Novi	13,557	87.4%	1708	74.8%	1,277	18,446	93.1%	23,251	94.5%
Plymouth	4,528	99.9%	5	100.0%	-	4,862	100.0%	5,117	100.0%
Plymouth Township	9,219	94.8%	479	100.0%	479	11,646	95.9%	12,877	96.3%
Redford Township	20,451	99.4%	123	96.9%	119	20,142	99.4%	20,142	99.4%
Romulus	8,212	94.3%	468	9.3%	33	946	96.5%	1,072	96.9%
Van Buren Township	8,430	86.1%	1172	19.1%	224	2,628	91.5%	3,727	94.0%
Wayne	7,325	99.7%	22	100.0%	22	7,822	99.7%	7,822	99.7%
Westland	34,514	99.2%	276	100.0%	276	39,093	99.3%	41,187	99.3%
Total	219,645	96.8%	6948	94.4%	6,559	234,500	97.2%	252,623	97.4%
WTUA Total	36,046	92.8%	2,610	100.0%	2,610	57,973	95.5%	67,417	96.1%
District - WTUA - Novi	170,042	98.5%	2,631	92.8%	2,441	158,082	98.5%	161,955	98.5%

1) Dearborn Heights, Romulus and City of Plymouth provided data for housing units on septic within the District.

e) Land Use

A map of the year 2000 land use is provided on Figure 2 and the land use breakdown is given in Table 11 for the area of each community in the District excluding the landfill in Salem Township and the Walled Lake-Novi diversion area. The SEMCOG 2000 Regional Land Use shape and data files were overlaid with the District and community boundaries to determine the land use breakdown for year 2000. The land use for Dearborn Heights, Novi, Romulus and Van Buren Township is shown for the portions of these communities within the District. The District contains 132,968 acres, with about 82,273 acres of developed land and 50,695 acres of undeveloped land. There are 60,081 acres of residential property in the District which is 73% of the total developed land area.

Table 11
Rouge Valley Sewage Disposal System
Year 2000 Land Use (acres)

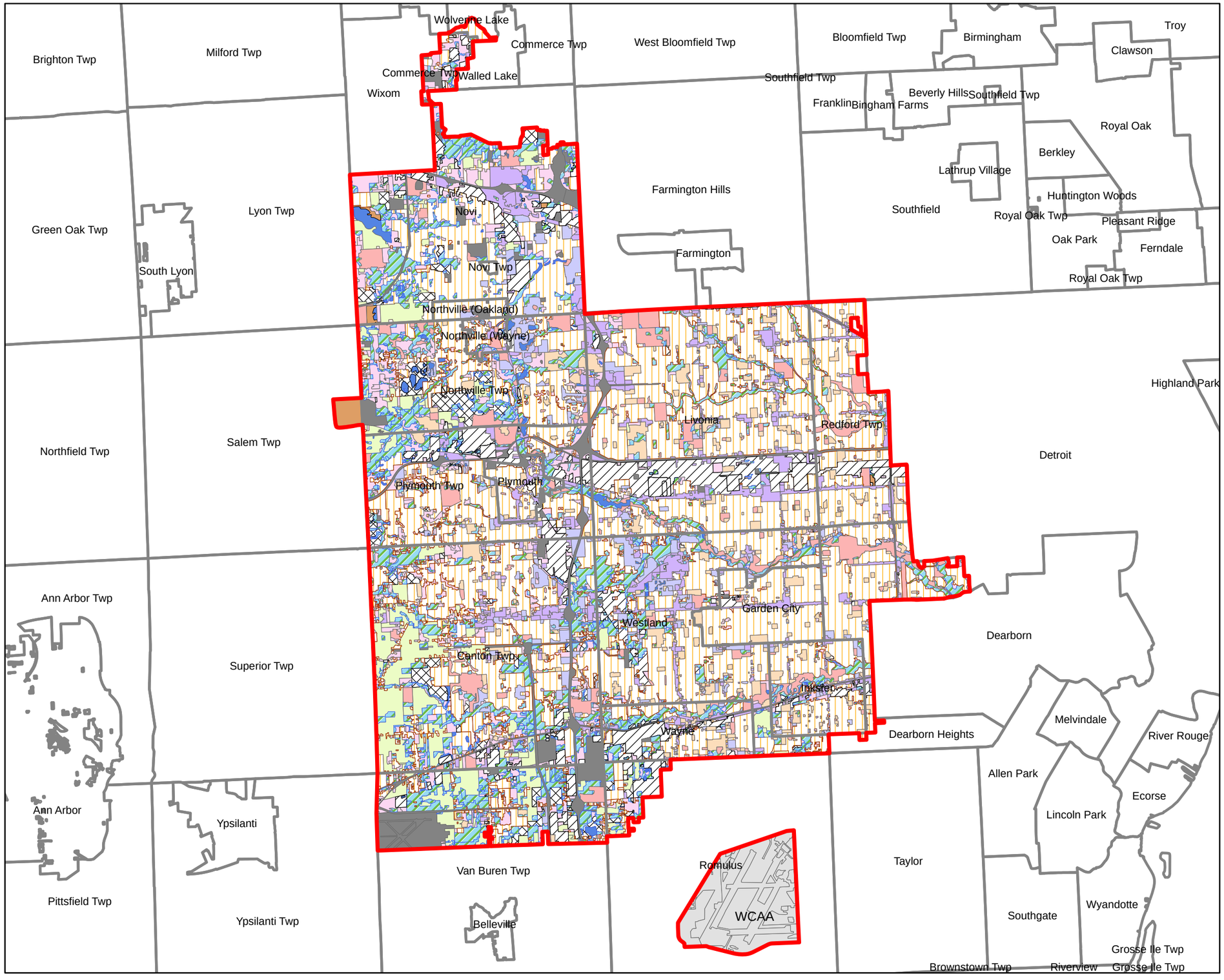
Community	Residential			Non-Residential					Under Development	Active Agriculture	Grassland and Shrub	Woodland and Wetland	Mining	Water	Developed Land	Acres in District
	Single Family	Multiple Family	Total Residential	Commercial and Office	Industrial	Institutional	Transportation and Utility	Parks and Cemetery								
Canton Township	7,802	804	8,606	874	883	445	1,182	769	650	3,310	2,786	3,502	0	95	10,809	23,102
Dearborn Heights (1)	3,335	129	3,465	333	43	276	92	613	12	0	82	377	0	0	4,117	5,293
Garden City	2,926	41	2,967	254	89	337	17	20	0	0	67	0	0	0	3,647	3,751
Inkster	2,289	159	2,448	209	146	312	57	274	4	2	205	341	0	2	3,116	4,001
Livonia	12,035	400	12,435	1,980	2,613	1,571	588	1,257	134	28	538	1,684	0	101	18,599	22,929
Northville	758	94	852	76	57	26	74	113	0	1	21	86	0	12	1,011	1,318
Northville Township	3,005	531	3,536	266	78	510	245	683	841	634	1,494	2,006	0	304	4,390	10,596
Novi (1)(2)	5,331	627	5,958	938	1,186	0	1,252	581	510	1,057	2,250	2,396	130	357	8,083	16,616
Plymouth	725	72	796	208	114	93	46	50	0	0	24	77	0	9	1,211	1,417
Plymouth Township	4,196	278	4,475	411	1,115	304	609	365	228	224	1,173	1,269	0	68	6,305	10,242
Redford Township (1)	4,505	42	4,547	537	520	473	210	511	0	0	57	181	17	0	6,078	7,054
Romulus (1)	311	0	311	14	428	0	49	0	113	208	205	369	0	15	753	1,712
Van Buren Township (1)	982	28	1,010	54	538	65	1,711	149	362	1,424	790	1,851	0	48	1,667	8,001
Wayne	1,349	134	1,483	247	773	329	96	140	32	0	130	623	0	0	2,832	3,852
Westland	6,224	966	7,190	1,082	542	842	84	614	28	287	472	1,902	0	42	9,656	13,085
Total	55,774	4,307	60,081	7,484	9,125	5,583	6,311	6,139	2,916	7,174	10,293	16,663	147	1,051	82,273	132,968
WTUA Total	15,003	1,614	16,617	1,551	2,077	1,260	2,037	1,816	1,719	4,167	5,453	6,777	0	467	21,504	43,940

Source: SEMCOG 2000 Regional Land Use Coverage.

Notes:

1) Data for the portions of these communities within the District were derived from the SEMCOG 2000 Regional Land Use Map and the Rouge Valley District boundary.
2) Novi Township is included in the part of the City of Novi within the District.
3) Canton Township, Plymouth Township and Northville Township are the WTUA Communities

Rouge Valley Sewage Disposal System



Legend

- District Boundary
- Community Boundary
- Active Agriculture
- Commercial and Office
- Cultural, Outdoor Recreation
- Extractive
- Grassland and Shrub
- Industrial
- Institutional
- Mixed Use
- Multiple-Family Residential
- Residential with 25% or more vacant land
- Single Family Residential
- Transportation
- Under Development
- Water
- Woodland and Wetland

N W E S

Figure 2
2000 Land Use Map

0 0.5 1 2 3 4 Miles

Prepared By:

Applied Science, Inc.

f) Significant Industrial User (SIU)

The permitted average daily flow rates for SIUs in the District for years 1999 and 2009 are shown in Table 12. The 1999 SIU information for the District was taken from Table 5.13 in the DWSD Wastewater Master Plan (2003). For 2009, a listing of all SIU permit holders and the permitted average daily flow rates was provided by the DWSD Industrial Waste Control Division. These data were first sorted by address, then geographically located to determine in which community they reside. A summary of each SIU permit holder within each community is given in Appendix B. It is important to note that some institutions, such as hospitals, are permitted SIUs.

Table 12

Permitted Average Daily SIU Flow Rate by Community

Community	1999 Average Daily SIU Flow Rate (cfs)	2009 Average Daily SIU Flow Rate (cfs)
Canton Township	0.15	0.08
Dearborn Heights	0.04	0.00
Garden City	0.01	0.01
Inkster	0.20	0.17
Livonia	2.21	2.36
Northville	0.00	0.01
Northville Township	0.01	0.11
Novi	0.32	0.08
Plymouth	0.05	0.05
Plymouth Township	0.41	0.31
Redford Township	0.15	0.09
Romulus	0.52	0.70
Van Buren Township	0.02	0.04
Wayne	2.01	3.19
Westland	0.15	0.13
Total	6.26	7.33

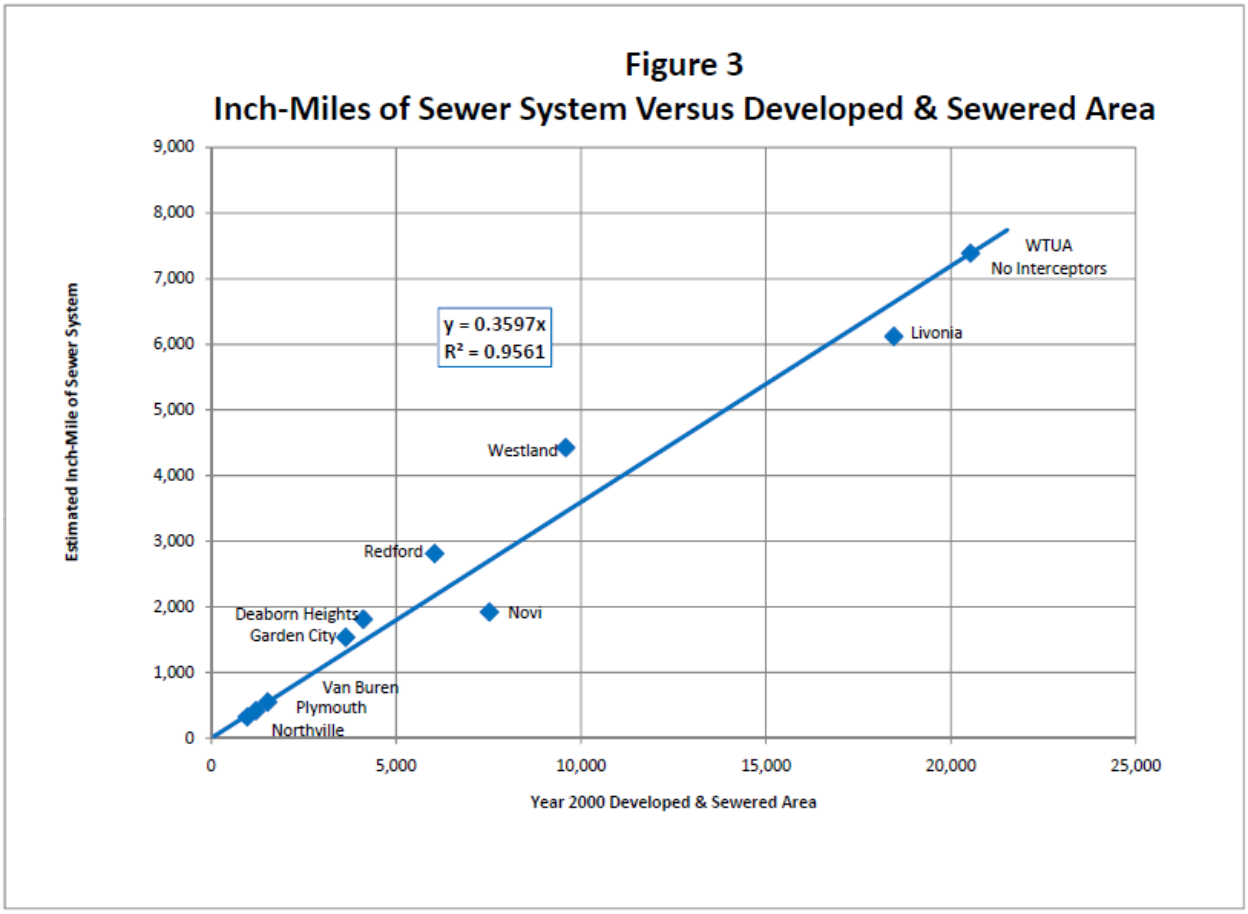
g) Inch – Miles of Sewer

The inch – miles of the community sewers and WTUA interceptors tributary to the Rouge Valley Sewage Disposal System, and of the Wayne County interceptor system itself are estimated on Table 13. Most of the communities provided these data or a GIS coverage that was used to develop the data. The inch-miles versus developed area for each community are plotted on Figure 3.

Table 13

Inch – Miles of Sewer by Community for Year 2010

Customer	Estimated % Served by Public Sewer	Year 2000 Developed Area in District (acres)	Year 2000 Developed and Sewered Area in District (acres)	Total Area in District (acres)	# Manholes	Length of Sewers (miles)	Inch-Miles of Sewer
Dearborn Heights	99.9%	4,117	4,114	5,293	3,500	139	1,811
Garden City	99.7%	3,647	3,637	3,751	1,928	99	1,536
Livonia	99.3%	18,599	18,462	22,929	9,855	442	6,122
Northville	96.3%	1,011	973	1,318	700	31	323
Novi	93.1%	8,083	7,523	16,616	4,860	183	1,922
Plymouth	100.0%	1,211	1,211	1,417	767	35	417
Redford Township	99.4%	6,078	6,042	7,054	3,348	153	2,813
Van Buren Township	91.5%	1,667	1,525	8,001	-	40	549
Westland	99.3%	9,656	9,588	13,085	6,797	288	4,427
WTUA (No Interceptors)	95.5%	21,504	20,536	43,940	15,761	611	7,389
WTUA Interceptors	--	--	--	--	--	27	811
Wayne County Interceptors	--	--	--	--	1,126	93	5,281



The inch-miles of sewer system are estimated on Table 14 for the remaining 3 communities using the best fit relationship given on Figure 3.

Table 14

Estimated Inch – Miles for Remaining Communities

Community	Developed and Sewered Area (Acres)	Inch-Miles
Inkster	3,095	1113
Romulus	691	261
Wayne	2,824	1016

h) Walled Lake – Novi Diversion Area

Table 15 is the Characteristics for the portions of the communities in the Walled Lake-Novi Diversion area. No projections for future conditions were made as this area will be disconnected in the near future.

Table 15

Walled Lake – Novi Diversion Area Year 2000 Census & Land Use Data

Community	Year 2000 Census Data				Year 2000 SEMCOG Land Use (acres)				
	Population	Housing Units	Pre-1970 Housing Units	Median Housing Age	Residential	Commerical	Industrial	Institutional	Total Developed
Commerce Twp.	949	335	94	1991	255	21	156	0	431
Novi	992	678	42	1992	32	5	0	0	38
Wolverine Lake	933	357	233	1963	180	2	0	0	182
Total	2,873	1,370	369	1984	467	28	156	0	651

4. ANALYSIS OF FLOW METER DATA

Available flow meter data for the RVSDS were obtained and analyzed to characterize system flow rates. Figure 4 presents a map of meters operated by Wayne County and the Detroit Water & Sewerage Department (DWSD). Meters WCS1, WCS2 and WCS3 are located just upstream of the three points of discharge from the RVSDS into the DWSD interceptor system, and data from these meters are used by DWSD to determine the wastewater disposal costs billed to the RVSDS. The accuracy of these high quality wastewater billing meters has been verified through dye-dilution testing. The meters receive regular maintenance and the data are QA/QC reviewed.

The daily and hourly flow meter data for Meters WCS1, WCS2 and WCS3 were obtained and evaluated for the years 2006 through 2009. The data from 2006 and 2007 was found to have some gaps with filled in data. Years 2008 and 2009 had generally complete data sets. Year 2008 was slightly wetter than normal in Metropolitan Detroit but had temperatures close to average. The total precipitation for 2008 was 33.98 inches at Metro Airport in Romulus, which is about 1.09 inches above the long-term average of 32.89 inches.

There was a long dry spell in the summer of 2008 that had the lowest sewage flow rates throughout the District in the 4 year period. Year 2009 was also slightly wetter than normal in Metropolitan Detroit but cooler than normal. The total precipitation for the year was 34.12 inches at the Detroit Wayne County Metropolitan Airport in Romulus, which is about 1.23 inches above the long-term average. Year 2008 was selected for further analysis of dry and wet weather flow rates.

a) Peak Average Daily Flow Rates

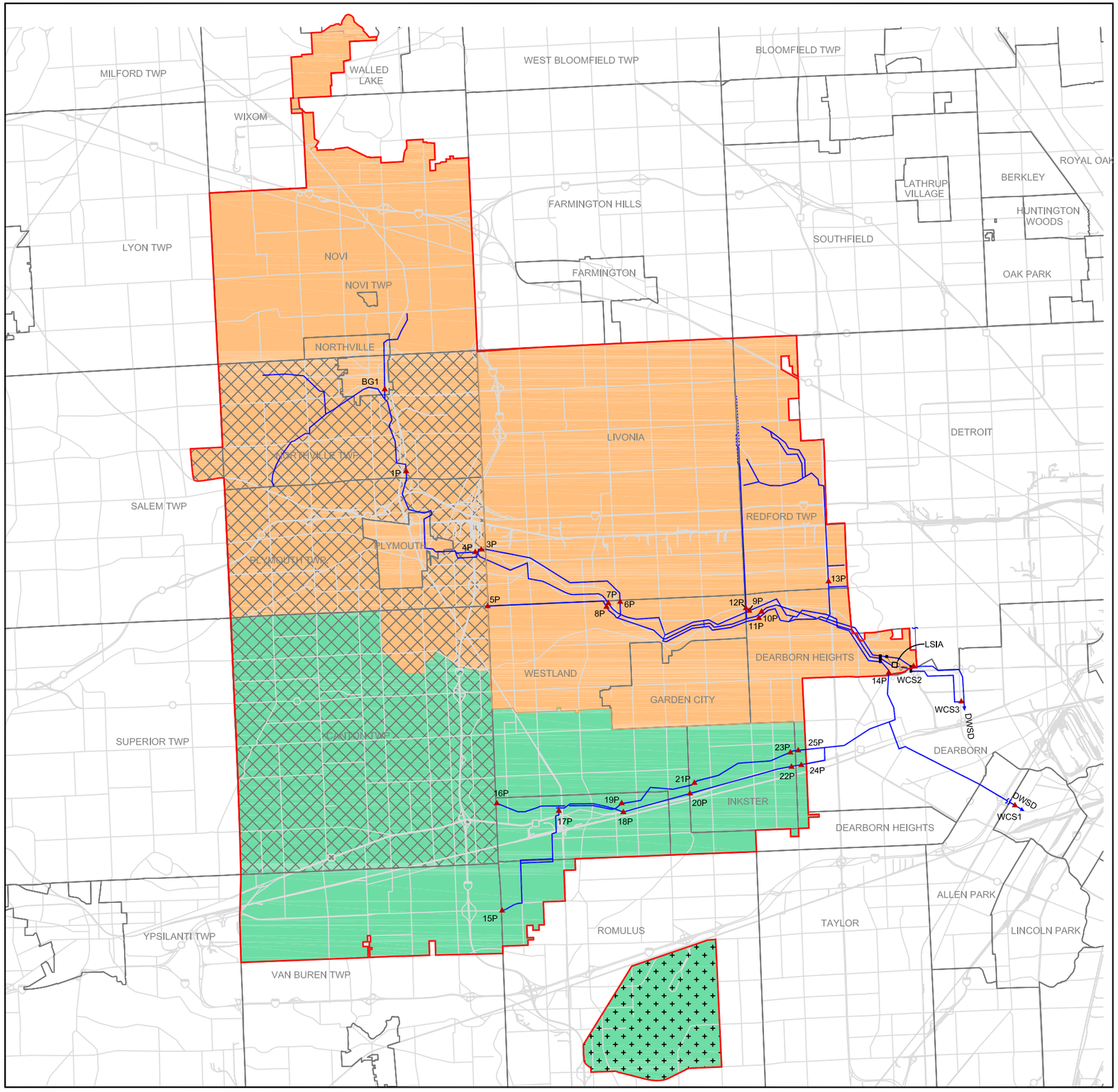
The highest average daily flow rate in the RVSDS at the District outlet for 2008 was recorded on July 3rd. The peak average daily flow meter data are summarized on Table 16.

Table 16

Peak Average Daily Flow Rate for Outlet Meters for 2008

Flow Meter	Average Daily Flow Rate on 7/3/2008 (cfs)
WCS1	195
WCS2	88
WCS3	87
Total =	370

ROUGE VALLEY
SEWAGE DISPOSAL SYSTEM



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W E
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LEGEND

- FLOW METER
- WAYNE COUNTY INTERCEPTOR
- DISTRICT BOUNDARY
- COMMUNITY BOUNDARY
- MIDDLE ROUGE SERVICE AREA
- LOWER ROUGE SERVICE AREA
- WTUA SERVICE AREA
- METRO AIRPORT

FIGURE 4
INTERCEPTOR MAP
AND METER LOCATION

PREPARED BY:

Applied Science, Inc.

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b) Peak Hourly Flow Rates

As summarized in Table 17, there were five wet weather events in 2008 for which the total peak hourly flow rate in the RVSDS exceeded 300 cfs. The peak hourly flow rates for Meter WCS1 ranged from 170 to 206 cfs for these events. The peak hourly flow rate ranged from 68 to 90 cfs and from 72 to 89 cfs for Meters WCS2 and WCS3, respectively.

Table 17

Peak Hourly Wet Weather Flow Rates for 2008

Date	Flow Meter			Total (cfs)
	WCS1 (cfs)	WCS2 (cfs)	WCS3 (cfs)	
February 6, 2008	195	87	72	355
February 18, 2008	170	75	77	322
July 3, 2008	202	90	88	380
September 14, 2008	178	68	89	334
December 28, 2008	206	89	80	375

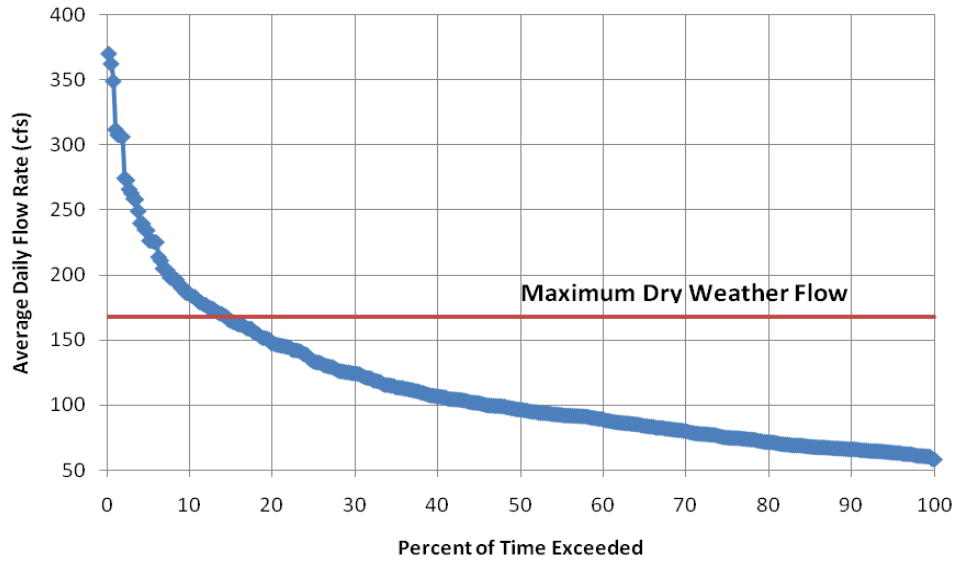
c) Average Daily Flow Rates

The 2008 total daily flow data for the RVSDS were statistically evaluated as presented in Table 18 and shown on Figure 5. The median average daily flow rate for the District in 2008 was about 96 cfs. The minimum average daily flow rate was 58 cfs and occurred on August 31, 2008. The entire preceding week had flow rates equal to about 58 cfs. The maximum average daily flow rate was 370 cfs and occurred on July 3, 2008.

Table 18
Outlet Meter Daily Flow Rate Statistics for 2008

Percent of Time Exceeded	Average Daily Flow Rate (cfs)
Minimum for the Year =	58
90	66
80	71
70	80
60	88
50	96
40	106
30	124
20	147
10	185
Maximum for the Year =	370

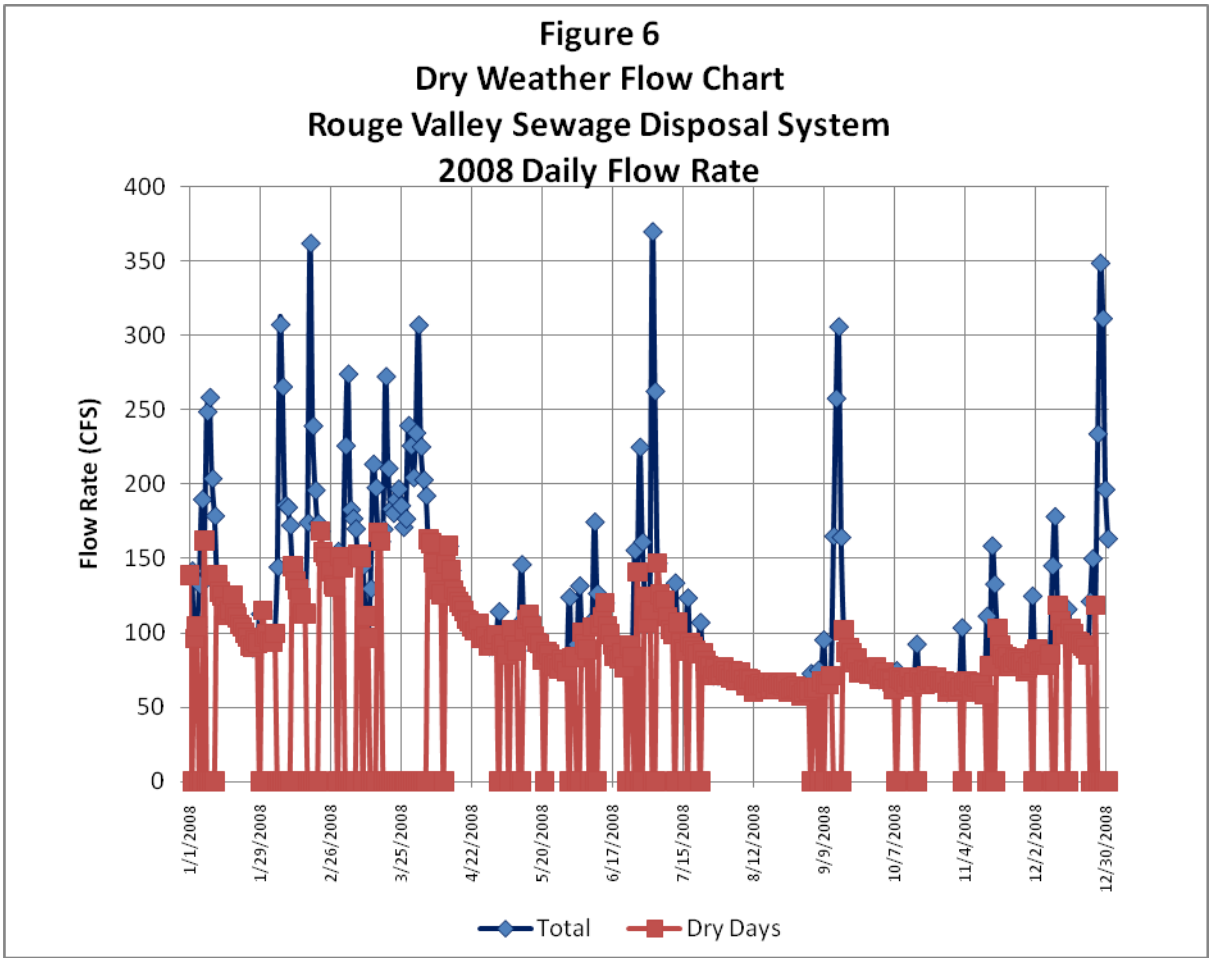
Figure 5
Daily Flow Rate Exceedence Curve
2008 Average Daily Flow Rate



d) Dry Weather Flow Rates

The RVSDS average daily flow rate data were also evaluated for dry versus wet weather conditions. Figure 6 shows the plot of total average daily flow rate and dry weather days for 2008. Wet weather days were statistically determined using the following criteria: average daily flow rates were greater than the mean plus one standard deviation; average daily flow rates were 10% higher than on the previous day; or average daily flow rates were 33% higher than on the following day.

As shown on Figure 6, a typical range of dry weather flow rates in the RVSDS for 2008 was from 58 cfs to about 168 cfs. The average dry weather flow rate was about 92 cfs. The maximum dry weather flow rate occurred on March 16th during the early spring months when high groundwater table conditions on days following snowmelt and rainfall. The minimum dry weather flow rate occurred on August 31st during the late summer with groundwater table levels were at a minimum.



Flow meter data were obtained from some of the communities and reviewed. Dry weather flow rates were taken for the March 16 and August 31, 2008 and other dry weather periods. These data were used to estimate sanitary wastewater generation and dry weather ground water infiltration rates.

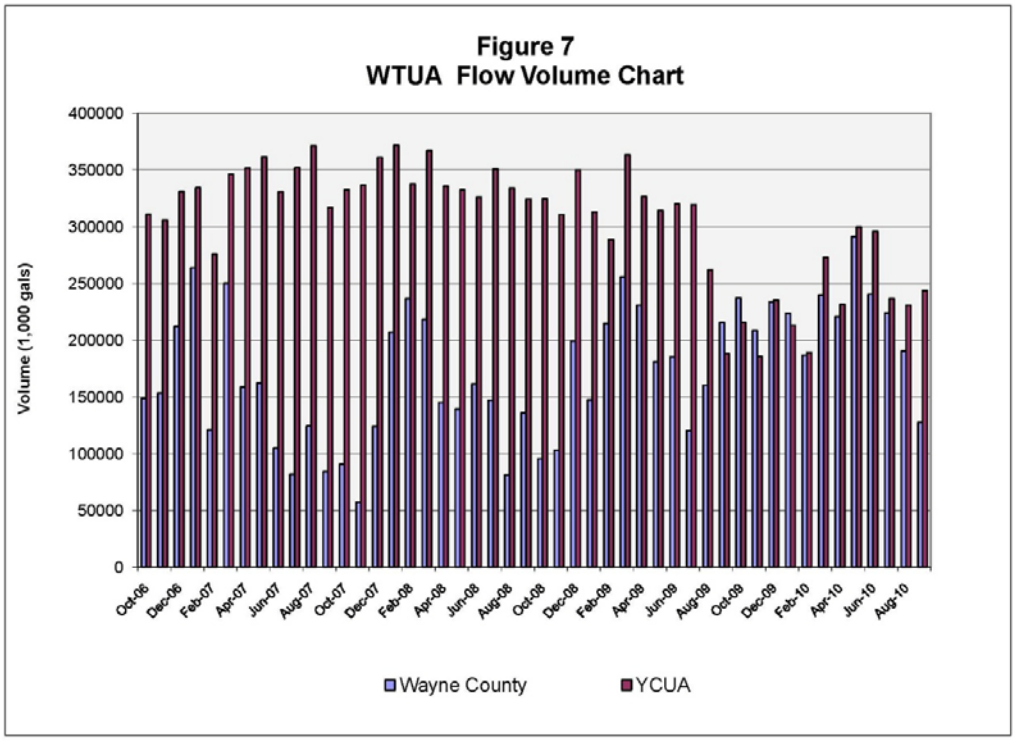
e) WTUA Flow Rates

The WTUA wastewater flow rate to the RVSDS varies and does not include all of the sanitary wastewater. A portion of the wastewater has been historically discharged to the YCUA system. The split to the RVSDS for the past 4 years is given on Table 19. Figure 7 depicts the split of the WTUA monthly wastewater volume between the RVSDS and YCUA system for a four year period from October 2006 through September 2010. A change in operational procedures occurred in about September of 2009. At that time, the wastewater split appears to be fairly even on a monthly basis.

Table 19

Annual WTUA Flow Split

Time Period		% to RVSDS
Oct-06	Sep-07	31.1%
Oct-07	Sep-08	29.0%
Oct-08	Sep-09	36.1%
Oct-09	Sep-10	47.8%



The flow rates discharged by the WTUA connections to the RVSDS are measured by Wayne County Meters 5P and 16P. Part of the flow rate measured by Meter 5P includes wastewater from about 32% of the City of Plymouth that passes through the WTUA interceptor system. The sum of the daily flow rates for Meters 5P and 16P were 3.04 and 12.34 cfs on August 31, 2008 and March 16, 2008, respectively. The daily flow rates sent to YCUA were 15.95 and 17.67 cfs on August 31, 2008 and March 16, 2008, respectively.

5. SANITARY WASTEWATER GENERATION RATE

A sanitary wastewater generation rate relationship for the District was determined using the dry weather flow rate and median housing year built data. On August 31, 2008, the ground water infiltration was nearly zero and the recorded flow rates were assumed to be sanitary wastewater. The WTUA contributions measured by Meters 5P and 16P and the Novi contributions measured by Meter BG1 were subtracted from the District outlet flow meter data in order to estimate the sanitary wastewater generation rate for most of the District.

The residential population, employment, housing units, housing age, and SIU flow rates were determined for: the District, the District excluding the WTUA communities, the portion of Plymouth tributary to Meter 5P, and Novi; for WTUA; and for the community flow meters.

The equivalent residential population was determined to be equal to the residential population plus 15% of the employment. The 15% factor indicates that each employee would generate about 15% of the wastewater flow volume of a full-time resident. This factor agrees with textbook values and values determined for the Evergreen-Farmington Sewage Disposal System.

An average sanitary wastewater generation rate was then determined for the District (excluding Novi and the WTUA communities), for WTUA, for Novi, and for the community meter districts as given on Table 20. The SIU flow rates were subtracted from the minimum dry weather flow rates, and the differences were divided by the equivalent populations.

The populations were multiplied by factors to account for housing units on public sewers. The median year that the housing units were built also is given in Table 2. A summary of the Dearborn Heights water consumption data for fiscal year 2008 to 2009 is shown in Table 21. The non-growing season per capita water consumption was calculated using two methods, with both yielding a value of 69.0 gpcd.

There is a relationship between the sanitary wastewater generation rate and median housing year built. Figure 8 shows a relationship developed between the median year that the housing units were built and the per capita flow rates for the District minus WTUA and Novi, for WTUA and for Novi**.** The relationship is based on the three highest quality meter data points with the largest equivalent populations served. The marker sizes on Figure 8 are proportional to the equivalent populations served. The non-growing season water consumption data point for Dearborn Heights falls close to the relationship. The Livonia Meter LV11+4 data point also falls close to the relationship. The remaining data points are all high outliers. This may be due to the community flow meters systematically overestimating the minimum flow rates or the ground water infiltration not being zero for some of the community flow meter districts.

Table 20									
Sanitary Wastewater Generation Rate									
	2008 Dry Weather Flow Average Daily Flow Rates (cfs)		**2009 SIU (cfs)**	**2009 Estimated Percentage Served by Public Sewer**	**2009 Residential Population on Public Sewer**	**2010 Employment**	**Equivalent Population**	**Sanitary Wastewater Flow Rate (gpcd)**	**2009 Median Housing Year Built**
	Minimum 8/31/08	**Maximum 3/16/08**							
Total District	58	168	7.33	97.2%	526,227	285,010	568,978	NA	NA
District Excluding: Novi, WTUA & 32% City of Plymouth	49	147	6.77	98.5%	350,802	192,720	379,710	72.3	1963
WTUA	18.99	30.01	0.55	95.5%	132,098	52,929	140,038	85.1	1985
Novi	5.71	8.43	0.08	93.1%	40,920	31,840	45,696	79.6	1988
Livonia Meter LV11+LV4	4.99	12.51	0.82	99.3%	29,037	37,992	34,736	77.6	1968
Garden City & part of Westland (M1 + M2)	3.80	12.16	0.01	99.7%	28,114	8,523	29,393	83.4	1957
Westland 12 +20	11/16/07 4.81	4/12/07 7.00	0.13	99.3%	22,877	12310	24,723	122.3	1975
Northville Township and part of Plymouth Township (Meters FE 08 + B)	2.95	4.79	0.19	94.0%	16,161	4,643	16,857	105.8	1987
Westland 39	2.27	-	0.00	99.3%	14,540	5104	15,306	95.8	1971
Livonia Meter LV15	1.29	3.32	0.00	99.3%	10,132	2147	10,454	79.7	1955
Livonia Meter LV14	1.29	3.22	0.10	99.3%	6,151	6784	7,169	107.2	1956

Table 21		
Water Consumption		
July 2008 through June 2009	**Dearborn Heights**	**Novi**
Total Purchases from DWSD Growing Season (April-September) Non-Growing Season (October – March)	243,780 MCF 134,550 MCF 109,231 MCF	291 746 MCF 184 885 MCF 106 861 MCF
Dearborn Heights Sales to Customers	216,045 MCF	
Estimated Water Loss	27,736 MCF 11.38% of Purchased Volume	0% assumed
Estimated Outdoor Water Use	25318 x 88.62% = 22,437 MCF	78,023 MCF
2009 Estimated Residential Population in City	55,677	54,391 x 87% on public water
2010 Estimated Employment	11,857	39,746
2009/2010 Equivalent Population (Population + 15% of Employment)	57,455	53,282
2009 Median Housing Year	1960	1988
Per Capita Per Day	69 gpcd	82.2 gpcd

Per Capita Per Day Calculation

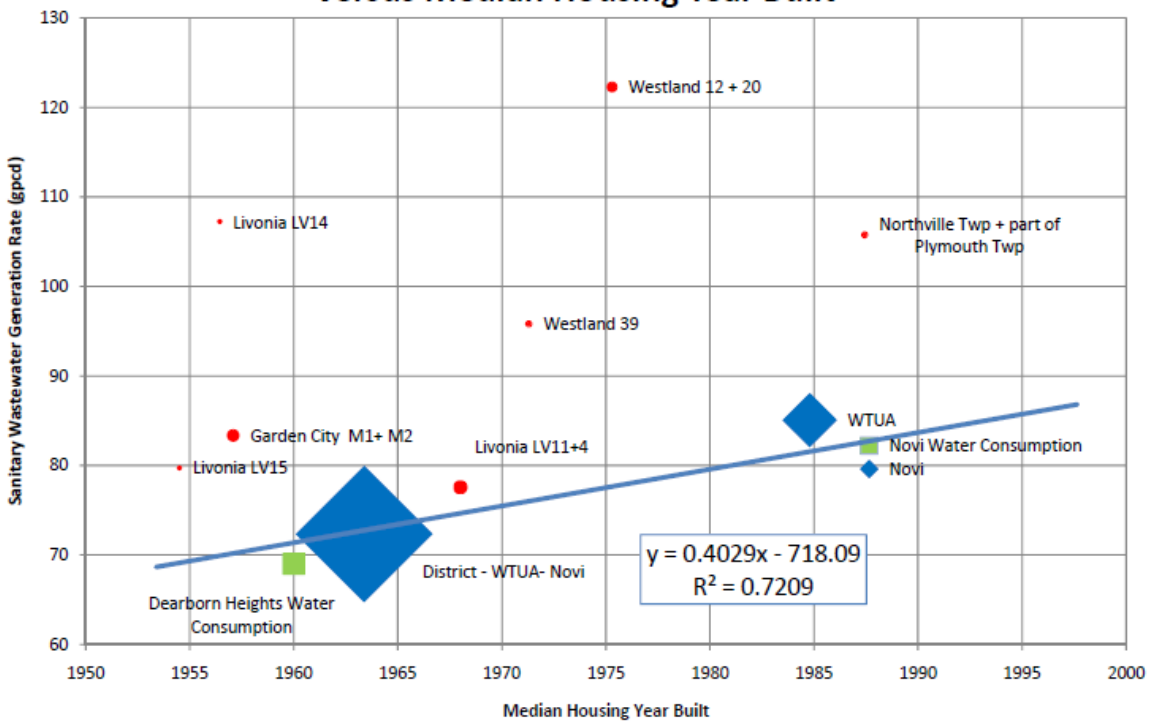
Method 1: Non-Growing Season Purchases Adjusted by Water Loss

$$\frac{Non-Growing\ Season\ MCF\ x\ 1000\ x\ 7.48\ x\ \%\ Water\ Loss}{182.5\ days\ x\ \ Equivalent\ Population} = gpcd$$

Method 2: Annual Sales Adjusted by Outdoor Water Use

$$\frac{(Total\ Purchases\ MCF - Outdoor\ Water\ Use MCF\ x\ \%\ Water\ Loss) x 1000\ x\ 7.48}{365\ days\ x\ \ Equivalent\ Population} = gpcd$$

Figure 8
Sanitary Wastewater Generation Rate
Versus Median Housing Year Built



6. DRY WEATHER GROUNDWATER INFILTRATION RATE

The rate of groundwater infiltration (GWI) into the RVSDS that occurs during peak dry weather conditions was estimated by subtracting the minimum dry weather flow rate recorded for the RVSDS in the summer from the maximum dry weather flow rate in the spring. GWI was assumed to be zero on August 31, 2008 and at a maximum dry weather value on March 16, 2008. Consequently, the District-wide average GWI rate in the spring of 2008 was about 110 cfs (168 – 58 = 110 cfs).

The GWI rates are not expected to be uniform across the District and are expected to be significantly higher for communities with older sewer systems and housing units. GWI was correlated to the number of housing units and the percentage of pre-1970 housing units.

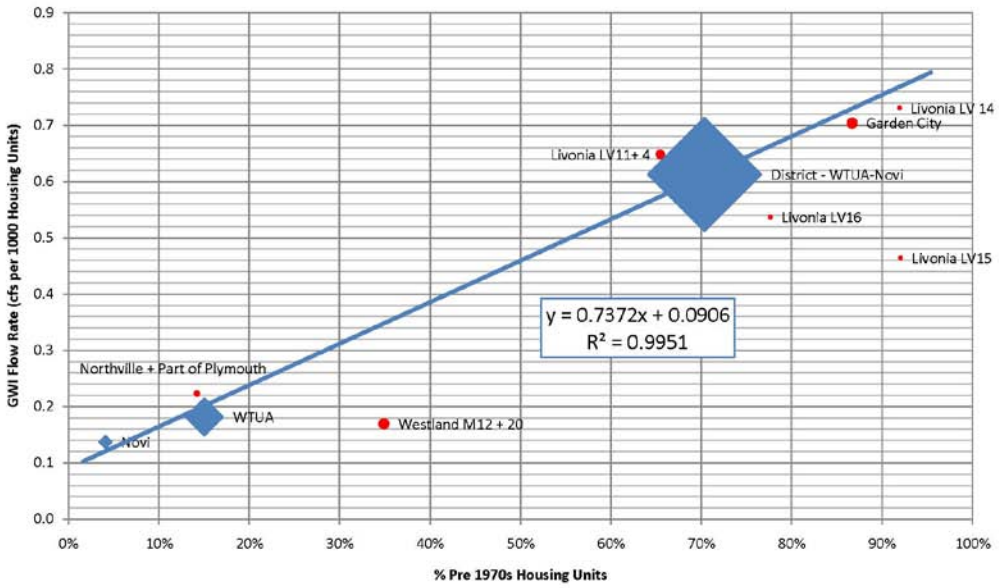
Data for the ages of the community sewer systems was not available. Therefore, the percentage of pre-1970's housing units was used as a surrogate for the age of the sewer system, and was related to the GWI rate. Prior to about 1970, homes were commonly built with footing drains connected to the sanitary or combined sewer system. Also the older sanitary or combined sewers may have open or ungasketed pipe joints.

Table 22 presents calculations of the peak GWI rate per 1,000 housing units for the District excluding Novi and the WTUA communities, for Novi, for WTUA, and for the community meter districts. The GWI rate was calculated as the difference between maximum spring and minimum summer dry weather flow rates. The resulting GWI flow rate was divided by the total housing units.

Figure 9 plots the GWI rate per 1,000 housing units versus the percentage of pre-1970 housing units. A trendline was fit to the three highest quality data points. The marker sizes on Figure 9 are proportional to the total housing units served. All but three of the community data points fall close to the trendline. The trendline plotted on Figure 9 can be used to estimate the GWI rate for each community in the District using the percentage of pre-1970 housing units in the community.

Table 22 Dry Weather Groundwater Infiltration Rate								
	2008 Dry Weather Flow Average Daily Flow Rates (cfs)			2009 % of Housing Units served by Public Sewer	Year 2009 Pre-1970 Housing Units	Year 2009 Total Housing Units	Year 2009 % of Pre-1970 Housing Units	GWI Rate (cfs/per 1000 Housing Units)
	Minimum 8/31/08	Maximum 3/16/08	GWI					
District	58	168	110	97.2%	2,893	234,292	1.2%	NA
District Excluding WTUA Communities & Plymouth (part) & Novi	49	147	97	98.5%	109,999	156,318	70.4%	0.61
WTUA	18.99	30.01	11.02	95.5%	8,714	57,973	15.0%	0.18
Novi	5.71	8.43	2.72	93.1%	752	18,446	4.1%	0.14
Westland M12 + 20 (Flow Data from 2007)	4.81	7.00	2.19	99.3%	4,476	12,825	34.9%	0.17
Garden City & part of Westland (M1 + M2)	3.80	12.16	8.36	99.7%	10,266	11,843	86.7%	0.70
Livonia Meter LV11+LV4	4.99	12.51	7.52	99.3%	7,539	11,517	65.5%	0.65
Northville Township and part of Plymouth Township (Meters FE 08 + B)	2.95	4.79	1.84	94.0%	1,103	7,754	14.2%	0.22
Livonia Meter LV15	1.29	3.32	2.03	99.3%	3,997	4,342	92.1%	0.46
Livonia Meter LV14	1.29	3.22	1.93	99.3%	2,407	2,618	91.9%	0.73
Livonia Meter LV16	1.13	2.38	1.25	99.3%	1,795	2,311	77.7%	0.54

Figure 9
Dry Weather Ground Water Infiltration Rate



7. REFERENCES/DATA SOURCES

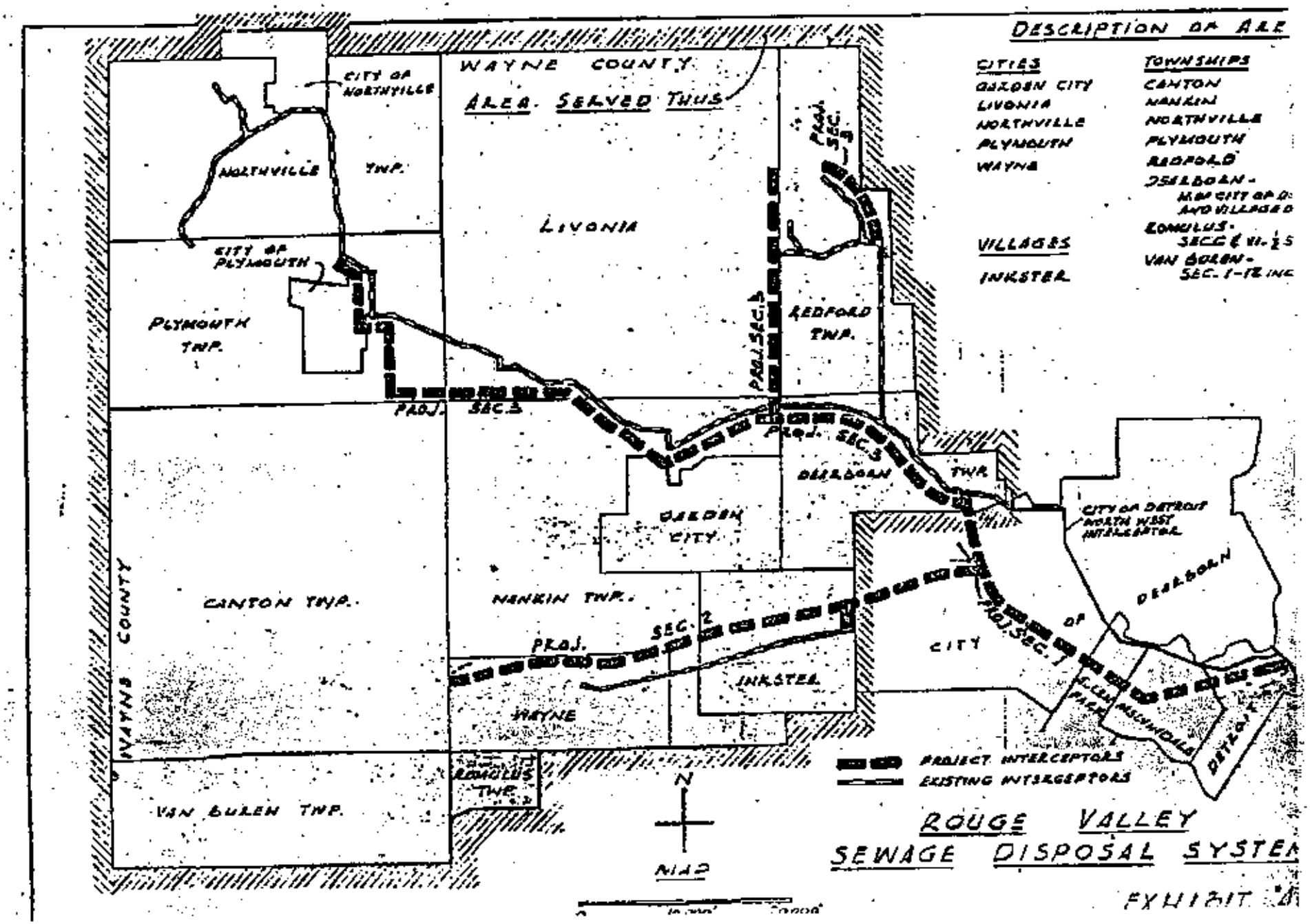
The following references/data sources were used to develop the District characteristics provided in the report:

- U.S. Bureau of Census, Census 2000
- U.S. Bureau of Census, Census 1990
- SEMCOG, Population and Household Estimates for Southeast Michigan, July 2009
- SEMCOG, GIS, 2000 Land Use/Land Cover, Southeast Michigan
- SEMCOG, Community Profiles for Southeast Michigan, July 2009
- SEMCOG, 2035 Regional Forecast, 2009
- SEMCOG, Community Residential Building Permits, 2000-2009
- DWSD Wastewater Master Plan Volume 1 : Planning Criteria, prepared by CDM, October 2003
- Exhibit B-2 NHV/RV Service Area, Detroit – Wayne Agreement for use of certain Detroit Sewers Rouge Valley Sewage Disposal District Amendment #2, March 1, 1988
- Greater Detroit Regional Sewer System SWMM Model
- Wayne County – Oakland County Construction, Finance and Service Agreement, 1988
- Wayne County 1961 Rouge Valley Exhibits, Cost and Sewage Flow Breakdowns
- Wayne County 1983 North Huron Valley – Rouge Valley Exhibits, Cost and Sewage Flow Breakdowns
- Sewage Disposal Agreement, City of Detroit – Wayne County, Rouge Valley Sewage Disposal District, Amendment #2, 1984
- Community Sewer Maps, GIS Files and Sewer System Data from Dearborn Heights, Garden City, Inkster, Northville, Wayne, Westland, Novi, Oakland County Water Resources Commissioner, Redford Township, Romulus, WTUA and Van Buren Township.
- Dearborn Heights Water Purchases

Appendix A

Historical District Boundary Maps, Rouge Valley Sewage Disposal System

1961


DESCRIPTION OF AREA
CITIES
GARDEN CITY
LIVONIA
NORTHVILLE
PLYMOUTH
WAYNE
TOWNSHIPS
CANTON
NANKIN
NORTHVILLE
PLYMOUTH
REDFORD
DEARBORN - ALL CITY OF D. AND VILLAGES
ROMULUS - SECS 6 11-12 & 15
VAN BUREN - SEC. 1-12 INC
VILLAGES
INKSTER
AREA SERVED THUS
WAYNE COUNTY
CITY OF NORTHVILLE
NORTHVILLE TWP.
LIVONIA
CITY OF PLYMOUTH
PLYMOUTH TWP.
REDFORD TWP.
PROJ. SEC. 3
DEARBORN TWP.
CITY OF DETROIT NORTH WEST INTERCEPTOR
GARDEN CITY
DEARBORN
CITY OF
CITY
CANTON TWP.
NANKIN TWP.
PROJ. SEC. 2
INKSTER
WAYNE
WAYNE COUNTY
ROMULUS TWP.
VAN BUREN TWP.
PROJECT INTERCEPTORS
EXISTING INTERCEPTORS
N
MAP
ROUGE VALLEY
SEWAGE DISPOSAL SYSTEM
EXHIBIT "A"

1983

NORTH HURON VALLEY - ROUGE VALLEY
WASTEWATER CONTROL SYSTEM
SERVICE AREA

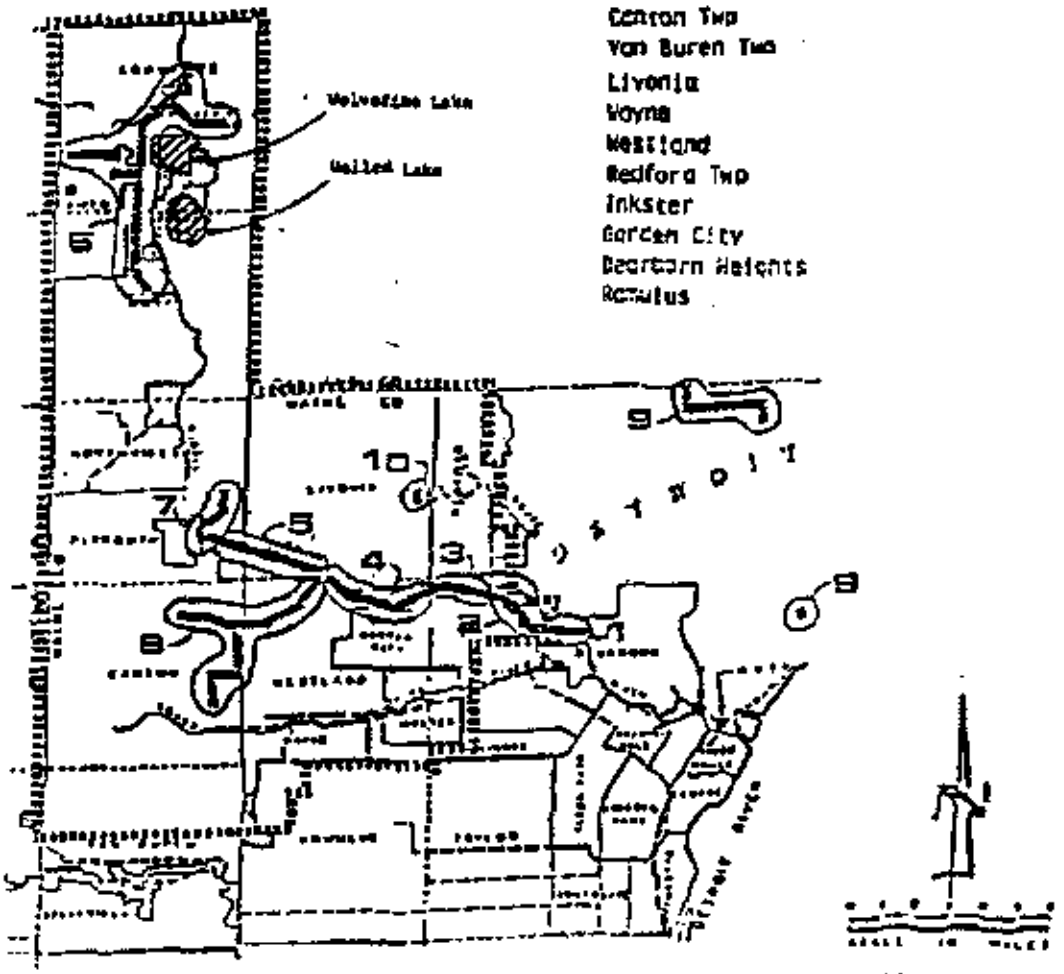
Not in Service Area

Wolverine Lake
Walled Lake

Service Area Includes:

Commerce Twp
Wixom
Novi
Northville Twp
Northville
Plymouth Twp
Plymouth
Canton Twp
Van Buren Twp
Livonia
Wayne
Westland
Redford Twp
Inkster
Garden City
Dearborn Heights
Romulus

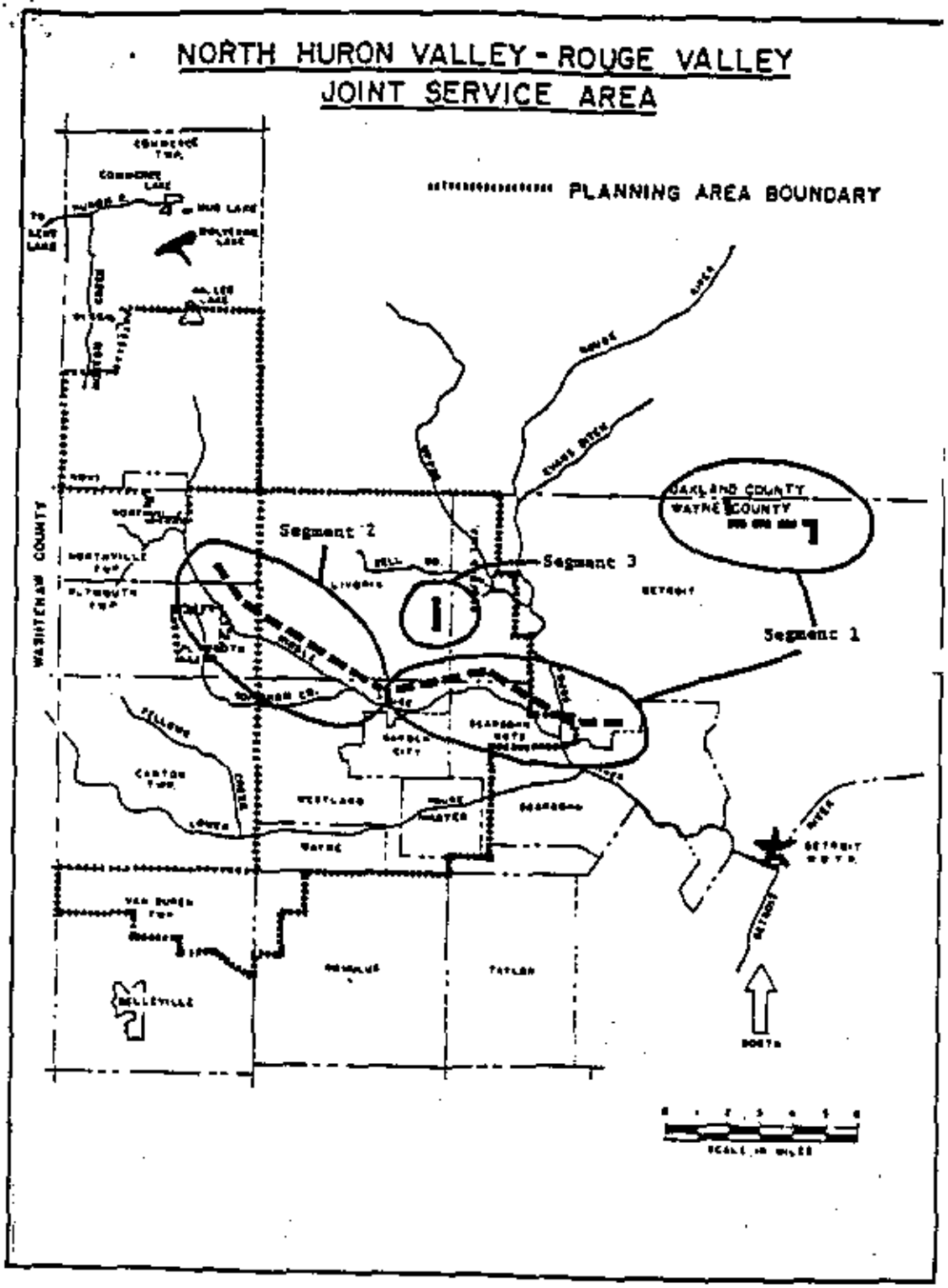
EXHIBIT "A"



11/30/83

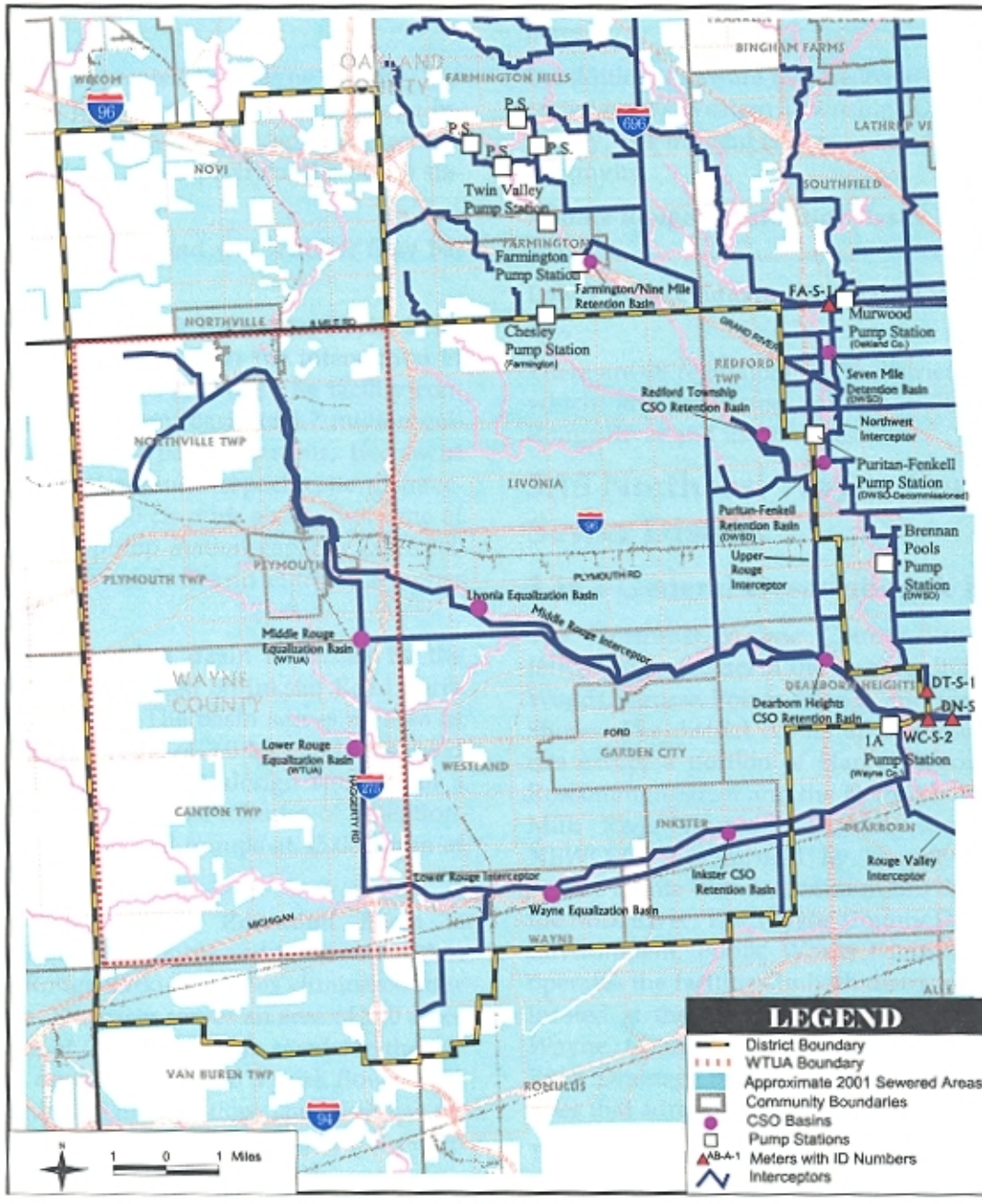
Current Service Agreement

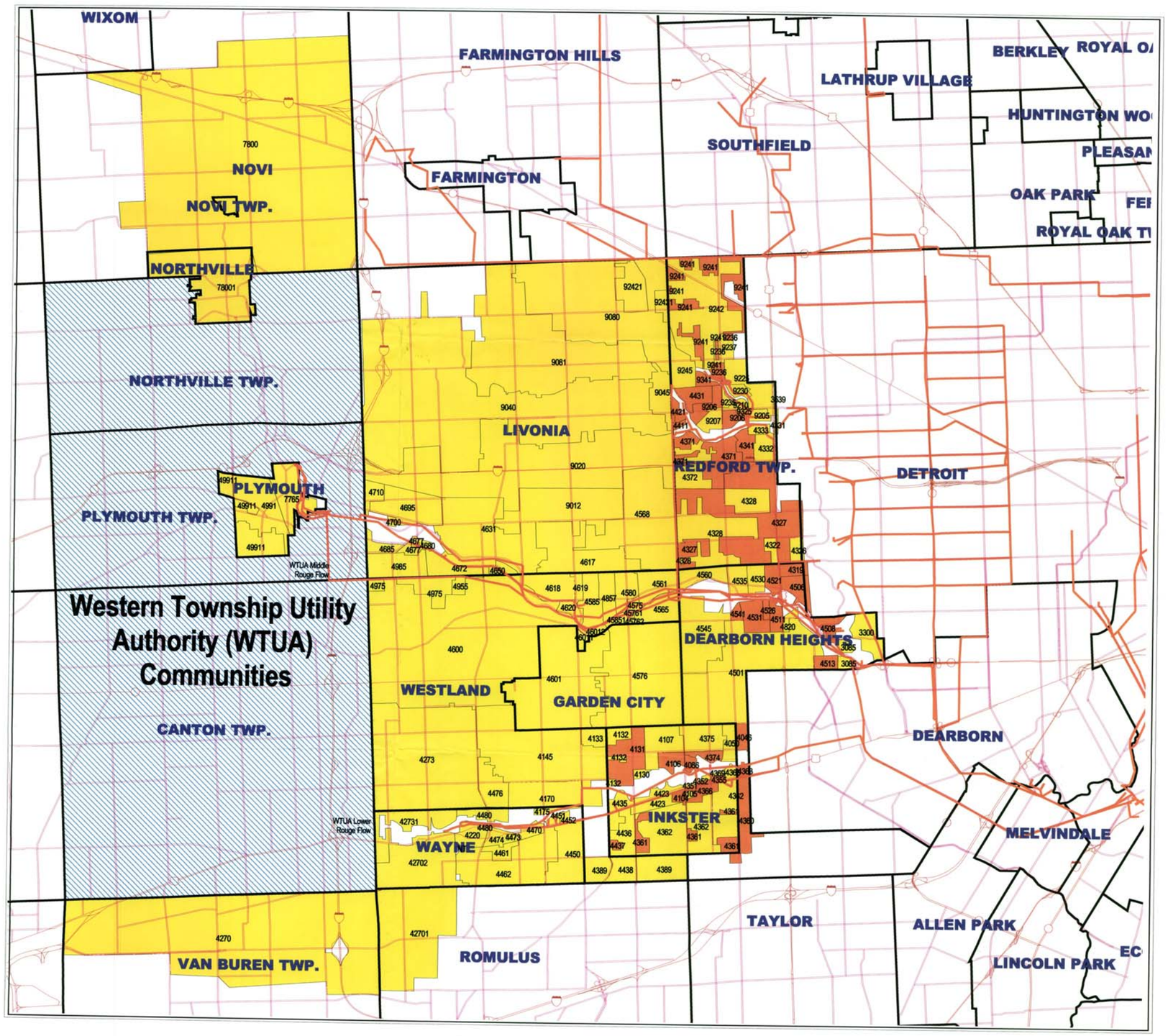
NORTH HURON VALLEY - ROUGE VALLEY JOINT SERVICE AREA



11/20/87

North Huron Valley-Rouge Valley Sewer District





N

Legend

- Major Roads
- Highways
- EXTRAN Model Schematic
- Community Boundary
- Western Township Utility Authority (WTUA) Communities

Subarea Sewer District Classification:

- Combined Sewer Area
- Separated Sewer Area
- Not connected to NHV/RV System
- 4568 RUNOFF Subarea ID Number

4-29-03
WAW2008-86Tgis/GIS-DATA/NHVRVGDRSS.APR

Wayne County
Department of Environment

Wade-Trim
P.O. Box 10
25251 Northline Road, Taylor, MI 48180
734-947-9700 / 800-482-2864
FAX No. 734-947-9726

FIGURE 2.
NHV/RV RUNOFF
Model Subareas

Appendix B

Significant Industrial Users, Rouge Valley Sewage Disposal System

Significant Industrial Users

Company Name	Address		Average Daily Flow Rate (gpd)	Total for Community (gpd)	Total for Community (cfs)
Canton					
Final Touch Co. Inc.	8537 Ronda Drive	Canton, MI 48188	240	50,240	0.08
Sauk Trail Hills Development, Inc.	5011 South Lilley Road	Canton, MI 48188	50,000		
Garden City					
Extrusion Painting, Inc.	5800 Venoy / 32800 Industrial Rd	Garden City, MI 48135	4,865	4,865	0.01
Inkster					
Advanced Resource Recovery L.L.C.	27140 Princeton Avenue	Inkster, MI 48141	111,589	111,589	0.17

Livonia					
Company Name	**Address**	**Average Daily Flow Rate (gpd)**	**Total for Community (gpd)**	**Total for Community (cfs)**	**Company Name**
Alpha Stamping Company	33375 Glendale Avenue	Livonia, MI 48150	4,200	1,527,560	2.36
A & R Packing L.L.C.	34165 Autry	Livonia, MI 48150	4,200		
Awrey Bakeries, LLC	12301 Farmington Road	Livonia, MI 48150	117,000		
Black Ox Corporation	36865 Schoolcraft Road	Livonia, MI 48150	100		
City of Livonia - Type III Landfill	32500 Glendale Road	Livonia, MI 48150	16,000		
Classic Container Corporation dba Pratt Industries,	32432 Capitol Street	Livonia, MI 48150	1,000		
Country Fresh LLC	31770 Enterprise Drive	Livonia, MI 48150	106,000		
Daniels Sharpsmart Inc.	13111 Newburgh Road	Livonia, MI 48150	3,300		
EPI Marketing Services	13305 Wayne Road	Livonia, MI 48150	4,061		
Ford Motor Company - Livonia Transmission Plant	36200 Plymouth Road	Livonia, MI 48150	787,640		
General Motors Company - Livonia Engine Plant	12200 Middlebelt Road	Livonia, MI 48150	64,299		
GST AutoLeather, Inc.	31601 Industrial Road	Livonia, MI 48150	7,500		
Hughes Electronics Products Corp.	34467 Industrial Road	Livonia, MI 48150	2,700		
Laboratory Corporation of America	32355 Capitol	Livonia, MI 48150	4,250		
McGean-Rohco, Incorporated	38521 Schoolcraft Road	Livonia, MI 48150	6,000		
Michigan Dairy	29601 Industrial Road	Livonia, MI 48150	242,000		
North American Photo, Inc.	27451 Schoolcraft Road	Livonia, MI 48150	7,141		
Producto Chemicals	31003 Industrial Road	Livonia, MI 48150	810		
The Crown Group - Livonia Plant	31774 Enterprise Drive	Livonia, MI 48150	25,575		
Williams Diversified, Inc.	13170 Merriman Road	Livonia, MI 48150	58,000		
McLaren Performance Technologies	32233 W. Eight Mile Road	Livonia, MI 48152	5,784		
St. Mary Mercy Hospital	36475 W. Five Mile Road	Livonia, MI 48154	60,000		

City of Northville					
Company Name	**Address**		**Average Daily Flow Rate (gpd)**	**Total for Community (gpd)**	**Total for Community (cfs)**
Belanger Inc. - Plant #2	1001 Doheny Ct.	Northville, MI 48167	4,796	4,796	0.01
Northville Township					
Gas Recovery Systems, Inc.	10611 W. 5 Mile Road	Northville Twp, MI 48167	19,700	73,700	0.11
Veolia Environmental Services-Arbor Hills West Landfill	10690 W. Six Mile Road	Northville Twp, MI 48167	54,000		
Novi					
Providence Park Hospital	47601 Grand River Avenue	Novi, MI 48374	45,000	51,570	0.08
Caparo Vehicle Components,/ Formerly Voestalpine Polynorm	44550 W. Grand River Avenue	Novi, MI 48376	1,800		
General Filters, Inc.	43800 Grand River	Novi, MI 48376	4,000		
Power Vac of Michigan, Inc.	44300 Grand River	Novi, MI 48376	770		
City of Plymouth					
Packaging Corporation of America	936 Sheldon Road	Canton, MI 48187	34,000	34,000	0.05
Plymouth Township					
Automotive Components Holdings, LLC - Sheldon Road Plant	14425 Sheldon Road	Plymouth Twp MI 48170	57,500	199,800	0.31
Plymouth Plating Works, Inc.	42200 Joy Road	Plymouth Twp MI 48170	18,000		
Cygnet Automated Cleaning Inc.	45889 Mast Street	Plymouth Twp MI 48170	9,000		
Metokote Corporation	43963 Plymouth Oaks Blvd	Plymouth Twp MI 48170	104,000		
Protech Coatings', LLC	16580 Northville Road	Plymouth Twp MI 48170	2,500		
R & D Enterprises	46900 Port Street	Plymouth Twp MI 48170	2,000		
Sun Plastic Coating Company	42105 Postiff Drive	Plymouth Twp MI 48170	6,800		

Redford Township					
Company Name	**Address**		**Average Daily Flow Rate (gpd)**	**Total for Community (gpd)**	**Total for Community (cfs)**
Advance Engineering Company	12025 Dixie Avenue	Redford Twp, MI 48239	2,905	60,170	0.09
General Oil Company, Inc.	12680 Beech Daly Road	Redford Twp, MI 48239	46,665		
George W. Trapp Co.	26015 Glendale	Redford Twp, MI 48239	5,500		
McNichols Polishing & Anodizing, Inc	12139 Woodbine	Redford Twp, MI 48239	2,100		
Z Technologies Corporation	26500 Capitol Avenue	Redford Twp, MI 48239	3,000		
Romulus					
EQ Resource Recovery Inc.	36345 Van Born Road	Romulus, MI 48174	181,969	449,648	0.70
General Motors Company - Romulus Engine Operations	36880 Ecorse Road	Romulus, MI 48174	265,179		
Woolf Aircraft Products, Inc.	6401 Cogswell	Romulus, MI 48174	2,500		
Van Buren Township					
Bayloff Stamped Products	5910 Belleville Road	Van Buren Twp, MI 48111	2,500	25,000	0.04
American Waste Technologies, Inc.	44141 Yost Road	Van Buren Twp, MI 48111	13,500		
L & W Engineering Co., Plant #2	6201 Haggerty Road	Van Buren Twp, MI 48111	9,000		
City of Wayne					
Ford Motor Company - Wayne Assembly Plant	37625 Michigan Avenue	Wayne, MI 48184	1,830,000	2,064,618	3.19
Hajjar Plating Services, Inc.	38300 Van Born Road	Wayne, MI 48184	5,480		
Oakwood Healthcare System Laundry Services	4800 Venoy	Wayne, MI 48184	76,138		
Oakwood Hospital - Annapolis Center	33155 Annapolis Road	Wayne, MI 48184	64,000		
Ringmasters Manufacturing, L.L.C	36502 Van Born Road	Wayne, MI 48184	20,000		
Unistrut International Corporation	4205 Elizabeth Street	Wayne, MI 48184	40,000		
Waste Management of MI, Inc.- Woodland Meadows RDF-N Landfill	4620 Hannan Road	Wayne, MI 48184	10,000		
Waste Management of MI, Inc.- Woodland Meadows RDF-Van Buren	5900 Hannan Road	Wayne, MI 48184	19,000		

Westland					
Company Name	**Address**		**Average Daily Flow Rate (gpd)**	**Total for Community (gpd)**	**Total for Community (cfs)**
Cintas Corporation - Cleanroom Resources	39120 Webb Drive	Westland, MI 48185	58,100	82,100	0.13
Cintas Corporation - Westland	39145 Webb Drive	Westland, MI 48185	17,000		
Westside Flame Hardening, Inc.	38200 Executive Drive	Westland, MI 48185	7,000		
			District Total =	**4,739,656**	**7.33**