Detroit Water and Sewerage Department

Wastewater Master Plan

DWSD Project No. CS-1314

Wastewater Facilities Inventory: Pump Stations and Meters

Technical Memorandum
Original Date: May 1, 2003
Original Date: May 31, 2003
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Table of Contents

1. Pump Stations.....1

2. Meters.....10

Wastewater Facilities Inventory: Pump Stations and Meters

1. Pump Stations

Detroit Water and Sewerage Department (DWSD) currently operates 22 individual pump stations, as described in Table 1.1. This number will drop to 21 when the Garfield Pump Station in Mount Clemens is closed. Of the 21 pump stations, 7 are package stations on Belle Isle, and one (Lighthouse Point) has a capacity less than one million gallons per day. Therefore, there are a total of 13 major pump stations to be operated by DWSD indefinitely. Figure 1 shows the location of these pump stations.

In December 2001, the Detroit Wastewater Partners, under contract to DWSD, conducted an inventory and evaluation of assets in the DWSD system called the ***Asset Audit Report***. The report was completed under PC-744, Program Management for Wastewater Treatment Plant Rehabilitation and Upgrade. The purpose of the asset audit is to assess the current and projected operational status of all significant system components, their state of repair condition, and their projected maintenance and replacement status. Included in the asset audit was an inventory of pump stations.

One important factor in the evaluation of repair and replacement needs, and in the development of a capital improvement program, is the age of the facilities and their components. Table 4.1 in the ***Asset Audit Report*** lists the estimated age range of the assets evaluated. These results have been summarized in the attached Table 1.2 according to the type of asset evaluated - mechanical, electrical, or structural or building item. This table also shows the age range of the most critical pump station component, the pumps. A summary of the results is shown in Graph 1.

The graph shows that a large proportion of the assets found during the inventory are listed as being older than 20 years. Unfortunately, the ***Asset Audit Report*** does not list actual ages, so it is difficult to know how old the majority of components are. The significance of the age of the item will vary with they type of system evaluated. While most electrical and mechanical components will have a recommended maximum life of 20 years, building components often typically last longer and may be replaced at longer intervals.

DWSD has already recognized the need for rehabilitation and replacement of critical pump station facilities and has been rehabilitating and replacing pump station components through its contracts. As shown on Table 1.2, all of the pump stations except Brennan Pools have had either major pump rebuilds (2) or rehabilitation contracts (10) planned or underway in the past few years. Pump Stations Nos. 1 and 2 are not listed, but they are also currently undergoing substantial assessment and rehabilitation under the PC-744 contract.

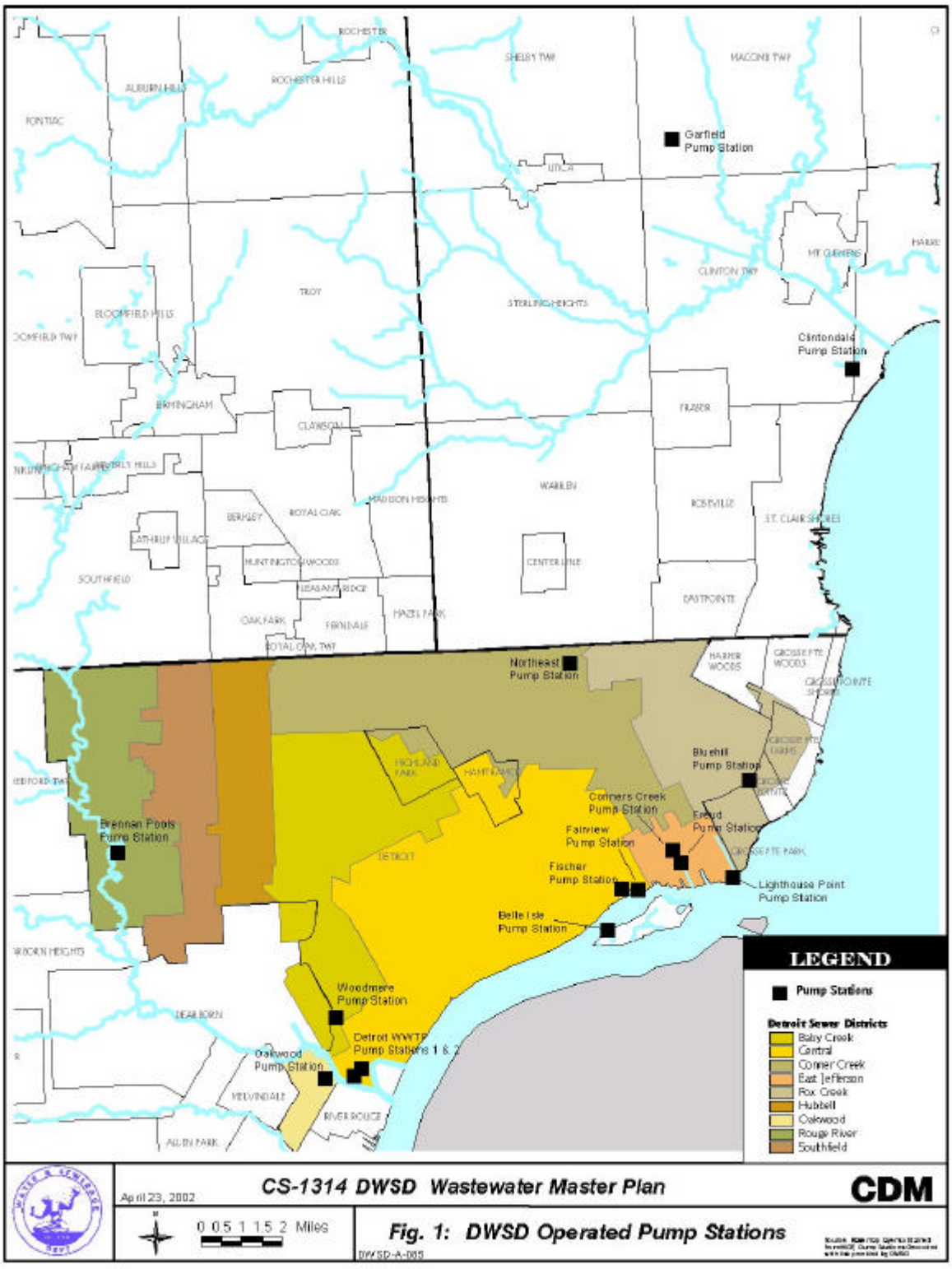

Garfield Pump Station
Clintondale Pump Station
Northeast Pump Station
Bluehill Pump Station
Conners Creek Pump Station
Fairview Pump Station
Freud Pump Station
Fischer Pump Station
Lighthouse Point Pump Station
Belle Isle Pump Station
Brennan Pools Pump Station
Woodmere Pump Station
Detroit WWTP Pump Stations 1 & 2
Oakwood Pump Station
LEGEND
Pump Stations
Detroit Sewer Districts
Baby Creek
Central
Conner Creek
East Jefferson
Fox Creek
Hubbell
Oakwood
Rouge River
Southfield
April 23, 2002
CS-1314 DWSD Wastewater Master Plan
CDM
0 0.5 1 1.5 2 Miles
Fig. 1: DWSD Operated Pump Stations
DWSD-A-005

Table 1.1 - DWSD Pump Stations

Name of Pump Station	Location	Function	Sanitary Capacity				Storm Capacity				No. of Pumps		Comments
			DESIGN		MAXIMUM		DESIGN		MAXIMUM		San.	Storm	
			MGD	CFS	MGD	CFS	MGD	CFS	MGD	CFS			
Belle Isle	Sunset Drive, Belle Isle, Detroit	Sanitary/ Storm	2.02	3	4.03	6	10.2	16	20.4	32	2	2	Storm flow pumped to storage tank.
Belle Isle Package Pump Stations (7)	Belle Isle, Detroit	Sanitary, except for P.S. 7	N/A	N/A	4.26	7	N/A	N/A	2.88	4	12	2	
Bluehill	17145 Mack, Detroit	Sanitary/ Storm	6.46	10	12.92	20	504	780	756	1170	2	3	PC-685 to add Pump 4 by 2004.
Brennan Pools (Rouge Park)	21415 Plymouth Road, Detroit	Sanitary	1.3	2	2.6	4	--	--	--	--	2	-	Pumps service Brennan Swimming Pools Complex at Rouge Park.
Clintondale	3475 Union Lake Road, Mt. Clemens	Sanitary	52	80	78	121	--	--	--	--	3	-	
Conner Creek	12244 E. Jefferson, Detroit	Sanitary/ Storm	158.4	245	229.5	355	2226	3444	2544	3936	4	8	PC-674 to replace pumps 9-12 by 2004.
Fairview	202 Parkview, Detroit	Sanitary	242.3	375	339.3	525	--	--	--	--	4	-	
Fischer	8650 E. Jefferson, Detroit	Sanitary	6.8	11	13.6	21	--	--	--	--	2	-	
Freud	12300 Freud, Detroit	Sanitary/ Storm	12.96	20	35.64	55	2031	3143	2322	3592	2	8	Pumps 9 & 10 operate alternately. Station includes 20 MG of storage.
Lighthouse Point	Alfred Brush Ford Park, Harbor Island, Detroit	Sanitary	0.65	1	1.3	2	--	--	--	--	2	-	Submersible pumps - not accessible. Pumps from sewage from recreation center.
Northeast	11000 E. Eight Mile, Detroit	Sanitary	162	251	258.4	400	--	--	--	--	3	-	PC-736 to add one 97 mgd pump by 2004.
Oakwood	12330 Sanders, Detroit	Sanitary/ Storm	13	20	26	40	246.9	382	315.4	488	2	6	PC-719 to provide pump 3, replace 4,5,6, and rehab 7,8 by 2004.
Wastewater Treatment Plant - Pump Station 1	9300 W. Jefferson, Detroit	Combined	1036	1603	1222	1891	1225	1895	1444	2234	-	8	Station capacity is for dry and wet weather flows and based on design values.
Wastewater Treatment Plant - Pump Station 2	9300 W. Jefferson, Detroit	Combined	749	1159	856	1324	805	1246	920	1423		7	Station capacity is for dry and wet weather flows and based on design values. Includes Pump No. 10 to be installed under PC-740.
Woodmere	9300 W. Vernor, Detroit	Sanitary/ Storm	5.17	8	10	15	331	512	497	768	2	3	Pump 4 to be installed in future (date undetermined).
Other:													
Garfield (21 Mile & Garfield)	16650 21 Mile Road, Mt. Clemens	Sanitary - to be closed	11.8	18	17.7	27	--	--	--	--	3	-	PCI-45 to eliminate this station and replace with Garfield Rd. gravity interceptor by 2002.
Puritan (former important station)	16100 Riverview, Detroit	No longer operated - backup only	--	--	--	--	--	--	--	--		--	Decommissioned when Puritan-Fenkell CSO Basin completed in 1999.

Source: DWSD-owned pump station information from ***Asset Audit Report***, 12/19/01, and ***Needs Assessment Study, Revision 2*** for the Detroit Wastewater Treatment Plant, 11/15/01, Detroit Wastewater Partners.

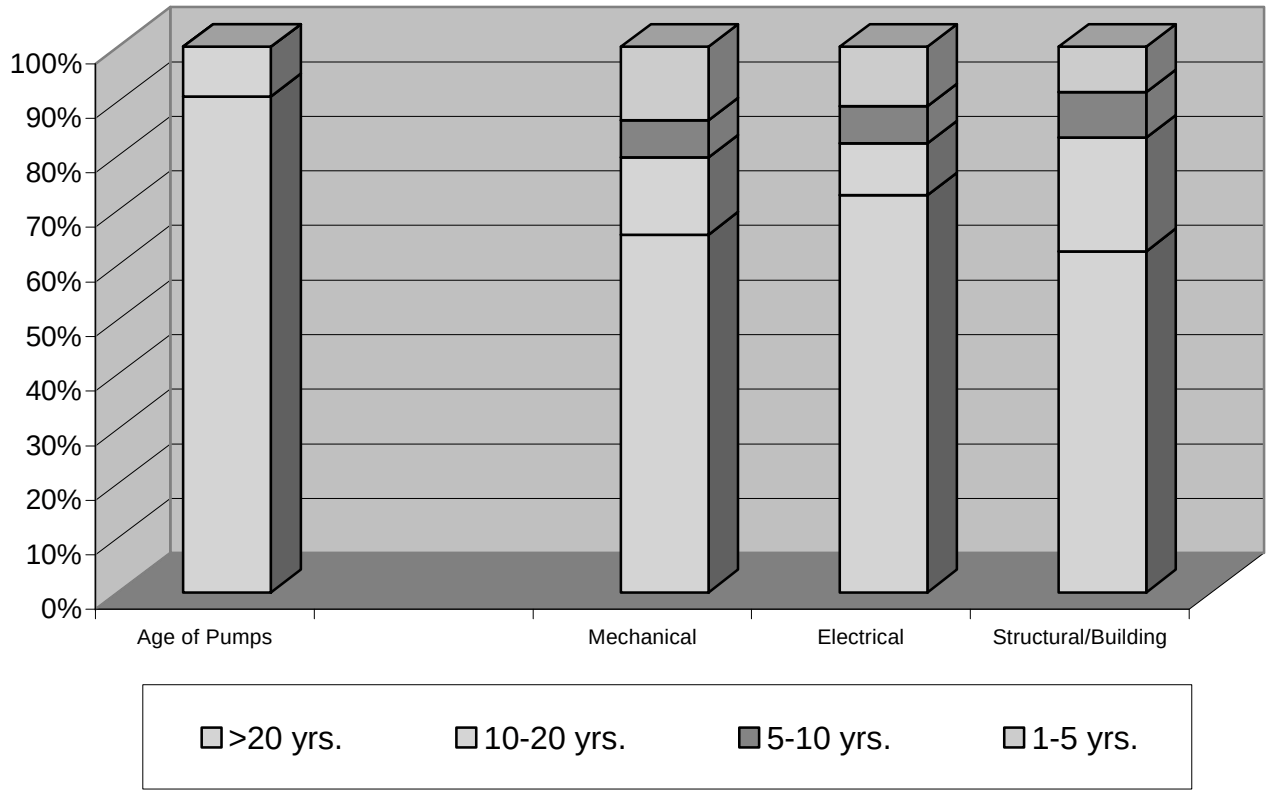
Table 1.2 - Asset Audit Age Assessment

Name of Pump Station	No. of Main Pumps by Age					No. of Asset Audit Items in Each Age Category														Rehab/ Replace Projects & Completion Date
						Mechanical				Electrical				Structural/Building Item				Age Not Available	Total	
	1-5 yrs.	5-10 yrs.	10-20 yrs.	>20 yrs.	N Avail	1-5 yrs.	5-10 yrs.	10-20 yrs.	>20 yrs.	1-5 yrs.	5-10 yrs.	10-20 yrs.	>20 yrs.	1-5 yrs.	5-10 yrs.	10-20 yrs.	>20 yrs.			
Belle Isle - Main Pump Station	-	-	-	4		1	-	-	4	2	-	-	4	2	-	-	-	8	21	PC-682 (2002?),CS-1363 (?), pump rebuild 1993, CS-1279 CSO basin design underway
Belle Isle - Package Stations	-	-	-	10	4		4	4	10	-	-	7	-	-	1	8	-	18	52	
Bluehill	-	-	2	3	-	1	4	2	9	2	-	-	-	-	-	-	2	2	22	CS-1314 (2004), DWS-837 (2003)
Brennan Pools (Rouge Park)	-	-	-	2	-	-	-	2	2	-	-	1	2	-	-	1	-	-	8	--
Clintondale	-	-	-	3	-	2	-	1	5	-	-	1	5	-	-	-	1	2	17	Pump rehab 1995
Conner Creek	-	-	-	8	4	2	-	-	17	-	-	1	35	-	-	-	3	12	70	PC-674 (2003), 4 rebuilds in 2001
Fairview	-	-	-	4	-	9	1	1	5	1	1	-	9	2	2	-	2	13	46	PC-684 (1998), 1 rebuild in 2001
Fischer	-	-	-	2	-	1	-	-	5	1	1	-	3	-	-	-	1	1	13	2 rebuilds 1993
Freud	-	-	2	8	-	-	1	5	15	7	2	-	14	-	-	-	5	14	63	DWS-837 (2001), roof repairs 2001
Lighthouse Point	-	-	2	-	-	-	-	2	-	-	-	-	1	-	-	-	1	-	4	2 rebuilds 1989
Northeast	-	-	-	3	-	2	-	2	8	1	3	-	12	-	1	-	5	5	39	PC-736 (2003), PC-672 (1994), rebuilds 1999 & 1993
Oakwood	-	-	-	8	-	1	-	2	8	2	3	4	8	-	-	1	8	-	37	PC-671 (1997), PC-719 (2004)
Woodmere	-	-	-	5	-	1	-	-	9	-	-	-	14	-	-	-	2	5	31	PC-671 (1997)
TOTAL	0	0	6	60	8	20	10	21	97	16	10	14	107	4	4	10	30	80	423	

Notes:
Mechanical: Pumps, compressors, diminutors, boilers, water heaters
Electrical: Pump motors, generators, transformers, panels
Structural/Building: Structural repairs on building and wet well, and mechanical fixed building items (HVAC, cranes, etc.)
N Avail = Age not available

Source: PC-744 Asset Audit Report, 12/19/01, Table 4-1

Graph 1: Age Distribution of Pump Station Assets Listed in 2001 Asset Audit



The ***Asset Audit Report*** evaluated the condition of each item in the pump stations and gave it a score. From the scores, each item was categorized by the size and complexity of the repair or rehabilitation, and the time frame, as follows:

Size and Complexity:

- Light: Major maintenance and / or light restoration
- Medium: Recommended rehabilitation and / or medium restoration
- Major: Replacement and / or major restoration

Time Frame:

- Immediate: Equipment or item requires rehabilitation within 2 years.
- Short Term: Rehabilitation required within 2 to 5 years
- Long Term: Rehabilitation required within 5 to 10 years.

For this technical memorandum, the recommended rehabilitation / repair / replacement items were categorized according to mechanical, electrical, and structural / building repairs, as follows:

Type of Rehabilitation / Repair / Replacement:

- Mechanical: Pumps, compressors, diminutors, boilers, furnaces, water heaters
- Electrical: Pump motors, generators, transformers, electrical panels
- Structural / Building: Structural repairs on building and wet well, and mechanical fixed building items such as HVAC components, cranes, etc.

Table 1.3 shows the results of this analysis. The overall distribution of these results is shown in the Table 1.4 below.

General comments on the above results:

- The Asset Audit identified a large number of repairs that require immediate attention (as it was required to do). A large proportion of the repairs are major projects.
- A large number of mechanical and electrical components need to be rehabilitated, as opposed to structural / building items (However, this result needs to be viewed with caution, as some repair listings covered more than one structural / building component. For example, one audit listing might list several concrete crack repairs to a structure.)

The estimated cost of rehabilitation and repairs for the next ten years, as shown in the ***Asset Audit Report***, will be covered in a subsequent memorandum.

Table 1.3 - Pump Station Asset Audit Recommendations

Name of Pump Station	Classification of Rehabilitation Needed (1)	No. of Items in Each Category of Repair (2)									Total
		Mechanical			Electrical			Structural/Building			
		IMMED	ST	LT	IMMED	ST	LT	IMMED	ST	LT	
Belle Isle (Main and 7 Package Stations)	Light	-	5	-	1	-	-	-	-	-	6
	Medium	3	6	-	-	-	-	-	2	1	12
	Major	5	1	5	-	-	8	4	-	5	28
Bluehill	Light	-	4	-	4	-	-	-	-	-	8
	Medium	5	-	1	2	4	-	2	1	-	15
	Major	1	1	-	-	-	5	1	1	-	9
Brennan Pools	Light	-	1	-	-	-	-	-	-	-	1
	Medium	1	1	-	-	3	1	-	-	-	6
	Major	1	-	-	-	-	-	-	1	-	2
Clintondale	Light	2	1	-	-	-	-	-	-	-	3
	Medium	1	-	-	-	4	-	1	-	-	6
	Major	-	1	-	-	-	-	-	1	1	3
Conner Creek	Light	8	-	-	8	4	-	2	-	-	22
	Medium	-	-	-	-	-	-	-	-	-	0
	Major	1	-	1	1	5	6	-	-	-	14
Fairview	Light	-	-	-	-	-	-	1	-	-	1
	Medium	-	3	-	-	-	-	1	3	1	8
	Major	2		8	-	-	4	-	-	2	16
Fischer	Light	3	1	-	1	-	-	-	-	-	5
	Medium	2	-	-	-	-	-	1	1	-	4
	Major	1	-	-	-	-	1	-	-	-	2
Freud	Light	3	11	-	10	-	-	-	1	-	25
	Medium	2	1	-	-	-	-	1	-	-	4
	Major	4		1	1		9	2	1	1	19
Lighthouse Point	Light	1	-	-	-	-	-	-	-	-	1
	Medium	-	-	-	-	-	-	-	-	-	0
	Major	2	-	-	1	-	-	-	-	-	3
Northeast	Light	1	2	-	2	2	-	1	5	-	13
	Medium	2	1	-	2	-	-	2	-	2	9
	Major	2	2	1	2	-	-	-	-	5	12
Oakwood	Light	5	-	-	-	9	-	3	1	-	18
	Medium	2	-	-	-	-	-	-	2	-	4
	Major	1	-	3	-	-	2	1	-	2	9
Woodmere	Light	5	-	-	-	5	-	1	1	-	12
	Medium	-	-	-	-	-	-	2	-	-	2
	Major	-	-	2	-	3	5	-	-	-	10
	TOTAL	66	42	22	35	39	41	26	21	20	312

Notes:

(1) Full description of categories:
- Major Maintenance and/or LIGHT Restoration
- Recommended Rehabilitation and/or MEDIUM Restoration
- Replacement and/or MAJOR Restoration

(2) Categories of Repair:
- Mechanical: Pumps, compressors, diminutors, boilers, water heaters
- Electrical: Pump motors, generators, transformers, panels
- Structural/Building: Structural repairs on building and wet well, and mechanical fixed building items (HVAC, cranes, etc.)

Source: Pump station asset audit recommendations from Asset Audit Report, Detroit Wastewater Partners, 12/19/01

Table 1.4 - Summary of Asset Audit Results for Pump Stations

Analysis	Category	Percent of Total
Size/Complexity of Repair	Light	37
	Medium	22
	Major	41
Time Frame	Immediate	41
	Short Term	33
	Long Term	27
Type of Repair	Mechanical	42
	Electrical	37
	Structural/Building	21

2. Meters

DWSD maintains a total of 65 major meters throughout its service area. Of these, 56 are important billing or flow-monitoring meters, 7 are meters at the Wastewater Treatment Plant measuring incoming flow, and 2 measure final effluent. The location of these meters is shown in Figure 2.

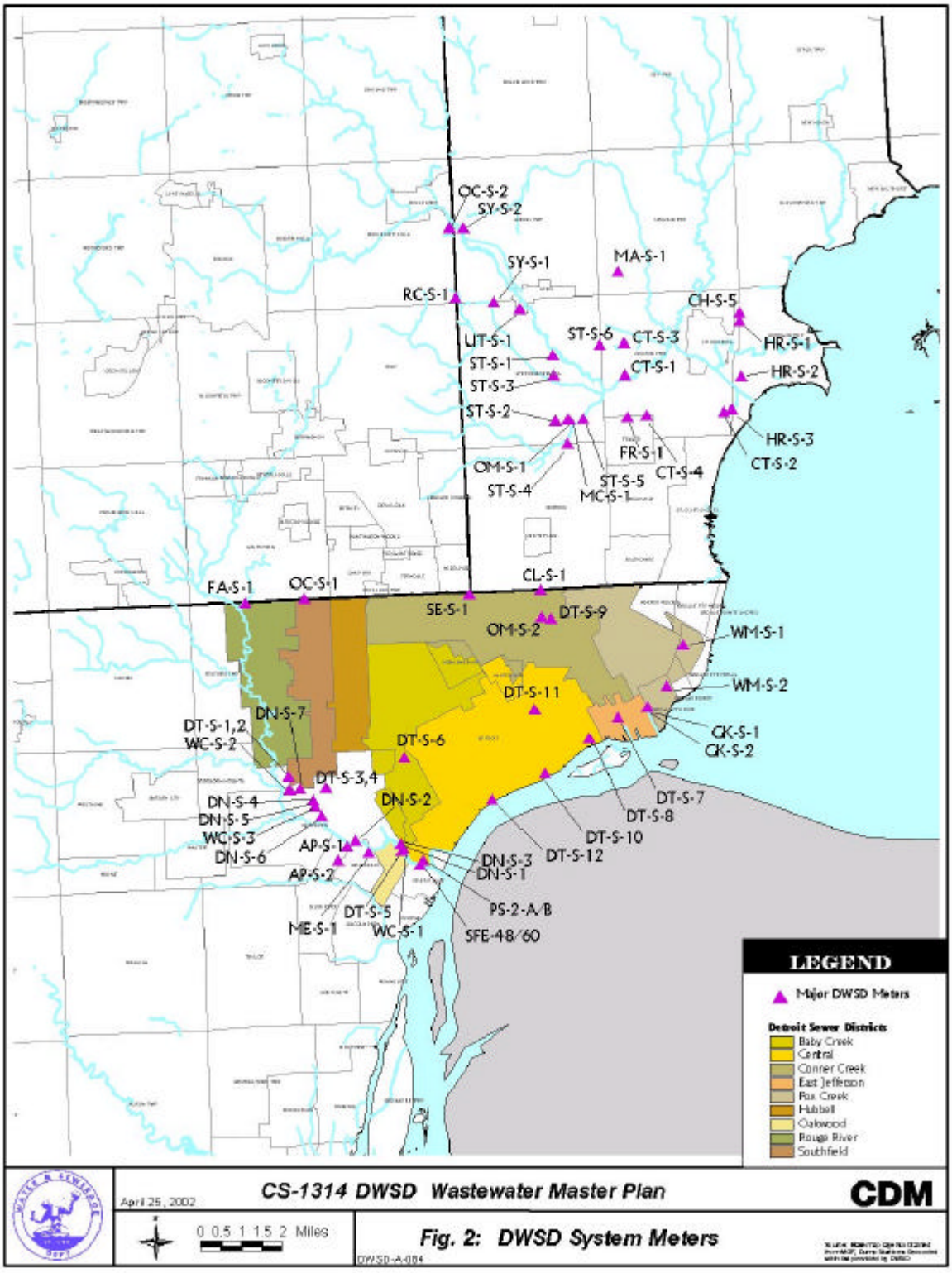
The meters are listed and described in Table 2.1. Through the CS-1249 (Greater Detroit Regional Sewer System Amendment 4) project, CDM is monitoring, maintaining, and evaluating these meters as part of an ongoing program to upgrade the billing system. The list in Table 2.1 is derived from information gathered to date from this project.

Meter types are listed in the table and include parshall flumes, ultrasonic, magmeter, transit time, and weir installations. Table 2.2 gives a description of these meter types based on Table 1 of the GDRSS Technical Memorandum No. 4-1: Flow Metering Technology Assessment.

Information on the age of the meters has been obtained from the DWSD billing meter staff and DWSD notes and publications, where available. The age of the meters, as shown in the table, varies from less than a year (some meters have been replaced under the program) to 57 years. At least half of the meters are older than 20 years, the expected maximum life of mechanical and electrical equipment, as shown in Graph 2. A large proportion of the meters listed with "unknown" age are suspected to be older than 20 years.

The condition of the meters was not systematically evaluated under the PC-744 project (Program Management for Wastewater Treatment Plant Rehabilitation and Upgrade), but some observations of condition have been made under the CS-1249 project. Notes on the condition of the meters are listed in Table 2.1, where available. Many of the meter installations have a structural component, as noted above. Except where indicated, most of the condition information in Table 2.1 refers to the mechanical and electrical components of the meter installation, not the flume or weir structure itself.

The condition information reflects recent problems noted and improvements made, but may not indicate current status, as many of the repairs needed have been made. No significant problems are noted with approximately 75%, or 49 of these meters, as shown in Graph 2. The rest require minor adjustments, or the need for repair and replacement is being documented under the CS-1249 project.


OC-S-2
SY-S-2
SY-S-1
MA-S-1
RC-S-1
CH-S-5
UT-S-1
ST-S-6
CT-S-3
HR-S-1
ST-S-1
CT-S-1
HR-S-2
ST-S-3
ST-S-2
HR-S-3
FR-S-1
CT-S-2
OM-S-1
CT-S-4
ST-S-5
ST-S-4
MC-S-1
FA-S-1
OC-S-1
CL-S-1
SE-S-1
DT-S-9
OM-S-2
WM-S-1
WM-S-2
DT-S-11
DN-S-7
DT-S-1,2
WC-S-2
CK-S-1
CK-S-2
DT-S-6
DT-S-3,4
DT-S-7
DN-S-4
DN-S-2
DT-S-8
DN-S-5
DT-S-10
WC-S-3
AP-S-1
DN-S-6
DT-S-12
DN-S-3
DN-S-1
AP-S-2
PS-2-A/B
DT-S-5
ME-S-1
WC-S-1
SFE-48/60
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April 25, 2002
CS-1314 DWSD Wastewater Master Plan
CDM
0 0.5 1 1.5 2 Miles
Fig. 2: DWSD System Meters
DWSD-A-004

Table 2.1 - Meters in the DWSD System

DWSD Meter No.	Meter Type	Typical Dry Weather Flow or Maximum Flow Rate (cfs)	Location	City/District Served[2]	Installation Date	Age (Years)	Instrumentation Manufacturer	GDRSS Condition Notes
AP-S-1	Transit Time	10 max scale*; 2.76 ave[3], 3.48 max (2001 data)	16601 S. Dearborn (Enterprise & Dearborn), Allen Park	Allen Park	11/12/01	1	Accusonic	Interference causes scatter in velocity path readings, likely from entrained air (drop manhole upstream of meter)
AP-S-2	Magmeter	12 max scale; 0.225 ave, 0.55 max (2001 data)	17010 Oakwood (Rotunda & Rouge River), Allen Park	Allen Park	Commissioned 4/3/2001	1	Kent Taylor	No significant issues.
CH-S-5	Parshall Flume - 30-in.	40 max; 8.21 ave, 21.1 max (2001 data)	N.B. Joy Road & I-94, Chesterfield	Chesterfield	9/24/92 new monitoring sensor (Date?)	11	Badger; updated w/ Miltronic	No significant issues.
CL-S-1	Magmeter - 10-in.	10 max scale, 2.12 ave; 14.2 max (2001 data)	8020 E. 8 Mile Road (8 Mile & Van Dyke), Warren	Center Line	1/8/63	39	Fischer - Porter	Meter cabinet hit by car. Meter reinstalled 7/16/01.
CT-S-1	Parshall Flume - 18-in.	23 max; 3.35 ave, 8.5 max (2001 data)	38201 Garfield (Garfield & Clinton River Rd.), Clinton Township	Clinton Township (Oakland-Macomb Interceptor)	7/19/1973, new sensor 5/8/86	29	Bristol; updated w/ Miltronic	No significant issues.
CT-S-2	Parshall Flume - 24-in.	35 max; 4.86 ave, 16.9 max (2001 data)	35362 Union Lake (Union Lake & Sorrentino Ct.), Clinton Twp.	Clinton Township	3/1/1975, updated 5/27/86	27	Fischer - Porter; updated w/ Miltronic	Replaced failed Miltronic on 8/30/01.
CT-S-3	Parshall Flume - 24-in.	15 max; 4.5 ave, 8.75 max (2001 data)	40940 Garfield (Garfield & 18 Mile Rd.), Clinton Twp.	Clinton Township	3/3/1976, updated (Date?)	26	Badger Sonic; updated w/ Miltronic	No significant issues.
CT-S-4	Parshall Flume - 6-in.	4 max; 0.337 ave, 1.46 max (2001 data)	18275 15 Mile (15 Mile Rd. & Kelly), Clinton Twp.	Clinton Township	11/9/1977 updated (Date?)	25	Penn/Badger; updated w/ Miltronic	No significant issues.
DN-S-1	Parshall Flume - 48-in. for gravity flow	12.8 DWF, 75-100 max	Miller Road Pump Station, 1390 Miller Rd., Dearborn	Dearborn: East	1/14/1959, updated 5/9/01	43	Badger; updated w/ Miltronic	Gate controlling flow to pump station is not fully closed so flow going through P.S. and flume. New downlooker installed.
DN-S-2	Magmeter - 36-in.	19.8 DWF, 50.4 or 70 max	Greenfield Pump Station, 2701 or 2501? Greenfield Rd. (Butler Rd. & Greenfield), Dearborn	Dearborn: West	5/23/63	39	Fischer & Porter	2 phone line failures in 2001 - repairs made 10/2/01.
DN-S-3	Herschell Hollow Crest Weir (72-in.) for pumped flow	5.2 DWF	Miller Road Pump Station, 1390 Miller Rd., Dearborn	Dearborn: East	1/14/1959, updated 5/9/01	43	N/A; updated w/ Miltronic level sensor	Gate controlling flow to pump station is not fully closed so flow going through P.S. and flume. New downlooker installed.
DN-S-4	Magmeter - 12-in.	30 max scale*; 0.83 ave, 1.78 max (2001 data)	3824 Southfield Rd. (Southfield North of Hubbard), Dearborn	Dearborn: North Centra	Commissioned 4/3/01	1	Kent Taylor	No significant issues.
DN-S-5	Magmeter - 6 in.	8 max scale*; 0.60 ave, 1.65 max (2001 data)	4896 Southfield Rd. (Southfield South of Hubbard), Dearborn	Dearborn: North Centra	Commissioned 4/3/01	1	Kent Taylor	7/01 - Telog failed and was replaced. Backwater problems during rain events.

Table 2.1 - Meters in the DWSD System, continued

DWSD Meter No.	Meter Type	Typical Dry Weather Flow or Maximum Flow Rate (cfs)	Location	City/District Served[2]	Installation Date	Age (Years)	Instrumentation Manufacturer	GDRSS Condition Notes
DN-S-6	Parshall Flume-3-in.	1.1 max scale*; 0.01 ave, 0.11 max (2001 data)	17301 Michigan Ave (Michigan Ave. & Southfield Expressway), Dearborn	Dearborn: North Central	2/13/80?	22	Badger; updated w/ Miltronic	Flume clogged - cleaned on 10/2/01 and 1/21/02. Data gaps due to power disconnects.
DN-S-7	Parshall Flume - 3-in.	1.86 max scale; 0.02 ave, 0.09 max (2001 data)	19320 Ford Road (Ford/Altar E. of Evergreen), Dearborn	Dearborn: North Central	8/20/1985, Updated (Date?)	17	Badger; updated w/ Miltronic	Data gap, reprogrammed Telog 10/15/01. Flume glogged - cleaned on 12/15/01
DT-S-1_2	Transit Time	39.7	6371 Evergreen (Northwest Interceptor at Evergreen), Detroit	Rouge	9/26/96	6	Accusonic	Electronic board repaired 11/01.
DT-S-10	Transit Time	186.7	2201 Franklin (DRI at Dubois & Franklin), Detroit	Central City	10/1/1997?	5	Accusonic	Clocks needed resetting. No other significant issues.
DT-S-11	Transit Time	119.5	5540 Mt. Elliot (Mt. Elliot & Palmer), Detroit	Central City/Conner Creek	12/5/96	6	Accusonic	Enclosure needs replacement. Flow & level discrepancies between Accusonic & Telog.
DT-S-12	Transit Time	282.8	1980 W. Jefferson (Rosa Parks & Jefferson), Detroit	Central City	12/11/96	6	Accusonic	No significant issues.
DT-S-3_4	Transit Time	47.6 (Southfield)	16401 Ford Rd. (Hubbell-Southfield at Ford Rd., Detroit	Hubbell/Southfield	12/5/1996?	6	Accusonic	No significant issues.
DT-S-3_4	Transit Time	2.9 (Hubbell)	16401 Ford Rd. (Hubbell-Southfield at Ford Rd., Detroit	Hubbell/Southfield	12/5/1996?	6	Accusonic	No significant issues other than interference from sediment.
DT-S-5	Transit Time	83.0	10501 W. Fort St. (Oakwood Interceptor at Reisner), Detroit	Baby Creek	12/6/96	6	Accusonic	No significant issues. Flow & level discrepancies between Accusonic & Telog.
DT-S-6	Transit Time	24.5	7457 Weatherby (Weatherby & Majestic), Detroit	Baby Creek	11/14/96	6	Accusonic	Transducer and new barrier installed in 2001.
DT-S-7	Transit Time	54.5	Conner Creek Pump Station - 12244 Jefferson, Detroit	Conner Creek	4/7/97	5	Accusonic	No significant issues other than level discrepancies from downlooker interference.
DT-S-8	Transit Time	164.9	9002 E. Jefferson (Detroit River Interceptor downstream of Fairview Pump Station), Detroit	East Side/Grosse Pointe Park/Milk River	12/11/96	6	Accusonic	No significant issues. Flow & level discrepancies between Accusonic & Telog.
DT-S-9	Transit Time	21.3	8718 Seven Mile Rd. (Conner in Mt. Olivet Cemetary), Detroit	Conner Creek	1/15/98	4	Accusonic	No significant issues.
FA-S-1	Parshall Flume - 9-in.	6.5 max; 2.67 ave, 5.64 max (2001 data)	22990 8 Mile Road (8 Mile & Berg), Detroit	City of Farmington	8/23/1957, updated 6/19/86	45	Bristol; updated w/ Miltronic	No significant issues.
FR-S-1	Parshall Flume - 12-in.	14 max; 3.0 ave, 13.5 max (2001 data)	34900 Garfield (Garfield & 15 Mile), Fraser	Fraser	8/14/1973, updated 6/16/86	29	Bristol; updated w/ Miltronic	No significant issues.

Table 2.1 - Meters in the DWSD System, continued

DWSD Meter No.	Meter Type	Typical Dry Weather Flow or Maximum Flow Rate (cfs)	Location	City/District Served[2]	Installation Date	Age (Years)	Instrumentation Manufacturer	GDRSS Condition Notes
GK-S-1	Parshall Flume - 72-in. (Wet weather pumped flows)	103.5 max scale; 9.68 ave, 39.2 max (2001 data)	15115 E. Jefferson (Jefferson & Maryland), Grosse Pointe Park	Grosse Pointe Park	5/22/1962, updated June-2001	40	Burgess Manning; updated w/ Miltronic	No significant issues.
GK-S-2	Venturi - 16-in. (Dry weather flow through P.S.)	10 max scale; 2.74 ave, 5.41 max (2001 data)	15115 E. Jefferson (Jefferson & Maryland), Grosse Pointe Park	Grosse Pointe Park	Approx. 1945	57	Republic	No significant issues.
HR-S-1	Parshall Flume - 12-in.	16 max; 1.0 ave, 5.4 max (2001 data)	25098 H.B.Joy Blvd. (H.B. Joy & Executive Dr.), Harrison Twp.	Harrison Township	5/13/74, updated 6/20/86	28	Bristol; updated w/ Miltronic	No significant issues.
HR-S-2	Parshall Flume - 24-in.	34 max; 2.96 ave, 7.42 max (2001 data)	38027 Reimold (Reimold & Lanse Creuse), Harrison Twp.	Harrison Township	3/6/74, updated 6/20/86	28	Bristol; updated w/ Miltronic	No significant issues.
HR-S-3	Parshall Flume - 9-in.	8 max; 0.83 ave, 2.94 max (2001 data)	35115 Union Lake Rd. (Union Lake Rd. & Shook Rd.), Harrison Twp.	Harrison Township	2/4/1975, 6/20/86 updated	27	Fischer - Porter; updated w/ Miltronic	No significant issues.
MA-S-1	Magmeter - 16-in.	20 max; 10.9 ave, 16.0 max (2001 data)	16650 21 Mile Road (Garfield Pump Station, 21 Mile & Garfield Rd.), Macomb Twp.	Macomb Township	8/1/76	26	Fischer - Porter	No significant issues.
MC-S-1	Transit Time	350 max scale	15 Mile Rd. East of Corridor Interceptor, Sterling Heights	Macomb Sanitary District	Sep-00	1	Accusonic	New, no significant issues other than sediment buildup near or above velocity path 1.
ME-S-1	Magmeter - 14-in.	15 max scale; 3.95 ave, 11.3 max (2001 data)	3250 Greenfield (Greenfield & Wall), Melvindale	Melvindale	7/2/83, replaced 2/10/92	10	Tiger	Incorrect scaling on Telog. Scale corrected 11/13/01 and data corrected .
OC-S-1	Ultrasonic - 66-in.	71.8 DWF, 100 max.	18141 Westhaven (8 Mile & Southfield), Southfield	Evergreen-Farmington Sanitary District	2/10/92	10	Nusonics	New totalizer installed and other repairs made in 2001.
OC-S-2	Parshall Flume - 60-in.	45.2 DWF, 85.6 max	51379 Dequindre (Avon & Dequindre), Rochester Hills	Clinton-Oakland Sanitary District	7/18/72	30	Bristol; updated w/ Kistler-Morse	Improper hydraulic conditions - being redesigned.
OM-S-1	Transit Time	750 max scale	15 Mile Rd. West of Corridor Interceptor, Sterling Heights	Clinton-Oakland Sanitary District/Macomb Sanitary District	8/9/01	1	Accusonic	New
OM-S-2	Transit Time	120.3	18802 Van Dyke (North Interceptor-East Arm at Iowa), Detroit	Clinton-Oakland Sanitary District/Macomb Sanitary District	4/14/97	5	Accusonic	No significant issues.

Table 2.1 - Meters in the DWSD System, continued

DWSD Meter No.	Meter Type	Typical Dry Weather Flow or Maximum Flow Rate (cfs)	Location	City/District Served[2]	Installation Date	Age (Years)	Instrumentation Manufacturer	GDRSS Condition Notes
RC-S-1	Parshall Flume - 24-in.	2.8 DWF, 25 max	45450 Dequindre (West Utica & Dequindre), Utica, Shelby Twp.	Rochester Hills	10/17/1973; updated (date?)	29	Acco-Bristol; updated w/ Miltronic level sensor	No significant issues.
SE-S-1	Magmeter - 66-in.	98 DWF, 260 max	20480 Dequindre (8 mi. & Dequindre); 20450 Conant, Detroit 48234	Southeast Oakland Sanitary District	11/25/64	38	Bailey Fischer Porter	No significant issues.
ST-S-1	Parshall Flume - 24-in.	33.1 max scale: 8.32 ave, 18.2 max (2001 data)	40440 Utica Road (Utica at Dodge Park), Sterling Heights	Sterling Heights	original-7/18/72; updated (date?); flume insert replaced (date?)	?	Original - Bristol, Miltronic installed	No significant issues other than calibration.
ST-S-2	Parshall Flume - 12-in.	16.1 max scale; 3.11 ave, 8.26 max (2001 data)	11590 15 Mile (15 Mile & Dodge Park), Sterling Heights	Sterling Heights	7/19/72, updated8/22/80 ; flume insert replaced (date?)	?	Original - Bristol, Miltronic installed	No significant issues.
ST-S-3	Parshall Flume - 24-in.	33.1 max scale: 8.26 ave, 21.2 max (2001 data)	11637 Sorrento (Sorrento Blvd. & Dodge Park), Sterling Heights	Sterling Heights	7/18/72, updated 10/24/86; flume insert replaced (date?)	?	Original - Bristol, Miltronic installed	No significant issues.
ST-S-4	Parshall Flume - 12-in.	16.1 max scale; 2.62 ave, 9.98 max (2001 data)	7999 14 Mile Rd (14 Mile/Edison Corridor), Sterling Heights	Sterling Heights	11/13/73, updated (date?); flume insert replaced (date?)	?	Original - Bristol, Miltronic installed	No significant issues.
ST-S-5	Parshall Flume - 12-in.	16 max; 1.48 ave, 5.44 max (2001 data)	13793 15 Mile Rd. (15 Mile & Schoenherr), Sterling Heights	Sterling Heights	4/1/1973, updated 6/18/86	29	Fischer - Porter; updated w/ Miltronic	No significant issues.
ST-S-6	Parshall Flume - 24-in.	32.5 max; 2.7 ave, 3.66 max (2001 data)	41020 Hayes (18 Mile & Hayes), Sterling Heights	Sterling Heights	3/30/1976, updated (date?)	26	Badger; updated w/ Miltronic level sensor	No significant issues.
SY-S-1	Parshall Flume - 12-in.	16 max; 1.06 ave, 1.78 max (2001 data)	M-59, Dobry Road & Mound Road, Sterling Heights	Shelby Township	2/27/1974, updated 10/24/86; relocated 1994; recommissioned 2/1/01	28	Bristol; updated w/ Miltronic	No significant issues.
SY-S-2	Ultrasonic - 8-in.	15 max	2888 23 Mile Road (23 Mile & Ryan), Shelby Twp.	Shelby Township	2/18/82	20	Sparling	Temporary Sigma meter installed (5/2/01) upstream. Ave flow 0.79cfs, max 1.47cfs.

Table 2.1 - Meters in the DWSD System, continued

DWSD Meter No.	Meter Type	Typical Dry Weather Flow or Maximum Flow Rate (cfs)	Location	City/District Served[2]	Installation Date	Age (Years)	Instrumentation Manufacturer	GDRSS Condition Notes
UT-S-1	Parshall Flume - 9-in.	8.86 max scale; 1.10 ave, 3.85 max (2001 data)	44400 Utica Road (Utica at Nichols), Utica	Utica	4/13/73, updated 6/20/86	29	Bristol; updated w/ Miltronic	No significant issues.
WC-S-1	Ultrasonic - 54-in.	87.3 DWF, 230 max	173 S. Fort St. (S. Fort & Oakwood), Detroit	Wayne County Rouge Valley Sanitary District	2/10/92	10	Accusonics	No significant issues.
WC-S-2	Ultrasonic - 54-in.	17.7 DWF, 94.5 max	2110 Ford Road (Ford and Evergreen), Dearborn	Wayne County Rouge Valley Sanitary District	1/21/86?	16	Sparling	Wayne Co. planning to replace meter.
WC-S-3	Ultrasonic - 48-in.	10.3 DWF, 100 max	4896 Southfield (NB Southfield Service Dr. S. of Hubbard), Dearborn	Wayne County Rouge Valley Sanitary District	?	?	Sparling	Inaccurate readings observed. Wayne Co. planning to replace meter.
WM-S-1	Magmeter - 42-in.	50.6 DWF, 127 max	Kerby Road Pump Station - 311 Chalfonte, Grosse Pointe Farms	Northeast Wayne County	10/25/62 meter set; started 1/23/74	40	Bailey Fischer Porter	Meter readings off 2-3% - awaiting ABB report. No other problems.
WM-S-2	Transit Time	63.4	1202 Bishop (Fox Creek Enclosure at Kercheval), Grosse Pointe Park	Grosse Pointe/Grosse Pointe Farms	9/29/96	6	Accusonic	No significant issues.
PS-2-A/B (WWTP)	7 Magmeters (54-in.) at P.S. 2 measuring influent WW	150 max scale per magmeter	9300 W. Jefferson, Detroit (Pump Station 2)	Influent wastewater measurement to WWTP at P.S. 2	?	?	Tiger	No significant issues. Magmeter accuracy tested and reported acceptable in 2000.
SFE_48/60 (WWTP)	2 Transit Time Meters measuring final effluent	Up to 1200 mgd.	9300 W. Jefferson, Detroit (outfalls)	WWTP screened final effluent measurement	?	?	Accusonic	No significant issues. Additional outfall and meter under construction (DRO-2).

Notes

1 - GDRSS is tenatively performing all meter maintenance under CS-1249

2 - The City/Districts served are listed incrementally - only the tributary area between the meter indicated and the next meter upstream is listed.

3- The 2001 average flows are arithmetic mean of 5-min recorded data.

Other Planned?
CT-S-5
CT-S-6
S-1 Grosse Pte. Park

* "Max Scale" indicates the max flow Telog recorder is scaled to. If only "max" is noted, it is max flow recorded or max flow as listed in DWSD notes on meter.

TABLE 2.2 - METERING TECHNOLOGIES

TECHNOLOGY	CHARACTERISTICS	MANUFACTURERS
Hydraulic Structure		
Weir	• Sensitive to depth over weir. • Requires accurate level measurement. • Problems if submerged. • Can have different shapes (V-notch, sharp-crested, broad-crested).	• Weir is fabricated in the field. • Level monitors from various manufacturers.
Parshall Flume	• Highly accurate device primary element. • Requires accurate level measurement. • Problems with submergence.	• Inserts made by many different manufacturers.
Electromagnetic		
Magmeter (Magnetic Flow Meter)	• Installed around entire pipe. • Measures full pipe flow only. • Highly accurate permanent installation	• Fischer & Porter • Bailey
Electromagnetic local velocity	• Estimates point velocity on sewer wall. • Field calibration used to estimate average velocity from point velocity.	• Marsh-McBirney
Electromagnetic velocity profiler	• Develops vertical flow profile. • Estimates local velocity at probe surface. • Installs out of flow stream.	• MSR
Ultrasonic		
Transmissive Ultrasonic Flow Meter	• Full pipe flow only. • Measures single flow path velocity. • Installed as a spool piece or can be retrofitted to existing pipe.	• Sparling
Reflective Ultrasonic Flow Meter (spectrum analysis average velocity)	• Analyzes ultrasonic return spectrum to estimate average velocity. • Analysis of return spectrum typically performed using proprietary algorithm.	• American Sigma • Badger • ISCO
Reflective Ultrasonic Flow Meter (spectrum analysis peak velocity)	• Analyzes ultrasonic return spectrum to estimate peak flow. • Average flow based on field calibration of peak to average ratio. • Depth to peak and average velocity relationship not well known.	• ADS Environmental
Transit Time		
Single-path Transit Time Acoustic Flow Meter	• Single acoustic path. • Directly measures average flow velocity. • Field calibration needed to estimate average velocity.	• Badger
Multi-path Transit Time Acoustic Flow Meter	• Multiple acoustic paths. • Directly measures average flow velocity. • No field calibration needed.	• O.R.E., Accusonic
Estimation Methods		
Pumping Records (flow estimation method used at P.S. 1 at WWTP)	• Pump curves change with impeller wear. • Flow calculation dependent on discharge head.	• Pump curves produced in factory.

Graph 2: Age of Meters

