

Technical Memorandum

Phase 1 Part 2 CSO Control Plan Wellington Avenue CSO Facility

House to House Surveys

Prepared for:

City of Newport
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December 6, 2006

J.N. 82372

INTRODUCTION

This House to House Survey Technical Memorandum (TM) has been prepared to describe the investigation procedure used, results of the investigation, and recommendations for the identified inflow sources observed.

DESCRIPTION OF THE HOUSE TO HOUSE SURVEYS

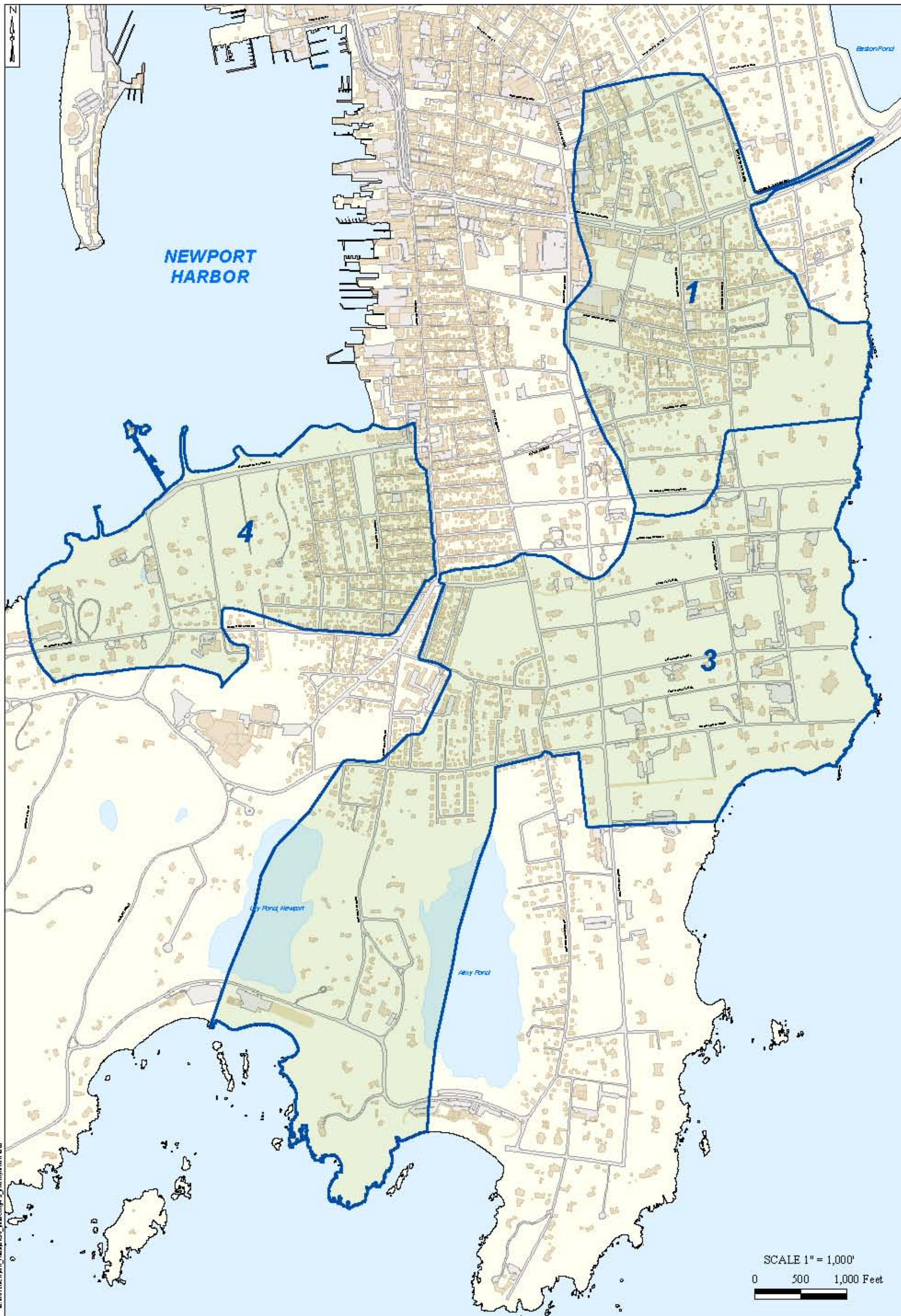
The house to house surveys were performed to investigate and identify potential inflow sources in the residential and commercial buildings in the three sewer catchment areas designated as priority inflow areas in the Phase 1 Part 1 CSO Control Plan report. House to house surveys were conducted in Sewer Catchment Areas 1, 3 and 4, by ADS Environmental Services (formerly Severn Trent Pipeline Services) between July 6 and August 31, 2006 generally between the hours of 8 AM and 5 PM. Figure 1 depicts Catchment Areas 1, 3, and 4.

HOUSE TO HOUSE SURVEY PROCEDURES

House to house surveys are performed to identify sources of inflow that can be described as being either a direct or an indirect source. A direct connection, as implied, is a drainage source that is observed to be directly tied into the sanitary collection system. Direct sources of inflow most often include roof leaders and basement, driveway or yard drains, etc that are connected directly to the sewer system. Indirect connections are most often sump pumps, which allow ground water or surface water to enter the sanitary sewer system. Once the sources are observed as direct or indirect, they can be classified by their location, or by party responsible for correcting the defect. All connections observed during the house to house surveys are considered private connections as they include yard or driveway drains, rain leaders and roof drains, and sump pumps which are all located on privately owned property. Figure 2 shows typical house connections to the sanitary sewer system.

All property owners in the areas surveyed were notified 24 to 72 hours prior to the house to house survey. A sample of a typical house to house survey notification is attached to this TM.

House to house surveys were attempted in all buildings within each of the 3 priority sewer catchment areas, totaling 1309 buildings, including 1210 residential buildings and 91 commercial buildings. If the first attempt at entry was unsuccessful, two additional attempts were made to gain entry to the building.



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- LEGEND:
- Priority Catchments for Inflow Investigation
 - Buildings
 - Docks
 - Paved Roads and Parking
 - Unpaved Roads and Parking

FIGURE 1
PRIORITY CATCHMENTS FOR
HOUSE TO HOUSE SURVEYS
PHASE I PART I CSO CONTROL PLAN

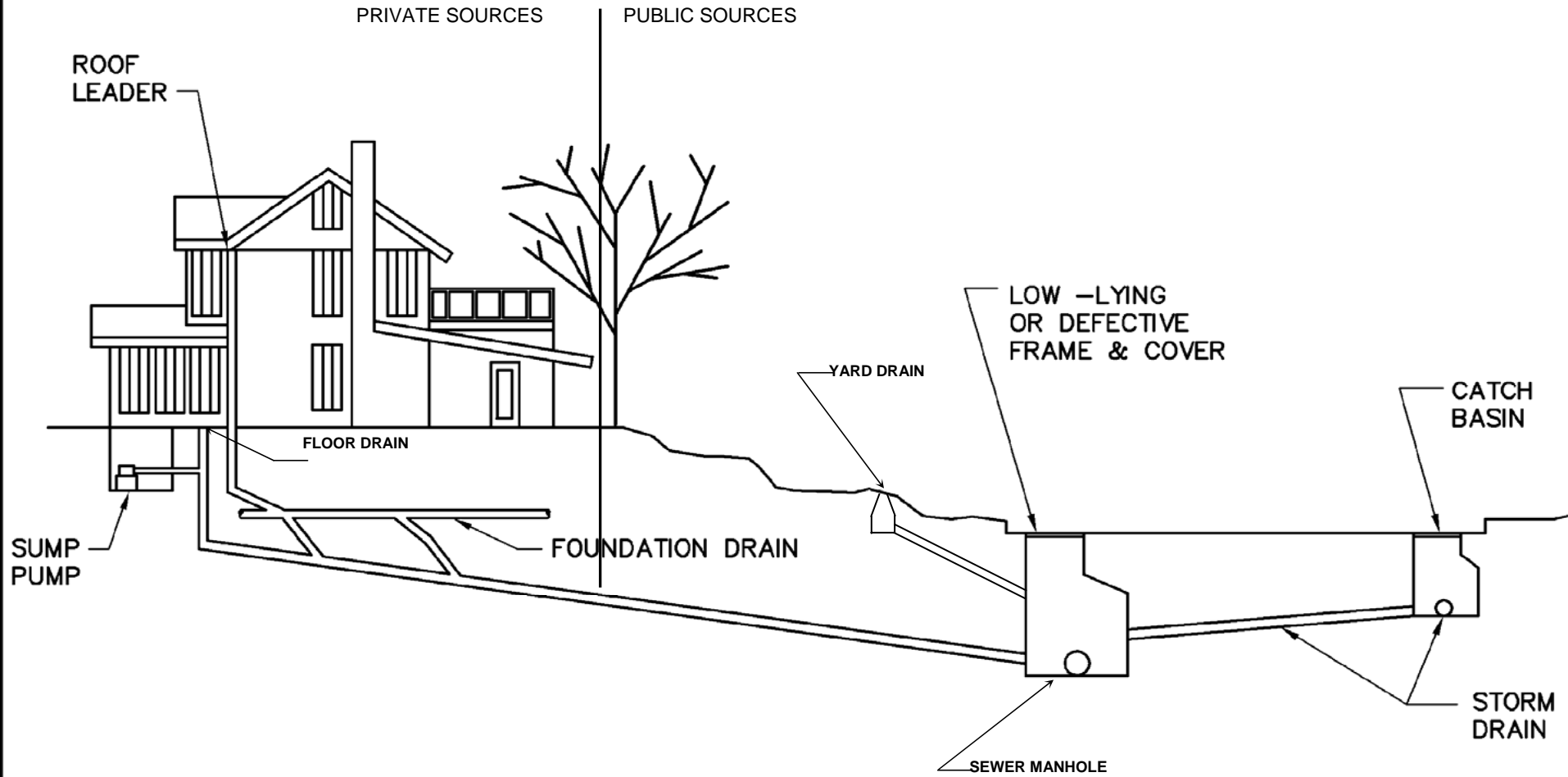


Figure 2
Potential Inflow Sources

SUMMARY OF HOUSE TO HOUSE SURVEY RESULTS

Buildings Surveyed

A total of 1309 buildings were surveyed during the house to house inspections including 1210 residential buildings and 91 commercial buildings. The success rate of accessing the buildings was approximately 80%, with approximately 2% of occupants refusing ADS entry to perform the survey and approximately 3% of the buildings were found to be vacant. A breakdown of the house to house survey information is presented by Catchment Area are shown in Tables 1, 2, and 3. Please see Appendix A for the results of the individual addresses.

Table 1
Summary of Building Type

	Total Buildings	Residential	Commercial
Area 1	454	412	39
Area 3	378	335	40
Area 4	477	463	12
Total	1309	1210	91

Table 2
Buildings Inspections Attempted

	Buildings Inspected	No Access after 3 rd Attempt	Refused	Vacant
Area 1	370	67	11	6
Area 3	318	42	9	9
Area 4	353	91	8	25
Total	1041	200	28	39

Table 3
Percentage of Buildings Inspected Attempted

	Buildings Inspected	No Access after 3 rd Attempt	Refused	Vacant
Area 1	81.5%	14.8%	2.4%	1.3%
Area 3	84.1%	11.1%	2.4%	2.4%
Area 4	74.0%	19.1%	1.7%	5.2%
Total	79.5%	15.3%	2.1%	3.1%

Sump Pumps

Approximately 39.8% or 415 of the buildings inspected (1041) had a sump pump. The following is a breakdown of sumps by discharge location. Figures 3, 4A, 4B, and 5 show the approximate locations of sump pumps observed during the building survey organized by Catchment Area.

- Approximately 18.4% or 192 of the buildings inspected had a sump pump discharging to the sanitary sewer.
- Approximately 17.3% or 179 of the buildings inspected had a sump pump discharging to the ground surface.
- Approximately 4.0% or 44 of the buildings inspected had a sump pump discharging to unknown or other locations.
- A breakdown of the sump pump information obtained during the house to house survey is presented by Catchment Area in Tables 4 and 5.

Table 4
Observed Sump Pump Connections

	Sump Pump To Sanitary	Sump Pump to Ground	Sump Pump to Other	Sump Pump to Unknown
Area 1	66	42	2	30
Area 3	56	40	0	7
Area 4	70	97	0	5
Total	192	179	2	42

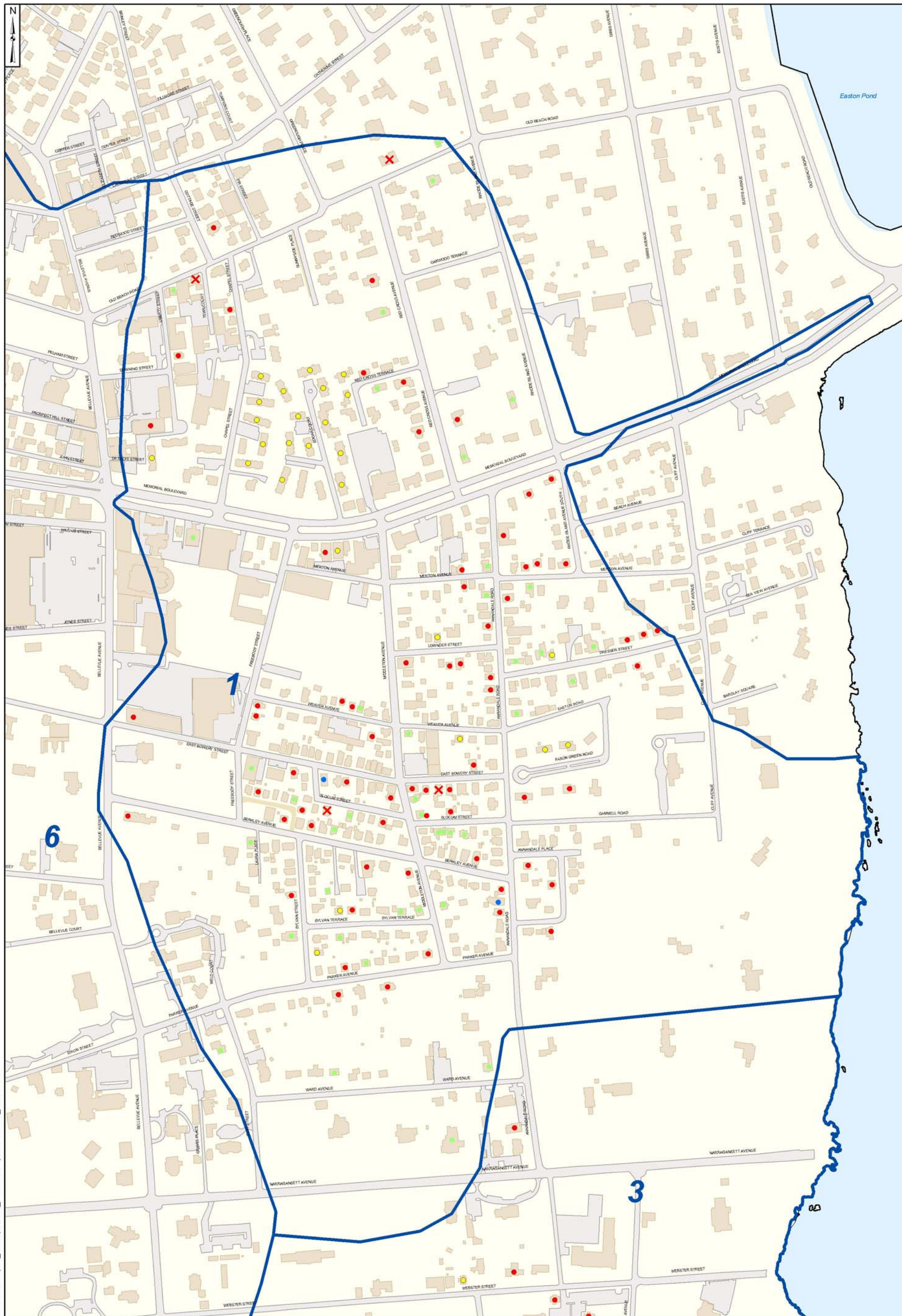
Table 5
Observed Sump Pump Connections
Percent of Inspected Buildings

	Sump Pump To Sanitary	Sump Pump to Ground	Sump Pump to Other	Sump Pump to Unknown
Area 1	17.8%	11.4%	0.5%	8.1%
Area 3	17.6%	12.6%	0.0%	2.2%
Area 4	19.8%	27.8%	0.0%	1.4%
	18.4%	17.3%	0.2%	4.0%

Using a standard average flow per pump range of 1 to 5 gallons per minute (gpm)¹ or 1440 to 7200 (gpd) to estimate the total contribution of the sump pumps to the sanitary system, the potential flow from each catchment is as follows:

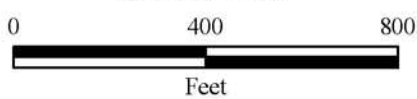
- Catchment Area 1 – 95,040 to 475,200 gpd
- Catchment Area 3 – 80640 to 403,200 gpd
- Catchment Area 4 – 100,800 to 504,000 gpd

¹-Massachusetts Department of Environmental Protection “Guidelines for Performing Infiltration/Inflow Analysis and Sewer System Evaluation Survey”, January 1993



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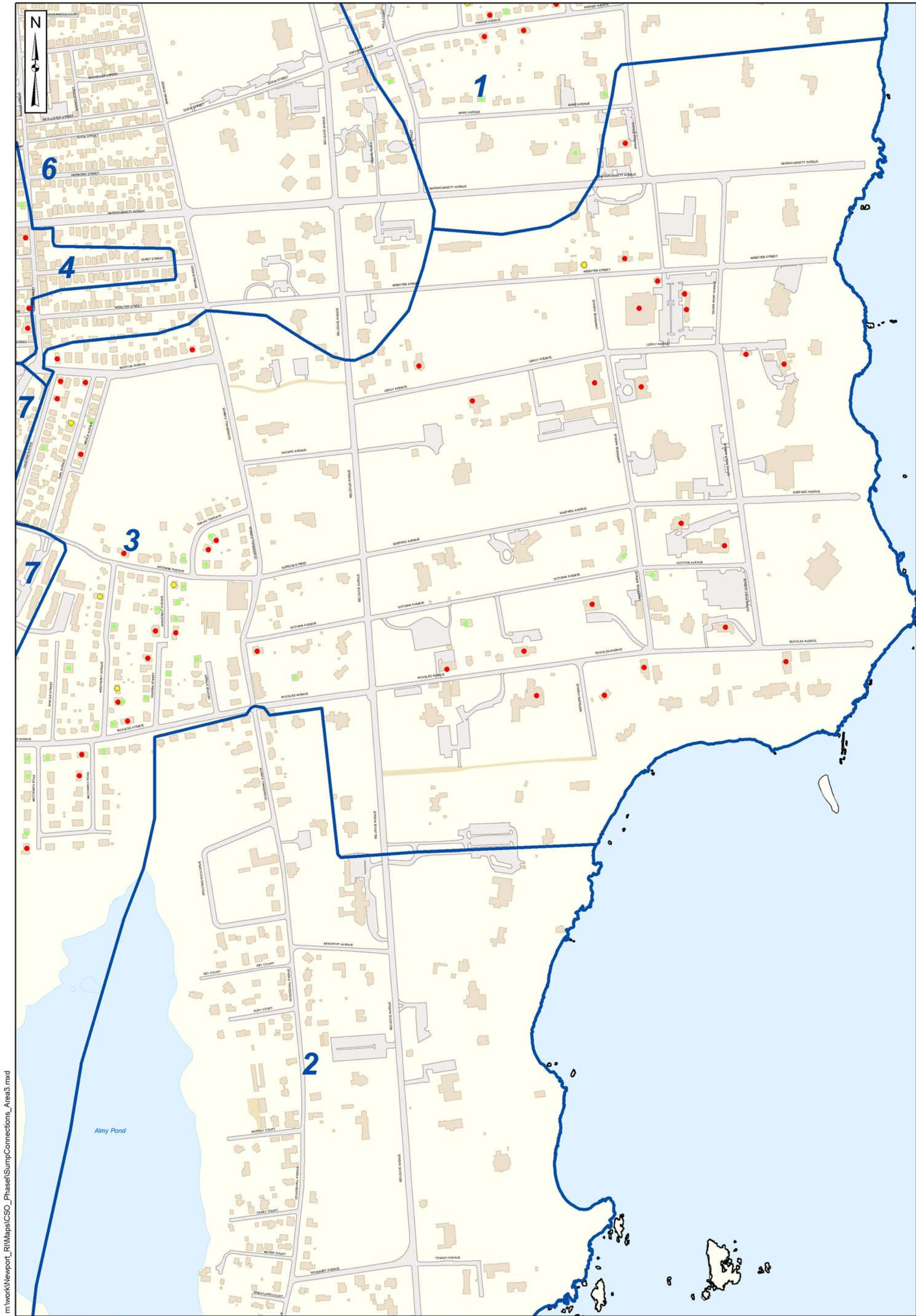
SCALE 1" = 400'



LEGEND:

- Sewer District Boundary
- Buildings
- Docks
- Paved Roads and Parking
- Unpaved Roads and Parking
- Sump to Sanitary
- Sump to Ground
- Sump to Other
- Sump to Unknown
- X Sump Disconnected

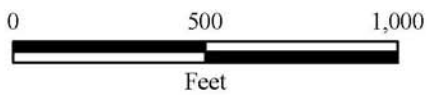
FIGURE 3
CATCHMENT AREA 1
SUMP PUMP LOCATIONS
PHASE I PART 2 CSO CONTROL PLAN



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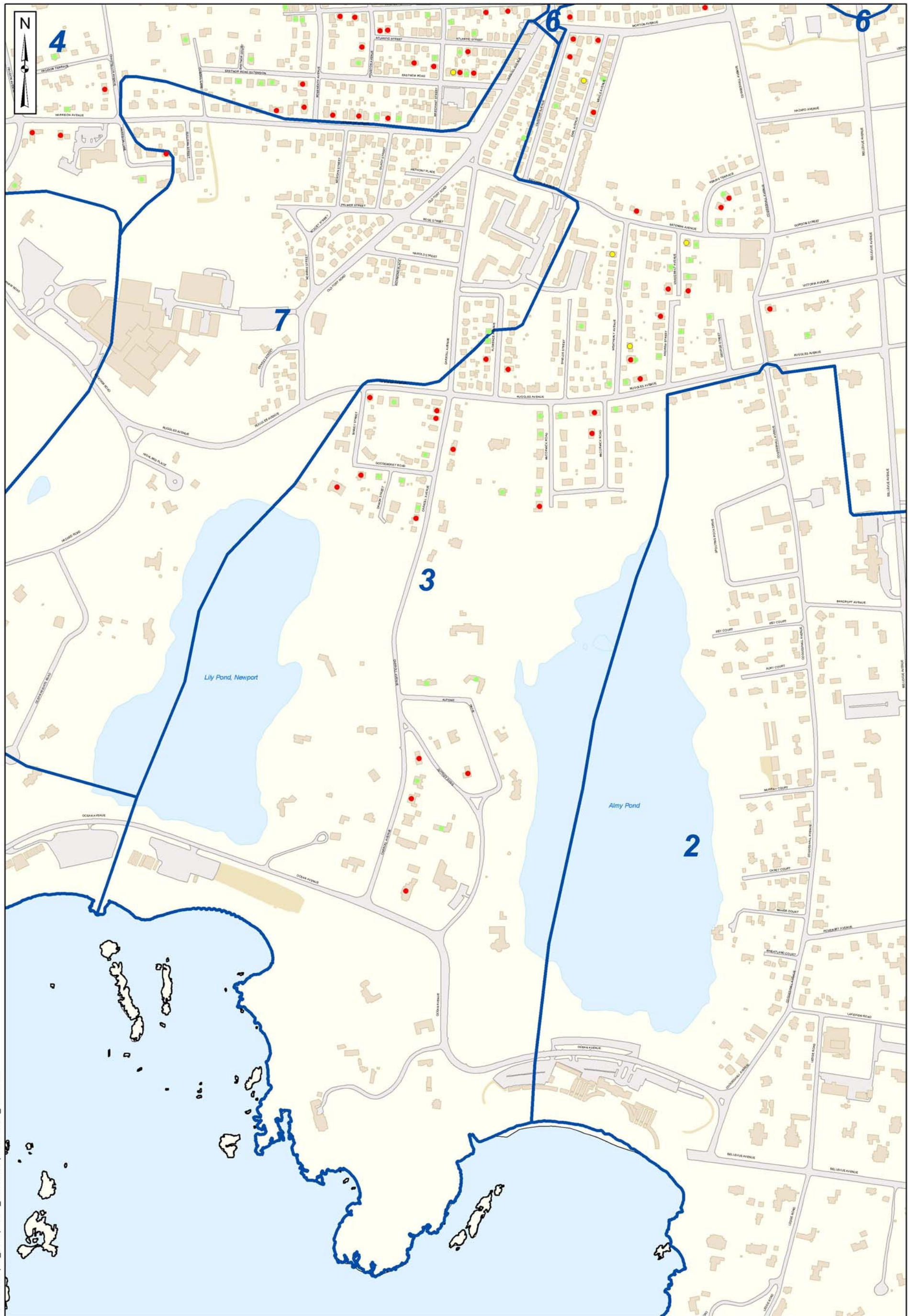
SCALE 1" = 500'



LEGEND:

- Sewer District Boundary
- Buildings
- Docks
- Paved Roads and Parking
- Unpaved Roads and Parking
- Sump to Sanitary
- Sump to Ground
- Sump to Other
- Sump to Unknown
- Sump Disconnected

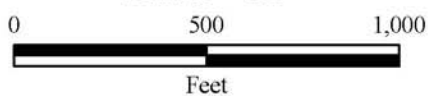
FIGURE 4A
CATCHMENT AREA 3
SUMP PUMP LOCATIONS
PHASE I PART 2 CSO CONTROL PLAN



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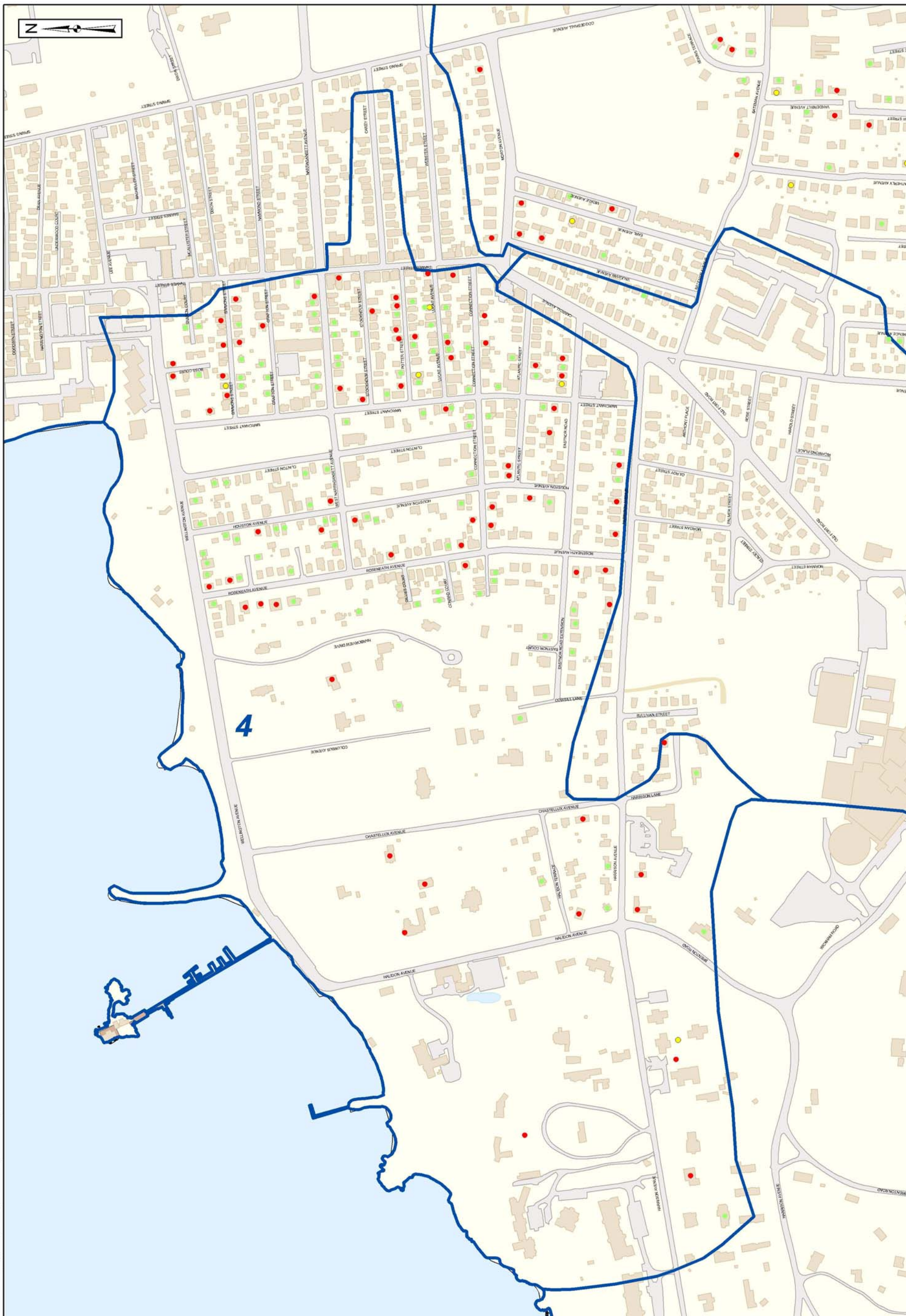
SCALE 1" = 500'



LEGEND:

- Sewer District Boundary
- Buildings
- Docks
- Paved Roads and Parking
- Unpaved Roads and Parking
- Sump to Sanitary
- Sump to Ground
- Sump to Other
- Sump to Unknown
- Sump Disconnected

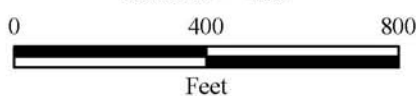
FIGURE 4B
CATCHMENT AREA 3
SUMP PUMP LOCATIONS
PHASE I PART 2 CSO CONTROL PLAN



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DECEMBER 2006

SCALE 1" = 400'



LEGEND:

- Sewer District Boundary
- Buildings
- Docks
- Paved Roads and Parking
- Unpaved Roads and Parking
- Sump to Sanitary
- Sump to Ground
- Sump to Other
- Sump to Unknown
- × Sump Disconnected

FIGURE 5
CATCHMENT AREA 4
SUMP PUMP LOCATIONS
PHASE I PART 2 CSO CONTROL PLAN



A tyco International Ltd. Company

Since CSO discharges are considered to typically occur during peak flow periods in the sanitary sewer system, the 1 to 5 gpm rate is the estimated sump pump peak flow rate during a high flow condition. During dry weather periods, the sump pumps are expected to be less active.

The estimated inflow from sump pumps within the priority areas ranges between 276,480 and 1,382,400 gpd during peak flow conditions. A list of sump pumps by address is included in at the end of this TM.

Rain Leaders

Approximately 38.7% or 507 of the total buildings (1309) have rain leaders that enter the ground, 81.4% or 1066 of the structures have rain leaders that discharge to the ground surface and approximately 3.4% or 44 with rain leaders entering the foundation. If a building could not be accessed, rain leaders observed from public property were noted on the inspection form. Rain leaders observed on all buildings are included in the total observed rain leaders.

A breakdown of the rain leader information obtained during the house to house survey is presented by Catchment Area are shown in Tables 6 and 7.

**Table 6
Building Rain Leader Summary**

	Buildings with Rain Leaders Connected into the Ground	Buildings with Rain Leaders Connected to Foundation	Buildings with Rain Leaders Discharging to the Ground Surface
Area 1	175	16	375
Area 3	177	15	293
Area 4	155	13	398
Total	507	44	1066

Note: Some buildings were observed to have more than one rain leader terminating in different locations.

**Table 7
Building Rain Leader Summary
Percent of Total Buildings**

	Rain Leaders Connected into the Ground	Buildings with Rain Leaders Connected to Foundation	Buildings with Rain Leaders Discharging to the Ground Surface
Area 1	38.5%	3.5%	82.6%
Area 3	46.8%	4.0%	77.5%
Area 4	32.5%	2.7%	83.4%
	38.7%	3.4%	81.4%

Direct connection of the roof leaders to the sanitary system were verified by the smoke testing which was presented in a separate technical memorandum. Dye testing is being performed to confirm separated rain leaders that were identified in the house to house survey.

Area Drains/Yard Drains/Other

Similar to the rain leaders, drainage structures observed from public property were included on the inspections forms of buildings where access was not gained. Of the 1309 total buildings, the following private drainage structures were observed:

- 91 Flat Roof
- 68 Yard Drains
- 72 Driveway Drains
- 22 Stair Drains
- 41 Window Well Drain

A breakdown of the private drainage structures obtained during the house to house survey is presented by Catchment Area are shown in Table 8.

**Table 8
Private Drains**

	Flat Roof	Yard Drain	Driveway Drain	Stair Drain	Window Well Drain
Area 1	30	14	12	3	24
Area 3	31	39	42	14	15
Area 4	30	15	18	5	2
Total	91	68	72	22	41

Of the 1309 structures inspected, the following gravity structures were observed:

- 17 Open Sewer Clean Outs
- 160 Basement Drains
- 24 Open Pipes
- 438 Sump Pits

A breakdown of the internal gravity structure information obtained during the house to house survey is presented by Catchment Area in Table 9.

Table 9
Summary of Internal Gravity Structure Observations

	Open Clean Out	Basement Drain	Open Pipe	Sump Pit Present
Area 1	7	72	13	152
Area 3	6	51	6	116
Area 4	4	37	5	170
Total	17	160	24	438

Confirmed Connections to the Sanitary Sewer

During the smoke testing, some of the defects observed in the house to house inspections were confirmed. The defects observed and confirmed in the smoke testing are organized by Catchment Area in the Tables 10, 11, and 12.

Table 10
Area 1 Connections to Sanitary Sewer
Confirmed by Smoke Testing

13	Annandale Road	Disconnected Roof Leader
22	Annandale Road	Roof Leader
63	Annandale Road	Roof Leader
75	Annandale Road	Roof Leader
1	Annandale Terrace	Roof Leader
340	Bellevue Avenue	Sidewalk Drain*, Area Drain*
49	Berkeley Avenue	Roof Leader
37	East Bowery Street	Clean Out
1	Red Cross Avenue	Catch Basins*, Clean Out, Roof Leaders
6	Red Cross Avenue	Foundation Drain*
40	Red Cross Avenue	Roof Leader
3	Sylvan Street	Roof Leader
7	Sylvan Street	Roof Leader

* - Observed and Confirmed during Smoke Testing.

Table 11
Area 3 Connections to Sanitary Sewer
Confirmed by Smoke Testing

489	Bellevue Avenue	Clean Out
109	Carroll Avenue	Disconnected Roof Leader
115	Carroll Avenue	Roof Leader
2	Earl Avenue	Roof Leader
6	Earl Avenue	Roof Leader
15	Earl Avenue	Roof Leader
8	Florence Avenue	Roof Leader, Driveway Drain*
15	Gooseberry Road	Roof Leader
10	Morton Avenue	Roof Leader
12	Morton Avenue	Roof Leader
94	Ruggles Avenue	Roof Leader
96	Ruggles Avenue	Roof Leader
1	Stevenson Place	Roof Leader
3	Stevenson Place	Roof Leader
4	Stevenson Place	Driveway Drain
14	Vaughan Avenue	Roof Leader
16	Vaughan Avenue	Roof Leader
24	Vaughan Avenue	Roof Leader
25	Vaughan Avenue	Roof Leader
27	Vaughan Avenue	Roof Leader
34	Vaughan Avenue	Roof Leader
74	Victoria Avenue	Roof Leader
160	Webster Street	Roof Leader

* - Observed and Confirmed during Smoke Testing.

Table 12
Area 4 Connections to Sanitary Sewer
Confirmed by Smoke Testing

9	Atlantic Street	Roof Leader
31	Atlantic Street	Roof Leader
5	Carey Street	Roof Leader*
23	Carey Street	Clean Out, Roof Leader*
53	Chastellux Avenue	Roof Leader
40	Eastnor Road	Roof Leader
5	Gilles Court	Roof Leader
63	Houston Avenue	Roof Leader
63	Marchant Street	Roof Leader
23	Potter Street	Disconnected Roof Leader
31	Potter Street	Roof Leader
30	Roseneath Avenue	Roof Leader
44	Roseneath Avenue	Roof Leader
73	Roseneath Avenue	Roof Leader
20	Simmons Street	Roof Leader
17	Stockholm Street	Roof Leader
25	Stockholm Street	Roof Leader
109	Wellington Avenue	Yard Drain*
28	West Narragansett Street	Roof Leader

* - Observed and Confirmed during Smoke Testing.

REHABILITATION RECOMMENDATIONS

Based on the results of the house to house surveys, the three priority sewer catchments appear to contain various inflow sources that contribute inflow to the sewer system, primarily sump pumps and rain leaders. These connections may require immediate correction or rehabilitation to prevent inflow from entering the sanitary system. The following actions are recommended to eliminate or reduce inflow into the sanitary sewer. All sources in this TM are considered private; therefore no rehabilitation costs have been included. Cost to rehabilitate private inflow sources shall be borne by the owner of the private property.

- Develop a disconnection policy to redirect flow from sump pumps to the city storm drains or to the ground surface. The disconnection policy should include procedures for property owners to perform the disconnection and a list of approved contractors to perform the disconnection.
- Develop a program to require private property owners to repair or replace leaking or damaged clean outs and open pipes to prevent inflow from entering the sanitary sewer system.
- Develop a program to require private property owners to disconnect roof drains and rain leaders from the sanitary sewer and redirect flow to the ground surface or into existing storm drain (if adequate capacity is available),
- Develop a program to require private property owners to disconnect yard, driveway, foundation and sidewalk drains from the sanitary sewer and redirecting flow into the storm drain system (if capacity allows) or into infiltration sumps. Dye flooding can be performed to verify the connection of the yard or other drain to the sanitary sewer. A cost estimate to perform the dye flooding to verify the connection of the drain to the sanitary sewer is presented in Table 13. As very few if any private drains were confirmed connected to the sanitary sewer during smoke testing, dye testing of private drainage structures is not a cost effective method to reduce inflow at this time.

Table 13
Cost to Perform Dye Flooding of Private Drain Structures
(e.g. Yard, Drive, Stairway, etc)

	No. of Drain Structures (From Table 8)*	Cost to Perform Dye Flooding	Cost to Perform Dye Flooding for the Entire Catchment Area
Area 1	53	\$750	\$39,750
Area 3	109**	\$750	\$82,500
Area 4	40	\$750	\$30,000
SUBTOTAL	203	\$750	\$152,250
Preparation of Technical Memorandum			\$9,750
TOTAL			\$163,000

* - Excluding Buildings observed to have flat roofs.

** - 109 structures to dye flood is derived from the 110 total structures minus 1 structure confirmed during smoke testing (109 Wellington Avenue, Table 12)

PRIORITY OF REHABILITATION RECOMMENDATIONS

As noted above, the City should develop a program to have private property owners disconnect private connections from the sanitary sewer as follows

- Disconnection of roof drains and rain leaders from the sanitary sewer
- Disconnection of sump pumps from the sanitary sewer

Connection of the inflow source to the storm drain system or discharging to the ground surface should be evaluated on a case by case basis. Prior to initiating the rehabilitation, the capacity of the storm drain requires verification before connecting any additional private drainage structures or storm water sources to assure that the storm drain system has adequate capacity.

CONCLUSIONS AND RECOMMENDATIONS

Pending the completion of the dye testing, the City should prepare programs to coordinate disconnection of sump pumps and rain leaders. Upon confirmation of the inflow sources by smoke testing and dye testing, the City should notify residents that the City will coordinate with the property owners to disconnect the inflow source(s).

Newport, RI Sump Pump Tables

Prepared by:

Severn Trent Pipeline Services, Inc.

December 2006

Summary of Sump Pump Connections - Catchment Area 1

Address		Sump Pumps				Comment
No.	Street	Sump Pump To Sanitary	Sump Pump to Ground	Sump Pump to Other	Sump Pump to Unknown	
8	Annandale Road	1				
13	Annandale Road		1			
17	Annandale Road		1			
18	Annandale Road	1				
23	Annandale Road	1				
30	Annandale Road		1			
33	Annandale Road	1				
35	Annandale Road	1				
44	Annandale Road		1			
73	Annandale Road	1				
75	Annandale Road			1		Sump Pump Discharges Outside to Pump in Ground
77	Annandale Road	1				
1	Annandale Terrace	1				
17	Annandale Terrace	1				
30	Annandale Terrace	1				
130	Bellevue Avenue	1				
284	Bellevue Avenue	1				
17	Berkeley Avenue		1			
22	Berkeley Avenue	1				
28	Berkeley Avenue	1				
32	Berkeley Avenue		1			
39	Berkeley Avenue	1				
60	Berkeley Avenue	1				
2	Berkeley Terrace	1				
6	Berkeley Terrace		1			
7	Berkeley Terrace	1				
11	Chapel Street	1				
2 - 8	Chapel Terrace				1	
10 - 20	Chapel Terrace				1	
21 - 31	Chapel Terrace				1	
22 - 32	Chapel Terrace				1	
33 - 39	Chapel Terrace				1	
34 - 44	Chapel Terrace				1	
41 - 51	Chapel Terrace				1	
46 - 56	Chapel Terrace				1	
53 - 59	Chapel Terrace				1	
66 - 73	Chapel Terrace				1	
9	Clay Street		1			
10	Cottage Street	1				
31 - 33	Deblois Street				1	Sump Pump in Separate pipe next to Sewer Line.
6	Dresser Street				1	
9	Dresser Street		1			
14	Dresser Street		1			
18	Dresser Street	1				
20	Dresser Street	1				
21	Dresser Street	1				
22	Dresser Street	1				
4.5	Dresser Street		1			
31	East Bowery Street	1				
35	East Bowery Street			1		Sump Pump Discharges to Floor Drain
39	East Bowery Street	1				
55	East Bowery Street	1				
57	East Bowery Street				1	Sump Pump is Disconnected

Summary of Sump Pump Connections - Catchment Area 1

Address		Sump Pumps				Comment
No.	Street	Sump Pump To Sanitary	Sump Pump to Ground	Sump Pump to Other	Sump Pump to Unknown	
59	East Bowery Street	1				
60	East Bowery Street	1				
22-28	Edgar Court				1	Sump Pump in Separate Pipe Next To Sewer Line
14,16	Edgar Court				1	Sump Pump in Separate Pipe Next To Sewer Line
18,20	Edgar Court				1	Sump Pump in Separate Pipe Next To Sewer Line
30,32	Edgar Court				1	Sump Pump in Separate Pipe Next To Sewer Line
34,36	Edgar Court				1	Sump Pump in Separate Pipe Next To Sewer Line
9	Faxon Green Road				1	Sump Pump has bolted cover. Recommend Dye Test
10	Faxon Green Road	1				
11	Faxon Green Road				1	
14	Faxon Green Road	1				
26	Freebody Street	1				
38-40	Freebody Street		1			
9	Horseman Terrace		1			
16 - 18	Liberty Street	1				Sump Pump For Washing Machines
1	Lowndes Street		1			
9	Lowndes Street	1				
10	Lowndes Street				1	Sump Pump Discharges into Roof Leader
11	Lowndes Street	1				
11	Memorial Boulevard		1			
37	Memorial Boulevard	1				
39	Memorial Boulevard				1	Onto Basement Floor
73	Memorial Boulevard	1				
79	Memorial Boulevard		1			
77	Memorial Boulevard	1				
33	Merton Road	1				
34	Merton Road	1				
43	Merton Road		1			
44	Merton Road	1				
46	Merton Road	1				
30	Middleton Avenue	1				
44	Middleton Avenue		1			
57	Middleton Avenue	1				
60	Middleton Avenue		1			
64	Middleton Avenue	1	1			Two Sump Pumps. Second Pump Discharges to Ground Surface
75	Middleton Avenue	1				

Summary of Sump Pump Connections - Catchment Area 1

No.	Address Street	Sump Pumps				Comment
		Sump Pump To Sanitary	Sump Pump to Ground	Sump Pump to Other	Sump Pump to Unknown	
81	Middleton Avenue		1			
82	Middleton Avenue		1			
93	Middleton Avenue	1				
56-58	Middleton Avenue	1				
13	Old Beach Road		1			
17	Old Beach Road				1	Sump Pump is Disconnected
50	Old Beach Road		1			
56	Old Beach Road				1	Sump Pump is Disconnected
79	Old Beach Road		1			Two Sump Pumps Discharging to Ground Surface
84	Old Beach Road		1			
31	Parker Avenue	1				
34	Parker Avenue	1				
38	Parker Avenue		1			
41	Parker Avenue	1				
5	Red Cross Avenue	1				Two Sump Pumps Discharging to Sanitary Sewer
7	Red Cross Avenue		1			
36	Red Cross Avenue	1				
37	Red Cross Avenue	1				
38 - 40	Red Cross Avenue		1			
40	Red Cross Avenue	1				
5	Red Cross Terrace	1				
6	Red Cross Terrace				1	
7	Red Cross Terrace				1	
11	Red Cross Terrace		1			
12	Red Cross Terrace	1				
189	Rhode Island Avenue		1			
213	Rhode Island Avenue South	1				
5	Slocum Street				1	Sump Pump Not Connected; Crack in Pipe
15	Slocum Street		1			
21	Slocum Street	1				Ejector Pump
31	Slocum Street		1			
33	Slocum Street		1			
34	Slocum Street	1				
35	Slocum Street		1			
37	Slocum Street		1			
9	Sylvan Street	1				
15 - 17	Sylvan Street		1			
18	Sylvan Street				1	
5	Sylvan Terrace		1			
6	Sylvan Terrace				1	
8	Sylvan Terrace	1				
18	Sylvan Terrace		1			
1	Ward Avenue		1			
16	Ward Avenue		1			
1	Weaver Avenue	1				
20	Weaver Avenue	1				
22	Weaver Avenue	1				
27	Weaver Avenue	1				
30	Weaver Avenue		1			
41	Weaver Avenue				1	
	TOTALS	66	42	2	30	

Summary of Sump Pump Connections - Catchment Area 3

Address		Sump Pumps				Comments
No.	Street	Sump Pump To Sanitary	Sump Pump to Ground	Sump Pump to Other	Sump Pump to Unknown	
2	Alpond Drive		1			
4	Alpond Drive		1			
6	Andrews Street		1			
9	Andrews Street		1			Two Sump Pumps Discharging to Ground
14	Andrews Street	1				
42	Bateman Avenue	1				
63 - 65	Bateman Avenue		1			
64	Bateman Avenue		1			
68	Bateman Avenue		1			
3	Binney Street	1				Sump Pump Discharged into sink sanitary pipe from sink
111	Carroll Avenue	1				
113	Carroll Avenue	1				
120	Carroll Avenue	1				
121	Carroll Avenue		1			
128	Carroll Avenue		1			
133	Carroll Avenue		1			
137	Carroll Avenue	1				
208	Carroll Avenue	1				
212 - 214	Carroll Avenue		1			
216 - 218	Carroll Avenue	1				
228	Carroll Avenue	1				
53	Coggeshall Avenue	2				Two Pumps in Two Buildings
9	Earl Avenue				1	
7	Florence Avenue	1				
10	Florence Avenue	1				
14	Florence Avenue		1			
16	Florence Avenue		1			
16	George Street		1			
6	Gooseberry Road		1			
12	Gooseberry Road		1			
16	Gooseberry Road	1				
4	Hazard Avenue		1			
2	Jeffrey Drive		1			
7	Jeffrey Drive	1				Two Sump Pumps discharge to Sanitary
3	Kerins Terrace	1				
5	Kerins Terrace	1	1			Two Sump Pumps second sump discharges to ground surface.
51	Lawrence Avenue	1				
56	Lawrence Avenue	1				
11	Leroy Avenue	1				
12	Leroy Avenue	1				
14	Leroy Avenue				1	
7	McCormick Road		1			
11	McCormick Road		1			
15	McCormick Road		1			
17	McCormick Road	1				
48	McCormick Road	1				
9	Meikle Avenue		1			
21	Meikle Avenue	1				

Summary of Sump Pump Connections - Catchment Area 3

Address		Sump Pumps				Comments
No.	Street	Sump Pump To Sanitary	Sump Pump to Ground	Sump Pump to Other	Sump Pump to Unknown	
5	Morton Avenue	1				
8	Morton Avenue	1				
11	Morton Avenue	1				
54	Morton Avenue	1				
97	Narragansett Avenue		1		1	
140	Narragansett Avenue		1			
158	Narragansett Avenue	1				
17	Ochre Point Avenue	1				
22	Ochre Point Avenue	1				
26	Ochre Point Avenue	1				
37	Ochre Point Avenue	1				
41	Ochre Point Avenue	1				Sump in well of elevator
?	Ochre Point Avenue	1				
65	Ruggles Avenue	1				
71	Ruggles Avenue		1			
119	Ruggles Avenue		1			
123	Ruggles Avenue	1				
126	Ruggles Avenue		1			
127	Ruggles Avenue		1			
128	Ruggles Avenue		1			
130	Ruggles Avenue	1				
176	Ruggles Avenue		1			
196	Ruggles Avenue	1				
206	Ruggles Avenue	1				
207	Ruggles Avenue	1				
218	Ruggles Avenue	1				
225	Ruggles Avenue	1				
234	Ruggles Avenue	1				
237	Ruggles Avenue	1				Two Sump Pumps discharge to Sanitary Sewer
13	Shields Street		1			
1	Stevenson Place		1			
2	Vanderbilt Avenue				1	Exiting in Separate pipe next to sewer
3	Vanderbilt Avenue		1			
4	Vanderbilt Avenue		1			
6	Vanderbilt Avenue		1			
7	Vanderbilt Avenue	1				Sump Pump Behind Wall
8	Vanderbilt Avenue	1				
4	Vaughan Avenue	1				
18	Vaughan Avenue		1			
27	Vaughan Avenue		1			
1 - 3	Victoria Avenue	1				
43	Victoria Avenue		1			
80	Victoria Avenue		1			
87	Victoria Avenue		1			
7	Weatherly Avenue				1	
28	Weatherly Avenue				1	
30	Weatherly Avenue	1				Two Sump Pumps. Second Sump Discharges to Ground Surface
138	Webster Street				1	
155	Webster Street	1				
160	Webster Street	1				Two Sump Pumps discharge to sanitary sewer
167	Webster Street	1				
177	Webster Street	1				
1	Wetmore Avenue	1				Three Sump Pumps to Sanitary Sewer
	TOTALS	56	41	0	7	

Summary of Sump Pump Connections - Catchment Area 4

No.	Address Street	Sump Pumps				Comments
		Sump Pump To Sanitary	Sump Pump to Ground	Sump Pump to Other	Sump Pump to Unknown	
14	Atlantic Street		1			
15	Atlantic Street	1				Main Sump Pump With Supplement Out to Street
17	Atlantic Street		1			
38	Atlantic Street	1				
40	Atlantic Street	1				
11	Boss Court		1			
2	Brenton Road	1				
4	Brenton Road		1			
2	Chastellux Avenue	1				
21	Chastellux Avenue	1				
27	Chastellux Avenue	1				
3	Clinton Street		1			
5	Clinton Street		1			
19	Clinton Street		1			
23	Clinton Street		1			
8	Columbus Avenue		1			
21	Connection Street	1				
36	Connection Street		1			
37	Connection Street	1				
54	Connection Street		1			
58	Connection Street		1			
69	Connection Street		1			
72	Connection Street		1			
82	Connection Street		1			
111	Connection Street	1				
112	Connection Street	1				
113	Connection Street	1				
127	Connection Street		1			
132	Connection Street		1			
4	Conrad Court		1			
6	Conrad Court		1			
-	Corner of Caron and Harrison		1			
10	Cowsill Lane		1			
64	Eastnor Ext		1			
66	Eastnor Ext		1			
67	Eastnor Ext		1			
72	Eastnor Ext		1			
9	Eastnor Road	1				Sump Pump into Cleanout
11	Eastnor Road		1			
13	Eastnor Road	1				
15	Eastnor Road				1	
25 - 27	Eastnor Road	1				
45	Eastnor Road		1			Also 125 Houston Avenue
5	Gilles Court		1			
18	Grafton Street	1				
32	Grafton Street		1			
36	Grafton Street		1			
40	Grafton Street		1			
8	Halidon Avenue	1				
24	Halidon Avenue	1				
25	Halidon Avenue	1				
26	Halidon Avenue		1			
6	Halidon Terrace		1			
3	Harborview Drive	1				
17	Harrison Avenue		1			
19	Harrison Avenue		1			
21	Harrison Avenue	1				
27	Harrison Avenue		1			
31	Harrison Avenue	1				

Summary of Sump Pump Connections - Catchment Area 4

Address		Sump Pumps				Comments
No.	Street	Sump Pump To Sanitary	Sump Pump to Ground	Sump Pump to Other	Sump Pump to Unknown	
37	Harrison Avenue	1				
47	Harrison Avenue	1				
71	Harrison Avenue		1			
72	Harrison Avenue	1				
90	Harrison Avenue				1	
94	Harrison Avenue	1				
103	Harrison Avenue	1				
106	Harrison Avenue	1				
108	Harrison Avenue		1			
2	Harrison Lane		1			
5	Harrison Lane	1				
11	Houston Avenue		1			
15 - 17	Houston Avenue		1			
27	Houston Avenue	1				
35	Houston Avenue		1			
39	Houston Avenue		1			
52	Houston Avenue		1			
55	Houston Avenue	1				
57	Houston Avenue		1			
59	Houston Avenue		1			
60	Houston Avenue	1				
63	Houston Avenue		1			
91	Houston Avenue		1			
123	Houston Avenue	1				
63.5	Houston Avenue		1			
6	Lucas Avenue		1			
7	Lucas Avenue		1		1	
11	Lucas Avenue		1			
13	Lucas Avenue		1			
15	Lucas Avenue	1				
16	Lucas Avenue		1			
17	Lucas Avenue		1			
19	Lucas Avenue	1				
5	Marchant Street	1				
35	Marchant Street		1			
50 - 52	Marchant Street		1			
57	Marchant Street		1			
61	Marchant Street	1				
63	Marchant Street		1			
75	Marchant Street		1			
85	Marchant Street		1			
87	Marchant Street	1				
1	Potter Street	1				
2	Potter Street		1			
3	Potter Street	1				
5	Potter Street	1				
8	Potter Street	1				
9	Potter Street	1				
10	Potter Street		1			
16	Potter Street		1			
19	Potter Street		1			
27	Potter Street				1	
30	Potter Street	1				
31	Potter Street		1			
6	Roseneath Avenue	1				
7	Roseneath Avenue	1				
8	Roseneath Avenue		1			
9	Roseneath Avenue	1				
11	Roseneath Avenue	1				
38	Roseneath Avenue		1			

Summary of Sump Pump Connections - Catchment Area 4

Address		Sump Pumps				Comments
No.	Street	Sump Pump To Sanitary	Sump Pump to Ground	Sump Pump to Other	Sump Pump to Unknown	
39	Roseneath Avenue		1			
78	Roseneath Avenue		1			
80	Roseneath Avenue	1				
81	Roseneath Avenue	1				
85	Roseneath Avenue		1			
97	Roseneath Avenue	1				
101	Roseneath Avenue	1				
70A	Roseneath Avenue	1				
61.5	Roseneath Avenue		1			
30	Roseneath Avenue		1			
3	Sharon Court		1			
5	Sharon Court		1			
5	Simmons Street	1				
18	Simmons Street	1				
19	Simmons Street		1			
23	Simmons Street	1				
26	Simmons Street	1				
31	Simmons Street		1			
35	Simmons Street		1			
36	Simmons Street	1				Sump Pump goes into cleanout outside
37	Simmons Street		1			
38	Simmons Street				1	
40	Simmons Street	1				
15	Stockholm Street	1				
16	Stockholm Street		1			
34	Stockholm Street	1				
635	Thames Street		1			
653	Thames Street	1				
675	Thames Street	1				
695	Thames Street	1				
35	Wellington Avenue	1				
37	Wellington Avenue	1				
99	Wellington Avenue		1			
103	Wellington Avenue		1			
109	Wellington Avenue		1			
111	Wellington Avenue		1			
113	Wellington Avenue		1			
115	Wellington Avenue	1				
117	Wellington Avenue		1			
8	West Narragansett Street	1				
12	West Narragansett Street		1			
14	West Narragansett Street		1			
21	West Narragansett Street		1			
23	West Narragansett Street		1			
24	West Narragansett Street		1			
29	West Narragansett Street		1			
31	West Narragansett Street		1			
36	West Narragansett Street		1			
37	West Narragansett Street	1				
38	West Narragansett Street		1			
68	West Narragansett Street		1			
73	West Narragansett Street	1				
	Totals	70	97	0	5	