

**Collier Township
Route 50 Washington Pike (South)
Sanitary Sewer Rehabilitation Project
EPA Grant C-429948-01
3 Rivers #00-1-02
Contract No. 6-130-76**

**Project Summary
(Revised 9/25/06)**

General

The Washington Pike (south) collection line, consisted of approximately 2,600 L.F. of 8" VCP pipe and thirteen (13) brick manholes. This line provides sewage service to a total of fourteen (14) commercial establishments, in which eight (8) establishments are connected directly to the collection line, including four (4) eating establishments. This line is directly connected to the Alcosan Chartiers Creek Interceptor at SSO DCKH adjacent to Bridgeville Borough.

Original Project Scope

The objective of this demonstration project was to reduce or eliminate infiltration of inflow in this segment of line by rehabilitating the entire line segment. A complete rehabilitation was proposed that consisted of pipe slip lining or cure in place lining technology that would reduce the costs associated with pavement and curb restoration. At a minimum, each of the in use wye and break-in connections were to be pressure grouted up to eight feet (8') into the lateral, and unused wye connections would not be reinstated. All manholes on this segment would be rehabilitated utilizing hydraulic grout spray-on monolithic liner material. Due to the number of pipe sag conditions and inadequate repairs previously performed, it was anticipated to repair certain sections of the line by open cut excavation prior to the lining process.

Construction

The actual construction project consisted of the installation of 2,571 L.F. HDPE slip line pipe performed at several separate insertion points along the pipe. Stainless steel repair clamps were used to join the pipe sections and the manhole connections grouted in place excavated areas restored.

HDPE slip line pipe required the excavation and installation of manufactured wye fittings for the lateral reconnections including viewer ports excavated areas restored.

Manhole rehabilitation consisted of applying a strong seal patch and structural monolithic liner material on ten (10) manhole interior walls. A new manhole was installed to improve flow conditions.

Flow Monitoring (See attached Reports)

A Sigma 910 Flow Meter, on loan from 3 Rivers, was utilized for pre- and post-construction flow monitoring. The flow meter, initially installed April 2, 2002, was periodically downloaded and adjusted and removed on February 9, 2005, prior to construction.

Pre-construction flow monitoring results from April, 2002 to February, 2005 at various time periods measured an average 18 GPM flow rate and an average flow of 25,920 Gallons/Day.

The same flow meter, reinstalled on April 11, 2005, was periodically downloaded and adjusted and was found to be malfunctioning. The meter was removed on August 9, 2005 and sent to the Hatch Co. for evaluation and/or repairs. The repair costs were considerable. 3 Rivers decided not to repair the meter, instead offered another meter for use. However, 3 Rivers stock of meters was either being used or they were in the shop for calibration. Once a meter became available, the meter was reinstalled March 3, 2006.

Post-construction flow monitoring results from March, 2006 to June, 2006 measured an average 55 GPM flow rate and an average flow of 79,200 Gallons/Day. These post-monitoring results are not consistent with the current average daily water usage records and pre-construction flow monitoring results. Additional flow monitoring was performed to provide quantifiable data to evaluate the effectiveness of the project.

Post-construction flow monitoring results from July 7, 2006 to September 22, 2006 measured an average 14.39 GPM flow rate and an average flow of 20,722 Gallons/Day. The comparison of pre- and post-construction flow monitoring indicates an average reduction of 3.47 GPM flow rate and an average flow reduction of 4,997 Gallons/Day.

The summary results does indicate that this rehabilitation project was successful in lowering the flow rates and flows within the system.

PREDICTED SEWAGE USAGE from C.T.M.A. 2003 Daily Water Usage Records.

Customer	Average Daily Water Usage (gallons)	Average Water Usage (gpm)	Calculated Average Sewage Usage (gpm)**
Jim & Jerry's Lounge	1,322	0.92	1.01
Sherwin Williams	82	0.06	0.06
Barney's Auto Body	39	0.03	0.03
Goodyear	196	0.14	0.15
Pizza Hut	966	0.67	0.74
Procare	124	0.09	0.09
Port Authority Garage	15,556	10.80	11.88
Casto Skilken	1,740	1.21	1.33
Nicklas Supply	39	0.03	0.03
KFC	856	0.59	0.65
TOTALS	20,920	14.53	15.98

**Assumed a groundwater infiltration of 10%.

PRE-CONSTRUCTION Flowmetered Sewage Usage

Time Period	Average Daily Flow (gpm)	INFILTRATION Minimum 2-4am Flow (gpm)*	Average 2-4am Flow (gpm)*	Average Inflow (gpm)**
April '02 - March '03	17.59	1.38	18.94	15.00
June '03 - March '04	18.12	2.84	21.22	9.30
AVERAGE	17.86	2.11	20.08	12.15

*Infiltration: The Minimum Infiltration is taken to be the average of the minimum flowrates observed between 2:00am and 4:00am on each day. Please note that the Average 2-4am Flowrates are also noted in order to compare them with post-construction levels and additionally observe any reductions in infiltration.

**Average Inflow: Difference between the Average Wet Weather Flowrate and the Average Dry Weather Flowrate. These were determined by examining Average Daily Flow Graphs. The difference between the wet & dry flows is very clear on these graphs. Additionally, the peaks are very clear on the Minimum Hourly Flow vs. Rainfall graph for June 2003 through March 2004. The peaks on this graph during rainfall events average approximately 10 gpm.

PRE-CONSTRUCTION Conclusion

An average of 2.11 gpm (minimum infiltration) may be able to be removed by remediation to prevent groundwater infiltration. At least 10 gpm may be able to be removed from rainfall events by remediation to prevent inflow (i.e. manhole inflow pans) & correction of illegal stormwater connections.

POST-CONSTRUCTION Flowmetered Sewage Usage

Time Period	Average Daily Flow (gpm)	INFILTRATION Minimum 2-4am Flow (gpm)	Average 2-4am Flow (gpm)*	Average Inflow (gpm)**
July 7 '06 - September 22 '06	14.39	0.61	13.12	4.94

*Infiltration: The Minimum Infiltration is taken to be the average of the minimum flowrates observed between 2:00am and 4:00am on each day. Please note that the Average 2-4am Flowrates are also noted in order to compare them with post-construction levels and additionally observe any reductions in infiltration.

**Average Inflow: Average Dry Weather Flow (11.04 gpm) minus the Average Wet Weather Flow (15.98 gpm) equals an average inflow of 4.94 gpm.

POST-CONSTRUCTION Conclusion

The rehabilitation work was successful at reducing the infiltration and inflow into the Route 50-Washington Pike sanitary sewer system. An average of 3.47 gallons per minute (gpm) has been removed from the Average Daily Flowrates.

The rehabilitations were able to remove approximately 1.50 gpm (or 2,160 gallons per day) of infiltration from the system. This can be observed in the Minimum 2-4am Flowrates, which were reduced from a pre-construction average of 2.11 gpm to a post-construction average of 0.61 gpm. The rehabilitations were also able to remove approximately 7.21 gpm of inflow from wet weather flows.

In regards to the infiltration and inflow reductions, it should be noted that the pre-construction monitoring period saw a much larger quantity of rainfall then the post-construction monitoring period. This means that though a reduction in flow was observed, some of that reduction is due to the groundwater table being lower during post-monitoring then during pre-monitoring.

Date	Rainfall (in)	MIN Daily Flow (MGD)	MIN Daily Flow (gpm)	MAX Daily Flow (MGD)	MAX Daily Flow (gpm)	AVERAGE Daily Flow (MGD)	AVERAGE Daily Flow (gpm)	Monthly Average (gpm)	Average 2-4 am Flow (gpm)
7-Jul-06	0.00	0.001	0.68	0.071	49.37	0.011	7.65	11.88	
8-Jul-06	0.00	0.001	0.74	0.034	23.39	0.008	5.29		4.14
9-Jul-06	0.00	0.001	0.53	0.178	123.64	0.016	10.81		4.12
10-Jul-06	0.00	0.001	0.92	0.042	28.84	0.012	8.34		9.60
11-Jul-06	0.00	0.000	0.29	0.056	39.22	0.012	8.63		12.29
12-Jul-06	1.06	0.000	0.14	0.074	51.08	0.018	12.16		17.20
13-Jul-06	0.01	0.001	0.46	0.052	36.35	0.014	9.50		10.30
14-Jul-06	0.00	0.000	0.05	0.075	52.24	0.014	9.68		13.31
15-Jul-06	0.00	0.000	0.02	0.043	29.89	0.010	6.73		6.45
16-Jul-06	0.00	0.000	0.06	0.117	80.96	0.010	6.60		5.52
17-Jul-06	0.00	0.000	0.16	0.056	38.78	0.012	8.42		4.00
18-Jul-06	0.00	0.000	0.14	0.053	36.54	0.012	8.29		7.51
19-Jul-06	0.00	0.000	0.00	0.053	37.09	0.012	8.22		8.78
20-Jul-06	0.00	0.000	0.00	0.064	44.63	0.019	12.92		12.17
21-Jul-06	0.00	0.000	0.00	0.061	42.10	0.017	11.99		6.36
22-Jul-06	0.11	0.000	0.00	0.061	42.36	0.014	9.63		5.31
23-Jul-06	0.00	0.000	0.00	0.048	33.24	0.010	6.98		4.81
24-Jul-06	0.00	0.000	0.32	0.040	27.44	0.010	6.64		8.81
25-Jul-06	0.00	0.000	0.00	0.060	41.87	0.015	10.21		13.40
26-Jul-06	0.00	0.000	0.00	0.064	44.32	0.016	11.06		13.05
27-Jul-06	0.15	0.000	0.00	0.070	48.33	0.018	12.31		11.12
28-Jul-06	0.33	0.000	0.00	0.114	78.99	0.021	14.26		5.14
29-Jul-06	0.00	0.000	0.00	0.196	135.99	0.018	12.60		6.98
30-Jul-06	0.68	0.000	0.00	0.131	91.29	0.024	16.88		9.28
31-Jul-06	0.01	0.000	0.00	0.668	463.98	0.088	61.22		0.61

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1-Aug-06	0.00	0.001	0.38	0.741	514.89	0.132	91.87	20.47	8.29
2-Aug-06	0.00	0.000	0.16	0.895	621.85	0.040	27.95		169.71
3-Aug-06	0.08	0.001	0.46	0.127	88.27	0.017	11.75		16.49
4-Aug-06	0.00	0.000	0.00	0.267	185.12	0.034	23.37		11.87
5-Aug-06	0.00	0.000	0.00	0.211	146.22	0.032	22.37		19.74
6-Aug-06	0.00	0.000	0.00	0.521	361.53	0.039	26.86		19.04
7-Aug-06	0.00	0.000	0.00	0.099	68.96	0.019	13.12		1.93
8-Aug-06	0.00	0.000	0.17	0.356	246.88	0.026	17.72		30.82
9-Aug-06	0.00	0.000	0.00	0.401	278.73	0.052	35.78		62.25
10-Aug-06	0.00	0.000	0.31	0.314	217.89	0.024	16.94		10.74
11-Aug-06	0.00	0.000	0.06	0.733	508.73	0.108	74.81		8.70
12-Aug-06	0.00	0.000	0.00	0.694	481.83	0.048	32.99		58.50
13-Aug-06	0.00	0.000	0.19	0.092	64.13	0.025	17.33		8.30
14-Aug-06	0.00	0.000	0.00	0.078	54.38	0.014	9.58		12.29
15-Aug-06	0.25	0.000	0.12	0.036	24.96	0.009	6.11		2.96
16-Aug-06	0.00	0.000	0.14	0.037	25.51	0.008	5.33		2.86
17-Aug-06	0.00	0.000	0.06	0.036	24.72	0.007	4.98		4.13
18-Aug-06	0.00	0.000	0.03	0.041	28.43	0.008	5.41		3.40
19-Aug-06	0.69	0.000	0.13	0.094	65.49	0.007	5.00		7.32
20-Aug-06	0.01	0.001	0.76	0.227	157.39	0.037	25.95		5.27
21-Aug-06	0.00	0.001	0.35	0.124	85.87	0.043	29.83		19.23
22-Aug-06	0.08	0.000	0.00	0.090	62.77	0.024	16.73		27.32
23-Aug-06	0.00	0.000	0.00	0.163	113.20	0.035	24.47		19.40
24-Aug-06	0.00	0.000	0.30	0.492	341.54	0.042	29.34		47.79
25-Aug-06	0.00	0.000	0.00	0.047	32.97	0.012	8.33		7.18
26-Aug-06	0.00	0.000	0.00	0.050	34.50	0.010	7.01		6.76
27-Aug-06	0.32	0.000	0.00	0.058	40.59	0.013	9.23		4.50
28-Aug-06	0.03	0.000	0.00	0.038	26.11	0.010	7.25		7.11
29-Aug-06	0.14	0.000	0.00	0.054	37.18	0.012	8.27		7.65
30-Aug-06	0.00	0.000	0.00	0.046	31.83	0.013	9.36		11.20
31-Aug-06	0.00	0.000	0.08	0.050	34.47	0.014	9.59		7.19

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1-Sep-06	0.03	0.000	0.00	0.098	67.94	0.018	12.79	8.69	8.70
2-Sep-06	0.44	0.000	0.01	0.074	51.59	0.015	10.71		11.58
3-Sep-06	0.00	0.000	0.00	0.055	37.89	0.014	9.79		13.14
4-Sep-06	0.00	0.000	0.00	0.060	41.96	0.010	6.70		8.28
5-Sep-06	0.20	0.000	0.00	0.056	38.88	0.013	8.98		7.86
6-Sep-06	0.00	0.000	0.00	0.050	34.62	0.013	9.11		8.45
7-Sep-06	0.00	0.000	0.00	0.039	27.09	0.011	7.56		10.31
8-Sep-06	0.00	0.000	0.00	0.052	35.87	0.013	9.24		7.44
9-Sep-06	0.00	0.000	0.00	0.052	36.16	0.013	8.94		4.61
10-Sep-06	0.00	0.000	0.00	0.059	40.64	0.012	8.37		9.79
11-Sep-06	0.00	0.000	0.00	0.054	37.72	0.012	8.67		3.31
12-Sep-06	0.85	0.000	0.00	0.050	34.60	0.013	9.07		5.20
13-Sep-06	0.56	0.000	0.11	0.047	32.47	0.013	9.13		7.69
14-Sep-06	0.07	0.000	0.08	0.070	48.89	0.014	9.67		7.22
15-Sep-06	0.01	0.000	0.00	0.043	30.19	0.011	7.31		4.53
16-Sep-06	0.00	0.000	0.00	0.051	35.71	0.012	8.33		5.29
17-Sep-06	0.00	0.000	0.00	0.056	38.94	0.009	6.57		14.87
18-Sep-06	0.00	0.000	0.00	0.049	33.80	0.011	7.86		9.46
19-Sep-06	0.10	0.000	0.10	0.044	30.75	0.011	7.46		11.44
20-Sep-06	0.00	0.000	0.00	0.036	25.09	0.013	9.03		4.80
21-Sep-06	0.00	0.000	0.00	0.058	40.02	0.013	8.81		7.16
22-Sep-06	0.00	0.000	0.00	0.039	26.76	0.010	6.96		9.28
AVERAGE		0.000	0.11	0.140	96.88	0.021	14.39	13.68	13.12
MAXIMUM		0.001	0.92	0.895	621.85	0.132	91.87	20.47	169.71
MINIMUM		0.000	0.00	0.034	23.39	0.007	4.98	8.69	0.61