



Sanborn, Head & Associates

Consulting Engineers & Scientists

July 7, 2003
File No. 1003.04

Mr. John B. Gay
North Country Environmental Services, Inc.
3 Pitkin Court
Montpelier, VT 05602



Re: Construction Quality Assurance
Repairs to the leachate force main between the
Leachate Consolidation Building and Valve Box 301
North Country Environmental Services, Inc.
Bethlehem, New Hampshire

Dear Joe:

Sanborn, Head & Associates, Inc. (SHA) has prepared this report as a summary of construction quality assurance (CQA) activities associated with repairs to the leachate force main between the Leachate Consolidation Building and Valve Box 301 at the North Country Environmental Services, Inc. (NCES) facility in Bethlehem, New Hampshire. The repairs were performed in April and May 2003. Refer to Figure Number 1 for the location of the forcemain.

It is our understanding that Severn Trent Services (Severn) of Ballston Spa, New York was contracted to perform maintenance cleaning of the leachate forcemain this past winter. Severn encountered difficulty while attempting to clean the forcemain, and ultimately noticed liquid flowing from the containment pipe into one of the leak detection manholes. Since the ground was frozen, NCES decided to take the forcemain out of service until after repairs could be made. This report documents observations made by SHA field representatives while repairs were performed.

Repairs consisted of locating and replacing leaking sections of carrier pipe between the Leachate Consolidation Building and Valve Box 301, locating and clearing obstructions, cleaning the remainder of the forcemain, and pressure testing both the carrier and containment pipes between the Leachate Consolidation Building and Valve Box 301.

At NCES's request, SHA provided a field representative to observe and document the repairs and the pressure testing of the forcemain.

Severn mobilized to the site on Tuesday, April 29, 2003, and completed repairs to the forcemain on Thursday, May 8, 2003. NCES performed the earthwork.

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The forcemain consists of 2-inch diameter SDR-11 HDPE carrier pipe within 4-inch diameter SDR-17 HDPE containment pipe. The forcemain was cleaned using a 1-inch diameter water hose with a high pressure, self-propelled cleaning nozzle. Severn used the cleaning equipment and a pipe camera to measure approximate distances from the equipment access locations to leaks in the pipe. While attempting to find leaks, Severn encountered obstructions at two locations that prevented the cleaning and cameras equipment from advancing in the pipe.

The first carrier pipe leak was located approximately 8 feet east of Leak Detection Manhole No. 1, (LMH-1). The dual-walled pipe was cut, an 8-foot section of 2-inch diameter carrier pipe was installed from the cut location back to LMH-1. Both the carrier and containment pipes were butt-fusion welded. Representative photos of this pipe repair are included in Appendix B as Photo Nos. 1, 3 and 4. Refer to Figure Number 2 for the locations of forcemain repairs.

The second pipe repair was performed approximately 14 feet west of LMH-1. The video display from the pipe camera showed a cracked pipe weld at this location. The pipe was cut at the cracked weld, both sides of the cut pipe were re-faced, and a simultaneous butt-fusion weld made to join the carrier and containment pipes. Refer to Photo Nos. 2 and 6.

Misaligned carrier pipe welds were located approximately 170-feet and 280-feet west of LMH-2. The misaligned welds created the obstructions that stopped the cleaning and camera equipment. At each location a short section of the dual-walled pipe spanning the misaligned weld was removed and replaced. Both ends of the new sections of forcemain were simultaneously butt-fusion welded to the existing forcemain. These repairs are shown on Figure Number 2 as Forcemain Repair Nos. 3 and 4, respectively.

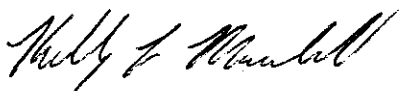
The pipe camera showed a crack in the vertical section of carrier pipe located just outside the Leachate Consolidation Building. The vertical section of carrier pipe was removed and replaced. Simultaneous butt-fusion welds of the carrier and containment pipes were completed at both ends of the vertical section of the forcemain. Refer to Photo Nos. 8 and 10.

Pressure tests were performed on both the carrier and containment pipes between the Leachate Consolidation Building and Valve Box 301; hydrostatic for the carrier pipes, and pneumatic for the containment pipes. The hydrostatic test involved filling the carrier pipe with water and applying a pressure of about 200 pounds per square inch (PSI) for 1 hour. The pneumatic test required pressurizing the containment and carrier pipes to 20 psi for 1 hour. The results of the pressure tests, provided in Appendix A, indicated that the pipes held the test pressure for the required period of time.

SUMMARY

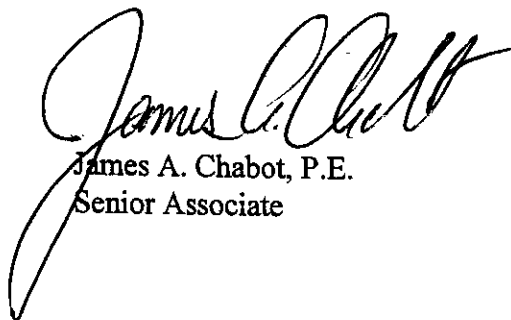
In summary, based on the observations made during the repairs, it is SHA's opinion that the dual-walled forcemain was repaired and tested in general accordance with the approved Plans and Specifications for the original construction of the forcemain.

Sincerely,
SANBORN, HEAD & ASSOCIATES, INC.



Kelly L. Marshall
Project Engineer

KELM/JAC:jsb



James A. Chabot, P.E.
Senior Associate


Encls: Figure Nos. 1 and 2
Appendix A Results of the Forcemain Pressure Testing
Appendix B Representative Photographs

cc: Larry Lackey, NCES
Lenny Wing, NCES

APPENDIX A

RESULTS OF FORCEMAIN PRESSURE TESTING

SHA LOW PRESSURE AIR PIPE TEST

<p>Sanborn, Head & Associates, Inc.</p>  <div style="display: flex; justify-content: space-around; font-size: small;"> <div style="text-align: left;">Concord, New Hampshire Westford, Massachusetts</div> <div style="text-align: left;">Canton, Ohio Portland, Maine</div> </div>	Project No.: 1003.04
	Project Name: Force Main Repairs
	Project Location: North Country Environmental Services Bethlehem, New Hampshire
	Weather: Overcast 50s

Contractor: Severn Trent Services	Test No.: 001
SHA Personnel: Kelly Marshall	Person/Company Performing the Test: Earle Forbes/Severn Trent Services
Date of Test: 5/7/03	Time of Test: 1155 Finish: 1255
Pipe Length: 742 feet Pipe Diameter: 4 inches	Pipe Material: HDPE Pipe SDR/Sch.: 17
Rated Working Pressure: 100 psi	Test Pressure: 20 psi
Location/designation of pipe tested: Force main containment pipe from LMH-1 to LMH-2	

t Time (min.)	T Pipe Temperature (°C)	P _t Pressure Gauge Reading (psig)	P _c Pressure Drop (%)
0		20.25	0
5		20.25	0
10		20.25	0
15		20.25	0
30		20.25	0
60		20.25	0

<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	Retest? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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Description of leaks and repairs of retested pipe segments:

$P_c = \text{Percent Pressure Drop} = \frac{P_o - P_t}{P_o} \times 100$	$P_o = \text{Initial Pressure Gauge Reading}$ $P_t = \text{Pressure Gauge Reading at Time } t$
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Comments: Containment pipe tested in place, with 20 psi of water in carrier pipe.

Signature: Kelly L. Marshall

SHA LOW PRESSURE AIR PIPE TEST

Sanborn, Head & Associates, Inc.



Concord, New Hampshire
Westford, Massachusetts
Canton, Ohio
Portland, Maine

Project No.: 1003.04

Project Name: Force Main Repairs

Project Location: North Country Environmental Services
Bethlehem, New Hampshire

Weather: Overcast 50s

Contractor: Severn Trent Services

Test No.: 002

SHA Personnel: Kelly Marshall

Person/Company Performing the Test: Earle Forbes/Severn Trent Services

Date of Test: 5/7/03

Time of Test: 1733 Finish: 1833

Pipe Length: 70 Pipe Diameter: 4 inches Pipe Material: HDPE Pipe SDR/Sch.: 17

Rated Working Pressure: 100 psi Test Pressure: 20 psi

Location/designation of pipe tested: Force main containment pipe from LMH-1 to consolidation building.

<i>t</i> Time (min.)	<i>T</i> Pipe Temperature (°C)	<i>P_t</i> Pressure Gauge Reading (psig)	<i>P_c</i> Pressure Drop (%)
0		20.0	0
5		20.0	0
10		20.0	0
15		20.0	0
30		20.0	0
60		20.0	0

Pass Fail Retest? Yes No

Description of leaks and repairs of retested pipe segments:

$$P_c = \text{Percent Pressure Drop} = \frac{P_o - P_t}{P_o} \times 100$$

P_o = Initial Pressure Gauge Reading
P_t = Pressure Gauge Reading at Time *t*

Comments: Containment pipe tested in place with 20 psi of water in carrier pipe.

Signature: Kelly L. Marshall

SHA PE PIPE HYDROSTATIC PRESSURE TEST LOG

<p>Sanborn, Head & Associates, Inc.</p> <p>Concord, New Hampshire Akron, Ohio Westford, Massachusetts Portland, Maine</p>	Project No.: 1003.04
	Project Name: Force Main Repairs
	Project Location: North Country Environmental Services, Bethlehem, New Hampshire
	Weather: Overcast 50s

Contractor: Seven Trent Services	Test No.:001
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SHA Personnel: Kelly L. Marshall	Person/Company Performing the Test: Earle Forbes, Severn Trent Services
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Date of Test: 5/7/03	Time of Test: Start: 1033 Finish: 1133
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Pipe Length: 742 feet	Pipe Diameter: 2 inches	Pipe Material	Pipe SDR/Sch.: SDR-11
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Rated Working Pressure:160 psi	Test Pressure: 200 psi
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Location/designation of pipe tested: Corner pipe from LMH-1 to LMH-2.

t Time (hours)	T _i Pipe Temperature (°C)	P _t Pressure Gauge Reading (psig)	P _c Pressure Drop (%)	Amount of Make-Up Water Added
0		204	0	0
1		204	0	0
2				
3				
4				
5				
6				

<input checked="" type="radio"/> Pass	<input type="radio"/> Fail	
Retest?	<input type="radio"/> Yes	<input checked="" type="radio"/> No

Description/location of defects for failed test:

- Test Procedure:**
1. Pressurize to 150 percent of rated pressure;
 2. Add make-up water each hour for three hours to maintain pressure;
 3. Test phase begins after the initial three hour phase;
 4. After one, two or three hours add a measured amount of makeup water to return to the test pressure; and
 5. The amount of makeup water added to return to the test pressure must not exceed the amount in the makeup water test values table on the back of this sheet.

Comments: Contractor used 1-inch diameter pump to pressurize carrier pipe. It took 3 hours to stabilize the pressure of pipe at 200 psi. Water was added during stabilization period. Air trapped in carrier pipe was released at LMH-2, pipe pressurized from LMH-1.

Signature: Kelly L. Marshall

SHA PE PIPE HYDROSTATIC PRESSURE TEST LOG

Sanborn, Head & Associates, Inc.



Concord, New Hampshire Akron, Ohio
Westford, Massachusetts Portland, Maine

Project No.: 1003.04

Project Name: Force Main Repairs

Project Location: North Country Environmental Services, Bethlehem, New Hampshire

Weather: Overcast 50s

Contractor: Seven Trent Services

Test No.:002

SHA Personnel: Kelly L. Marshall

Person/Company Performing the Test: Earle Forbes, Severn Trent Services

Date of Test: 5/7/03

Time of Test: Start: 1630 Finish: 1730

Pipe Length: 70

Pipe Diameter: 2 inches

Pipe Material: HDPE

Pipe ~~SDR~~Sch.: 11

Rated Working Pressure: 160 psi

Test Pressure: 200 psi

Location/designation of pipe tested:

t Time (hours)	T ₁ Pipe Temperature (°C)	P _t Pressure Gauge Reading (psig)	P _c Pressure Drop (%)	Amount of Make-Up Water Added
0		205		
1		205		
2				
3				
4				
5				
6				

Pass

Fail

Retest?

Yes

No

Description/location of defects for failed test:

Test Procedure:

1. Pressurize to 150 percent of rated pressure;
2. Add make-up water each hour for three hours to maintain pressure;
3. Test phase begins after the initial three hour phase;
4. After one, two or three hours add a measured amount of makeup water to return to the test pressure; and
5. The amount of makeup water added to return to the test pressure must not exceed the amount in the makeup water test values table on the back of this sheet.

Comments: Pipe tested in place. Contractor used a 1-inch pump to pressurize pipe, air released from consolidation building end of pipe, pressurized from LMH-1.

Signature: Kelly L. Marshall



PHOTO #1 – Excavation around Leak Detection Manhole #1



PHOTO #2 – Forcemain repair #2, located approximately 14' west of LMH-1



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THE LEACHATE CONSOLIDATION BUILDING &
VALVE BOX 301
NORTH COUNTRY ENVIRONMENTAL SERVICES, INC.

SHA PROJECT NO: 1003.04



PHOTO #3 – Butt-fusion welding of 2" carrier pipe at Forcemain repair #1 location



PHOTO #4 – Completed 4" containment pipe butt-fusion weld at Forcemain repair #1 location

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SHEET 2 OF 6



PHOTO #5 – Pneumatic testing of 4” carrier pipe at LMH-2



PHOTO #6 – Simulations butt-fusion welding of forcemain

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SHEET 3 OF 6



PHOTO #7 – Completed simultaneous butt-fusion weld



PHOTO #8 – Vertical forcemain excavation at consolidation building

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SHEET 4 OF 6



PHOTO #9 – 90° Elbow at bottom of vertical section of forcemain



PHOTO #10 – Crack in vertical section of 2" containment pipe

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SHEET 5 OF 6



PHOTO #11 – Completed simultaneous weld in vertical section of force main

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SHEET 6 OF 6