

ORIGINAL	
N.H.P.U.C. Case No.	<u>DG-10-139</u>
Exhibit No.	<u># 5</u>
Witness	
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**State of New Hampshire
Public Utilities Commission**

**Energy North Natural Gas, Inc. d/b/a National Grid NH
Cast Iron/Bare Steel Replacement Program
DG 10-139**

Response to June 18, 2010 Hearing Record Request

Marked as Exhibit 5

Attached to this exhibit is the 2009 New Hampshire Condition Bare Steel Main Replacement Program – Sample Analysis Report. The report consists of 10 pages containing photographs and descriptions of various pipe segments removed and cataloged as part of the Cast Iron/Bare Steel replacement program established in the National Grid/Keyspan merger.

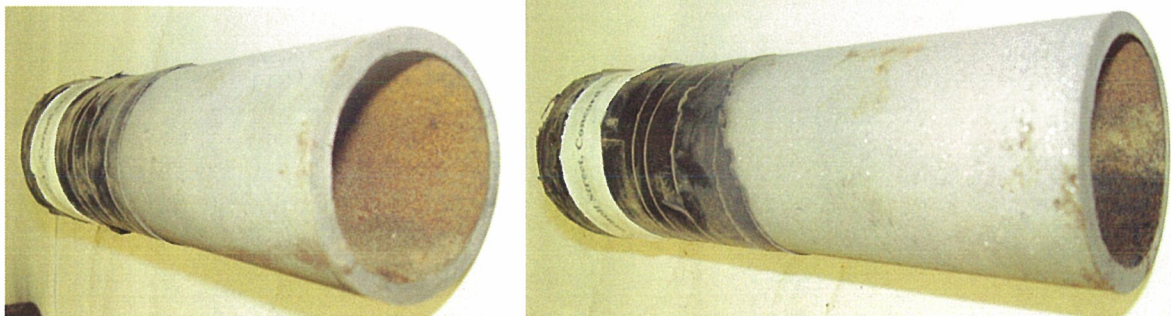
2009 New Hampshire Condition Bare Steel Main Replacement Program – Sample Analysis

Over the course of the 2009 construction season, steel pipe and soil samples were collected from the CIBS main replacement program projects completed in New Hampshire. These samples were taken with the intention of using the analysis conclusions as a tool to assist in the selection of candidates for future CIBS replacement programs. Each sample was treated so that approximately half of the pipe would be in the 'as found' condition when exposed, while the other half was sand blasted to clean the exposed pipe down to the bare metal. Soil samples were taken as close to the pipe samples as possible in an effort to retrieve 'native' soil.

Samples were taken at the following locations:

(1) **2-7Cornell Street, Concord – wo#641873** – 2 inch, 60 psig - installed in 1955

- A soil sample was taken and analyzed. The pH was measured to be between 7 and 8, slightly alkaline to neutral. Testing for chlorides was negative. Testing for microbiological acid producing (APB) and sulfate reducing bacteria (SRB) were performed. The APB testing produced a reading of 1,000 bacteria colonies per ML. The testing for SRB produced a reading of 10 bacteria colonies per ML. The soil was observed to be a normal color and odorless. Based on the testing, the bacteria levels of the soil do not appear to have accelerated the rate of corrosion.
- The pipe sample was coated steel, not bare as the records system had indicated. The sample was observed to be in good condition. Slight pitting was observed along the lines of the end of the tape seams. This segment was selected for replacement based on the attributed material of bare steel and the operating pressure of 60 psig. The selection was not based on leak history or an indication of poor condition. Exposure of this main should not result in a recommendation for replacement based on condition alone. Pit depths were not measured as the samples are available for continued visible review. Any pit depth readings taken are from the reference point of the remaining wall and do not represent the total amount of wall loss.
- The following pictures were taken:



(2) **83 Pleasant Street, Concord – wo#588562** – 2 inch, low pressure, installed in 1900

- A soil sample was taken and analyzed. The pH was measured to be approximately 6, slightly acidic to neutral. Testing for chlorides was negative. Testing for microbiological acid producing (APB) and sulfate reducing bacteria (SRB) were performed. The APB testing produced a reading of 100,000 bacteria colonies per ML. The testing for SRB produced a reading of 100 bacteria colonies per ML. The soil was observed to be a normal color and odorless.
- The pipe sample was observed to be in fair to poor condition with some areas of pitting and wall loss observed. Exposure of this main should result in a recommendation for replacement. Pit depths were not measured as the samples are available for continued visible review.
- The following pictures were taken:



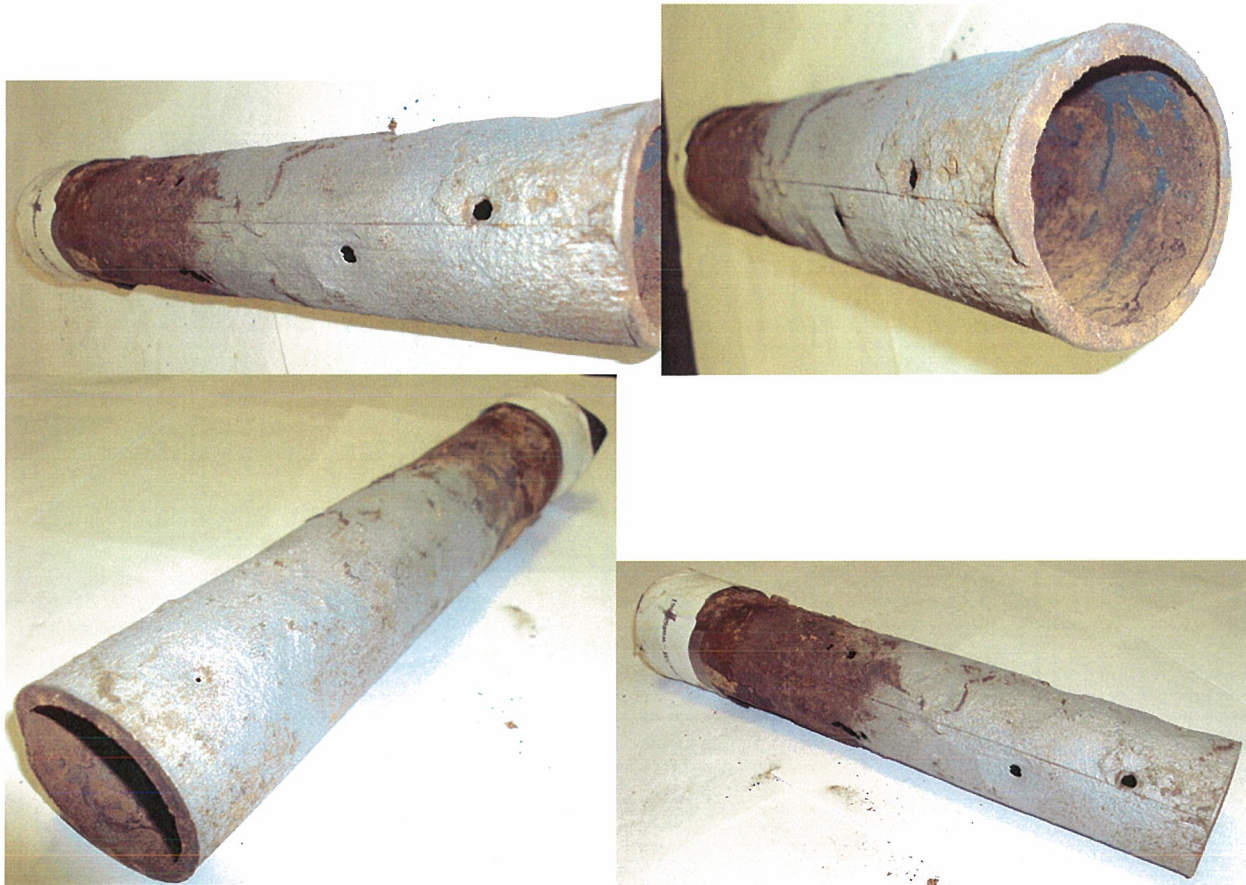
(3) **25-28 Depot Street, Franklin – wo#641892** – 2 inch, 60 psig, installed in 1931

- A soil sample was taken and analyzed. The pH was measured to be approximately 6, slightly acidic to neutral. Testing for chlorides was negative. Testing for microbiological acid producing (APB) and sulfate reducing bacteria (SRB) were performed. The APB testing produced a reading of 100,000 bacteria colonies per ML. The testing for SRB produced a reading of 100,000 bacteria colonies per ML. The soil was observed to be a normal color and odorless.
- The pipe sample was coated steel, not bare as the records system had indicated. This segment was selected for replacement based on the attributed material of bare steel and the operating pressure of 60 psig. The selection was not based on leak history or an indication of poor condition. The pipe was observed to be in good condition with some minor pitting. Exposure of this main segment should not result in a recommendation for replacement based on condition alone. Pit depths were not measured as the samples are available for continued visible review.
- The following pictures were taken:



(4) **80-113 Blossom Street, Nashua – wo#681861** – 2 inch, low pressure, installed in 1908 & 1913

- A soil sample was taken and analyzed. The pH was measured to be approximately 5, acidic to neutral. Testing for chlorides resulted in a reading of 500 mg/l. Testing for microbiological acid producing (APB) and sulfate reducing bacteria (SRB) were performed. The APB testing produced a reading of 1,000 bacteria colonies per ML. The testing for SRB produced a reading of less than 10 bacteria colonies per ML. The soil was observed to be a normal color and odorless. Based on the testing, the bacteria levels of the soil do not appear to have accelerated the rate of corrosion. Acidic soil and/or the presence of chlorides are possible contributors to the high amount of corrosion.
- The pipe sample was observed to be in extremely poor condition. This segment was specifically noted by field personnel for priority replacement. Pit depths were not measured as the samples are available for continued visible review. Exposure of this main should result in a recommendation for immediate replacement based on condition.
- The following pictures were taken:



(5) **5-11Bristol Street, Nashua – wo#642292** – 4 inch, low pressure, installed in 1947, 1951, 1954, & 1957???

- A soil sample was taken and analyzed. The pH was measured to be approximately 7, or neutral. Testing for chlorides was negative. Testing for microbiological acid producing (APB) and sulfate reducing bacteria (SRB) were performed. The APB testing produced a reading of 10,000 bacteria colonies per ML. The testing for SRB produced a reading of 1,000 bacteria colonies per ML. The soil was observed to be a normal color and odorless.
- The pipe sample was observed to be in fair condition. Some moderate, uniform pitting was observed. Pit depths were not measured as the samples are available for continued visible review. Exposure of this segment should result in a recommendation for replacement based on condition.
- The following pictures were taken:



(6) **12-25 Buck Street, Nashua – wo#655576** – 2 inch, low pressure, installed in 1901, 1903, & 1911

- A soil sample was taken and analyzed. The pH was measured to be between 6 and 7, slightly alkaline to neutral. Testing for chlorides was negative. Testing for microbiological acid producing (APB) and sulfate reducing bacteria (SRB) were performed. The APB testing produced a reading of 100,000 bacteria colonies per ML. The testing for SRB produced a reading of 100 bacteria colonies per ML. The soil was observed to be a normal color and odorless.
- The pipe sample was observed to be in poor condition with some heavy pitting observed. A threaded coupling was also included as part of the pipe sample. Pit depths were not measured as the samples are available for continued visible review. Exposure of this segment should result in a recommendation for replacement.
- The following pictures were taken:



(7) **2-4 Fourth Street, Nashua – wo#642294** – 2 inch, low pressure, installed in 1926

- A soil sample was taken and analyzed. The pH was measured to be approximately 6, slightly acidic to neutral. Testing for chlorides was negative. Testing for microbiological acid producing (APB) and sulfate reducing bacteria (SRB) were performed. The APB testing produced a reading of 100,000 bacteria colonies per ML. The testing for SRB produced a reading of 100 bacteria colonies per ML. The soil was observed to be a normal color and odorless.
- The pipe sample was observed in poor condition with one area of significant deep pitting. Pit depths were not measured as the samples are available for continued visible review. Exposure of this main should result in a recommendation for replacement based on condition.
- The following pictures were taken:



(8) **31-39 Newbury Street, Nashua – wo#642295** – 2 inch, low pressure, installed in 1898/1910/1928

- A soil sample was taken and analyzed. The pH was measured to be between 3 and 4, highly acidic. Testing for chlorides was negative. Testing for microbiological acid producing (APB) and sulfate reducing bacteria (SRB) were performed. The APB testing produced a reading of 10 bacteria colonies per ML. The testing for SRB produced a reading of 100 bacteria colonies per ML. The soil was observed to be a normal color and odorless. Based on the testing, the bacteria levels of the soil do not appear to have accelerated the rate of corrosion.
- The pipe sample was observed to be in poor condition with some significant wall loss observed. Pit depths were not measured as the samples are available for continued visible review. Exposure of this main should result in a recommendation for replacement based on condition.
- The following pictures were taken:



(9) **5-21 Winter Street, Tilton – wo#586554** – 4 inch, 60 psig, installed in 1931

- A soil sample was taken and analyzed. The pH was measured to be approximately 7, or neutral. Testing for chlorides was negative. Testing for microbiological acid producing (APB) and sulfate reducing bacteria (SRB) were performed. The APB testing produced a reading of 100,000 bacteria colonies per ML. The testing for SRB produced a reading of 1,000 bacteria colonies per ML. The soil was observed to be a normal color and odorless.
- The pipe sample was observed to be in fair condition. This segment was selected for replacement based the pipe attributes, bare steel with an operating pressure of 60 psig. Pit depths were not measured as the samples are available for continued visible review. Exposure of this main should not result in a recommendation for replacement based on condition alone.
- The following pictures were taken:



Conclusions/Recommendations:

- (1) Samples should continue to be taken as close to the area of leak activity as possible.
- (2) Crews taking the samples should specify the 12 o'clock position of the sample taken. The samples have been observed to be highly corroded along one longitudinal strip of the pipe, assumed to be the 6 o'clock position.
- (3) Integrity Engineering should continue to be contacted prior to each removal of the sample pipe. An engineering representative should be on site to verify that the pipe sample is acceptable and that the soil taken is valid for analysis.
- (4) A combination of high levels of microbiological acid producing (APB) and sulfate reducing bacteria (SRB) appeared to contribute to a higher rate of corrosion of the steel gas main based on 2008 testing. The sample from Depot Street in Franklin tested with high levels of both bacteria without the expected pipe corrosion. Further testing should be conducted test this scenario.
- (5) The criteria used for the segment selection process should continue to include exposed main reports indicating poor condition, as this data has proven to be useful and indicative of pipe in need of replacement.
- (6) Special attention should be paid to locations where the pH is highly acidic or highly alkaline. The Newbury St, Nashua sample testing showed highly acidic soil with a highly corroded pipe sample.
- (7) Special attention should be paid to locations where the presence of chlorides is observed. The soil sample taken from Blossom St in Nashua indicated the presence of chlorides around a highly corroded pipe sample.
- (8) Segments for replacement should not be approved based on attributes alone. Segments of coated steel main that were previously thought to be bare have been included in the replacement program. Examples include Cornell St in Concord and Depot St in Franklin.