June 6, 2001

David Locey
Environmental Engineer
NY State Dept. of Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203

Re: Hanna Furnace Site - Subparcel 1
Investigation of High pH in Groundwater

Dear Dave:

On behalf of Development Downtown, Inc., Malcolm Pirnie conducted an investigation of high pH in groundwater near monitoring wells MW-104 and MW-105 in Subparcel 1 of the Hanna Furnace Site in Buffalo, New York. The investigation was conducted in two phases: soil borings were completed on January 30, 2001 and test pits were conducted on May 17, 2001. As you recall, Malcolm Pirnie's on-site representative discussed the investigation locations with you in your role as the NYSDEC's on-site representative during both phases of the investigation.

FIELD INVESTIGATION

A total of five soil borings were completed around monitoring wells MW-104 and MW-105 to assess whether the high pH observed in the groundwater in the wells was due to grout contamination of the wells. Figure 1 shows the locations of the borings and the pH measurements in groundwater collected from these borings and Table 1 summarizes the pH measurements. Groundwater was collected from each boring using either a bailer or a bottle lowered on a string. The pH of each groundwater sample was measured using a portable pH meter that was calibrated immediately prior to the start of the boring program. The pH of the groundwater collected from these five borings ranged from 10.00 to 11.53.

Based on the results of the boring program, Malcolm Pirnie completed a total of ten test pits to delineate the areal extent of high pH in the groundwater in Subparcel 1. Figure 1 shows the locations of the test pits and the pH measurements in groundwater collected from these test pits and Table 1 summarizes the pH measurements. Groundwater was collected from each test pit either by lowering a bottle into the excavation or by collecting water from the backhoe bucket. The pH of each groundwater sample was measured using a portable pH meter that was calibrated immediately prior to the start of the test pit program. The pH of the groundwater collected from these test pits ranged from 8.67 to 11.95. Each test pit was inspected and logged by a Malcolm Pirnie geologist for subsurface soil type and composition, visible or olfactory evidence of subsurface contamination, and moisture conditions. The test pit logs are included in Attachment A.

Figure 1 shows the approximate extent of high pH in groundwater in Subparcel 1, based on the results of the boring and test pit investigations. In Subparcel 1, the pH measured in the borings and test pits in the high pH area ranged from 10.00 to 11.95, and the pH in the two test pits outside the high pH area (TP-3 and TP-7) was 8.67 and 9.27, respectively.

The three test pits completed in Subparcel 2 (TP-4 through TP-6) contained groundwater with pH measurements ranging from 11.57 to 11.88. Therefore, the area containing groundwater with high pH is not limited to Subparcel 1 of the Hanna Furnace Site.

RISK ASSESSMENT

Based on the findings of these investigations, Malcolm Pirnie evaluated the risk posed by the high pH. With regard to potential adverse health effects from exposure to the high pH groundwater at the Hanna Furnace site, potential dermal irritation resulting from construction/utility workers contacting the groundwater appears to be of most concern.

At the Hanna Furnace site, the groundwater is currently not used for any potable or non-potable purposes, and will not be used for such purposes in the future. As such, ingestion of and dermal contact with highly basic water is not an issue. However, construction/utility workers may become exposed to groundwater during excavation and related maintenance/repair work. Because the water table is relatively shallow (generally two to six feet below ground surface), it is likely that workers could contact the groundwater in the course of excavation work.

Water is considered the most common cause of irritant contact dermatitis. Work during which the skin remains wet is most likely to initiate irritancy because water leaches out a fair amount of the natural moisturizing factors that keep the stratum corneum (i.e., the dead outer layer of the skin) soft and pliable. Alkali (basic) substances (such as lime, cement, sodium hydroxide, and soap) are documented as being more irritating than acidic substances. Additionally, although initial effects from exposure may appear to be mild, they can later develop into more serious effects, such as vascularization and ulceration. Since the groundwater at the Hanna Furnace site is known to be of high pH, potential skin irritancy may result from exposure to potentially caustic water. This may be exacerbated by the fact that exposure to water already induces irritant contact dermatitis as indicated above.

Water quality parameters quantifying the concentrations of ions (e.g., hydroxide, chloride, and hypochlorite) are not available. Knowledge of the concentrations of specific ions in the groundwater and/or soil may provide an indication to the specific chemicals that may be significantly influencing the pH value. Examination of the concentrations of associated inorganics (e.g., sodium, potassium, magnesium, and calcium) indicate that relatively low levels of these inorganics are present in the groundwater and soil (in comparison to NYSDEC ambient water quality standards and recommended soil cleanup objectives), while concentrations of iron are more comparable to these standards and objectives. However, the available data do not

provide certainty as to the specific ions in the groundwater that may be affecting the pH value. As described previously, it is thought that the high pH is likely a result of the presence of high quantities of lime (calcium carbonate, an alkali substance) from previous manufacturing processes at the site.

Given the potentially caustic nature of the groundwater, consideration should also be given to corrosion of underground utility lines, culverts, and other such equipment. Chapter 850 (Physical Standards), Subtopic 854 (Kinds of Pipe Culverts) of the California Transportation Highway Design Manual provides guidance for pipe materials and thickness under specified soil pH conditions. For example, for a service life of 50 years, the pH is recommended to be between 6.5-8.5 for 1.6 mm aluminized steel with minimum resistivity of in excess of 1,500 ohm-cm. As such, it may be inferred that the corrosivity of groundwater with pH levels in excess of 8.5 (as in at the Hanna Furnace site) may require more robust materials or other engineering controls to ensure prolonged life of installed utility corridors.

The findings of the pH investigation will be incorporated into the Remedial Work Plan for Subparcel 1 of the Hanna Furnace Site. Sections of the Remedial Work Plan that will be modified include 2.0 (Previous Investigations) and 5.0 (Remedy Evaluation). Additionally, Section 4.0 (Health and Safety Procedures for Intrusive or Maintenance Activities) of the Soil/Fill Handling Plan will also be modified based on the pH investigation results.

Please do not hesitate to contact John Heffron at DDI or us if you have any questions or comments.

Very truly yours,

MALCOLM PIRNIE, INC.

Kent R. McManus, P.E., DEE
Senior Associate

Enclosures

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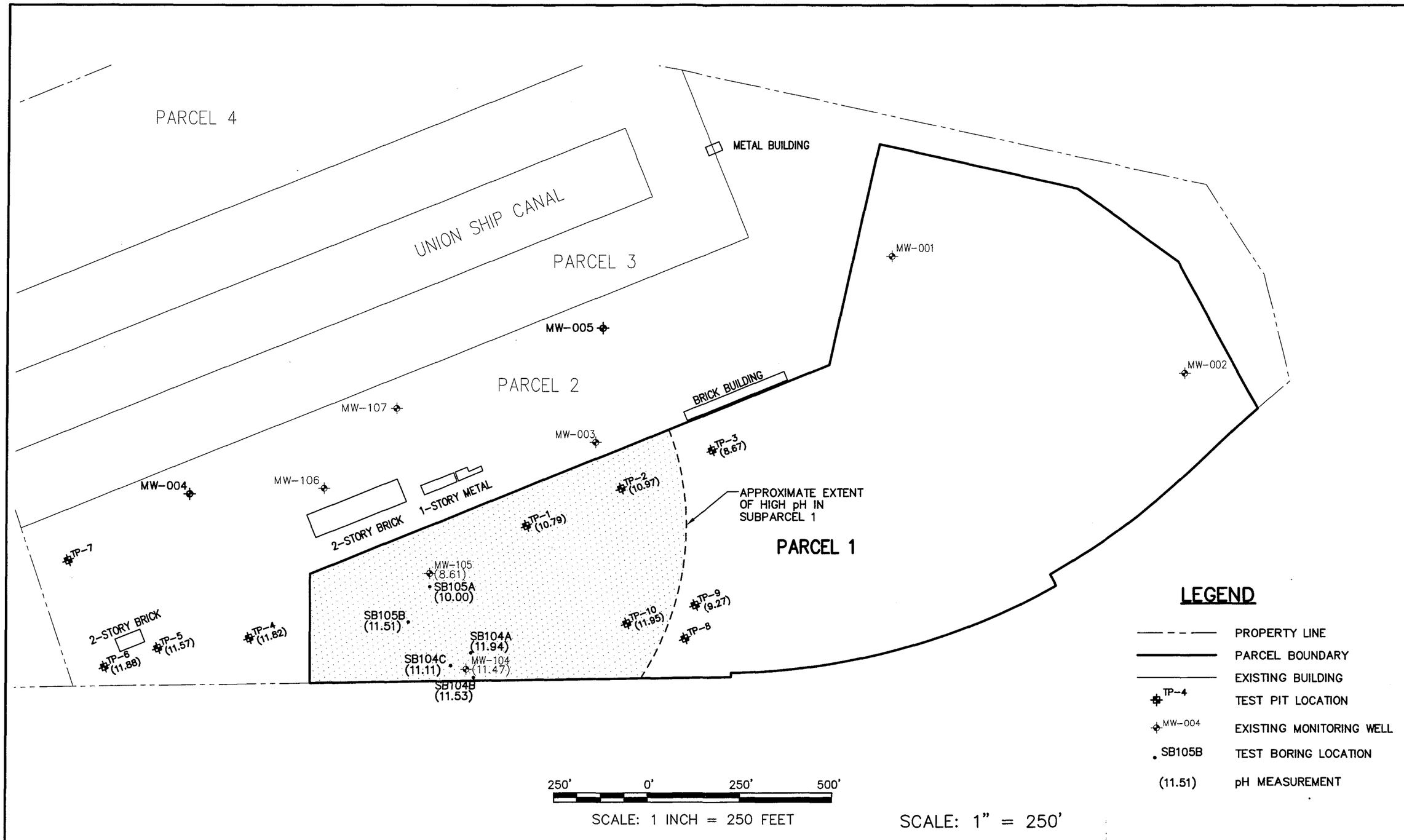
TABLE 1

SUMMARY OF pH MEASUREMENTS

HANNA FURNACE SITE - FORMER RAILROAD YARD (SUBPARCEL 1)
pH INVESTIGATION

Activity / Sampling Location	Date	Approximate Depth to Water	pH Measurement
Soil Borings			
SB-104A	1/30/2001	13	11.94
SB-104B	1/30/2001	-	11.53
SB-104 C	1/30/2001	-	11.11
SB-105A	1/30/2001	-	10.00
SB-105B	1/30/2001	-	11.51
Test Pits			
TP-1	5/17/2001	3.2	10.79
TP-2	5/17/2001	2.0	10.97
TP-3	5/17/2001	3.0	8.67
TP-4	5/17/2001	4.0	11.82
TP-5	5/17/2001	4.0	11.57
TP-6	5/17/2001	6.0	11.88
TP-7	5/17/2001	Refusal at 4.5 feet.	-
TP-8	5/17/2001	Refusal at 3.5 feet.	-
TP-9	5/17/2001	7.5	9.27
TP-10	5/17/2001	5.5	11.95

Notes:
- Not Available.



MALCOLM PIRNIE

05/05 4080F004.

HANNA FURNACE SITE
BUFFALO, NEW YORK

SUBPARCEL 1 – FORMER RAILROAD YARD

FIGURE 1

pH INVESTIGATION RESULTS

ATTACHMENT A

TEST PIT LOGS
AND
PHOTOGRAPHS

TP-1

TP-2

Note: Time stamp one hour slower than actual time photo was taken

TP-3

Note: Time stamp one hour slower than actual time photo was taken

TP-5

Note: Time stamp one hour slower than actual time photo was taken

TP-5

Note: Time stamp one hour slower than actual time photo was taken

TP-6

Note: Time stamp one hour slower than actual time photo was taken

TP-7

Note: Time stamp one hour slower than actual time photo was taken

TP-7

Note: Time stamp one hour slower than actual time photo was taken

TP-8

Note: Time stamp one hour slower than actual time photo was taken

TP-9

Note: Time stamp one hour slower than actual time photo was taken

TP-10

Note: Time stamp one hour slower than actual time photo was taken

ATTACHMENT B

ADDITIONAL INFORMATION

In the USEPA Drinking Water Standards and Health Advisories – Secondary Drinking Water Regulations (Office of Water; EPA 822-B-00-001; Summer 2000), the recommended pH range for drinking water is from 6.5-8.5. These standards are set for taste, odor, and aesthetics purposes. It is possible that water with pH>8.5 may contribute to corrosion of water distribution equipment.

No mention is made of pH in water in the following USEPA guidance documents: Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), 1989; and the Supplemental Guidance for this document: Dermal Risk Assessment – Interim Guidance, 1999.

ATTACHMENT C

REFERENCES

Amdur, M.O., Doull, J., Klaassen, C.D. (Eds.). 1991. *Casarett and Doull's Toxicology. The Basic Science of Poisons*. Fourth Edition. Macmillan Publishing Company, New York, NY. 974 p.

U.S. Environmental Protection Agency. 1989. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002. Office of Emergency and Remedial Response, Washington, DC.

U.S. Environmental Protection Agency. 1999. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. Supplemental Guidance. Dermal Risk Assessment. Interim Guidance. Office of Emergency and Remedial Response, Washington, DC. (do not cite or quote)

Williams, P.L., Burson, J.L. (Eds.). 1985. *Industrial Toxicology in the Workplace: Safety and Health Applicants in the Workplace*. Van Nostrand Reinhold, New York, NY. 502 p.

Internet sites: searched on USEPA website; www.askjeeves.com (search terms: "high pH water"); USGS webpage; www.water.com; www.awwa.com; etc.)