

# LEGGETTE, BRASHEARS & GRAHAM, INC.

## PROFESSIONAL GROUND-WATER AND ENVIRONMENTAL ENGINEERING SERVICES

76 PEARL STREET  
SUITE 203  
ESSEX JUNCTION, VT 05452  
802-288-9600  
FAX 802-288-9881  
www.lbgweb.com

June 30, 2010

Mr. John Ferraro  
Husky Injection Molding Systems, Ltd.  
288 North Road  
Milton, VT 05468

**Re: Boehringer Investigation, Husky Injection Molding Systems, Ltd., Milton, VT  
VT SMS #2009-4003  
Revision 2.0**

Dear Mr. Ferraro,

The professional hydrogeologic and environmental consulting firm of Leggette, Brashears & Graham, Inc. (LBG) has prepared this letter to summarize findings from the recent Boehringer Investigation conducted at Husky Injection Molding Systems, Ltd. (Husky), located in Milton, VT (the Site). The letter also includes recommendations for further environmental work at the Site. A brief summary of Husky's annual Henry Filter system inspection is included as well. A Site Location Map is provided as *Figure 1* and a Site Plan is included as *Figure 2*. Photographs of the Boehringer Investigation are provided in *Appendix 1*.

The Boehringer Investigation was conducted in accordance with a work scope and estimate of probable cost prepared by LBG on April 5, 2010 and approved by you on April 8, 2010. Unexplained accumulation of Henry Filter coolant in the Boehringer machines' sumps was discussed during an on-Site meeting with LBG and Husky personnel on March 12, 2010. Design and execution of the investigation followed, as both parties agreed the Boehringer machines would be a logical place to begin searching for the coolant leak.

The Boehringer machines are located along the northwestern wall of the plateline, up-gradient of the recovery well according to groundwater flow direction calculated from the on-Site groundwater monitor well network. The goal of the Boehringer Investigation was to assess whether the accumulation of coolant in the sumps could explain the presence of nearly full strength coolant in the recovery well (i.e. if the Boehringer machines were responsible for the coolant leak to the subsurface). Husky furnished LBG with construction drawings of a typical Boehringer foundation. Following review of the drawings, LBG devised the means of assessing the integrity of the Boehringer foundations and sumps presented in the April 5, 2010 work scope.

The annual Henry Filter system inspection was conducted over Memorial Day weekend by Husky maintenance personnel. Information included in this letter regarding

the inspection was provided by Husky; LBG was not directly involved with the inspection.

### **Boehringer Investigation Work Scope**

The Bohringer Investigation was conducted on April 14, 2010. Diamond plate sump covers were removed by Husky personnel and a visual inspection of the sump was recorded. The construction drawing detail of the sump is provided as *Figure 3*, Bohringer Machine Sump Detail. Environmental Products and Services of Vermont (EPS) was subcontracted to enter the sumps under a confined space permit. EPS personnel entered each sump to insert a down-hole video camera through the sump raceway, into the interstitial space beneath the Bohringer inertia block. LBG personnel monitored the video image for evidence of obvious abnormalities within the interstitial space (i.e. cracks in the concrete).

A mechanical seal was inserted into the sump raceway and the interstitial space was depressurized using a vacuum pump. Helium was introduced into the interstitial space in the rear of the Bohringer machine, where the Henry Filter coolant trench passes underneath the machine. A construction drawing detail of this area is included as *Figure 4*, Bohringer Machine Base Detail. A helium meter at the exhaust line of the vacuum pump was used to monitor leaks within the Bohringer machine foundation.

A hydrostatic test was performed to assess the integrity of the Bohringer machine sumps. The sumps were filled with water to the base of the raceway opening. The Bohringer machine No. 5 (BO-5) sump was filled to level that covered an apparent concrete seam to assess whether the seam was leaking (see below for a more detail). Refer to Photograph 7. Water level was recorded from the plateline floor immediately upon filling the sumps and again after approximately 24 and 48 hours.

### **Boehringer Investigation Findings**

Visual inspection of the Bohringer sumps revealed that more than one concrete pour was used to construct the sump. The apparent seam(s) may also be coincidental with the concrete form lines. All three sumps showed a distinct ring of staining at or near the base of the raceway. This staining may indicate that coolant has accumulated in the sumps but not at levels above the raceway. The staining and corrosion of the concrete at the raceway elevation depicted in the attached photographs insinuates that coolant may have accumulated to this sump elevation for some period of time before the sumps were evacuated.

It appears that the surface of the sump wall below the raceway in BO-5 was parged with concrete. The parged material has broken off from the poured concrete wall of the sump as depicted in Photographs 4, 5 and 6. Further evidence of concrete corrosion was also noted below the raceway, where coolant frequently seeps into the sump. More detailed information about Henry Filter coolant chemistry should be obtained to assess

the potential for unfavorable interactions between coolant and concrete (see **Recommendations**).

After assessing the sumps' oxygen levels, EPS personnel entered each sump. The down hole video camera was inserted into each interstitial space and maneuvered as best as possible until no further progress could be made. LBG personnel screened the video imagery. Novibra blocks, walls of the interstitial space, plywood used to construct the inertia block concrete form, and polyethylene sheeting used between the inertia block and Boehringer foundation were evident. A liquid layer (presumably coolant) of varying thicknesses was observed covering each interstitial space. No obvious cracks or other conduits to the subsurface were observed. However, it should be noted that visibility was limited due to maneuverability restrictions of the down-hole video camera and the presence of liquid on the interstitial space floor.

Helium was used to identify connectivity within the Boehringer foundations' interstitial spaces and the Henry Filter trench system. Approximately 5-10 minutes after introducing helium near the intersection of the Boehringer foundation and Henry Filter coolant trench, helium was detected by the helium meter at the vacuum pump exhaust. This observation was noted at each Boehringer machine. This observation does not identify the specific pathway by which coolant enters the interstitial space beneath the Boehringer machines and the sumps. However, LBG believes this finding to be significant because of the large number of concrete seams that exist within the plateline foundation.

After visually inspecting each sump and interstitial space and following completion of the helium test each sump was filled with water to a level at or near the base of the raceway opening to the sump. This level was selected as not to flood the interstitial space beneath the inertia blocks. Water level measurements from the hydrostatic test are summarized below. Boehringer machines are referred to by Husky's identification system. Depth to water was measured from a constant point on the plateline floor adjacent to the sump using a tape measure.

Boehringer	4/14/2010	4/15/2010	4/16/2010
BO-4	64.50	64.50	64.00
BO-5	64.25	64.00	64.00
BO-6	65.13	65.00	65.00

A slight drop in water levels was observed during the test in each sump. BO-4 and BO-5 both dropped  $\frac{1}{2}$  and  $\frac{1}{4}$  inches, respectively, to a level of 64.00 inches below the steel frame surrounding the top of the sump. The sump frame is approximately  $\frac{1}{4}$  inch below the floor surface to accept the steel plate cover. The water level in BO-6 was 1 inch higher at 65.00 inches below the steel frame and dropped only  $\frac{1}{8}$  inch. The design construction drawing detail shows the base of the interstitial space to be 5 feet, 4  $\frac{1}{2}$  inches (64  $\frac{1}{2}$  inches) below the finished floor.

### **Boehringer Investigation Conclusions**

The hydrostatic test does not appear to have yielded any conclusive evidence that breaches in the Boehringer machine sumps are responsible for coolant in the groundwater beneath the Site. However, the observations and results of the testing suggest that the cold joints of the interstitial space below the inertia blocks may leak. Any coolant that leaks into the interstitial space of the Boehringer machines from floor surface or from the Henry Filter trench does not appear to reach a static level higher than approximately 64.00 inches from the floor surface. Coolant continues to accumulate in the sump of BO-6, though we did not observe an increase in water level during the hydrostatic test as anticipated. Considering that the elevation of staining around each sump is consistent with the static water levels measured in the hydrostatic test and the cold joint seam in the base of the machine vault (below the inertia blocks), the leak to the subsurface may be through the cold joints.

Furthermore, the ongoing accumulation of coolant in the sump of BO-6 indicates that coolant may be entering the interstitial space from the Henry Filter trench system. Although the rate of coolant entering the interstitial space may vary, the leakage rate from the interstitial space of BO-6 may be less than that of the other two machines as supported by the accumulation of coolant into the BO-6 sump (i.e. the coolant may leak through the cold joints within the interstitial space in BO-4 and BO-5 before accumulating into their respective sumps).

The presence of cold joints in the concrete highlights Husky's and LBG's prior suspicion that the coolant leak(s) could be originating from one or more points within the Henry Filter coolant system as well as from the interstitial space beneath the Boehringer machine inertia blocks. Although the inertia block foundations have a waterproof membrane around the outside of the structures, the integrity of those membranes is unknown.

The potential for concrete corrosion following prolonged exposure to coolant is also important as it may support LBG's belief that metal concentrations in recovery well groundwater samples can be at least partially explained by leaching from concrete.

## **Recommendations**

Considering the available information and data collected to date, LBG has prepared the follow list of recommendations for further actions to be taken at the Site to address Henry Filter coolant impacts to the subsurface beneath the plateline:

- Perform Toxicity Characteristic Leaching Procedure (TCLP) analysis of concrete from the plateline foundation to further evaluate the potential that metals detected in the recovery well are leaching from concrete.
- Analyze coolant outbound (moving towards the machines) from Henry Filter for all parameters monitored in the recovery well in February and March 2010 (volatile organic compounds, Bis(2-ethylhexyl)Phthalate, total petroleum

hydrocarbons, chloride, and total metals (arsenic, beryllium, cadmium, chromium, copper, lead, nickel, silver, thallium, and zinc).

- Analyze pH of outbound Henry Filter coolant.
- Using the mechanical seal fabricated for the raceway to isolate the sump, flood the interstitial space beneath the inertia block and monitor the change in water level over time to establish approximate leakage rates and assess whether the leaks are in fact occurring at these specific locations.
- Conduct subsequent rounds of groundwater monitoring using standard low-flow sampling techniques to obtain in-situ groundwater chemistry data. In-situ parameters will include temperature, pH, conductivity, dissolved oxygen, and oxidation-reduction potential.
- Advance soil borings within the plateline to be completed as groundwater monitor wells (as recommended in the Supplemental Site Investigation Report). Considering the sensitivity of machines within the plateline to vibration, an air knife should be used to install the soil borings and wells. A core drill should be used to core through plateline floor. Due to space limitations within the plateline, LBG and Husky have discussed the installation of two soil borings/groundwater monitor wells between the Boehringer machines and the recovery well. Approximate locations for the proposed soil borings/groundwater monitoring wells have been identified following on-Site meetings with Husky personnel.
- Implement high vacuum extraction at the recovery well to apply a more aggressive means of coolant recovery. The feasibility of high vacuum extraction from the existing recovery well will be assessed by monitoring parameters such as induced vacuum and groundwater elevation in the newly installed groundwater monitoring wells in the plateline, as well as overall recovery rates and coolant concentration. The data and observations gathered during the high vacuum event may aid in determining the area of influence and possibly a change in the groundwater gradient towards the recovery well. Data and information obtained about the effectiveness of the high vacuum extraction method may be limited due to the limited number of monitoring points and their locations (as a result of space limitations), the potential for short circuiting of air flow, and unknown plume dynamics; however the primary purpose of introducing high vacuum extraction is to recover coolant at an increased rate.

### **Henry Filter System Inspection**

As in years past, a physical inspection of the Henry Filter system was completed during the Memorial Day weekend by Husky Maintenance personnel. The inspection typically consists of a Maintenance Technician physically entering the harpoon trench under a confined space entry permit and inspecting the condition of the harpoon itself, as well as the metal wear plate beneath the harpoon. This year, because of the coolant that had been collecting in the Boehringer machine sumps, a more complete and thorough inspection of the harpoon trench in that vicinity of the plateline was conducted in an effort to identify the source of the leak to the interstitial space beneath the machines.

During the inspection Husky maintenance personnel discovered a section of trench that was missing a horizontal weld. The sections of trench are 20' in length and welded together; this particular section had welds on the side-walls of the trench, but none along the bottom. Additionally, there was a pinhole identified in one section of trench. Photographs from the trench inspection were provided by Husky and are attached as *Appendix 2*. All identified problems were reportedly corrected during the inspection. Husky personnel have monitored the Boehringer machine sumps since the trench inspection and have reported that the sumps remain essentially coolant-free with only minor, residual amounts of coolant in the bottom.

The sumps will continue to be checked weekly to ensure they are not collecting coolant. Husky also plans to monitor the groundwater quality in the recovery well, in order to confirm that the source of the leak has been ceased. Husky is optimistic that the source of the leak to the sub-surface has been found and corrected.

Thank you for the opportunity to provide you with this summary of the Boehringer Investigation, LBG's recommendations for further environmental work at the Site and the annual Henry Filter system inspection.

Please feel free to contact us with any questions or concerns you may have.

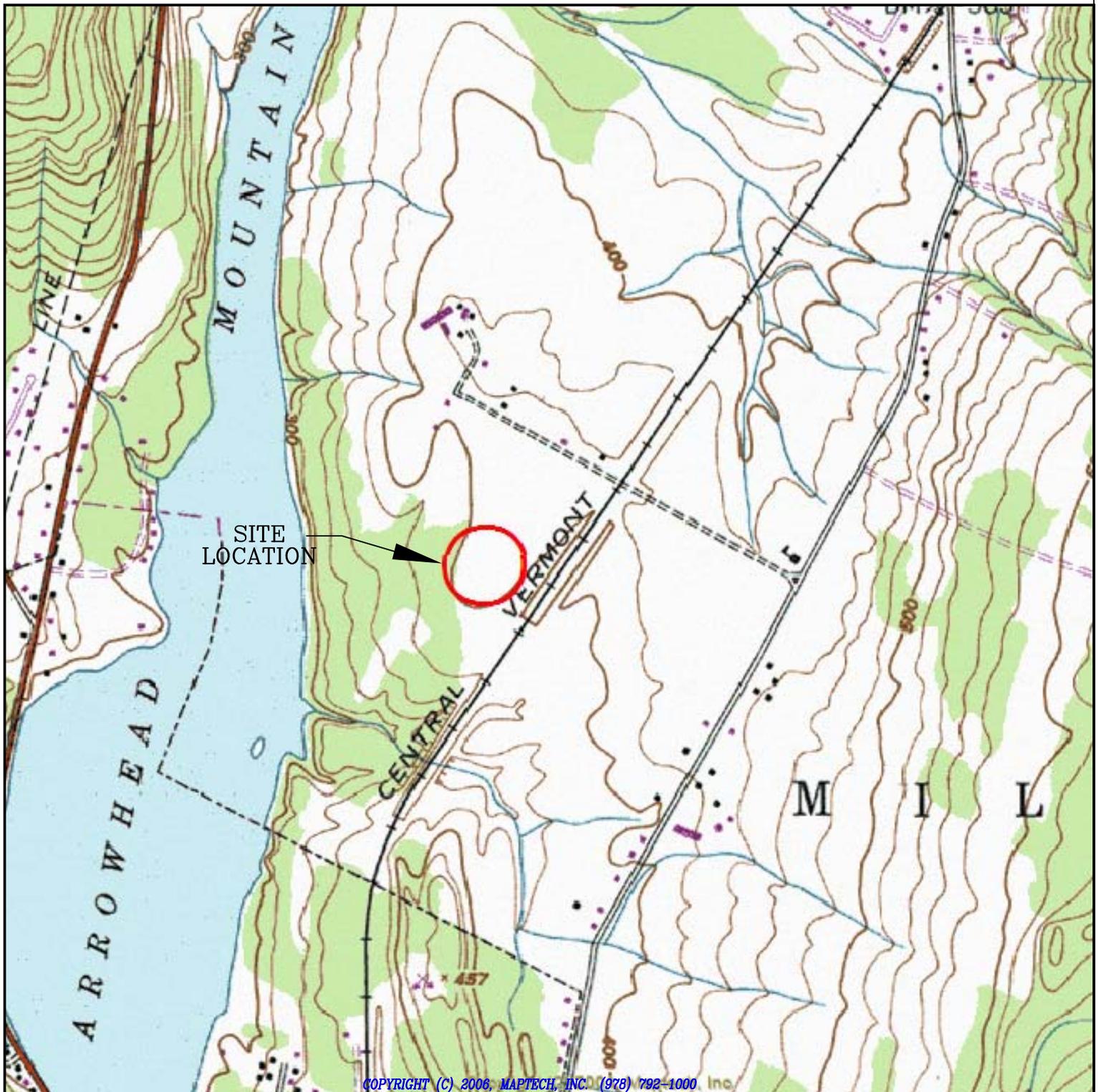
Sincerely,  
**Leggette, Brashears & Graham, Inc.**



John R. Diego  
Senior Associate

*Cc: Gerold Noyes, VT DEC*

## **FIGURES**



SOURCE: United States Geological Survey 7.5 Minute Topographic Map for the Milton, VT Quadrangle

HUSKY INJECTION MOLDING SYSTEMS LTD  
 NORTH ROAD  
 MILTON, VERMONT

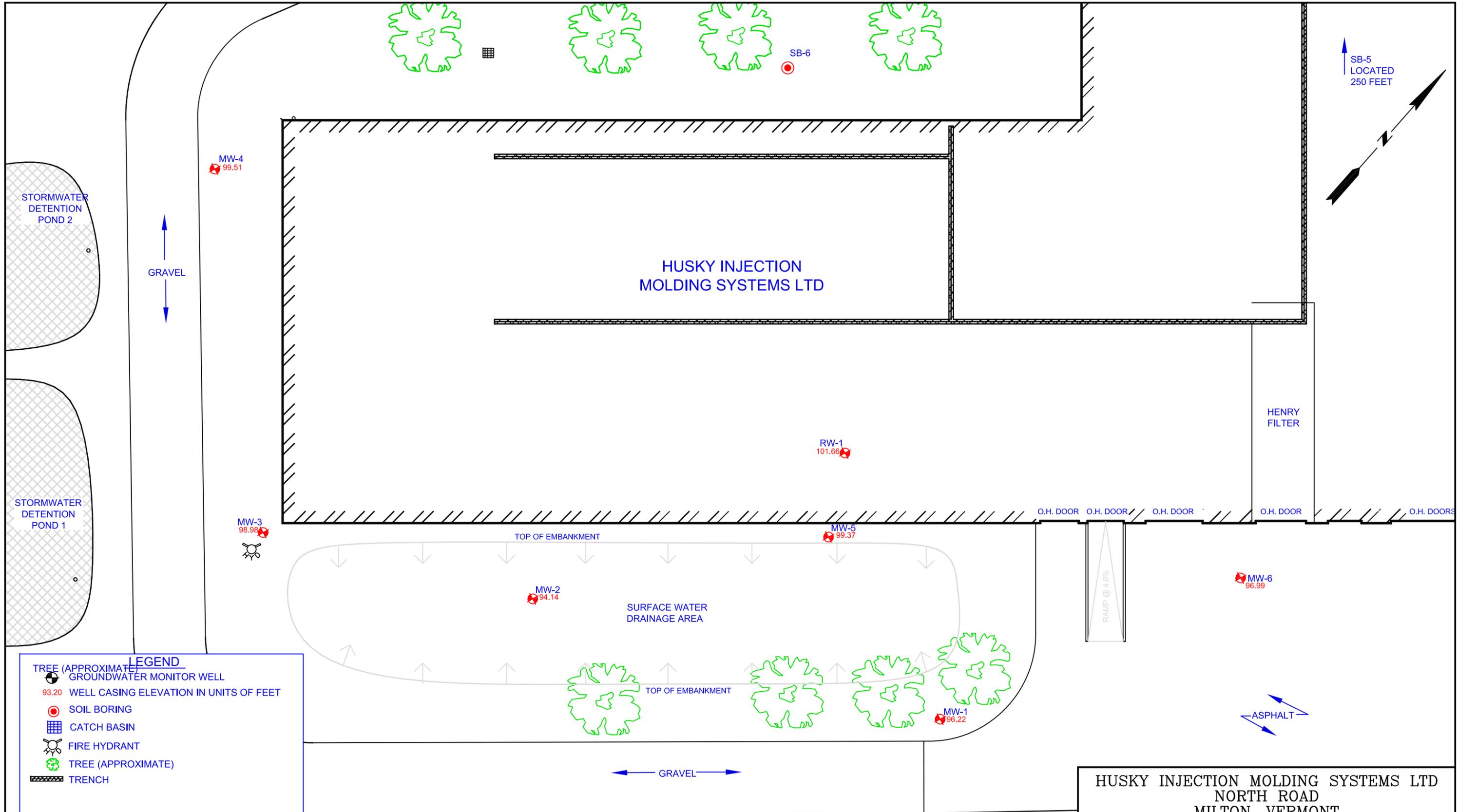
SITE LOCATION MAP



PREPARED BY:  
 LEGGETTE, BRASHEARS & GRAHAM, INC.  
 Professional Groundwater and Environmental Services  
 76 Pearl Street, Suite 203  
 Essex Junction, VT 05452  
 (802) 288-9600

DATE: 10/8/09

FILE: q:\Env. Proj./Husky DRAWN BY: DDR CHECKED BY: JRD FIGURE: 1



**LEGEND**

- TREE (APPROXIMATE)
- GROUNDWATER MONITOR WELL
- 93.20 WELL CASING ELEVATION IN UNITS OF FEET
- SOIL BORING
- CATCH BASIN
- FIRE HYDRANT
- TREE (APPROXIMATE)
- TRENCH



**REFERENCES:**

1. THIS PLAN REFERENCES AN ELEVATION AND DISTANCE SURVEY CONDUCTED BY LBG ON 9/17/2009.

NO.	DATE	DESCRIPTION	BY

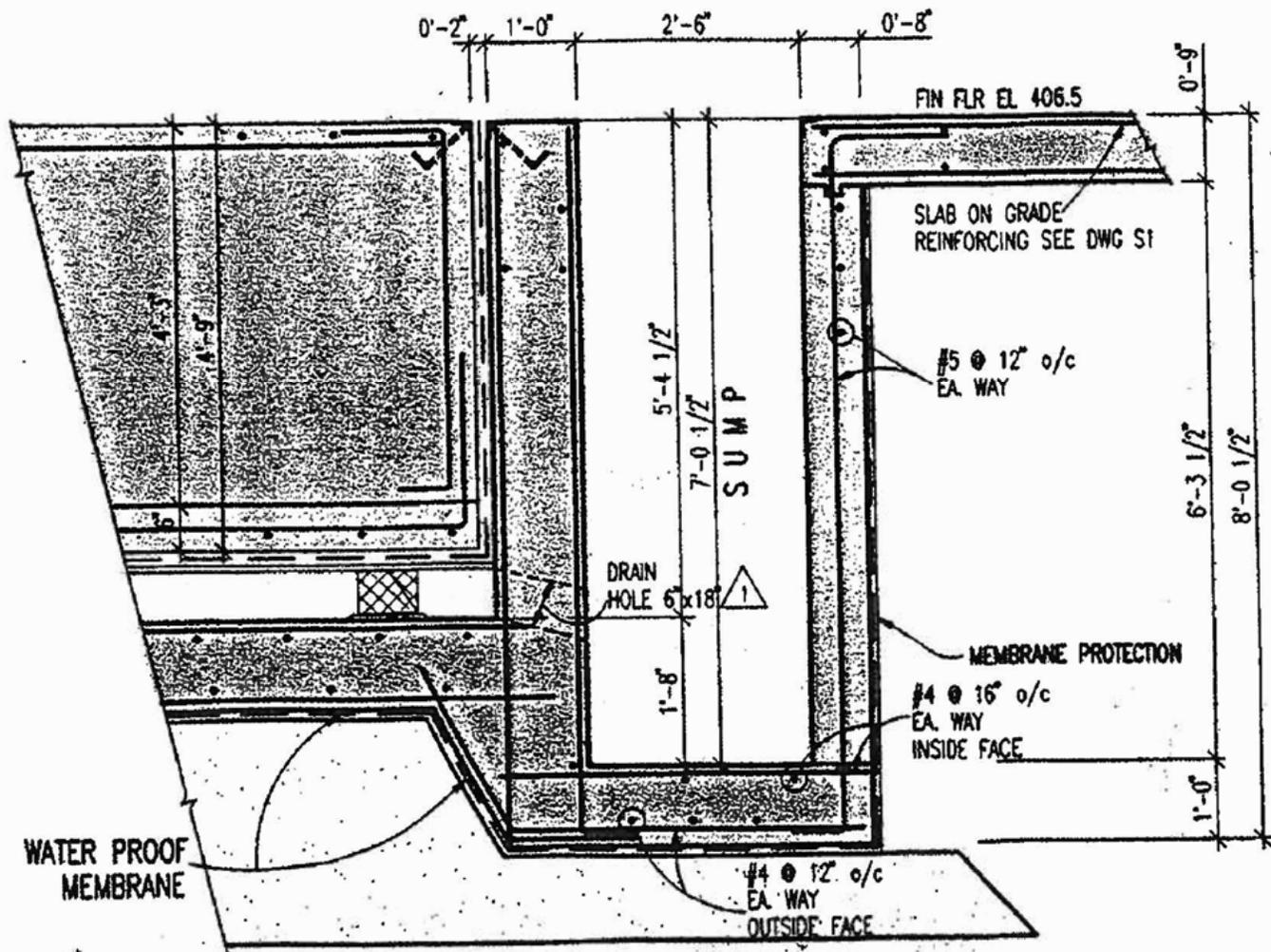
HUSKY INJECTION MOLDING SYSTEMS LTD  
NORTH ROAD  
MILTON, VERMONT

**SITE PLAN**

PREPARED BY:  
**LEGGETTE, BRASHEARS & GRAHAM, INC.**  
Professional Groundwater and Environmental Services  
76 Pearl Street, Suite 203  
Essex Junction, VT 05452  
(802) 288-9600

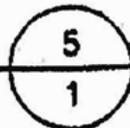
DATE: 9/22/09

FILE: Q:\ENV.PROJ\HUSKY DRAWN BY: DDR CHECKED BY: JRD FIGURE: 2



**SECTION**

SCALE 1/2" = 1'-0"



NOT TO SCALE

HUSKY INJECTION MOLDING SYSTEMS LTD  
NORTH ROAD  
MILTON, VERMONT

**BOEHRINGER MACHINE SUMP DETAIL**



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Professional Groundwater and Environmental Services

76 Pearl Street, Suite 203  
Essex Junction, VT 05452

(802) 288-9600

DATE: 6/1/2010

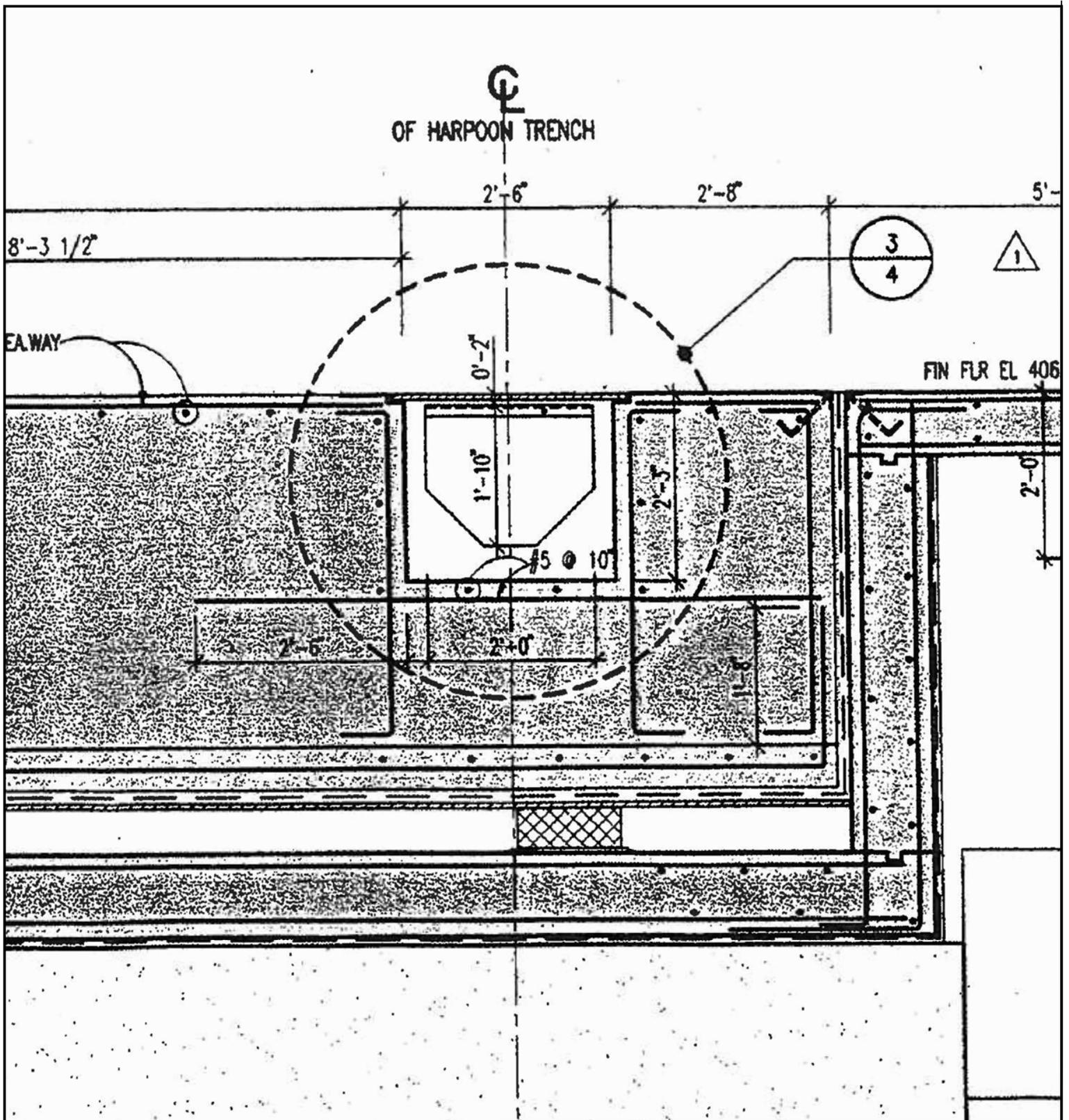
FILE: q:\Env. Proj./Husky

DRAWN BY: DDR

CHECKED BY: JRD

FIGURE: 3

SOURCE: INTERNORTH ENGINEERING, INC.  
CONSTRUCTION DRAWING ENTITLED VDF  
BOEHRINGER TAURUS 4P MACHINE BASE,  
DATED MARCH 19, 1998, PROJECT NO. 5-  
1126.



NOT TO SCALE

SOURCE: INTERNORTH ENGINEERING, INC.  
 CONSTRUCTION DRAWING ENTITLED VDF  
 BOEHRINGER TAURUS 4P MACHINE BASE,  
 DATED MARCH 19, 1998, PROJECT NO. 5-  
 1126.

HUSKY INJECTION MOLDING SYSTEMS LTD  
 NORTH ROAD  
 MILTON, VERMONT

BOEHRINGER MACHINE BASE DETAIL



PREPARED BY:  
**LEGGETTE, BRASHEARS & GRAHAM, INC.**  
 Professional Groundwater and Environmental Services  
 76 Pearl Street, Suite 203  
 Essex Junction, VT 05452  
 (802) 288-9600

DATE: 6/1/2010

## **APPENDIX 1**

## Appendix 1 – Photographs



**Photo 1.** Sump of Boehringer No. 4 (BO-4) prior to Boehringer Investigation testing.



**Photo 2.** Installing mechanical seal in BO-4.



**Photo 3.** Mechanical seal in BO-4.



**Photo 4.** BO-5 sump with crumbling concrete from parged surface.



**Photo 5.** BO-5 sump with crumbling concrete from parged surface.



**Photo 6.** BO-5 sump with crumbling concrete from parged surface.



**Photo 7.** BO-5 sump – apparent seam at raceway level.



**Photo 8.** Staining and deterioration of concrete within BO-5.



**Photo 9.** Polyethylene sheeting in BO-6 raceway at the entrance to the interstitial space.



**Photo 10.** BO-6 sump as it was filled for commencement of the hydrostatic test (Following extraction of all coolant from the sump and Boehringer Investigation activity).



**Photo 11.** BO-6 sump after filling it with water to complete the hydrostatic test.



**Photo 12.** Rear of BO-4 where helium was introduced into the Boehringer foundation to assess the potential for cracks in the concrete. Coolant was observed on the floor in this area.



**Photo 13.** Condensate on diamond plate covers above the harpoon system.