



North Country Environmental Services, Inc.

16 State Street
Montpelier, Vermont 05602

(802) 223-7220
(802) 223-7128 Fax

July 17, 1998

Mr. John Cotton
NH Department of Environmental Services
Waste Management Division
6 Hazen Drive
Concord, NH 03301-0509

**RE: North Country Environmental Services, Inc. - Bethlehem, NH
Groundwater Permit No. GWP-198704033-B-003
April 1998 Tri-Annual Groundwater Quality Monitoring - B-406U**

Dear John:

I wanted to follow-up on my letter to you on June 18, 1998 on the same subject. I have attached a copy of a letter from Scott Shillaber of Sanborn, Head & Associates also discussing the April sampling results from 406U. His report also includes excavation observations that were made on the northeast portion of Stage I. This area of Stage I did not have test pits or closure activities so I wanted to be certain there were no overfills in this area. We confirmed there were no overfills in this section of Stage I by the former owners.

We have taken a proactive measure on gas control by installing this Spring an active gas extraction trench in Stage II Phase I. We believe these additions to the active gas collection system will reduce the potential for the gas diffusion through the liners.

I have also attached a copy of the October 10, 1996 bi-weekly construction summary completed by Sanborn, Head & Associates. The overfill of waste by the pervious owner in the southwest portion of Stage I Phase I was by far the largest overfill discovered. The quantity of waste overfilled in this area was estimated to be 75 cubic yards. During construction in 1997 when the areas between the test pits were excavated some small areas of waste beyond the liner were discovered. The waste beyond the liner on the southeast side of the landfill was estimated to be 25 cubic yards. All of the materials found beyond the liner were placed by the former owner and removed for disposal in the active area.

Mr. John Cotton
July 17, 1998
Page 2 of 2

We believe the source of the VOC's in well 406U is most likely from the past waste beyond the liners and leachate outbreaks. The quantity and quality of leachate collected from the primary liners are within industry expectations, hence they are performing as expected. The quantities of leachate collected in the secondary systems of this landfill are minimal indicating that VOC's are not released from the lined landfill.

Larry Lackey and I would like to meet with you and our consultant to discuss this issue at your convenience. We look forward to your call.

Sincerely,

NORTH COUNTRY ENVIRONMENTAL SERVICES, INC.



Robert A. Watts
Permits, Compliance and Engineering

Encl.

c: James Berg, State of New Hampshire DES ✓
Town of Bethlehem Select Board
James W. Bohlig, North Country Environmental Services, Inc.
Larry B. Lackey, North Country Environmental Services, Inc.
William T. Clifton, North Country Environmental Services, Inc.
Donald Monahan, North Country Environmental Services, Inc.
Scott Shillaber, Sanborn, Head and Associates, Inc.

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Sanborn, Head & Associates

Consulting Engineers & Scientists

CASELLA WASTE
MANAGEMENT, INC.

JUL 6 1998

RECEIVED
STATE STREET

June 30, 1998
File No. 1003.2

Mr. Robert Watts
North Country Environmental Services, Inc.
16 State Street
Montpelier, VT 05602

Re: Perimeter Excavation to Expose Edge of Liner
North Country Environmental Services, Inc. (NCES)
Bethlehem, New Hampshire

Dear Mr. Watts:

At your request, Sanborn, Head & Associates (SHA) observed the excavation to expose the liner at the anchor trench along the southeast perimeter of Phase I of Stage I of the NCES facility in Bethlehem, New Hampshire. This work was prompted by the results of the April 1998 monitoring which identified the presence of volatile organic compounds (VOCs) in samples from monitoring well B-406U. VOCs have been detected in samples from B-406U dating back to July 1993. The VOCs 1,1-dichloroethane (1,1-DCA), trichloroethene, chloroethane, acetone, tetrachloroethene, methylene chloride, toluene, and cis-1,2-dichloroethene (1,2-DCE) have been detected. The recent results indicate a similar suite of VOCs. With the exception of methylene chloride, all of the VOCs listed above have been detected at concentrations below their respective ambient groundwater quality standards (AGQS). Methylene chloride was detected at concentrations of 7 and 5.9 $\mu\text{g/l}$ in the samples obtained in April and July of 1997 and was detected at a concentration of 10 $\mu\text{g/l}$ in the sample collected in April of this year. The AGQS for methylene chloride is 5 $\mu\text{g/l}$.

As was discussed in our September 1997 Summary of Water Quality Monitoring, SHA attributed the presence of VOCs in the samples from B-406U to the release of leachate over the edge of the liner upgradient of B-406U and/or gas condensate. Consistent with our prior interpretation of the data, SHA does not believe a release through the liner system of the double-lined Stage I landfill is a source of the VOCs detected in B-406U. Little, if any flow has been detected in the secondary leachate collection system of Phase I, indicating the primary liner is providing effective containment. Further, the groundwater elevation data indicate the landfill area upgradient of B-406U constitutes only a very small portion of the double-lined landfill and, importantly, lies at the upgradient end of the Phase, where head levels on the liner are expected to be negligible.

In the Fall of 1997, excavation to expose the edge of the liner was performed to complete the cap/liner tie-in around the majority of Stage I including along a portion of the southeast slope, an

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Charles A. Crocetti ■ Mathew A. DiPilato ■ Daniel B. Carr ■ Duncan W. Wood*

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area likely upgradient of B-406U. This work revealed areas where waste extended slightly beyond the limits of the Stage I liner and where leachate breakouts had occurred. The material at the toe of the slope was excavated and relocated to the landfill during cap construction. The purpose of the recent work was to confirm that this condition did not exist along the remainder of the Stage I liner, upgradient of B-406U.

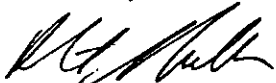
The excavation to expose the anchor trench was performed on June 10, 1998 by facility staff using a Caterpillar 320L excavator. As shown on Figure 1, the excavation extended from the limit of the geomembrane cap adjacent to the east gabion swale to the northeast approximately 240-feet to the southern corner of Stage II. A three foot wide trench was excavated to expose the liner at the anchor trench. The excavation did not reveal the presence of waste beyond the anchor trench. However, as a precautionary measure, the excavated material was loaded into a truck and placed within the landfill. The inside edge of the excavation was backfilled with screened sand to provide a free draining layer for moisture to infiltrate thereby limiting the potential for leachate breakouts at the toe. Till was placed along the outer wall of the trench to provide a less permeable layer.

During the excavation, two small holes were made in the liner near the anchor trench. The trench was left open in these areas to allow for repair. The repairs were made on June 12, 1998 and observed by Atlantic Testing Laboratories, Ltd. A copy of a June 29, 1998 letter from Atlantic Testing Laboratories, Ltd. documenting the repairs is enclosed.

Based on SHA's recent observations and the fact that the majority of Stage I upgradient of B-406U has been capped, there does not appear to be an ongoing release of leachate beyond the edge of the liner upgradient of B-406U. We believe the most likely source of the VOCs is past releases of leachate from breakouts over the edge of the liner which were addressed during construction of Stage II and as a result of the installation of the geomembrane cap which took place in the summer and fall of 1997.

If you have questions, or require further information, please give me a call.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.


R. Scott Shillaber, P.E.
Principal

RSS/TWR:twr/pmm/lje
Attachments

atl

ATLANTIC TESTING LABORATORIES, Limited

121 Riverfront Drive
Manchester, NH 03102
Phone: (603) 669-4828
Fax: (603) 669-1842

June 29, 1998

26 Taft Avenue
White River Junction, VT 05001
Phone: (802) 295-2234

North Country Environmental Services, Inc.
Trudeau Road
Bethlehem, NH 03574

P.O. Box 29
Canton-Potsdam Road
Canton, NY 13617
Phone: (315) 386-4578
Fax: (315) 386-1012

Attn: Mr. Bill Clifton

Re: Geomembrane Repairs
NCES Bethlehem, NH
ATL No. NH466E-6-98

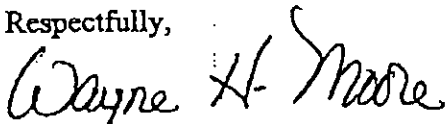
Ladies and Gentlemen:

At the request of Mr. Bill Clifton Representing North Country Environmental Services, Inc., our representative was on site to observe repairs to the geomembrane liner for the Stage 1 Cap. The repairs were performed on June 12, 1998 by representatives of Casella Construction. Two damaged areas were repaired.

These were located on the top of the southeast anchor trench. Each repair location was exposed, cleaned, and a patch was extrusion welded over the damage. The patches and extrusion welding were observed and no apparent defects were noted.

Please contact our office should you have any questions regarding the repairs or if we may be of service.

Respectfully,



Wayne H. Moore
Project Manager
Construction Engineering Division



Sanborn, Head & Associates

Consulting Engineers & Scientists

October 10, 1996
File No. 1232.1

Mr. Richard S. Reed, Supervisor
Waste Management Compliance Bureau
New Hampshire Dept. of Environmental Services
6 Hazen Drive, PO Box 95
Concord, NH 03302

Re: Construction Summary - Period Ending October 4, 1996
Stage I Closure Construction
North Country Environmental Services
Bethlehem, New Hampshire

Dear Mr. Reed:

This letter has been prepared pursuant to Env-Wm 310.07 (b)(5) and provides a status report of construction activities at the North Country Environmental Services (NCES) facility in Bethlehem, New Hampshire for the period of September 23 through October 4, 1996.

I. Construction Activities

During the two week period the Contractor, Casella Construction Company, installed silt fence at the top of the landfill around the proposed stockpile area. In addition, the Contractor excavated test pits to expose the liner at the edge of the anchor trench at approximately 100-foot intervals within the area of work. The test pits were surveyed and the data compared with SHA's plans. In general, the test pits confirmed the limit of liner shown on SHA's plans. The swales and perimeter roads will be laid out based on the test pit data.

In several of the test pits a thin layer of debris, predominantly paper, was found over the anchor trench. This material appeared to be windblown litter or cover soils that had washed down the slope and will be removed during swale or cap construction. In one test pit located near the southwest portion of Phase I, however, refuse was observed extending about ten feet beyond the edge of the liner. Facility staff excavated refuse from beyond the edge of the liner and placed it in the active landfill.

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II. Construction Schedule

In the next two weeks, the Contractor anticipates installing gas vents and working on the grading of the perimeter roads and swales. The Contractor has been directed not to deliver soil materials to the site or to process screened till until such time as comments regarding the cap system provided in NHDES's September 26, 1996 letter are resolved. A revised schedule for Phase I work will be developed and submitted to NHDES following NHDES approval of the design.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.



R. Scott Shillaber, P.E.
Principal

RSS:kmd/las

cc: Larry Lackey, NCES
Matt Poirier, NCES
Bob Watts, NCES

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From 1997
Summary Report

Consistent with our prior interpretation of the data, SHA does not believe a release through the liner system of the double-lined Stage I landfill is a source of VOC's detected in B-405U and B-406U. Little, if any flow has been detected in the secondary leachate collection system of Phase I, indicating the primary liner is providing effective containment. Further, the groundwater elevation data presented on Figure 4 indicate a groundwater divide passes through Phase I of Stage I such that groundwater to the east of the divide flows to the northeast through the Stage II area, while groundwater to the west flows in a northerly to northwesterly direction. The groundwater flow data indicate the upgradient area tributary to B-406U constitutes only a very small portion of the double-lined landfill area and, importantly, lies at the upgradient end of the Phase, where head levels on the liner are expected to be negligible.

As has been discussed in previous summary reports, possible sources of the VOC's detected in samples from B-405U&L and B-406U&L include the release of leachate over the liner anchor trench upgradient of the wells, and landfill gas condensate.

The release of leachate over the liner in the anchor trench became evident in the Fall of 1995 when the anchor trench along the east edge of Stage I was exposed. Excavation exposed the Stage I liner, revealed that a portion of the east slope of Stage I had been slightly overfilled and that waste materials had been placed above the horizontal liner runout extending from the top of the slope to the anchor trench. This refuse was excavated and now that the Stage II liner has been installed, the release of leachate in the area of the liner tie-in has been eliminated.

The facility has been addressing occasional leachate breakouts on slopes, which also may contribute to the release of leachate beyond the anchor trench. When the Stage I closure project is completed, the majority of Stage I will be capped with geomembrane, which will eliminate leachate breakouts on those slopes.

Another potential or contributory source of the VOC's in the wells beneath the liner is diffusion of landfill gas and resultant condensation. Studies have shown that diffusion of VOC's through geomembranes takes place (Rowe, Hrapovic and Korsaric, 1995). The diffusion of gas is evidenced by the presence of landfill gas within the secondary leachate collection system in the NCEs and other lined solid waste landfills. Monitoring wells located near landfills have been shown to be impacted by landfill gas (Morris, 1995; Kerfoot, 1994; Prosier and Janechek, 1995). Possible mechanisms of vapor phase transfer include migration of gas to the capillary fringe where it interacts with groundwater, dissolution of vapor-phase VOC's into soil moisture, migration directly through that portion of the well screen which extends above groundwater, and condensation within the well.

Methylene chloride, 1,1-DCE, and tetrachloroethene (PCE) are common constituents of landfill gas (Morris, 1995). These VOC's have been detected in B-406U but have not been detected in samples from other monitoring wells at the site, including those wells downgradient of the unlined landfill. We believe that wells located beneath the landfill are more likely to be impacted by landfill gas than

be differentiated from impacts from the unlined landfill. Operations began in Stage II in early June of 1996. Accordingly, the concentrations of bromide measured to date have remained generally consistent and should serve as baseline data for Stage II operations.

SUMMARY

In summary, the results of the analyses for inorganic parameters are generally consistent with the results of the analyses for VOCs. With the exception of nitrate, higher concentrations of VOCs and inorganic constituents and metals were measured in samples from wells downgradient of the unlined landfill (100-series, B-601U and B-602U) and the seep. These results are attributed to the effects of the unlined landfill and waste relocation project. Consistent with expectations, the concentrations of the various parameters detected in these wells and the seep are decreasing as the source (the former unlined landfill) has been removed. Continued improvement in water quality at these locations is expected.

Slightly elevated concentrations of the various inorganic parameters have also been detected in samples from B-405U and B-406U located to the east of Stage I beneath the Stage II liner. The likely source for the elevated parameters is the release of leachate over the anchor trench which was identified during construction of Stage II and the leachate breakouts on the Stage I slopes which should be eliminated once the cap is constructed on Stage I. Given that these wells are located beneath the liner system and have relatively long casing and tubing extending from the perimeter of the landfill to the tops of the wells, landfill gas could be a contributory factor in the presence of VOCs in samples from those wells.

Specific conductance at levels above background are evident in B-402U&L, B-404U and MW-701 located to the north of Stage I. Elevated levels in MW-402U and MW-404U first began to appear in 1993 or 1994. Chloride concentrations higher than background have been detected in samples from B-402U since about 1993 and have been detected in the two samples obtained from nearby well MW-701. With the exception of the presence of 10 µg/l of MEK in the sample from MW-402L in July 1996, VOCs have not been detected in samples from wells to the north of the landfill, nor have there been exceedances of AGQS detected in samples from these wells.

The elevated levels of the inorganic parameters are likely attributed to leachate breaking out of the slopes of Stage I and making its way to the detention ponds, where some infiltration occurs. Though not addressed in this summary report, impact from the breakouts have been identified in the analyses of the surface water sample from the detention ponds to the north and west of the site. The leachate breakouts should be eliminated by the ongoing closure construction project. Future monitoring of the detention ponds should provide data confirming whether leachate breakouts are the source as the breakouts should be eliminated once the cap is constructed above Stage I.