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North Country Environmental Services, Inc.

16 State Street
Montpelier, Vermont 05602

October 26, 1998

Mr. John Cotton
N.H. Department of Environmental Services
Waste Management Division
PO Box 95
Concord, NH 03302-0095

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

RE: Work Plan for Hydrogeologic Study
Proposed Stage III
North Country Environmental Services, Inc.
Bethlehem, New Hampshire

Dear John,

As we have discussed, North Country Environmental Services, Inc. (NCES) is proposing to develop additional landfill capacity in the area to the south and east of Stages I and II of our Bethlehem facility. The proposed development would be known as Stage III. As an initial step in the development process, we have requested that Sanborn, Head & Associates, Inc. (SHA) prepare a Work Plan for a hydrogeologic study to be used in support of design and permitting. SHA's Work Plan is enclosed for your review.

Please note that SHA's first task involves meeting with representatives to New Hampshire Department of Environmental Services (NHDES) and NCES to review the Work Plan and to discuss any comments you may have. We are anxious to have the fieldwork completed before winter conditions set in and will be calling to set up a meeting at your convenience to discuss the proposed Scope of Work.

We look forward to discussing the proposed project with you and other representatives of NHDES. In the meantime, should you have any questions, or require further information, please do not hesitate to call.

Sincerely,

NORTH COUNTY ENVIRONMENTAL SERVICES, INC.

Larry B. Lackey, Vice President
Permits, Compliance & Engineer

cc: Richard Reed, New Hampshire Department of Environmental Services
Jim Berg, New Hampshire Department of Environmental Services
Dan Dudley, New Hampshire Department of Environmental Services
James W. Bohlig, North Country Environmental Services, Inc.
Robert A. Watts, North Country Environmental Services, Inc.
R. Scott Shillaber, Sanborn, Head and Associates, Inc.



WORK PLAN
HYDROGEOLOGIC STUDY
PROPOSED STAGE III
North Country Environmental Services, Inc.
Bethlehem, New Hampshire

INTRODUCTION

Sanborn, Head & Associates, Inc. (SHA) has prepared this Work Plan for a Hydrogeologic Study to be completed in support of an application for a proposed Stage III Expansion at the North Country Environmental Services, Inc. (NCES) facility in Bethlehem, New Hampshire. Stage III is proposed to be located to the southeast of Stages I and II in the area indicated on Figure 1. NCES proposes to develop Stage III in a manner similar to Stage II development in that the Stage III liner system will be connected to the existing landfill liner system so that waste can be placed above waste in place in the existing landfill.

Background Site Hydrogeology

Site hydrogeology has been characterized through hydrogeologic studies completed in support of permit applications for Stages I and II. The geology in the area results primarily from sediment deposition during the last glacial period. Multiple glacial till units separated by stratified drift have been identified in the explorations completed at the site. The glacial till layers indicate at least two readvancements of the glacier over the area. The glacial till at the site generally consists of a non-stratified heterogeneous mixture of clay, silt, sand, and gravel. The stratified drift identified is comprised of layers of gravel, sand, silt, and clay which were sorted by mountain streams. The stratified drift at the NCES site is generally very dense, similar to the glacial till, indicative of consolidation as a result of overriding glacial ice.

In the Summer of 1995, SHA installed two monitoring well couplets designated MW-601U & L and MW-602U & L in the Stage II footprint downgradient of Phase I. In addition, a monitoring well, designated MW-603, was installed to the southeast of Stage II to provide water quality data which served as the basis for defining the southern limit of a groundwater management zone (GMZ). The GMZ was established identifying the limits of groundwater impacted from the unlined landfill that was present at the site and was excavated by NCES and placed in the double-lined Stage I landfill as part of development of Phase I of Stage II.

Generally, stratified drift forms the uppermost saturated unit. In many instances wells have been installed in pairs at the site with one well screened in the drift and the other at greater depth in the lower glacial till. Groundwater elevation data indicate groundwater flows generally to the north across the landfill in the lower till and to the north or northeast in the stratified drift. Based on the available data, the Stage III appears to be predominantly up or sidegradient of Stages I and II.

In the Spring of 1998, SHA updated the geologic cross-sections prepared by GZA GeoEnvironmental, Inc. (GZA) as part of their 1987 hydrogeologic report for the site to include the 600-series explorations completed by SHA in 1995. In addition, three groundwater elevation contour plans were developed using data from wells screened at the water table within the stratified drift and within the lower glacial. These cross-sections and contour plans depict much of the data providing the current understanding of site hydrogeology.

OBJECTIVE

The objective of SHA's services is to conduct subsurface explorations with well installations in the Stage III area to supplement existing hydrogeologic data at the site and to incorporate the new data into a hydrogeologic report for the NCES facility which discusses how soil and groundwater conditions in the Stage III area relate to overall site conditions. To meet this objective we propose the Scope of Services described below.

SCOPE OF SERVICES

TASK 1 Meeting with New Hampshire Department of Environmental Services

Prior to initiating field activities, SHA will meet with representatives of the New Hampshire Department of Environmental Services (NHDES) and NCES to review the Work Plan and discuss NHDES' comments with respect to the proposed Scope of Work. The purpose of this meeting is to confirm that the work proposed is consistent with NHDES' expectations for site characterization at the NCES site and to begin discussions with NHDES about the proposed development.

TASK 2 Subsurface Explorations

TASK 2.1 Drilling and Well Installation

SHA proposes to drill three observation well couplets in Stage III area, designated on Figure 1 as B-901 through B-903. Upper and lower wells (U and L designation) will be installed at each location. The couplets will allow for evaluation of groundwater flow directions in the stratified drift and lower till and the relative gradient between the two units. The monitoring wells will be installed using either hollow-stem auger or cased drilling techniques. Potable water for drilling the cased borings will be obtained from the hydrant on the municipal water line located to the north of the site. Split spoon samples will be obtained at 5-foot intervals from the ground surface to the groundwater surface. Samples will be obtained continuously below groundwater to the base of the deep boring which is proposed to be at a depth corresponding to about 20 feet into the lower glacial till identified at the site. The second boring will be drilled using hollow stem auger or cased drilling techniques to a depth equivalent about elevation 1,295 to 1,300 feet, about 10 to 15 feet below the water table.

We propose to construct the observation wells of 2-inch PVC well screen (0.01 inch slot) and riser pipe. (Note that it may be necessary to use 1.5-inch screen, if because of difficulties encountered during drilling, it is necessary to telescope to 3-inch steel casing). The wells will be constructed by placing filter sand between the well screen and borehole wall to about two feet above the top of the screened interval. A two to three foot bentonite seal will be placed above the sand and the remainder of the borehole will be filled with cement bentonite grout. It is anticipated that the well screen in the deep well will be installed about 10 to 20 feet below the surface of the lower till while the screen in the upper wells will be installed to intercept the upper ten feet of groundwater. A locking steel protective casing will be provided for each well. Drilling and well installation will be observed and logged by SHA. Following installation, the locations and elevations of the wells will be surveyed by a surveyor to be retained by NCES.

TASK 2.2 Hydraulic Conductivity Testing

SHA will perform the falling or constant head permeability (wick) testing at selective depths below groundwater during drilling. We anticipate that two tests will be performed in each deep boring. We propose to perform one test in the stratified drift and a second test in the glacial till. In addition to the wick testing, SHA proposes to perform slug tests in the completed wells. Results of these tests will be correlated with hydraulic conductivity estimated from grain size analyses and will be considered in conjunction with hydraulic conductivity data gathered during previous studies to evaluate hydraulic conductivity of the various soils at the site.

TASK 2.3 Comprehensive Groundwater Level Measurements

Following installation of the monitoring wells, SHA will obtain two rounds of water levels in the newly installed wells and the viable observation and monitoring wells at the site. Water levels will be compared with historic water level measurements, where historical data are available, and used to refine the groundwater elevation contour plans.

TASK 3 Laboratory Soil Testing

Soil samples obtained during drilling will be submitted to a soil laboratory for grain size analysis. Samples will be submitted from each wick test interval and from other selected depths to confirm field classifications of the various soils encountered and to evaluate hydraulic conductivity using published correlations of hydraulic conductivity with grain size distribution. We anticipate that 12 samples will be submitted for combined gradation and hydrometer analyses.

TASK 4 Evaluation and Report

SHA will compile the hydrogeologic data gathered from the explorations with the existing data. We will update the six figures depicting geologic cross-sections and three water level contour plans that were provided to NHDES in May 1998 to incorporate the new data. We will prepare a report that

describes the exploration field and laboratory testing programs and describes site hydrogeology. We will discuss hydraulic conductivity of the various soils based on the field testing and correlations with grain size and will develop an estimate of seepage velocities in the stratified drift and lower till based on hydraulic conductivity and observed gradients. SHA's report will include a discussion of groundwater table fluctuations and provide recommendations for landfill base grades in the Stage III footprint. We will also include recommendations for groundwater monitoring of Stage III.

RSS:lje/pmm

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STATE OF NEW HAMPSHIRE

INTER-DEPARTMENT COMMUNICATION

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~



DATE: November 13, 1998



TO(OFFICE): Permitting and Design Review Section

FROM: John Cotton, Hydrogeologist
through John Regan, Supervisor
Hazardous Waste Remediation Bureau

SUBJECT: BETHLEHEM - North Country Environmental Services; Proposed Work
Plan for Hydrogeologic Study for Proposed Stage III (DES #198704033)

TO: P&DRS File through Pamela H. Sprague, Supervisor
Permitting and Design Review Section

Richard S. Reed, Administrator
Solid Waste Management Bureau

I have reviewed the proposed scope of work, dated October 26, 1998, prepared for North Country Environmental Services by Sanborn, Head & Associates, Inc. The work plan can be approved as written. I suggest that when water level measurements are taken throughout the site (Task 2.3) measurements also be made in the 500 series wells at the transfer station.

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cc: PM File

Moved to PUBLIC FILE
PER NH DOJ / AMY MILLS
MM 12-28-01

TOWN: Bethlehem
PROJECT: NCES Landfill Proposed Stage III
LETTER/DATA/PERMIT/PA/OTHER: confidential

~~CONFIDENTIAL~~



Sanborn, Head & Associates

Consulting Engineers & Scientists



November 29, 1999
File No. 1647

*By phone
12/1/99 Requested SHA to add mercury.
JC*

Mr. John Cotton
NH Department of Environmental Services
Waste Management Division
PO Box 95
Concord, NH 03302-0095

Re: Background Water Quality Sampling
North Country Environmental Services, Inc.
Bethlehem, New Hampshire

Dear John:

In response to your recent request, North Country Environmental Services, Inc. (NCES) has retained SHA to obtain water samples for laboratory analysis to provide background water quality data for observation wells B-901U & L through B-904U & L installed as part of the Hydrogeologic Study for the proposed Stage III expansion. NCES understand that two rounds of sampling and analysis are required. Based on our discussions, we propose that the first round of water quality monitoring include all the parameters for which water quality monitoring is performed at the facility with the exception of acid/base/neutral extractable compounds. Accordingly, samples will be collected from the eight wells for analysis for the following:

- Chemical Oxygen Demand (COD)
- Nitrate
- Total kjeldahl nitrogen (TKN)
- Dissolved manganese
- Dissolved metals
- Chloride
- Bromide
- Dissolved iron
- Volatile Organic Compounds (VOCs),
by USEPA Method 8260(b)

Arsenic, antimony, barium,
beryllium, cadmium, chromium,
lead, nickel, silver and thallium

*Paul M. Sanborn ■ Charles L. Head ■ R. Scott Shillaber
Charles A. Crocetti ■ Mathew A. DiPilato ■ Daniel B. Carr ■ Duncan W. Wood*

Sanborn, Head & Associates, Inc.
6 Garvins Falls Road ■ Concord, New Hampshire 03301
Fax (603) 229-1919 ■ Phone (603) 229-1900

In addition, pH and specific conductance measurements will be made in the field. It is anticipated that the first round of water quality monitoring will be performed in December 1999. At this time, it is anticipated that the second round would be performed in April 2000.

We believe the proposed monitoring is consistent with your requirements. Should you have any comments or questions, please do not hesitate to call.

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



R. Scott Shillaber, P.E.
Principal

RSS:lje

cc: Larry Lackey, NCES
Len Wing, NCES
Dave Adams, NCES

Department of Environmental Services
Water Supply and Pollution Control Division
6 Hazen Drive, PO Box 95
Concord, New Hampshire 03302-0095

R.S.A. 485-A:17

SITE-SPECIFIC APPLICATION

Application Date October 20, 1999 File Number _____

Name of Project North Country Environmental Services, Inc. - Stage III Expansion

Location of Project (town) Bethlehem, New Hampshire

Tax Map and Lot Number Map 419 Lot 1

PLEASE COMPLETE THE FOLLOWING, ATTACH ADDITIONAL SHEETS AS NECESSARY,
ONE COPY MUST BE FILED.

1) Name of Owner North Country Environmental Services, Inc. Tele No. (603) 869-3366

Mailing Address Permitting and Compliance Office, 3 Pitkin Court

City Montpelier State VT Zip Code 05602

2) Engineer Sanborn, Head & Associates, Inc. Tele No. (603) 229-1900

Address 6 Garvins Falls Road

City Concord State NH Zip Code 03301

3) Project Effects or Requires (Provide Approval Numbers if Available):

Wetlands NA

Subsurface Wastewater Disposal NA

Public Sewers/Wastewater Discharge Permit NA

Water Supply NA

- 4) Describe the project briefly. Include information relative to filling and dredging locations and quantities, location with respect to surface waters, wetlands, total amount of area to be disturbed, amount of contiguous area to be disturbed.

The project involves the construction of a refuse disposal facility to the southeast of the existing Stages I and II of the NCES facility, development of a borrow area to the north of Stage II for landfill cover and construction material, and drainage improvements. The area of disturbance for the project occupies about 1,040,000 square feet. Please refer to plans and narrative for more detail.

- 5) Estimated Construction Schedule.

Start Date June 2000 following approval of Solid Waste Permit

Completion Date November 2000

Subsequent Phases Excavation of landfill cover and borrow material will be ongoing through the operating life of Stage III which is expected to be 4 or 5 years.

- 6) Have you made application to the Wetlands Board? Please provide date of application and file/approval number. Not applicable to this project.

Date 10/19/99

File/Approval # _____

Fairy & Family
Signature of Applicant (owner or agent)

_____ Date



State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

6 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095
(603) 271-2900 FAX (603) 271-2456



March 19, 1999



Mr. Larry B. Lackey, P.E.
North Country Environmental Services, Inc.
501 South Street, Box E, Suite 302
Bow New Hampshire 03304

**SUBJECT: BETHLEHEM - NORTH COUNTRY ENVIRONMENTAL SERVICES (NCES)
LANDFILL; PROPOSED WORK PLAN FOR HYDROGEOLOGIC STUDY
FOR PROPOSED STAGE III (DES #198704033)**

Dear Mr. Lackey:

The Department of Environmental Services (Department) has reviewed the text of the proposed scope of work, dated October 26, 1998, and the Exploration Location Plan received on March 4, 1999, both prepared for NCES by Sanborn Head & Associates, Inc. The Department approves the written work plan, but as discussed at the March 4 meeting, will require a fourth well couplet to be constructed midway between the proposed locations of B-902U&L and B-903U&L. These monitor wells should be designated sequentially as MW-901 through MW-904 beginning at the couplet at location B-901.

As discussed at the March 4 meeting, when water level measurements are taken throughout the site (Task 2.3), measurements should also be made in the remaining 500-series wells.

If you have any questions pertaining to this letter, please contact me at (603) 271-2925.

Sincerely,

John Cotton, Hydrogeologist
Waste Management Division

JEC/neo\l:\gwl\lib\conman\solwaste\87043326

cc: Richard Reed, SWMB
Pamela Sprague, P&DRS
John Regan, HWRB
R. Scott Shillaber, Sanborn, Head & Associates
Town of Bethlehem, Board of Selectmen
HWRB File

TOWN: BETHLEHEM
PROJECT: NCES Stage III
LETTER/DATA/PERMIT/FA/OTHER: _____