

STATE OF NEW HAMPSHIRE

INTER-DEPARTMENT COMMUNICATION

*M. Guilfoyle/PLB*



DATE: January 30, 2003



AT(OFFICE): Permitting and Design Review Section

FROM: *Je* John Cotton, Hydrogeologist  
through Karlee Kenison, Supervisor  
Groundwater Remediation Permitting

SUBJECT: **BETHLEHEM – North Country Environmental Services Facility, Trudeau Road, Hydrogeologic Study for Proposed Stage IV Expansion (DES #198704033)**

TO: *RS* Richard S. Reed, Administrator  
Solid Waste Management Bureau

Sanborn, Head & Associates, Inc. (SHA) prepared this hydrogeologic report for North Country Environmental Services (NCES). The report includes a brief review of all previous subsurface investigations and associated series of borings, piezometers and monitoring wells.

### Water Quality

The present investigation reports on the installation of four clusters of three wells each and one well couplet. These wells and two pre-existing wells north of proposed Stage IV were sampled and analyzed for VOCs and indicator parameters in September 2001. These parameters and 10 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, silver and thallium) were analyzed for a November 2002 sampling round of these wells and two surface water sites in the wetland north of proposed Stage IV. Analytical results for the second round were received on January 21, 2003. To date, water quality data would not preclude the construction of Stage IV.

### Soil Conditions North of Stage I

Three VOCs at low concentrations have been detected at B-402U since November 2000. Three additional VOCs have been detected at this well since November 2001. Storage and handling of leachate, infiltration from detention ponds and perhaps earlier breakouts on the lower slopes of Stage I prior to closure have been identified as the likely sources of these VOCs.

If Stage IV is permitted, NCES shall conduct an assessment of soil conditions north of Stage I and up gradient of B-402U, including all of the leachate holding/staging area and adjacent access road.

The design and execution of the survey would be similar to that conducted in 1993 for soils remaining following removal of all wastes from the former unlined landfill area. The survey shall include subsurface explorations to obtain soil samples for field screening and analytical testing to evaluate the presence and extent of any soil contamination that may exist.

Any soil containing residual VOC contamination would be removed and placed within the lined landfill. All affected soil would have to be removed prior to any Stage IV construction.

### **Assessment of Remediation Responses to Potential Liner Leak**

DES requests detail consideration of remedial responses to a potential leak in the bottom liner system resulting in a significant release of leachate and resulting contamination of groundwater. Because of lithologic differences beneath the liner systems, several locations of assumed leaks shall be chosen.

Responses shall include considerations of time sensitive parameters, such as groundwater travel times to the array of monitoring wells and potential receptors, and remediation response times. In turn, consideration of how long it would take before a leak would be detected at monitoring wells would aid in determining the appropriate frequency of water quality sampling.

Hydraulic containment shall be one remedial alternative that is assessed. To aid in conducting and reviewing the analyses, the grades of bottom liners for all stages should be added to or projected into appropriate cross sections so that hydraulic conductivities (or ranges of conductivities) of different earth materials determined and reported in the hydrogeologic reports may be appropriately chosen.

### **Additional Proposed Monitoring Wells**

In the report, two additional well clusters of three wells each are proposed, one cluster half way between B-918 and B-919 and one north of B-301. These additional wells would be necessary to adequately monitor Stage VI.

A well couplet would also be needed just north of proposed detention pond #4 to monitor water quality and hydraulic effects of infiltration from the pond.

### **Detention Ponds**

The bottom grades of the proposed detention ponds shall be added to the appropriate cross sections.

Provide clarification of the flow path for flowage from detention pond #4.

### **Sheet 3, Section A-A'**

Clarification of the rationale used to reach interpretations referred to below is needed.

1. In B-905 the top of upper till may be at about 2.5 feet higher (16 feet below land surface). Blow counts in the split spoon sample from 15 to 17 feet suggests that till may be reached at 16 feet (Appendix B.1.9).
2. B-915U could be interpreted as being screened (28–38 ft) in the upper till rather than in stratified drift. Grain-size analysis curve (Appendix E.2) for sample from 33–37 ft is typical of till. The water level value from this well is used appropriately in constructing the water table contours (Figure 7). However, that value is not used in constructing groundwater level contours in stratified drift (Figure 8).
3. B-916M could be interpreted as being screened at the bottom of the stratified-drift, just above the lower till. Grain-size analysis (Appendix E.2) of sample from depth of 81 to 86 feet shows very well sorted coarse and very coarse sand and fine gravel (95% of grains between 1.5 and 10 mm in diameter). Calculated hydraulic conductivities were 22 ft/d (wick test, 77–79 ft) and 27.4 ft/d (slug test, 84.5–89.5 ft).

### **Sheet 6, Section J-J'**

Clarification of the rationale used to reach interpretations referred to below is needed.

1. B-916M, see above
2. B-919D could be interpreted as being screened in lower till based on grain-size analysis. (See also Sheet 5)