RMT®
Integrated Environmental Solutions

100 Verdae Blvd. 29607-3825
P.O. Box 16778 29606-6778
Greenville, SC
Telephone: 864-281-0030
Fax: 864-281-0288

March 7, 2000

Ms. Cheryl Marks
NC DENR-Division of Waste Management
Solid Waste Section
Mail Service Center 1646
Raleigh, NC 27699-1646

Fac/Perm/Co ID #	Date	Doc ID#
94-01	10 106 LXXI	DIN 15304

Subject: Response to NC DENR's February 3, 2000, Comments to the Weyerhaeuser No. 3 Landfill Permit Application

Dear Ms. Marks:

I have attached RMT North Carolina, Inc.'s (RMT) and Weyerhaeuser Company's (Weyerhaeuser) response to the questions you posed in your February 3, 2000, letter to Wynne Shaw. In addition, I am transmitting six revised drawings that show the requested groundwater information and the engineering modifications we discussed in our January 10, 2000, meeting in Raleigh and a subsequent telephone conversation on February 28, 2000. The revised drawings are as follows:

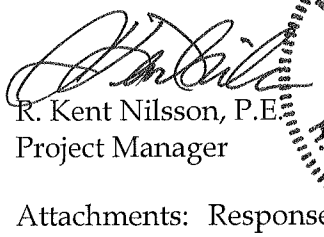
- Data Point Location (Drawing No. 510101-C02, Rev. D)
- Water Table Configuration (April 2, 1993) (Drawing No. 510101-C03, Rev. D)
- Modeled Water Table Configuration (Drawing No. 510101-C04, Rev. D)
- Water Table Configuration (December 21, 1999) (Drawing No. 510101-C19, Rev. C)
- Phase Progression Plan (Drawing No. 510101-C14, Rev. C)
- Landfill Details – Sheet (Drawing No. 510101-C18, Rev. C)

A revised Phase Progression Plan shows the subdivision of our original Phase 1 into Phases 1A and 1B. As we discussed in our meeting, because of compliance boundary issues, only Phase 1A will be constructed at this time. The Landfill Detail Sheet has been modified to show the 1-foot thick prepared subgrade layer that will underlay the geosynthetic clay layer. This layer will be moisture conditioned and compacted to achieve a maximum hydraulic conductivity of 2.44×10^{-4} cm/sec. This hydraulic conductivity was the geometric mean of several rate estimates for wells in the vicinity of Phase 1. This number was assumed in our groundwater modeling.

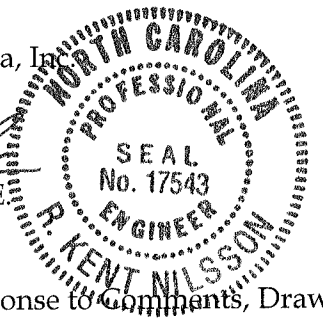
We hope this provides the information needed at this time. Please feel free to contact this office if we can provide further clarification.

Sincerely,

RMT North Carolina, Inc.

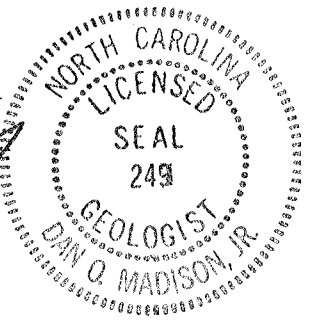


R. Kent Nilsson, P.E.
Project Manager



RMT, Inc.

Dan O. Madison, Jr., P.G.
Consulting Hydrogeologist



Attachments: Response to Comments, Drawings

cc: Bob Kimball, Tracy Coleman, Joe Kloeker, John Gray – Weyerhaeuser
Ed Timmons, Kathy Huibregtse - RMT
RMT Central Files – 00-05101.01

Response to NC DENR's February 3, 2000 Comments to the Weyerhaeuser No. 3 Landfill Permit Application

1. *Provide a table with a tabulation of water levels at time of boring, twenty-four hours, seven days, and monthly or quarterly reading for all monitoring wells and observation wells.*

   We do not have water level data collected at the frequency requested. Since installation, groundwater levels have been measured periodically from on-site monitoring and observation wells. That data is presented in the attached tables. Note that the tables refer to the monitoring wells as LF and observation wells as LFO. LF is the same as MW (monitoring well) and LFO is the same as OW (observation well) on the maps and text of the Permit Application. For example, LFO-1 is the same well as OW-1.

2. *Provide boring logs for the following; monitoring well 6A; observations wells; 8, 9, 10, 11, 12, 13, 14, and 15.*

   The boring log for monitoring well MW-6A and observation wells OW-8 through OW-15 are attached.

3. *None of the SB's are shown on Water Table Configuration drawings. Where are the locations of SB 1 through SB 9? Also where are the locations of B-201 and B-202?*

   The locations of borings SB-1 through SB-9 are now shown on revised Drawing 510101-C02. A copy of that drawing is enclosed. Regarding the locations for B-201 and B-202, please provide reference where these two borings are mentioned.

4. *What is the distance of MW-8 to OW-4?*

   Observation well OW-4 is 8 feet away from monitoring well MW-8.

5. *A drainage feature was restored on the eastern boundary of the site. Has there been any notable change in the groundwater table? Provide updated water level readings.*

   Several water level measurements have been recorded for monitoring well MW-1 since the drainage feature was restored in 1998. Well MW-1 is located near the southern end of the drainage feature. Overall, water levels in well MW-1 demonstrate a clear downward trend in groundwater elevations over time. Water levels in observation well OW-9 have exhibited seasonal fluctuations; however, an overall downward trend is evident since the drainage feature was restored.

6. *Provide a potentiometric (water table) map with recent water level readings. The potentiometric map submitted is dated June 1990.*

   A new water table map has been prepared using water levels measures on December 21, 1999. A copy of that map (Drawing No. 510101-C19) is enclosed.

7. *Stratigraphic intervals on the site have a variety of sedimentary structures. The sediment size and thickness of a stratigraphic unit affect the behavior of water through the pore space. This impacts groundwater velocity and flow direction. Water transport in a homogenous stratigraphic unit is generally uniform. Recompacted natural soils aid in providing uniformity in a heterogeneous environment. Twelve inches of recompacted soil is necessary to provide a buffer between the natural soils and the GCL.*

   Twelve inches of recompacted soil will be included in the liner design. The recompacted soil will have a maximum hydraulic conductivity of 2.44×10^{-4} cm/sec. This is hydraulic conductivity assumed in the groundwater modeling for the liner evaluation.

8. *It is not clear what is meant by the comment that the northeast is relatively high and complex relief. Please expand on the comment.*

   The statement regarding the relatively high relief refers to the topographic change in elevation (over 20 feet) over a short horizontal distance (100 to 200 feet). This is a high relief when compared to the rest of the site. The complex relief refers to the two drainage swales located on the east and west sides of the northeast end of the site. These swales along with associated ravines result in an irregular topographic surface.

9. *What time of year does the seasonal high water table occur?*

   Water level measurements are sporadic; however, the seasonal high water level appears to occur during the first quarter of each year. This is the late winter/early spring season.

10. *Monitoring well, MW-8 is a compliance well for existing landfill number 2 and cannot be abandoned at this time. Monitoring well abandonment requires approval from the Solid Waste Section.*

    Well MW-8 will not be abandoned at this time. However, Weyerhaeuser will abandon observation wells OW-5 and OW-6, which are located within the proposed footprint for the first Phase of the landfill. These wells are scheduled to be abandoned immediately following installation of the new monitoring wells in March 2000.

11. *Proposed monitoring wells are stated as shown on Drawing ... C02, however the proposed monitoring wells are missing from the drawing.*

The proposed monitoring wells are shown on revised Drawings 510101-C03, 510101- C04, and on the new water table map, 510101-C19. Two additional wells have been added at the north end of the first Phase (see response to comments 12 and 13). Proposed monitoring wells have been renumbered to allow for the new wells.

12. *Proposed monitoring well MW-10 is located downgradient of the sediment basin. Any potential release could be diluted by seepage from the sediment basin and mask a release. Two monitoring wells need to be appropriately fit downgradient in order to provide adequate detection monitoring.*

Monitoring well MW-10 will be moved to a location approximately 100 feet west-northwest of the northwest corner of the sediment basin. A second well, MW-11, will be installed approximately 50 feet east of the northeast corner of the sediment basin.

13. *There is potential for escaping leachate from the landfill to migrate downward toward the deep clay unit. Nested wells are necessary for detection monitoring where there is potential for downward migration of a release.*

The clay unit that separates the water table aquifer and the semi confined aquifer does not appear to be present at the north end of the landfill. (See hydrogeologic cross section AA' on Drawing 510101-C05). A boring will be located adjacent to proposed monitoring well MW-10 and will be advanced to a depth of 15 feet below the expected bottom elevation of the clay unit. If the clay unit is found, well MW-10A will be installed in the borehole. Well MW-10A will have a screen length of 5 feet, which will be placed below the confining clay unit. If the clay unit is not present, well MW-10A will not be installed.

14. *What is the minimum, maximum and average thickness of the clay unit?*

It is assumed that the comment refers to the clay separating the water table aquifer and the semi confined aquifer. Only three wells, MW-1A, OW-1, and MW-8 penetrate the entire clay unit; however, several wells and soil borings penetrate the upper portions of the clay. As illustrated on the hydrogeologic cross sections (Drawings 510101-C05 and 510101-C06), this clay unit appears to be present beneath most of the site. The clay was not found on the western edge of landfill number 2 and proposed landfill number 3 Phases 11 through 18 (in vicinity of wells MW-6A and MW-3 near Welch creek). Welch creek and its resulting alluvial deposits have truncated the unit. Likewise, the clay unit is not present at the north end of proposed landfill number 3 Phase I-A. The clay in this area appears to have been truncated by a drainage swale associated with a tributary stream to Welch creek. The thickness of the clay, according to boring logs for the three wells that penetrated it, is generally consistent ranging from 16.5 feet to 18 feet.

15. *Provide the formula used to calculate the hydraulic conductity.*

The hydraulic conductivity was determined using the Bouwer and Rice method for partially penetrating wells in an unconfined aquifer. This method incorporates the following formula:

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln(b/r_w)} + \frac{A + B \ln[(D-b)/r_w]^{-1}}{d/r_w} \right]$$

where A and B are dimensionless parameters, which are functions of d/r_w, where

r_w = horizontal distance from well centre to undisturbed aquifer
R_e = radial distance over which the difference in head, h_o, is dissipated in the flow system of the aquifer
d = length of the well screen or open section of the well
h_o = head in the well at time t_o, = 0
h_t = head in the well at time $t > t_o$
D = saturated thickness of aquifer
b = saturated portion of aquifer above bottom of well screen

For wells that fully penetrated the aquifer, the following method from Bouwer and Rice was used:

For fully penetrating wells

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln(b/r_w)} + \frac{C}{d/r_w} \right]^{-1}$$

where C is a dimensionless parameter, which is a function of d/r_w

16. *When sampling, the field collection sheet must also have pH recorded.*

The pH will be recorded on the field collection sheet.

17. *Where is sampling equipment decontaminated?*

Monitoring wells will be equipped with QED-brand Environmental low flow purge system dedicated bladder pumps and water level meters. The pumps and water level meters will remain in the wells. No equipment will require removal prior to measuring water levels and sampling. Any decontamination activities that do take place at the site will take place at the Truck Wash Pad located at the sludge dewatering building to be constructed adjacent to the landfill. If not yet constructed, a temporary decontamination pad constructed of plastic sheeting will be used. The temporary pad will be located in the same general area as the Truck Wash Pad.

18. *Tubing retained for a dedicated well must also be decontaminated prior to use in a sampling event.*

    The pumps and water level meters will remain in the wells. No equipment will require removal prior to measuring water levels and sampling. This equipment will be shipped to the site pre-cleaned. Therefore, decontamination of pump equipment at the site will not be necessary.

19. *What dedicated equipment would be hanging in the well requiring removal prior to measuring water levels?*

    The pumps and water level meters will remain in the wells. No equipment will require removal prior to measuring water levels and sampling.

20. *Inside the landfill footprint all wells must have risers removed prior to well abandonment. Documentation of the abandoned wells must be received prior to landfill construction.*

    Agree. The risers will be removed prior to well abandonment. This will be accomplished by overdrilling the wells using hollow stem augers and backfilling the resulting bore hole from the bottom up with a betonite/cement slurry grout.