6 Spatial and Temporal Behavior of Water Table

In general, groundwater from the site flows in an east-southeast direction toward Pine Creek. More specifically, groundwater flows east from the western boundary (railroad tracks) and then turns southeast towards the creek once on site. Groundwater flow entering the western boundary generally flows towards the creek. The groundwater flow north from the railroad tracks is most likely induced by a sharp drop in ground elevation to the contamination site. It could also be due in part to a sudden change in bedrock elevation or sharp contrast in soil properties (permeable heavy gravel from construction of the railroad tracks).

July 1999 water contours, directions, and gradients are shown in Figure 6.1. Table 6.1 shows the range of water levels and the range of hydraulic gradients for the July 1999 data as well as the all other contour plots found in Appendix C. Water levels are unusually high in July due to above average rainfall in both June and July of 1999 (9.62 and 4.82 inches respectively). Contours indicate groundwater flow in an east-southeast direction towards Pine Creek. A bowing effect in the water contours can be seen in Figure 6.1 through the central section of the poplar trees is noticed. This indicates a groundwater sink which is due to water use by the trees lowering the water table in this section and causing water to flow towards the trees from the surrounding area.

March 2000 water contours, directions, and gradients are shown in Figure 6.2. The bowing in the water level contours is not as noticeable in this data set because the trees have not yet begun to consume water in March. Figure 6.2 provides information regarding the range of water levels and range of hydraulic gradients during March 2000. The remaining water contour plots are found in Appendix C. Additional data is given for December 1997, August 1998, June 1999, August 1999, November 1999, and January 2000. Water contours plots in the summer into late fall (December 1997, August 1998, June 1999, August 1999, and November 1999) all show relatively low water levels and small hydraulic gradients at the eastern end of the site (Triangles 2 and 7). This is due to a combination of water consumption by the trees and activity of the interception trench “pumping” down the water table. The trees are the largest and most established at this end of the site which correlates to larger water use (Hinckley et. al., 1994) and explains why the effect is not as noticeable at the western end of the site. The phenomenon is still noticed into December in both 1997 and 1998 because recharge had not been sufficient yet

Figure 6.1: July 1999 water level data, contours, directions, and gradients for the Oneida, TN tie yard site

Jul-99 pm			
Triangle	H1<H2<H3	Angle (degrees)	Gradient (ft/ft)
1	P16, P15, P2	256.90	0.0169
2	P7, P4, P5	114.73	0.0404
3	P2, P18, P1	173.87	0.0161
4	P3, P17, P18	227.26	0.0361
5	P12, P4, P3	206.79	0.0501
6	P4, P3, P15	137.41	0.0514
7	P10, P7, P12	186.67	0.0438

*Angles Measured CCW from Horizontal

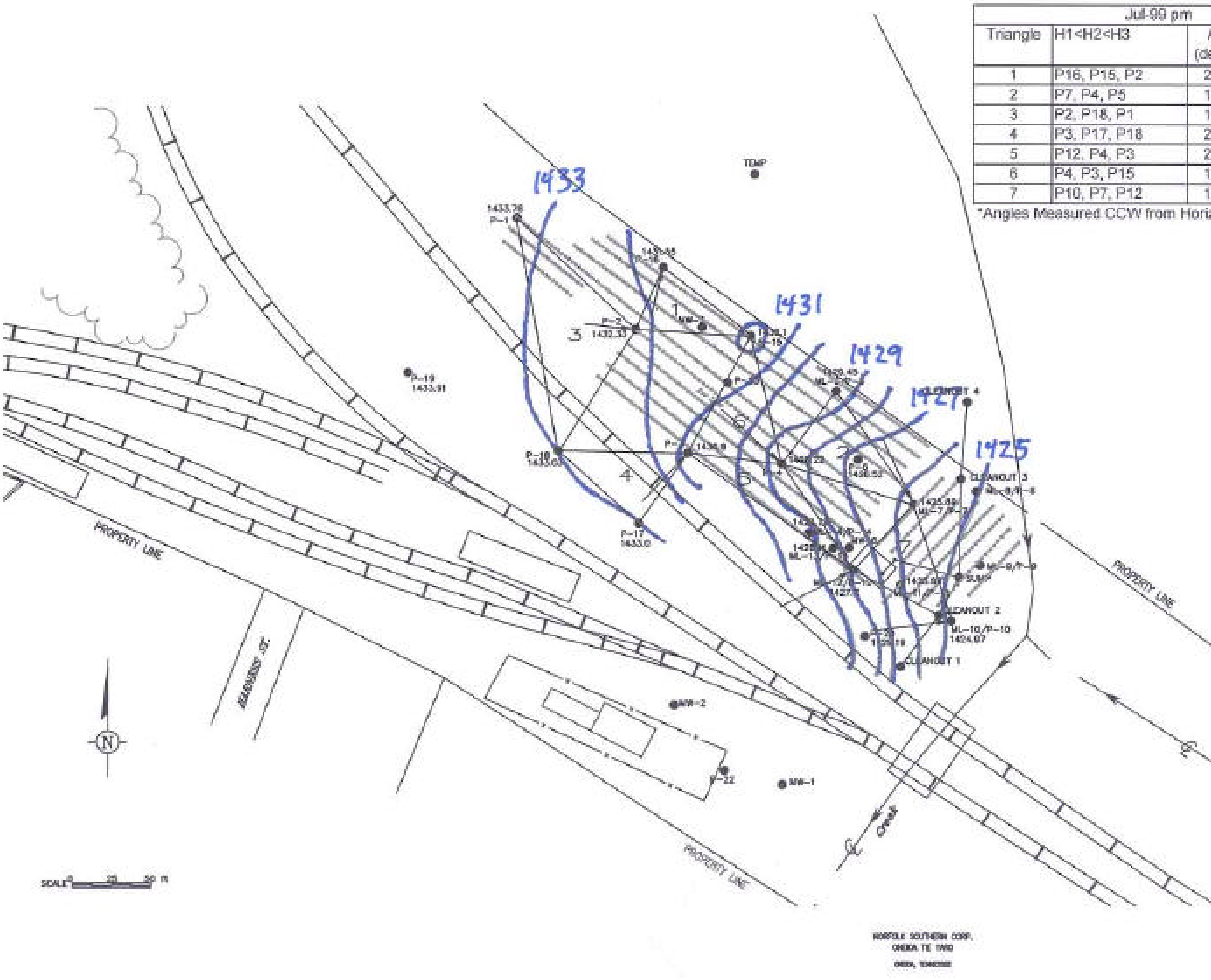

Figure 6.2: March 2000 water level data, contours, directions, and gradients for the Oneida, TN tie yard site

Mar-00			
Triangle	H1<H2<H3	Angle (degrees)	Gradient (ft/ft)
1	P16, P2, P15	268.58	0.0201
2	P7, P5, P4	165.94	0.0183
3	P2, P18, P1	171.94	0.0187
4	P3, P17, P18	226.54	0.0339
5	P12, P4, P3	173.95	0.0380
6	P4, P3, P15	134.85	0.0484
7	P10, P7, P12	146.43	0.0169

*Angles Measured CCW from Horizontal

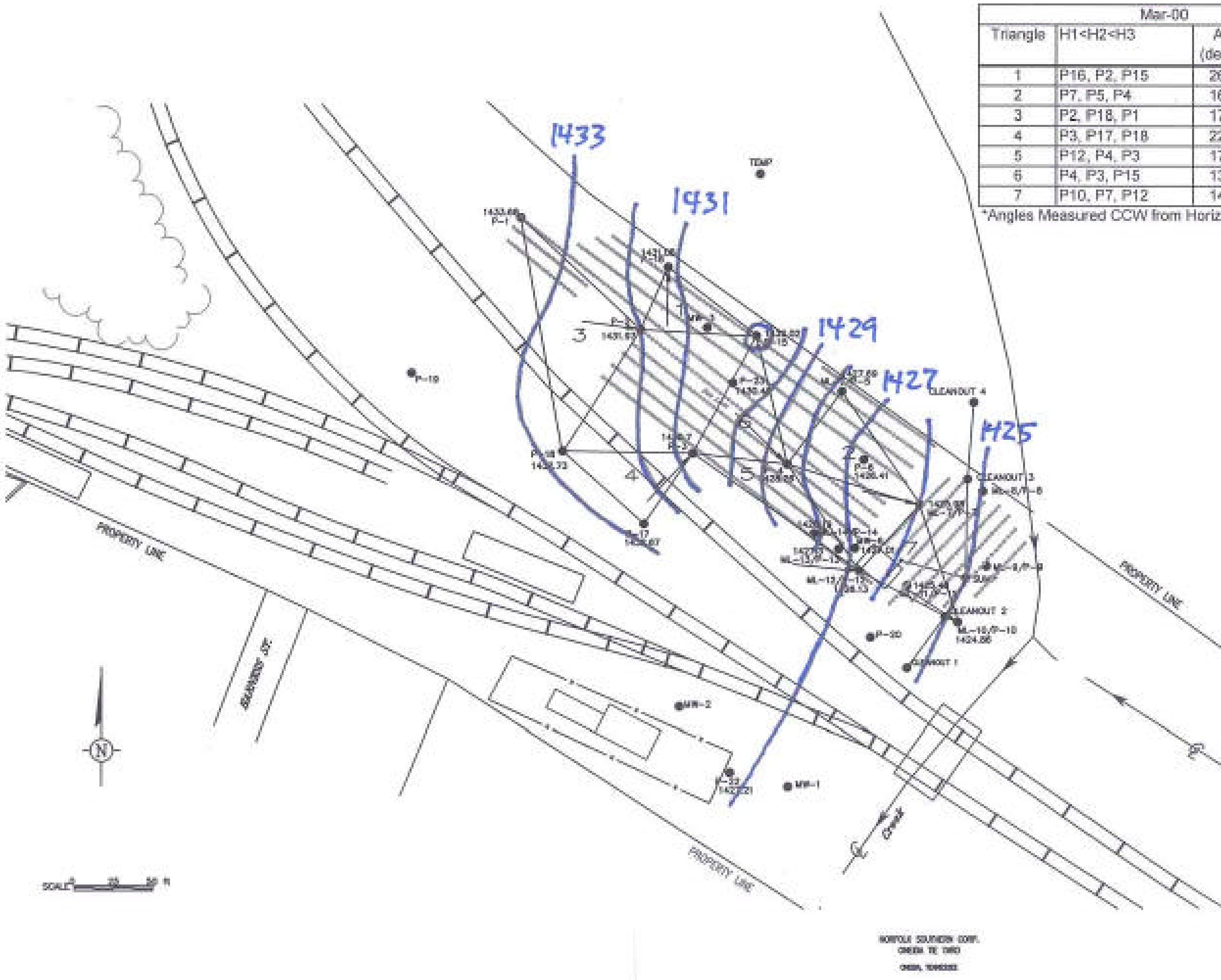

Table 6.1 – Extreme water elevations and gradients for water contour plots (Figure 6.1 and 6.2 as well as plots contained in Appendix C). See plots for location of Triangles.

Dates	Min/Max Water Contours (ft)	Max Hydraulic Gradient (ft/ft)	Min Hydraulic Gradient (ft/ft)
Dec-97	1426/1433	0.113 – Triangle 5	0.004 – Triangle 3
Aug-98	1425/1433	0.061 – Triangle 4	0.008 – Triangle 3
Jun-99	1425/1433	0.064 – Triangle 4	0.002 – Triangle 3
Jul-99	1425/1434	0.051 – Triangle 6	0.016 – Triangle 3
Aug-99	1425/1431	0.054 – Triangle 4	0.009 – Triangle 2
Nov-99	1425/1431	0.051 – Triangle 8	0.005 – Triangle 7
Jan-00	1425/1433	0.147 – Triangle 8	0.018 – Triangle 3
Mar-00	1425/1434	0.048 – Triangle 6	0.018 – Triangle 2

to raise the water table as shown in Figure 4.3. Water table recovery is illustrated by the January 2000 water contour plot. It has noticeably tighter water contours in this area than the December 1998.

The bowing of the water contours can be noticeable during the non-growing months, but to a lesser extent. Because the poplar trees do not have leaves during this period, they do not consume water. The lowering of the groundwater table on-site during the non-growing months is due to the activity of the interception trench and natural groundwater outflow.

In general, the water contours (see Table 6.1) are highest in the winter and spring months and lowest in the summer and fall months. The maximum hydraulic gradient usually occurs in the middle of the site whereas the minimum hydraulic gradient occurs at either the east or west end of the site.