

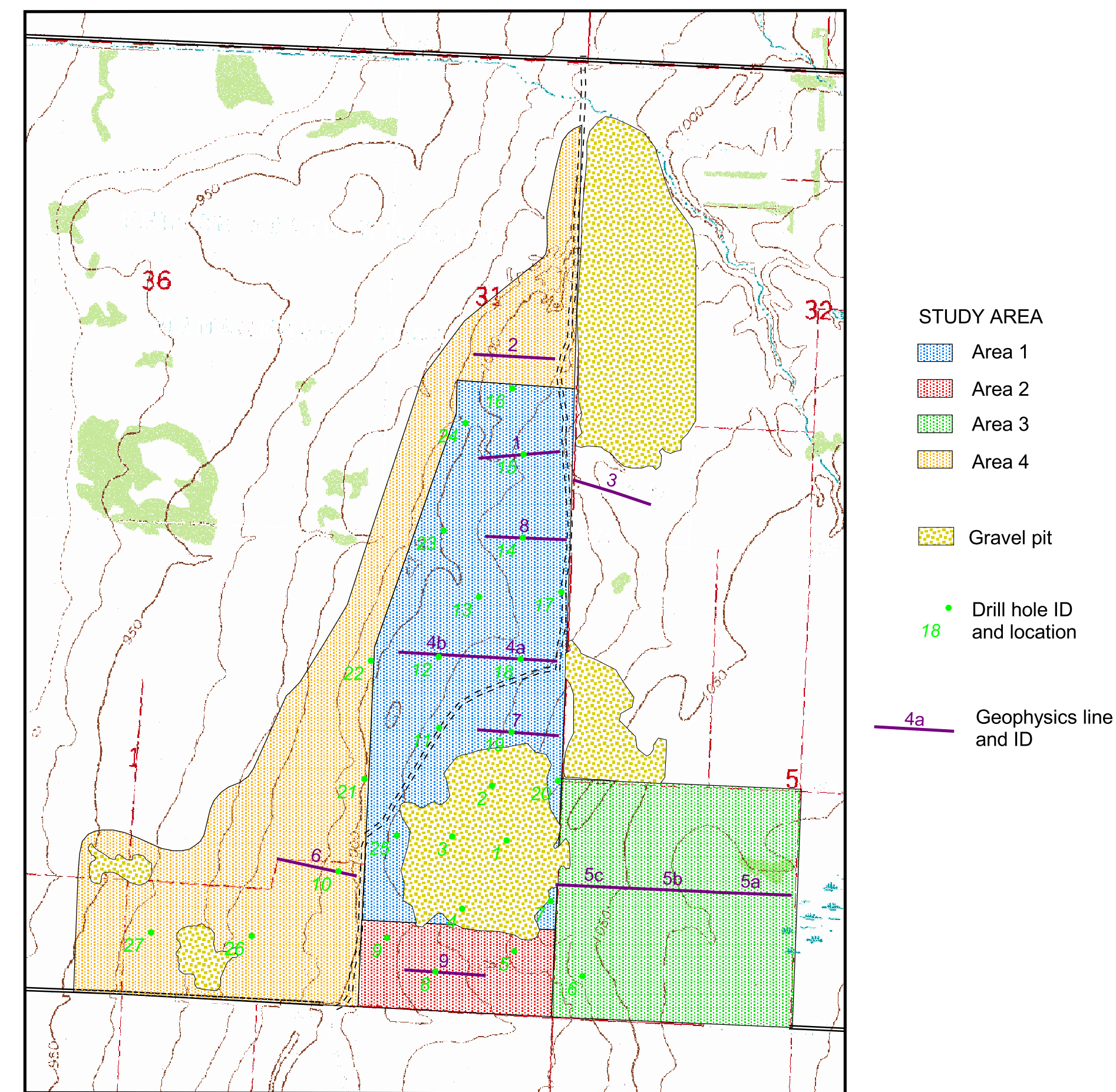
AGGREGATE RESOURCE EVALUATION FOR A PORTION OF FELTON PRAIRIE CLAY COUNTY, MINNESOTA

RESULTS OF ROTOSONIC DRILLING AND GEOPHYSICS

2000

This plate is the first of a two plate series. It features data obtained from a rotonsonic drilling program completed on approximately 735 acres of Felton Prairie in January 2000. Twenty-seven holes were drilled for a total of 2,059 linear feet of core. Drill core was collected from the drill holes, described, and then sampled for quality analysis. This plate includes graphic displays of the gravel thickness and its relation to the water table and overburden, as well as tabular summaries of drill hole information and quality test results. Cross sections from a geophysical study conducted in May 1999 are also shown. The geophysical cross sections were used to determine the placement of the drill holes.

LOCATIONS OF DRILL HOLES AND GEOPHYSICAL LINES



STUDY AREA

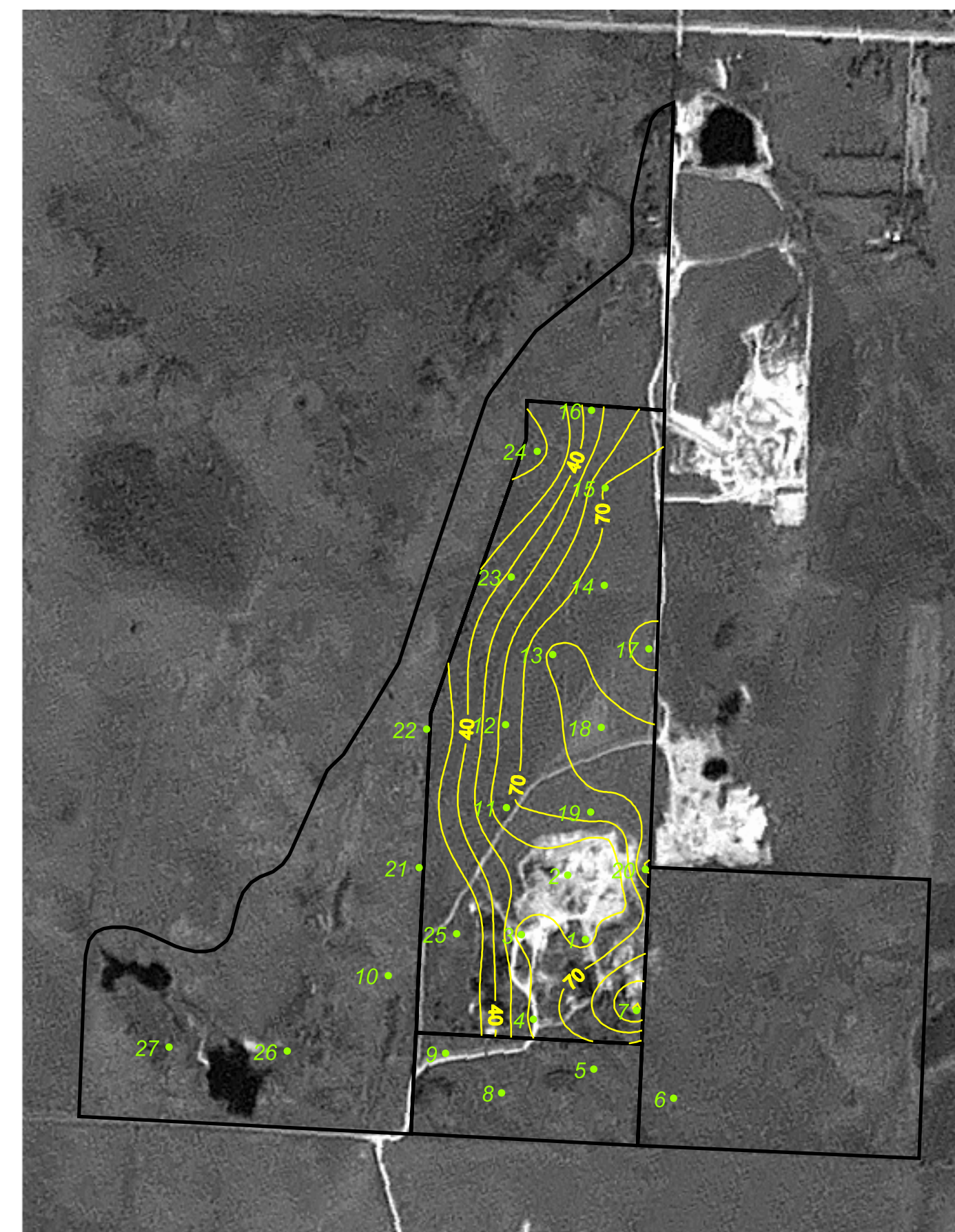
Area 1
Area 2
Area 3
Area 4

Gravel pit

Drill hole ID and location

Geophysics line and ID

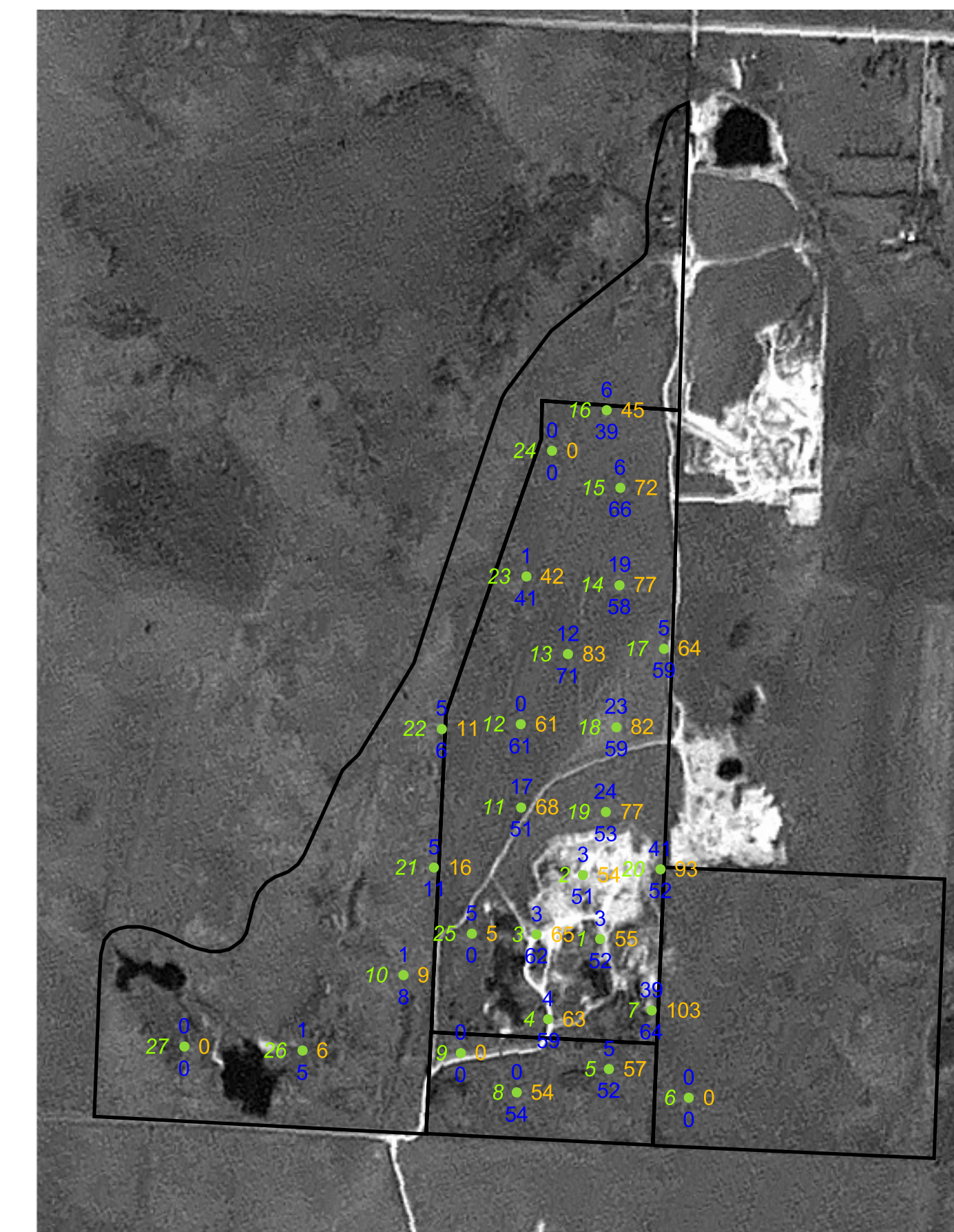
DEPOSIT THICKNESS



18 • Rotonsonic drill hole - ID and location
Deposit thickness (10 foot contours)

The deposit is thick in the east and thins to the west. The deposit includes sand with gravel, sand and gravel, and cobby sand and gravel. There may be minor lenses of non-gravel sediment included within the deposit interval. The deposit thickness was determined by measuring the top and bottom of the deposit. The thickest interval of the deposit (about 100 feet) was found in holes 7 and 20. The average thickness is approximately 60 feet. The contour lines of the deposit thickness are approximate, based on drill hole information and can be used for the purpose of visualizing deposit trends.

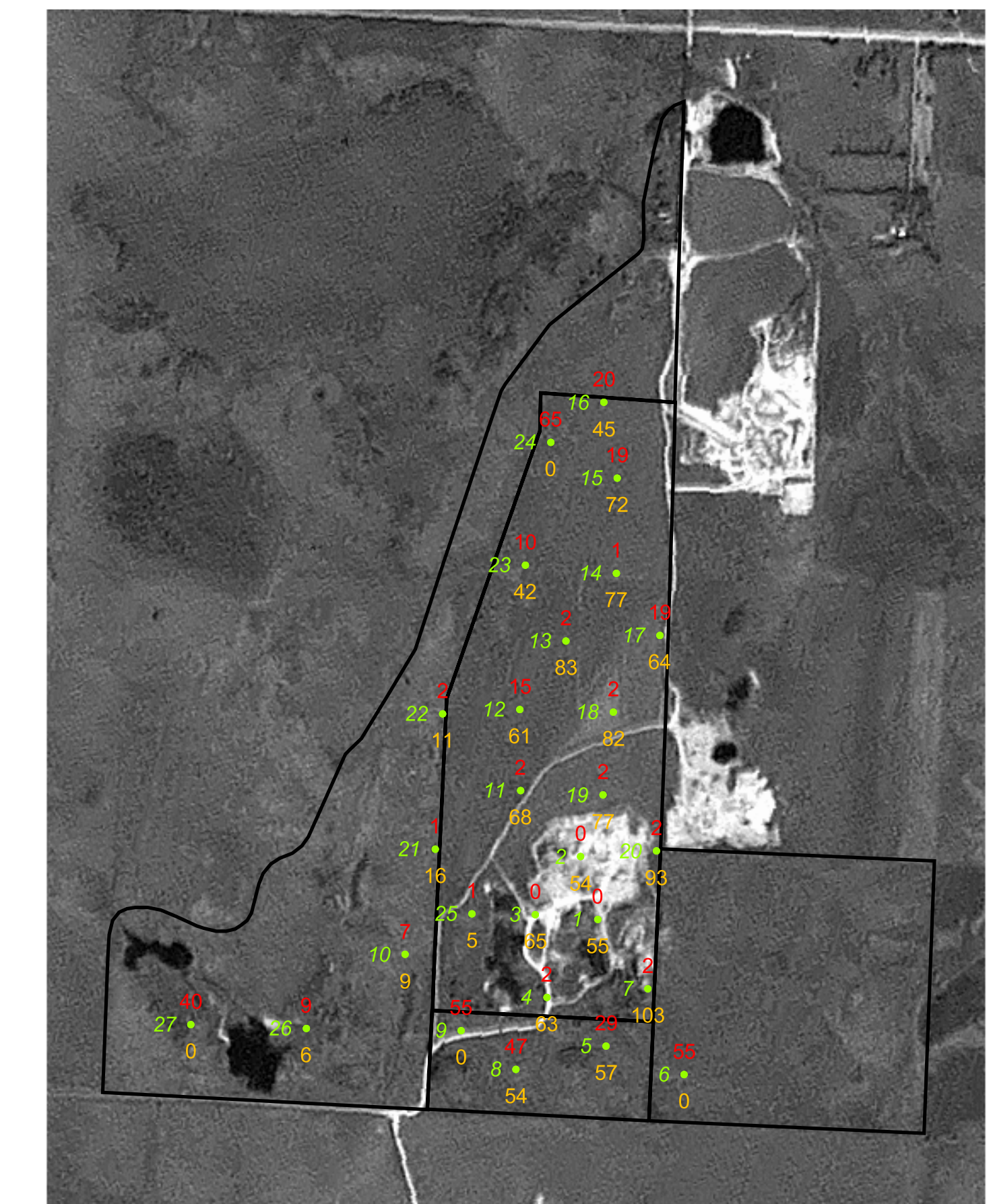
DEPOSIT THICKNESS IN RELATION TO THE WATER TABLE



Deposit thickness (in feet) above water table
Drill hole ID and location
Deposit thickness (in feet)
Deposit thickness (in feet) below water table

Depth to water table was observed in the field and described while sampling the core. Due to the use of water during drilling, water table elevations are approximate. This approximation was used to determine the amount of gravel above and below the water table. Due to the fluctuation of the water table over time, the amount of sand and gravel found above and below the water table would fluctuate accordingly.

OVERBURDEN IN RELATION TO DEPOSIT THICKNESS



2 • Overburden thickness (in feet)
Drill hole ID and location
82 • Deposit thickness (in feet)

Thick overburden is found in the northern and southern portions of the study area. Overburden is defined as material with a gravel content less than 15 percent. The type of overburden sediment includes sand with little gravel, fine sand, silt, and clay. Overburden thickness is one factor that may limit mining potential.

RESULTS OF ROTOSONIC DRILLING, BY DRILL HOLE

Drill hole ID	Overburden thickness (in feet)	Gravel interval from this depth (in feet)	Gravel interval to this depth (in feet)	Gravel thickness (in feet)	Gravel above water table (in feet)	Gravel below water table (in feet)
1	0	0	55	55	3	52
3	0	0	54	54	3	51
4	2	2	65	63	4	59
5	29	29	57	86	57	52
6	55+	0	0	0	0	0
7	2	2	105	103	39	64
8	47	47	54	101	0	54
9	55+	0	0	0	0	0
10	7	7	16	9	1	8
11	2	2	70	68	17	51
12	15	15	76	61	0	61
13	2	2	85	83	12	71
14	1	1	77	77	19	58
15	19	19	91	72	6	66
16	20	20	65	45	6	39
17	19	19	83	64	5	59
18	2	2	84	82	23	59
19	2	2	79	77	24	53
20	2	2	95	93	41	52
21	1	1	17	16	5	11
22	2	2	13	11	5	6
23	10	10	52	42	1	41
24	65+	0	0	0	NA	0
25	1	1	6	5	5	0
26	9	9	15	9	1	5
27	40+	0	0	0	0	0

This table summarizes the results of rotonsonic drilling for each hole. The location of each drill hole is shown on the map above.

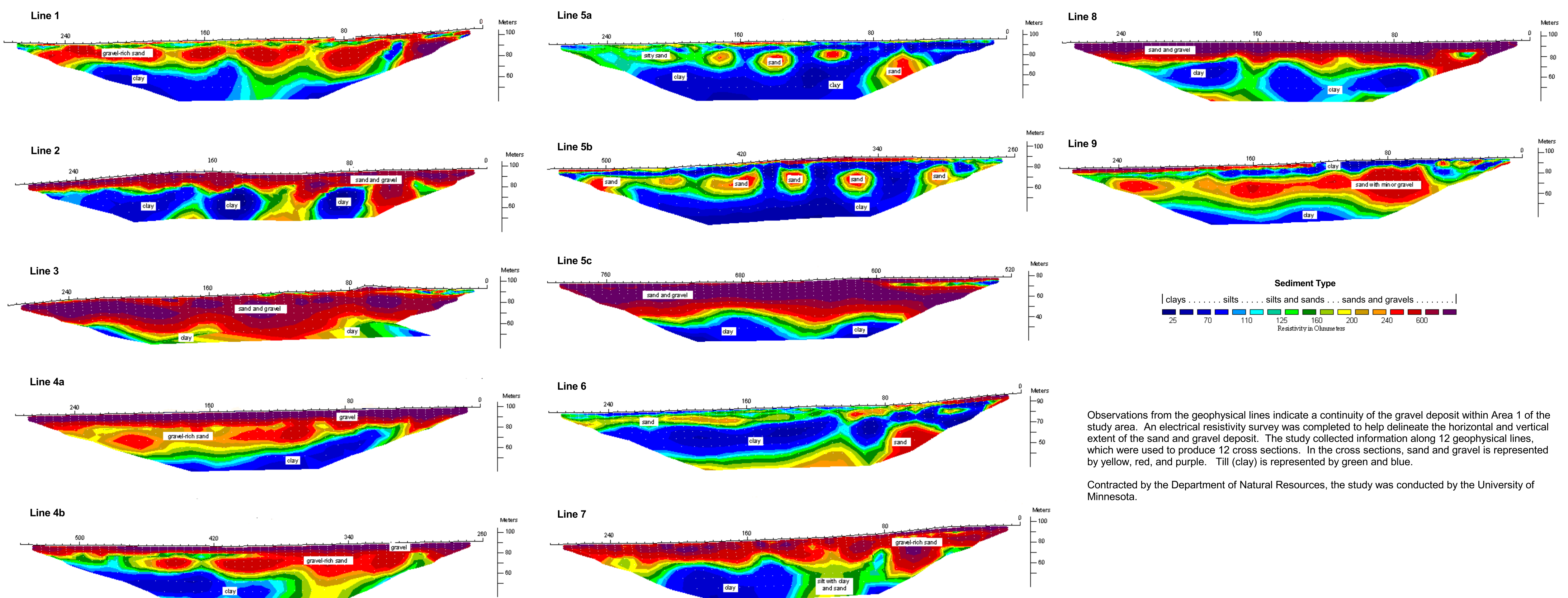
AGGREGATE QUALITY TEST RESULTS FOR COMPOSITED SAMPLES*

QUALITY TESTS	COMPOSITE SAMPLES BY REGION							MNDOT SPECIFICATIONS	
	Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6	Comp 7	Concrete	Structures
% Shale in Sand	0.2	0.3	0.3	0.2	0.8	0.3	0.7	< 0.4	< 0.2
% Total Shale +4	0.0	0.0	0.1	0.1	0.0	0.0	0.0	< 0.7	< 0.3
% Other Rock	99.9	100	99.9	99.9	100	100	100		
% Total Spall +4	0.1	0.0	0.1	0.1	0.0	0.0	0.0	< 1.0	< 0.3
% Spall, S/rock and Chalk	0.1	0.0	0.1	0.1	0.0	0.0	0.0	< 3.5	< 3.0
% Absorption +4	0.74	0.69	0.97	0.87	0.68	0.89	0.84		
% Absorption -4	1.25	1.04	0.8	1.11	1.09	0.78	1.06		
Bulk Specific Gravity -4	2.82	2.82	2.82	2.82	2.84	2.84	2.83		
Bulk Specific Gravity +4	2.7	2.71	2.67	2.69	2.73	2.68	2.7		
% Loss (LAR)	19.7		20.0	19.6				< 40 %	

*Composited samples listed by the portion of the drill core and the drill hole number.
Comp 1: Upper portion of drill holes 1, 2, 3, 4, 5, 7, and 8
Comp 2: Lower portion of drill holes 1, 2, 3, 4, 5, 7, 8
Comp 3: Upper and lower portions of drill holes 9, 10, 21, 22, 25, 26
Comp 4: Upper portion of drill holes 11, 12, 13, 17, 18, 19, 20
Comp 5: Lower portion of drill holes 11, 12, 13, 17, 18, 19, 20
Comp 6: Upper portion of drill holes 14, 15, 16, 23, 24
Comp 7: Lower portion of drill holes 14, 15, 16

A total of 7 samples were composited to represent areas of the deposit. A series of quality tests were conducted on the composited samples, with the results presented above.

GEOPHYSICAL CROSS SECTIONS



Observations from the geophysical lines indicate a continuity of the gravel deposit within Area 1 of the study area. An electrical resistivity survey was completed to help delineate the horizontal and vertical extent of the sand and gravel deposit. The study collected information along 12 geophysical lines, which were used to produce 12 cross sections. In the cross sections, sand and gravel is represented by yellow, red, and purple. Till (clay) is represented by green and blue.

Contracted by the Department of Natural Resources, the study was conducted by the University of Minnesota.