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SDMS 133847

EAST STREET - AREA II
MONITORING REPORT
SPRING 1989

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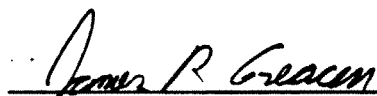
GENERAL ELECTRIC COMPANY
100 WOODLAWN AVENUE
PITTSFIELD, MASSACHUSETTS 01201

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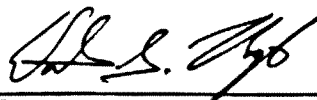
GROUNDWATER TECHNOLOGY, INC.
1641 RIVERDALE STREET
WEST SPRINGFIELD, MASSACHUSETTS 01089

JUNE 1989

Prepared By:



James R. Greacen
Geologist
Project Manager



Wilson S. Clayton
Hydrogeologist
Territory Manager

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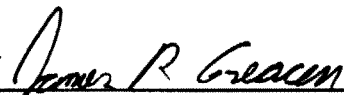
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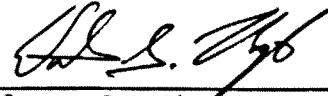
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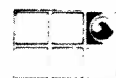
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INTRODUCTION

Groundwater Technology, Inc. was contracted by General Electric (GE) to conduct semi-annual environmental monitoring in East Street Area II of GE's Pittsfield, Massachusetts facility. The semi-annual monitoring program involves field measurement of water table elevations and oil thicknesses if present, in groundwater monitoring wells. The program also includes an assessment of oil recovery results. This report presents data collected during April 13, 14, 20, and 21, 1989 and provides interpretation and comparison to data collected in April 1988.



METHODS

On April 13 and 14, 1989, Groundwater Technology personnel removed separate-phase oil from Area II monitoring wells. Previous monitoring data were used to determine which monitoring wells contained oil. Oil in these wells was removed to allow water levels and oil thicknesses to be measured the following week, after oil recharged into the well. This provided water table elevation and oil thickness measurements in the wells which were representative of aquifer conditions. Specific gravity of the oil was measured in various wells throughout the area to allow accurate evaluation of loading effects on the water table surface. Oil in monitoring wells containing significant amounts of oil in previous seasons was removed with PVC bailers. Monitoring wells which contained small or trace amounts of oil in previous seasons were bailed with clear acrylic bailers in order to evaluate the presence of oil in these locations.

Equipment used during field activities was decontaminated between wells to avoid cross-contamination. Oil was removed from field equipment with acetone, followed by a deionized water/alconox wash, a deionized water rinse, and a methanol rinse, then allowed to dry. Oil removed from monitoring wells and field equipment was taken to the Thermal Oxidizer Building on-site for disposal.

On April 20 and 21, 1989 all monitoring wells in the East Street Area II monitoring program were gauged using an ORS Environmental Equipment Interface Probe which measures depth to water and oil thickness. Existing monitoring well survey data were used by Groundwater Technology to calculate relative water table elevations in each well based on well gauging data. A specific gravity of 0.89 was determined to represent the

density of oil in Area II, allowing for correction of water table elevations to represent the water table surface as a piezometric surface. Well gauging data are included on well monitoring forms in Appendix A. A groundwater contour map and hydrocarbon plume map are presented in Appendix B.

Several wells in the Area II monitoring program were found to have been paved over or destroyed. Monitoring Well 1 north of the railroad tracks and Monitoring Well N in the Tank Farm Area, were destroyed. The top-of-casing of Well S in the Tank Farm Area was submerged in surface water during field activities and was not gauged. All wells in the Area II monitoring program south of East Street were gauged.

RESULTS

GROUNDWATER FLOW

The water table is between one and thirty-five feet below grade in East Street Area II. The water table elevation is highest north of the railroad tracks at the northeastern boundary of Area II and decreases approaching the Housatonic River, the southern boundary of the site. In much of the Tank Farm Area, the water table is relatively flat with higher elevations to the north and northeast across the railroad tracks. The highest water table elevation recorded was 1005.05 feet above mean sea level in Monitoring Well 2 north of the railroad tracks. The lowest elevation, 964.06 feet, was recorded in Recovery Well 64-V, where the water table is artificially depressed for petroleum recovery. Groundwater is also withdrawn from two other recovery facilities, Caisson 64-S and Caisson 64-X(s). Groundwater from these recovery facilities is discharged on-site to the Recharge Pond.

The hydraulic gradient is greatest in the eastern portion of the Tank Farm Area, with groundwater flow toward the southwest. In the western portion of the Tank Farm Area hydraulic gradient is less, with a high gradient north of the railroad tracks. Much of the groundwater flow pattern south of East Street is controlled by groundwater pumping and recharge associated with petroleum recovery. The average hydraulic gradient between East Street and the Housatonic River is approximately 0.008.

North of East Street, April 1989 water table elevations and hydraulic gradient are similar to those measured in April 1988. South of East Street, artificial control of groundwater flow has improved since April 1988. Water table depression at

recovery facilities 64-S and 64-V in conjunction with groundwater mounding at the Recharge Pond located between these two facilities, has effectively controlled groundwater flow, diverting oil toward the recovery facilities.

ASSESSMENT OF WELL SCREEN ELEVATIONS

The elevation of the water table was compared to the screened interval of each monitoring well. Of the monitoring wells in the Spring 1989 Area II Monitoring Program, the water table or oil-air interface was above the well screen in seven wells. Monitoring Well 4, north of the railroad tracks, was not screened at the water table on April 20 and 21, 1989. Because this well is upgradient of the oil plume and has not indicated the presence of oil during the past three years, this well may not be considered critical to the monitoring program, and was not used in preparing the water table contour map. In the Tank Farm Area two wells were screened below the water table. Monitoring Well QQ is located in the center of the oil plume and is not critical to plume definition. Monitoring Well VV-R is located beyond the western boundary of the oil plume, and is also not critical to oil plume definition.

South of East Street, four wells (6, 16, 17, and 22) were not screened across the water table on April 20 and 21, 1989. Monitoring Well 22, in the center of the plume, in part defined the western portion of the plume where thicknesses were greater than 0.8 feet. Monitoring Well 6, north of Caisson 64-S, was not crucial in defining the plume due to its location adjacent to Monitoring Well 5. It was useful, however, in providing data for water table elevation. Monitoring Wells 16 and 17 were important in defining the smaller oil plume north of the Reclamation Center.

While some of these wells are not critical to oil plume definition, none may be used to confirm the absence of petroleum in each location. This is due to the inability of the oil to enter the wells at the water table surface at the prevailing groundwater conditions.

OIL PLUME

The Area II separate-phase oil plume extended from north of the railroad tracks in the northern section of East Street Area II to Recovery Facility 64-X, 1,300 feet to the south. At its maximum width, beneath East Street, the plume extended approximately 1,200 feet from east to west. The oil plume covered an area of approximately 675,000 square feet.

Separate-phase petroleum thicknesses greater than 0.8 feet were recorded in all three sections of Area II, North of the Railroad Tracks, the Tank Farm Area, and South of East Street. Of the wells in the East Street Area II monitoring program, one well north of the railroad tracks, four wells in the Tank Farm Area, and eleven wells south of East Street contained more than 0.8 feet of separate-phase oil.

A second, much smaller plume, was located in the western section of Area II. This plume, defined by four monitoring wells, had a minimum length of approximately 300 feet and a maximum thickness of 0.52 feet. Two other plumes of separate-phase oil were each defined by one monitoring well. Monitoring Well 14, north of the railroad tracks, contained 0.55 feet of oil and Monitoring Well 50, located north of the Thermal Oxidation Building, contained 0.01 feet of oil.

North of the Railroad Tracks

The areal extent of separate-phase oil north of the railroad tracks remained largely unchanged from April 1988 to April 1989. With the exception of Monitoring Well 11, wells containing petroleum in April 1988 also contained petroleum in April 1989. Monitoring Well 11 contained 0.36 feet of oil in April 1989, similar to thicknesses recorded in October 1986 and October 1987. Monitoring Well 19, with 0.03 feet of oil, contained significantly less oil than the 0.50 feet recorded in April 1988, however, this thickness is similar to the thickness measured in September 1988, 0.02 feet. Oil thicknesses in Monitoring Well 23 north of the railroad tracks have been highly variable over time, increasing from 0.06 feet in April 1988 to over 0.8 feet in April 1989.

Tank Farm Area

Twenty monitoring wells in the Tank Farm Area, between East Street and the railroad tracks, contained separate-phase oil during April, 1989. The greatest oil thicknesses occurred in three wells adjacent to East Street. Two of the wells, QQ and PP containing greater than 0.8 feet of oil, are located in the center of the Area II plume. Monitoring Well L, containing greater than 0.8 feet of oil, is located near the western boundary of the plume.

Two wells that did not contain separate-phase oil in April 1988, Monitoring Well V and Monitoring Well FF, were found to contain oil in April 1989. Monitoring Well V contained petroleum as recently as September 1988. Monitoring Well FF located near the eastern boundary of the plume in the Tank Farm Area, contained 0.14 of oil during the April 1989 monitoring program. Oil has not been detected in this monitoring well

since October 1986, when a trace (<0.01 feet) was detected. The reappearance of oil in this well indicates plume migration back into this area.

South of East Street

The greatest thickness of oil south of East Street during April, 1989 extended from East Street to Recovery Facility 64-V. This is the central portion of the Area II plume and is continuous with the plume along East Street in the Tank Farm Area. Monitoring wells in the area adjacent to Caisson 64-S defined the western portion of the main plume and contained between 0.00 and greater than 0.8 feet of oil.

The Area II plume extended approximately 1,200 feet from east to west at its maximum width. Downgradient, the width of the plume was approximately 400 feet at the Recharge Pond and Recovery Facility 64-V. The areal extent of the plume has not changed significantly since April 1988. Only two wells containing oil in April 1988 did not contain oil in April 1989. Oil in these wells, Monitoring Wells 30 and P-5, migrated due to mounding associated with groundwater discharge into the Recharge Pond.

OIL RECOVERY

Oil recovery for the period October 1988 through March 1989 took place in four recovery facilities, 64-S, 64-R, 64-X, and 64-V. A total of 27,618 gallons of oil were recovered during this six month period. This represents an 8.7% increase from the same six months the previous year.

As agreed to by DEQE, Caisson 64-R was taken out of service in November 1988 due to decreased recovery rates caused by water table elevation changes associated with groundwater discharge to the Recharge Pond. Oil not captured by Caisson 64-R is expected to migrate into 64-V. Recovery rates in Caisson 64-R decreased significantly once Facility 64-V was put into operation in April 1988. The depression pump from Caisson 64-R was moved to Caisson 64-X.

Recovery rates at Caisson 64-S and 64-X were slightly less than rates measured during the spring monitoring period of the previous year. 64-X reduction is explainable by the slurry wall cutting off the source of oil upgradient (see page 11). Approximately 20% of the total oil recovered from October 1988 through March 1989 took place in these two facilities. The remaining 80% took place in Facility 64-V. Table I summarizes oil recovery in Area II during the six month monitoring periods of October 1988 through March 1989 and October 1987 through March 1988.

TABLE 1

Six Month Recovery Totals
 October 1987 - March 1988
 and
 October 1988 - March 1989

	<u>64-X</u>	<u>64-R</u>	<u>64-S</u>	<u>64-V</u>	<u>Total</u>
October 1988	150	100	1,503	5,079	6,832
November 1988	138	100	900	3,720	4,858
December 1988	50	0	229	2,824	3,103
January 1989	75	0	400	2,675	3,150
February 1989	100	0	750	3,975	4,825
March 1989	<u>200</u>	<u>0</u>	<u>675</u>	<u>4,175</u>	<u>5,050</u>
Six Month Total	713	200	4,457	22,448	27,618
October 1987	270	2,125	1,700	0	4,095
November 1987	375	6,000	900	0	7,275
December 1987	195	3,500	1,400	0	5,095
January 1988	0	3,500	500	0	4,000
February 1988	579	1,572	0	0	2,151
March 1988	<u>300</u>	<u>1,400</u>	<u>1,100</u>	<u>0</u>	<u>2,800</u>
Six Month Total	1,719	18,097	5,600	0	25,416

Caisson 64-X

Facility 64-X was in operation 162 days during the six month period from November 1988 through March 1989. System downtime was 10.5% for the period. Downtime was a result of equipment failure and lack of an available oil storage tanker. On February 2, 1989, a Water Table Depression Pump (WTDP) was installed in Caisson 64-X(s) to control migration and improve recovery of oil in the 64-X area. Groundwater withdrawn from Caisson 64-X(s) was discharged into the Recharge Pond. Oil recovery rates in the months following the installation of the WTDP improved slightly over rates from the preceding two months.

Total oil recovery at 64-X for the six month period was 713 gallons. This total is approximately 1,000 gallons less than the total from the six month period of the previous year. This reduction in recovery was likely due to the installation of the slurry wall approximately 100 feet upgradient, inhibiting migration of oil to the facility.

Caisson 64-R

Caisson 64-R was in operation only during the first two months of the monitoring period. During this time two hundred gallons of oil was recovered. On February 2, 1989 the WTDP was removed and installed into Facility 64-X(s).

Caisson 64-S

Oil recovery in Caisson 64-S totalled 4,457 gallons for the monitoring period. This total is down from 5,600 gallons recovered during the same period the previous year. System downtime for the six month period was 2.1%, primarily due to equipment failure.

Facility 64-V

Oil recovery in Facility 64-V totalled 22,448 gallons during the six month period from October 1988 to March 1989. Monthly recovery totals ranged from 5,079 gallons in October 1988 to 2,675 gallons in January 1989. The system was deactivated for a total of four days over the six month monitoring period. Oil recovery for the monitoring period (October 1988 - March 1989) was 20% less than the preceding six months (April 1988 -

September 1988). Since Facility 64-V was not activated until April 1988, recovery can not be compared to the October through March period of the previous year. Subsequent reports will compare recovery during the same months of the previous year.

CONCLUSIONS

1. Water table elevations measured during April 1989 are similar to elevations measured in April 1988. The configuration of the water table is also similar, with a steep hydraulic gradient in the north along the railroad tracks and a lesser hydraulic gradient south of East Street.
2. Preventive maintenance of recovery equipment and Water Table Depression Pumps during the monitoring period has kept system downtime to 10.3%. Regularly scheduled maintenance has kept recovery equipment operating at maximum efficiency.
3. Oil recovery for the period October 1988 through March 1989 totalled 27,618 gallons. Recovery total for the same six month period during 1988 was 25,416 gallons.
4. Monitoring Well 8, at the western edge of the plume, continues to have over 0.8 feet of oil.
5. The areal extent of the oil plume in April 1989 is similar to that in April 1988. Differences between the April 1988 plume map and the April 1989 plume map are summarized below.
 - * Oil thickness in Monitoring Well 5, north of Caisson 64-S, decreased to 0.65 feet measured in April, 1989. Previous measurements over the past three years were greater than 0.8 feet.

- * Monitoring Well FF in the Tank Farm Area contained 0.14 feet of oil during April 1989. Oil was not detected in this well during 1987 and 1988. A trace amount of oil was detected in this well during the Fall and Spring of 1986.



EAST STREET - AREA II
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A P P E N D I X A
WELL GAUGING FORMS

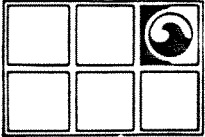
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JUNE 1989



**GROUNDWATER
TECHNOLOGY, INC.**
OIL RECOVERY SYSTEMS

WELL MONITORING FORM

Project: G.E. Semiannual
Location: Area II
North of Railroad
Tracks
Date: April 20-21, 1989

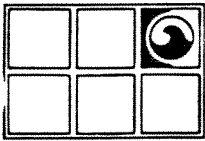
Operator: Dick Schwarz
Method: E.I.P.
Equipment: #711

WELL ID	WELL DEPTH (feet)	T.O.C. ELEV. (feet)	PETRO THICK (feet)	CORR WAT ELEV (feet)
2	20.00	1015.56		1005.05
3	20.00	1010.60		996.01
4	39.00	1010.15		987.25
5	28.00	1009.23		984.91
6	37.00	1010.83		979.02

8	38.00	1010.89		979.09
9	34.00	1011.01		983.44
11	40.00	1010.85	0.36	979.12
14	34.00	1010.53	0.55	986.92
16	40.00	1010.65	0.09	978.91

19	40.00	1010.68	0.03	979.26
20	40.00	1010.66		980.96
21	40.00	1010.81		979.73
22	40.00	1010.64		978.82
23	40.00	1011.13	>0.8	978.93
27	35.00	1010.40		984.73

Note: sh = sheen
Well 1 destroyed



**GROUNDWATER
TECHNOLOGY, INC.**
OIL RECOVERY SYSTEMS

WELL MONITORING FORM

Project: G.E. Semiannual
Location: Area II
Tank Farm Area
Date: April 20-21, 1989

Operator: D. Schwarz
Method: E.I.P.
Equipment: #711

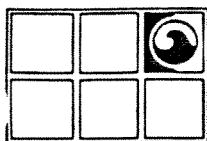
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F		1000.89		1000.89
I		997.79	0.22	978.39
K		995.82	0.60	977.94
L		994.18	>0.8	978.12
M		993.06	0.18	978.17

O		1003.77		979.54
Q		1002.66	>0.8	978.49
R		1002.88	>0.8	978.59
T				
V		999.67	0.18	978.52

W		1004.83		978.70
X		999.41	0.69	978.77
Y		1002.86	0.17	978.66
AA-1		999.09	0.03	978.33

CC		998.84	0.17	978.71
EE		1004.27		979.14
FF		1005.70	0.14	980.93
GG		1007.40		982.14
HH		1006.93	0.01	979.53

II		1007.26	0.40	979.37
JJ		1006.38		978.98
KK		1006.61	0.10	978.95
LL		996.25		983.31
MM		994.00		980.71



**GROUNDWATER
TECHNOLOGY, INC.**
OIL RECOVERY SYSTEMS

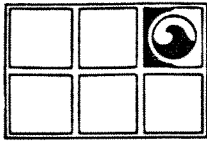
WELL MONITORING FORM

Project: G.E. Semiannual
Location: Area II
Tank Farm Area
Date: April 20-21, 1989

Operator: D. Schwarz
Method: E.I.P.
Equipment: #711

WELL ID	WELL DEPTH (feet)	T.O.C. ELEV. (feet)	PETRO THICK (feet)	CORR WAT ELEV (feet)
NN		994.27		978.64
OO		995.65		978.72
PP		995.77	>0.8	978.66
QQ		996.19	>0.8	978.59
UU-R		997.70		978.92
VV-R		997.89		988.42

Note: Well S destroyed
Well N destroyed



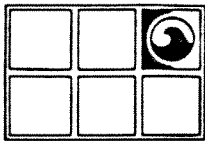
**GROUNDWATER
TECHNOLOGY, INC.**
OIL RECOVERY SYSTEMS

WELL MONITORING FORM

Project: G.E. Semiannual
Location: Area II
South of East Street
Date: April 20-21, 1989

Operators: D. Schwarz
J. Kaplan
Method: E.I.P.
Equipment: #711

WELL ID	WELL DEPTH (feet)	T.O.C. ELEV. (feet)	PETRO THICK (feet)	CORR WAT ELEV (feet)
2	25.0	994.09	>0.8	977.78
3	25.0	993.96	>0.8	977.78
5	20.0	992.94	0.65	978.03
5A		996.10	0.06	976.92
6	25.0	989.12	0.38	975.49
8	20.0	985.39	>0.8	974.85
10	20.0	987.95		969.28
11R	26.0	988.82		976.58
12	31.0	990.37		973.89
13	30.0	990.88	0.52	973.86
14	30.0	991.61	0.05	974.25
15R	26.0	989.23	0.34	973.97
16	25.0	987.18		974.10
16R	26.0	987.10		974.08
17	25.0	985.28		974.03
17R	22.0	984.89		974.10
18	25.0	983.33		973.31
19		983.59		973.17
21	20.0	983.82		973.64
22	27.0	994.69	>0.8	977.68
24	28.5	993.12	>0.8	977.83
25	29.0	992.48	>0.8	977.83
26	28.5	993.49	0.02	979.53
27	30.0	993.71	0.70	979.17
28	25.0	991.81	>0.8	NA



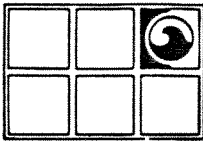
**GROUNDWATER
TECHNOLOGY, INC.**
OIL RECOVERY SYSTEMS

WELL MONITORING FORM

Project: G.E. Semiannual
Location: Area II
South of East Street
Date: April 20-21, 1989

Operators: D. Schwarz
J. Kaplan
Method: E.I.P.
Equipment: #711

WELL ID	WELL DEPTH (feet)	T.O.C. ELEV. (feet)	PETRO THICK (feet)	CORR WAT ELEV (feet)
29	27.0	991.57	0.78	973.36
30	24.0	989.34		980.59
31	25.0	990.60		980.42
32	20.0	990.81		981.13
34	15.0	982.54	0.35	974.53
35	15.0	982.81		975.86
36	15.0	982.94		974.72
37	15.0	980.37		975.11
38	15.0	980.77		976.75
39	15.0	983.86		979.07
40	20.0	991.52	>0.8	977.40
42	20.0	988.33		977.53
43	20.0	985.68		978.25
44	20.0	988.38		978.20
47	25.0	991.09	>0.8	973.15
48	25.0	988.89	>0.8	973.21
49R	18.0	988.71		973.53
49RR		989.80		973.35
50	26.0	985.77	0.01	974.10
51	26.0	985.42		974.18
52	26.0	985.18		973.85
53	29.0	986.90		973.30
54	28.0	985.78		972.89
55	29.0	985.95	>0.8	973.14
56	29.0	987.28		972.24



**GROUNDWATER
TECHNOLOGY, INC.**
OIL RECOVERY SYSTEMS

WELL MONITORING FORM

Project: G.E. Semiannual
Location: Area II
South of East Street
Date: April 20-21, 1989

Operators: D. Schwarz
J. Kaplan
Method: E.I.P.
Equipment: #711

WELL ID	WELL DEPTH (feet)	T.O.C. ELEV. (feet)	PETRO THICK (feet)	CORR WAT ELEV (feet)
57	30.0	989.80	0.14	977.12
58	30.0	985.79		972.97
59	29.0	986.32	0.18	970.30
60	27.0	996.11		974.83
61	25.0	992.31		974.06
62	14.0	979.14		973.21
63	18.0	986.45		972.92
64	14.0	985.00		973.16
65	27.0	992.50		977.05
66		990.70		973.72
P-1	14.0	988.75	0.29	984.21
P-2	13.0	988.22		980.59
P-3	14.0	989.25	0.03	985.95
P-3D	19.5	988.54		980.60
P-4	14.0	987.16	0.04	984.61
P-5	14.0	985.64		984.63
P-6	11.0	985.71		984.45
P-7	11.0	985.17		979.70
C-60		979.62		976.01
64R		993.44		981.24
64S		984.48	0.02	972.52
64V		987.29	0.29	964.06
64Xn		984.89	0.04	973.55
64Xs		981.54	0.06	973.25
64Xw		984.87	0.11	973.29

EAST STREET - AREA II
MONITORING REPORT
SPRING 1989

A P P E N D I X B
GROUNDWATER CONTOUR MAP
HYDROCARBON PLUME MAP

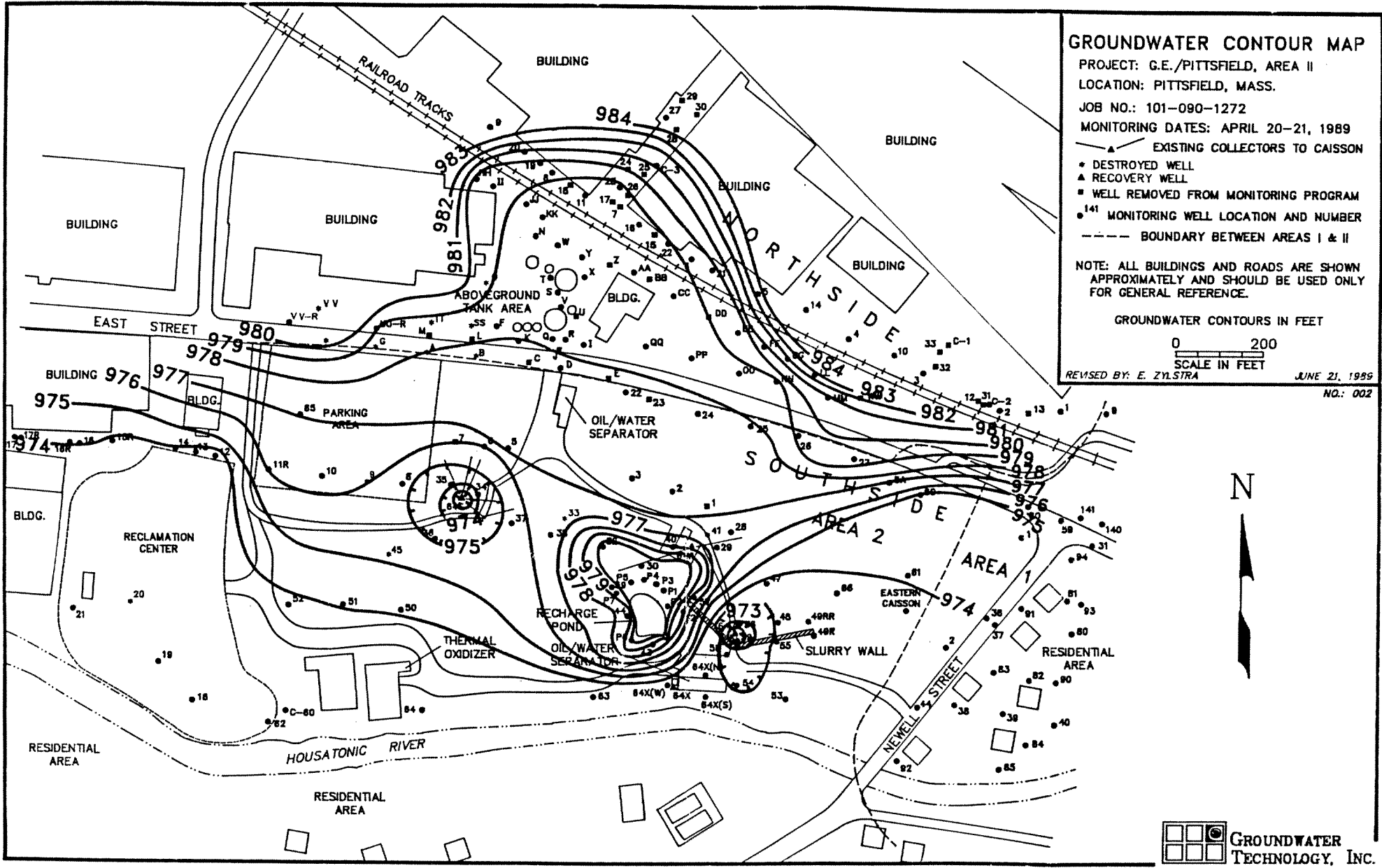
SUBMITTED TO:

GENERAL ELECTRIC COMPANY
100 WOODLAWN AVENUE
PITTSFIELD, MASSACHUSETTS 01201

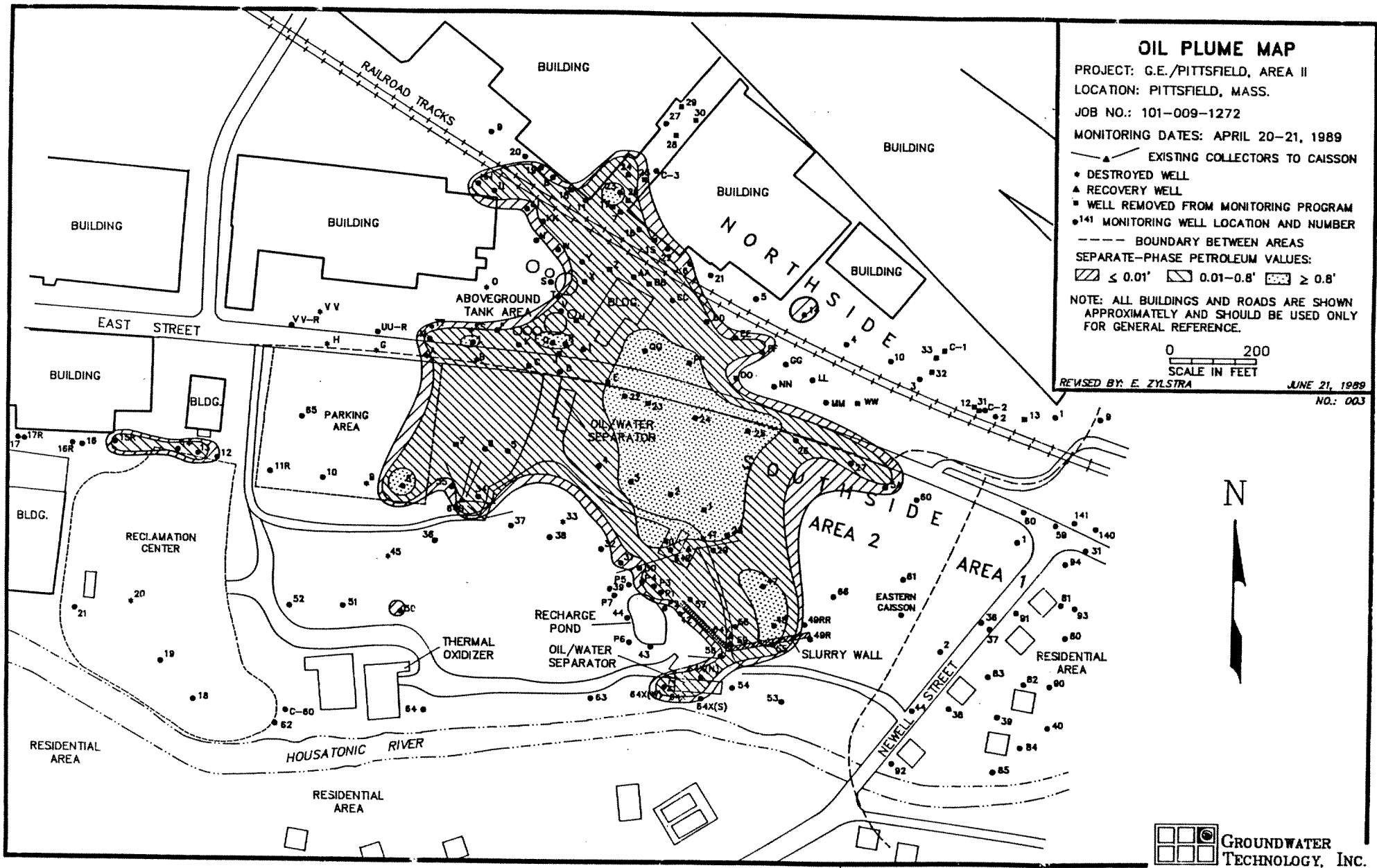
SUBMITTED BY:

GROUNDWATER TECHNOLOGY, INC.
1641 RIVERDALE STREET
WEST SPRINGFIELD, MASSACHUSETTS 01089

JUNE 1989

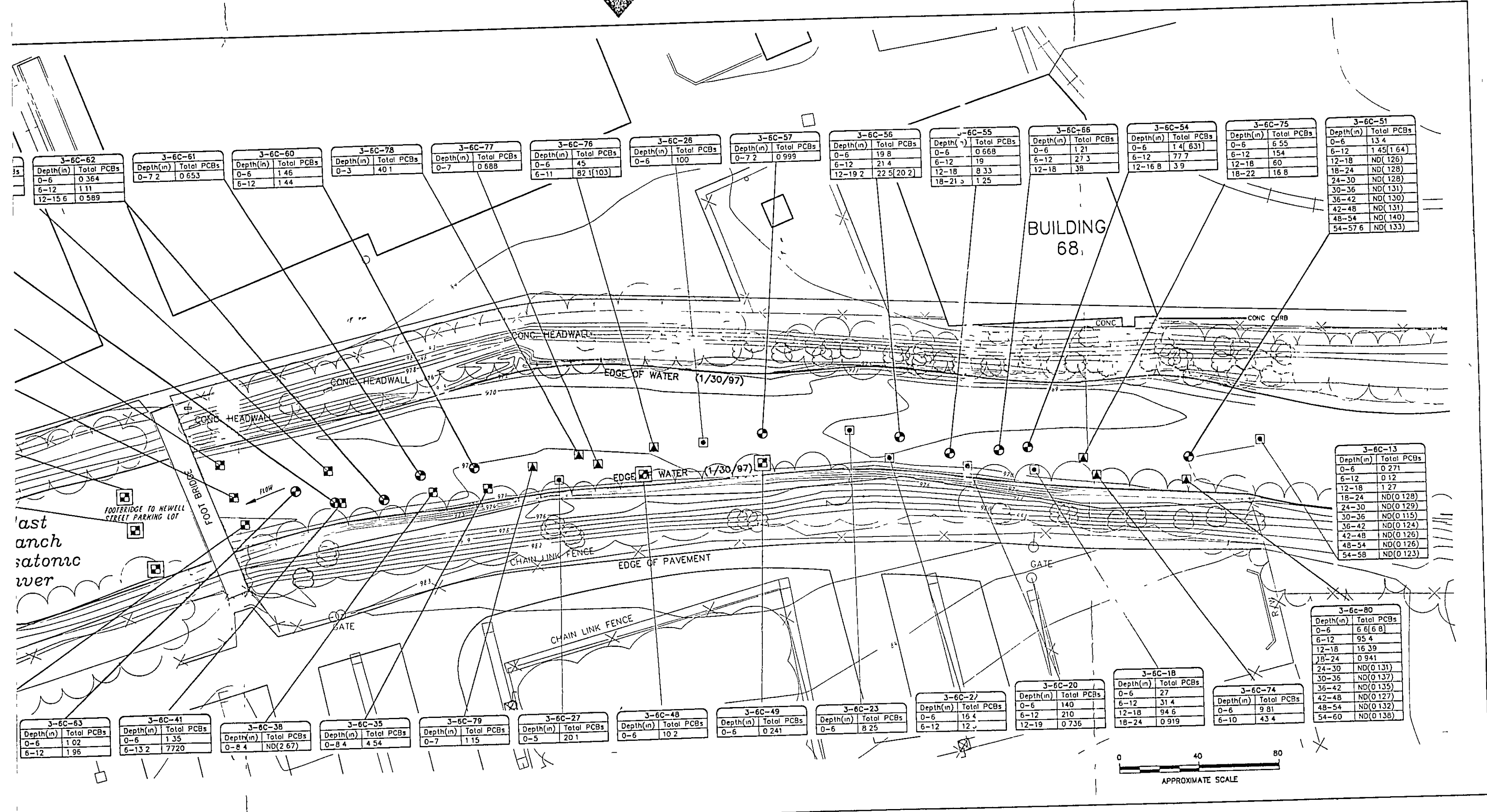
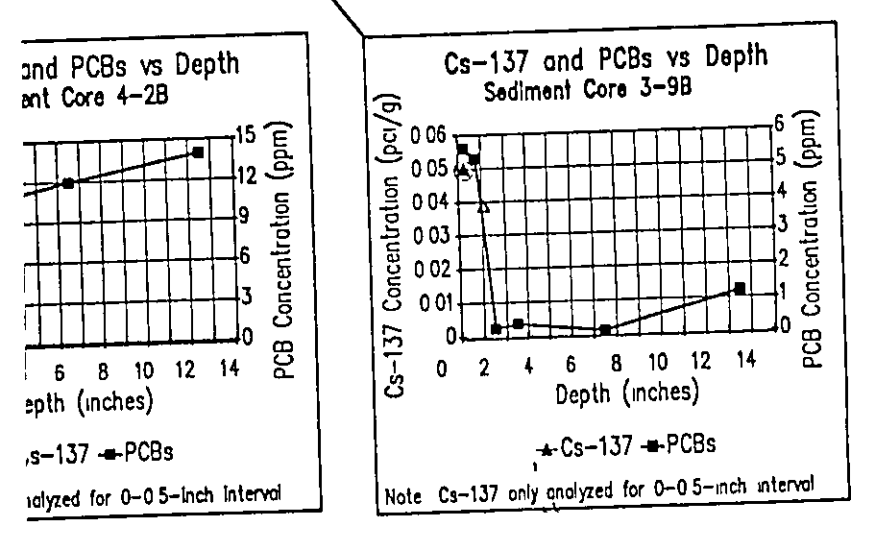
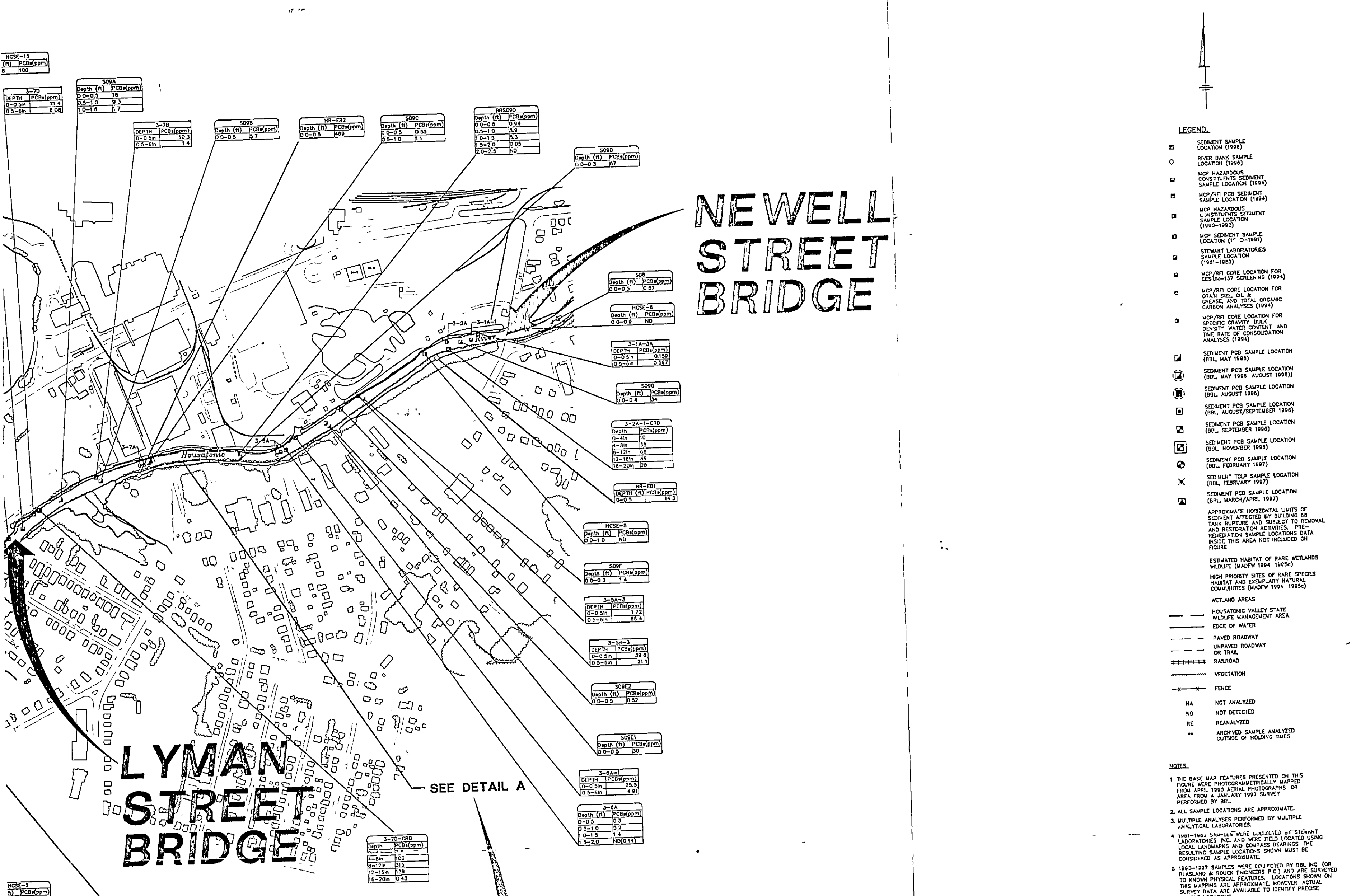



GROUNDWATER TECHNOLOGY, INC.



GROUNDWATER TECHNOLOGY, INC.

Street to West Branch Confluence



**FIGURE 1
SEDIMENTS**

Housatonic River Sediment Investigations, Newell Street to We

