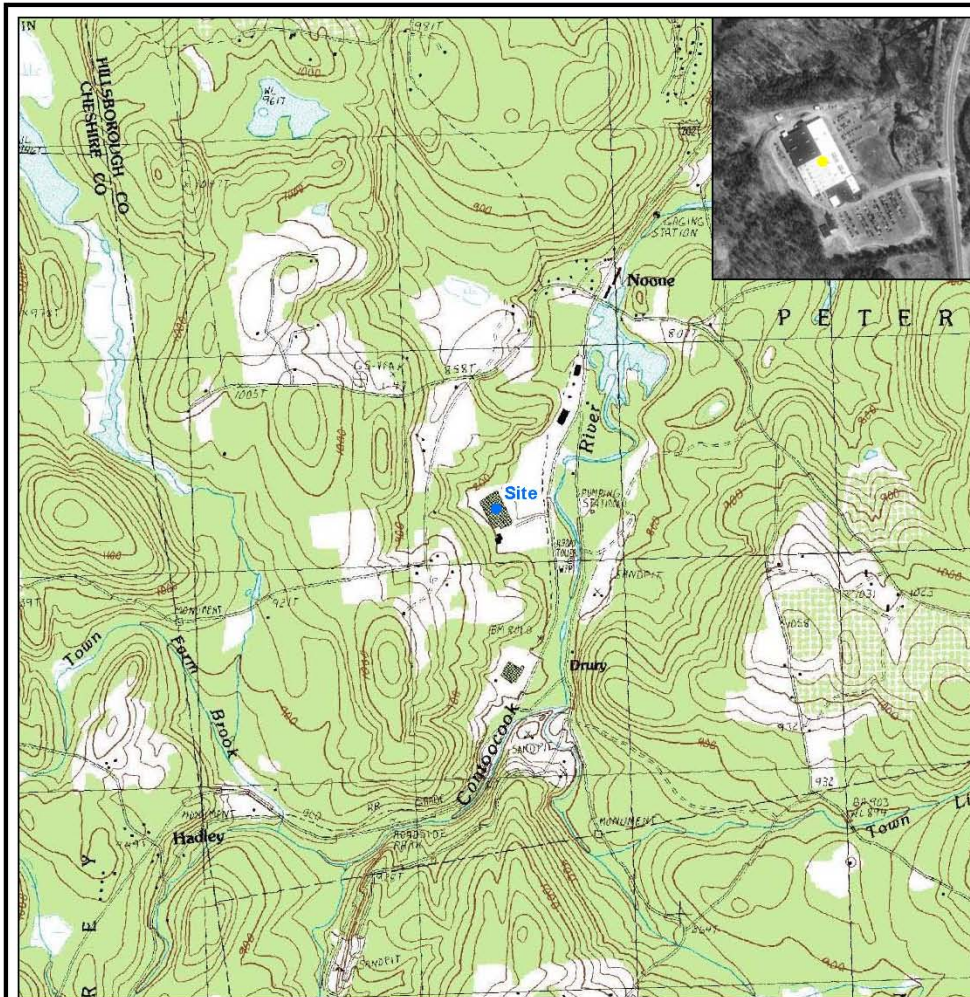


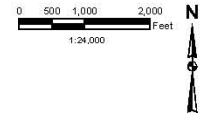
# Changing Remedial Landscape at a DNAPL Site

Richard Willey, Hydrologist



**Legend**  
 ● Site Location

Source: The topographic map was obtained from the Terraserver website, <http://terraserver-usa.net>. Quadrangle name: Peterborough South, New Hampshire, photo revised July 01, 1987.  
 The aerial photo in the inset was obtained from the Terraserver website. Aerial photography dated April 13, 1998.



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Groundwater Focused Feasibility Study  
 South Municipal Water Supply Well Superfund Site

**Site Location Map**

175 Jeffrey Road  
 Peterborough, Hillsborough County, New Hampshire

Date: **November 2008**

Project Number: NHB034  
 Geodatabase: Projects.mdb  
 File Name: NHB034\_01\_Fig1-1\_SiteLocationMap.mxd

Figure  
**1-1**

Produced using ArcGIS 9.2

## Changing Remedial Landscape at a DNAPL Site

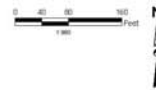
- 1952 South Well installed (safe yield 750 gpm).
- 1982 State discovered well was contaminated (primarily PCE, and 1,1,1,-TCA); EPA and State recommend its use be discontinued.
- 1989 RI/FS completed (PCE, up to 240,000 ug/L; no mention of DNAPLs).
  - ROD signed. Selected remedy was groundwater extraction and treatment to attain cleanup (drinking water) goals, and to prevent contaminant migration.



- Legend**
- Groundwater Extraction Well
  - Groundwater Monitoring Well
  - Mrs. Picconeri
  - Picconeri



Quadrangle Location



Groundwater Focused Feasibility Study  
South Municipal Water Supply Well Superfund Site

**Site Aerial Map**

Peterborough, New Hampshire

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Date:  
November 2008

Project Number: 000004

Prepared by: Priscilla Hill  
Reviewed by: Jennifer Hill, Ph.D.,  
and Jeff Picconeri, Ph.D.

Figure  
**1-2**

## Changing Remedial Landscape at a DNAPL Site

- 1991 GW Issue Paper: Dense Nonaqueous Phase Liquids (EPA/540/4-91-002)
- 1991 DNAPL Workshop takes place in Dallas (EPA/600/R-92/030)
- 1993 DNAPL Fact Sheet (EPA 9355.4-07FS)
- 1993 TI Guidance (OSWER Directive 9234.2-25)

## Changing Remedial Landscape at a DNAPL Site

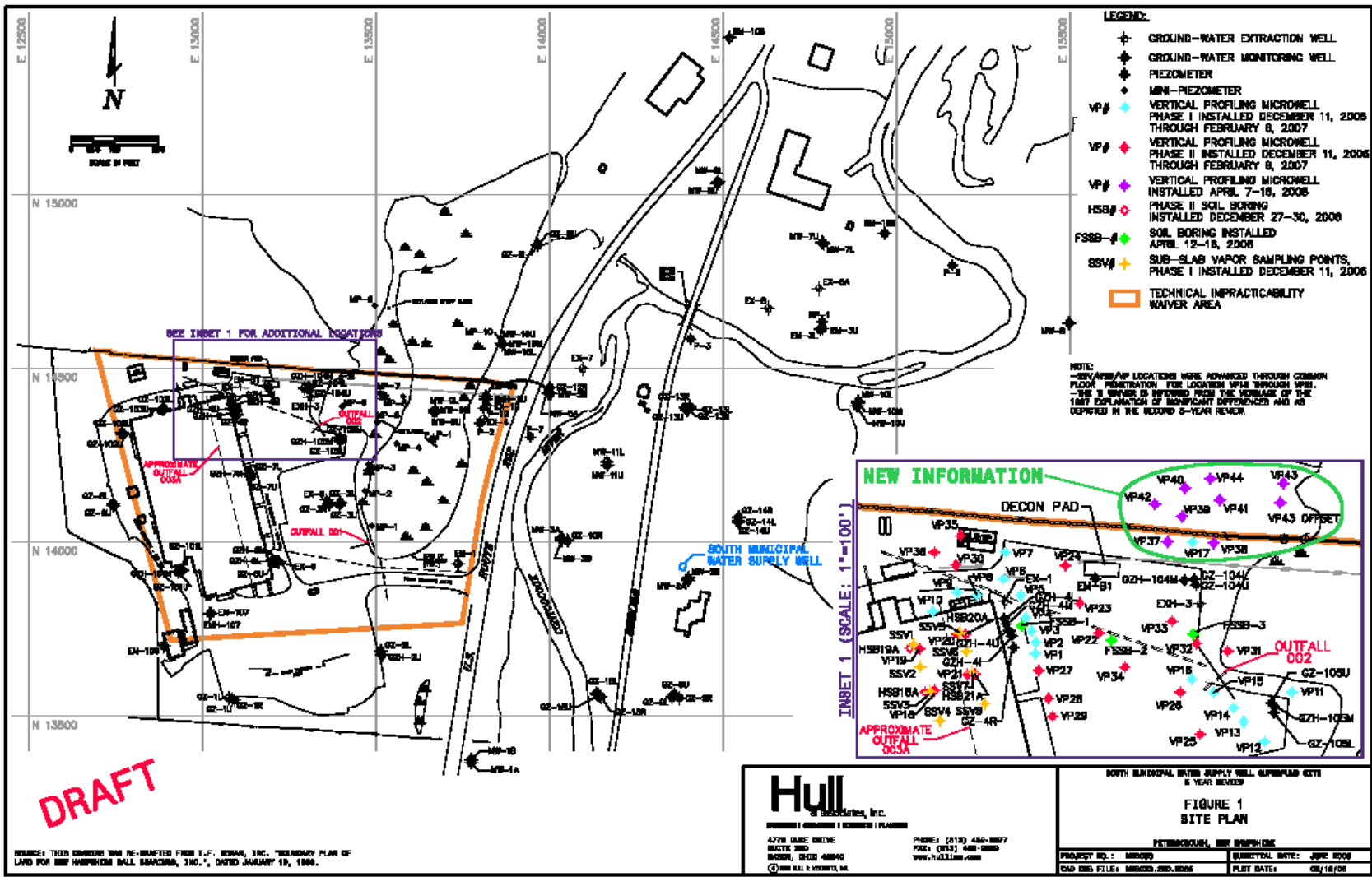
- 1994 Ground-water extraction and treatment system began operation at site.
- 1997 TI Waiver (2nd ESD) issued (DNAPLs acknowledged to be present).
  - Ground-water extraction and treatment system [will be] adjusted to ensure containment of contamination at the facility boundary, and to allow the [concurrent] use of the former supply well and restoration of groundwater quality outside of the waiver area.

## Changing Remedial Landscape at a DNAPL Site

- 2003 Given the apparent containment and declines in VOC concentrations, town began long term pump test to determine if South Well could operated without it being recontaminated.
- 2005 Long term pump test stopped. Monitoring data indicated containment system failed to fully capture contaminant plume while pumping South Well at 150 gpm (on a 24 hour basis). PCE concentrations increased, and exceeded MCLs, at some monitoring wells.

## Changing Remedial Landscape at a DNAPL Site

- 2006 In series of meetings, RP informed that existing remedy does not meet objectives set forth in the Second ESD, and that adjustments are needed.
- 2007 RP conducted additional source area delineation at 36 vertical profiling locations.
- 2008 Ground-water contamination found (8 vertical profiles) in previously unsuspected offsite area.

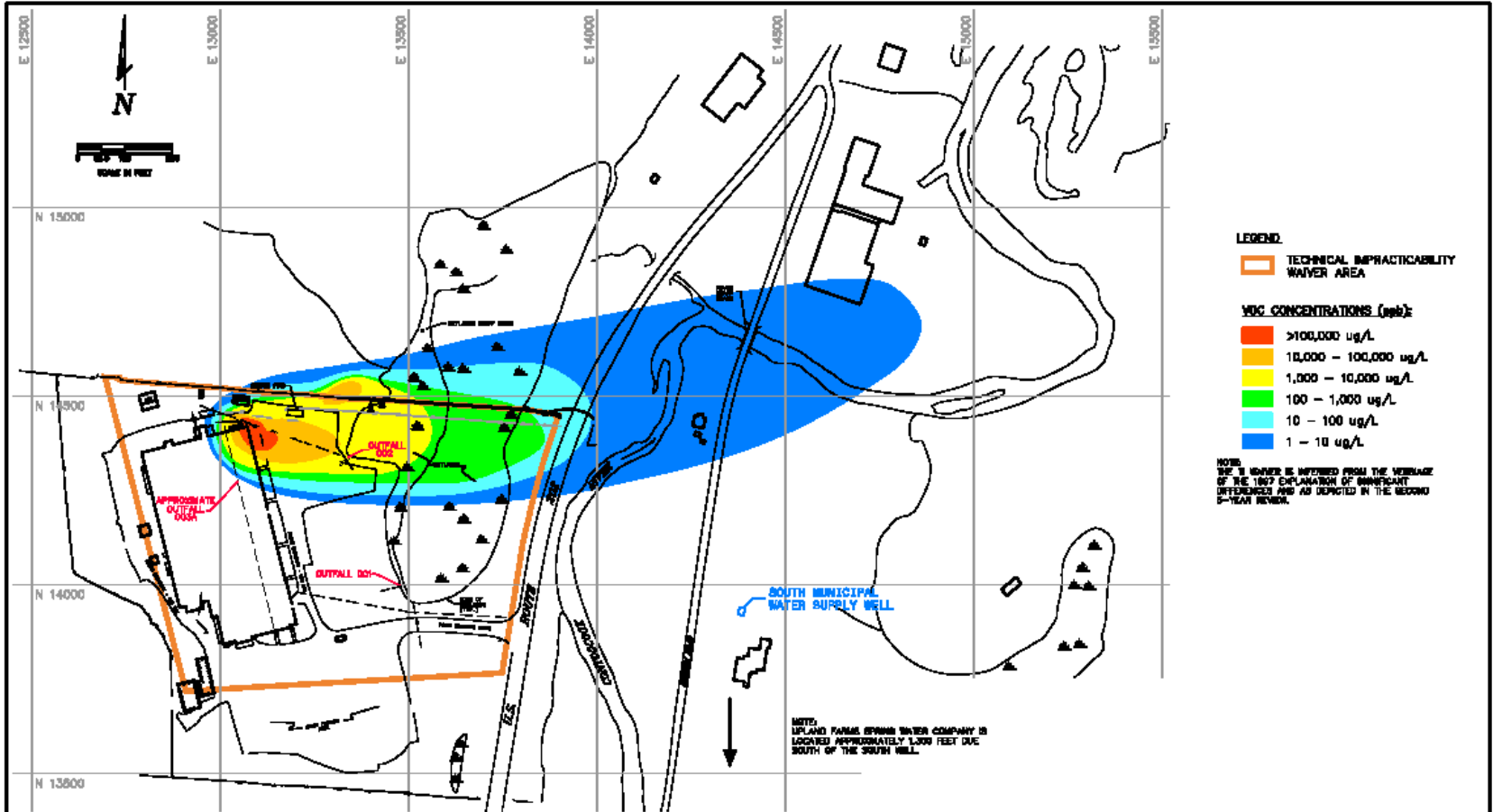


**SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE  
GROUNDWATER FOCUSED FEASIBILITY STUDY  
SUMMARY OF SUPPLEMENTAL VERTICAL PROFILING MOBILE LABORATORY ANALYTICAL RESULTS UG/L**

**TABLE 1-1**

VP-37 ug/l													
MOBILE LABORATORY													
Depth of Screened Interval Date	11-12 4/8/2008	16-17 4/8/2008	21-22 4/8/2008	26-27 4/8/2008	31-32 4/8/2008	36-37 4/8/2008	41-42 4/8/2008	46-47 4/8/2008	51-52 4/8/2008	56-57 4/8/2008	61-62 4/8/2008	66-67 4/8/2008	71-72 4/8/2008
Vinyl Chloride	<2	3.7	3.3	3.5	3.6	2.4	<2	<2	<2	<2	<2	2.2	<2
1,1-Dichloroethene	<0.5	23	60	50	87	12	8.2	2.2	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	<2.5	9.6	11	11	10	9.4	9	8.9	<2.5	<2.5	<2.5	<2.5	<2.5
cis-1,2-Dichloroethene	<2.5	47	130	95	78	15	14	0.5	<2.5	<2.5	<2.5	<2.5	<2.5
1,1-Dichloroethane	<2.5	24	44	40	55	22	13	<	<2.5	<2.5	<2.5	<2.5	<2.5
1,1,1-Trichloroethane	0.8	2,300D	3,600D	3,400D	3,800D	1,000D	950D	16D	0.83	0.7	0.7	9.2	1.4
Trichloroethene	0.52	1,600D	2,700D	2,600D	1,800D	560D	630D	7.2D	0.5	0.5	0.4J	1.9	<2.5
Tetrachloroethene	1.7	12,000D	20,000D	20,000D	20,000D	4,000D	4,000D	95D	3.5	3.7	1.2	13	1.9
<b>Totals</b>	<b>3.02</b>	<b>16,007.30</b>	<b>26,548.30</b>	<b>25,199.50</b>	<b>25,833.60</b>	<b>5,620.80</b>	<b>5,624.20</b>	<b>123.03</b>	<b>4.83</b>	<b>4.90</b>	<b>1.90</b>	<b>26.30</b>	<b>3.30</b>

VP-38 ug/l										
MOBILE LABORATORY										
Depth of Screened Interval Date	10-11 4/9/2008	15-16 4/9/2008	20-21 4/9/2008	25-26 4/9/2008	30-31 4/9/2008	35-36 4/9/2008	40-41 4/9/2008	45-46 4/9/2008	50-51 4/9/2008	54.5-55.5 4/9/2008
Vinyl Chloride	<2	2.5	<2	<2	<2	<2	<2	<2	<2	<2
1,1-Dichloroethene	<0.5	<0.5	<0.5	24	5.6	2.9	6.9	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	<2.5	<2.5	<2.5	9.3	9	8.9	9	<2.5	<2.5	<2.5
cis-1,2-Dichloroethene	<2.5	<2.5	<2.5	20	13	9.8	15	9.4	<2.5	<2.5
1,1-Dichloroethane	<2.5	<2.5	<2.5	19	13	0.3J	3.8	<2.5	<2.5	<2.5
1,1,1-Trichloroethane	0.96	1.8	3.2	1,400D	880D	700D	900D	13	1.4	1
Trichloroethene	<2.5	<2.5	8	1,000D	660D	500D	700D	3.9	0.9	0.7
Tetrachloroethene	4.4	17	120D	17,000D	3,600D	1,300D	4,300	200D	8.7	4.3
<b>Totals</b>	<b>5.36</b>	<b>21.30</b>	<b>131.20</b>	<b>19,472.30</b>	<b>5,180.60</b>	<b>2,521.90</b>	<b>5,934.70</b>	<b>226.30</b>	<b>11.00</b>	<b>6.00</b>



- LEGEND**
- TECHNICAL IMPRACTICABILITY WAIVER AREA
- VOC CONCENTRATIONS (ug/L)**
- >100,000 ug/L
  - 10,000 - 100,000 ug/L
  - 1,000 - 10,000 ug/L
  - 100 - 1,000 ug/L
  - 10 - 100 ug/L
  - 1 - 10 ug/L

**NOTE:** THE 1987 EXPLANATION OF SIGNIFICANT DIFFERENCES HAS BEEN DELETED IN THE SECOND 5-YEAR REVIEW.

**NOTE:** UPLAND PARK SPRING WATER COMPANY IS LOCATED APPROXIMATELY 1,000 FEET DUE SOUTH OF THE SOUTH WELL.

**DRAFT**

BOUNDARY THIS DRAWING WAS RE-WATER FROM T.F. BROWN, INC. "BOUNDARY PLAN OF LAND FOR NEW BRIDGEVILLE HULL BRANCH, 310.", DATED JANUARY 18, 1994.

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PROJECT NO.: 060000  
 CAD FILE: MISSISSIPPI.DWG

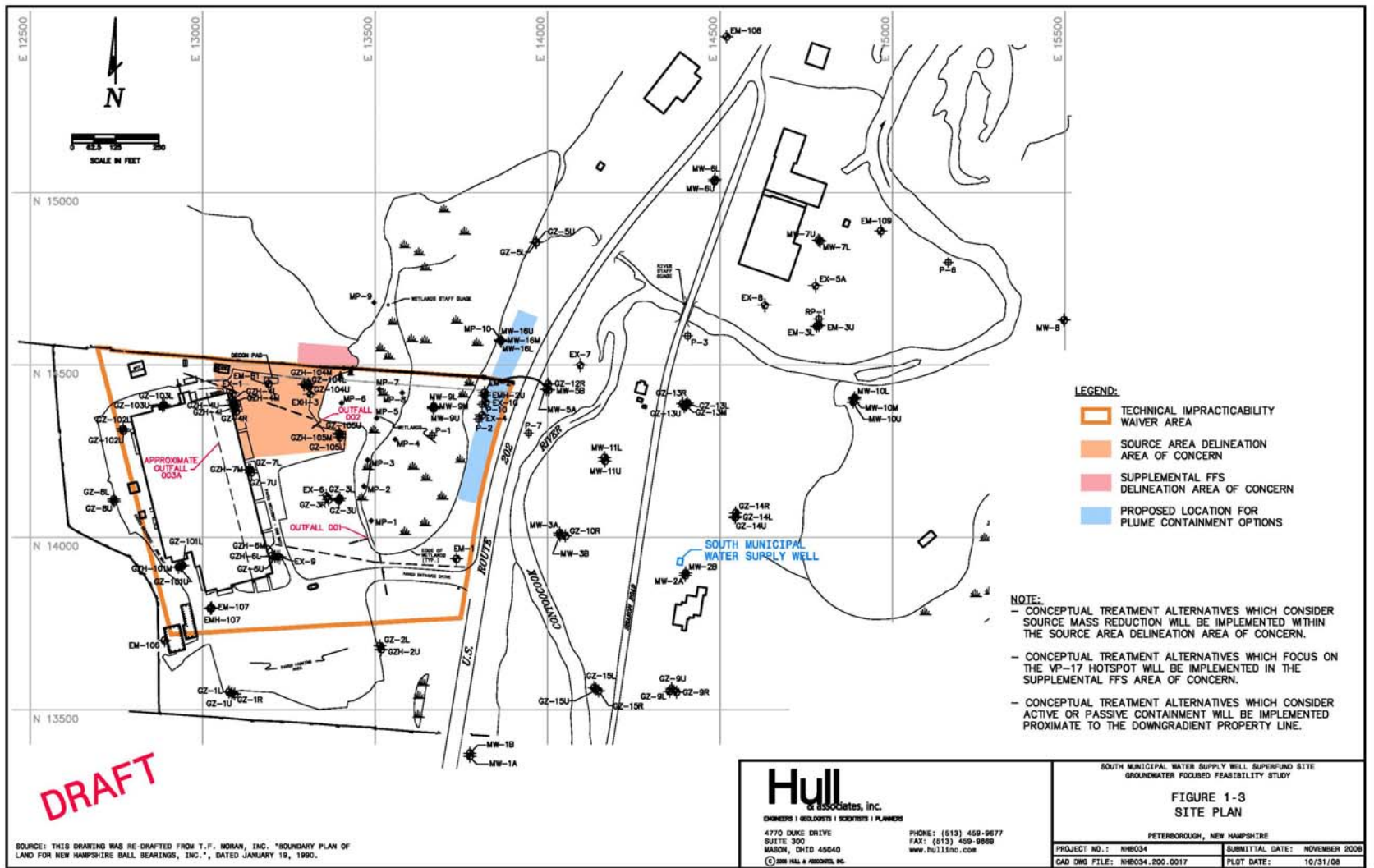
SOUTH MUNICIPAL WATER SUPPLY WELL SPREADING GATE  
 5 YEAR REVIEW  
**FIGURE 2**  
 APPROXIMATED PLUME MAP BASED ON OCTOBER  
 2007 AND APRIL 2008 GROUNDWATER DATA

PETROBRASIA, NEW BRIDGEVILLE

PROJECT NO.: 060000  
 SUBMITTAL DATE: JULY 2008  
 CAD FILE: MISSISSIPPI.DWG  
 PLOT DATE: 07/04/08

## Changing Remedial Landscape at a DNAPL Site

- 2008 Rehabilitation of containment wells reveals biofouling is worse than anticipated, and O&M frequency is increased to semi-annually.
  - Existing remedy considered “not protective” in third Five Year Review Report.
  - Focused Feasibility Study implemented to evaluate alternative remedial technologies to meet current remedial objectives. Report delivered Jan. 2009 (now under review).



SOURCE: THIS DRAWING WAS RE-DRAFTED FROM T.F. MORAN, INC. "BOUNDARY PLAN OF LAND FOR NEW HAMPSHIRE BALL BEARINGS, INC.", DATED JANUARY 19, 1990.

# Changing Remedial Landscape at a DNAPL Site

## Closing thoughts

- Monitor and evaluate hydraulic containment system performance on a continual basis.
- Chronic biofouling of extraction wells can cause containment failure.
- Containment systems should be designed and operated to maintain capture while the public water supply wells are in operation (rather than by adjusting PWS pumping rates to maintain containment).

# Changing Remedial Landscape at a DNAPL Site

## Closing thoughts

- Test and confirm all critical (pivotal) assumptions.
- Avoid site management by autopilot.
- Reassess TI boundary monitoring (space, and time) system if stress patterns change.
- 5 Year Reviews can be the “salvation” or “Achilles heel” of the Superfund Program.

# Changing Remedial Landscape at a DNAPL Site

## Closing thoughts

- Current benefit-cost analysis favors long-term plume management over short-term source removal, and trivializes some important concerns:
  - o Understated capital replacement or O&M costs,
  - o RPs/states unable to assume long term costs,
  - o contamination “forgotten” and inappropriate (re)development occurs,
  - o water utility rates rise to meet alternative water supply sources or water treatment costs.

# Changing Remedial Landscape at a DNAPL Site

## Closing thoughts

- New business reporting requirements (Sarbanes-Oxley, SEC accounting rules) to disclose “material environmental risks” to corporate investors may influence management decisions regarding long-term remedial actions.
- Methods to factor in long-term stewardship and intergenerational cost concerns should be explored.

# Changing Remedial Landscape at a DNAPL Site

## Final notes

- Ongoing need for scientific and technological innovation, and to foster more rapid application of these innovations at routine sites.
- Encourage greater communication and coordination of research planning among Federal stakeholders.
- Encourage more jointly sponsored stakeholder field trials at routine sites, and more intensive long term monitoring at selected sites.