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Waste Management Division

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Bennington Iron Works
Site #1998-2482

- and -

Monument Plaza
Site #2005-3338

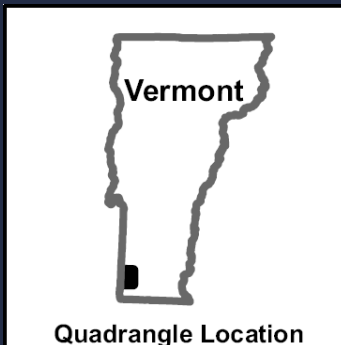
NEWMOA ISCO Workshops
Westford, MA & Quinebaug, CT
March 15 & 16, 2011

Bennington Iron Works Site History

- Discovered 09/18/98 during UST removal
- First letter to BIW 09/29/98
- BIW hires Aaron & Sons, Inc. of Bennington to investigate
- PCE identified in groundwater on BIW property, and in two water supply wells on Buckley Drive

Site Location Map

USGS 1:24k
Topographic Map

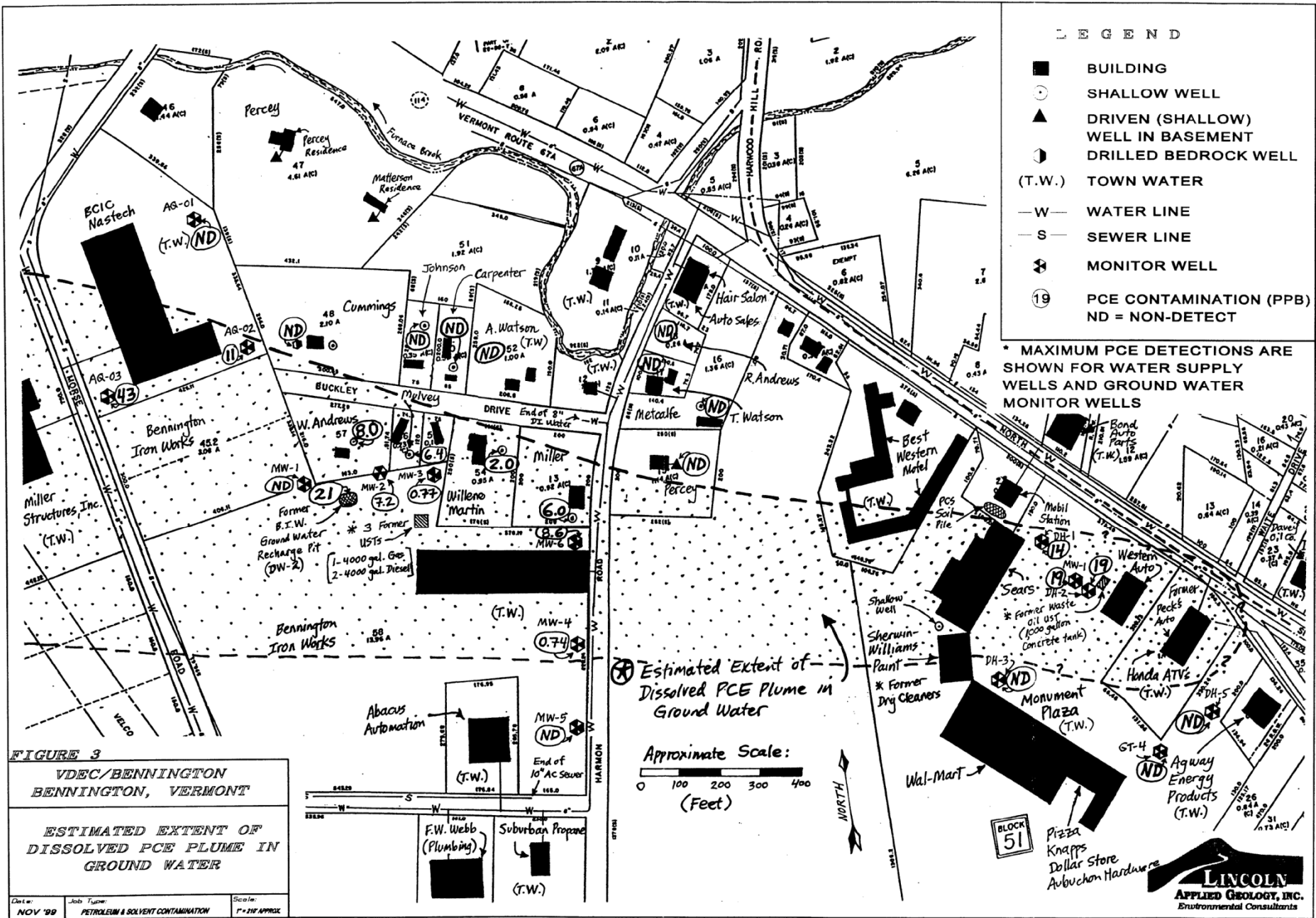


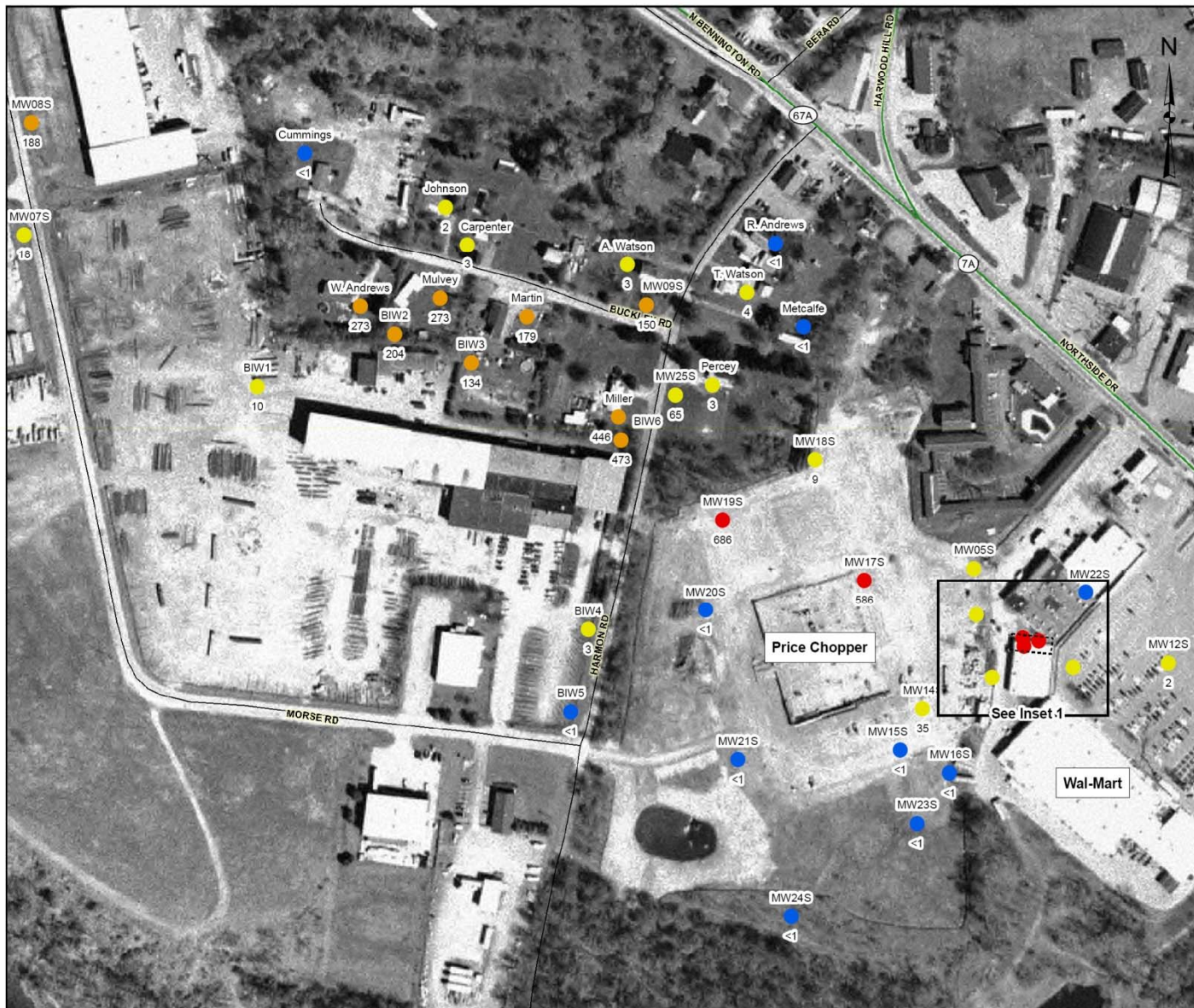
Bennington Iron Works Site History, Cont.

- 12/98 DW wells sampled and analyzed PCE found in many wells in area
- Consultant couldn't do job, BIW hired Heindel & Noyes, Inc. of Burlington
- 08/26/99 Six MWs installed on-site
- PCE found along up-gradient BIW property boundary
- 2000 NFA letter issued to BIW, site remained open

Bennington Iron Works Site History, Cont.

- 1999/2000, SMS hires Lincoln Applied Geology, Inc. (LAG) to investigate PCE and MTBE
- 03/14/00 Report on sources
- MTBE - low levels and insignificant
- PCE - sources include
 - Monument Plaza Shopping Center (dry cleaner from '60s and '70s)
 - Western Auto waste oil tank
 - Peck's Auto Junk Yard
 - Fill-in area from CERCLA site



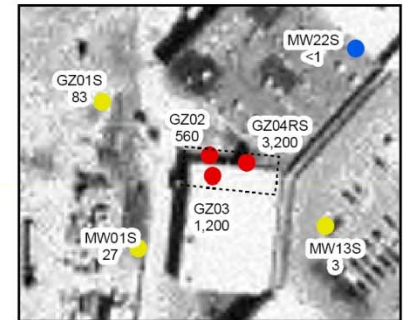


Legend

Max PCE Concentrations 2001 - 2004, 2007

- Not Detected <2 ug/L
- 2 - 99 ug/L
- 100 - 499 ug/L
- >500 ug/L

Former Location of Monument Laundrette



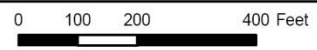
Map Inset 1

Sources:

Basemap data, including roads and 1995 Aerial Photo, obtained from VCGI. Original scale of aerial photo 1:5000.

Site features and some well locations from "EXISTING CONDITIONS PLAN, ENVIRO-STRATEGIES WAL-MART, ROUTE 67 A, BENNINGTON" (27-May-2008), by MSK Engineering and Design, Inc., Bennington, VT. Other well locations are based on plan entitled, "Bennington Iron Works & Related Sites" (no date or company information).

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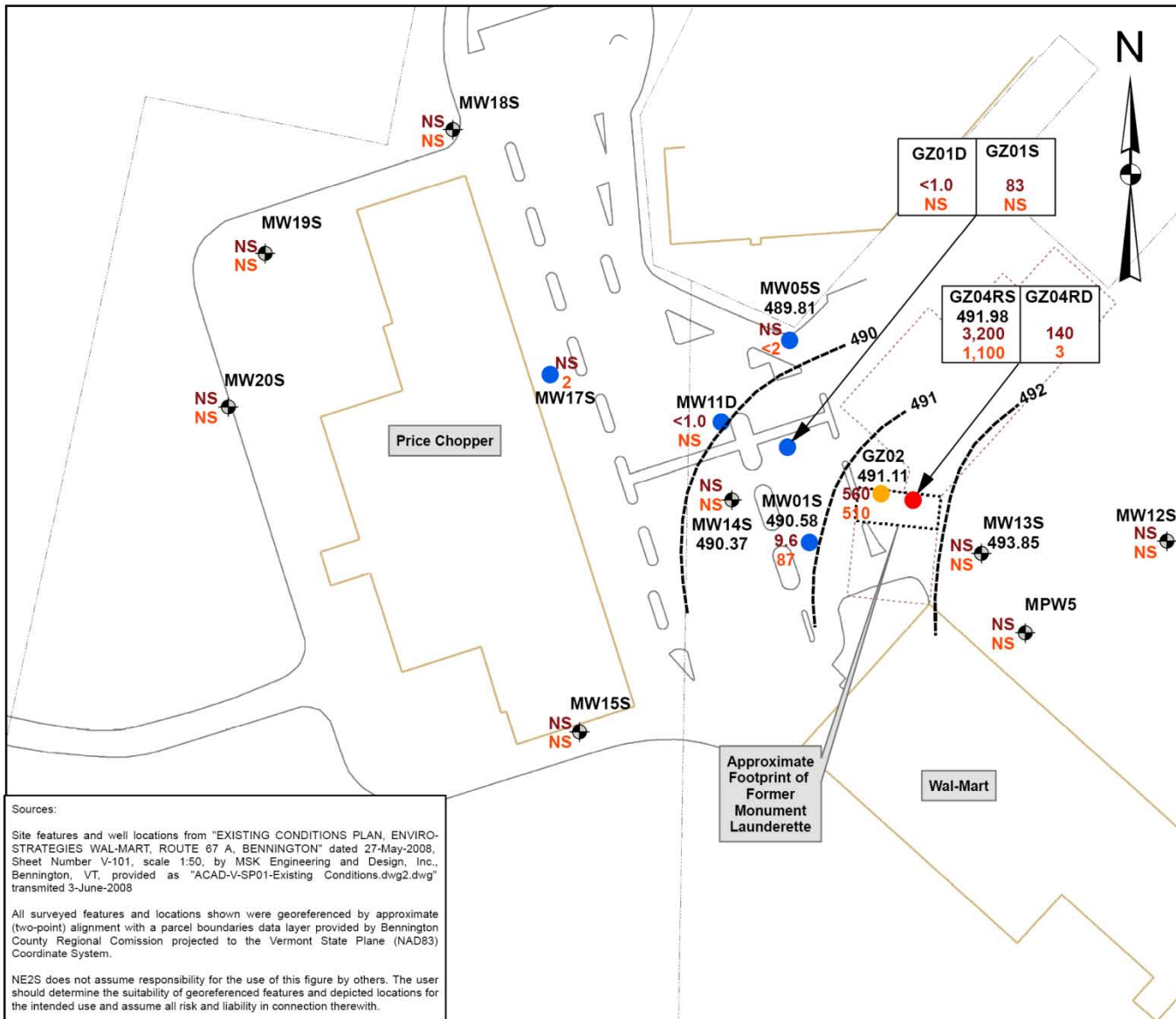
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CAP IMPLEMENTATION PROGRESS REPORT #1
 FORMER MONUMENT LAUNDERETTE
 NORTHSIDE DRIVE (ROUTE 7)
 BENNINGTON, VT

Historic Maximum PCE Concentrations
 (2001 - 2004, 2007)

April 2009

Figure 4



Legend

- ◆ Monitoring Well
- Groundwater Contour
- Water Quality Data from 2007 and 2008 Sampling**
- PCE Concentration (ug/L) in Monitoring Well**
- <200
- 200 - 1,200
- 1,200 - 4,500

Field Located Features

- Parcel Boundaries
- Existing Buildings
- Former Building Footprint
- Edge of Pavement
- Curb

Notes:

- 1) Posted groundwater elevation (black values) are feet relative to an arbitrary vertical datum.
 - 2) Posted PCE values (ug/L) from February and March 2007 (top values) and January 2008 (bottom values).
- NS - not sampled



Sources:

Site features and well locations from "EXISTING CONDITIONS PLAN, ENVIRO-STRATEGIES WAL-MART, ROUTE 67 A, BENNINGTON" dated 27-May-2008, Sheet Number V-101, scale 1:50, by MSK Engineering and Design, Inc., Bennington, VT, provided as "ACAD-V-SP01-Existing Conditions.dwg2.dwg" transmitted 3-June-2008

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FORMER MONUMENT LAUNDERETTE
NORTHSIDE DRIVE (ROUTE 7)
BENNINGTON, VT

GROUNDWATER CONTOUR MAP AND
POSTED DISSOLVED PHASE
PCE CONCENTRATIONS

August 2008

Figure 3

Bennington Iron Works Site History, Cont.

- LAG reports 12/31/01, 09/03/02, 02/19/03, 06/06/04, and 01/26/05 (Soil Gas Survey)
- 01/26/05 report found PCE contaminated soils above the water table @ MP dry cleaner location (the smoking gun)
- 03/31/05 BIW site file closed, Monument Plaza site file opened

Bennington Iron Works/Monument Plaza Site History, Cont.

- 2001 sampling of DW supplies
 - PCE levels went from ones of PCE to hundred of PCE (in ug/l or ppb)
- SMS requested EPA extend water lines to homes in area
 - 12 homes hooked to town water in 2002

Monument Plaza Site History

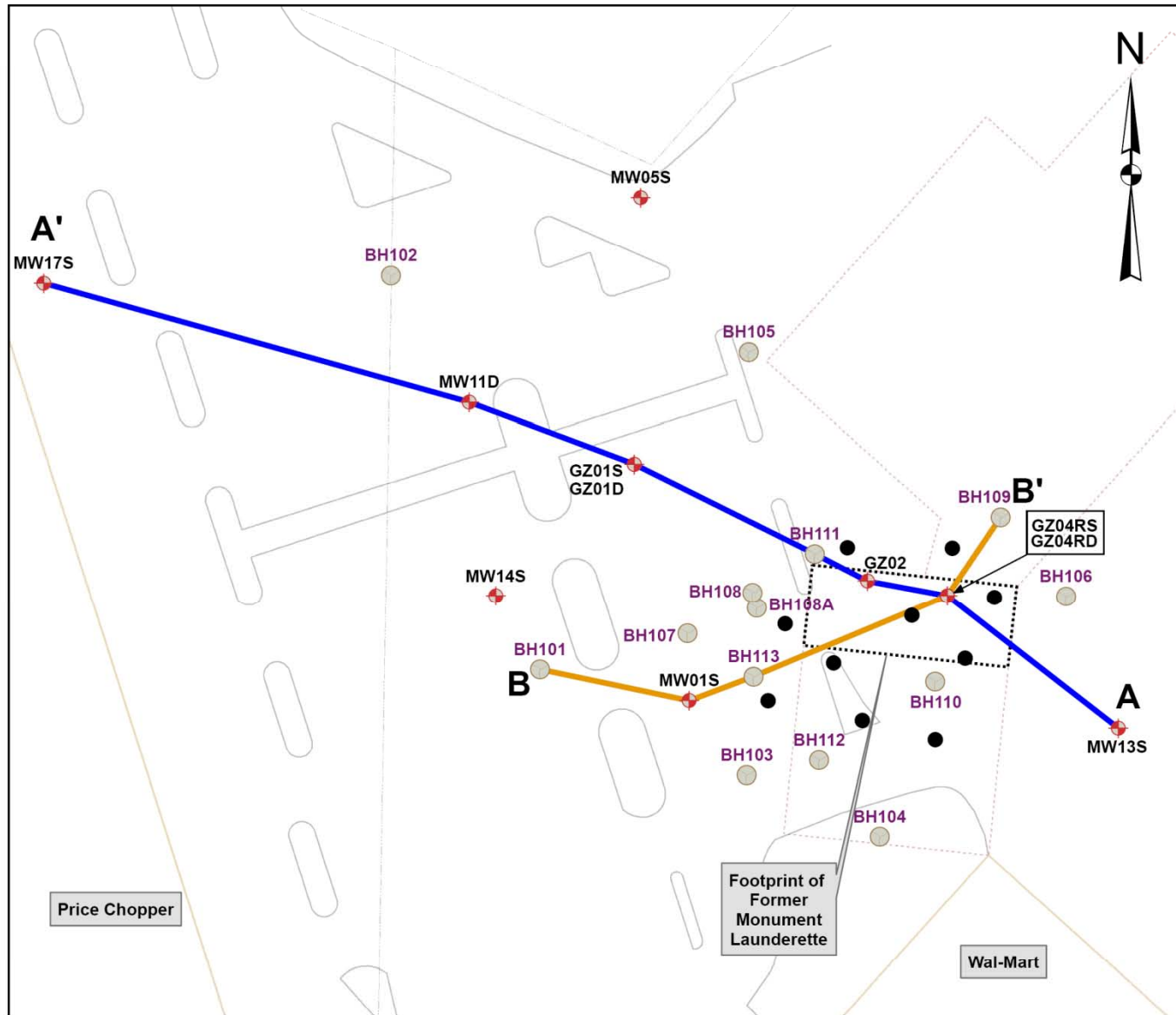
- Letters sent to four PRPs on 03/31/05
- 30 days to respond
- Letters indicated that they should investigate sources, clean-up the site, repay the State

Monument Plaza Site History, Cont.

- Consent Decree sent in 2005
- Negotiations between 2005 and 2006
- 2007: RPs hire New England EnviroStrategies of Gilmanton, NH
- Repay State over \$174K
- Repay EPA

Monument Plaza Site History, Cont.

- Install additional MWs 2007
- Complete CAFI 2007 – reported on 05/31/07
- CAFI results:
 - Residual source material limited in concentration and extent
 - In-situ Chemical oxidation (ISCO) recommended to remediate source
 - CAP submitted 08/08
 - ISCo implemented 10/08 – 11/08
 - Site currently in post-remediation monitoring

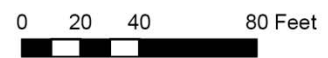


Legend

	Soil Borings		Parcel Boundaries
	Monitoring Wells		Existing Buildings
	Proposed Injection Wells		Former Building Footprint
			Edge of Pavement
			Curb

Note:
 1) BH104 not field located, location is approximate

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FORMER MONUMENT LAUNDERETTE
 NORTHSIDE DRIVE (ROUTE 7)
 BENNINGTON, VT

SECTIONS A-A' AND B-B' LOCATIONS

August 2008 Figure 4

1.23.07

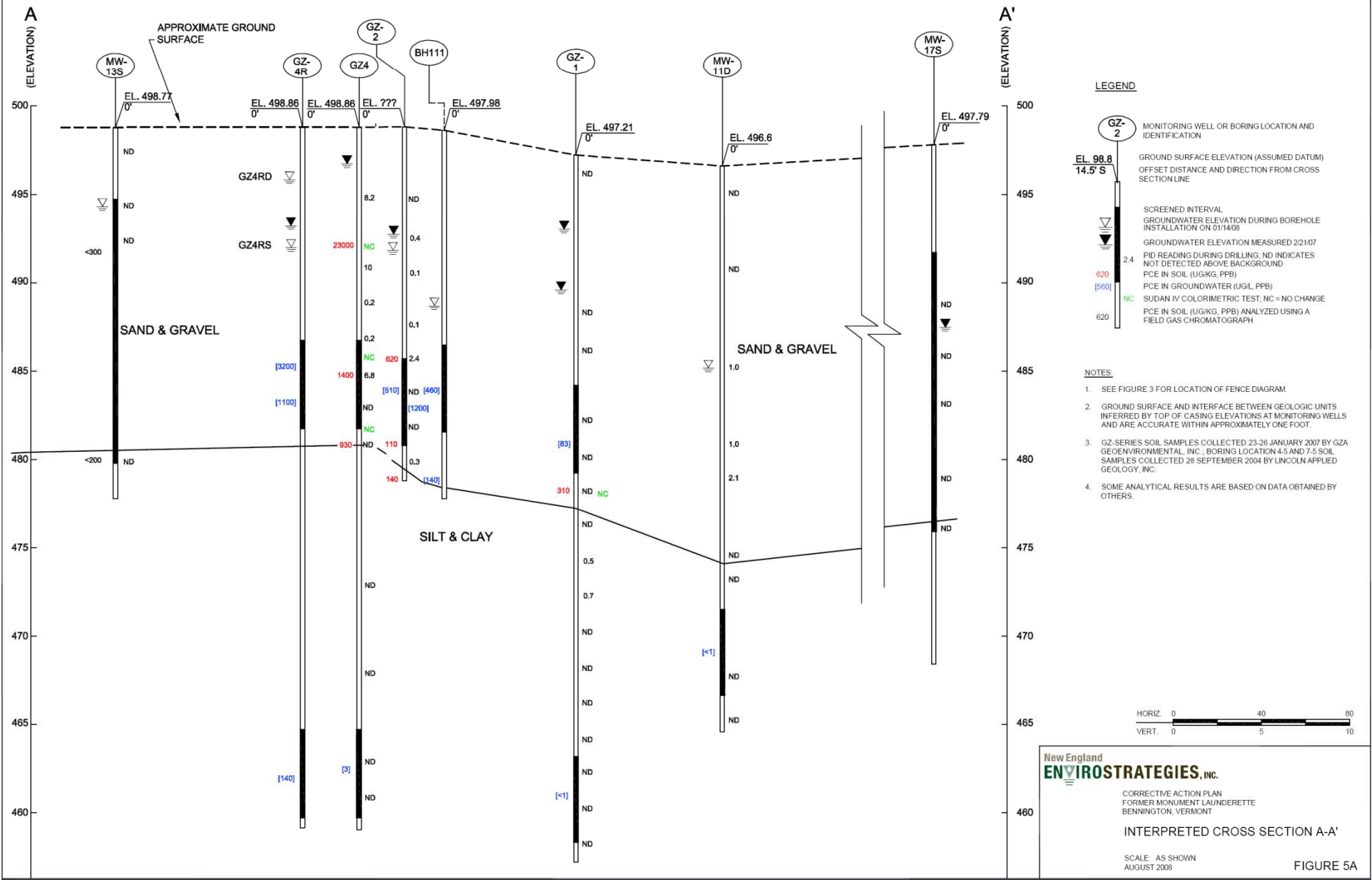
GZ-1

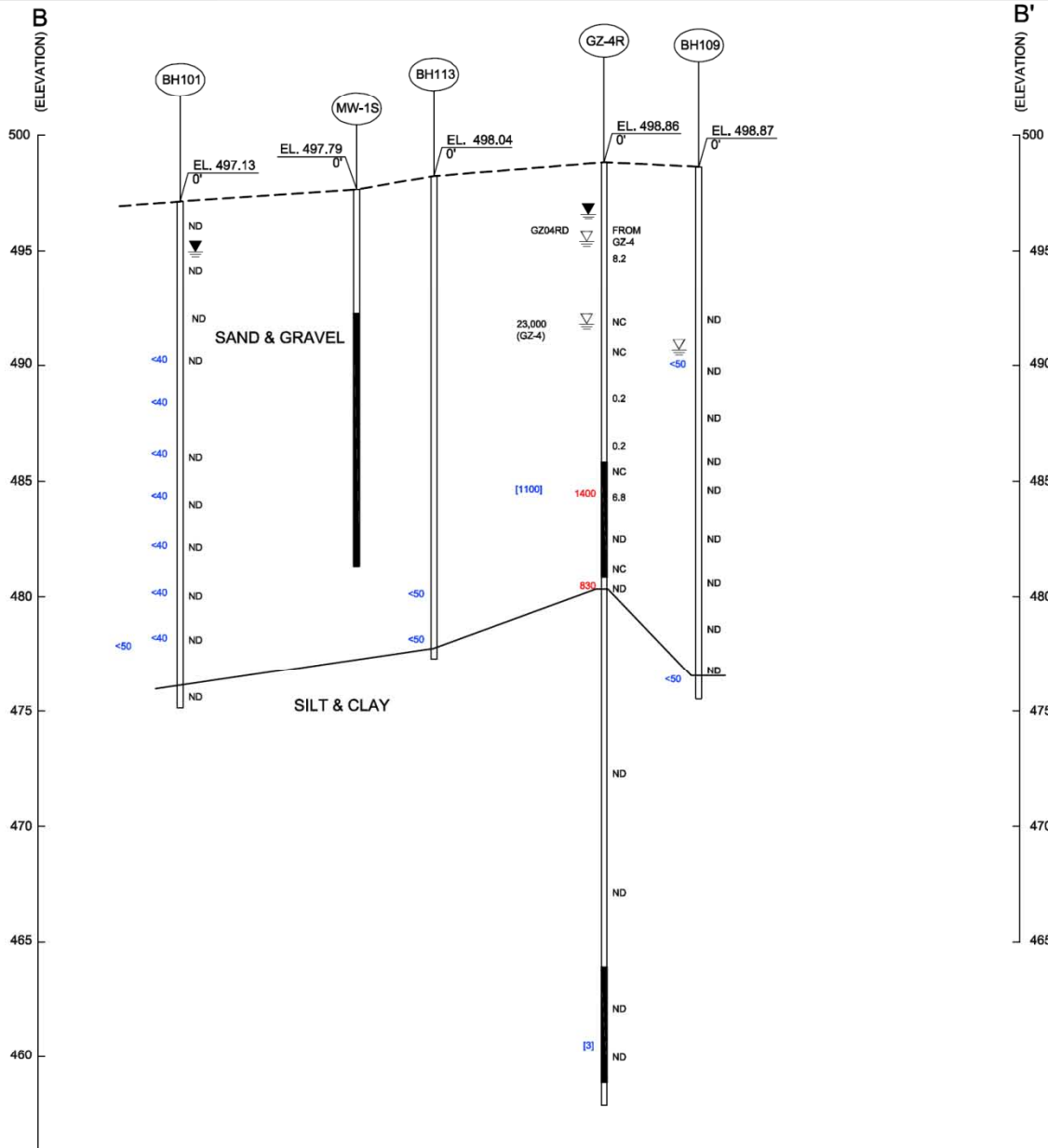
S-3

10-12

BOONE
CLIP ON







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FORMER MONUMENT LAUNDERETTE
BENNINGTON, VERMONT

INTERPRETED CROSS SECTION B-B'

SCALE: AS SHOWN
AUGUST 2008

FIGURE 5B

Important Steps in CA Process

- Bench ISCO steps at PRIMA Labs
- Modeled MnO_4 migration
- Sampled MnO_4 migration using Color Test
- Installed dedicated injection points to apply MnO_4
- Monitored for possible Cr(VI) creation

Lab Test

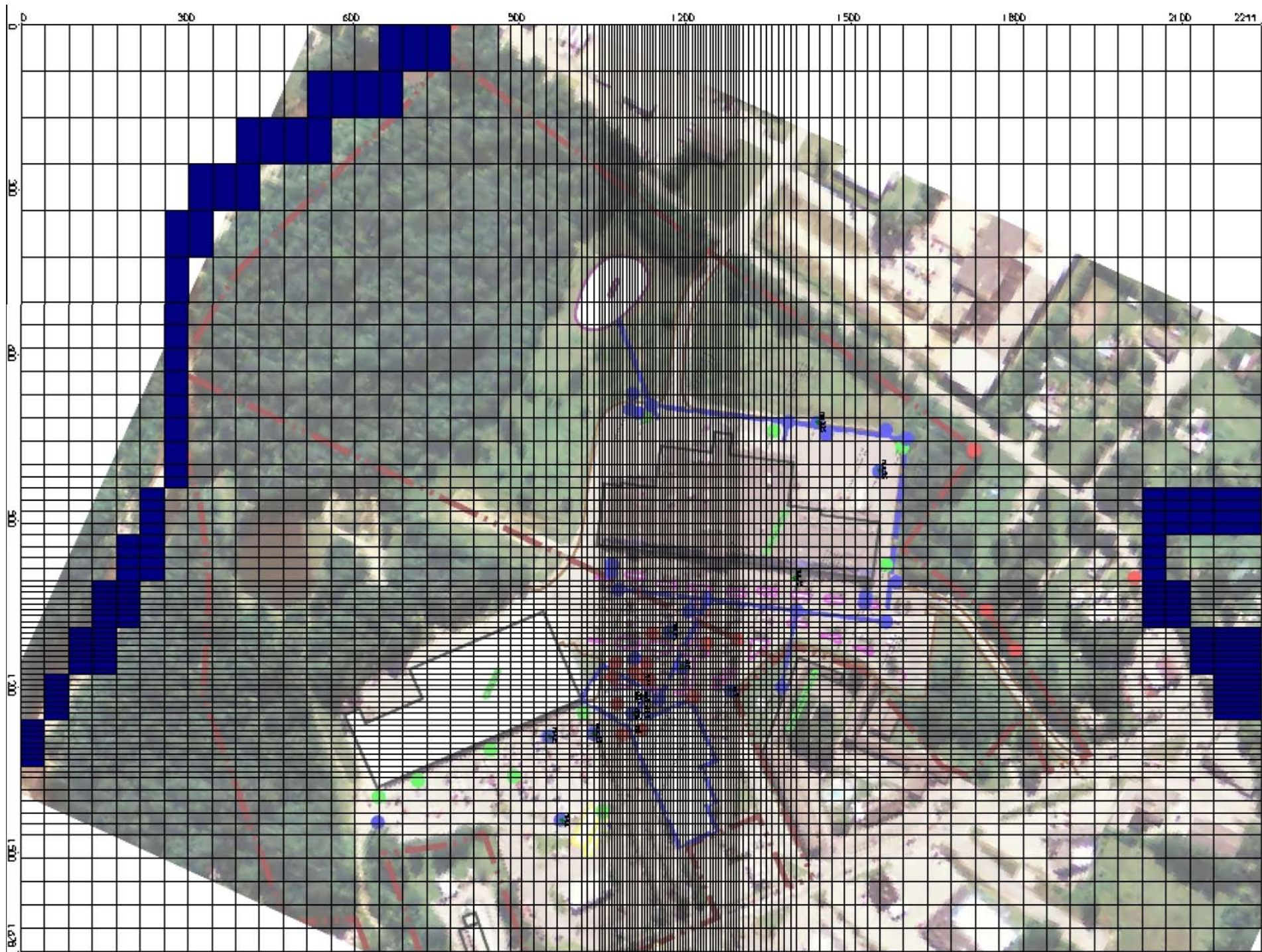
- Test done to determine total soil oxidant demand and destruction routes
- PRIMA Lab results indicated using 400 mg/kg KMnO_4 would result in total destruction of PCE w/in 48 hours
- From this determine 8500 ga of 20% MnO_4
 - Used NaMnO_4

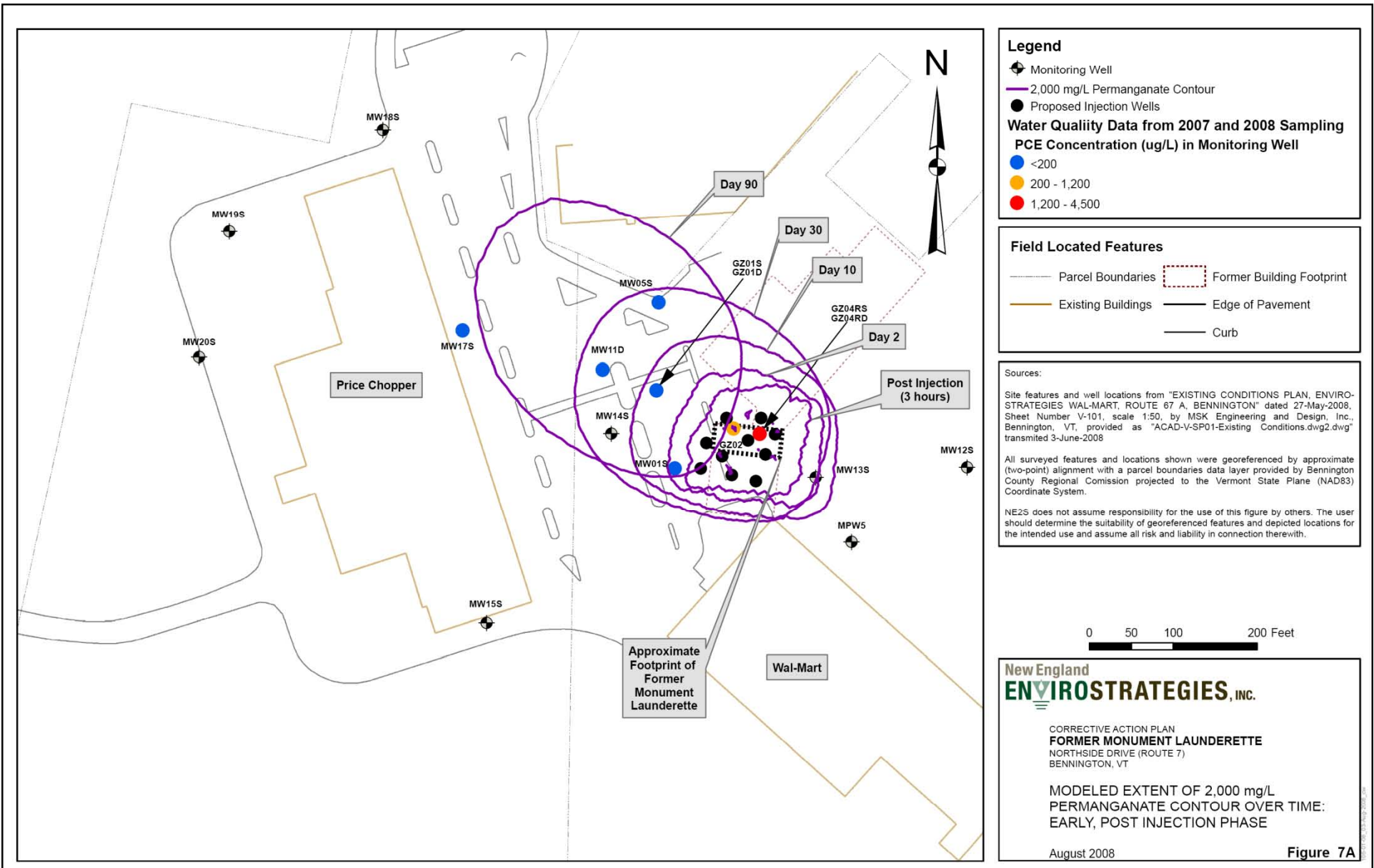
Modeling

- Consultant created dynamic model of site using Modflow
- Model predicted MnO_4 spread and breakdown in aquifer
- Post application monitoring verified model predictions

Possible Cr(VI) Creation

- Problem identified
- Plan to sample for Cr(VI)
- Total Cr standard 100 $\mu\text{g}/\text{L}$ so analyzed GW for Cr and if Cr > 100 $\mu\text{g}/\text{L}$, then perform Cr(VI) analysis
- If Cr(VI) created, biotic (nano-scale zero valent iron, ferrous sulfate, calcium polysulfide), and abiotic (Na-lactate) methods to reduce aquifer





Legend

- Monitoring Well
- 2,000 mg/L Permanganate Contour
- Proposed Injection Wells

Water Quality Data from 2007 and 2008 Sampling

PCE Concentration (ug/L) in Monitoring Well

- <200
- 200 - 1,200
- 1,200 - 4,500

Field Located Features

- Parcel Boundaries
- Existing Buildings
- Former Building Footprint
- Edge of Pavement
- Curb

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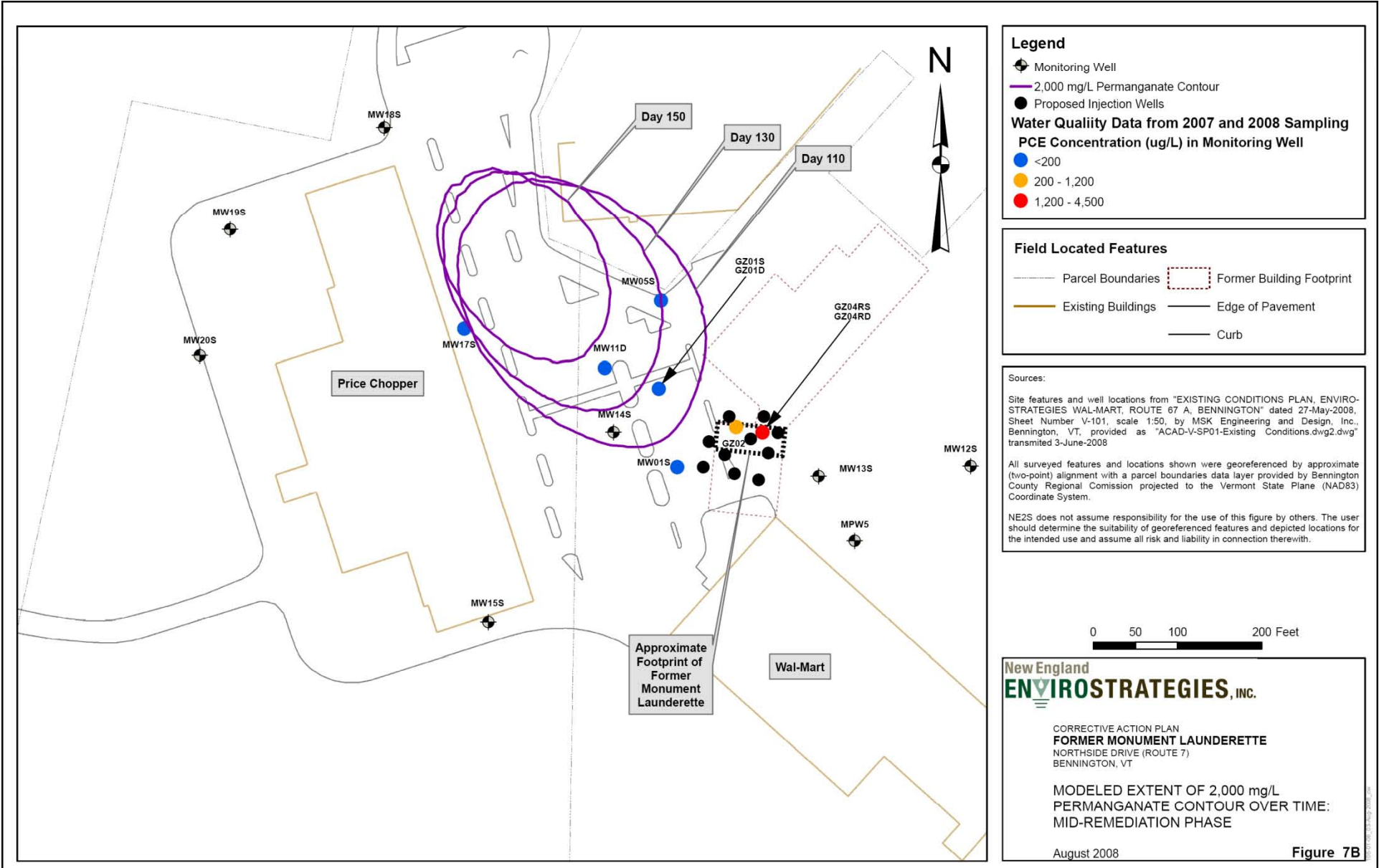


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 NORTHSIDE DRIVE (ROUTE 7)
 BENNINGTON, VT

MODELED EXTENT OF 2,000 mg/L PERMANGANATE CONTOUR OVER TIME: EARLY, POST INJECTION PHASE

August 2008 Figure 7A



Legend

- Monitoring Well
 - 2,000 mg/L Permanganate Contour
 - Proposed Injection Wells
- Water Quality Data from 2007 and 2008 Sampling**
PCE Concentration (ug/L) in Monitoring Well
- <200
 - 200 - 1,200
 - 1,200 - 4,500

Field Located Features

- Parcel Boundaries
- Existing Buildings
- Former Building Footprint
- Edge of Pavement
- Curb

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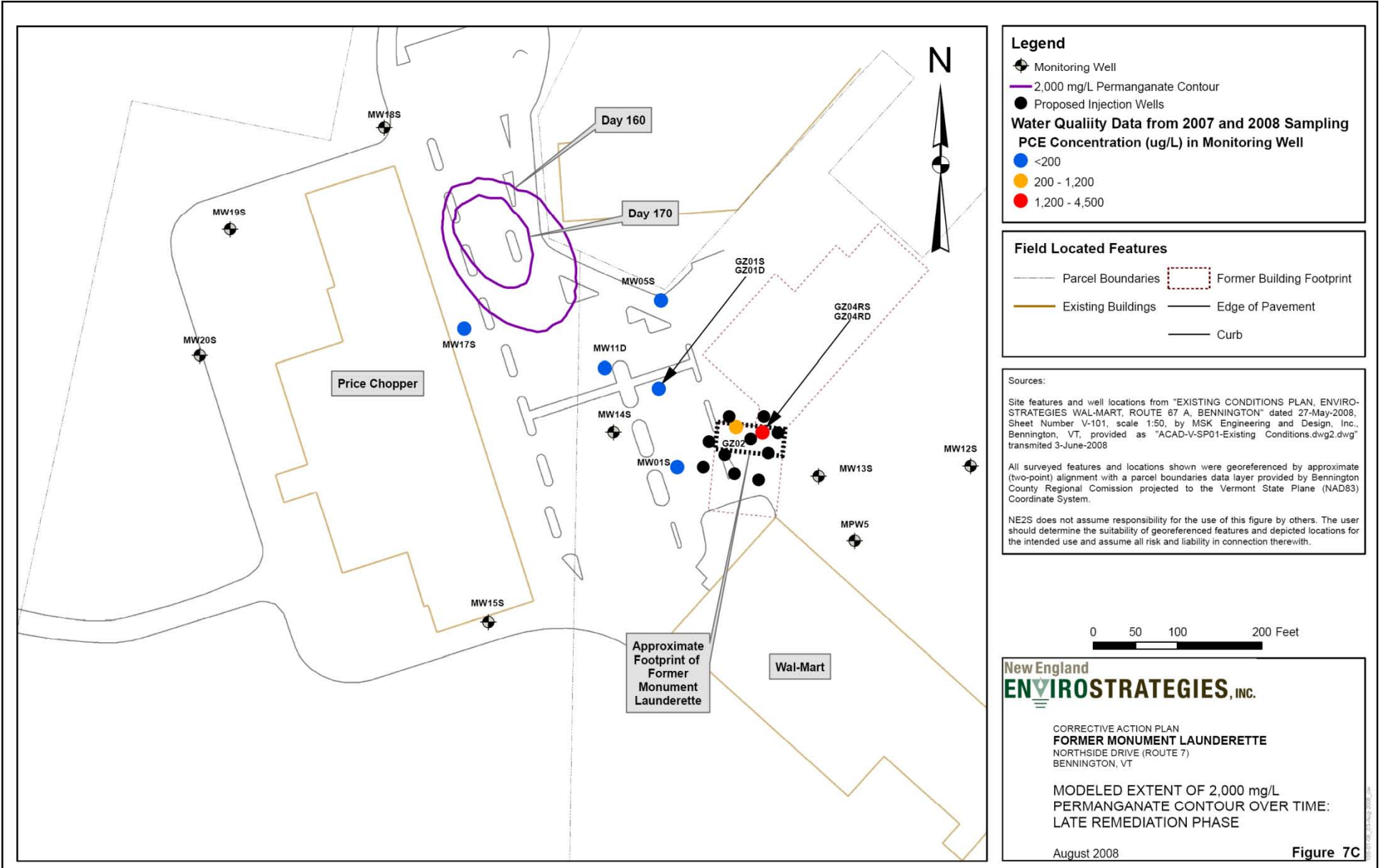
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 BENNINGTON, VT

MODELED EXTENT OF 2,000 mg/L
 PERMANGANATE CONTOUR OVER TIME:
 MID-REMEDIATION PHASE

August 2008

Figure 7B



Legend

- Monitoring Well
- 2,000 mg/L Permanganate Contour
- Proposed Injection Wells

Water Quality Data from 2007 and 2008 Sampling

PCE Concentration (ug/L) in Monitoring Well

- <200
- 200 - 1,200
- 1,200 - 4,500

Field Located Features

- Parcel Boundaries
- Existing Buildings
- Former Building Footprint
- Edge of Pavement
- Curb

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 NORTHSIDE DRIVE (ROUTE 7)
 BENNINGTON, VT

MODELED EXTENT OF 2,000 mg/L PERMANGANATE CONTOUR OVER TIME: LATE REMEDIATION PHASE

August 2008 Figure 7C





















GPI Industrial Grade
Electronic Digital Meter


CALIBRATE
DISPLAY

8.08

Great Plains Industries, Inc. Wichita, KS.
Model Number under battery.






Sodium Permanganate 40% Min
Net Weight: 260kg
UN No: 3214
Haz Class: 5.1
Packing Group: II
Made in China
Batch No.: 20080705
Wintersun Chemical
Ontario, CA 91761
www.wintersunchem.com


Sodium Permanganate 40% Min
Net Weight: 260kg
UN No: 3214
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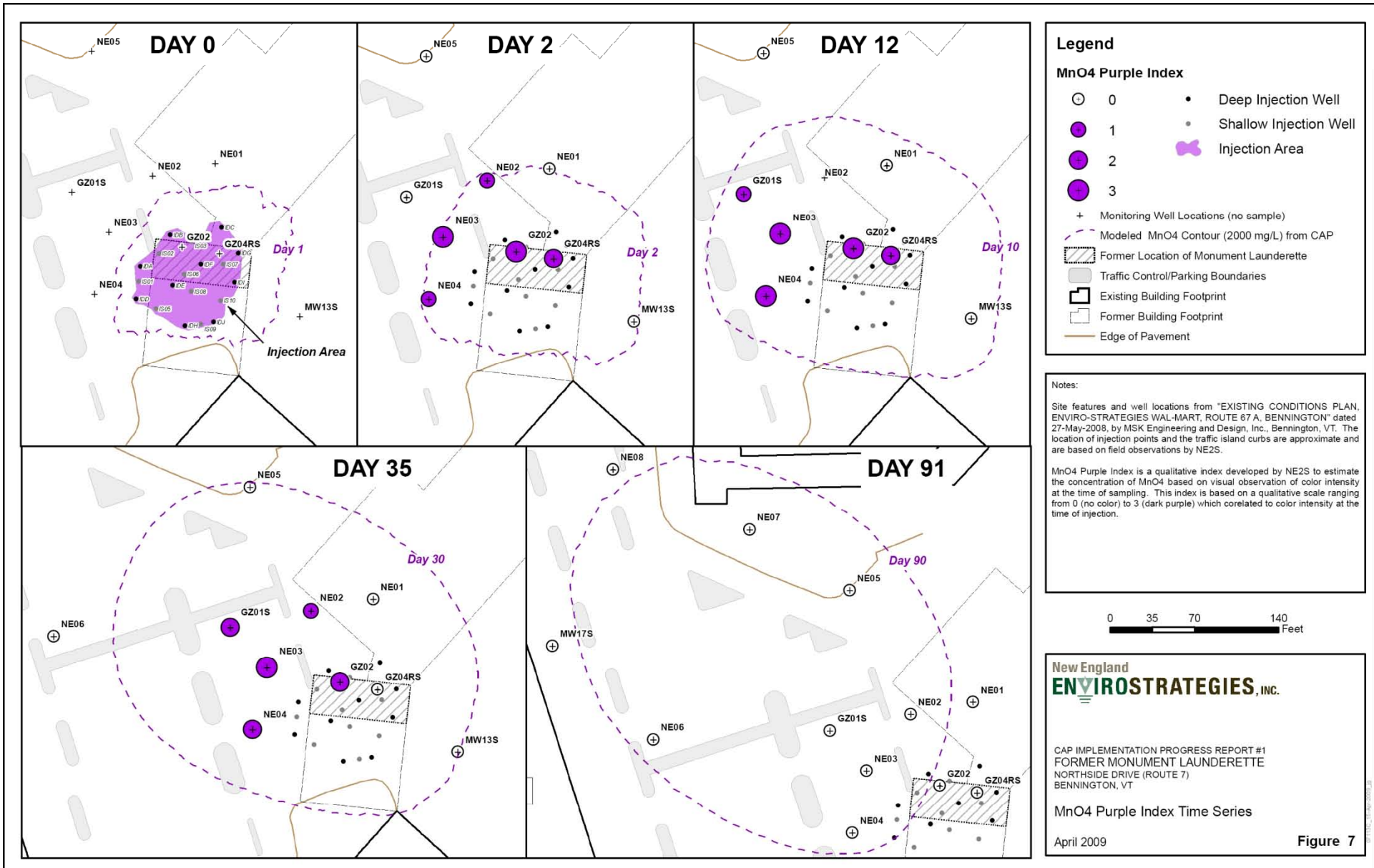
www.wintersunchem.com

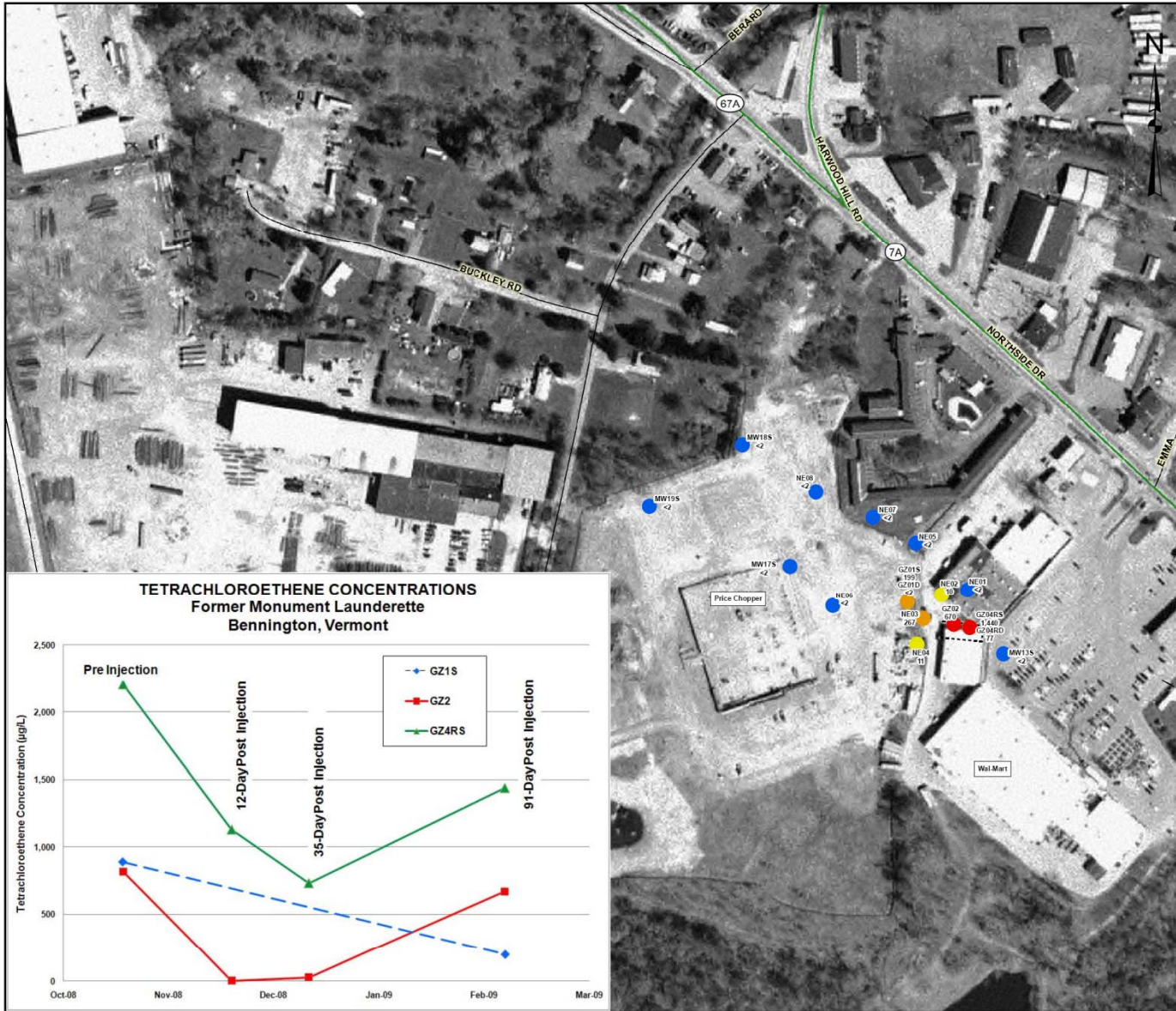












Legend

91 Day PCE Concentrations

- Not Detected <2 ug/L
- 2 - 99 ug/L
- 100 - 499 ug/L
- >500 ug/L

▭ Former Location of Monument Launderette

Sources:

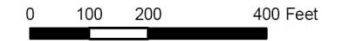
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Note:

For the two well pairs GZ01S/GZ01D and GZ04RS/GZ04RD, the symbology represents only the higher PCE concentration reported for each well pair.



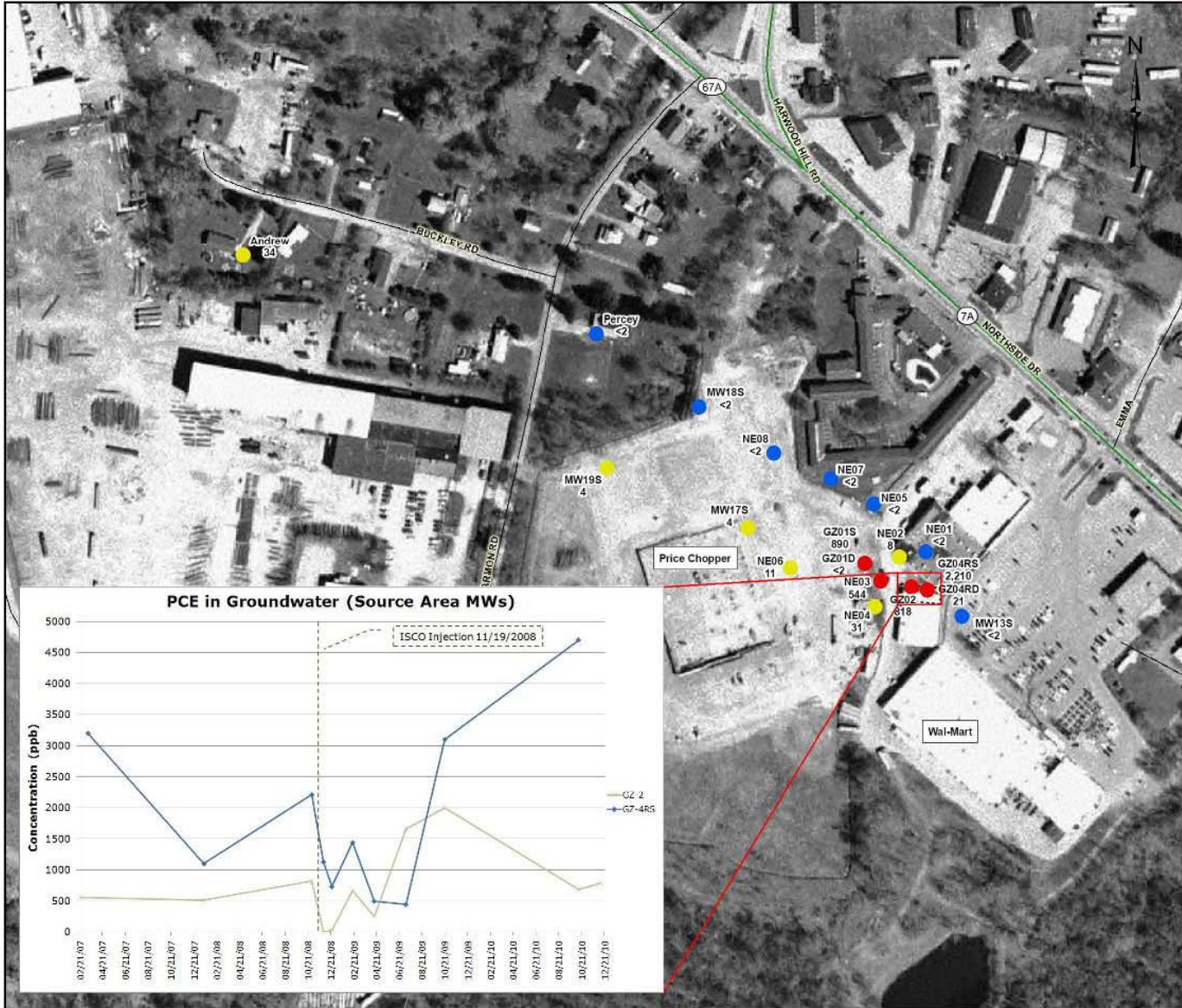
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NORTHSIDE DRIVE (ROUTE 7)
BENNINGTON, VT

Day 91 Post-Injection PCE Concentrations

April 2009

Figure 6



Legend

PCE Concentrations

- Not Detected <2 ug/L
- 2 - 99 ug/L
- 100 - 499 ug/L
- >500 ug/L

⊠ Former Location of Monument Launderette

Sources:

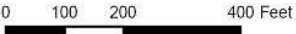
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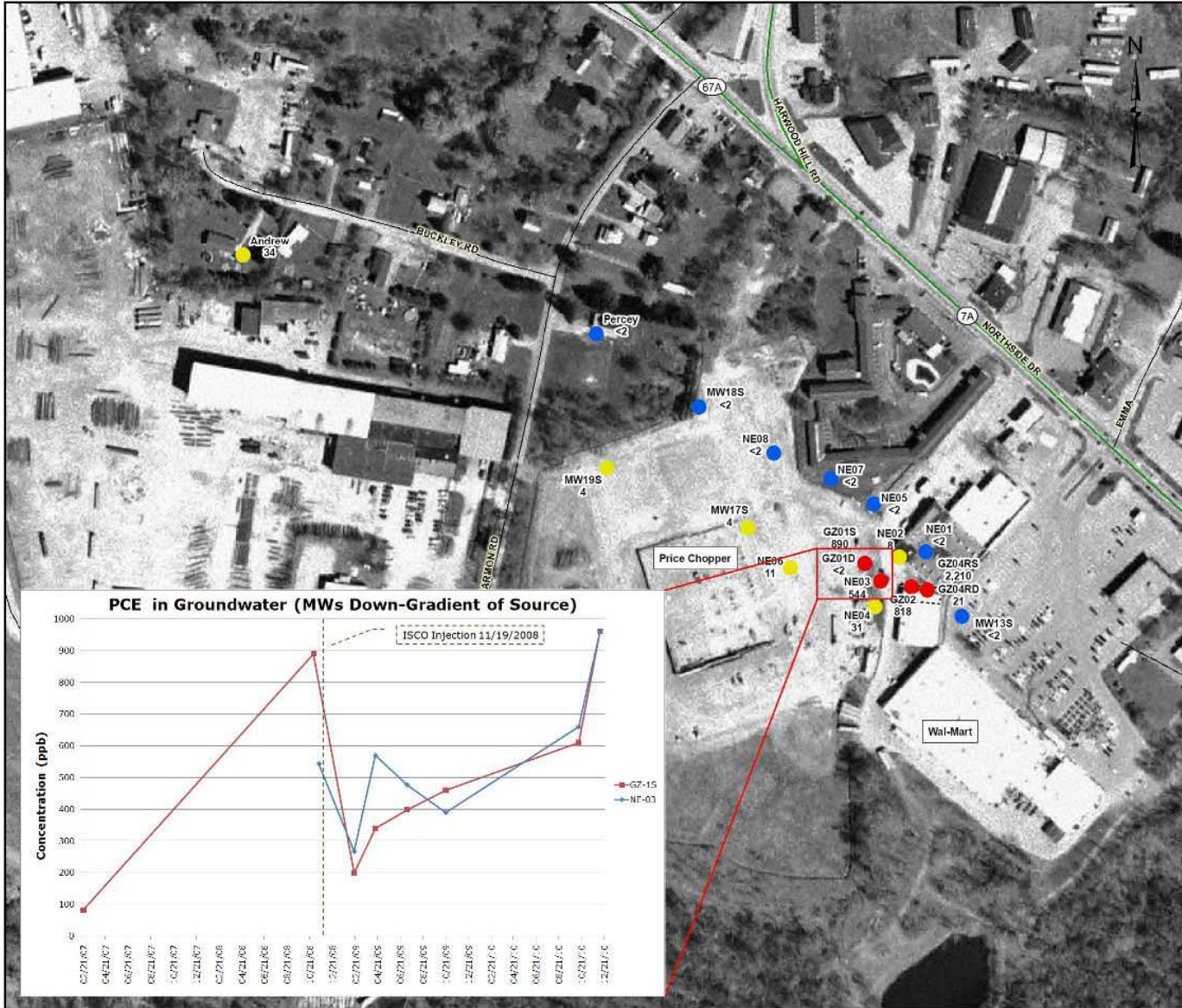


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Pre-Injection PCE Concentrations

April 2009 Figure 5



Legend

PCE Concentrations

- Not Detected <2 ug/L
- 2 - 99 ug/L
- 100 - 499 ug/L
- >500 ug/L

⬡ Former Location of Monument Launderette

Sources:

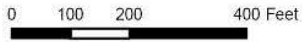
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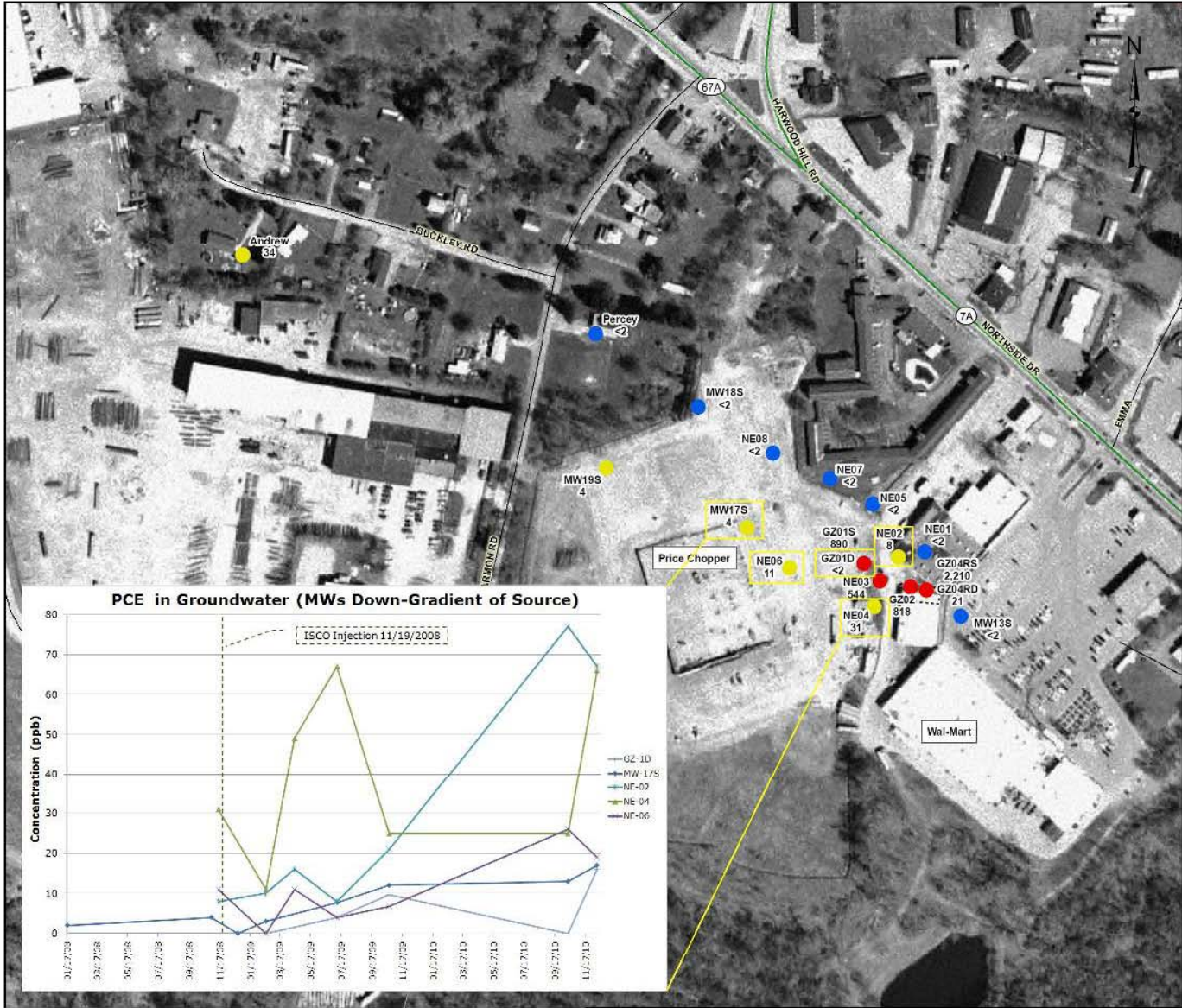


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 NORTHSIDE DRIVE (ROUTE 7)
 BENNINGTON, VT

Pre-Injection PCE Concentrations

April 2009 Figure 5



Legend

PCE Concentrations

- Not Detected <2 ug/L
- 2 - 99 ug/L
- 100 - 499 ug/L
- >500 ug/L

⌚ Former Location of Monument Launderette

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 BENNINGTON, VT

Pre-Injection PCE Concentrations

April 2009 Figure 5

Monument Plaza Presentation

Thanks for your attention!!!

Any Questions???

Richard Spiese

Waste Management Division

802-241-3880

Richard.spiese@state.vt.us