BERKELEY LAB

Environment / Health / Safety
DIVISION
Environmental Services

Via email and certified mail
Receipt No. 7011 2970 0003 2882 6640

Reference No.: ES-14-041

January 24, 2014

Mr. Jacinto Soto
Project Manager, Brownfields and Environmental Restoration Program
Department of Toxic Substances Control
700 Heinz Ave., Suite 200
Berkeley, CA 94710-2737

Subject: Lawrence Berkeley National Laboratory (LBNL) Status Report for Old Town Groundwater Plume Building 52 Lobe and Building 25 Subplume and Request to Modify Well Operation Based on Rebound Testing Analytical Results

Dear Mr. Soto,

Attached for your review and approval is a status report on the rebound testing for the Old Town Groundwater Plume Building 52 Lobe and Building 25 Subplume. Based on the analytical results obtained to date, LBNL recommends that rebound testing continue as planned, with a minor modification to the Building 52 Lobe *in situ* soil flushing system.

LBNL is requesting that California Environmental Protection Agency Department of Toxic Substance Control (DTSC) approve modification of two groundwater injection wells at the upgradient edge of the Building 52 Lobe to operate as groundwater extraction wells. Extraction would proceed concurrently with the rebound test to assess whether groundwater extraction (rather than injection) in the source area is a more effective method for controlling the migration of the contaminated groundwater.

Please contact David Baskin (dabaskin@lbl.gov) at 510-486-5684 or me (ropauer@lbl.gov) at 510-486-7614 if you have any questions or require additional information.

Sincerely,

Ron Pauer

Ron Pauer
Environmental Manager

cc via email:

Kim Abbott (kvabbott@lbl.gov)
David Baskin (dabaskin@lbl.gov)
Jim Floyd (JGFloyd@lbl.gov)
Iraj Javandel (ijavandel@lbl.gov)
David Kestell (djkestell@lbl.gov)
Jack Salazar (jjsalazar@lbl.gov)
Karen Toth (ktoth@dtsc.ca.gov

Ernest Orlando Lawrence Berkeley National Laboratory
One Cyclotron Road | Berkeley, California 94720 | Mail Stop 75R0123 | Tel: 510.486.7614 | Fax: 510.486.6939
Email: ROPauer@lbl.gov

WORKPLAN FOR REBOUND TESTING OF
OLD TOWN GROUNDWATER PLUME
BUILDING 52 LOBE AND BUILDING 25 SUBPLUME:

FIRST STATUS REPORT AND REQUEST TO MODIFY WELL OPERATION

Lawrence Berkeley National Laboratory
Environmental Services Group
Environmental Restoration Program

January 2014

Owner: United States Department of Energy
1 Cyclotron Road
MS90-1023
Berkeley, CA 94720

Operator: University of California Lawrence Berkeley National Laboratory
1 Cyclotron Road
Berkeley, CA 94720

This work was done at the Lawrence Berkeley National Laboratory, which is operated by the University of California for the U. S. Department of Energy under contract DE-AC02-05CH11231.

WORKPLAN FOR REBOUND TESTING OF
OLD TOWN GROUNDWATER PLUME
BUILDING 52 LOBE AND BUILDING 25 SUBPLUME:

FIRST STATUS REPORT AND REQUEST TO MODIFY WELL OPERATION

Lawrence Berkeley National Laboratory
Environmental Services Group
Environmental Restoration Program

January 2014

Prepared by:

David Baskin

Date: 24 Jan 2014

David Baskin, Professional Geologist
LBNL Environmental Restoration Program

Reviewed by:

Date: 24 Jan 2014

David S. Diamond, Certified Hydrogeologist

Approved by:

Ron Pauer

Date: 1/24/2014

Ron Pauer
LBNL Environmental Services Group Manager

CONTENTS

LIST OF ABBREVIATIONS ..... **III**

1.0 BACKGROUND **1**

2.0 BUILDING 25 SUBPLUME REBOUND TEST **2**

2.1 STATUS 2
2.2 RECOMMENDATIONS 2

3.0 BUILDING 52 LOBE REBOUND TEST **4**

3.1 STATUS 4
3.2 RECOMMENDATIONS 4

LIST OF FIGURES **6**

LIST OF ABBREVIATIONS

DTSC	Cal-EPA Department of Toxic Substances Control
GAC	Granular Activated Carbon
LBNL	Lawrence Berkeley National Laboratory
MCL	Maximum Contaminant Level (for drinking water)
MCS	Media Cleanup Standard
µg/L	micrograms per liter (10^{-6} grams per liter)
PCE	Tetrachloroethylene (Perchloroethene)
TCE	Trichloroethylene
VOCs	Volatile Organic Compounds

1.0 BACKGROUND

On April 24, 2013, Lawrence Berkeley National Laboratory (LBNL) submitted a Workplan for Rebound Testing of Old Town Groundwater Plume Building 52 Lobe and Building 25 Subplume to the California Environmental Protection Agency Department of Toxic Substance Control (DTSC). The DTSC approved the workplan in a letter dated June 25, 2013. The Workplan provided the rationale and established the requirements for conducting rebound testing of contaminant concentrations in the groundwater in the Building 52 Lobe and Building 25 Subplume, two areas of groundwater contamination where soil flushing systems have operated for more than seven years. The locations of the two areas are shown on Figure 1.

This status report provides a brief summary of test progress and recommendations based on the data collected to date. Prior to the start of rebound testing, contaminant concentrations in the groundwater had been reduced in both the Building 52 Lobe and Building 25 Subplume to concentrations less than Maximum Contaminant Levels (MCLs) for drinking water, which are the DTSC-required Media Cleanup Standards (MCSs) for these areas. The purpose of the rebound testing is to assess whether contaminant concentrations can be sustained at levels less than the MCSs in the absence of continued in situ soil flushing, or if not, whether continued soil flushing is likely to be effective in achieving the required MCSs in a reasonable time frame.

2.0 BUILDING 25 SUBPLUME REBOUND TEST

2.1 STATUS

The rebound test for the Building 25 Subplume started on September 16, 2013. The test consists of termination of groundwater extraction from well MW25-95-5, termination of injection of treated water into MW25-98-10, and shutdown of the Building 25 granular activated carbon (GAC) treatment system. Required test monitoring consists of analyzing groundwater samples collected from injection well MW25-98-10 and extraction well MW25-95-5 for volatile organic compounds (VOCs). The configuration of the soil flushing system and the locations of the rebound test monitoring wells are shown on Figure 2. Analytical results for samples collected during the rebound test are provided in Table 1. Concentration trends for the three VOCs detected both prior to and during the test in MW25-98-10 and MW25-95-5 are shown on Figure 3. The results indicate that concentrations of tetrachloroethene (PCE), trichloroethene (TCE), and/or chloroform have rebounded slightly in the two wells since the test began, but concentrations of all VOCs still remain below MCLs.

2.2 RECOMMENDATIONS

At this time, there are no plans to request that the rebound test for the Building 25 Subplume be terminated or recommend any modifications to the Building 25 Subplume in situ soil flushing system.

Table 1
Building 25 Subplume and Building 52 Lobe Rebound Test Well Results
Volatile Organic Compounds - EPA Method 8260
(concentrations in µg/L)

Building 25 Subplume

Chemical of Potential Concern	MCL	25-95-5			25-98-10		
		9/30/13	12/11/13	1/13/14	9/30/13	12/11/13	1/13/14
Carbon Tetrachloride	0.5	<0.5	<1.2	<0.5	<0.5	<0.5	<0.5
Chloroform	80	<0.5	<1.2	<0.5	<0.5	0.88	0.9
1,1-Dichloroethane	5	<0.5	<1.2	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5	<0.5	<1.2	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	6	<0.5	<1.2	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethene	6	<0.5	<1.2	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	10	<0.5	<1.2	<0.5	<0.5	<0.5	<0.5
Methylene Chloride	5	<1	<2.5	<10	<1	<1	<10
Tetrachloroethene	5	<0.5	<1.2	0.5	<0.5	0.73	0.8
1,1,1-Trichloroethane	200	<0.5	<1.2	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	5	<0.5	<1.2	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	<0.5	<1.2	1.3	1.1	3.0	3.4
Vinyl Chloride	0.5	<0.5	<1.2	<0.5	<0.5	<0.5	<0.5

Building 52 Lobe

Chemical of Potential Concern	MCL	27-92-20		SB27-96-1*		52-98-9		52A-98-8B		53-93-9		MW91-8		MW91-9		SB5A-98-1		EW53-04-2		IW5-04-1	IW5-04-2
		10/9/13	12/4/13	10/9/13	12/4/13	9/23/13	11/19/13	9/30/13	11/22/13	9/23/13	11/14/13	10/14/13	12/11/13	9/20/13	11/14/13	9/30/13	11/19/13	9/23/13	11/14/13	12/6/13	12/6/13
Carbon Tetrachloride	0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<0.5	<0.5
Chloroform	80	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<0.5	<3	<3	<3	<3	<3	<3	<0.5	1.7
1,1-Dichloroethane	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<0.5	<0.5
1,2-Dichloroethane	0.5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.5	<2	<2	<2	<2	<2	<2	<0.5	<0.5
1,1-Dichloroethene	6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<0.5	<0.5
cis-1,2-Dichloroethene	6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<0.5	2.1
trans-1,2-Dichloroethene	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<0.5	<0.5
Methylene Chloride	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	5	<1	<1	<1	1.5	<1	<1	<1	<1	<1	<1	<1	4.3	4.2	3.7	15	28.3	<1	<1	4.3	2.1
1,1,1-Trichloroethane	200	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<0.5	<0.5
1,1,2-Trichloroethane	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<0.5	<0.5
Trichloroethene	5	<1	<1	<1	1.1	<1	<1	<1	1.4	<1	<1	<1	<0.5	2.4	2.1	<1	<1	<1	<1	<0.5	3.9
Vinyl Chloride	0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<0.5	<0.5
Other VOCs Detected																					
Acetone																					12

* Additional B52 lobe well sampled

3.0 BUILDING 52 LOBE REBOUND TEST

3.1 STATUS

The rebound test for the Building 52 Lobe started on September 11, 2013. The configuration of the soil flushing system and the scope of the rebound test are illustrated on Figure 4. As shown on the figure, the test consists of the termination of groundwater injection and extraction from several wells. The Building 53 GAC system used for the Building 52 Lobe soil flushing system remains in operation since it also treats groundwater from another source (the Building 7 Lobe). Required test monitoring consists of collecting groundwater samples at 13 locations for VOC analysis. The locations of the rebound test monitoring wells are shown on Figure 5. Samples have also been collected from SB27-96-1, an additional location in the Building 52 lobe.

Concentration trends for VOCs detected above MCLs prior to the start of the test in the rebound test monitoring wells are shown on Figures 6a through 6d for source area wells and Figures 7a through 7c for core and downgradient area wells. These data show that only PCE in well SB5A-98-1 has rebounded to a level above the MCL. SB5-98-01 is located only a short distance upgradient of injection well IW5-04-1. PCE concentrations in this well increased from 15 micrograms per liter (µg/L) on September 30, 2013 to 28.3 µg/L (approximately six times the MCL) on November 19, 2013 (Table 1 and Figure 6a). This concentration is approaching the level observed prior to soil flushing.

3.2 RECOMMENDATIONS

The increasing level of PCE in SB5A-98-1 indicates that PCE concentrations in groundwater in the relatively impermeable Orinda Formation at the upgradient edge of the lobe will exceed MCLs in the absence of soil flushing. If this contamination is not controlled it could migrate downgradient into the relatively permeable Moraga Formation rocks that underlie most of the Building 52 Lobe, resulting in groundwater contamination above MCLs.

Although there are no current plans to terminate the rebound test, LBNL is requesting that DTSC approve modification of groundwater injection wells IW5-04-1 and IW5-04-2 to operate as

groundwater extraction wells to control the migration of contaminated groundwater in the source area. The proposed configuration is shown on Figure 8. Extraction would proceed concurrently with the rebound test to assess whether groundwater extraction (rather than injection) in the source area is a more effective method for controlling the migration of the contaminated groundwater.

LIST OF FIGURES

Key to Symbols Used on Figures

Figure 1. Locations of Building 25 Subplume and Building 52 Lobe – Old Town Groundwater Plume

Figure 2. Locations of Building 25 Subplume Rebound Test Monitoring Wells.

Figure 3. Concentration Trends for VOCs, Building 25 Subplume (South of Building 25).

Figure 4. Building 52 In Situ Soil Flushing System, Showing Scope of Rebound Test.

Figure 5. Locations of Building 52 Lobe Rebound Test Monitoring Wells.

Figure 6a. Concentration Trends for PCE, Building 52 Lobe Source Area.

Figure 6b. Concentration Trends for TCE, Building 52 Lobe Source Area.

Figure 6c. Concentration Trends for Cis-1,2-DCE and 1,1-DCE, Building 52 Lobe Source Area.

Figure 6d. Concentration Trends for Carbon Tetrachloride and Chloroform, Building 52 Lobe Source Area.

Figure 7a. Concentration Trends for PCE and TCE, Building 52 Lobe Core and Downgradient Areas.

Figure 7b. Concentration Trends for Cis-1,2-DCE and 1,1-DCE, Building 52 Lobe Core and Downgradient Areas.

Figure 7c. Concentration Trends for Carbon Tetrachloride and Chloroform, Building 52 Lobe Core and Downgradient Areas.

Figure 8. Building 52 In Situ Soil Flushing System Showing Proposed Modifications.

MW52-98-9 Groundwater monitoring well

T SB52A-98-1 Temporary groundwater sampling point

EW Groundwater extraction well

IW Groundwater injection well

700 Topographic contour line (elevation in ft above mean sea level)

53 Surface structure (e.g. buildings, etc.)

52 Former building location

90K Building under construction

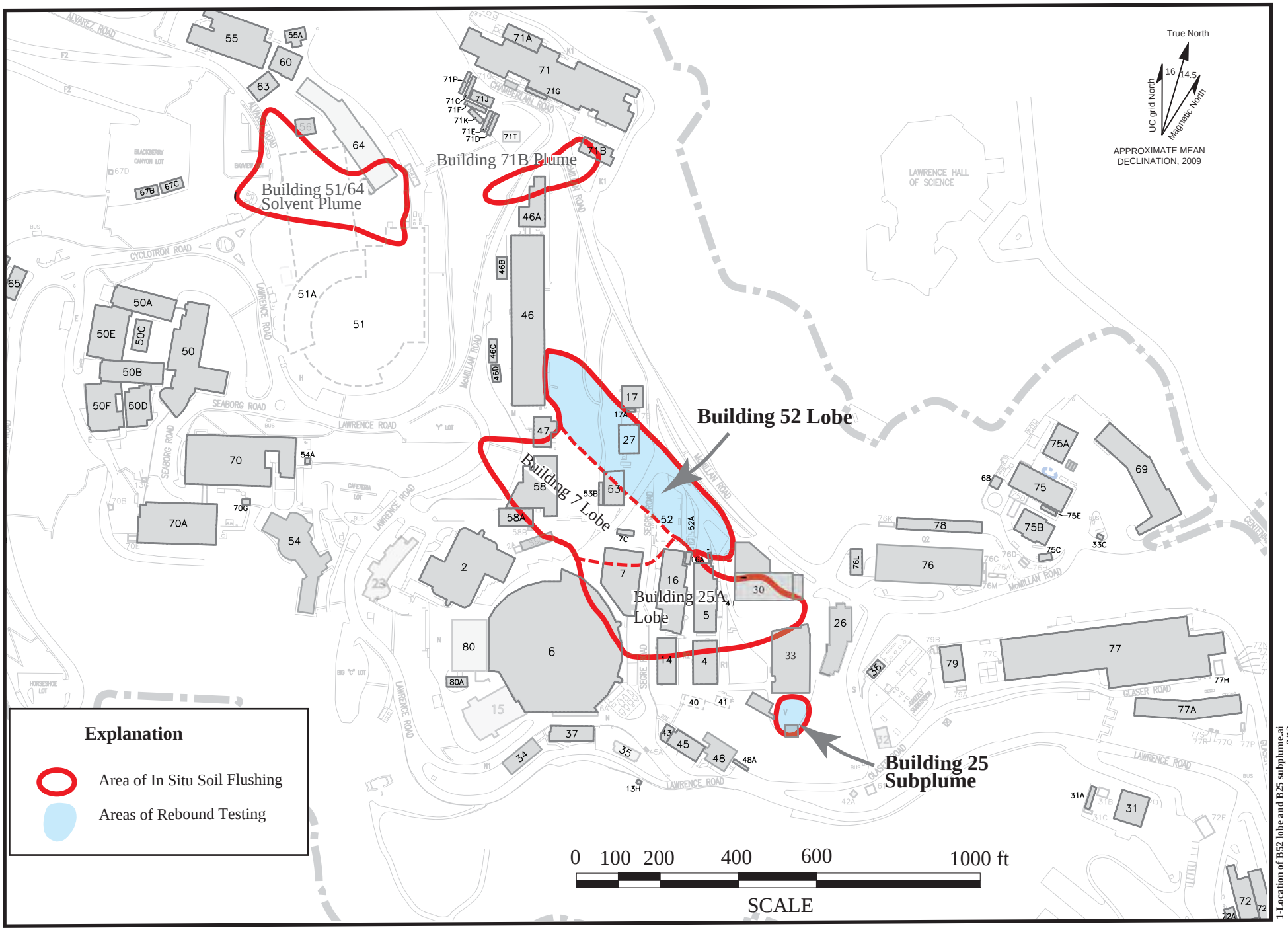
Groundwater collection trench

GAC GAC Granular activated carbon (GAC) treatment system

NOTES:
All other symbols used are explained on the figures.

Symbols.ai
1/14

Key to Symbols Used on Figures.



1-Location of B52 lobe and B25 subplume.ai
3/13

Figure 1. Locations of Building 25 Subplume and Building 52 Lobe - Old Town Groundwater Plume.

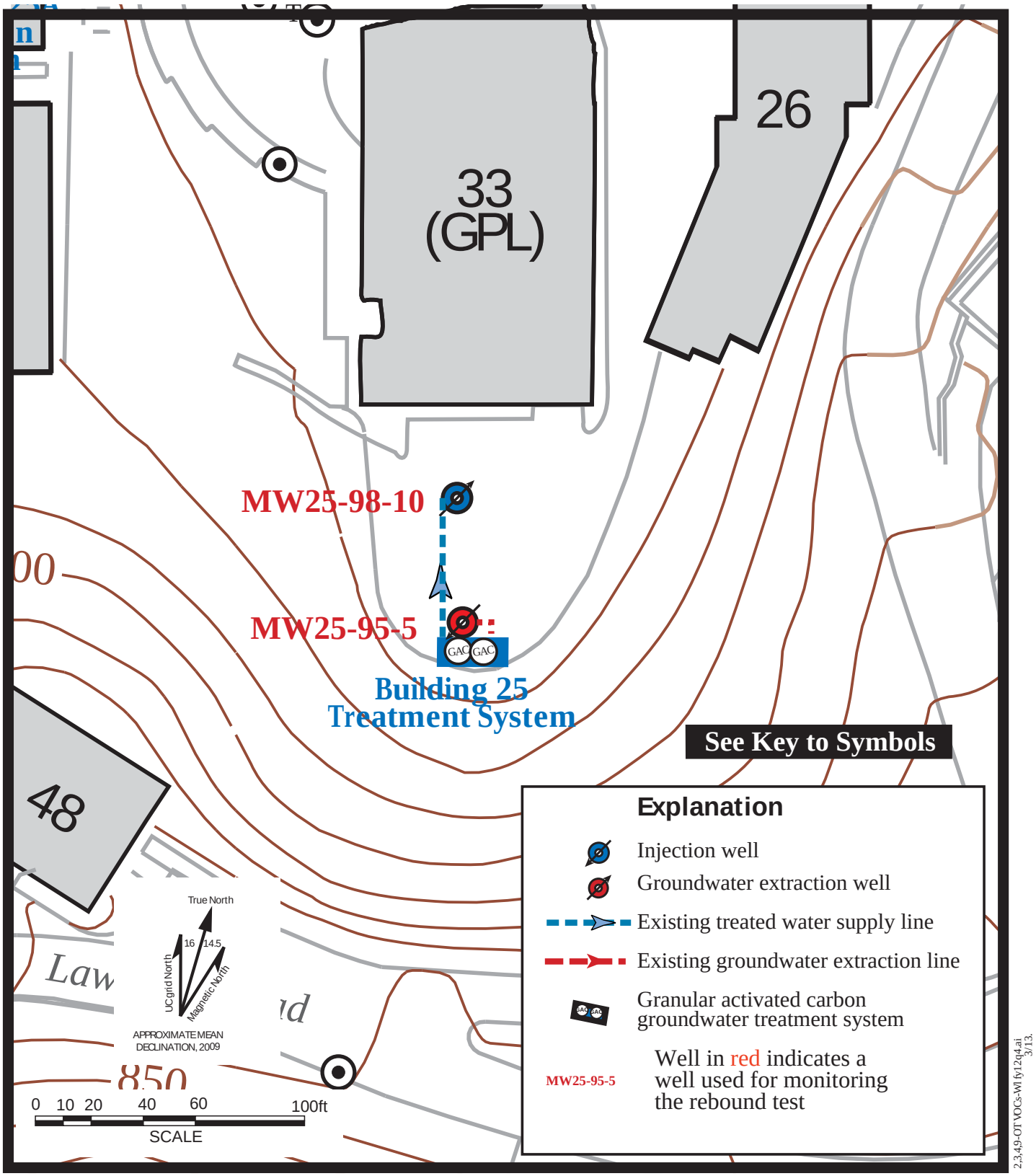


Figure 2. Locations of Building 25 Subplume Rebound Test Monitoring Wells.

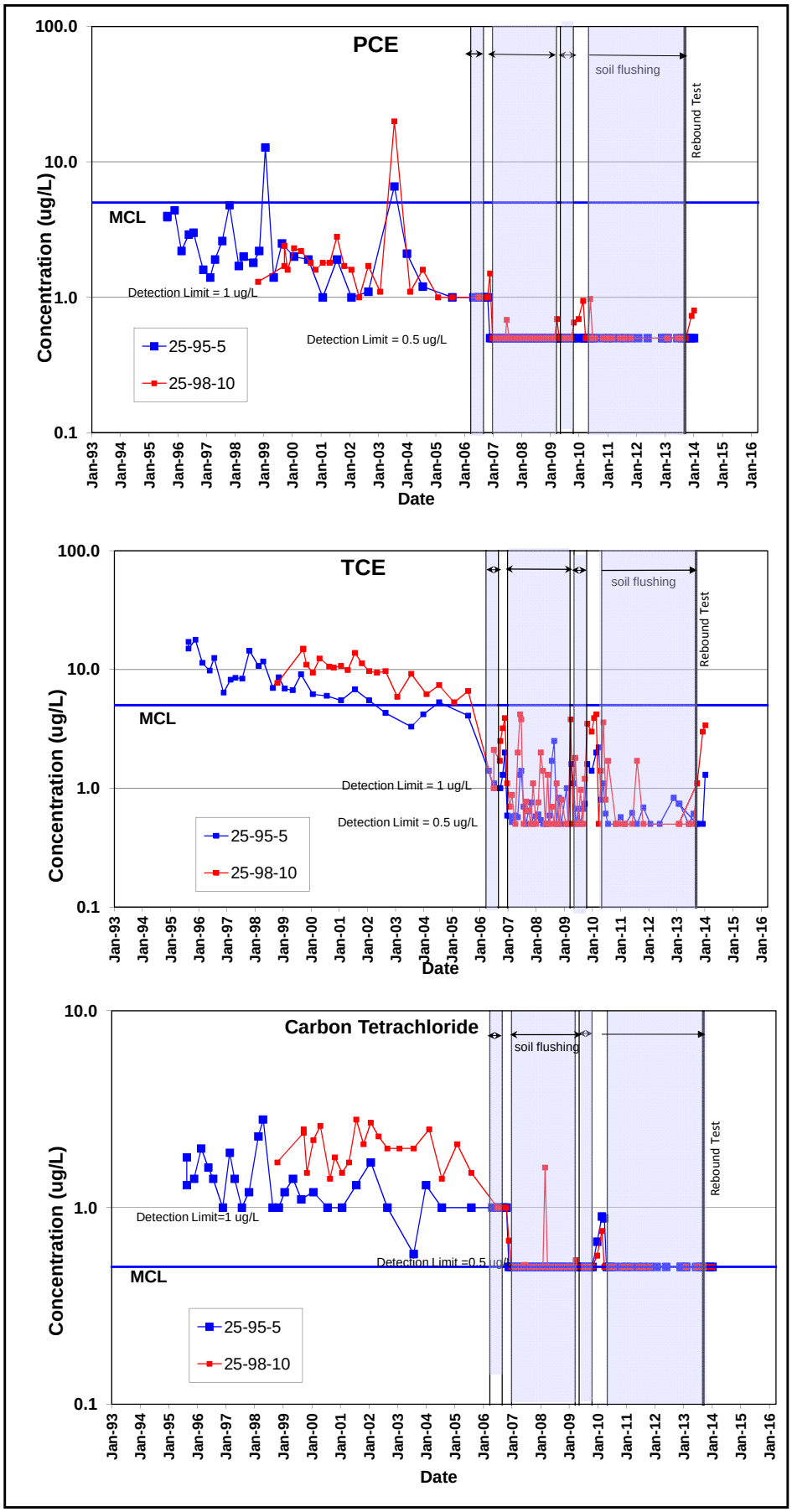


Figure 3. **Concentration Trends for VOCs, Building 25 Subplume (South of Building 25).**

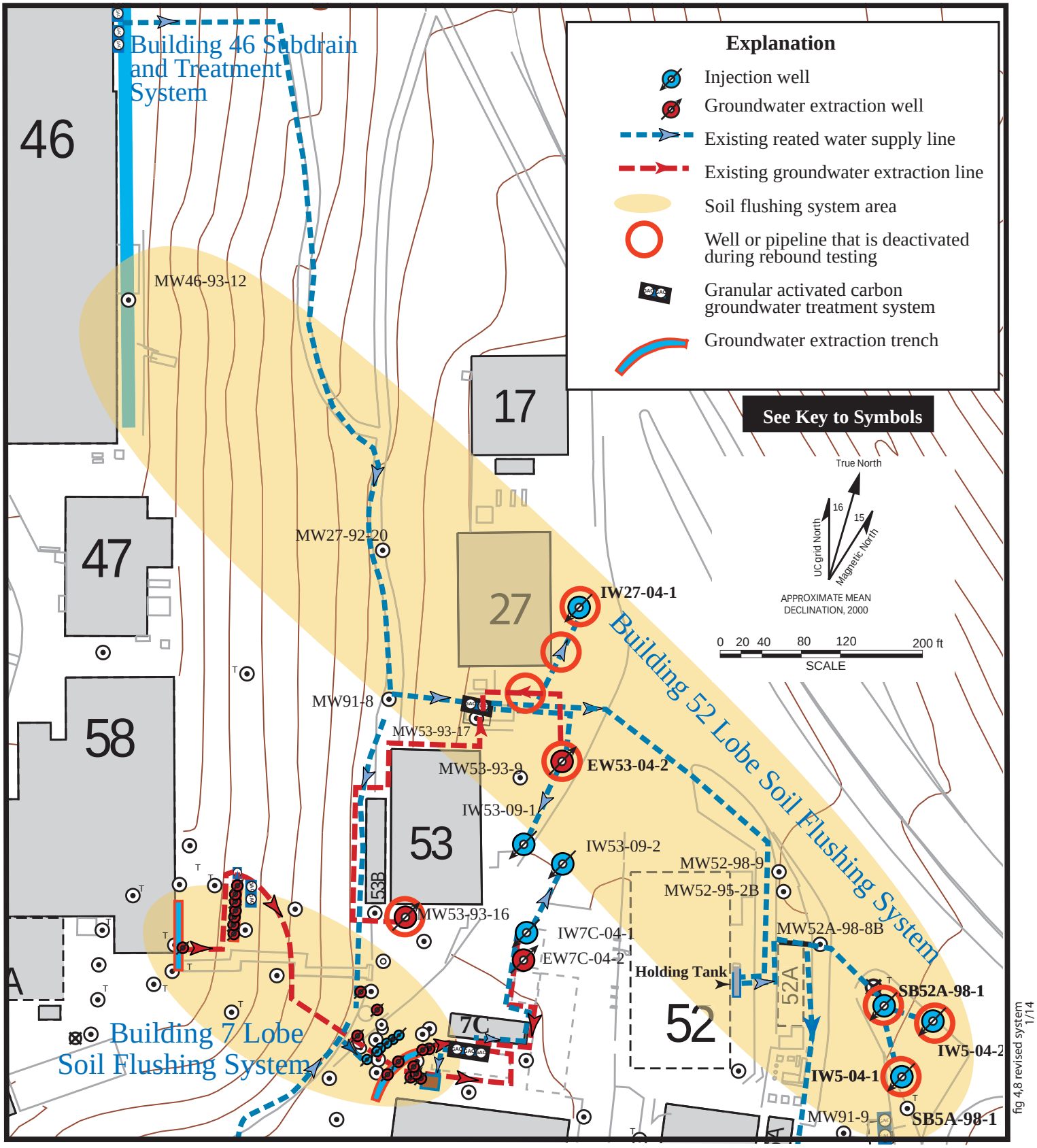


Figure 4. Building 52 In Situ Soil Flushing System, Showing Scope of Rebound Test.

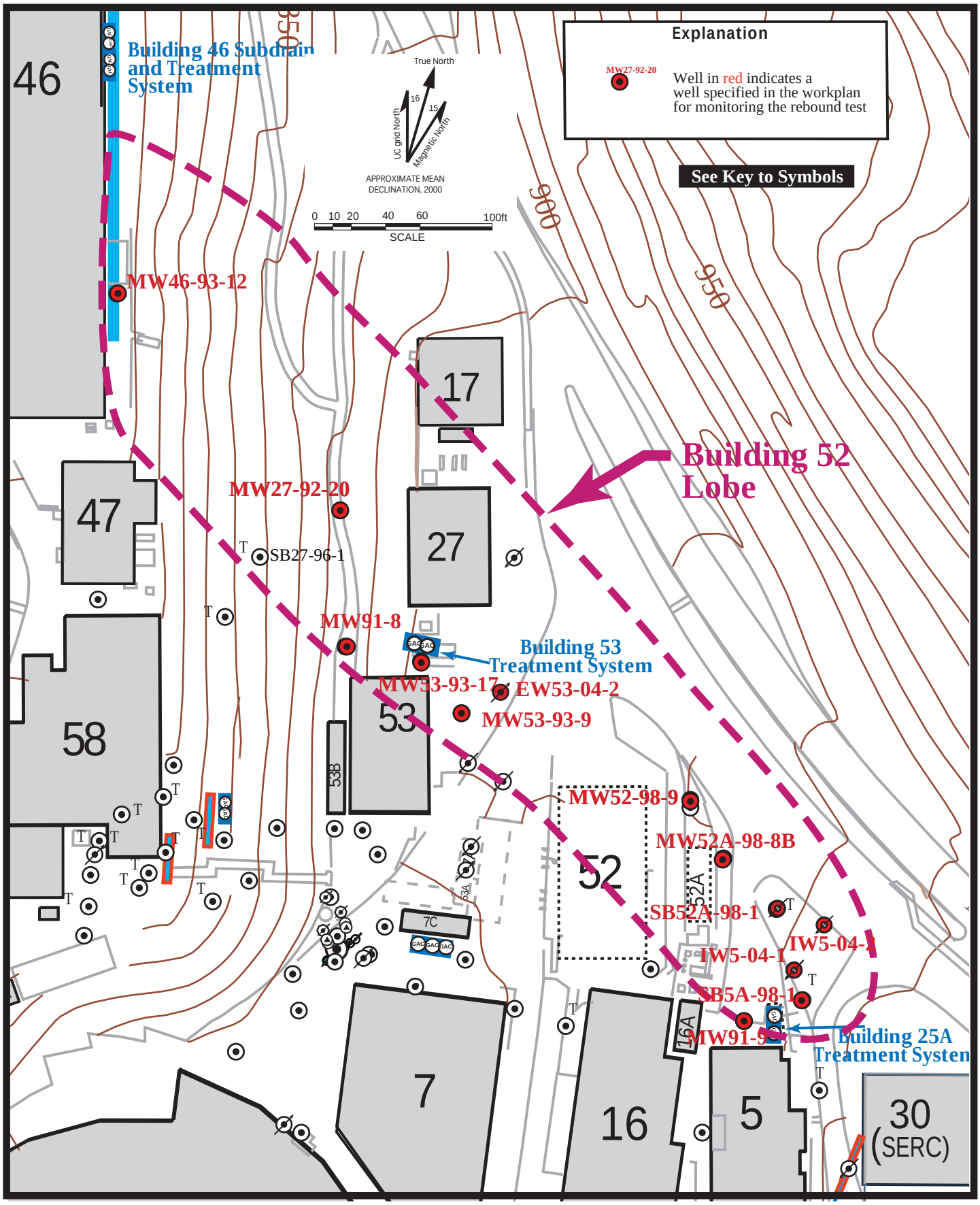


Figure 5. Locations of Building 52 Lobe Rebound Test Monitoring Wells.

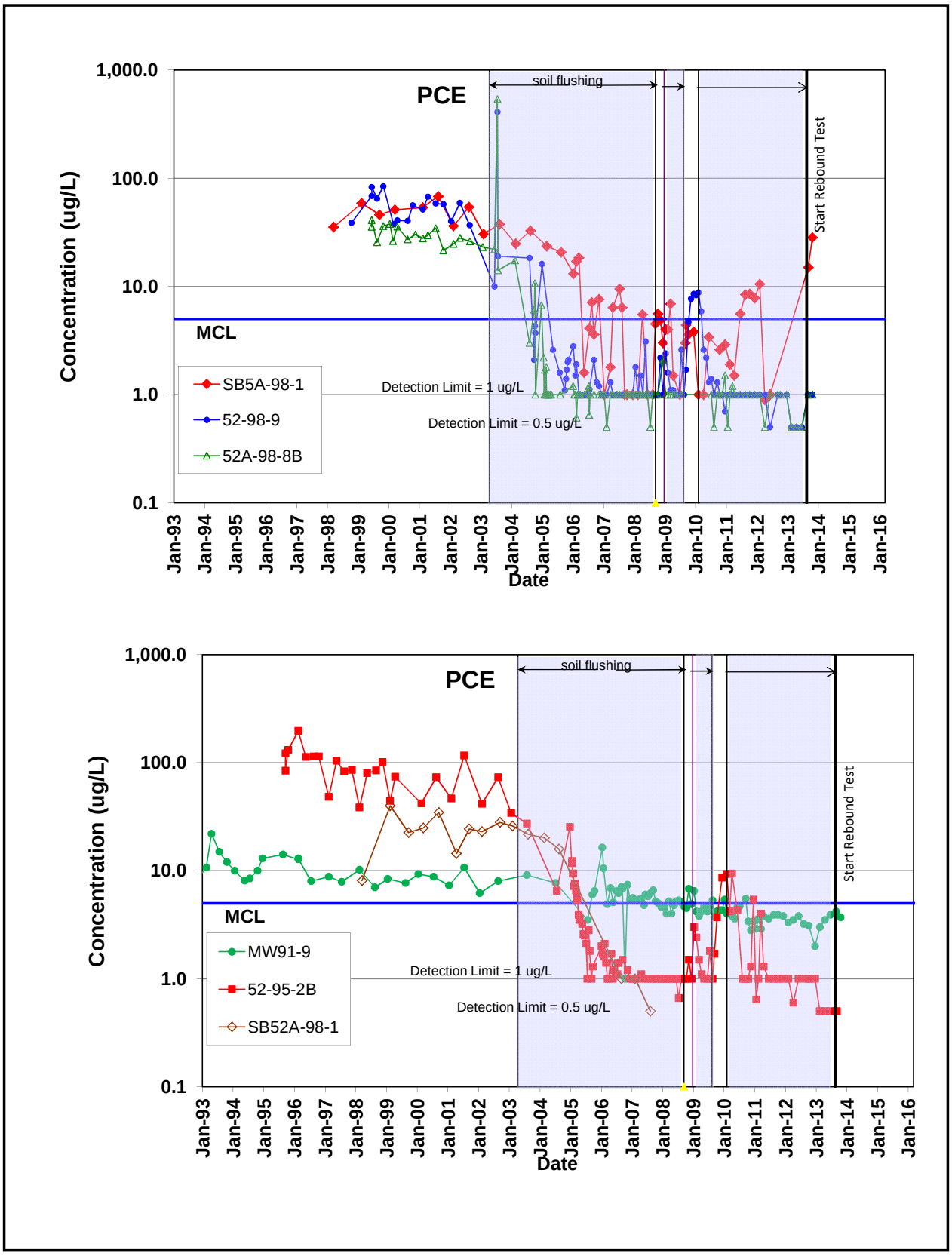


Figure 6a. **Concentration Trends for PCE, Building 52 Lobe Source Area.**

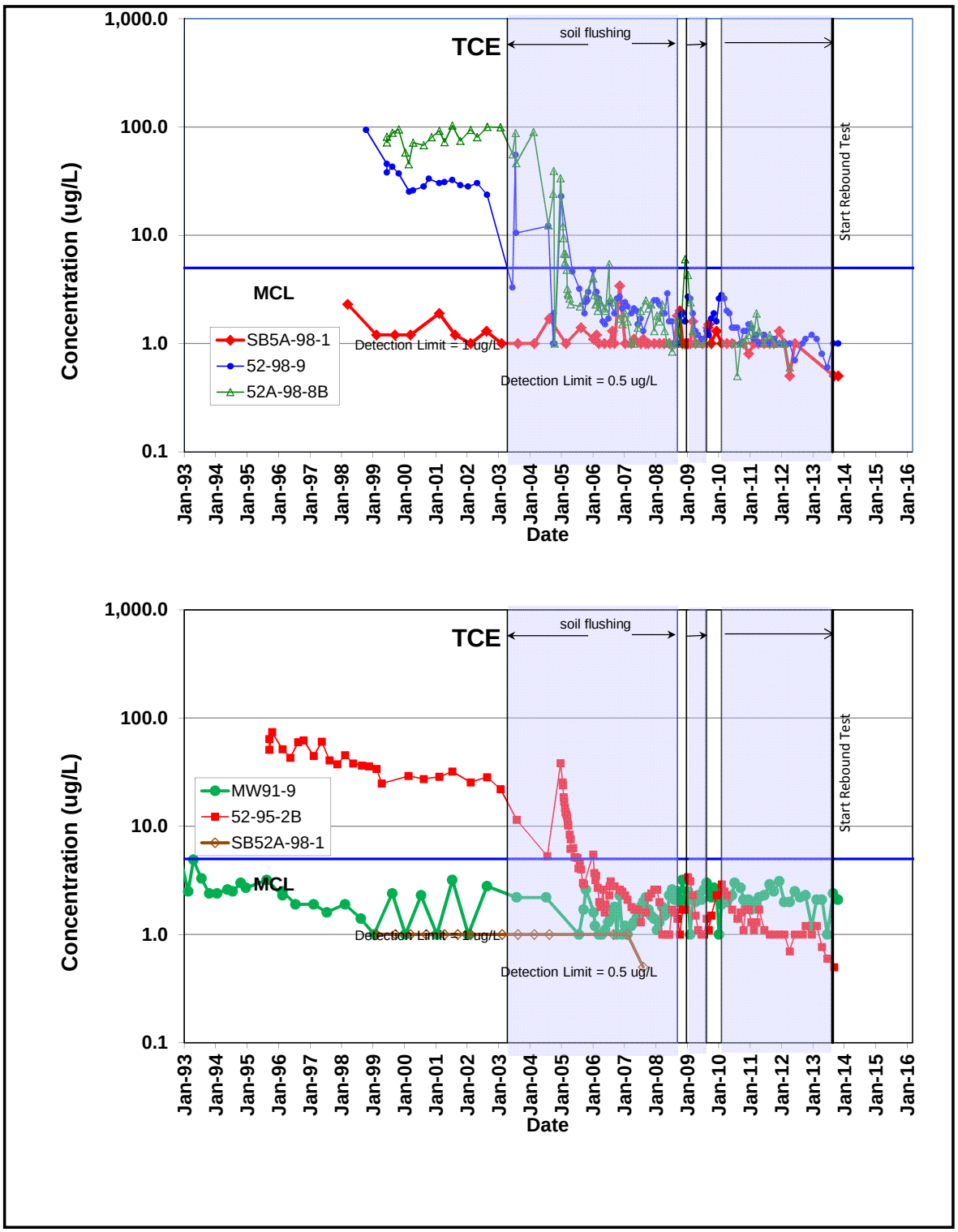


Figure 6b. **Concentration Trends for TCE, Building 52 Lobe Source Area.**

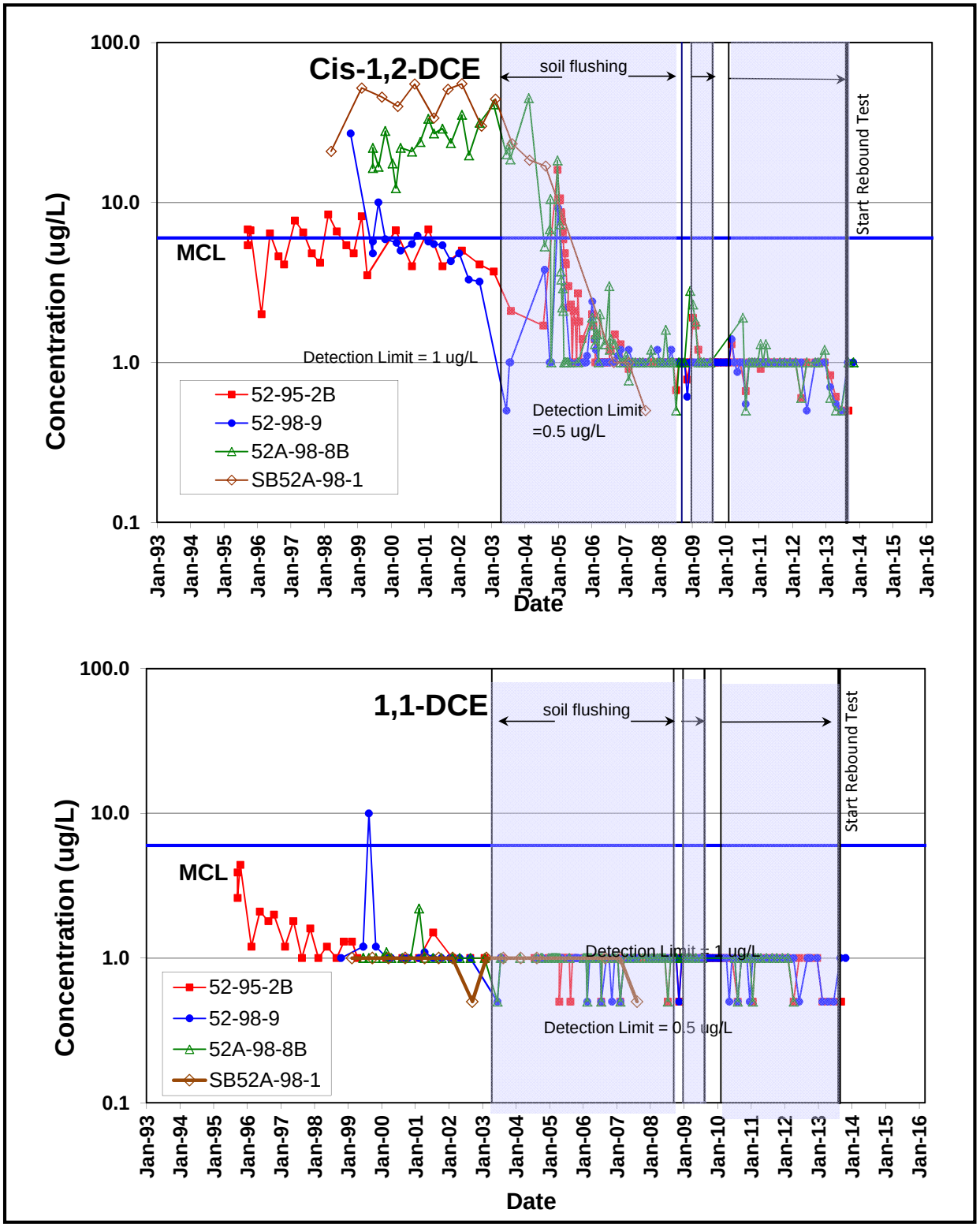


Figure 6c. Concentration Trends for Cis-1,2-DCE and 1,1-DCE, Building 52 Lobe Source Area.

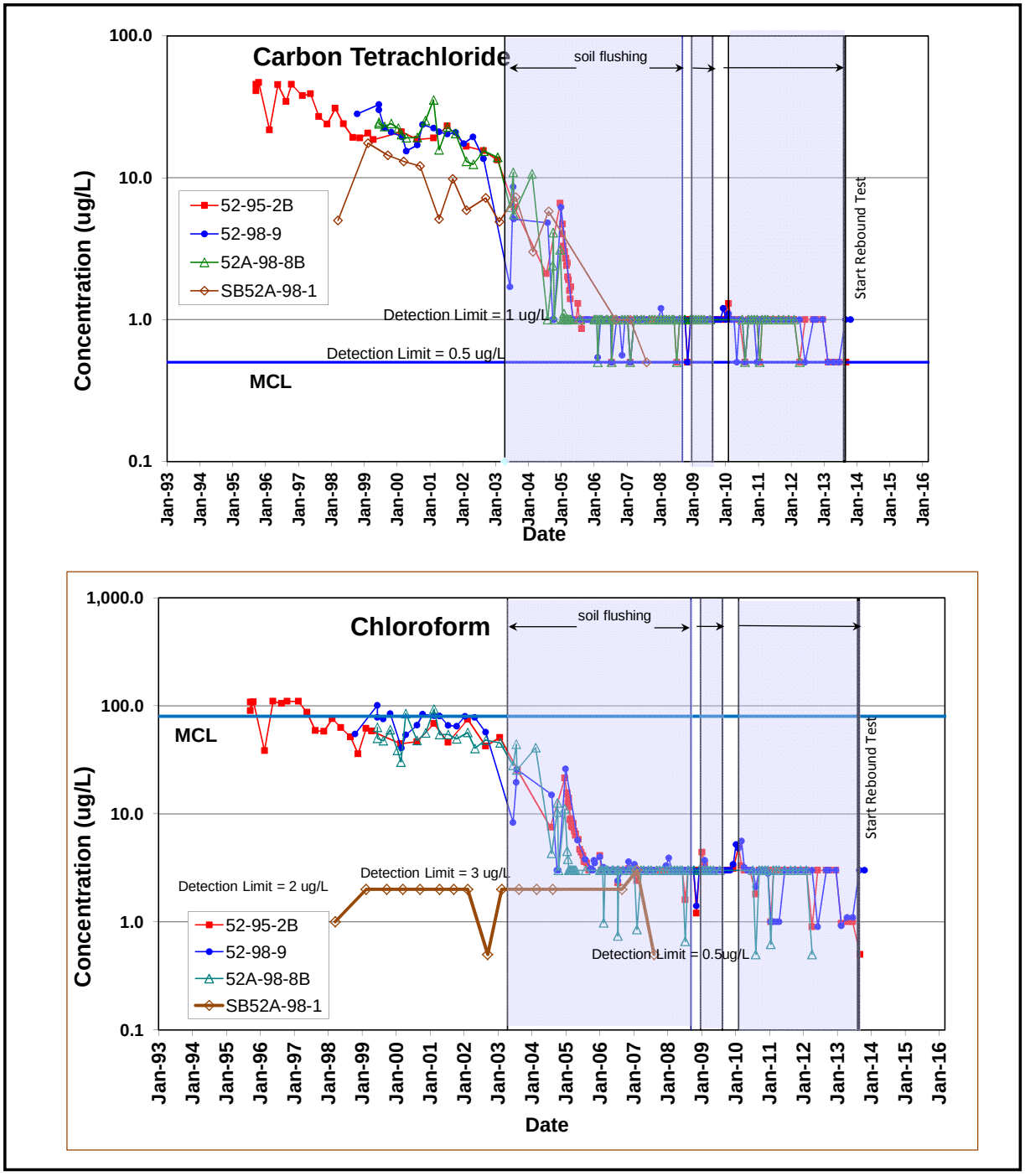


Figure 6d. Concentration Trends for Carbon Tetrachloride and Chloroform, Building 52 Lobe Source Area.

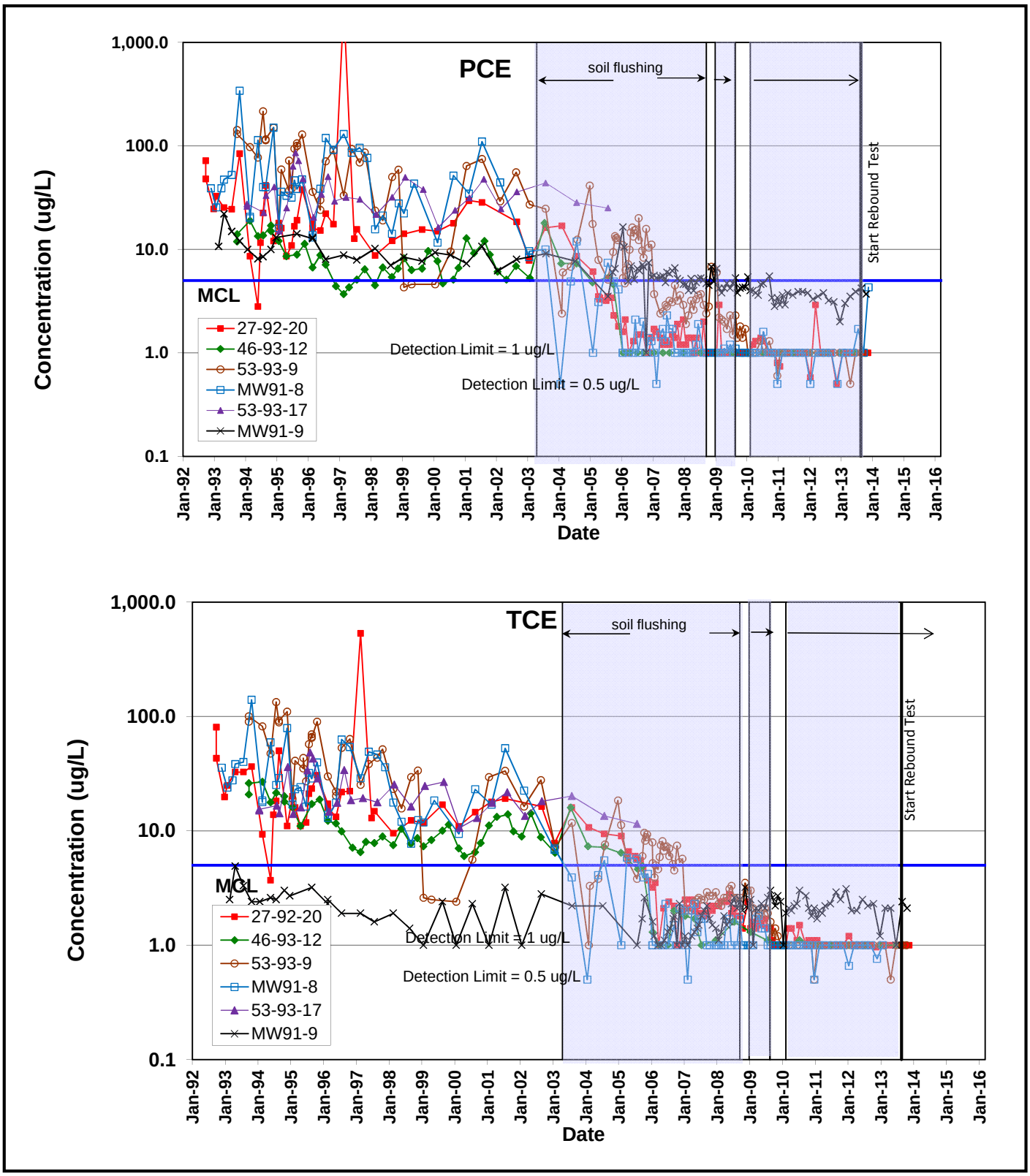


Figure 7a. **Concentration Trends for PCE and TCE, Building 52 Lobe Core and Downgradient Areas.**

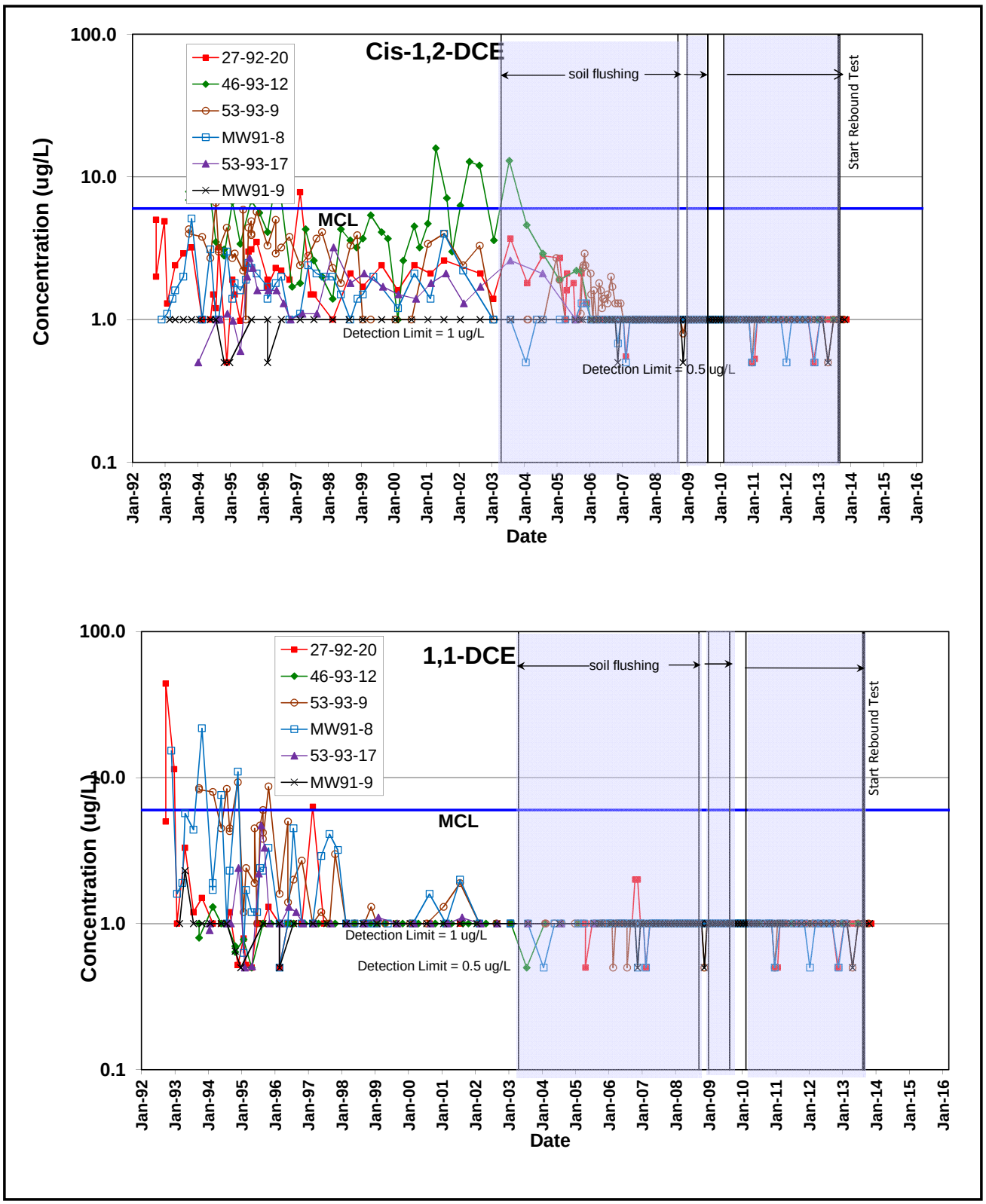


Figure 7b. **Concentration Trends for Cis-1,2-DCE and 1,1-DCE, Building 52 Lobe Core and Downgradient Areas.**

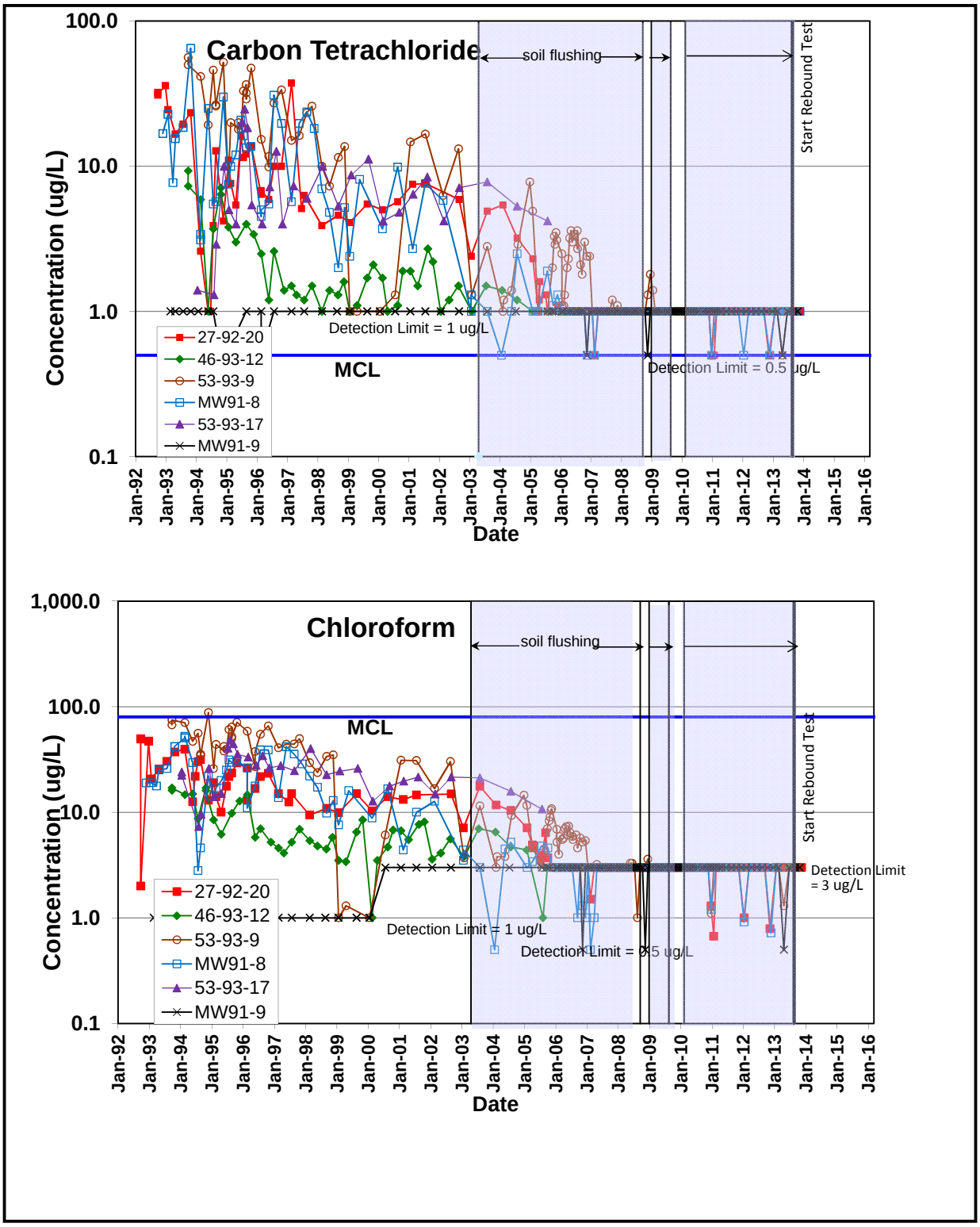


Figure 7c. Concentration Trends for Carbon Tetrachloride and Chloroform, Building 52 Lobe Core and Downgradient Areas.

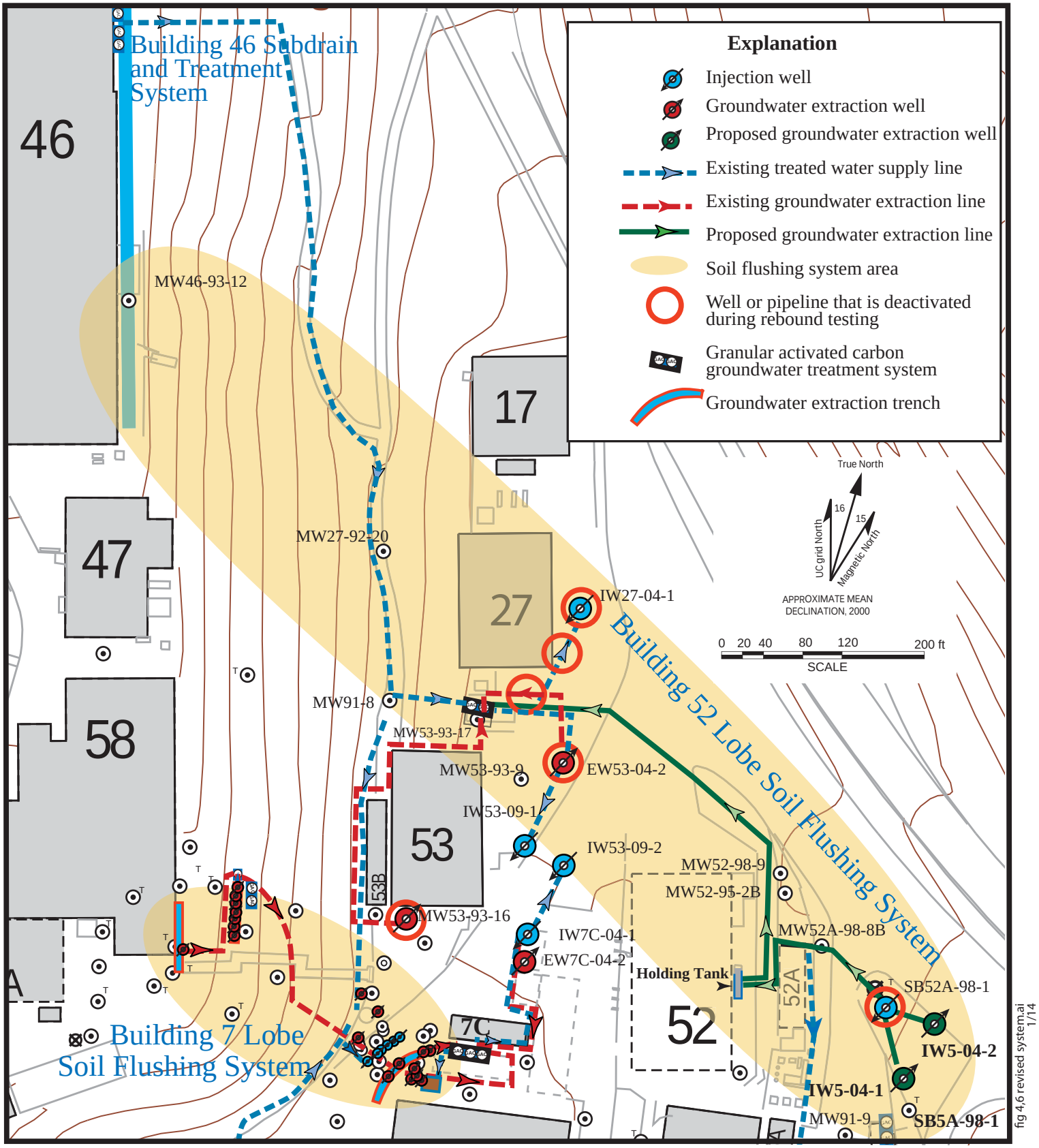


Figure 8. Building 52 Lobe In Situ Soil Flushing System Showing Proposed Modifications.