DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater under Control

Facility Name:	**Radio Materials Corporation**
Facility Address:	**1095, E. Summit St., Attica, IN**
Facility EPA ID #:	**IND 005 477 021**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   X If yes check ere and continue with #2 below.

   If no re-evaluate existing data, or

   If data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

The Radio Material Corporation (RMC) Facility encompasses approximately 38 acres in Fountain County in west central Indiana within the Middle Wabash River Basin. The Wabash River is located approximately 3,500 feet northwest of the Site. The Site is located at the edge of Wabash River basin on a local topographic high at approximately 670 feet above mean sea level (amsl). From this local high, there is a slope to the south toward an intermittent stream (approximately 650 feet amsl) in Ravine Park and a regional slope to the northwest, toward the Wabash River (approximately 500 feet amsl). In general, the glacial overburden deposits are up to 60 feet thick in the southern portion of the site but thin to approximately 10 feet in the northern portion of the Site.

Historical Site operations, which began in 1948, included the manufacture of television tubes and disc capacitors within the main plant located south of Summit Street. There are no active manufacturing operations at the Site. Production was discontinued in the year 2000. The Site buildings, including the main building, are used for general storage of equipment and supplies.

The Preliminary Assessment/Visual Site Inspection PA/VSI identified nine SWMUs (including SWMU 2 and SWMU 5) and one Area of Concern (AOC), AOC 5. Based on the U.S. EPA PA/VSI information and the past releases and management areas at the Site, the U.S. EPA Region 5 issued a RCRA 3008 (h) Consent Order to RMC that became effective on March 1, 1999. The Description of Current Conditions Report (DOCC) report identified three additional SWMUs and four additional AOCs beyond those identified in the revised Part A application, PA/VSI and Consent Order. Site location is provided in Figure1.1 and Site plan with SWMUs and AOCs is provided in Figure 1.2.

GEOLOGY AND HYDROGEOLOGY

The regional geology in the area of the Site consists of unconsolidated glacial deposits overlain by clastic and carbonate bedrock units. The unconsolidated glacial deposits include subglacial till deposits (Wedron Formation), coarse clastic (cobbles to sand) outwash fans, deposited mainly in the boundaries of

the Wabash River channel, to fine-grained (predominantly clay and silt) non-contact lacustrine deposits located in tributary areas upstream. Bedrock, which is comprised primarily of a combination of clastic (shale and siltstone) with inter bedded sandstone and carbonate rock, dips to the southwest and is generally weathered in the upper 50 to 150 feet.

During the Phase IIB RFI, the geology was investigated through observations during the advancement of numerous soil borings and monitoring wells. In addition, pilot borings were drilled at BW-01, BW-03, BW-07, and BW-18 to depths of approximately 150 feet bgs or greater in order to assess the bedrock lithology, stratigraphic continuity, permeable zones, and fractures. A cross section location plan along with cross sections A to A' and B to B' are provided as Figure 3 and 4 respectively.

OVERBURDEN GEOLOGY

The depth to bedrock in Attica varies from less than 10 feet below ground surface ("bgs") to greater than 100 feet bgs. The thickness of the unconsolidated overburden deposits is related to the surface topography and bedrock topography. The highest elevations are observed near the intersection of Summit Street and 6th Avenue where surface elevations approach 670 feet above mean sea level ("amsl"). The surface elevations decrease towards the northwest as the Wabash River is approached.

BEDROCK GEOLOGY

The depth at which bedrock was encountered at the Site ranged from less than 10 feet bgs to approximately 60 feet bgs. Off-Site, the depth to bedrock increased substantially approaching the Wabash River as discussed in the previous subsection. On-Site, the depth to bedrock was primarily dependent on the regional topography (see previous section). However, the depth to bedrock increases substantially in the western portion of the study area. Initially, the slope of the bedrock surface is relatively gentle, but the slope becomes steeper in the western portion of the study area. This is the result of the presence of a buried bedrock valley associated with the Wabash River. As noted above, that valley has been filled with alluvial deposits.

HYDROGEOLOGY

The background literature indicates that the Wabash River is a major regional discharge point for groundwater. The groundwater flow data developed to date during the RMC Phase IIB RFI confirms this conclusion. Groundwater flow in the overburden and shallow bedrock has been determined to be towards the west-northwest. The groundwater gradient is relatively flat at the Site, coincident with the topographic high in the area of the Site. However, the groundwater gradient is relatively steep immediately west and northwest of the Site, to a distance of approximately one-third of a mile northwest of the Site. Between that point and the Wabash River, the groundwater gradient flattens distinctly. The steepening of the groundwater gradient occurs coincident with the occurrence of a bedrock high associated with the east bank of the buried paleo channel known as the Attica Trough. The Attica Trough is infilled with thick coarse-grained deposits of sand and gravel.

Based on the investigations completed in the area during the Phase IIB RFI, the bedrock drops off steeply from this high point into the Attica Trough as the Wabash River is approached, particularly in the western portion of the study area. To the north, the bedrock elevation falls off more gradually. The groundwater gradients flatten in the buried paleochannel where the bedrock is deepest.

Groundwater flow in this area is generally towards the west, with the flow becoming southwest as the Wabash River is approached. The subparallel flow pattern near the River is indicative of an aquifer that is in hydraulic communication with the River. Beginning at the Site, the groundwater flow is towards west-northwest and turns towards the west-southwest as the River is approached. This flow pattern is evident whether or not the City wells are operating, although the gradient is slightly steeper in the immediate vicinity of the City wells when the pumps are operating and groundwater is being extracted. It is apparent that the operation of the City wells does not significantly change the direction of

groundwater flow.

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in

Relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of Migration of Contaminated Groundwater Under Control EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be **contaminated** [1] above appropriately protective levels (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

   X If yes - continue after identifying key contaminants, citing appropriate levels, and Referencing supporting documentation.

   If no - skip to #8 and enter YE status code, after citing appropriate levels, and referencing supportingdocumentation to demonstrate that groundwater is not contaminated.

   If unknown - skip to #8 and enter IN status code.

Rationale and Reference(s):

[1] Contamination and contaminated describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate levels (appropriate for the protection of the groundwater resource and its beneficial uses).

1. *Descriptions of Current conditions Report, RCRA 3008(h) Consent Order, CRA May 1999*
2. *USEPA RCRA 3008(h) Consent order for Radio Materials Corporation, CRA March 1999*
3. *Phase I RFI report, CRA June 2000*
4. *Phase IIB RFI Work Plan, Radio Materials Corporation Facility, CRA June 2003*
5. *Interim Data transmittal and supplemental Phase IIB RFI scope of Work, CRA June 2004*
6. *Phase IIB RCRA Facility Investigation Report, CRA Oct 2005*
7. *Interim Corrective Measures work plan, CRA July2006*
8. *Interim Corrective Measures Excavation Work Plan, SWMUs 1 and 2, and AOC 3B, February 2007*
9. *Aquifer Testing Report, Radio Materials Corporation, Attica, Indiana, CRA December 2008*
   City Water Treatment System Interim Corrective Measures Work Plan, City of Attica, Indiana, CRA November 2009
10. *Groundwater Interim Corrective Measures Workplan, CRA November 2009*
11. *Groundwater Interim Measures Design Plans and Specifications, CRA February 2010*
12. *Hydrogeologic Modeling Report, CRA, April 2012*
13. *CA 725 and CA 750 Environmental Indicators Determination, November 2012*
14. *Baseline Ecological Risk Assessment, Technical Memorandum, CRA February 2013*
15. *RFI Addendum 3 Groundwater investigation update, CRA September 2013*

Groundwater analytical data obtained during the investigations conducted at the Site were compared to the IDEM's Residential Default Closure Levels (RDCLs) for groundwater. The RDCLs are equivalent to the maximum contaminant levels (MCLs) promulgated under the Federal Safe Drinking Water Act (SDWA). Phase IIB RFI groundwater analytical results indicate that the primary analytes detected above the RDCLs were several VOCs including PCE, TCE, cis-1,2-dichloroethene (cDCE), and vinyl chloride. The highest concentrations of total VOCs were detected in overburden groundwater near and immediately down gradient of SWMU 1 and 2 (Northern Study Area), and SWMU 5 and SWMU 11/AOC 2 (Southern Study Area). VOC concentrations in bedrock groundwater were generally below 2000 µg/l (ppb). Groundwater total VOC concentrations fall below100 µg/l within several hundred feet down gradient of SWMU 1 and 2 and SWMU 5 areas. Overburden groundwater containing VOCs at concentrations above the RDCLs extends to the northwest of the Site.

Southern Study Area

Table 1: Groundwater contamination at Southern Study Area

Groundwater Constituent	**Bedrock** Maximum Conc.(ppb) in aquifer Onsite Offsite		**Overburden** Maximum Conc. (ppb) in aquifer Onsite Offsite		**IDEM RDCL** (ppb)
Monitoring well	BW-14	BW-07	OB-06	OB-50	
Cis 1,2 DCE	75	25	2100	7.6	70
TCE	4.7	ND	870	25	5
PCE	ND	ND	24	ND	5
Vinyl chloride	12	10	11	ND	2

ND = Not detected or below screening criteria. Highlights indicate exceedance of RDCLs

In the Southern Study Area, groundwater VOC impacts, primarily consisting of dissolved PCE, TCE, and cDCE, originate from SWMU 5, where the highest VOC groundwater concentrations were observed in the overburden monitoring wells. Elevated levels of VOCs were observed in soil samples collected from SWMU 5 and SWMU 11/AOC2.

SWMU 5, which is currently grass covered, reportedly was used for the placement of site generated manufacturing byproducts from approximately 1950 until 1963. The manufacturing byproducts placed in SWMU5 contained chlorinated solvents, acetone, phenolic resins, ceramic byproduct, waxes, and paints. SWMU 11 was located in the north central portion of the Building 1 of the main plant. The degreasing unit utilized TCE and PCE while in operation from the early 1970s to 1986.

The overburden groundwater VOC plume in the Southern Study Area extends towards the west-northwest. TCE concentrations in the monitoring wells located farthest down gradient (OB-49 through OB-53) range from non-detect at OB-49 to 28 micrograms per liter (µg/l) at OB-50. In this farthest down gradient reach, non-Site related sources of VOCs may be present. The bedrock groundwater down gradient of SWMU 5 does not exhibit the same magnitude of VOC concentrations as was observed in the overburden groundwater. Moreover, rather than TCE, cDCE is the VOC exhibiting the highest concentrations down gradient of SWMU 5, comprising 70 percent or more of the total VOC concentration. Additionally, vinyl chloride is detected more frequently and at higher concentrations in the bedrock groundwater than is detected in the overburden monitoring wells down gradient of SWMU 5. Farther down gradient at monitoring well BW-07, vinyl chloride comprises a larger percentage of the total VOC concentration. These data indicate that the parent compounds (TCE and, to a lesser extent, PCE) are undergoing degradation with depth and distance down gradient of SWMU 5.

Northern Study Area

SWMU 1 was an outdoor drum storage area located north of Summit Road and 1 overlies the apparent (and older) footprint of SWMU 2 which operated as an open unlined pit for site-generated manufacturing byproducts. Materials in SWMU2 contained PCE and TCE, acetone, alcohol, phenolic resin and barium titanate ceramic sludges.

Table 2: Groundwater contamination at Northern Study Area

Groundwater Constituent	**Bedrock** Maximum Conc.(ppb) in aquifer Onsite	Offsite	**Overburden** Maximum Conc. (ppb) in aquifer Onsite	Offsite	**IDEM RDCL** (ppb)
Monitoring well	BW-09	BW-18	OB-19	OB-30	
Cis 1,2 DCE	1300	0.6	25	ND	70
TCE	310	1.3	9.6	9.4	5
PCE	210	0.2	68	26	5
Vinyl chloride	80	ND	ND	ND	2

ND = Not detected or below screening criteria. Highlights indicate exceedance of RDCLs

In the Northern Study Area, an overburden groundwater VOC plume extends towards the northwest from the SWMU 1 and 2 areas where the most elevated concentrations are observed in the groundwater. The northern overburden VOC plume is comprised primarily of dissolved PCE and TCE. Elevated concentrations of VOCs were detected in proximity to the buried waste deposits present in the SWMU 1 and 2 areas, and seem to be the primary contributor to dissolved VOCs in the overburden groundwater in this area. As shown in Figureure 3, the sandstone unit pinches out to the northwest of OB-30 and the underlying shale and siltstone unit is present beneath the overburden. Also, to the northwest of OB-30, the bedrock elevations drop as the buried bedrock valley is encountered. To the northwest of OB-30, no overburden monitoring wells are present because, as shown by the location of the water-table interface in Figure 4, there is no groundwater present in the overburden in this area.

PCE and TCE concentrations in bedrock are highest at the bedrock monitoring wells located closest to SWMUs 1 and 2 (BW-05 and BW-09). The concentrations of VOCs dissipate rapidly with distance from SWMUs 1 and 2. The compound cDCE forms a large percentage of the total VOC concentrations in the bedrock groundwater samples in this area. These data indicate that the parent compounds (TCE and PCE) are undergoing degradation with depth and distance down gradient of SWMUs 1 and 2.

The overburden is much thinner in this area (less than 20 feet thick) as compared to the Southern Study Area. The overburden VOC plume extends towards the northwest, parallel to groundwater flow beneath an agricultural field and the former Riley Airport landing strip located to the northwest. PCE and TCE concentrations in groundwater of 6 and 11 parts per billion are present in the farthest down gradient overburden monitoring wells (OB-30 and OB-31). However, groundwater is absent from the overburden farther down gradient of these well locations and VOC concentrations above the MCLs were not detected in the down gradient bedrock monitoring wells.

CDCE forms a large percentage of the total VOC concentrations in the bedrock groundwater samples in this area. These data indicate that the parent compounds (TCE and PCE) are undergoing degradation with depth and distance down gradient of SWMUs 1 and 2.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within existing area of contaminated groundwater as defined by the monitoring locations designated at the time of this determination)?

   X If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the existing area of groundwater contamination[2]).

   If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the existing area of groundwater contamination@[2]) - skip to #8 and enter NO status code, after providing an explanation.

   If unknown - skip to #8 and enter IN status code.

   Rationale and Reference(s):

SOUTHERN STUDY AREA

To demonstrate, groundwater VOC concentration trends, thus attenuation, analytical results for selected representative monitoring wells screened in the overburden and the bedrock were evaluated using the Mann-Kendall trend test, the results are discussed below and provided in Table 1.

OVERBURDEN

Groundwater analytical results for overburden monitoring wells OB-06, OB-08, OB-32, OB-34, OB-36, OB-43D, and OB-45D were evaluated using the Mann-Kendall trend test. A downward trend or no trend was identified for analytes detected at down gradient monitoring wells OB-08, OB-32, OB-34, OB36, OB-43D, and OB-45D. No trend was identified for cDCE, PCE or TCE in groundwater from monitoring well OB-6 near the main plant.

Over the time period of 2001 to 2012, an upward concentration trend was identified for the daughter product vinyl chloride in groundwater samples collected from monitoring well OB-6. Mann-Kendall

analysis was performed on data from 2009 to 2012 to identify more recent vinyl chloride concentration trends after the implementation of source control measures. No statistically significant vinyl chloride concentration trend was detected for the period 2009 to 2012.

Vinyl chloride is indicative of degradation of PCE and TCE near the source area. An upward trend for one daughter product near the source area is not indicative of an expanding plume down gradient. This monitoring well is located up gradient of the groundwater pump and treat ICM and within the capture zone for groundwater extraction. Therefore an increase in vinyl chloride, if any, in monitoring well OB-6 will have no effect on the concentration of vinyl chloride down gradient of the groundwater pump and treat ICM. The installation and operation of the groundwater ICMs have cut off the down gradient plume from any remaining VOCs in the source areas and the groundwater VOC plume down gradient of the ICMs will attenuate.

BEDROCK

Groundwater analytical results for bedrock monitoring wells BW-02, BW-07, BW-11, and BW-14 were evaluated using the Mann-Kendall trend test. A downward trend was identified for all analytes at BW-11 and BW-14. Since 2003, a slight upward trend was noted for TCE at BW-02, which is located close to SWMU 5. Mann- Kendall analysis was performed on data from 2008 to 2012 to identify recent TCE concentration trends. No statistically significant TCE concentration trend was detected for the period 2009 to 2012.

Monitoring well BW-02 is located up gradient and within the capture zone of the bedrock extraction well BW-01; therefore an upward trend for TCE, if any, will have no effect on bedrock groundwater concentrations down gradient of the groundwater pump and treat ICM.

Groundwater analytical results for BW-07 were evaluated using Mann-Kendall trend test and a downward trend was noted for TCE and no trend was noted for PCE and vinyl chloride. A slight upward trend was noted for cDCE when the dataset was analyzed back to 2003. The apparent increase in the cDCE concentrations at this location was slight and within the expected range of analytical error. Mann-Kendall analysis of cDCE concentrations from 2008 to 2012 shows no statistical upward trend and the last two cDCE concentrations were lower than the previous two sampling events for cDCE.

The concentration of cDCE in bedrock monitoring well BW-07 is below its U.S. EPA MCL. Down gradient of monitoring well BW-07, the bedrock outcrops into the overburden alluvium associated with the Wabash River valley. Concentrations of cDCE in the down gradient overburden monitoring wells remain below U.S. EPA MCL.

NORTHERN STUDY AREA

There is over nine years of quarterly or semi-annual groundwater sampling and analytical data; therefore, the extent of VOCs in groundwater in the northern study area is well understood and there is no evidence of plume expansion. The soil ICM implemented in the SWMU 1 and 2 continues to reduce the VOCs in the source area soils. Correspondingly the concentrations of VOC in groundwater near the source area continue to decrease. To demonstrate these decreases in VOCs in the Northern Study Area, analytical results for selected representative monitoring wells screened in the overburden and the bedrock were evaluated using the Mann-Kendall trend test. The results for all analytes indicate either no trend identified or a downward trend.

OVERBURDEN

Groundwater analytical results for overburden monitoring wells OB-19, OB-28, OB-30, OB-31, and OB-38 were evaluated using the Mann-Kendall trend test. The results for all analytes indicate either no trend identified or a downward trend.

BEDROCK

Groundwater analytical results for bedrock monitoring wells BW-03, BW-05, BW-09, BW-15, BW-16, and BW-18 were evaluated using the Mann-Kendall trend test. With the exception of vinyl chloride at BW-05 and BW-09, the results for all analytes indicate either no trend identified or a downward trend. BW-05 and BW-09 are located adjacent to and immediately down gradient of SWMUs 1 and 2.

Although Mann-Kendall testing of data from 2003 to 2012 shows an upward concentration trend for vinyl chloride in monitoring wells BW-05 and BW-09, trend testing of recent data (2008 to 2012) shows no trend for BW-09 and an upward trend in BW-05. The presence of vinyl chloride is not un-expected given that concentrations of PCE and TCE at these locations have decreased steadily since the start of the RFI. Increasing concentrations of vinyl chloride are indicative of degradation of PCE and TCE.

There is no upward trend in vinyl chloride in the bedrock monitoring wells down gradient of BW-05 and no expansion of the footprint of the groundwater VOC plume.

The groundwater ICMs north and south of Summit Street are operational; therefore, there is no further contribution of VOC impacted groundwater down gradient. Based on the data compiled to date, the contaminated groundwater is expected to remain within the existing area of contaminated groundwater as defined by the monitoring locations designated at the time of this determination.

4. Does contaminated@ groundwater **discharge** into **surface water** bodies?

X If yes - continue after identifying potentially affected surface water bodies.

If no - skip to #7 (and enter a AYE@ status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater contamination does not enter surface water bodies.

If unknown - skip to #8 and enter IN status code.

Rationale and Reference(s):

WABASH RIVER

Based on the available geological and hydro geological data developed to date it is possible that VOC impacted groundwater is discharging to the Wabash River. Area of potential discharge to Wabash River is shown in Figure 4.1.

OTHER SURFACE WATER

An artesian well was discovered northwest of the Riley residence in an undeveloped portion of Riley Land. Water emerged from this well and flows onto the ground surface at rate of approximately 10 to 15 gallons per minute. A sample of the water emerging from the well was collected and analyzed for VOCs. Vinyl chloride (15 µg/l) and cDCE (98 µg/l) were detected above ingestion-based RDCLs. The artesian well was closed by an Indiana licensed well driller in accordance with IDNR regulations (312 IAC 13-10-2) in July 2005. Consequently, contaminated groundwater no longer discharges from this artesian well.

In July 2012, off-Site groundwater seeps were investigated as potential sources of human exposure to Site contaminants. These groundwater seeps on the hillside of the Riley residence, if present, would likely drain to one of two ditches that are located down-hill to the northwest. These ditches are located next to residential properties and would be an exposure pathway to VOC contaminants in surface water, if any. Since VOCs are the only identified chemicals of concern in groundwater above a risk-based level, surface water samples were collected from these ditches and were submitted for VOC analysis. The sampling locations are provided in Figure.4.3.

TCE was estimated at 0.31 µg/l in the ditch water sample collected at the intersection of Derrick Street. This water enters a City of Attica storm water culvert and is conveyed to the north. The storm water daylights near a corn field north of North Street. Analytical results of the water sample collected from where the storm water daylights did not have concentrations of VOCs above the laboratory detection levels. The third sample was collected from a ditch located east of east end of North Street. Analytical results of water collected from this ditch revealed concentrations of cis-DCE of 0.69 µg/l, TCE of 1.1 µg/l and PCE of 1.8 µg/l . These levels do not exceed the ecological risk screening criteria or drinking water criteria.

5. Is the **discharge** of contaminated groundwater into surface water likely to be **insignificant** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater level, and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

X If yes - skip to #7 (and enter YES status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater level, the value of the appropriate level(s), and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

If no - (the discharge of contaminated groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater level, the value of the appropriate level(s),and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater level, the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

If unknown - enter IN status code in #8.

Rationale and Reference(s):

WABASH RIVER

As shown in Figure 4.1, VOCs have been detected in groundwater at monitoring wells located near the Wabash River. In the downtown Attica area, other non-Site related potential source(s) of groundwater VOCs detections could be present. Regardless of the potential sources for the VOCs, the maximum concentration of TCE observed in the groundwater sample collected during semiannual monitoring events from overburden monitoring well located closest to the Wabash River (OB-52) was 11 µg/l, which is above the IDEM RDCL of 5 µg/l. The maximum concentration of TCE discharging to the surface water

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

is less than 10 times the appropriate groundwater level (i.e., 50 µg/l). Additionally, the maximum concentration of TCE observed in the groundwater samples collected from overburden monitoring wells located closest to the Wabash River is well below the U.S. EPA Region 5 Ecological Screening Level (ESL) of 47µg/l and the IDEM Chronic Aquatic Life level of 260 µg/l. There are no other conditions, which significantly increase the potential for unacceptable impacts to surface water, sediments, or ecosystems at this concentration. Therefore, it is concluded that the discharge of contaminated groundwater is likely to be insignificant.

City of Attica's water wells are located adjacent to the Wabash River, approximately 4,000 feet down gradient of the Site. Historically low-level detections of TCE were detected in the City's water supply. As the TCE levels were just below the MCL, a City Water Treatment system was installed in 2010. Chlorinated VOCs have been reported as non-detect in City water supply samples in subsequent monitoring events since the installation of the treatment system. The City of Attica passed a restrictive groundwater use ordinance that prohibits the installation and use of new water supply wells within the City limits.

OTHER SURFACE WATER

VOCs were detected in surface water samples collected from ditches, possibly sourced by groundwater seeps. These detections are well below U.S. EPA MCLs and IDEM's 2009 RDCLs and 2012 RCG screening levels. In addition, the maximum concentration of TCE observed in the ditch water samples is well below the U.S. EPA Region 5 Ecological Screening Level (ESL) of 47 µg/l and the IDEM Chronic Aquatic Life level of 260 µg/l. The groundwater seeps are not impacting these surface waters above a risk-based action level.

A review of the National Wetlands Inventory (NWI) map shows Riley Lake as an unidentified wetland. The Screening Level Ecological Risk Assessment (SLERA) in the Phase IIB RFI (May 2010) evaluated the surface water and sediment of Riley Lake and VOCs were not detected above risk based levels. The NWI map identifies a large area of palustrine emergent and forested wetlands and riparian open waters associated with the Wabash River. These wetlands are approximately 2,400 feet northwest of the facility, as referenced in USFWS letter. All of the wetlands are on the northwest side across the River from the RMC property. Given the locations of the wetlands relative to the Wabash River, it is unlikely that groundwater that flows beneath the Site discharges to these wetlands.

Therefore, it is concluded that the discharge of contaminated groundwater is insignificant and there are no other conditions, which significantly increase the potential for unacceptable impacts to surface water, sediments, or ecosystems at these concentrations.

6. Can the **discharge** of contaminated@ groundwater into surface water be shown to be **currently acceptable@** (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

If yes - continue after either:

1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site=s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR

2) providing or referencing an interim-assessment,[5] appropriate to the potential for impact, that

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable

shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment levels, as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

If no - (the discharge of contaminated groundwater cannot be shown to be **currently acceptable**) - skip to #8 and enter NO status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

If unknown - skip to 8 and enter IN status code.

Rationale and Reference(s):

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the existing area of contaminated groundwater?

X If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the existing area of groundwater contamination.@

If no - enter NO status code in #8.

If unknown - enter IN status code in #8.

Rationale and Reference(s):

GROUNDWATER MONITORING PLAN

The groundwater VOC plume is being addressed by ICMs including on-Site overburden and bedrock groundwater extraction wells installed (and operating) down gradient from the main plant area south of Summit Street, and a groundwater AS/SVE remedial trench installed to the north of Summit Street. The ICMs have resulted in significant reductions in on-Site VOC concentrations in soil and groundwater and reductions in contaminant migration. Figure 5.1 shows the simulated hydraulic containment for groundwater ICMs. Further the Attica city water treatment system has eliminated low-level concentrations of TCE in the city water supply.

The ICM monitoring plan has been implemented in addition to the semi-annual groundwater monitoring events that continue. A new groundwater monitoring plan will be mandated in future that combines portions of these two plans into one monitoring program. This new groundwater monitoring plan will include monitoring well locations that are chosen to evaluate the effectiveness of the ICMs and wells to verify that plume attenuation occurs within the existing area of contaminated ground water.

impacts to the surface waters, sediments or eco-systems.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

X YES - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Radio Materials Corporation facility, EPA ID # **IND005477021** located **at Attica, Indiana**. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater." This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

NO - Unacceptable migration of contaminated groundwater is observed or expected.

IN - More information is needed to make a determination.

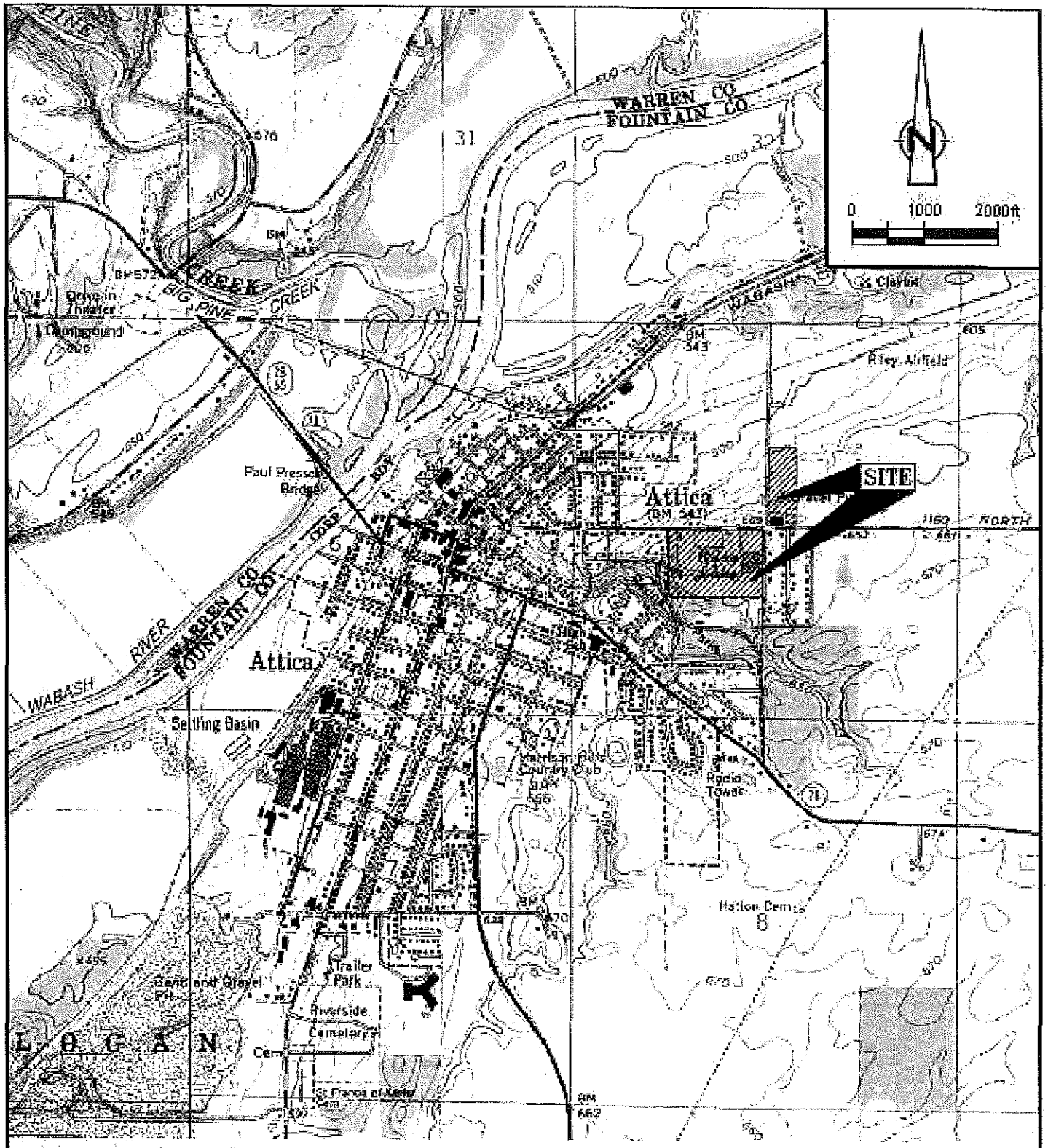
Completed by	(signature)	BSundar	Date
	(print)	Bhooma Sundar	3/31/14
	(title)	Toxicologist	

Supervisor	(signature)	Tammy M	Date
	(print)	Tammy Moore	4/3/14
	(title)		
	(EPA Region or State)	EPA Region 5	

Locations where References may be found:

Attica Public Library, Attica, IN
Metcalfe Center
7th Floor
77, W. Jackson Blvd
Chicago, IL 60604

Contact telephone number and e-mail
Bhooma Sundar
312-886-1660
Sundar.bhooma@epa.gov



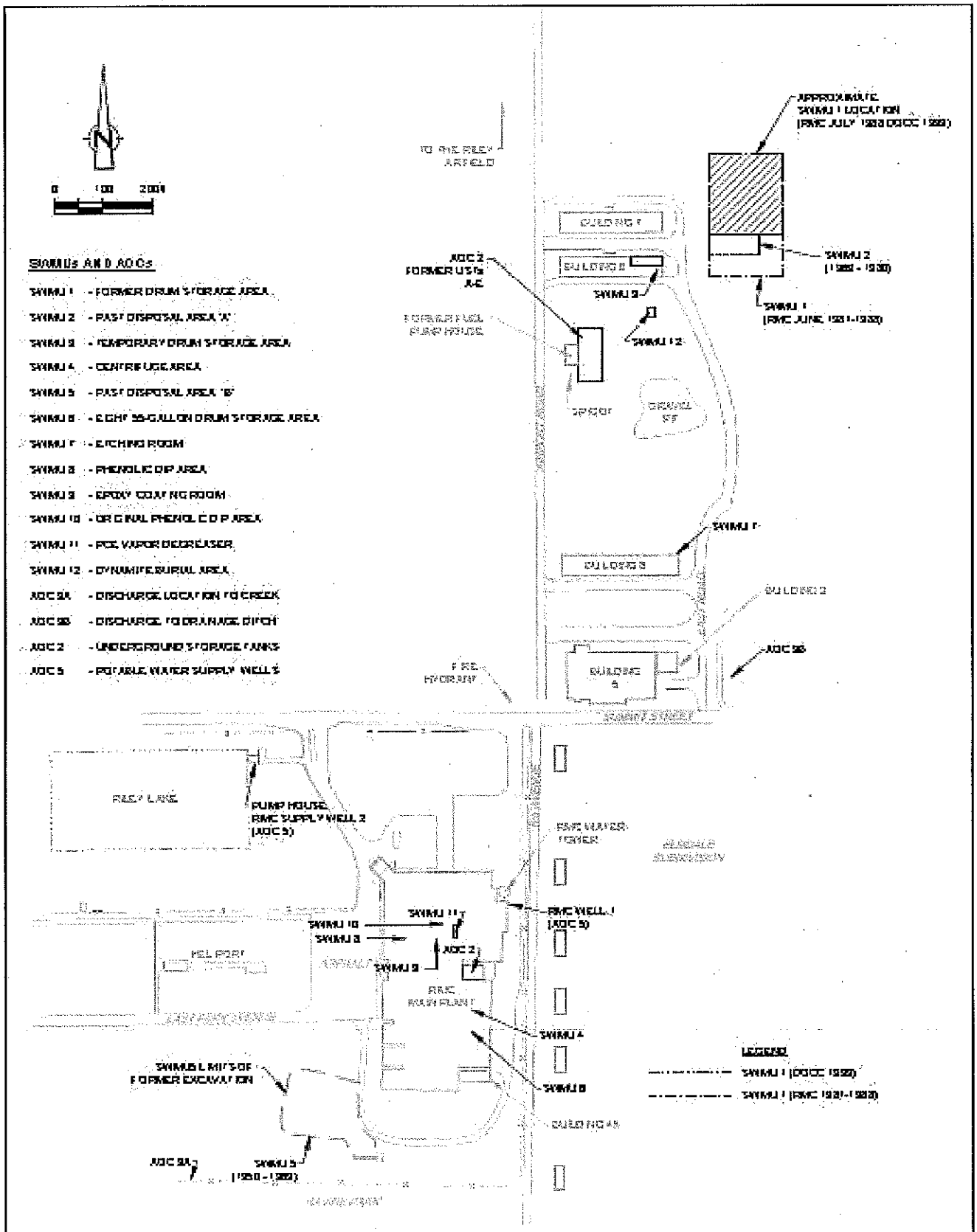
SOURCE: ATTICA AND WILLIAMSPORT, INDIANA
U.S.G.S. TOPOGRAPIC MAPS

INDIANA

figure 1.1

SITE LOCATION
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-02(056)GN-WA004 SEP 24/2013



NOTE:

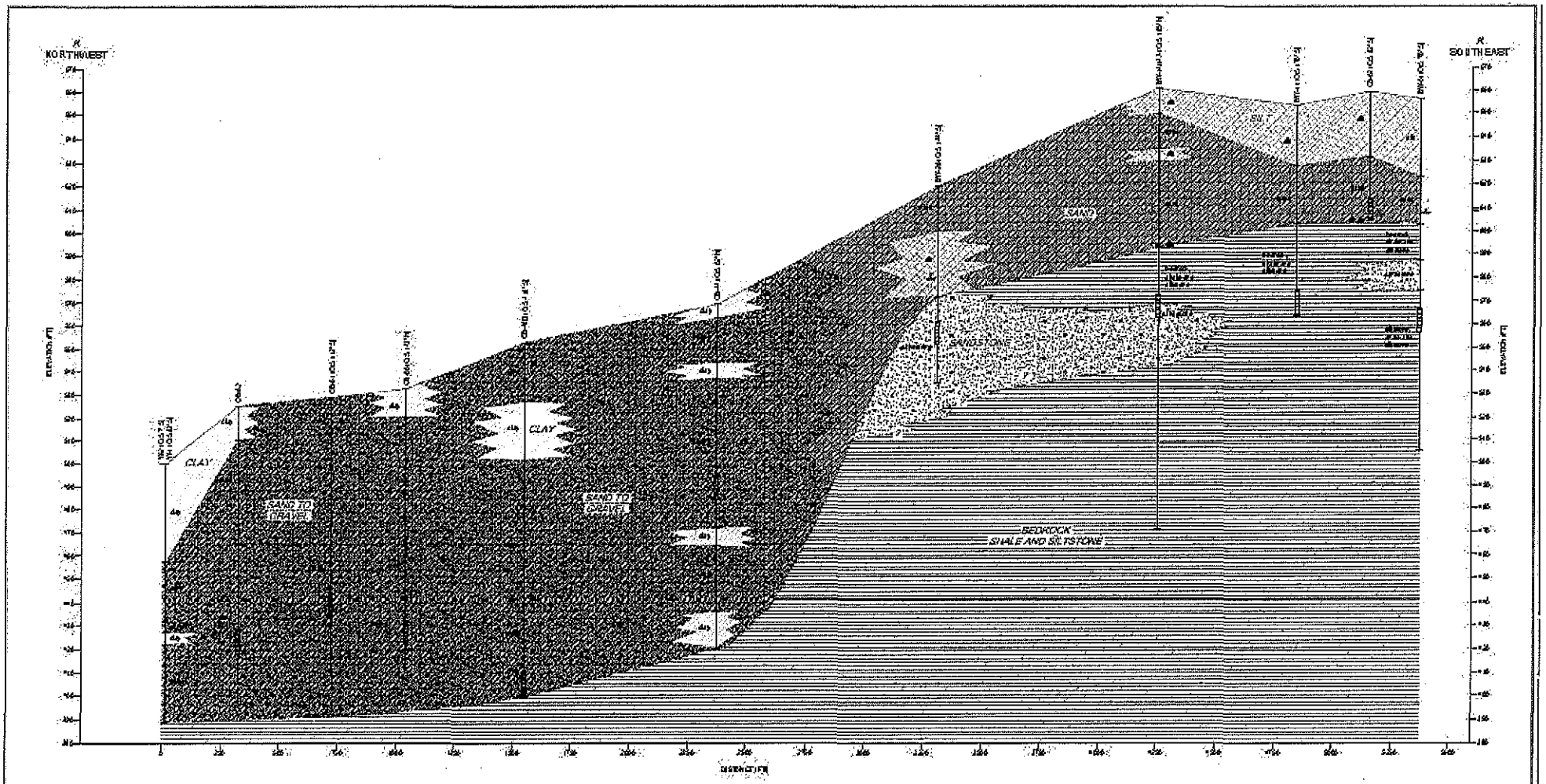
SWMU 1 APPEARS TO HAVE VARIED IN SIZE FROM THE EXTENTS SHOWN IN RMC DRAWINGS (1981 TO 1988) TO THE DOCC REPORT (1989)

SOURCE: PHASE I RI (2000)

figure 1.2

SITE PLAN WITH SWMUs AND AOCs
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-03(058)GN-WA005 SEP 24 2019



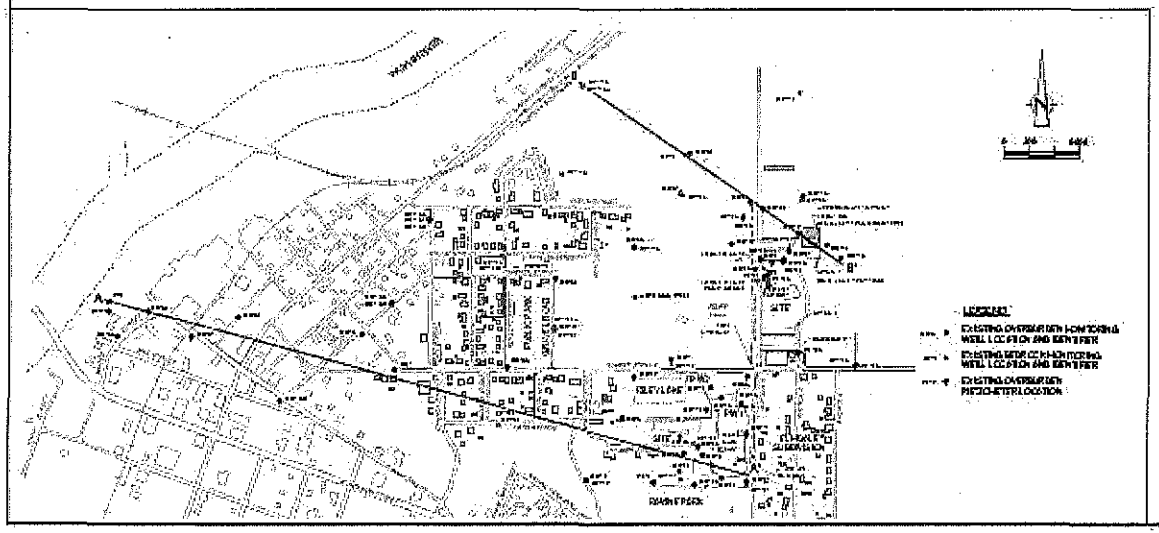


Figure 3. Geological Cross Section South of Summit Street

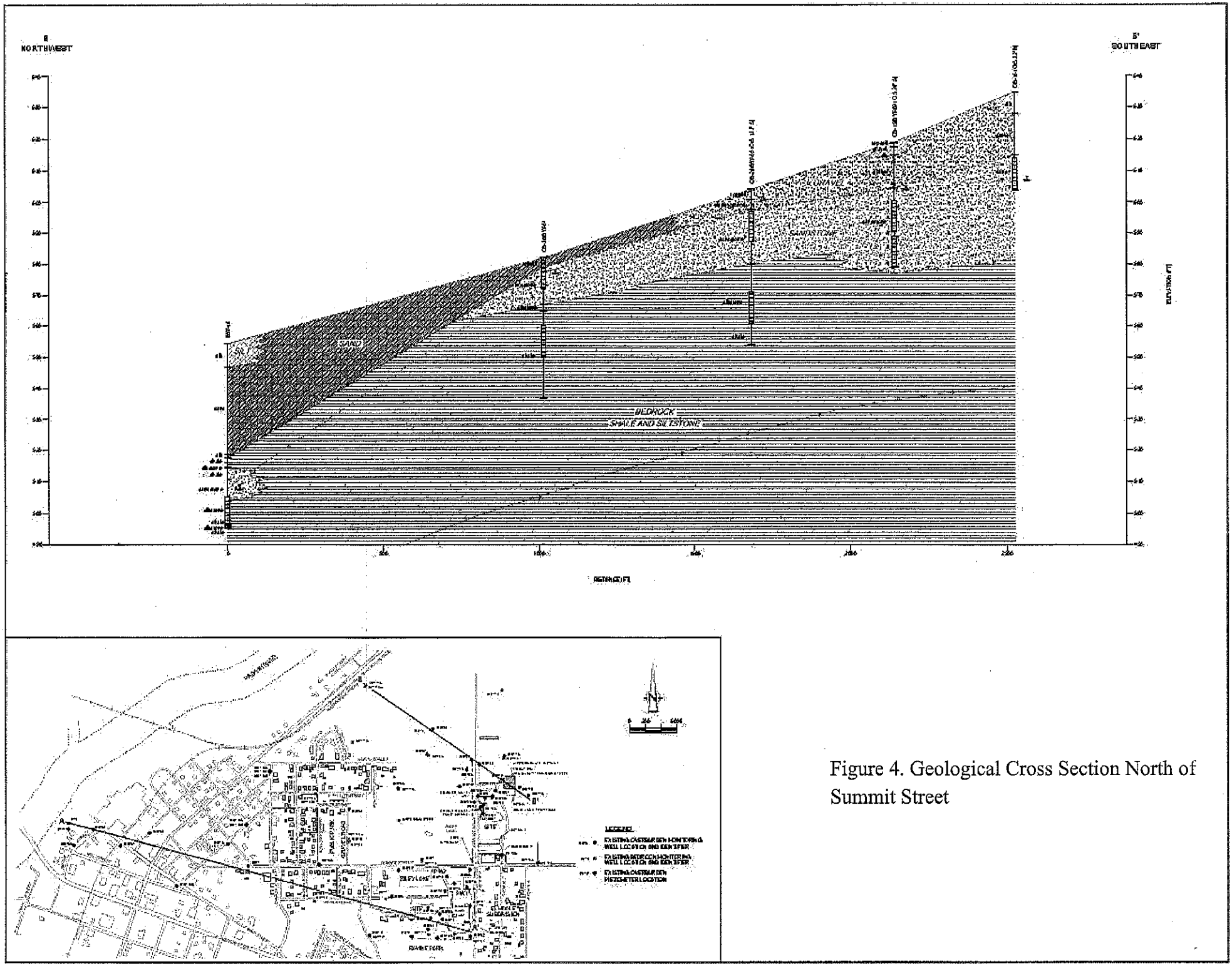


Figure 4. Geological Cross Section North of Summit Street

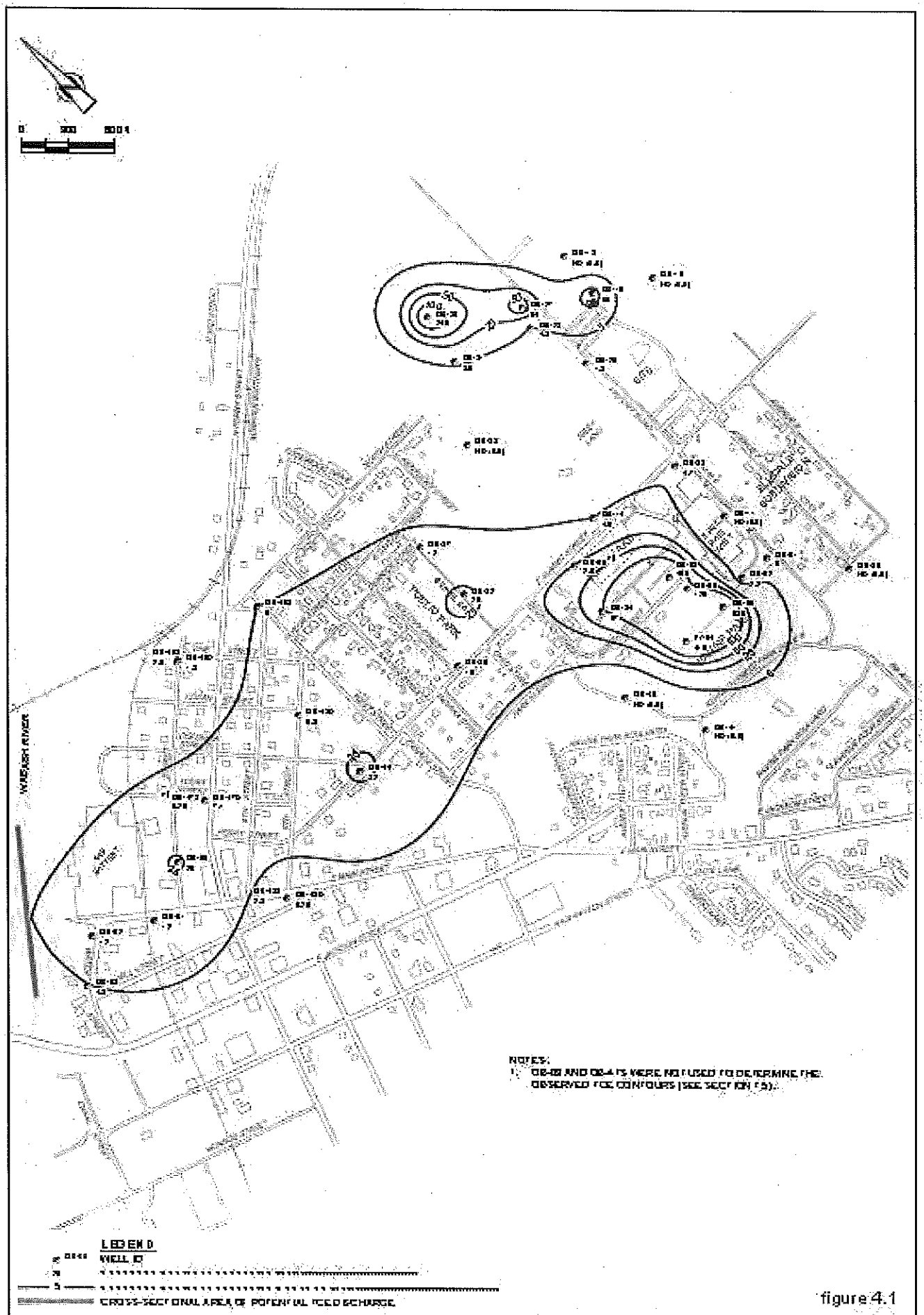
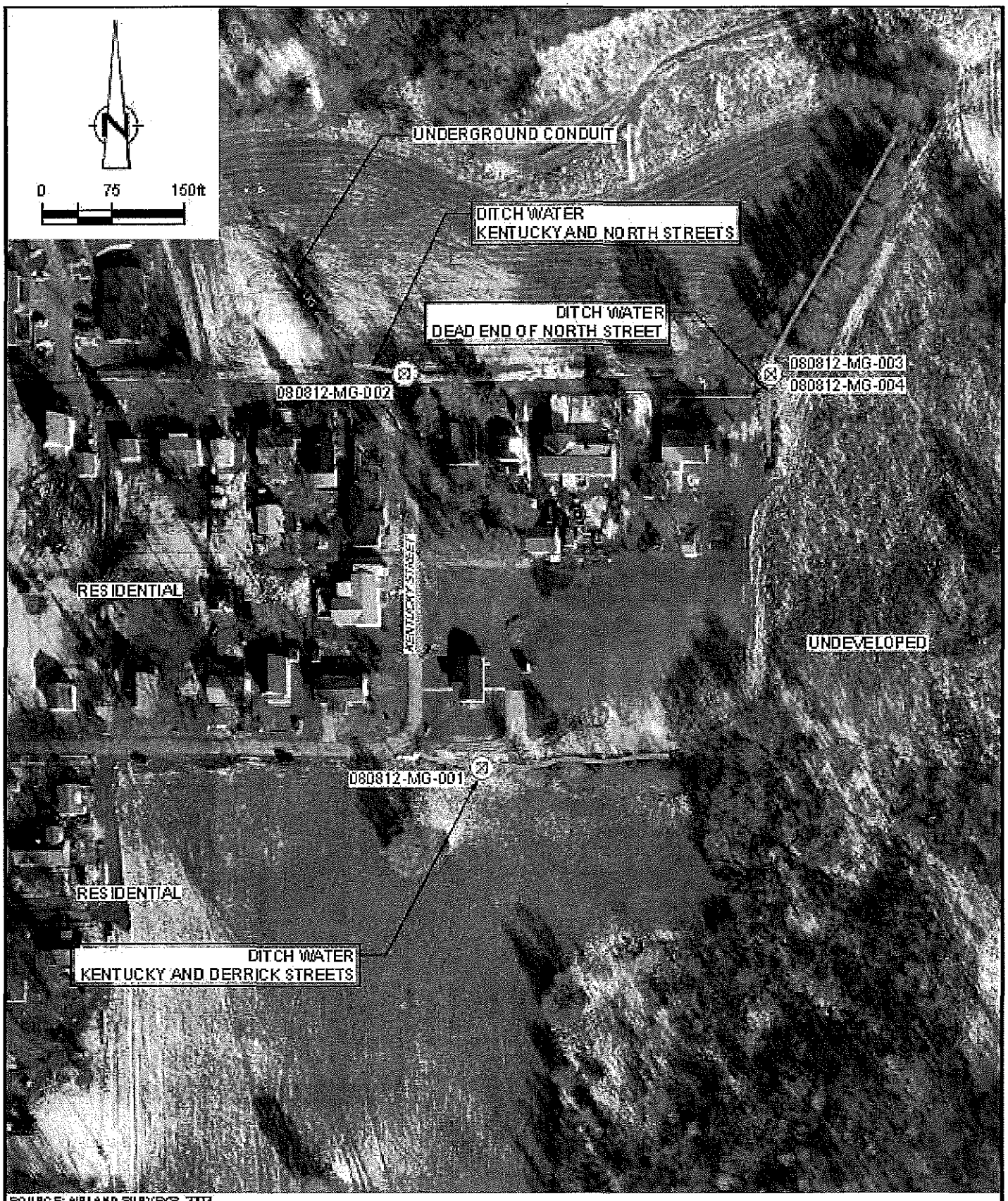


figure 4.1

AREA OF POTENTIAL DISCHARGE TO WABASH RIVER
RADIO MATERIALS CORPORATION
Attica, Indiana

19150-00050/GN-WA003 SEP 24 2012



SOURCE: AIRLAND SURVEYS, 2003.

LEGEND

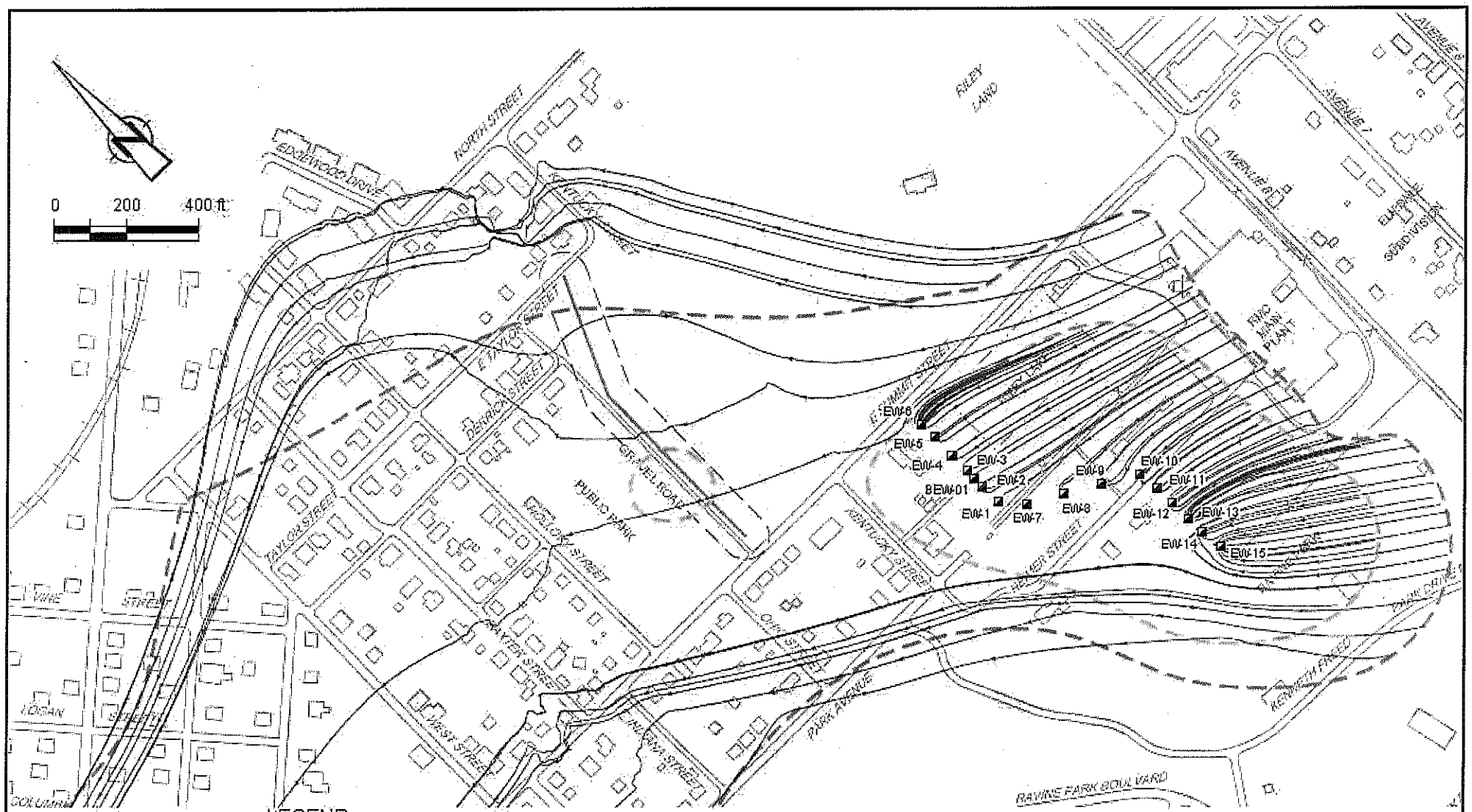
DITCH WATER SAMPLING LOCATION

DITCH

figure 4.3

2012 SURFACE WATER SAMPLING LOCATIONS
RADIO MATERIALS CORPORATION
Attica, Indiana

19190-02(056)GN-WA009 SEP 24/2013



LEGEND

- EW-03 OVERBURDEN EXTRACTION WELL ID
- BEW-03 BEDROCK EXTRACTION WELL ID
- AS/SVE REMEDIAL TRENCH
- 65-FOOT RADIUS OF INFLUENCE
- OBSERVED TCE 5 µg/L PLUME EXTENT
- OBSERVED TCE 25 µg/L PLUME EXTENT
- PARTICLE PATHLINE ORIGINATING FROM 5 µg/L CONTOUR UPGRADIENT OF GW ICMs
- PARTICLE PATHLINE ORIGINATED FROM 25 µg/L CONTOUR UPGRADIENT OF GW ICMs

NOTE: ARROWS REPRESENT THE DISTANCE A SIMULATED PARTICLE WILL TRAVEL IN 1 YEAR.

figure 5.1

SIMULATED HYDRAULIC CONTAINMENT FOR GW ICMs
RADIO MATERIALS CORPORATION
Attica, Indiana

CRA

19190-02(056)GN-WA010-SEP 24/2013

Table 1: Mann-Kendall Trend Test Summary

Well ID	*Date Range*		*# Values*	*cDCE*	*PCE*	*TCE*	*Vinyl Chloride*
Northern Plume Wells							
BW-03	8/21/2003	4/30/2013	26	Downward Trend	Downward Trend	Downward Trend	No Trend
BW-05	10/25/2003	4/30/2013	23	Downward Trend	Downward Trend	Downward Trend	**Upward Trend**
BW-09	10/26/2003	4/23/2013	24	Downward Trend	Downward Trend	Downward Trend	**Upward Trend**
	1/30/2008	4/23/2013	16	Downward Trend	Downward Trend	Downward Trend	Downward Trend
BW-15	12/8/2004	4/30/2013	20	No Trend	No Trend	No Trend	No Trend
BW-16	12/8/2013	4/22/2013	21	Downward Trend	Downward Trend	Downward Trend	No Trend
BW-18	12/8/2004	4/22/2013	24	Downward Trend	No Trend	Downward Trend	No Trend
OB-19	2/28/2001	4/23/2013	24	Downward Trend	Downward Trend	Downward Trend	No Trend
OB-28	2/28/2001	4/30/2013	23	Downward Trend	Downward Trend	Downward Trend	No Trend
OB-30	10/24/2013	4/30/2013	23	Downward Trend	Downward Trend	Downward Trend	No Trend
OB-31	10/24/2003	4/30/2013	24	No Trend	Downward Trend	No Trend	No Trend
OB-38	12/8/2004	4/30/2013	22	No Trend	Downward Trend	No Trend	No Trend
Southern Plume Wells							
BW-02	10/25/2013	7/12/2013	28	No Trend	Downward Trend	**Upward Trend**	Downward trend
BW-04	10/24/2003	11/4/2009	17	No Trend	No Trend	No Trend	No Trend
BW-07	8/19/2003	4/24/2013	33	No Trend	No Trend	Downward Trend	No Trend
BW-11	12/9/2004	7/15/2013	27	Downward Trend	Downward Trend	Downward Trend	Downward Trend
BW-14	12/10/2004	4/29/2013	23	Downward Trend	No Trend	Downward Trend	Downward Trend
OB-03	1/17/2000	11/3/2009	12	No Trend	No Trend	No Trend	No Trend
OB-06	3/2/2001	7/15/2013	24	No Trend	No Trend	No Trend	**Upward Trend**
	7/14/2009	7/15/2013	14	Downward Trend	Downward Trend	Downward Trend	No Trend
OB-08	3/1/2001	7/15/2013	31	Downward Trend	Downward Trend	Downward Trend	No Trend
OB-32	10/24/2003	7/10/2013	27	No Trend	No Trend	Downward Trend	No Trend
OB-34	10/10/2004	4/29/2013	23	Downward Trend	Downward Trend	Downward Trend	No Trend
OB-36	12/6/2004	4/24/2013	23	Downward Trend	Downward Trend	Downward Trend	No Trend
OB-37	12/6/2004	7/10/2013	27	**Upward Trend**	Downward Trend	Downward Trend	**Upward Trend**
OB-43D	8/22/2006	4/19/2013	24	No Trend	No Trend	No Trend	No Trend
OB-45D	8/17/2005	10/28/2009	16	No Trend	No Trend	Downward Trend	No Trend
OB-45S	8/16/2005	4/19/2013	19	No Trend	No Trend	Downward Trend	No Trend

PCE – Tetrachloroethene

TCE – Trichloroethene

cDCE – cis-1,2-dichloroethene