THIRD FIVE-YEAR REVIEW REPORT

For

Commodore Semiconductor Group Superfund Site

Lower Providence Township,
Montgomery County, Pennsylvania

August 2015

PREPARED BY:

United States Environmental Protection Agency
Region III
Philadelphia, Pennsylvania

Approved by:

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U.S. EPA Region III

Date:

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List of Acronyms

AOC	Administrative Order by Consent
AGC	Advanced GeoServices Corporation
ARAR	Applicable or Relevant and Appropriate Requirement
AWC	Audubon Water Company
CBM	Commodore Business Machines
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Contaminant of Concern
CSG	Commodore Semiconductor Group
EPA	Environmental Protection Agency
ERM	Environmental Resources Management
ESD	Explanation of Significant Differences
ET	Enhanced Treatment
FD	French Drain System and Sump
FS	Feasibility Study
GWRTS	Groundwater Recovery and Treatment System
ICs	Institutional Controls
ISCO	In-Situ Chemical Oxidation
MCHD	Montgomery County Health Department
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
OU1	Operable Unit One
OU2	Operable Unit Two
PA	Preliminary Assessment
PADEP	Pennsylvania Department of Environmental Protection
PCE	Tetrachloroethene or perchloroethene
PCOR	Preliminary Closeout Report
POTW	Publicly Owned Treatment Works
PPB	Part Per Billion
PRP	Potentially Responsible Party
RA	Remedial Action
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act

List of Acronyms (continued)

SDWA	Safe Drinking Water Act
SI	Site Inspection
SMCL	Secondary Maximum Contaminant Level
TCE	Trichloroethene
TCL	Target Compound List
USACE	U.S. Army Corps of Engineers
VE	Vapor Extraction
VI	Vapor Intrusion
VFCC	Valley Forge Corporate Center
VOC	Volatile Organic Contaminant
WTU	Wellhead Treatment Unit

Executive Summary

The United States Environmental Protection Agency (EPA) Region III conducted this Third Five-Year Review of the Commodore Semiconductor Group Superfund Site (CSG Site or Site). This five-year review consisted of a site inspection, township and State interviews, and the review of monitoring data on the current groundwater extraction system including off-site monitoring wells and site investigations. During the review, several issues were identified and as a result recommendations were established regarding the groundwater remedy.

The CSG Site is located at 950 Rittenhouse Road in Norristown, Lower Providence Township, Pennsylvania. Trichloroethene (TCE), used in the manufacturing process at the Site, was detected in nearby public water supply wells in 1978 which led to the Site being listed on the National Priorities List (NPL). The Record of Decision (ROD), signed by EPA on September 29, 1992, is comprised of two operable units (OUs). Operable Unit One (OU1) focused on providing safe drinking water to nearby residences with the construction of a waterline extension and service connections. Operable Unit Two (OU2) addressed remediating the contaminated groundwater by installing a groundwater extraction and treatment system. On August 24, 2000, the Site achieved construction completion status with the signing of the Preliminary Closeout Report (PCOR). The trigger for this Third Five-Year Review was the date of the Second Five-Year Review which was completed on September 29, 2010.

The remedy for the Site is protective in the short-term. Long-term protectiveness of the remedy will be achieved by continuing to pump and treat the groundwater, and maintaining effective ICs until cleanup standards have been achieved. Further evaluation will be conducted on the impact of upgradient VOC contamination on achievement of site groundwater cleanup levels.

This Third Five-Year review finds that the remedy has been constructed in accordance with the requirements of the ROD and is functioning as designed. The remedy for OU1 (water line) remains protective of human health since it supplied a permanent source of clean drinking water to residences. The remedy for OU2 (groundwater treatment) has been effectively capturing the Site plume and is expected to achieve the groundwater cleanup standards, which are protective of human health and the environment. However, based upon upgradient groundwater data, additional sources of groundwater contamination that are believed to be unrelated to the CSG Site exist in the area and, if not addressed, will likely impact decisions about when site cleanup levels are achieved

As part of this Five Year Review, the Government Performance and Results Act (GPRA) Measures have also been reviewed. The GPRA Measures are provided as follows:

Environmental Indicators
Human Health: Human Exposure Under Control (HEUC).
Groundwater Migration: Groundwater Migration Under Control (GMUC)

Site-wide Ready for Anticipated Use (SWRAU):
The Site was designated Site-Wide Ready for Anticipated Use (SWRAU) in 2006.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Commodore Semiconductor Group Superfund Site		
EPA ID: PAD093730174		
Region: 3	**State:** PA	**City/County:** Lower Providence Township, Montgomery County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Sharon Fang
Author affiliation: USEPA, Region 3
Review period: 07/2014 – 06/2015
Date of site inspection: 09/24/2014
Type of review: Policy
Review number: 3
Triggering action date: 09/29/2010
Due date *(five years after triggering action date)*: 09/29/2015

Five-Year Review Summary Form, continued

Issues/Recommendations

Issues and Recommendations Identified in the Five-Year Review:

OU(s): OU2	**Issue Category: Remedy Performance**			
	Issue: Off-site sources of groundwater contamination continue to impact the CSG Site.			
	Recommendations: PADEP will perform additional off-site investigations at upgradient property.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	12/30/2016
OU(s): OU2	**Issue Category: Remedy Performance**			
	Issue: Off-site sources of groundwater contamination impact the cleanup at the CSG Site.			
	Recommendation: PRP will establish technical information regarding the effects of off-site contamination on the CSG Site.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	3/30/2017
OU(s): OU2	**Issue Category: Remedy Performance**			
	Issue: VFCC-4 is an Audubon Water Company reserve well on the CSG property which is not currently used due to naturally occurring, elevated concentrations of dissolved salts. Although capped, the well bore is open and available for shallow contamination from man-made or natural sources to migrate into the deep bedrock.			
	Recommendation: Work with AWC to reinstall packer or other technology in VFCC-4 at the proper interval to prevent vertical migration of contamination between the shallow and deep portions of the bedrock aquifer.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/30/2015

Five-Year Review Summary Form, continued

Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
OU1	Protective

Protectiveness Statement:

The remedy for OU1 (water line) of the Site is protective in the short-term and long-term. This Third Five-Year review finds that the remedy has been constructed in accordance with the requirements of the ROD and is functioning as designed. The remedy for OU1 remains protective of human health since it supplied a permanent source of clean drinking water to residences.

Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
OU2	Protective

Protectiveness Statement:

The remedy for OU2 (groundwater) of the Site is protective in the short-term. Long-term protectiveness of the remedy will be achieved by continuing to pump and treat the groundwater, and maintaining effective ICs until cleanup standards have been achieved. Further evaluation will be conducted on the impact of upgradient VOC contamination on achievement of site groundwater cleanup levels.

This Third Five-Year review finds that the remedy has been constructed in accordance with the requirements of the ROD and is functioning as designed. The remedy for OU2 has been effectively capturing the Site plume and is expected to achieve the groundwater cleanup standards, which are protective of human health and the environment. However, based upon upgradient groundwater data, additional sources of groundwater contamination that are believed to be unrelated to the CSG Site exist in the area and, if not addressed, will likely impact decisions about when site cleanup levels are achieved.

Third Five-Year Review Report for the
Commodore Semiconductor Group Superfund Site
Lower Providence Township, Montgomery County, Pennsylvania

I. Introduction

The purpose of a five-year review is to determine whether the remedy at a Site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify issues found during the review, if any, and recommendations to address them.

Environmental Protection Agency (EPA) guidance on conducting the five-year review is provided by OSWER Directive 9355.7-03B-P, *Comprehensive Five-Year Review Guidance* (EPA, 2001). EPA personnel followed the guidance provided in this OSWER directive in conducting the five-year review performed for the Site.

Five-year reviews are conducted either to meet the statutory mandate under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) § 121, or as a matter of EPA policy. The statutory requirement to conduct a five-year review was added to CERCLA as part of the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA §121states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

EPA Region III conducted a policy five-year review of the remedial action implemented at the Commodore Semiconductor Group (CSG) Superfund Site (Site) in Lower Providence

Township, Montgomery County, Pennsylvania. This report documents the results of the review, which determines whether the remedy at this Site is protective of human health and the environment. Support for this review was provided by Rockwell Automation, Inc. (Rockwell), the Potentially Responsible Party (PRP) for the Site. Sampling data and other technical data reviewed and taken into consideration during this review was generated by Rockwell. The methods, findings, and conclusions of the review are documented in this five-year review report. In addition, this five-year review report identifies issues found during the review and follow-up actions to address them.

This is the Third Five-Year Review for the Site. The Second Five-Year Review was completed on September 29, 2010 and is the trigger for this Third Five-Year Review. The review was conducted for the entire Site by the Remedial Project Manager from July 2014 to August 2015. This Third Five-Year Review is required because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1 Chronology of Site Events

Event	Date
Audubon Water Company detected trichloroethene (TCE) in two of its public water supply wells located near the CSG Site	1978
EPA completed Preliminary Assessment/Site Inspection (PA/SI) which revealed the presence of TCE in residential wells, groundwater, surface water, and soil samples	February 1984/December 1986
Commodore Business Machines (CBM) entered Administrative Order on Consent (AOC) to perform Remedial Investigation and Feasibility Study (RI/FS)	July 29, 1988
National Priorities List (NPL) listing	October 4, 1989
RI/FS Proposed Plan released to public	July 1992
Record of Decision (ROD) for Site Signed-OU1 waterline extension, OU2 groundwater pump and treat	September 29, 1992
First Explanation of Significant Difference (ESD) Issued-withdrew sulfate applicable or relevant and appropriate ("ARAR") standard	May 5, 1993
Unilateral Administrative Order (UAO) issued to CBM And Rockwell to perform activities necessary for the ROD, First ESD, Remedial Design/Remedial Action (RD/RA), and Operation and Maintenance (O&M)	June 30, 1993
RD-OU1 start (waterline extension)	October 1993

RD-OU2 start (groundwater pump & treat)	
RD-OU1 complete	November 18. 1994
RA-OU1 on-site start	September 16, 1996
EPA approves RA-OU1 report	June 14, 1998
EPA approves final design report and RA Work Plan -OU2	September 9, 1999
RA-OU2 on-site start	September 20, 1999
EPA determined RA-OU2 activities constructed and completed	August 9, 2000
Preliminary Closeout Report (PCOR) signed	August 24, 2000
EPA approved interim Remedial Action Report for OU2	December 20, 2000
Second ESD issued- modified Institutional Controls (ICs)	September 28, 2004
Rockwell conducts evaluation of remedy enhancements	January 2001 to May 2003
Full-Scale Vapor Extraction (VE) system design, installation and testing	May 2003 - June 2003
Full Scale VE operation	August 2003 – March 2005
In-situ Oxidation of shallow soils and bedrock beneath building	August 2003 - October 2003
Preparation for in-situ oxidation of bedrock aquifer	June 2004 – November 2006
Third ESD issued- eliminated background cleanup standard	September 8, 2006
Installed and sampled well MW-32S to evaluate potential for Vapor intrusion	June 2010
Fourth ESD issued- added ICs for potential Vapor Intrusion	September 28, 2011
Off-site Perched Water and Soil Sampling Report	January 15, 2014
Plume Stability Verification began	Fall 2014

III. Background

Physical Characteristics

The CSG facility is located at 950 Rittenhouse Road, Norristown, Lower Providence Township, Montgomery County, Pennsylvania. Commodore Business Machines (CBM) previously operated a semiconductor manufacturing business at the Site in a 147,000 square foot building located on a 14.1-acre parcel within the Valley Forge Corporate Center (VFCC). The property is bordered on the northwest by Rittenhouse Road, on the northeast by Van Buren Avenue and on the southeast by Adams Avenue. The Transcontinental Gas Company (Transco) Pipeline, which includes three natural gas pipes, transverses the property. The CSG Site includes the 14.1 acre parcel as well as surrounding property beneath which contaminated groundwater has come to be located. See Figure 1- Site Location Map.

The Site is underlain by the middle member of the Triassic-age Stockton Formation. The Stockton Formation is characterized by interbedded siltstone, fine-grained and medium-grained arkosic sandstone, red shale, very fine-grained red arkosic sandstone, and a few beds of coarse-

grained sandstone and conglomerate. Well locations are shown in Figure 2. Groundwater movement through the bedrock aquifer occurs mainly through bedding plane and high angle fractures. Minor amounts of groundwater flow in the bedrock may occur through the primary porosity. The aquifer system has been divided for the purpose of discussion into two units based on depth. See Figures 3, 4, 5, and 6. The shallow transition zone consists of overburden and bedrock and is defined as the upper 100-150 feet of the subsurface. The shallow transition zone is underlain by the deep bedrock aquifer. The transition zone and the deep bedrock aquifer are hydraulically connected. Groundwater movement and the migration of the Site-related contaminants are influenced by the pumping of the nearby bedrock public water supply wells. The regional groundwater flow is to the southeast: however, groundwater in the vicinity of the Site appears to move south-southwest as well. Based on the population and development of the area, pumping of the bedrock aquifer will likely continue in the future.

The Site is located in a gently rolling terrain in the Schuylkill River Drainage Basin. The Schuylkill River is approximately one mile south of the Site. Regional surface water drainage near the Site is directed to the south toward the Schuylkill River via tributary systems. Local surface drainage in the vicinity is to the south or west, while actual Site runoff is collected and discharged through the VFCC storm water system to Lamb Run a small tributary of the Schuylkill River. There are no known endangered species or critical habitats within the immediate vicinity of the Site.

Land and Resource Use

The Site is located within the VFCC which has had a mix of land uses including industrial and commercial office space. Land use in the vicinity of the Site has not changed significantly since the issuance of the ROD in 1992. From 1970 to 1993, CBM conducted operations at the Site which consisted of manufacturing semiconductor chips. CBM is no longer active, and has been dissolved for several years. In 1994, GMT Microelectronics, Inc. acquired the Site, and its process technology and equipment, to produce integrated microelectronic circuits. GMT Microelectronics, Inc. discontinued its operation in 2000 and abandoned all of its assets including the Site. Currently, the property is owned by a private party who hopes to develop the property for reuse. The building is currently unoccupied.

The golf course at the Club at Shannondell, formerly named Washington Golf Course, occupies the property immediately west of the facility on Rittenhouse Road. This property has been permanently preserved as public open space. Residential land use exists within a ½ mile of the Site in all directions.

Groundwater is the only source of potable water in the area of the Site for both residents and businesses. EPA has classified this aquifer as a Class IIA aquifer, a current source of drinking water. This aquifer is located in a Groundwater Protected Area of Southeastern Pennsylvania as designated by the Delaware River Basin Commission. The Audubon Water Company (AWC) has been the primary supplier of public water to homes and businesses in the vicinity of the Site. Several of the AWC production wells are located within ½ mile radius of the Site. AWC treats groundwater prior to distribution.

There are residential wells in use within ½ mile of the Site. Most of the residences on Rittenhouse Road are connected to the public water supply; however, there were some homeowners who did not accept the connection to public water. The PRP gave carbon treatment units to those homeowners who are now responsible for maintaining the carbon filter units. Further to the southwest of the Site on Apple Valley Lane there are private wells in use. According to AWC, a couple homes in the Apple Valley Lane area recently connected to public water due to bank financing requirements. Groundwater monitoring data indicates that these private wells are located beyond the Site plume. Also according to AWC, there have been some changes in residential groundwater use near Egypt and Rittenhouse Roads, which is upgradient of the CSG Site.

History of Contamination

CBM was a prior owner/operator of the Site and manufactured silicon wafers into semiconductor chips from approximately 1970 to 1993. Allen-Bradley Company, Inc., now known as Rockwell, was the owner from approximately 1969 to 1978, during which time CBM also operated at the Site. TCE was used by CBM in the semiconductor cleaning process from 1970 until 1979. The TCE used in the process generated a TCE waste which was disposed of at the Site in a 250-gallon underground concrete storage tank. According to information obtained by EPA from CBM, the underground concrete storage tank leaked in 1974. As a result, in 1975, CBM discontinued the use of the concrete tank, and installed a steel tank adjacent to the concrete tank.

In 1978, AWC detected TCE in two of its wells located near the CSG Site. The Pennsylvania Department of Environmental Resources, now known as Pennsylvania Department of Environmental Protection (PADEP), identified the CSG facility as a possible TCE source.

Initial Response

In the fall of 1979, the underground tanks and surrounding contaminated soil were excavated. Sampling for TCE and tetrachloroethene (PCE) during the excavation revealed high levels of TCE and PCE in the soil directly below the underground storage tanks and in the surrounding groundwater. CBM replaced the tanks with a waste solvent collection system consisting of a tank within a lined vault. In 1981, CBM discontinued the use of TCE in its manufacturing process. At the same time, the company installed groundwater monitoring wells and began a sampling program.

Measures to reduce TCE contamination at the Site started in early January 1981. From 1981 to 1983, CBM pumped and spray irrigated water from AWC's public supply well, VFCC-4. Spray irrigation is a practice consisting of spraying contaminated water on a field and allowing volatile organic compounds (VOCs) to evaporate into the air. CBM obtained informal state approval for the spray irrigation system, but did not operate the system under a PADER permit.

In February 1984, CBM purchased and installed an air stripper on VFCC-4 to be used in the treatment of contaminated groundwater. Naturally occurring elevated concentrations of dissolved salts in

groundwater produced from VFCC-4 limited its use by AWC to a back-up/reserve water source. In 1984, CBM began a residential sampling program and installed whole-house carbon filter systems on 23 residences where at least 1 part per billion (ppb) of TCE was detected in the well water.

In February 1984, EPA performed a Site Inspection (SI) at the CSG Site. A Preliminary Assessment (PA) and another SI were subsequently completed on December 5 and 12, 1986, respectively. Sampling results revealed the presence of TCE in nearby residential wells. TCE and TCE-related compounds were also found in the groundwater, surface water, and soil samples taken from the Site. The Site was proposed for inclusion on the CERCLA National Priorities List (NPL) in January 1987. The EPA finalized the listing of the Site on the NPL on October 4, 1989 (54 Fed. Reg. 4100041015).

On July 29,1988, CBM entered into an Administrative Order by Consent (AOC), EPA Docket No. III-88-09-DC, to perform a Remedial Investigation (RI) and Feasibility Study (FS) at the Site. The purpose of the RI/FS is to characterize the type and extent of contamination at the Site, to quantify any existing or potential human health risk, to evaluate potential environmental risks, and to develop alternatives to remediate the contamination. The EPA approved the final RI/FS report for the Site on March 3, 1993.

Basis for Taking Action

The Contaminants of Concern (COCs) that had been identified in the RI/FS report were volatile organic compounds, primarily TCE and its breakdown products. VOC concentrations detected in onsite soil and in surface water were below risk- based screening levels and therefore did not represent a risk. However, groundwater sampling identified a plume of VOCs above maximum contaminant levels (MCLs) in the bedrock aquifer beneath the CSG property and portions of the Township. The RI/FS Report explained that the ingestion of, and contact with, contaminated groundwater posed the primary risk to human health in connection with the Site. The hazardous substances detected at the Site in groundwater and identified as COCs are listed in Table 2.

The highest VOC concentrations detected were in the shallow groundwater near the former underground concrete tank and the steel tank. The VOCs detected in that area were TCE, TCA, 1,1-DCE, 1,2-DCE, 1,1-DCA, PCE and chloroform.

Exposure to contaminated groundwater posed the primary risk to human health. The highest total lifetime cancer risk of $1.4x10^{-4}$ was calculated from exposure to contaminants in groundwater for the hypothetical future residential well at the golf course. All of the other total lifetime cancer risks were within EPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$. For non-cancer risk, a hazard index that exceeds 1.0 is indicative of an unacceptable risk. The calculated Hazard Index, based on combined exposure due to groundwater ingestion and inhalation that exceeded 1 was for the child receptor, exposed to untreated public water. All other hazard indices were 1 or less.

Table 2
Contaminants of Concern (COC) Cleanup Standards

COC	MCL (ppb)
Bromodichloromethane	80*
Chloroform	80*
1,2 Dichlorobenzene (1,2-DCB)	75
1,4 Dichlorobenzene (1,4-DCB)	600
1,1 Dichloroethane (1,1-DCA)	810**
1,2 Dichloroethane (1,2-DCA)	5
1,1 Dichloroethene (1,1-DCE)	7
1,2 Dichloroethene (1,2-DCE)	70
Tetrachloroethene (PCE)	5
1,1,1 Trichloroethane (TCA)	200
Trichloroethene (TCE)	5
Vinyl Chloride (VC)	2

* Contaminant with updated MCL
**Non- carcinogenic health-based concentration

IV. Remedial Actions

Remedy Selection

The decision by EPA on the remedial action to be implemented at the Site is embodied in a ROD, signed on September 29, 1992, and modified by four Explanation of Significant Differences (ESDs). The ROD for the Site established the remedial action objectives as follows:

- to prevent current or future exposure to contaminated groundwater,
- to protect uncontaminated groundwater for current and future use, and
- to restore contaminated groundwater to MCLs or to background concentrations, if background for Site-related contaminants is lower than the MCLs.

The ROD remedy was divided into two parts, called Operable Units (OU): Operable Unit One (OU1) and Operable Unit Two (OU2). OU1, Waterline Extension, focused on providing safe drinking water to the residences to prevent current or future exposure to contaminated groundwater. OU2, Groundwater Pump and Treat, addresses capturing contaminated groundwater to protect uncontaminated groundwater and the cleanup of contaminated

groundwater to site cleanup standards. OU2, Groundwater Pump and Treat, is the focus of this five-year review since this operable unit is a long-term remedial action which requires more than five years to achieve the cleanup standards.

The selected remedy included the following major components:

- Construction of public water supply lines and connections to the residences south of the CSG facility on Rittenhouse Road and on Audubon Road between Rittenhouse Road and Thrush Lane;

- Continued maintenance of the whole-house carbon filtration systems previously supplied to residences along Audubon Road near Trooper Road;

- Installation, operation, and maintenance of groundwater extraction wells to remove contaminated groundwater from beneath the Site and to prevent contaminants from migrating further;

- Installation, operation, and maintenance of air strippers at the groundwater extraction wells to treat groundwater to the required levels;

- Installation, operation, and maintenance of vapor phase carbon units on air strippers;

- Periodic sampling of groundwater and treated water to ensure that treatment components are effective and that groundwater remediation is progressing towards the required cleanup levels; and

- Creation of a groundwater management zone with restrictions on the installation of new wells in areas of contamination which exceed MCLs set forth under the Safe Drinking Water Act (SDWA).

On May 5, 1993, EPA issued its First ESD which withdrew Pennsylvania's secondary maximum contaminant levels (SMCLs) as relevant and appropriate requirements for the discharge of treated water to the AWC. The SMCLs identified in the 1992 ROD required the removal of naturally occurring sulfates from the groundwater. While such SMCLs would be enforceable standards for any treated water distributed to customers of AWC, as ultimate users of the system, such SMCLs are not enforceable standards for water provided from Rockwell's treatment plant to the AWC. Therefore, EPA determined that the SMCLs were not relevant and appropriate requirements for the selected remedy for the Site.

On September 28, 2004, EPA issued the Second ESD for the Site. EPA determined that a change to the 1992 ROD regarding implementation of institutional controls (ICs), the purpose of which is to minimize the potential for human exposure to the contaminated groundwater, was warranted. As stated above, the 1992 ROD required the creation of a groundwater management zone with restrictions on the installation of new wells in areas of contamination which exceed

applicable maximum contaminant levels ("MCLs") set forth under the SDWA, 42 U.S.C. §§ 300f-300j-26. The MCLs, which are health-based levels, are the maximum permissible concentrations of a chemical in drinking water as established in the SDWA. Since there was no statutory mechanism in the Commonwealth of Pennsylvania governing the establishment of groundwater management zones, EPA was unable to implement a groundwater management zone for this Site. However, on February 1, 1997, the Montgomery County Board of Health Department's Division of Water Quality Management adopted Chapter XVII, Individual Water Supply System Regulations ("Regulations") and amended these regulations on August 1, 2003. The purpose of these Regulations is "to establish minimum standards for location, construction, modification or abandonment of individual water supply wells and system installation for protection of public health and welfare" based on groundwater quality results. The Second ESD modified the IC component of the remedy by removing the provision calling for the creation of a Groundwater Management Zone and selecting the Regulations as the institutional control mechanism that would aid in minimizing exposure to contaminants in groundwater that exceed MCLs.

Additionally, the Second ESD incorporated, as a component of the ICs required by the 1992 ROD, two deeds of grants dated May 24, 2000 and June 28, 2000, which were executed in connection with the Site to protect the integrity of the constructed remedy. The May 24, 2000 Deed of Grant from GMT Microelectronics, Inc. to Rockwell created an easement and right-of-way upon and across property located at 950 Rittenhouse Road for the purpose of, among other things, constructing, maintaining and "removing buildings, facilities and pipelines for treating and transporting water" from Rockwell's treatment system to AWC's public water supply system. The June 28, 2000 Deed of Grant from AWC to Rockwell created an easement and right-of-way upon and across property located at 950 Rittenhouse Road for the purpose of, among other things, constructing, placing, operating and "removing pipelines, power cables, control cables and other related equipment for transporting and transferring water" to Rockwell's treatment facility. Both Deeds of Grant also provided that the above-mentioned property owners would not interfere with Rockwell's Site remedial activities.

EPA issued a Third ESD on September 8, 2006. The Third ESD provided for the elimination of the Commonwealth of Pennsylvania's groundwater background concentration cleanup standard set forth at 25 PA Code § 264.97(i) and (j) as set forth in the 1992 ROD. Since the Commonwealth repealed that standard and established a new groundwater cleanup standard in the Land Recycling and Environmental Remediation Standards Act of May 19, 1995, P.L. 4, No.2., 35 P.S. § 6026.101 *et seq*. ("Act 2"). EPA evaluated whether Act 2 should be an applicable or relevant and appropriate ("ARAR") standard. EPA determined that Act 2 is no more stringent than the Safe Drinking Water Act's MCL for contaminants of concern at the Site, therefore, Act 2 standards are not ARARs.

EPA issued a Fourth ESD on September 28, 2011 since concentrations of contaminants in the groundwater in the vicinity of the former manufacturing building on the Site are above the MCLs and redevelopment was believed to be imminent. This Fourth ESD modified the IC component of the 1992 ROD in an effort to prevent potential occupant exposure to VOCs

underlying the former manufacturing building in the event that the building is rehabilitated and reoccupied. This modification was also necessary to prevent potential occupant exposure to Site contaminants in the event that future development or construction takes place on top of the groundwater contamination at the CSG Site.

Remedy Implementation

On June 30, 1993, EPA issued a Unilateral Administrative Order, EPA Docket No. III 93-37-DC)(Order or UAO), to both CBM and Rockwell Automation. The Order required both parties to perform all activities necessary to implement the remedial design and remedial action for the Site. CBM went bankrupt shortly after the UAO was issued and has since been dissolved; therefore, Rockwell Automation (Rockwell) is the PRP performing the response actions at the Site. Rockwell selected Advanced GeoServices Corporation (AGC) to design and oversee construction of the selected remedy.

OU1 included the installation of a waterline extension to twelve residences along Audubon and Rittenhouse Roads and maintenance of the existing whole-house carbon filtration systems until the remedy was constructed. Filters were also maintained in homes southeast of the Site along Audubon Road near Trooper Road, until EPA's revaluation of this area confirmed the existence of a groundwater divide which would prevent site-related contaminants from migrating in this direction.

EPA provided final approval of the Final Design for OU1, the AWC Waterline Extension, on November 18, 1994. Onsite construction of the waterline extension began during the week of September 16, 1996. Installation of the service laterals to residences began in November 1996. The service laterals were installed from the curb stops on the waterlines to the homes, through the foundation or basement wall of the property, and either capped (homeowners refusing to connect to the public water system) or temporarily plugged (pending activation of the waterline and connection the AWC system). The waterline was officially transferred to AWC in November 1997 and, therefore, Rockwell Automation has had no maintenance responsibility of the waterline. A total of fourteen properties had service laterals installed. The indoor plumbing of each property electing to be connected to the waterline was connected to the service laterals in winter and early spring of 1998. Those that did not accept the connection were provided carbon filter units by Rockwell Automation. Responsibility for future maintenance of the whole house treatment system remains with the property owner. On June 14, 1998, EPA accepted Rockwell's RA report for the AWC waterline extension.

Rockwell installed two treatment systems: (1) a newly constructed on-site groundwater treatment system and (2) an air stripping system at AWC's production well, VFCC-2. On September 9, 1999, EPA provided contingent approval to Rockwell of the Final Design Report and the Remedial Action Work Plan for the groundwater extraction and treatment system component of the remedy. The onsite construction of the groundwater extraction system and treatment building began on September 20, 1999. On August 9, 2000, EPA, in conjunction with the United States Army Corps of Engineers and PADEP, conducted a pre-final inspection of the groundwater extraction system and treatment building. EPA determined that the Remedial

Action activities at the Site were constructed and completed satisfactorily. On August 24, 2000, EPA issued the Preliminary Closeout Report for the Site.

The IC remedial action objective (RAO) at the Site is to prevent human exposure to site-related contaminants. This exposure could occur if new drinking water wells were installed within the area of the Site plume exceeding MCLs. This IC RAO is being achieved by relying on the MCHD's Regulations set forth at Chapter XVII of the Public Health Code and the two Deeds of Grant. This exposure could also occur through a VI pathway if the existing building were reoccupied, or a new building is constructed above the groundwater contamination. The RAOs are achieved under these scenarios through an environmental covenant pursuant to the Pennsylvania Uniform Environmental Covenants Act, Act No. 68 of 2007, 27 Pa. C.S. §§ 6501 – 6517 (UECA). This environmental covenant, signed by the owner of the property, provides for the performance of a VI assessment in the event the existing building is reoccupied or a new structure is built above groundwater contamination. The owner filed the covenant with the Montgomery County Land Records on July 17, 2015.

System Operation/Operation and Maintenance/Groundwater Sampling

The Site's groundwater extraction system (OU2) was designed to include the VFCC-2 System, the French Drain (FD) system and Rockwell's groundwater extraction and treatment system (GWRTS). The VFCC-2 System consists of a groundwater extraction system, air stripping system, and disinfection and distribution system, which is owned, maintained, and operated by the AWC. Rockwell and AWC had an agreement which called for AWC to maintain a certain pumping rate to provide groundwater capture in the deep aquifer. AWC uses the treated water from VFCC-2 as a source of drinking water. As of 2007, the agreement between Rockwell and AWC was dissolved and the pumping of VFCC-2 continues outside of input from Rockwell. Since VFCC-2 is distal from the Site, the operation of VFCC-2 as part of the CSG remediation is not optimally effective at capturing groundwater contamination from CSG (See Figures 4 and 6). Therefore, it is no longer necessary to operate the VFCC-2 system as part of the CSG's OU2 cleanup. Going forward, the Site's groundwater extraction system (OU2) shall consist of the FD system and the Site's GWRTS.

The FD system and sump collects shallow, infiltrating water from beneath the former CSG building to keep the basement from flooding. In the past, the FD discharged contaminated groundwater to the Publicly Owned Treatment Works (POTW) via the Lower Perkiomen Valley Regional Sewer Authority sanitary sewer system. Currently, the FD discharges into the GWRTS, where it is treated and then is discharged into the POTW.

The GWRTS consists of seven pumping wells: EW-1, EW-2, EW-3, AUD-MW-1M, VFCC-4, MOS-11R, and MOS-14. Rockwell has retained Environmental Resource Management (ERM) to conduct long-term operation and maintenance of the GWRTS, which began regular operation in August 2000. VFCC-4 was reclaimed by AWC and ceased operation as part of the GWRTS. ERM modified operation of a nearby extraction well, MOS-11R to replace VFCC-4. The extraction well pumping rates presented in the quarterly reports are

summarized in Table 3. During this five-year review cycle, the operation of the GWRTS entailed the following:

- Extraction from wells EW-1, EW-2. EW-3, and MOS-11R,
- Air stripping to remove COCs from the water,
- Vapor phase carbon adsorption to capture COCs from air, and
- Liquid phase carbon adsorption to serve as a final polishing step.

Prior to January 2007, Rockwell had an agreement with AWC that provided for treated water from the GWRTS to be used in AWC's public water supply distribution system. In January 2007, AWC ended their agreement with Rockwell. Since then, the treated water from GWRTS goes to the Publicly Owned Treatment Works (POTW) via the Lower Perkiomen Valley Regional Sewer Authority sanitary sewer system.

An Operations & Maintenance Plan (O&M Plan) for the GWRTS and FD, submitted by Rockwell Automation to EPA on December 6, 2001, describes standard procedures and routine maintenance required to keep the groundwater extraction system operating efficiently. Most of the GWRTS is automated so that it can be operated remotely. On-going maintenance, quarterly water level monitoring, and system performance sampling were all completed during the reporting period.

Rockwell Automation has conducted semi-annual groundwater sampling since 2004. Monitoring wells were sampled semi-annually or annually. The Sampling and Analysis Plan was updated in 2006 to include a current Target Compound List (TCL) list. This TCL list included both 1,4-dichlorobenzene and 1,2-dichlorobenzene. Concentrations of COCs by well are presented in Table 3. An overall decrease in contaminant concentrations has been observed. Pump and treat performance and plume recovery analysis is reported annually.

As of the first quarter 2015, more than 1 billion gallons of water had been treated and 625 pounds of COCs had been removed via the recovery wells and the French drain. Table 4 shows the number of gallons treated by the GWRTS from January 2011 to March 2015.

Voluntary Remedial Enhanced Treatment

Rockwell is committed to expediting the remediation of the CSG Site by implementing enhanced treatment activities that are in addition to those required by the ROD. The enhanced treatment (ET) was developed to address COCs concentrations located in the vadose zone and shallow bedrock adjacent to and beneath the building. Under the ROD remedy, infiltrating water slowly transports the COCs through these localized areas downward to be captured by the GWRTS. ET is designed to reduce the time necessary to achieve the Site groundwater cleanup standards.

Table 3
Groundwater Extracted (in gallons)

MONTH	MOS-14	French Drain	EW-1	EW-2	EW-3	AUD-MW-1M	VFCC-4	MOS-11R	Total	Total, Less French Drain
2011										
January flow total	0	62,840	191,563	143,885	102,269	0	0	348	500,906	438,066
February flow total	0	163,450	153,017	106,090	77,187	0	0	3,441	503,185	339,735
March flow total	0	298,641	112,289	72,297	55,491	0	0	266	538,983	240,342
April flow total	0	373,015	45,307	26,166	20,843	0	0	3,520	468,851	95,836
May flow total	0	294,782	150,704	77,398	60,389	0	0	155	583,428	288,647
June flow total	0	81,083	241,958	135,832	86,785	0	0	21,631	567,290	486,207
July flow total	0	18,192	28,234	140,596	86,171	0	0	78,561	607,854	589,633
August flow total	0	166,476	228,021	62,056	65,625	0	0	83,863	606,042	439,566
September flow total	0	304,540	32,804	93,190	41,175	0	0	0	471,709	167,169
October flow total	0	242,858	76,483	73,404	48,530	0	0	0	441,274	198,416
November flow total	0	218,642	70,505	103,708	58,032	0	0	59	450,946	232,304
December flow total	0	308,396	90,887	80,142	50,758	0	0	31,168	561,351	252,955
2012										
January flow total	0	246,450	132,494	73,409	46,150	0	0	44,066	542,570	296,120
February flow total	0	131,782	113,487	56,603	71,715	0	0	62,784	436,370	304,588
March flow total	0	117,484	32,056	36,944	36,799	0	0	24,120	247,403	129,919
April flow total	0	68,580	189,251	47,986	107,446	0	0	19,449	432,712	364,132
May flow total	0	71,272	203,783	96,900	120,594	0	0	23,232	515,780	444,508
June flow total	0	63,112	143,834	177,348	51,336	0	0	36,669	472,299	409,187
July flow total	0	10,500	221,933	74,078	268,222	0	0	163,902	738,635	728,135
August flow total	0	35,740	286,680	45,652	79,055	0	0	79,467	526,593	490,853
September flow total	0	81,828	248,808	115,236	76,968	0	0	145,617	668,457	586,629
October flow total	0	54,828	216,073	146,740	71,204	0	0	122,818	611,664	556,836
November flow total	0	81,916	209,788	149,186	71,086	0	0	124,752	636,728	554,812
December flow total	0	82,436	234,832	188,280	88,202	0	0	57,598	651,348	568,912
2013										
January flow total	0	135,588	234,733	148,804	69,598	0	0	24,161	612,884	477,296
February flow total	0	148,248	81,753	63,494	31,267	0	0	56,176	380,938	232,690
March flow total	0	172,384	130,037	96,638	94,545	0	0	76,284	569,888	397,504
April flow total	0	143,592	130,792	86,274	98,626	0	0	107,600	566,883	423,291
May flow total	0	124,092	99,708	88,346	146,164	0	0	116,259	574,568	450,476
June flow total	0	229,736	56,583	68,272	97,471	0	0	77,490	529,552	299,816
July flow total	0	148,784	123,315	88,322	111,324	0	0	125,567	597,311	448,527
August flow total	0	153,500	116,063	71,218	112,771	0	0	137,498	591,049	437,549
September flow total	0	64,720	126,197	104,992	128,336	0	0	158,046	582,291	517,571
October flow total	0	21,036	167,825	114,848	152,724	0	0	143,043	599,476	578,440
November flow total	0	1,300	157,359	114,468	137,879	0	0	114,226	525,232	523,932
December flow total	0	92,780	76,427	122,384	59,065	0	0	137,782	488,438	395,658
2014										
January flow total	0	180,588	52,200	67,142	47,678	0	0	155,574	503,181	322,593
February flow total	0	252,892	26,726	44,124	51,172	0	0	65,280	440,194	187,302
March flow total	0	303,044	20,569	43,092	55,194	0	0	57,506	479,405	176,361
April flow total	0	337,940	17,170	22,552	24,777	0	0	36,060	438,499	100,559
May flow total	0	356,712	23,134	29,530	29,284	0	0	29,223	467,883	111,171
June flow total	0	173,152	75,008	42,306	59,890	0	0	188,499	467,768	365,703
July flow total	0	93,596	188,032	*	0	0	0	174,444	456,072	362,476
August flow total	0	47,432	166,853	*	0	0	0	253,483	467,768	420,336
September flow total	0	29,612	155,778	*	13,291	0	0	270,887	469,568	439,956
October flow total	0	35,000	140,583	149,904	35,585	0	0	106,260	467,332	432,332
November flow total	0	79,532	112,593	143,402	77,903	0	0	50,748	464,178	384,646
December flow total	0	135,532	27,660	21,158	10,515	0	0	9,641	204,506	68,974
2015										
January flow total	0	97,556	0	0	0	0	0	0	97,556	0
February flow total	0	119,116	476	634	665	0	0	846	121,737	2,621
March flow total	0	269,040	0	0	0	0	0	0	269,040	0

Table 4
Summary of Groundwater Sampling Results-
Trichloroethene (TCE) concentrations (µg/l)

Well	Q3 2010	Q1 2011	Q3 2011	Q1 2012	Q3 2012	Q1 2013	Q3 2013	Q1 2014	Q3 2014	Q1 2015
RW-2										
RW-1	0.9							1.5		
RW-4										
RW-3	0.5 U							0.5 U		
AUD-5	NS	12	9.4		NS		NS	11	9.0	
AUD-MW-1D	23	11	6.5	10	5.8		2.8	4.8	4.0	2.0
AUD-MW-1M	5.4	5.5	17	4.0	4.8	5.5	7.4	6.3	5.0	4.8
AUD-MW-2	20	15	16 J	8.5	14	8.0	6.4	6.1	4.0	2.8
EW-1	130	60	34	15	39	33	14	26	30	16
EW-2	58	51	64	73	25	74	110	270	26	16
EW-3	67	49	62	63	43	54	64	95	21	17
French Drain	170	140	270	410	190	130	190	180	59	71
GW-1	17		16		17		14	14	9.2	
GW-2	7.6		1.6		7.0		6	1.2	7.8	
MOS-11R	14	29	18	6.1	13	32	29	27	4.8	5.4
MOS-13	14	3.6	7.8	4.2	6.0		3.6	3.6	12	3.7
MOS-14	57	14	12	13	68	6.9	7.7	7.4	17	7.2
MOS-15	22	11	10	5.9	7.4	5.5	5.2	4.4	5.0	3.4
MOS-18	1.1	0.5	0.2 J	0.4 J	0.4 J	0.5 J	0.5	0.7	1.3	0.8
MW-19D	2.0	2.8	2.3	3.1	2.9	2.9	2.8	3.2	4.0	2.9
MW-19M	0.4 J	0.5 U	0.5 U	0.4 J	0.1 J	0.1 J	0.7	0.8	0.7	0.1 J
MW-20D	1.3	11	4.3 J	5.6 J	25 U	1.3 J	2.4	5.0	25 U	1.0
MW-21D	16	18	18	12	9.6	11	12	11	12	12
MW-21M	14	16	20	10	11		6.8	8.7	6.0	8.2
MW-23	0.1 J		0.5 U	0.1 J	0.5 U		0.1 J	1.0	0.5 U	0.5 U
MW-24	0.2 J	1.6	0.5 U	0.4 J	0.5 U	0.4 J	0.5	1.8	0.5 U	1.4
MW-29	0.8		0.5 U	0.1 J	4.7		0.5 U	0.3 J	1.0	0.3 J
MW-30D	6.8	0.2 J	1.0 K	23	8.0	14	15	4.2	0.5	6.8
MW-30S	200	340	720	1100	390	440	690	340	97	190
MW-31D	63	30	19	0.6	62	34	33	37	46	38
MW-31S	5.4	2.3	2.7	1.5	8.7	2.5	3.0	1.6	5.3	2.5
MW-32S	2.3	2.3	4.5	1.9	2.0	1.9	1.2	2.4	1.0	1.8
MW-33S				5.3	3.6	3.7	3	3.9	4.0	5.0 U
MW-33D				8.3	6.6	5.1	6.4	7.1	5.0	0.8
VFCC-2	8.9	7.1	6.6	3.1	8.3	7.4	8.2	9.0	7.4	
VFCC-3	28		25		25		NS	43	21	21
VFCC-4	46	36	85	24	23	24	23	34	18	14

NS: This well was not sampled due to dry conditions or inaccessibility; or not reported due to sampling irregularities.
Blanks indicate that the well was not scheduled for sampling during the quarter.
J: This result should be considered a quantitative estimate
U: Compound was not detected. The numerical value represents the sample quantitation/detection limit of the compound.
Shading indicates that the result exceeds the EPA MCL of 5 µg/l

Table 4 Summary of Groundwater Sampling Results-
Tetrachloroethene (PCE) concentrations (µg/l)

Well	Q3 2010	Q1 2011	Q3 2011	Q1 2012	Q3 2012	Q1 2013	Q3 2013	Q1 2014	Q3 2014	Q1 2015
RW-2										
RW-1	0.1 J							0.2 J		
RW-4										
RW-3	0.5 U							0.5 U		
AUD-5	NS	0.5 J	0.4 J		NS		NS	0.7	0.4 J	
AUD-MW-1D	3.0	1.2	0.8	1.8	2.3		1.3	3.1	2.0	0.9
AUD-MW-1M	3.2	1.2	3.5	0.6 J	4	3.5	6.3	7.4	8.0	5.8
AUD-MW-2	9.8	7.4	2.1	1.6	10	1.9	1.9	2.5	8.0	2.5
EW-1	16	18	24	18	22	19	19	18	20	17
EW-2	16	13	17	21	13	16	16	11	17	12
EW-3	13	9.3	13	14	11	13	13	8.9	13	10
French Drain	1.3 J	3.4	9.2	6.0	7.6	3.1	8.6	6.3	3.3	3.9
GW-1	2.0		1.6		2.2		1.9	2	0.6	
GW-2	0.5 U		0.5 U		0.5 U		0.5 U	0.5 U	0.5 U	
MOS-11R	5.4	15 J	6.6	3.2	6.1	17	17	13	2.8	2.5
MOS-13	9.3	6.5	11	13	5.8		11	9.6	11	6.4
MOS-14	5.5	0.1 J	0.4 J	1.1	14	0.1 J	0.5 U	0.1 J	0.1 J	0.5 U
MOS-15	0.2 J	0.2 J	0.2 J	0.5 U	0.2 J	0.1 J	0.1 J	0.5 U	0.1 J	0.5 U
MOS-18	33	21	9.2	14	16	13	21	5.1	31	23
MW-19D	0.2 J	0.2 J	0.2 J	0.3 J	0.2 J	0.3 J	0.3 J	0.3 J	0.4 J	0.3 J
MW-19M	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-20D	0.2 J	1.6	10 U	25 U	25 U	2.5 U	0.3 J	0.5	25 U	0.1 J
MW-21D	1.8	3.7	4.2	3.1	2.5	4.1	4.2	3.3	4.0	5.0
MW-21M	1.2	1.3	1.8	1.3	1.3		1.4	1.2	1.0	0.9
MW-23	0.5 U		0.5 U	0.5 U	0.5 U		0.5 U	0.5 U	0.5 U	0.5 U
MW-24	0.1 J	0.5	0.5 U	0.3 J	0.5 U	0.2 J	0.2 J	2.4	0.4 J	0.5
MW-29	0.5 U		0.5 U	0.5 U	0.2 J		0.5 U	0.5 U	0.5 U	0.5 U
MW-30D	1.1	0.5 U	0.3 J	10	4.7	7.7	0.5 U	0.4 J	0.2 J	3.3
MW-30S	2.0 U	2.5 U	2.5 U	5.0 U	5.0 U	5.0 U	5 U	5.0 U	0.5 U	0.1 J
MW-31D	0.5 U	2.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J	2.5 U
MW-31S	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-32S	2.4	3.5	4.1	2.9	2.8	3.6	1.3	3.1	1.0	3.0
MW-33S				15	14	11	11	18	16	2.9 J
MW-33D				1.9	2.2	1.7	2.4	2.5	1.0	0.2 J
VFCC-2	0.4 J	0.4 J	0.4 J	0.3 J	0.4 J	0.4 J	0.5 J	0.7	0.5	
VFCC-3	4.8		3.9		3.9		NS	3.7	4.2	3.9
VFCC-4	4.8	6.3	15	7.1	6.5	14	14	17	6.8	4.9

NS: This well was not sampled due to dry conditions or inaccessibility; or not reported due to sampling irregularities.
Blanks indicate that the well was not scheduled for sampling during the quarter.
J: This result should be considered a quantitative estimate
U: Compound was not detected. The numerical value represents the sample quantitation/detection limit of the compound.
Shading indicates that the result exceeds the EPA MCL of 5 µg/l

Table 4 Summary of Groundwater Sampling Results-
Cis-1,2 Dichloroethene (cis-1,2 DCE) concentrations (µg/l)

Well	Q3 2010	Q1 2011	Q3 2011	Q1 2012	Q3 2012	Q1 2013	Q3 2013	Q1 2014	Q3 2014	Q1 2015
RW-2										
RW-1	**0.9**							**1.6**		
RW-4										
RW-3	0.5 U							0.5 U		
AUD-5	NS	**21**	**15**		NS		NS	**19**	**16**	
AUD-MW-1D	**27**	**14**	**8.1**	**16**	**22**		**12**	**24**	**18**	**19**
AUD-MW-1M	**83**	**140**	**150**	**140**	**140**	**170**	**150**	**89**	**61**	**150**
AUD-MW-2	**57**	**61**	**160**	**160**	**59**	**160**	**44**	**23**	**14**	**7.3**
EW-1	**30**	**98**	**49**	**67**	**49**	**26**	**13**	**93**	**24**	**21**
EW-2	**240**	**200**	**260**	**330**	**130**	**65**	**69**	**98**	**37**	**24**
EW-3	**410**	**180**	**250**	**360**	**180**	**100**	**61**	**52**	**27**	**25**
French Drain	**330**	**190**	**260**	**240**	**320**	**82**	**130**	**130**	**90**	**55**
GW-1	**51**		**51**		**52**		**18**	**11**	**14**	
GW-2	0.5 U		0.5 U		0.5 U		0.5 U	0.5 U	0.5 U	
MOS-11R	**7**	**12**	**12**	**4.0**	**8.9**	**26**	**25**	**16**	**1.7**	**2.3**
MOS-13	**24**	**5.6**	**12**	**6.5**	**11**		**5.1**	**5.4**	**14**	**4.8**
MOS-14	**210**	**5.6**	**19**	**47**	**780**	**1.8**	**2.2**	**1.1**	**1.3**	**1.0**
MOS-15	**12**	**7.2**	**8.4**	**7.9**	**8.1**	**6.0**	**4.8**	**4.7**	**4.0**	**3.6**
MOS-18	**2.5**	**0.99**	**0.4 J**	**0.8**	**0.9**	**0.5**	**1.0**	**0.3 J**	**2.6**	**1.6**
MW-19D	0.5 U	**0.1 J**	**0.1 J**	**0.4 J**	**0.3 J**	**0.6**	**0.4 J**	**0.4 J**	**0.3 J**	**0.5 J**
MW-19M	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-20D	**8.5**	**4.4**	10 U	25 U	25 U	**0.9 J**	**0.99**	**1.2**	25 U	**0.6**
MW-21D	**27**	**33**	**34**	**28**	**22**	**29**	**31**	**27**	**22**	**28**
MW-21M	**20**	**12**	**14**	**11**	**15**		**8.4**	**8.2**	**9**	**6.3**
MW-23	0.5 U		0.5 U	0.5 U	0.5 U		0.5 U	0.5 U	0.5 U	0.5 U
MW-24	0.5 U	**0.2 J**	0.5 U	0.5 U	0.5 U	**0.1 J**	**0.1 J**	**0.4 J**	0.5 U	**0.2 J**
MW-29	**0.9**		0.5 U	**0.1 J**	**3.6**		0.5 U	**0.2 J**	**0.8**	**0.2 J**
MW-30D	**4.3**	0.5 U	**0.7 K**	**59**	**12**	**24**	**2.7**	**1.1**	**0.1 J**	**7.1**
MW-30S	**61**	**62**	**150**	**240**	**120**	**110**	**180**	**84**	**24**	**41**
MW-31D	**0.3 J**	2.5 U	2.5 U	0.5 U	**0.3 J**	**0.2 J**	**0.2 J**	**0.2 J**	**0.1 J**	2.5 U
MW-31S	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-32S	**13**	**11**	**21**	**13**	**11**	**9.2**	**8.5**	**13**	**7.0**	**8.0**
MW-33S				**2.0**	**1.7**	**1.2**	**1.2**	**1.7**	**2.0**	5.0 U
MW-33D				**2.6**	**2.0**	**1.3**	**1.7**	**1.8**	**1.0**	**0.4 J**
VFCC-2	**9.3**	**7.5**	**6.6**	**3.0**	**11**	**8.6**	**11**	**11**	**8.5**	
VFCC-3	**14**		**5.1**		**5.1**		NS	**5.8**	**4.3**	**4.5**
VFCC-4	**69**	**78**	**430**	**160**	**89**	**55**	**51**	**44**	**35**	**23**

NS: This well was not sampled due to dry conditions or inaccessibility; or not reported due to sampling irregularities.
Blanks indicate that the well was not scheduled for sampling during the quarter.
J: This result should be considered a quantitative estimate.
U: Compound was not detected. The numerical value represents the sample quantitation/detection limit of the compound.
Shading indicates that the result exceeds the EPA MCL of 70 µg/l.

Table 4 Summary of Groundwater Sampling Results- 1,1 Dichloroethene (1,1 DCE) concentrations (µg/l)

Well	Q3 2010	Q1 2011	Q3 2011	Q1 2012	Q3 2012	Q1 2013	Q3 2013	Q1 2014	Q3 2014	Q1 2015
RW-2										
RW-1	0.5 U							0.5 U		
RW-4										
RW-3	0.5 U							0.5 U		
AUD-5	NS	1	0.7		NS		NS	1.2	1.0	
AUD-MW-1D	1.4	0.6	0.3 J	0.9	0.6		0.3 J	0.6	0.4 J	0.4 J
AUD-MW-1M	0.4 J	0.5	0.8	0.7 J	0.4 J	0.4 J	0.2 J	0.3 J	0.3 J	0.3 J
AUD-MW-2	0.9	0.9	0.9	0.9	0.9	0.5	0.3 J	0.1 J	0.3 J	0.5 U
EW-1	6.1	3.8	3.2	1.3	4.0	3.3	1.5	1.2	3.7	2.0
EW-2	3.2	2.8	3.1	2.4	2.2	4.8	5.1	12	2.4	1.8
EW-3	2.6	2.6	2.4	3.2 J	2.2 J	3.6	4.1	8.4	2.0	1.7
French Drain	3.4	2.0	2.4	5.3	2.5	2.7	2.9	2.5	1.2	1.1
GW-1	1.2		1.4		1.6		1.5	2	1.3	
GW-2	2.0		0.3 J		2.0		1.7	0.3 J	2.1	
MOS-11R	1.2	2.2	1.4	0.5	1.5	3.7	2.8	2.7	0.5	0.6
MOS-13	0.7	0.1 J	0.4 J	0.3 J	0.2 J		0.3 J	0.4 J	0.8	0.4 J
MOS-14	1.9	1.1	1.2	1.0	1.2	1.1	0.7	0.6	0.8	0.5 J
MOS-15	1.7	0.80	0.7	0.3 J	0.7	0.3 J	0.4 J	0.2 J	0.4 J	0.1 J
MOS-18	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.2 J	0.5 U	0.3 J	0.5 U	0.5 U
MW-19D	0.5 U	0.5 U	0.5 U	0.2 J	0.1 J	0.3 J	0.2 J	0.2 J	0.3 J	0.2 J
MW-19M	0.1 J	0.1 J	0.1 J	0.3 J	0.1 J	0.3 J	0.3 J	0.3 J	0.2 J	0.5 U
MW-20D	0.4 J	0.8	10 U	25 U	25 U	2.5 U	0.2 J	0.5	25 U	0.2 J
MW-21D	0.6	0.9	1.1	0.7	0.8	1.0	1.0	1.0	1.0	1.2
MW-21M	0.3 J	0.5 U	0.5 U	0.1 J	0.1 J		0.5 U	0.5 U	0.5 U	0.5 U
MW-23	0.5 U		0.5 U	0.5 U	0.5 U		0.5 U	0.3 J	0.5 U	0.5 U
MW-24	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J	0.5 U	0.1 J
MW-29	0.5 U		0.5 U	0.5 U	0.4 J		0.5 U	0.5 U	0.5 U	0.5 U
MW-30D	0.3 J	0.5 U	0.5 U	1.5	0.3 J	1.1	0.9	0.2 J	0.5 U	0.4 J
MW-30S	14	31	50	79	33	37	50	23	14	20
MW-31D	5.0	2.0 J	1.4 J	0.5 U	4.4	2.5	2.6	3.4	3.0	3.3
MW-31S	1.4	0.6	0.6	0.3 J	1.9	0.7	0.7	0.4 J	1.6	0.6
MW-32S	0.1 J	0.1 J	0.1 J	0.1 J	0.5 U	0.2 J	0.1 J	0.2 J	0.1 J	0.1 J
MW-33S				0.4 J	0.4 J	0.3 J	0.2 J	0.3 J	0.3 J	5.0 U
MW-33D				0.4 J	0.3 J	0.3 J	0.3 J	0.3 J	0.2 J	0.5 U
VFCC-2	0.6	0.5	0.5 J	0.2 J	0.7	0.6	0.6	0.7	0.6	
VFCC-3	1.8		2.4		2.4		NS	2.7	1.9	1.8
VFCC-4	3.1	3	3.2	1.3 J	2.4	1.7	2.0	2.5	1.8	1.2

NS: This well was not sampled due to dry conditions or inaccessibility; or not reported due to sampling irregularities.
Blanks indicate that the well was not scheduled for sampling during the quarter.
J: This result should be considered a quantitative estimate
U: Compound was not detected. The numerical value represents the sample quantitation/detection limit of the compound.
Shading indicates that the result exceeds the EPA MCL of 7 µg/l

Table 4 Summary of Groundwater Sampling Results- Vinyl Chloride concentrations (µg/l)

Well	Q3 2010	Q1 2011	Q3 2011	Q1 2012	Q3 2012	Q1 2013	Q3 2013	Q1 2014	Q3 2014	Q1 2015
RW-2										
RW-1	0.5 U							0.5 U		
RW-4										
RW-3	0.5 U							0.5 U		
AUD-5	NS	0.5 U	0.5 U		NS		NS	0.5 U	0.5 U	
AUD-MW-1D	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U	0.5 U	0.5 U
AUD-MW-1M	**0.2 J**	**1.5**	**1.2**	**1.0 J**	**0.9**	**1.9**	**1.0**	**1.9**	**0.1 J**	**1.6**
AUD-MW-2	0.5 U	0.5 U	**0.2 J**	**0.1 J**	0.5 U	**0.1 J**	0.5 U	0.5 U	0.5 U	0.5 U
EW-1	1.0 U	1.0 U	0.5 U	1.0 U	0.5 U	0.5 U	0.5 U	**0.2 J**	0.5 U	0.5 U
EW-2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
EW-3	**0.2 J**	1.3 U	1.0 U	5.0 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
French Drain	**2.5**	**0.4 J**	**0.6 J**	5.0 U	**0.6 J**	0.5 U	**0.2 J**	**0.3 J**	**0.2 J**	0.5 U
GW-1	0.5 U		0.5 U		0.5 U		0.5 U	0.5 U	0.5 U	
GW-2	0.5 U		0.5 U		0.5 U		0.5 U	0.5 U	0.5 U	
MOS-11R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MOS-13	**0.4 J**	0.5 U	**0.2 J**	**0.1 J**	0.5 U		0.5 U	0.5 U	0.5 U	0.5 U
MOS-14	**4.0**	0.5 U	**1.9**	**1.7**	**19**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MOS-15	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MOS-18	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-19D	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-19M	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-20D	0.5 U	0.5 U	10 U	25 U	25 U	2.5 U	0.5 U	0.5 U	25 U	0.5 U
MW-21D	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-21M	**0.2 J**	0.5 U	0.5 U	0.5 U	**0.2 J**		0.5 U	0.5 U	0.5 U	0.5 U
MW-23	0.5 U		0.5 U	0.5 U	0.5 U		0.5 U	0.5 U	0.5 U	0.5 U
MW-24	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-29	0.5 U		0.5 U	0.5 U	0.5 U		0.5 U	0.5 U	0.5 U	0.5 U
MW-30D	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-30S	**3.4**	2.5 U	2.5 U	5.0 U	5.0 U	5.0 U	5 U	5.0 U	0.5 U	0.5 U
MW-31D	0.5 U	2.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U
MW-31S	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-32S	**0.1 J**	**0.1 J**	**0.1 J**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-33S				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5.0 U
MW-33D				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VFCC-2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	
VFCC-3	0.5 U		0.5 U		0.5 U		NS	0.5 U	0.5 U	0.5 U
VFCC-4	1.0 U	**0.1 J**	**0.5 J**	2.5 U	**0.2 J**	**0.1 J**	0.5 U	0.5 U	0.5 U	0.5 U

NS: This well was not sampled due to dry conditions or inaccessibility; or not reported due to sampling irregularities.
Blanks indicate that the well was not scheduled for sampling during the quarter.
J: This result should be considered a quantitative estimate.
U: Compound was not detected. The numerical value represents the sample quantitation/detection limit of the compound.
Shading indicates that the result exceeds the EPA MCL of 2 µg/l.

In January 2001, a draft "Conceptual Enhanced Treatment Work Plan," discussed the technologies to be evaluated and the work to be performed. Phase I evaluated three technologies: vapor extraction (VE), in-situ chemical oxidation (ISCO), and anaerobic biodegradation. Based on the work performed VE and ISCO were selected for ET. A report "Enhanced Treatment Technologies Screening Evaluation Report" was issued in August 2002. The First Five Year Review, dated August 2005, summarizes the VE and shallow soil ISCO performed under Phase I ET.

Phase II ET consisted of an ISCO pilot to treat COCs in the transition zone bedrock under and immediately adjacent to the former CSG building. While ERM was preparing for Phase II in situ chemical oxidation, wellhead treatment units (WTU) were installed at drinking water wells VFCC-2 and VFCC-3 as a precaution. Part of this installation included flushing the WTUs with water and food grade citric acid. At the same time, AWC was flushing the water distribution lines. The timing of the two typically routine activities caused copper to chelate in the water lines and AWC distributed blue-green water to customers for less than one day in November 2006. This incident eventually led to AWC terminating their agreement with Rockwell Automation, causing the Phase II ET activities to cease.

In July 2010, ERM submitted a draft workplan to continue efforts under ET. Comments from AWC stalled that effort. In 2013, ERM performed an Off-Site Investigations at 960 Rittenhouse Road to better define upgradient contamination. This investigation included a GORE survey and follow-up soil and perched water sampling. The results indicate a localized VOC source not associated with the CSG Site. The current groundwater pumping of the CSG Site French drain and recovery wells are pulling the offsite contamination onto the CSG Site.

As such, Rockwell is currently performing a Plume Stability Verification (PSV) study to evaluate the effects of this upgradient contamination while the GWRTS is off for short periods of time. The PSV study began in December 2014. The duration of this study is expected to be one year, however, the GWRTS will be restarted if monitoring yields results greater than a statistically calculated threshold for each contaminant. Additionally, the PSV study may continue beyond the one year duration if data indicate stable or declining plume conditions. Rockwell remains committed to expediting the remediation with ET.

Vapor Intrusion

Methods to evaluate the vapor intrusion pathway are evolving. In the First Five-Year Review, the Johnson and Ettinger Subsurface Vapor Intrusion Model was run to evaluate this pathway and vapor intrusion was not found to be a concern. However, more recent guidance indicates that additional investigations should be performed if the shallow groundwater contamination is above MCLs.

In June 2010, MW-32S, was installed to evaluate the potential for vapor to impact residents adjacent to the golf course. MW-32S is located on the Northwest side of Rittenhouse Road between AUD-3 and MW-1 (See Figure 2). For this five-year review period, groundwater concentrations in MW-32S continued to be below MCLs.

The building on the CSG site resides directly above contaminated groundwater, which exceeds MCLs for VOCs. There is currently no exposure because the building is unoccupied. However, the owner has produced development plans for the property. As recommended in the last five-year review, ICs were incorporated into the remedy by issuing the Fourth ESD. ICs were implemented in the form of a UECA covenant to protect potential exposure if the existing building is rehabilitated and reoccupied or in the event there is future development on top of the groundwater contamination at the CSG property.

Evaluation of Background Contamination

The groundwater sampling results suggest the presence of off-site contaminant sources that impact the CSG Site. This upgradient source is predominantly a VOC plume and is believed to be unrelated to the CSG contamination. The presence of off-site COCs sources was presented in the 1992 CSG Remedial Investigation Report and the 1997 Step 2 Technical Memorandum. In June 1997, sampling of eight monitoring wells around the facility at 970 Rittenhouse Road, identified a plume of contamination. TCE was detected in upgradient wells: MW31-S (1100 to 2000 ppb) and MW31-D (200 to 1700 ppb). TCA was detected at concentrations of 22 ppb and 7.9 ppb in MW-31D and VFCC-3 respectively. Freon 113 was also detected in the plume at concentrations as high as 2000 ppb. From 1998-1999, EPA performed a preliminary assessment and site inspection of the property at 970 Rittenhouse Road. EPA conducted soil and groundwater sampling. Based on soil samples collected it was concluded there was no source of VOC contamination present at the CSG Site and no further action was recommended under the Superfund program at the property. An Off-Site Investigation Report, dated January 15, 2014 provides data that there may be another source of groundwater contamination originating at 960 Rittenhouse Road. To date, no active remediation has occurred to address the migration of these contaminants onto the CSG Site.

It is likely that operation of the CSG extraction wells (since system start-up in 2000) has promoted the migration of background COCs toward the CSG Site. It is anticipated that the off-site COCs will persist at concentrations that are above MCLs and extend operation of the GWRTS under current remedy completion requirements. EPA will continue to evaluate the criteria for determining shutdown of the onsite extraction wells since the wells appear to be intercepting the upgradient plume and there is currently no active remediation of the upgradient plume.

V. Progress Since Last Five-Year Review

This is the Third Five-Year review for the Commodore Semiconductor Group Superfund Site. The Second Five-Year review concluded that “The remedy for the Site is protective in the short-term. Long-term protectiveness of the remedy will be achieved by continuing to pump and treat the groundwater, monitoring for potential vapor intrusion issues at the leading edge of the plume, implementing ICs with regards to redevelopment and potential VI on the Site, and maintaining effective ICs until cleanup standards have been achieved.”

The assessment of the Second Five-Year review found that the remedy was constructed in accordance with the requirements of the ROD and is functioning as designed. The remedy for OU1 remains protective of human health since it supplied a permanent source of clean drinking water to residences. The remedy for OU2 is effectively capturing the Site plume and is expected to achieve the groundwater cleanup standards, which are protective of human health and the environment." Since the Second Five-Year review, groundwater contamination levels continue to decrease. However, implementation of the remedy has promoted the migration of background COCs toward the CSG Site and as a result all performance standards still have not been met.

The first issue in the Second Five-Year review concerns "Unknown upgradient source of contamination is migrating to Site extraction and monitoring wells." EPA and PADEP continue to have discussions regarding background levels for contaminants. In January 2014, ERM submitted the Off-Site Perched Water and Soil Sampling Report providing additional information for the adjacent, upgradient property northeast to the Site at 960 Rittenhouse Road. This report included results of water and soil sampling and concluded that localized VOC impacts exist under the 960 Property. PADEP has committed to identify, investigate, and remediate sources not related to the CSG Site.

The second issue in the Second Five-Year review concerns "Vapor intrusion at the leading edge of the plume may be a concern in the future." As mentioned above, MW-32S, was installed in June 2010 to evaluate the potential for vapor to impact residents adjacent to the golf course. Samples taken from this well has not indicated a potential for VI at the leading edge of the plume, and the well will continue to be monitored.

The third issue discussed in the Second Five-Year review is "Vapor intrusion on the Site may be a concern in the future if the existing building is reused or if new buildings are constructed." The ICs in the remedy were modified by the issuance of the Fourth ESD. Also, the ICs were implemented when the owner filed an environmental covenant to "prevent potential occupant exposure to Site contaminants in the event that future development or construction takes place on top of the groundwater contamination at the Site." To date, the on-site building has not been occupied since the last five-year review documented the building's vacant status and no new buildings have been constructed on the property.

VI. Five-Year Review Process

Administrative Components

Rockwell and Lower Providence Township were notified in July 2014 at the start of this Third Five-Year Review process. The Five-Year Review team was led by Sharon Fang of EPA, Remedial Project Manager (RPM) for the Site and included members of the technical support staff with expertise in hydrogeology, risk assessment, and ecology. Lena Harper and Tim Cherry, PADEP Project Officers, assisted in the review as representatives of the support agency.

Community Involvement

An advertisement appeared in the Times Herald newspaper on March 31, 2015 indicating that EPA was conducting a five-year review for the Site. The advertisement explained the reason EPA was conducting a five-year review and provided websites for more Site information. The advertisement also provided point-of-contact information and solicited comments or concerns from the public that might be helpful to the review process. In addition, the advertisement stated the five-year review report would be available to the public by August 2015 and provided a website where the five-year review can be found. Neither the EPA RPM nor EPA Community Involvement Coordinator received community input as a result of this advertisement.

Document Review

The five-year review consisted of a review of relevant information on the Site which included the ROD, ESDs, the previous five-year review report, and reports and data provided by Rockwell.

Reports which present the monitoring results and summaries of the operation of the remedial systems were reviewed for current operation and analytical data trends. Reports available for review included, Monthly Progress Reports, CSG Pump and Treat Performance and Plume Recovery Analysis Reports which covers operation of the system from second Quarter 2010 to First Quarter 2014 (ERM) and Off-Site Perched Water and Soil Sampling Report, dated January 15, 2014, and Plume Stability Verification Workplan, dated July 2014.

Data Review

Pump and treat performance and plume recovery analysis is reported by Rockwell semi-annually. The well locations are depicted on Figure 2. The potentiometric data indicates that hydraulic containment of the plume is effective. The June 2014 groundwater level data obtained from the site monitoring and extraction well network show that the contaminant plume on the Site is being captured (Figures 3 & 4) when the GWRTS is operating. Table 4 shows the Monthly Well Total Output for the Site. Transient zone groundwater is either captured by the shallow extraction wells, the French Drain system, or migrates vertically downward into the VFCC-2 capture zone. Since VFCC-2 is the primary well influencing deep COCs plume containment, EPA suggests that Rockwell work with AWC to isolate the deep groundwater fractures in VFCC-4 to close any potential pathway influenced by VFCC-2 pumping into the deeper bedrock.

Groundwater quality monitoring has been conducted for VOCs at the CSG Site since start-up of the GWRTS in August 2000 in accordance with the approved Groundwater Monitoring Plan. The current groundwater analytical data (see Table 3) show that groundwater conditions at the CSG Site have improved. Figure 5 shows the shallow TCE plume based on the first quarter sampling in 2015. Figure 6 shows the deep TCE plume based on the first quarter sampling in 2015. Most of the decreases have occurred since the third quarter of 2003, after ET activities (VE and shallow ISCO) and VFCC-4 was reconfigured with a packer to pump from a shallow contaminated interval instead of the entire depth of the well. As mentioned above, VFCC-4 was reclaimed by AWC and ceased operation as part of the GWRTS. Current

groundwater plume concentrations appear to be decreasing or stable throughout the plume with one exception, MW-30S. MW-30S, a monitoring well on an adjacent property upgradient of CSG, has experienced increases of contaminant levels, further suggesting there is upgradient contamination migrating onto the CSG Site.

The groundwater sampling results continue to suggest the presence of an off-site contaminant source that impacts the CSG Site. This upgradient source is predominantly a VOC plume. The presence of off-site COCs sources was presented in the 1992 CSG Remedial Investigation Report and the 1997 Step 2 Technical Memorandum. In June 1997, sampling of eight monitoring wells around the facility at 970 Rittenhouse Road, identified a plume of contamination. From 1998-1999, EPA's contractor Tetra Tech sampled soil and groundwater at a facility located northeast of the Site. Based on soil samples collected EPA concluded there was no source of VOC contamination present at that facility and as a result no further action was recommended under the Superfund program at the property. To date, no active remediation has been performed to address the migration of these contaminants onto the CSG Site. It is likely that operation of the CSG extraction wells (since system start-up in 2000) has promoted the migration of background COCs toward the CSG Site. It is anticipated that the off-site COCs will persist at concentrations that are above MCLs and extend operation of the GWRTS under current remedy completion requirements. Based on the information gathered in the 2014 Off-site Perched Water and Soil Sampling Report performed by Rockwell, EPA will perform additional upgradient investigation to identify suspected upgradient sources.

Since the CSG monitoring wells appear to be intercepting the upgradient plume and currently there is no active remediation of the upgradient plume, Rockwell and EPA have discussed a potential approach for determining whether current groundwater plume concentrations will continue to decrease or remain stable if operation of the GWRTS is discontinued. To test this theory, EPA reviewed and subsequently approved a Plume Stability Verification Workplan, dated July 2014. Starting in December 2014, onsite extraction wells were placed in shutdown mode and Rockwell is currently monitoring the CSG plume. During this testing, the groundwater recovered from the French Drain continues to be discharged into the treatment plant, treated, then discharged into the sanitary sewer.

When the GWRTS is extracting groundwater, it discharges treated water into the sanitary sewer. The water discharge is in compliance with the permit issued by the POTW. Emissions from the air stripper vapor phase carbon unit are in compliance with applicable air regulations. The air phase carbon is monitored by calculating mass usage based upon water samples before and after treatment.

Chemicals are being discovered in water that previously had not been detected or are being detected at levels that may be significantly different than expected. These are often referred to as "contaminants of emerging concern" (CECs) because the risk to human health and the environment associated with their presence, frequency of occurrence, or source may not be known. EPA is working to improve its understanding of a number of CECs, particularly 1,4-dioxane, and perfluorinated compounds (PFCs), among others. Perfluorooctanoic acid (PFOA)

and perfluorooctane sulfonate (PFOS) are two of the PFCs. As part of this five-year review process, Rockwell collected samples from wells MOS-11R and MOS-13 for 1,4-dioxane and PFOS/PFOA since these wells are located near the area of release. Results (in µg/L) were beneath their respective screening level/Provisional Health Advisory screening level:

Analyte	Standard	MOS-13	MOS-11R	MOS-11R Dup
1,4-dioxane	0.46*	<1	<1	<1
PFOS	0.2**	0.026	0.011	0.023
PFOA	0.4**	0.014	0.013	0.014

*EPA screening level for 1x10E-6 risk, June 2015 RSL
** Provisional Short-term Health Advisory screening level

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site.

Site Inspection

A key component of this Five-Year review at the CSG Site included the physical inspection of the groundwater treatment system, its components, and visual inspection of Site wells. A Site Inspection was conducted on September 24, 2014. In attendance were Sharon Fang, EPA RPM; Mark Leipert, EPA hydrogeologist; Lena Harper, PADEP Project Officer; Tim Cherry, PADEP; Ellen Davies, PADEP; John Roberts, ERM Project Manager; and Fred Mattison, Terranear PMC Site Operator.

The Site inspection did not identify any issues regarding operation or maintenance of the treatment system or any site condition that would affect protectiveness of the remedy. The overall visual inspection of the Site buildings, fenced entryway and asphalt paved areas revealed no damage or deterioration. Documentation such as daily access/security logs, training records, and maintenance logs are housed on the ERM server that can be accessed on-Site via computer. EPA used the relevant portion of the checklist in EPA's Five-Year Review Guidance. An inspection checklist and site photos are available in the EPA CSG Site file.

Interviews

The EPA RPM, Vance Evans EPA Community Involvement Coordinator, PADEP personnel, and John Roberts ERM met with the Lower Providence Township Manager Rich Gestrich and Township Director of Special Projects & Technology Bill Roth on September 24, 2014. The township officials were satisfied with Site operations, however lack of property maintenance does generate some phone calls. The township has been in contact with the Site owner. The township did not have any concerns regarding specific cleanup activities at the Site and were not aware of any community concerns related to Site cleanup activities. The township's

biggest concern was getting the property and onsite building back in use in order to generate jobs and tax revenue for the township. They were not aware of any stigma related to the lack of reuse of the property.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The review of the documents related to operation and performance of the groundwater pump and treat system indicate that the extraction and treatment system is functioning as intended. Hydraulic containment and capture of site related VOCs is occurring. Review of analytical data indicates that contaminant concentrations are generally decreasing. Process monitoring indicates that treated water and air are achieving discharge requirements.

The implementation of the MCHD regulations regarding Individual Water Supply Wells should prevent any potential future exposure to contaminated groundwater via the use of a newly installed water supply well. The Deeds of Grant, creating the easements and the rights of way, should provide the appropriate access to and protect the integrity of the groundwater treatment system. The newly filed environmental covenant should protect future occupants of the existing building currently located on the property or a new building constructed above contaminated groundwater on the property from potential exposure to VOCs through VI.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy still valid?

Yes, exposure assumptions, toxicity data, cleanup levels, and RAOs as described in the remedy (ROD and four ESDs) are still valid. Note, however, there have been changes in toxicity criteria that are not expected to impact the remedy selected for the Site, since the cleanup levels are based on the MCLs. Changes in toxicity criteria for 1,1-DCA could impact the remedy completion targets, since it could result in a lower risk-based cleanup level [note that this contaminant does not have an MCL and the current Regional Screening Level (RSL) is 2.7 ppb]. However, the 1,1,-DCA groundwater data from 2010 to the present do not show levels of contamination near the current risk-based cleanup level of 810 ppb. As of the first quarter of 2015, the 1,1-DCA was below 2ppb and the current RSL in all wells. Thus, calculation of a new risk-based cleanup level is not warranted at this time.

In addition, since the ROD, the potential ecological significance of exposure to contaminants in the hyporheic zone (the ecosystem beneath the bed of a river or stream that is saturated with water and that supports invertebrate fauna) and the discharge of groundwater contaminants to surface water have become further recognized as potential issues and are now addressed in the ecological risk assessment process. While the remedial investigation did evaluate the potential impact of groundwater on surface water, it did not evaluate exposure in the

hyporheic zone. While this evaluation was not conducted, the established groundwater cleanup values are expected to be protective to receptors in the hyporheic zone.

Vapor intrusion is a pathway that was not evaluated during the baseline risk assessment and was not evaluated at the time of remedy selection. However, during the previous five-year reviews, VI concerns were evaluated and addressed by installing and monitoring MW-32, modifying the ICs in the remedy, and implementing these modified ICs through an environmental covenant which was filed with the Montgomery County Land Records on July 17, 2015. VI guidance indicates that additional investigations should be performed if the shallow groundwater contamination is above MCLs; Site groundwater remains more than one order of magnitude above MCLs.

In June 2010, MW-32S, was installed to evaluate the potential for vapor to impact residents adjacent to the golf course. MW-32S is located on the Northwest side of Rittenhouse Road between AUD-3 and MW-1 (See Figure 2). For this five-year review period, groundwater concentrations in MW-32S continued to be below MCLs.

There is currently no VI exposure on the CSG property because the CSG building is unoccupied. However, the owner has produced development plans for the property. As recommended in the last five-year review, Institutional Controls (ICs) were incorporated into the remedy by issuing the Fourth ESD. ICs have been implemented in the form of a UECA covenant to protect potential exposure if the existing building is rehabilitated and reoccupied or in the event there is future development above of the groundwater contamination at the CSG property.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes, potentially. Upgradient contamination will impact decisions regarding the future operation of the extraction wells at the CSG Site. In addition, at AWC's direction, removal of the packer assembly in VFCC-4 has left the well open and available for shallow contamination from CSG to migrate into the deep bedrock.

Technical Assessment Summary

According to the data and monitoring reports reviewed, the site inspection and the interviews the remedy is functioning as intended by the ROD, as modified by the ESDs. There have been no changes in the physical conditions of the Site or surrounding land use that would affect the protectiveness of the remedy. Site operations are in compliance with action specific ARARs, and the remedy is expected to achieve the groundwater cleanup ARARs.

There have been no changes in groundwater cleanup standards that would call into question the protectiveness of the remedy. There have been changes in toxicity criteria that are not expected to impact the remedy selected for the Site, since the cleanup levels are based on the MCLs. Changes in toxicity criteria for 1,1-DCA could impact the remedy completion targets, since it could resulted in a lower risk-based cleanup level (e.g., the RSL is 2.7 ppb; note that this contaminant does not have an MCL). However, the 1,1,-DCA groundwater data from 2010 to

the present does not show levels of contamination near the current risk-based cleanup level of 810 ppb. As of the first quarter of 2015, the 1,1-DCA in all wells were below 2ppb which is below the current RSL for this contaminant. Thus, calculation of a new risk-based cleanup level is not warranted at this time.

The groundwater extraction and treatment system is well maintained, and is in good working condition. Groundwater is hydraulically contained by the treatment system. There is no evidence of damage to the Site system or to the monitoring wells. The Site groundwater extraction system is expected to be able to achieve restoration of the Site plume if upgradient contamination can be addressed. Enhanced Treatment (ET) can accelerate the time to reach cleanup.

There is a need to evaluate upgradient sources of groundwater contamination as this may affect when the groundwater treatment system may be turned off. PADEP has committed to identify, investigate, and remediate sources not related to the CSG Site.

VIII. Issues

Table 5 Issues Identified

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
#1 Off-site sources of groundwater contamination impact the cleanup at the CSG Site.	N	Y
# 2 VFCC-4 is open and available for shallow contamination from man-made or natural sources to migrate into the deep bedrock.	N	Y

IX. Recommendations and Follow-Up Actions

Table 6 Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
#1 Upgradient Sources	Additional off-site investigations at upgradient property.	PADEP	EPA	December 30, 2016	N	Y
#1 Upgradient Sources	PRP will establish technical information regarding the effects of off-site contamination on the CSG Site.	PRP	EPA	March 30, 2017	N	Y
#2 VFCC-4	Work with AWC to reinstall packer or other technology in VFCC-4 at the proper interval to prevent vertical migration of contamination between the shallow and deep portions of the bedrock aquifer.	PRP	EPA	December 30, 2015	N	Y

X. Protectiveness Statement

The remedy for OU1 (water line) of the Site is protective in the short-term and long-term. This Third Five-Year review finds that the remedy has been constructed in accordance with the requirements of the ROD and is functioning as designed. The remedy for OU1 remains protective of human health since it supplied a permanent source of clean drinking water to residences.

The remedy for OU2 (groundwater) of the Site is protective in the short-term. Long-term protectiveness of the remedy will be achieved by continuing to pump and treat the groundwater, and maintaining effective ICs until cleanup standards have been achieved. Further evaluation will be conducted on the impact of upgradient VOC contamination on achievement of site groundwater cleanup levels.

This Third Five-Year review finds that the remedy has been constructed in accordance with the requirements of the ROD and is functioning as designed. The remedy for OU2 has been effectively capturing the Site plume and is expected to achieve the groundwater cleanup standards, which are protective of human health and the environment. However, based upon upgradient groundwater data, additional sources of groundwater contamination that are believed to be unrelated to the CSG Site exist in the area and, if not addressed, will likely impact decisions about when site cleanup levels are achieved.

XI. Next Review

The next five-year review for the Commodore Semiconductor Group Superfund Site is required five years from the date of this review.

Figure 1
Site Location Plan
Commodore Semiconductor Group
Norristown, PA

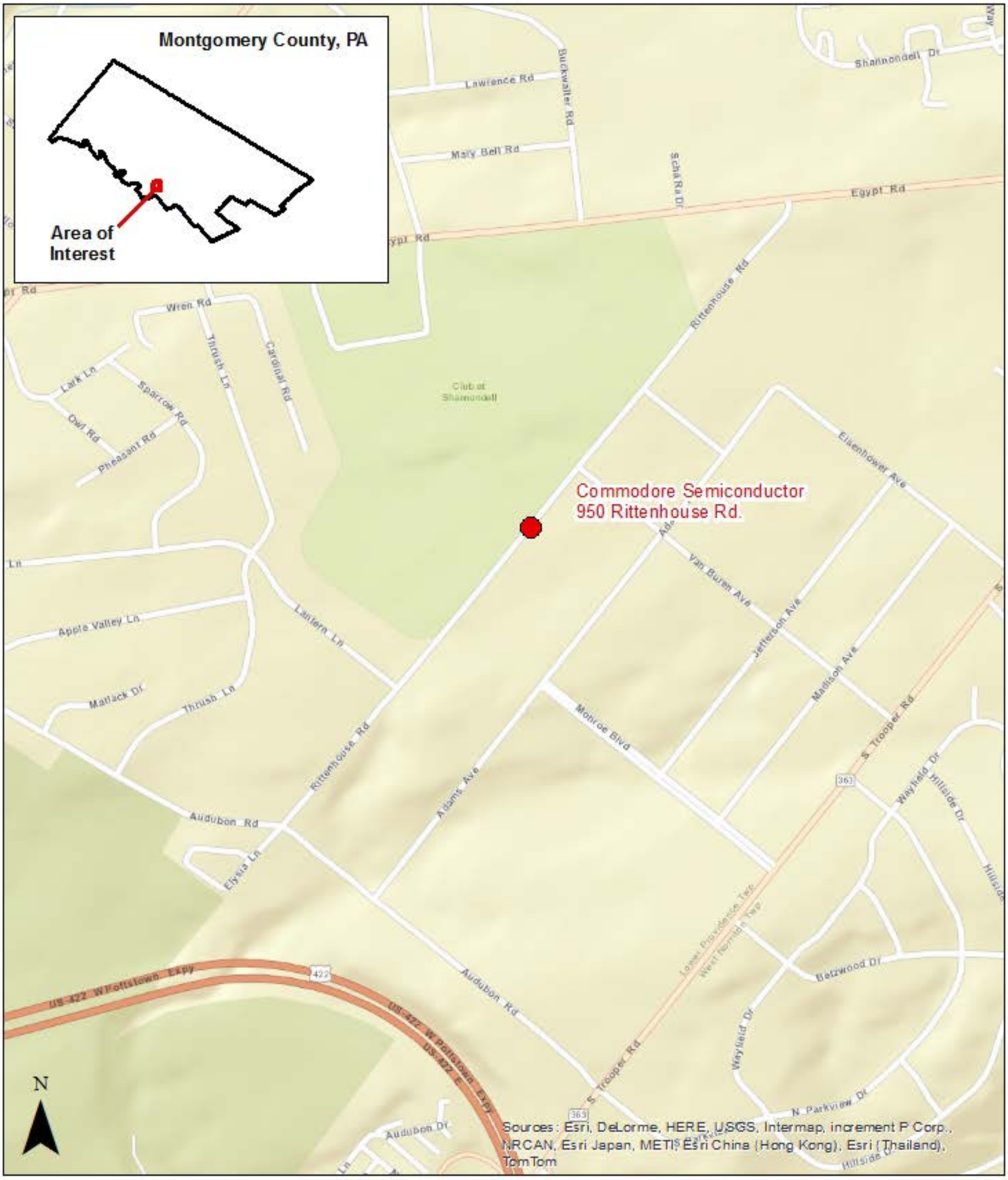
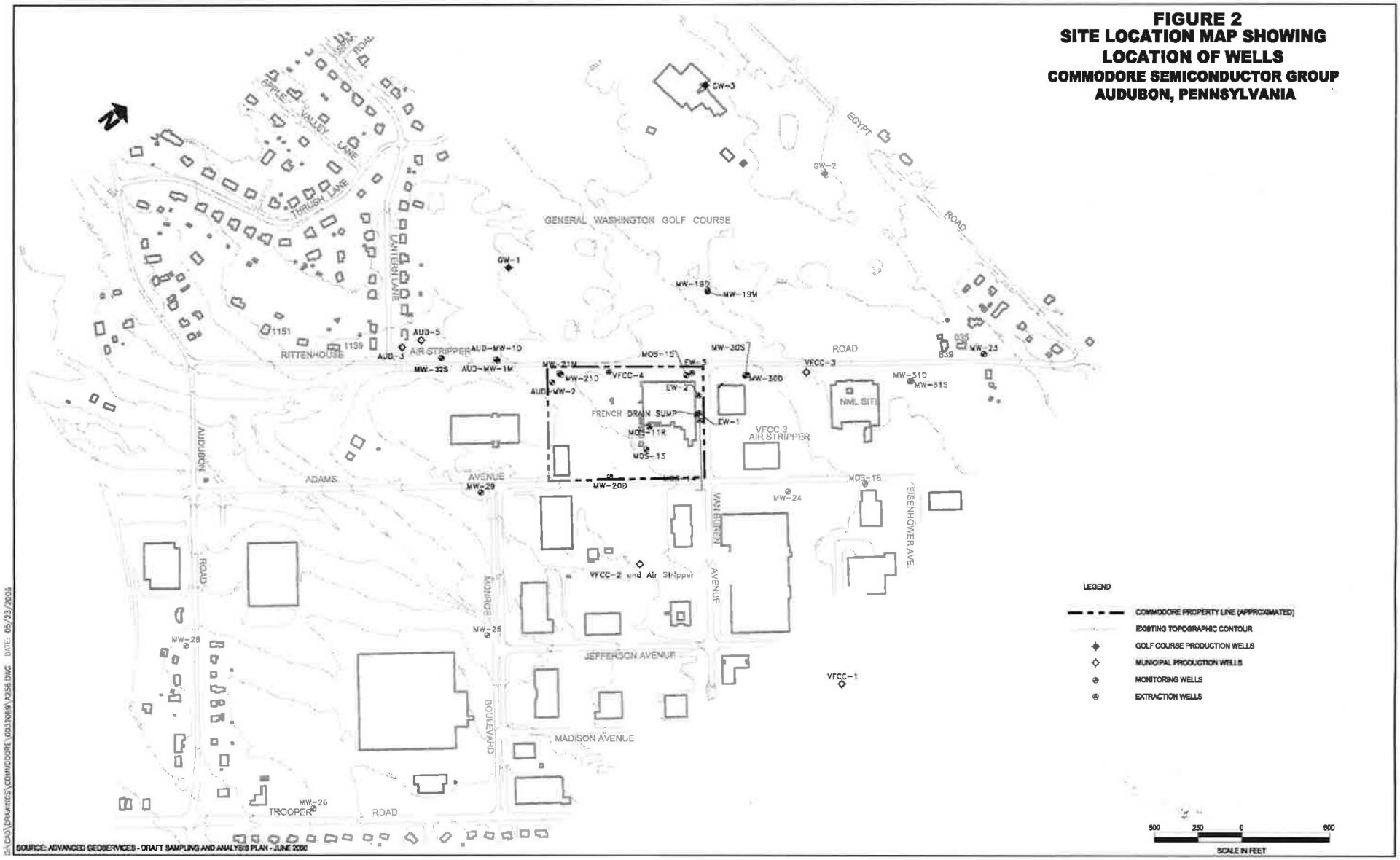


FIGURE 2
SITE LOCATION MAP SHOWING LOCATION OF WELLS
COMMODORE SEMICONDUCTOR GROUP
AUDUBON, PENNSYLVANIA



SOURCE: ADVANCED GEOSERVICES - DRAFT SAMPLING AND ANALYSIS PLAN - JUNE 2000

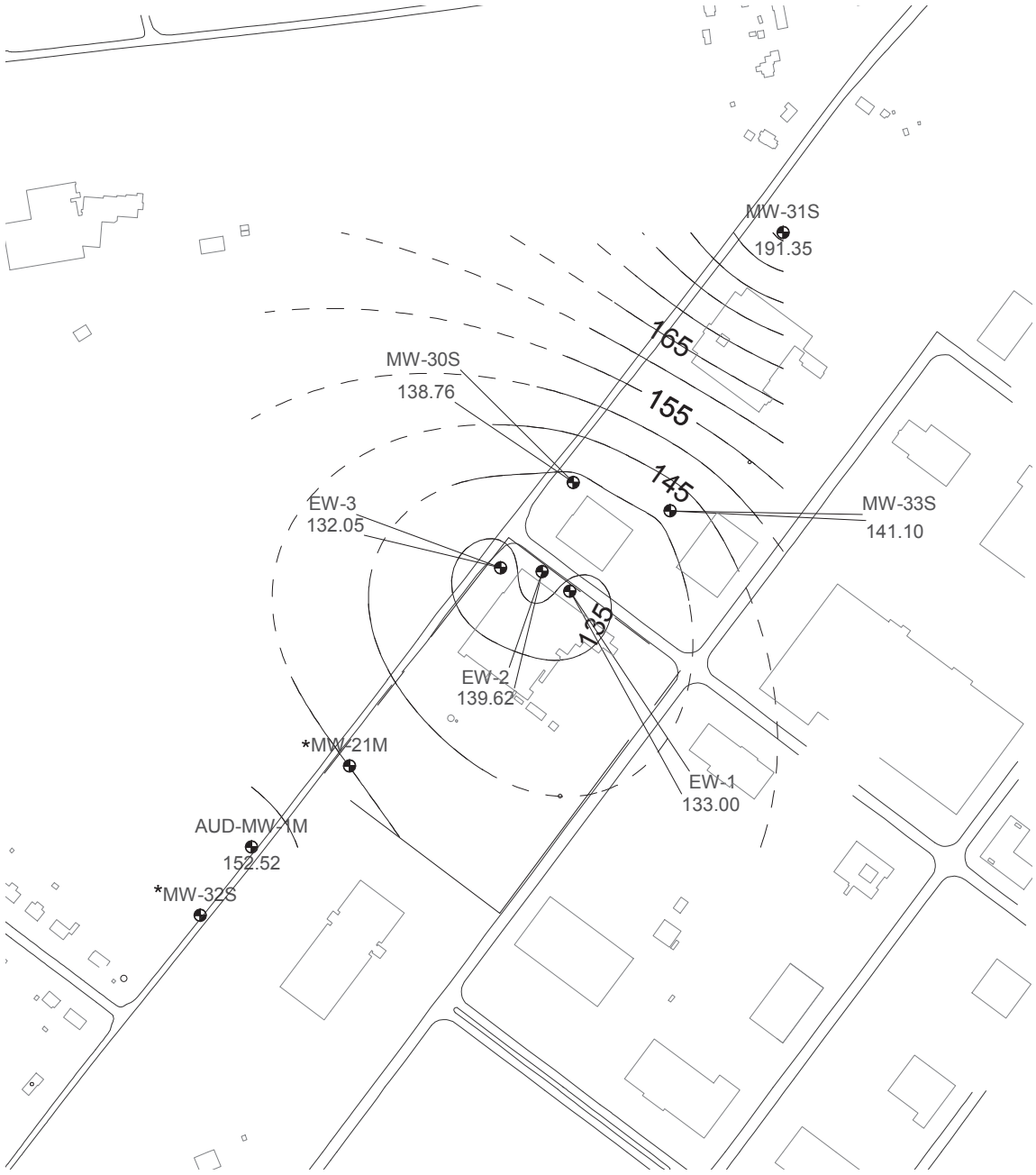
J:\CAD\DRAWINGS\COMMODORE\0032689\A258.DWG DATE: 05/23/2006

MLB/05-25-06

ERM, INC

FIGURE 3

SHALLOW GROUND WATER CONTOUR MAP
JUNE 27, 2014
COMMODORE SEMICONDUCTOR GROUP SITE
AUDUBON, PENNSYLVANIA



* MW-21M and MW-32S are perched zone wells (not used)

SCALE IN FEET

0 500 1000

N
W E
S

ERM

FIGURE 4

DEEP GROUNDWATER CONTOUR MAP
JUNE 27, 2014
COMMODORE SEMICONDUCTOR GROUP SITE
AUDUBON, PENNSYLVANIA

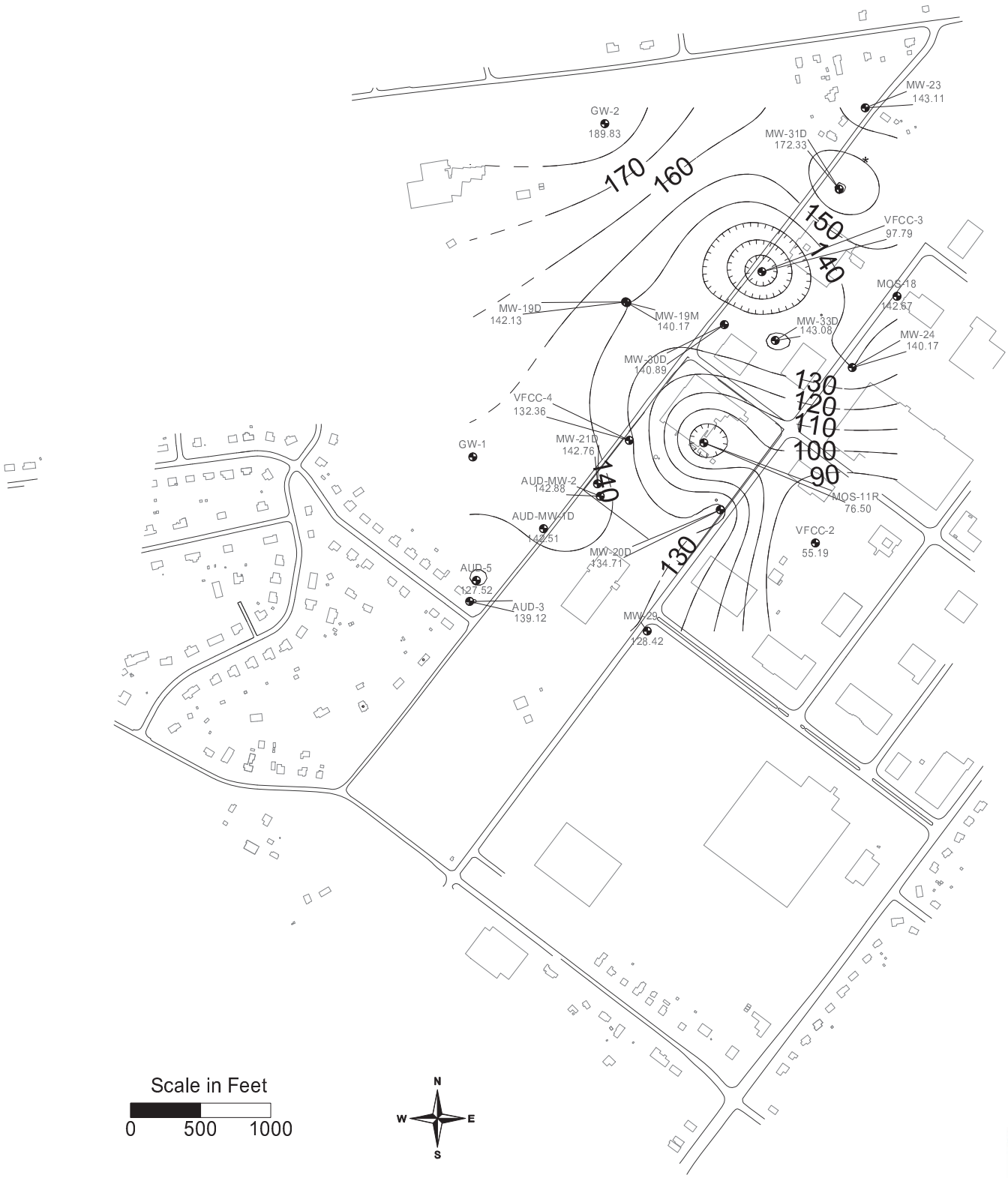
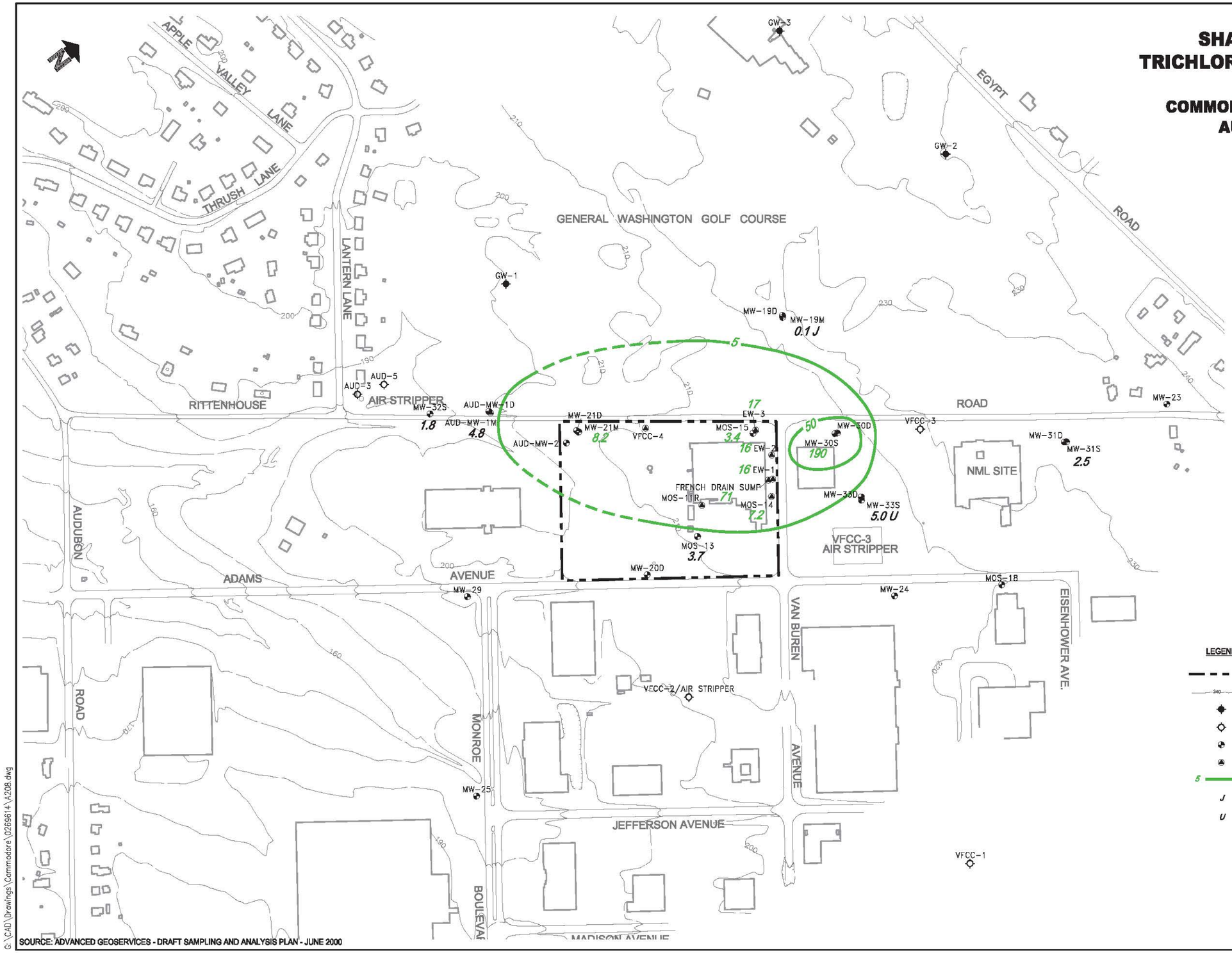


FIGURE 5
SHALLOW GROUND WATER TRICHLOROETHENE CONCENTRATIONS 1st QUARTER 2015
COMMODORE SEMICONDUCTOR GROUP
AUDUBON, PENNSYLVANIA



LEGEND

- COMMODORE PROPERTY LINE (APPROXIMATED)
- EXISTING TOPOGRAPHIC CONTOUR
- GOLF COURSE PRODUCTION WELLS
- MUNICIPAL PRODUCTION WELLS
- MONITORING WELLS
- EXTRACTION WELLS
- 5 — TCE ISOCONCENTRATION (MCL = 5 ug/L)
- J — THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE.
- U — THIS COMPOUND WAS NOT DETECTED. THE NUMERICAL VALUE REPORTED REPRESENTS THE SAMPLE QUANTITATION/ DETECTION LIMIT OF THE COMPOUND.

RESULTS THAT ARE *GREEN* EXCEED THE EPA MCL (MAXIMUM CONTAMINANT LEVELS)

400 200 0 400
SCALE IN FEET

ERM

SOURCE: ADVANCED GEOSERVICES - DRAFT SAMPLING AND ANALYSIS PLAN - JUNE 2000

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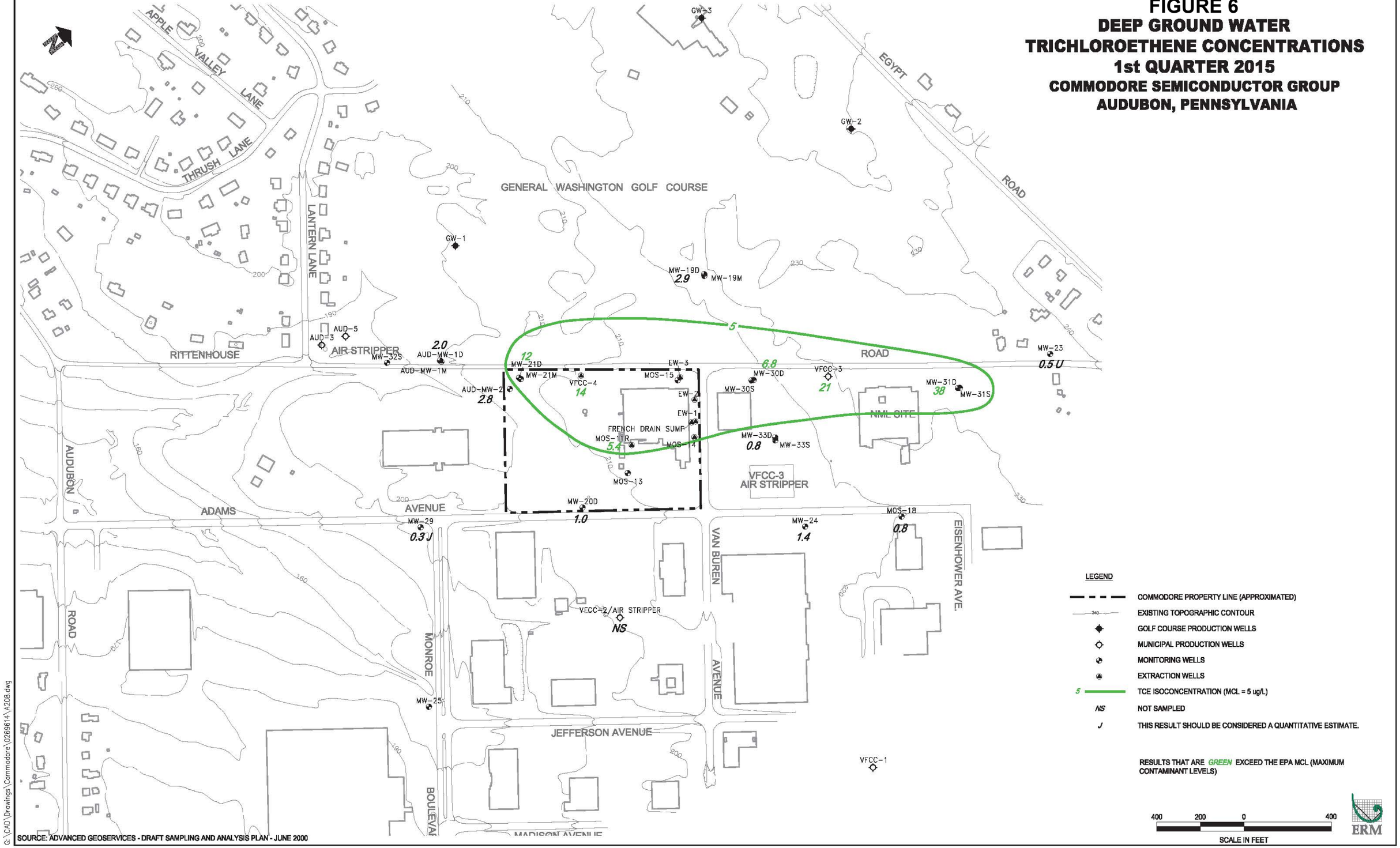
MLB/4-2015

FIGURE 6
DEEP GROUND WATER
TRICHLOROETHENE CONCENTRATIONS
1st QUARTER 2015
COMMODORE SEMICONDUCTOR GROUP
AUDUBON, PENNSYLVANIA



LEGEND

- COMMODORE PROPERTY LINE (APPROXIMATED)
- EXISTING TOPOGRAPHIC CONTOUR
- GOLF COURSE PRODUCTION WELLS
- MUNICIPAL PRODUCTION WELLS
- MONITORING WELLS
- EXTRACTION WELLS
- 5 — TCE ISOCONCENTRATION (MCL = 5 ug/L)
- NS — NOT SAMPLED
- J — THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE.

RESULTS THAT ARE *GREEN* EXCEED THE EPA MCL (MAXIMUM CONTAMINANT LEVELS)

400 200 0 400
SCALE IN FEET

SOURCE: ADVANCED GEOSERVICES - DRAFT SAMPLING AND ANALYSIS PLAN - JUNE 2000

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